

**National Sports Academy "Vassil Levski"
Sofia, Bulgaria**

**International Scientific Congress
"Applied Sports Sciences"
1-2 December 2017**

PROCEEDING BOOK



International Congress



*Applied Sports Sciences
Sofia 2017*

WWW.ICASS2017.COM

INTERNATIONAL SCIENTIFIC CONGRESS

“APPLIED SPORTS SCIENCES”

1-2 December 2017
Sofia, Bulgaria

PROCEEDING BOOK

EDITORS OF THE PROCEEDING BOOK:

Prof. Tatiana Iancheva, DSc

Assist. Prof. Stefka Djobova, PhD

Assist. Prof. Milena Kuleva, PhD

SCIENTIFIC COMMITTEE

**Members of the Editorial board from
National Sports Academy
“Vassil Levski”**

**International members of the Scientific
committee**

Prof. Pencho Geshev	Prof. J. P. Verma
Assoc.prof. Nikolay Izov	Prof. Sidonio Serpa
Prof. Apostol Slavchev	Dr. Maria Efstratopoulou
Prof. Krasimir Petkov	Prof. Vassil Girginov, PhD
Prof. Ognyan Miladinov	Prof. Milovan Bratic, PhD
Assoc. prof. Ivan Maznev	Prof. Juris Grants, PhD
Prof. Daniela Dasheva	Prof. Dr. Nikolay Boyadzhiev D.M.
Prof. Latchezar Dimitrov	Prof. Yana Simova
Prof. Kiril Andonov	Prof. Trayana Djarova
Prof. Biser Tzolov	Assos. Prof. Vladimir Grigorov
Prof. Evgenia Dimitrova	Prof. Lence Velickovska, PhD
Prof. Rumian Hristov	Assoc. Prof. Sebahattin Devocioğlu
Prof. Bonka Dimitrova	Prof. Mehmet Gunay
Prof. Diana Dimitrova	Prof. Matthew J. Robinson, PhD
Prof. Svilen Neykov	Prof. Dr. Emin Ergen
Prof. Daniela Lyubenova	Prof. Argon Cuka
Prof. Dimitar Mihaylov	Prof. Janis Zidens
Assoc. prof. Albena Alexandrova	Prof. Luis Miguel Ruiz
Assoc. prof. Zdravko Stefanov	Prof. Kairat Zakirianov
Assoc. prof. Karolina Lazarova	Prof. Franja Fratrić

Design: Vladimir Ivanov, Stanislav Hristov and Ognyan Karamanchev

Printed and bounded by: BPS Ltd

Publisher: NSA Press

ISBN (Print): 978-954-718-489-3

ISBN (Online): 978-954-718-490-9

CONTENTS

	TRAINING, COACHING, SPORT PERFORMANCE	9
A.Manolova	BALANCE ASSESSMENT AFTER TWO TYPES OF BADMINTON TRAINING	11
E.Stoimenov, I.Kiuchukov, I.Yanev	IMPACT OF PRECEDING HANDSPRING UPON KINEMATIC CHARACTERISTICS OF DIFFERENT SALTO BACKWARDS	16
I.Dimova, A.Slavchev, G.Gutev, P.Petkova	SPECIFIC FEATURES OF STRUCTURE AND CONTENT OF THE PREPARATION FOR THE BULGARIAN NATIONAL RECORD OF ATHLETIC PENTATHLON (GIRLS UNDER 18)	21
K.Atanasov, Z.Zsheliaskova- Koynova	JUDO LEGENDS LOSE FROM OUTSIDERS	25
P.Peev, M.Gadev, B.Petrova	CHANGES IN ANAEROBIC POWER OF YOUTH SOCCER PLAYERS IN AN ANNUAL TRAINING CYCLE	30
R.Lambros, D.Shalamanova	STRUCTURE OF THE POWER POTENTIAL OF ADOLESCENT RACERS IN RUNNING AT 800M.	34
K.Dunayev, S.Seyranov	THE PREPARATION OF YOUNG BIATHLETES IN THE ANNUAL CYCLE	38
S.Bahchevanski	DETERMINATION THE MAIN INDICATORS OF SAILING PERFORMANCE IN OPTIMIST SAILOR'S	41
N.Kurtovic	QUANTIFICATION AND EVALUATION OF THE KATA PERFORMANCE IN SPORTS KARATE	46
G.Gutev	SPORT RESULTS DYNAMICS IN AGE ASPECT OF BULGARIAN 110M HURDLERS	52
I./Bonova, Y.Karabiberov, V.Mihajlov, B.Petrova, G.Maximov, K.Kisiov	COMPARATIVE ANALYSIS OF THE CHANGES IN THE CARDIO-PULMONARY TEST FOLLOWING A PROLONGED INTERVAL NORMOBARIC HYPOXIC TRAINING OF TRACK AND FIELD MIDDLE AND LONG DISTANCE RUNNERS	56
B.Dimitrova, N.Tankusheva, M.Petrova	FORECAST MODEL TO OPTIMIZE THE PREPARATION ON BALANCE BEAM	61
M.Petrova	EXPERT ANALYSIS OF THE FLOOR EXERCISE TRAINING SYSTEM	66
D.Velcheva	WORKOUT DYNAMICS OF NATIONAL TEAM IN RHYTHMIC GYMNASTICS WOMEN'S ENSEMBLE	70
G.Gantcheva, M.Damjanovska	RHYTHMIC GYMNASTIC MOVEMENTS AND FOLKLORE DANCES IN STUDENTS' COORDINATION ABILITIES	73
H.Guteva	SURVEY OF FEMALE FOOTBALL REFEREES ABOUT THEIR PHYSICAL CONDITION	77
R.Karapetrova, G.Stoykov, S.Stoykov	MODELLING ANTHROPOMETRY OF TENNIS PLAYERS (AGE 17-18-YEARS)	81
D.Zagorsky, M.Gikova, O.Tishinov	RELATIONSHIP BETWEEN JOINT MASTERY AT ONE HAND AND THE ANTHROPOMETRIC, KINEMATIC AND STABILOGRAPHIC CHARACTERISTICS OF SELECTED SPORTS TECHNIQUES IN SHOTOKAN-KARATE	85
Y.Yankov, T.Simeonova	PHYSICAL AND TECHNICAL READINESS OF 12 YEAR OLD BOYS FROM BASKETBALL CLUB SHUMEN	91
Y.H.ÜNLÜ	EXAMINING THE EFFECTS OF STRENGTH BUILDING EXERCISES ON THE STAGE PERFORMANCE OF PROFESSIONAL FOLK DANCERS	97
V. Tsvetkov, M. Gadev, P.Peev	DETERMINATION OF MOTOR MOBILITY SPEED ZONES FOR PLAYERS FROM AGE GROUPS U16 AND U17	102
Vesela Ivanova	ASYMMETRY IN THE DEVELOPMENT OF THE MOTOR QUALITIES	106

V.Kotev	MAIN TRENDS IN ORGANIZING THE ATTACK OF THE BRAZILIAN NATIONAL VOLLEYBALL TEAM ON MEN'S WORLD CHAMPIONSHIP POLAND2014	110
G.Ignatov, E.Atanasov	RESEARCH OF THE PRESSING APPLIED BY THE NSA „VASSIL LEVSKI“ FOOTBALL TEAM, DURING THE NATIONAL STUDENT CHAMPIONSHIP OF BULGARIA	115
I.Lazarov	COMPARATIVE ANALYSE OF BASIC PHYSICAL MARKS WITH MEN AND WOMEN – RUNNERS OF MIDDLE AND LONG DISTANCES	120
M.Živković, V.Jovanović, K.Herodek, Z.İlanović, V.Antić	DIFFERENCES IN THE MOTOR ABILITIES OF FOOTBALL PLAYERS IN RELATION TO THEIR POSITION ON THE TEAM	126
M.Borukova, M.Kuleva, A.Tsarova	FACTOR STRUCTURE AND BASIC FACTORS OF THE SPORTS PREPAREDNESS OF 15-16 YEARS OLD NATIONAL BASKETBALL COMPETITORS	131
B.Zauranbekov, L.Kudashov, N.Kafer, ZI Andreyushkin, I. L., Kudashov, E.S.	STUDY OF THE DYNAMICS OF PHYSICAL QUALITIES OF STUDENTS OF BASKETBALL IN THE ANNUAL MACROCYCLE	136
M.Akhmetkarim R.Tzarova, L.Kudashova, N.Kefer, I.Andryushkin	MORPHOLOGICAL MODEL RELATIVE INDICATORS OF STUDENTS – BASKETBALL PLAYERS IN PRE-CONTEST PERIOD	141
R.Dyussupova, L.Kudashova, Zh.Dyussupova	FORMATION OF THE CULTURE OF INTERNATIONAL COMMUNICATION OF PHD DOCTORS OF THE SPECIALTY “PHYSICAL CULTURE AND SPORTS”	145
I.Yazarer, M.Borukova, A.Tsarova	COMPARATIVE ANALYSIS OF THE PHYSICAL DEVELOPMENT AND SPECIFIC EFFICIENCY OF STUDENTS-BASKETBALL PLAYERS FROM TURKEY	149
M.Đurović, T.Okčić, D.Madić, M.Dopsaj, V.Thanopoulos, G.Rozi, M.Pešić, M.Trivun	THE INFLUENCE OF FLEXIBILITY ON THE SPECIFIC MOTOR SKILLS IN BOY-SWIMMERS AGED 10–12	154
V.Petkova, S.Yordanov	CHARACTERISTICS AND ADVANTAGES OF THE EDUCATIONAL AND TRAINING PROCESS IN CHESS OF CHILDREN-TWINS	159
Z.Tasevski, N.Markovski, S.Gontarev	ANTHROPOMETRICAL CHARACTERISTICS AND SOMATOTYPE OF YOUNG MACEDONIAN SOCCER PLAYERS AGED 11–18	163
U.Mitrović, D.Bjelja	MULTILAYERED EFFECTS OF NEW MEDIA AND SOCIAL NETWORKS ON CONTEMPORARY SPORTS	168
	SPORT FOR PERSONS WITH DISABILITIES AND INCLUSIVE PHYSICAL EDUCATION	173
F.Akcakoyun, V.Mutlu, Z.Punduk, Y.Alper, Z.Göktaş	EATING HABITS AND PHYSICAL ACTIVITY OF GRADE 9 AND 12 STUDENTS IN BALIKESİR SCIENCE SCHOOL	175
E.GÜLGÖSTEREN, P.DEMİRCİ, A.DEMİRCİ, N.DEMİRCİ	WHAT SHOULD BE MINDED WHEN FAMILIES WITH DISABLED CHILDREN ARE PLANNING A SUMMER VACATION?	178
V.Alexandrova	ADAPTED SWIMMING FOR CHILDREN WITH DOWN SYNDROME	184
A.Evald, M.Albert, E.Dimitrova	SURVEYING THE INFLUENCE OF THE KINESITHERAPEUTIC COMPLEX ON THE SOCIAL AND MENTAL STATUS OF STUDENTS WITH VISUAL DISTURBANCES	187
	SPORT PSYCHOLOGY, PHILOSOPHY	193
Z.Zsheliaskova-Koynova	RELATIONSHIPS BETWEEN PSYCHOLOGICAL CHARACTERISTICS AND SPORT PERFORMANCE IN ORIENTEERING	195

I.Ivanov, G.Ignatov	COGNITIVE STYLES OF ELITE FOOTBALL REFEREES IN BULGARIA	200
L.Rogaleva, V.Malkin, A.Kim, N.Khon	ATTITUDES OF YOUNG HOCKEY PLAYERS OF 6–7 YEARS TO COMPETITIONS	205
V.Malkin, L.Rogaleva, I.Mamaeva	USE OF PSYCHODIAGNOSTICS IN THE WORK OF A COACH	209
M.Zdravcheva, K.Zgurovski	STUDY OF SITUATIONAL ANXIETY IN SNOW SPORT COURSES	214
T.Iancheva, M.Kuleva	GOAL ORIENTATION AND COPE WITH SUCCESS IN SPORT	218
L.Doncheva	PSYCHOLOGY OF LANGUAGE LEARNING – MOTIVATION AND LANGUAGE IDENTITY	224
T.Andonova	IMPROVEMENT OF THE PSYCHO-EMOTIONAL STATE OF PARAOLYMPIC SHOOTERS	228
M.Georgiev, N.Mladenova,, L.Doncheva	STRUCTURAL MODEL OF BURNOUT DETERMINING FACTORS WITH ATHLETES	231
I.Presnyakov, I.Andruchshin, Y.Denisenko, A.Geraskin, D.Presnyakov	PERSONAL FACTORS DETERMINING THE EFFECTIVENESS OF SKILLED PLAYERS	236
E.Savcheva	TYPOLOGICAL CHARACTERISTICS IN NATIONAL FENCING ATHLETES	241
SPORT AND TECHNOLOGIES		245
I.Nedelchev	SWOT ANALYSIS OF MOBILE SOLUTIONS FOR HEALTH PREVENTION, PROMOTION, AND FITNESS ACTIVITY	247
S.Napolitano, A.Ascione	STUDY OF INDIVIDUAL TACTIS IN WATER POLO THROUG VIDEO ANALYSIS	250
D.Stankovic, M.Kostadinovic	OPINION AND ATTITUDES OF CHILDREN HIGHER GRADES OF PRIMARY SCHOOL ON ELECTRONIC SPORTS	256
I.Kabulbekova, L.Kudashova, E.Kudashov	BIOPEDAGOGICAL MODELING OF SPORTS PREPARATION OF VOLLEYBALL PLAYERS OF HIGH QUALIFICATION	259
Z.Kuderiyevev	CONTENT BASES OF GAMES IN AGONISTICS IN KAZAKHSTAN	265
SPORT MEDICINE, EXERCISE PHYSIOLOGY, BIOMECHANICS, NUTRITION		271
G.Vanlyan, D.Dimitrova	STUDY ON THE FACTORS FOR MENSTRUAL DYSFUNCTION IN FEMALE ATHLETES	273
Z.Punduk, A.Hismiogullari, K.Rahman	AGE SUPPLEMENTATION MODULATES IL-6, IL-10 AND HSP27 RESPONSE IN HEALTHY MEN: EFFECT ON THE MUSCLE STRENGTH	278
V.Panayotov, K.Petkov, N.Iankova, J.Karabiberov	IMPLEMENTING A CUSTOMISED SOFTWARE FOR WEIGHT MANAGEMENT OF OVERWEIGHT AND OBESE PEOPLE	284
E.Miloshova	HEALTHY LIFESTYLE – A SURVEY AMONG YOUNG BULGARIANS	288
N.Zaekov, G.Bogdanov, M.Baymakova, M.Zaharinova	ANTHROPOMETRIC NUTRITIONAL STATUS OF 11–14 YEAR OLD PUPILS OF SOFIA MUNICIPALITY	292
B.Ilinova, M.Toteva.	ANTHROPOMETRIC AND SOMATOTYPE CHARACTERISTICS OF RACERS IN DIFFERENT SKI EVENTS	296
B.Jorgic, K.Petrović, S.Milenković, D.Živković	PILATES EFFECTS ON SPINAL COLUMN POSTURAL STATUS: A SYSTEMATIC REVIEW	299
I.Ivanov	WHOLE BLOOD VISCOSITY CHANGES AT COAGULATION UNDER COUETTE FLOW	304

M.Zaharinova, N.Zaekov, K.Rankov, M.Nikolova	CHRONOTYPE IDENTIFICATION OF BULGARIAN SPORTS STUDENTS	308
N.Stojiljković, M.Bratić, S.Pantelić	HEALTHY AGING – THE ROLE OF SPORT SCIENCE	313
M.Mathunjw, S.Mugandani, A.Kappo, S.Ivanov, T.Djarova-Daniels	MOTOR ABILITY PROFILE OF JUNIOR AND SENIOR MALE SOUTH AFRICAN TAEKWONDO ATHLETES	318
S.Mugandani, T.Djarova-Daniels	DIFFERENCE IN THE DISTRIBUTION OF SELECTED BLOOD VARIABLES AMONG ATHLETES DURING A COMPETITION PERIOD	323
Dilyana Zaykova, Lubomir Petrov, Albena Alexandrova	USE OF NUTRITIONAL SUPPLEMENTS BY MALE GRECO-ROMAN WRESTLERS	326
HEALTH AND FITNESS		331
M.Angelcheva	EXTRACURRICULAR SPORT ACTIVITIES AND INSTITUTIONALIZED CHILDREN. SOCIALIZATION EFFECTS	333
P.DEMIRCI, N.DEMIRCI, E.DEMIRCI	THE EFFECTS OF EATING HABITS, PHYSICAL ACTIVITY, NUTRITION KNOWLEDGE AND SELF-EFFICACY LEVELS ON OBESITY	337
I.Nesheva	DYNAMICS THE RR FOR EVALUATION OF INTENSITY OF PHYSICAL ACTIVITY UNTO PREGNANT WOMEN	343
S.Kolimechkov, L.Petrov, A.Alexandrova	PHYSICAL ACTIVITY ASSESSMENT USING A MODIFIED PAQ-C QUESTIONNAIRE	346
D.Zivkovic, N.Randjelovic, M.Djordjevic, D.Pirsl	CHANGES OF PARAMETERS OF METABOLIC SYNDROME UNDER THE INFLUENCE OF TRAINING PROGRAM	351
PHYSICAL EDUCATION, QUALITY IN PHYSICAL EDUCATION, TEACHING AND LEARNING		357
E.Mileva, I.Klincarov, B.Popeska, M.Kovac, G.Starc	TENDENCIES IN THE DEVELOPMENT OF SCHOOL PHYSICAL EDUCATION IN BULGARIA, MACEDONIA AND SLOVENIA	359
A.Buyuklieva	ANALYZING TEST RESULTS IN BILATERAL DEVELOPMENT AT 5–7 YEAR OLDS	364
I.Vladova	ATTITUDES OF THE STUDENTS AT THE NATIONAL SPORTS ACADEMY “VASSIL LEVSKI” TOWARDS WORK IN MULTICULTURAL ENVIRONMENT	370
B.Popeska, I.Klincarov, E.Mileva, N.Goran	EDUCATION OF PHYSICAL EDUCATION TEACHERS IN PRIMARY SCHOOL LEVEL IN MACEDONIA AND BULGARIA	375
N.Zhunisbek, N.Mavrudieva, L.Kudashova, N.Kefer, I.Andrewishkin, E.Kudashov	SCIENTIFIC SUBSTANTIATION OF EFFICIENCY OF CONTROL OF PHYSICAL PREPATIVITY OF HANDBALL	380
Y.Nasiyev, M.Shepetyuk, B.Konakbayev, B.Dzhamberbayev	FORMATION OF JUDO TECHNIQUE, USING OF THE BASE OF TECHNICAL PREPARATION OF WRESTLERS OF NATIONAL WRESTLING “KAZAKH KURES”.	385
S.Abildabekov, I.Andruchishin,	FEATURES OF CHANGES IN INDICATORS OF PHYSICAL PREPAREDNESS OF 6–9 GRADE STUDENTS	391
SPORTS PEDAGOGY, CREATIVITY AND INNOVATION IN THE EDUCATIONAL SYSTEM AND MOTOR DEVELOPMENT AND MOTOR LEARNING		397
L.Dimitrova	SURVEY OF CHESS “PROFILE” OF SECONDARY SCHOOL PUPILS	399

V.Slavova, N.Iankova, V.Panayotov	STUDY OF THE APPLICATIONS OF PUNISHMENT AS AN EDUCATIONAL METHOD	402
B.Dimitrova	RECREATIVE INDUSTRY, INNOVATIONS AND THE BULGARIAN EDUCATIONAL MODEL FOR SPECIALISED STAFF	406
K.Zgurovski, M.Zdravcheva	MODERN DESIGN OF A CHILDREN 'S ZONE IN NATURAL PARK VITOSHA	411
N.Mavrudieva, D.Zhunisbek, P.Mavrudiev, M.Kuleva	FACTORIAL STRUCTURE OF PHYSICAL DEVELOPMENT AND PHYSICAL ABILITY OF STUDENTS	417
B.Peneva, V.Chernev, L.Borisov	POSITIVE AND NEGATIVE CHARACTERISTICS OF THE WESTERN THEORIES FOR MOVEMENT LEARNING	421
M.Kuleva	DETERMINING CRITERIA FOR EVALUATING THE EFFICIENCY OF THE EDUCATION IN A DISTANCE LEARNING PLATFORM	424
	SPORTS MANAGEMENT, INTEGRITY OF SPORT, GOOD GOVERNANCE, LEGAL ISSUES AND VOLUNTEERING	429
V.Dimitrov	INTEGRITY OF SPORT, GOOD GOVERNANCE, LEGAL ISSUES	431
Se.SAMUR	UEFA CRITERIA AND CLUB MANAGEMENT	435
S.Djobova	THE ROLE OF SPORT IN THE MODEL OF EU YOUTH POLICY	440
	ETHICS, SOCIOLOGY, SPORT STATISTICS AND ANALYSES	443
A.Dimitrova	SOCIAL INTEGRATION OF PEOPLE WITH DISABILITIES IN THE FIELD OF SPORT	445
P.SCHOLZ	ON THE FOOTBALL TERRACE IN THE CZECH REPUBLIC	449
J.Gošnik, K.Žažar	HEALTH AND SOCIAL ASPECTS OF CONDUCTING SPORTS ACTIVITIES	455
	PHYSIOTHERAPY IN ORTHOPEDICS AND TRAUMATOLOGY	461
L.Sazdova,	CLOSED KINETIC CHAIN EXERCISES FOR TRAINING OF THE DYNAMIC STABILIZATION IN SHOULDER IMPINGEMENT SYNDROME	463
N.Popova, G.Petrov, D.Mileshkina, I.Nesheva	PROGRESSION OF THE PHYSICAL ACTIVITY AFTER DELIVERY BY CAESAREAN SECTION	469
T.Grueva, K.Stambolieva	STABILOGRAPHY A RELIABLE METHOD FOR MEASUREMENT OF POSTURAL BALANCE IN PATIENT AFTER ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION	474
D.Mileshkina, D.Popova-Dobreva, N.Popova	DISTRIBUTION OF LOWER LIMB EDEMA IN PREGNANT WOMEN	478
V.Taskova, S.Rusev, D.Ganchev	INJURY ASSESSMENT OF ANTERIOR TALOFIBULAR LIGAMENT IN KARATE ATHLETES	482
R.Tasheva, K.Kolev, V.Belchev, V.Dalev, D.Popova, G.Mitrev	DIAGNOSTIC OF THE FOOT IN CHILDREN VIA A TENSOMETRIC PLATFORM	485
Hudáková Z., Lysá E., Lesňáková A., Kurzeja P.	POSITION AND STABILITY OF THE BODY IN CASE OF CHILDREN IN YOUNGER SCHOOL AGE	488
Lesňáková, A., Hudáková, Z., Kolárová, M., Rusnák, R.	INTERDISCIPLINARY COOPERATION IN DEALING WITH SPINAL DISEASES	493
	PHYSIOTHERAPY IN CARDIO AND RESPIRATORY DISEASE	499
A.Dimitrova, Z.Koleva, I.Maznev, N.Izov, D.Lubenova, K.Grigorova- Petrova, M.Nikolova	PHYSICAL THERAPY PROGRAM IN PATIENTS WITH TRANSCATHETER AORTIC VALVE IMPLANTATION	501

M.Nikolova, N. Izov, I.Maznev, I.Ivanov, D.Vasileva, A.Dimitrova, K.Grigorova-Petrova	PHYSIOTHERAPY IN PATIENTS WITH CHRONIC RESPIRATORY FAILURE IN CLINICAL STAGE	506
PHYSIOTHERAPY IN NEUROLOGY AND PSYCHIATRY		511
D.Lyubenova, T.Bizheva, N.Izov, I.Maznev, A.Dimitrova	PRINCIPLES OF MODERN PHYSIOTHERAPY AFTER SURGICAL TREATMENT OF LUMBAR SPINE PAIN (REVIEW ARTICLE)	513
T.Bizheva	THE INFLUENCE OF PHYSIOTHERAPY ON GAIT AFTER SPINAL SURGERY	518
D.Vasileva, N.Izov, I.Maznev, D.Lubenova, K.Grigorova-Petrova	MOTOR ACTIVITY IN PATIENTS WITH SUPRATENTORIAL UNILATERAL STROKE	521
D.Marinova	USE OF PHYSIOTHERAPY TO IMPROVE FATIGUE IN PATIENTS WITH MULTIPLE SCLEROSIS	526
PHYSIOTHERAPY IN PEDIATRICS AND GERIATRICS		531
N.Gencheva, A.Malinova, R.Mitrova	APPLICATION OF A PHYSIOTHERAPEUTIC PROGRAM IN CHILDREN WITH PNEUMONIA	533

TRAINING, COACHING, SPORT PERFORMANCE

BALANCE ASSESSMENT AFTER TWO TYPES OF BADMINTON TRAINING

Anna Manolova

National Sports Academy “Vassil Levski”, Sofia, Bulgaria

Summary:

The purpose of the present study is to investigate the effect of two types of badminton training (specific and technical and tactical) on balance. Taking into account this purpose, 22 young badminton players (age 11 to 15 years) participate in the study. Methodology: Stork balance stand test, modified Bass test and Star excursion balance test were used to determine balance. All subjects performed the tests pre- and post- 60- minute- training session. The two types of training were performed in different days.

Results: At the pre-test significant difference between the right and left foot at the Stork balance stand test and the posterolateral direction of the Star excursion balance test was observed. Significant decrease of the results after both types of training was reported at the modified Bass test, the right leg in the Stork balance test and the left leg's posteromedial direction in the Star excursion test. After 60 minutes of specific training a decrease at the results in anterior direction in the right foot was observed. Only the modified Bass test showed significant differences between the two types of training.

Conclusions: This study shows that both trainings lead to decrease of balance ability. Taking this in consideration the balance training should be performed prior to the main part of the training session.

Key words: badminton, balance assessment

Introduction

Nowadays badminton is one of the most popular played racquet sports in the world. The Badminton World Federation (BWF) assessed that about 150 million people play the game and more than 2 000 participate in international competitions. It is the fastest racquet sport with a structure characterized by repetitive actions of short duration, requiring compound of speed, power, agility, strength, flexibility and balance ability.

For many years specialists have been interested in the role of balance in performance. Simply, balance can be defined as “the ability to maintain the body's center of gravity within the limits of stability as determined by the base of support” (Yim-Chiplis, 2000). Balance control involves the interaction of the neurologic, musculoskeletal, proprioceptive, vestibular and visual systems. Postural control (balance) can be classified as static and dynamic. Static postural control tries to maintain a base of support while minimizing movement of body segments and the center of mass, and dynamic control involves the completion of a functional task with purposeful movements without compromising an established base of support (Gribble, 2004; Kahle, 2009). Loss of balance during fast side-to-side movements may contribute to lower limb injuries. The lack of balance is often a result from muscular fatigue, which leads to a decrease in neuromuscular control.

Fatigue is defined as a reduction in force production capacity regardless of the performed movements (Erik, 2004). In order to investigate the effects of fatigue on postural control system, different techniques have been used to exhaust body and limbs, specially lower limbs, which include isokinetic contractions (Yaggie, 2002), repetitive motions (Olmsted, 2004), isometric contractions (Forestier, 2002; Sarshin, 2011). But these methods turned out to be not practical and relevant to any kind of sport, so the researches have defined functional fatigue protocols (Aydoğmuş, 2015; Rowe, 1999; Sparto, 1997). Most of the studies which have been reviewed concluded that fatigue resulted in a reduction in postural control.

Performing of badminton skills in a better way during a match requires an advanced function of lower limbs and dynamic postural control. Considering this it is necessary to examine the probable relationship between the whole body fatigue and postural control by using a functional fatigue protocol similar to the badminton and its events (Sarshin, 2011).

Aim of the study

The purpose of the study is to investigate the effect of the fatigue, induced by two different kinds of badminton specific work, on balance ability.

Methods

Participants

Twenty-two young badminton players, aged between 11 and 15 (boys=9, girls=13), agreed to participate in the study. All the participants in the study did not have any health problems or disability, and had at least 1-year prior badminton experience.

Protocol

Participants attended three training sessions that included assessment of static balance (using the Stork balance stand test), dynamic balance (using the modified BASS test and the Y balance test), and leg length. For assessment of leg length, we used a tape measure to determine the distance (to the nearest millimeter) between the anterior superior iliac spine and the most distal portion of each lateral malleolus of the same leg (Plisky, 2006). At the first training session the participants were given practice trials to become familiar with the testing procedures and at the same session were received the pre-test results. The second session (on the next day) was 60-minute specific badminton training, after which some post-test results were collected. The third session was 60-minute technical and tactical training, after which some post results were also collected.

Procedures

To perform the Stork balance stand test, each boy or a girl stood first on his dominant foot, with his/her opposite foot against the inside of the supporting knee, and both hands on his hips. At the start signal, each participant raised the heel of the dominant foot from the floor and attempted to maintain balance as long as possible. The trial ended if the participant either moved his hands from his hips, the ball of the dominant foot moved from its original position, or his heel touched the floor. Then the test was done when the boys and girls stood on the other leg. Each participant performed this test three times, with only the best time used in data analysis. The time between trials was within 5 and 10 seconds. Standard protocol for implementing this test suggests stopping the test once a participant achieves the norm of 45 seconds (Hobbs, 2008).

For the modified Bass test, eleven pieces of tape (1" X ¾") were placed in the pattern shown in Figure 1. When ready, the participant: 1) stood with the right foot on the starting mark and the left foot elevated; 2) leapt to the first tape mark, landed on the ball of the left foot, and attempted to hold this position for

5 seconds; 3) leapt to the second tape mark, landed on the ball of the right foot, and attempted to hold for 5 seconds; and 4) continued to the other tape marks. The test scoring was following: 5 points for landing successfully on the tape mark; 1 point for each second (up to 5 seconds) the steady position was held on the tape marks. A maximum of 10 points per tape mark and 100 points for the test could have been earned. The participant was not rewarded the 5 points for landing if: fail to stop upon landing; touch the floor with any part other than the ball of the landing foot; fail to completely cover the tape mark. If the participant landed successfully on the tape mark but committed any of the following errors before completing the 5-second count, the point count was immediately stopped: touch the floor with any part other than the ball of the landing foot; fail to hold the landing foot steady (Tsigilis, 2001).

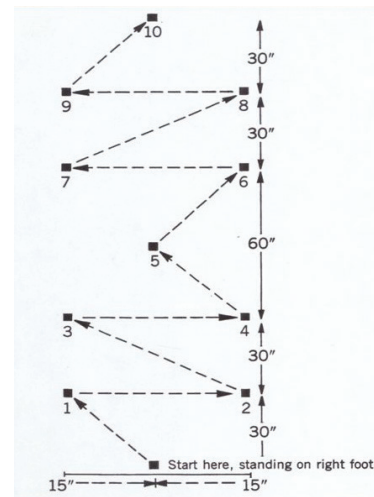


Figure 1 – Modified BASS Test

For the Y balance test participants stood on one leg on a center of Y - Junction shape surface. While maintaining single-leg stance, the player was asked to reach with the free limb in the anterior, posteromedial, and posterolateral directions in relation to the stance foot. The maximal reach distance was measured by marking the tape measure with erasable ink at the point where the most distal part of the foot reached. The trial was discarded and repeated if the player: fail to maintain unilateral stance; lift or move the stance foot from the grid; touch down with the reach foot; fail to return the reach foot to the starting position. The process was repeated while standing on the other leg. The greatest of 3 trials for each reach direction was used for analysis of the reach distance in each direction (Plisky, 2006).

Training protocols

- Specific badminton training (60 minutes) – at this session were included: 5 min of slow running/ 2-3 min for warm up of all body segments/ ladder work (10 exercises x 3 times/ repeat)/ clock face jumps – 3 times in a roll/ 6 point shadowing partner (unpredictable) (10 times x 15 sec)/ cone work/ multi shuttle – full court, 5 times x 20 shuttles/ 2 against 1 exercises – 7 minutes/ 3 against 2 exercises – 7 minutes;
- Technical and tactical training protocol (60 minutes): 5 min of slow running/ 2-3 min for warm up of all body segments/ match on a half court – to 11 points with 4 different opponents, 2 games on forehand side and 2 on backhand side, without smash/ single math – each game with different opponent (the number of games depends on the remaining time)

Statistical Analyses

Data were analyzed using SPSS Version 16.0 software. Descriptive statistics (Mean \pm SD) were calculated for all variables. Data from pre-test and post-test and between the two different training protocols were compared with Pared Samples T test. Statistical significance was set at $p \leq 0.05$.

Results

The aim of the study is to investigate the effect of the fatigue on balance ability. The statistical analyses on pre- and post-test data show a significant difference after both types of training in the BASS test (table 1), the right leg in the Stork balance stand test (table 2) and the left leg's posteromedial direction in the Star excursion test (table 3).

Table 1. Pre- and Post-test comparisons for the BASS test

BASS	n	Pre-test Mean \pm SD	Post-test Mean \pm SD	t value	P (t)
Before and after ST	22	81.59 \pm 6.06	66.184.09 \pm	13.14	100.00*
Before and after TTT	22	81.59 \pm 6.06	72.64 \pm 5.38	7.99	100.00*

ST – specific training; TTT – technical and tactical training

* Statistically significant relationships

Table 2. Pre- and Post-test comparisons for the Stork balance stand test

Stork balance stand test		n	Pre-test Mean \pm SD	Post-test Mean \pm SD	t value	P (t)
Before and after ST	Left leg	22	3.86 \pm 1.74	3.39 \pm 1.57	1.57	86.78
	Right leg	22	5.16 \pm 2.68	3.36 \pm 1.18	3.40	99.73*
Before and after TTT	Left leg	22	3.86 \pm 1.74	3.55 \pm 1.63	1.04	69.12
	Right leg	22	5.16 \pm 2.68	3.28 \pm 1.13	3.59	99.83*

ST – specific training; TTT – technical and tactical training

* Statistically significant relationships

After 60- minute specific training a decrease at the results in anterior direction in right foot is observed (table 3).

Table 3. Pre- and Post-test comparisons for the Star excursion balance test

Star excursion balance test		Direction	n	Pre-test Mean \pm SD	Post-test Mean \pm SD	t value	P (t)
Before and after ST	Right leg	Anterior	22	76.64 \pm 8.77	73.829.36 \pm	2.44	97.63*
	Left leg	Post. medial	22	80.23 \pm 11.14	76.27 \pm 9.65	3.17	99.53*
Before and after TTT	Right leg	Anterior	22	75.36 \pm 9.72	73.82 \pm 9.36	1.16	74.11
	Left leg	Post. medial	22	80.23 \pm 11.14	76.95 \pm 9.09	2.42	97.54*

ST – specific training; TTT – technical and tactical training

* Statistically significant relationships The BASS test and right's leg anterior direction in the Star excursion balance test show a significant difference in the post-result between the two different training protocols (table 4).

Table 4. Differences in the post-test results after the two types of training

	n	After ST Mean \pm SD	After TTT Mean \pm SD	t value	P (t)
BASS	22	66.18 \pm 4.09	72.64 \pm 5.38	11.27	100.00*
SEBT; right leg; anterior direction	22	76.64 \pm 8.77	75.36 \pm 9.72	2.26	96.55*

ST – specific training; TTT – technical and tactical training

SEBT – Star excursion balance test

* Statistically significant relationships *Discussion*

At the pre-test results we see a difference between the right and the left foot in the Stork balance stand test and the posterolateral direction in the Star excursion balance test. We can explain these results with the biomechanical characteristics of the sport and the dominance of one of the legs. Regardless of the fact that the exercises are fulfilled bilateral so the both limbs can be properly trained, there are still bigger loads at the dominant leg during the game.

A first observation is that the fatigue has an initial effect on the control of balance; it yielded a significant decrease of the results in the BASS test, which is a test for accuracy and endurance. This decline of performance agrees with previous studies concerning the effect of strenuous fatigue on the control of upright standing posture (Yaggie, 2002). Decreases in the results in the Star excursion balance test (SEBT) are also observed from Sarshin et al. (2007) and Plisky et al. (2006). They found out that the neuromuscular inefficiency resulting from fatigue has an undesirable effect on the control role of the lower limb muscles responsible for the reaching distance. Moreover, the fatigue protocol can affect muscles' co-contraction which is necessary in performing reaching in SEBT and it can create some disorders in doing the act of reaching. The observed reduction of the results in the Stork balance stand test could result from muscular fatigue resulting from proprioceptive deficit in muscle receptors and loss of muscular reflexes responsible for dynamic joint stability (Fabunmi, 2011). According to Simoneau et al. with fatigue, muscle spindles tend to decrease their firing rate and the cortico-motor neuronal cells firing decreases and become more irregular, also fatigue induces greater variability or noise in the afferent signal and these initial changes could result in a poorer detection of the CP position (Simoneau, 2006).

There is a reduction in the balance performance after fatiguing exercises which leads to a bigger risk of injuries. Applying good exercise bouts which are conformed to the involving models during a

badminton match or training are recommended in order to reduce fatigue experience and improve physical fitness. It is also advisable to include balanced exercises in badminton training to minimize the risk of falls and injuries.

Acknowledgements

With gratitude to Badminton club NSA "V. Levski", Badminton club "Pobeda", Dupnitsa and associate professor Aneta Yaneva.

References

- Aydoğmuş, M., Aarslanoglu, E., Özmen, T., Effect of badminton specific training versus badminton match on aerobic fitness, *The Online Journal of Recreation and Sport*, 2015, Volume 4, Issue 2
- Erik, A. et al., Dynamic stabilization time after isokinetic and functional fatigue, *J Athl Train*, 2004, Volume 39
- Fabunmi, A., Lesi, A., Akosile, O., Effect of exercise induced fatigue on standing balance performance, *The 53rd ICHPER-SD Anniversary World Congress*, Egypt, 2011
- Forestier, N., Teasdale, N. and Nougier, V., Alteration of the position sense at the ankle induced by muscular fatigue in humans, *Med Sci Sports Exerc*, 2002, Volume 34
- Gribble, P. et al., The effects of fatigue and chronic ankle instability on dynamic postural control, *J Athl Train*, 2004, Volume 39
- Hobbs, M., Dynamic balance and basketball playing ability, 2008, Thesis for the degree Master of education, San Marcos, TX
- Kahle, N., The effects of core stability training on balance testing in young, healthy adults, 2009, Thesis for the Bachelor science degree, University of Toledo
- Olmsted, L., Hertel, J., Influence of foot type and orthotics on static and dynamic postural control, *J Sport Rehab*, 2004, Volume 13
- Plisky, Ph. et al., Star excursion balance test as a predictor of lower extremity injury in high school basketball players, *Journal of Orthopedic & Sports Physical Therapy*, 2006, Volume 36, Issue 12
- Rowe, A. et al., Effects of a 2-hour cheerleading practice on dynamic postural stability, knee laxity and Hamstring extensibility; *Journal of Orthopedic & Sports Physical Therapy* 1999, Volume 29
- Sarshin, A. et al., The effect of activity related fatigue

- on dynamic postural control as measured by the Star excursion balance test, *Journal of Biomechanics*, 2007, Volume 40
- Sarshin, A. et al., The effects of functional fatigue on dynamic postural control of badminton players, *Biology of exercise*, 2011, Volume 7.2
- Simoneau, M., Bégin, F., Teasdale, N., The effects of moderate fatigue on dynamic balance control and attentional demands, *Journal of NeuroEngineering and Rehabilitation*, 2006, 3:22
- Sparto, P. et al., The effect of fatigue on multijoint kinematics, coordination, and postural stability during a repetitive lifting task, *J Orthop Phys Ther*, 1997, Volume 25
- Tsigilis, N., Zachopoulou, E., Mavridis, T., Evaluation of the specificity of selected dynamic balance tests, *Perceptual and Motor Skills*, 2001, Volume 92
- Yaggie, J., McGregor, S., Effects of isokinetic ankle fatigue on the maintenance of balance and postural limits, *Arch Phys Med Rehabil*, 2002, Volume 83
- Yim-Chiplis, P., Talbot, L. Defining and measuring balance in adults, *Bio Rsrch for Nurs.* 2000, Volume 1

IMPACT OF PRECEDING HANDSPRING UPON KINEMATIC CHARACTERISTICS OF DIFFERENT SALTO BACKWARDS

Emil Stoimenov, Iliya Kiuchukov, Iliya Yanev

Summary

A comparison is made between salto backwards of different complexity, performed after round off and back handspring (salto backwards stretched, double salto backwards tucked and salto backwards stretched with 2\1 twist).

Six competitive gymnasts performed salto backwards stretched, double salto backwards tucked and salto backwards stretched with 2\1 twist from round off and backward handspring. The performances were videotaped with a 60 Hz video camera and analyzed independently utilizing the Ariel Performance Analysis System (APAS). The best gymnast's performances were selected for analysis. The left foot; the knee, shoulder, and elbow joints; the hand, and the top of the head digitized. The raw data were digitally smoothed with a cut-off frequency of 7 Hz before being submitted to further analysis. Data from the APAS were transferred to Microsoft EXCEL for further processing and presentation of results.

By the means of kinematic analysis, differences are found between the studied exercises. For the three exercises considered, higher kinematic values of the vertical component of the center of gravity velocity were established at the time of take-off of gymnast from the floor in the backward salto performance.

By the means of kinematic analysis, differences are found between the studied exercises. For the three exercises considered, higher kinematic values of the vertical component of the center of gravity velocity were established at the time of take-off of gymnast from the floor in the backward salto performance.

The obtained results can be used in optimization of the training process of teenage and elite gymnasts.

Key words: Artistic gymnastics, floor, variation in technique

Introduction

There is a constant striving towards increasing the efficiency of the motor motions education. According to each sport's specific features, the most rational approaches are searched for solving of variety of motor problems. In order to achieve the correct motor progress of the educated sportsmen, the sport pedagogue must have a profound knowledge about the biomechanics peculiarities of the motor events. Various aspects of the performance technic of floor exercises arouse the interest of a number of researchers. Geiblinger et al. (1995) examine some biomechanics characteristics at the performance of double salto backwards on floor exercise. R. Burgess и G. Noffal (2001) discuss difference of such indices as speed, touchdown angle, duration of the last supporting phase at saltos backwards performed by gymnasts with different qualification. P. Hedbávný, M. Kalichová (2011) examine the relation between the amount of rotation of the body around the longitudinal axis and touchdown angle at the last phase of the supporting period. Mkaouer et al. (2013) compare the biomechanics characteristics of salto backwards stretched, performed after back handspring and after tempo salto backwards. Farana et al. (2013) examine the influence of various options of placing of the hands at round off on reaction force and elbow joint torque.

A comparison is made between salto backwards of different complexity, performed after round off and back handspring (salto backwards stretched, double salto backwards tucked and salto backwards stretched with 2\1 twist).

Methodology

Six competitive gymnasts performed salto backwards stretched, double salto backwards tucked and salto backwards stretched with 2\1 twist from round off and backward handspring. The performances were videotaped with a 60 Hz video camera and analyzed independently utilizing the Ariel Performance Analysis System (APAS). The best gymnast's performances were selected for analysis. The left foot; the knee, shoulder, and elbow joints; the hand, and the top of the head digitized. The raw data were digitally smoothed with a cut-off frequency of 7 Hz before being submitted to further analysis. Data from the APAS were transferred to Microsoft EXCEL for further processing and presentation of results. Position of CG during saltos, horizontal speed of CG, angle formed between the horizontal and the connecting line of CG and the contact point of the feet with the support (touchdown angle and take off angle) are calculated (fig. 1).

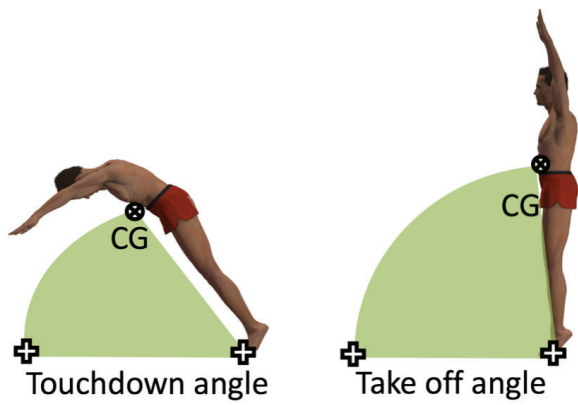


Figure 1. Touchdown angle and take off angle

Results

By the means of kinematic analysis, differences are found between the studied exercises. For the three exercises considered, higher values of the vertical component of the center of gravity velocity were established at the time of take-off of gymnast from the floor in the backward salto performance.

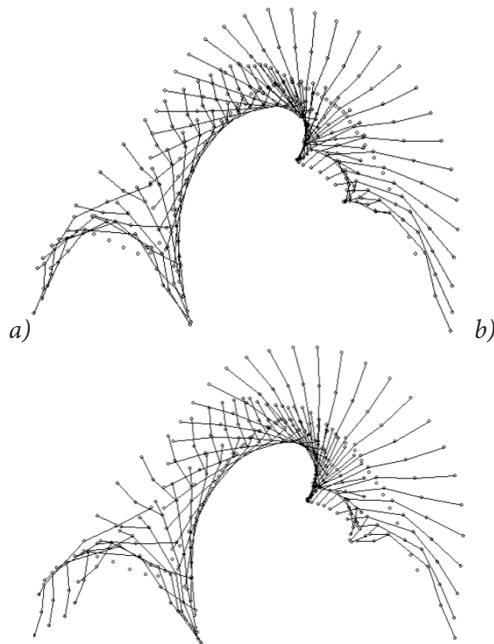


Figure 2. Salto backwards stretched after round off (a) and back handspring (b)

Performance of salto backwards stretched after round off (fig. 2a) touchdown angle is 47 degrees (fig. 3a), and after back handspring 53 degrees (fig. 3b).

Take off angle after round off is 86 degrees (fig. 3c), after backhandspring this angle is 83 degrees (fig. 3d). Horizontal speed after performance basic acrobatic gymnastics skills (round off and back handspring) before touchdown moment at performance round

off is 4,60 m/s and 4.75 m/s after back handspring. Regarding the height of both saltos, salto backwards stretched performed after back handspring is 2,46 m (fig. 4b), which is 10 cm higher than performance after round off - 2,36 m (fig. 4a).

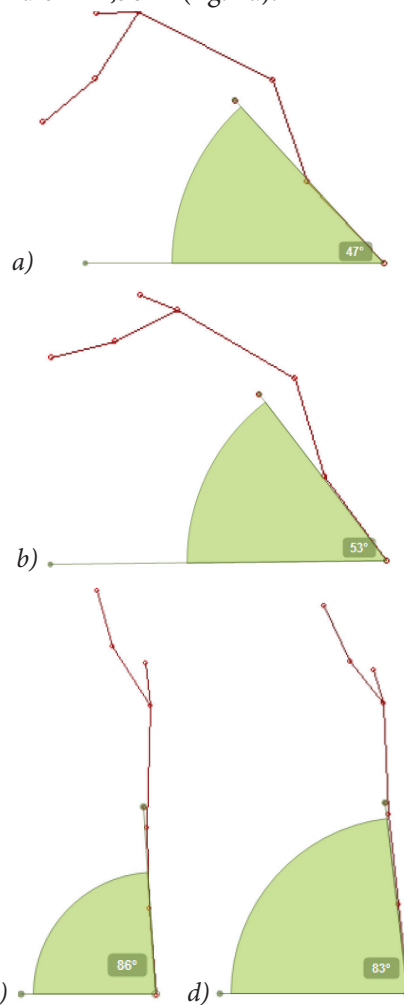


Figure 3. Touchdown and take off angle after round off and back handspring at salto backwards stretched

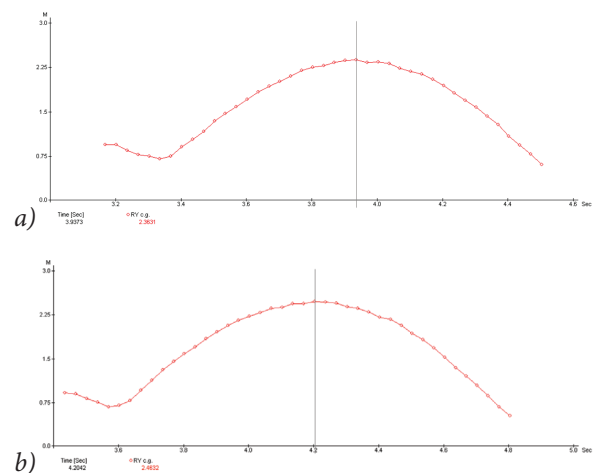


Figure 4. Position of CG at salto backwards stretched

performed after round off (a) and back handspring (b)

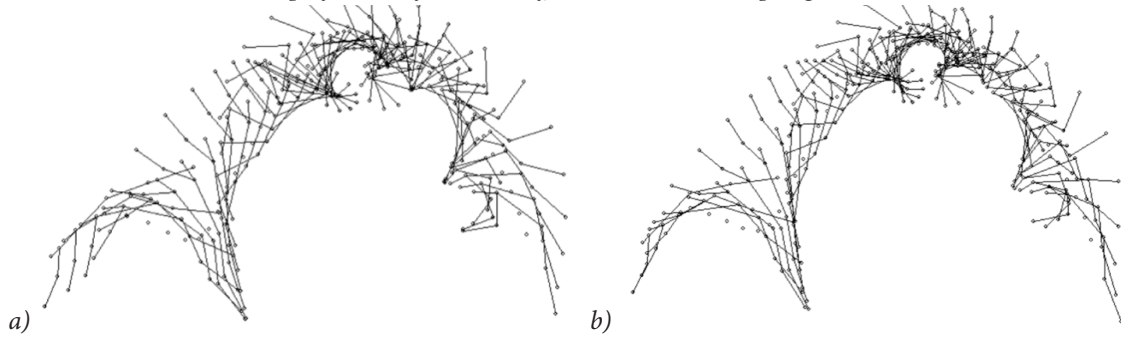


Figure 5. Double salto backwards tucked performed after round off (a) and back handspring (b)

It was found out that at performance of double salto backwards, touch down angle after round off entry is 51 degrees (fig. 6a), and after back handspring is 47 degrees (fig. 6b). In take-off phase angle is 81 degrees (fig. 6c) after round off and 81 degrees (fig. 6d) after back handspring. The horizontal speed after performance of both kinds of preparatory turns, is respectively 4.2 m/s after round off entry and 4.54 m/s after back handspring. Vertical CG offset, both in the salto backwards stretched and in the double salto backwards has a higher value after a back handspring – 2.52 m (fig. 7b) against 2.40 m (fig. 7a) performed after round off.

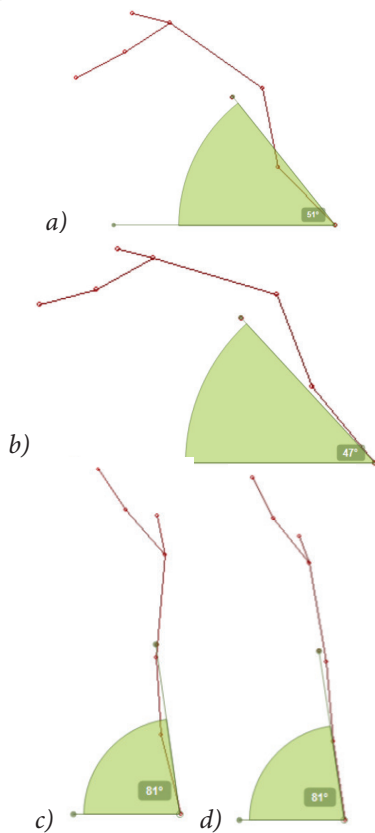


Figure 6. Touchdown angle and take off angle after round off and back handspring at double salto backwards

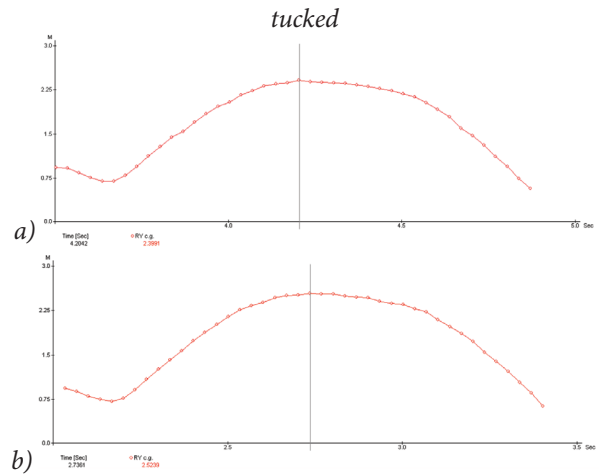


Figure 7. Position of CG at double salto backwards tucked performed after round off (a) and back handspring (b)

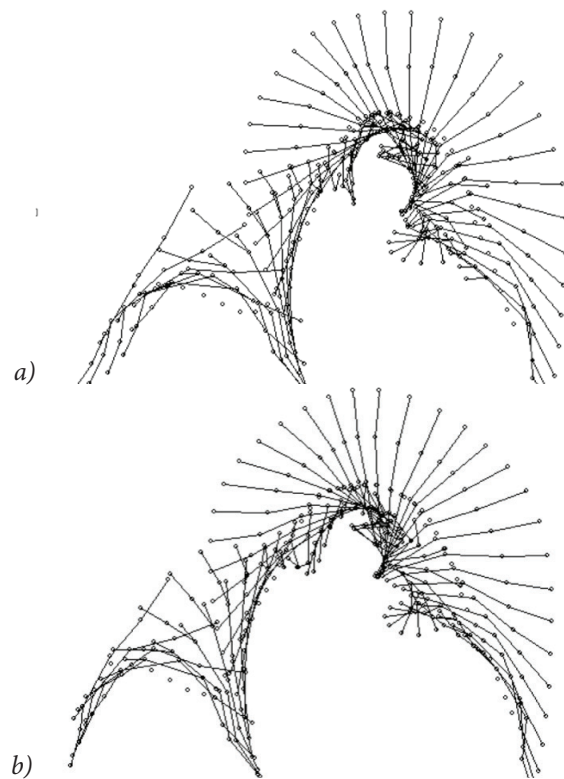


Figure 8. Salto backwards stretched with 2\1 twist performed after round off (a) and back handspring (b)

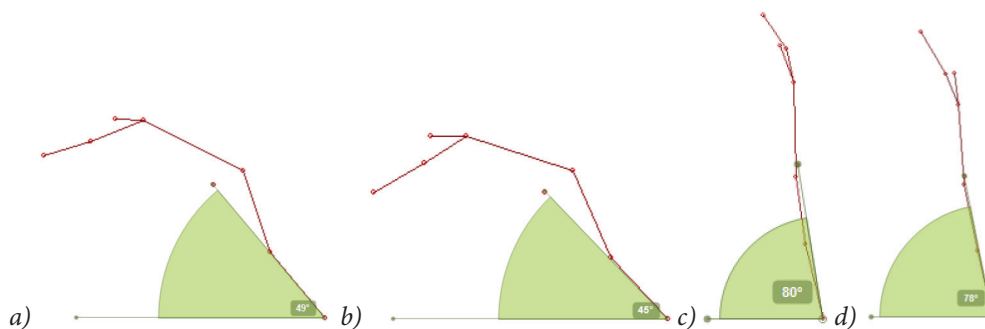


Figure 9. Touchdown angle and take off angle after round off and back handspring at salto backwards stretched with 2\1 twist

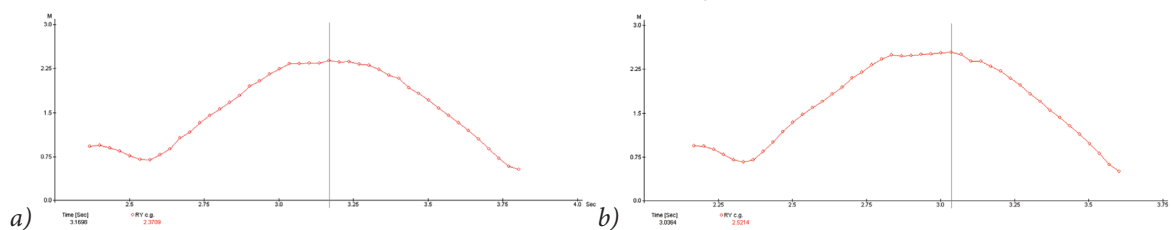


Figure 10. Position of CG at salto backwards stretched with 2\1 twist performed after round off (a) and back handspring (b)

At performance of salto backwards stretched with 2/1 twist after round off and back handspring the touchdown angle is 49 degrees (fig. 9a) after round off and 45 degrees (fig. 9b) after back handspring. The take-off angle is 80 degrees in performance after round off (fig. 9c) and 78 degrees after back handspring (fig. 9d). The horizontal speed during execution of the two types of preliminary handsprings is 4.09 m/s after round off and 4.68 m/s after back handspring. About the height, there are advantages in performance from back handspring where the height is 2.52 m (fig. 10b), which is 15 cm. higher than the performance after a round off entry, which is 2.37 m (fig. 10a).

Discussion

The performance capacity of the flight phase depends on the sportsman's actions in the final phase of the supporting period. The angular momentum, necessary for the non-support period, is provided by the acquired motion of the previous exercises (for example by round off or back handspring) and the added rotational impulse, as a result of the gymnast's actions in the last phase before the take-off from the support.

The comparative analysis of the studied exercises established that after the performance of back

handspring the horizontal speed of CG is higher compared to the performance after round off entry. The analysis showed that during performing of various saltos backward performed after back handspring a bigger height is achieved. The main indicator for a high level of performance and the ability to complicate an exercise is "the height of the salto". Research of impact of preceding handspring upon kinematic characteristics of different salto backwards, means that backward handspring before the main exercise leads to better conditions for its performance.

Conclusions

The knowledge of biomechanical regularities of the transition from support to flight phase may be useful for the pedagogue at the analysis of the performer's actions in practice. The established data refer to a limited number of performances. In our opinion, the performance of a bigger number of competitors shall be analyzed in order to achieve more definiteness of the conclusions in our future studies. The obtained results can be used in optimization of the training process of young and elite gymnasts. The study shows the quantitative advantages of the various preceding handspring, which can help the work of the coaches.

References

- Burgess, R., G. Noffal. (2001), Kinematic analysis of the back salto take-off in a tumbling series: advanced vs. beginner techniques. *19 International Symposium on Biomechanics in Sports, San Francisco USA*.
- Farana, R., D. Jandacka, J. Uchytíl, D. Zahradník and G. Irwin (2013), The effect of different hand position on impact forces and elbow loading during the round off in female gymnastics. *31 International Symposium on Biomechanics in Sports Taipei, Taiwan*.
- Geiblinger, H., W. E. Morrison & P. A. McLaughlin. (1995), Take-off characteristics of double back somersaults on the floor. *13 International Symposium on Biomechanics in Sports*. Thunder Bay Ontario, Canada, pp. 142-146.
- Hedbávný, P., M. Kalichová. (2011), Analysis of Take-off Phase of Somersaults with Twisting along the Longitudinal Body Axis. *World Academy of Science, Engineering and Technology*, 59, 2011, pp 590-593.
- Mkaouer, et al. (2013), Kinematic and Kinetic Analysis of Two Gymnastics Acrobatic Series to Performing the Backward Stretched Somersault. *Journal of Human Kinetics* vol. 37, pp.17-26.

SPECIFIC FEATURES OF STRUCTURE AND CONTENT OF THE PREPARATION FOR THE BULGARIAN NATIONAL RECORD OF ATHLETIC PENTATHLON (GIRLS UNDER 18)

Iva Dimova, Apostol Slavchev, Grigor Gutev, Petya Petkova
NSA "Vassil Levski", Sofia

Summary

The current report provides profound study of structure and content of the preparation cycle of the current national record holder U18. The aim of the study is to reveal the specifics of the training model. The main tasks are: reveal the individual model of competition and the specifics of the sports training, concerning the structure and distribution of training means. The analysis is based on the orientation of the training methodical units, which are primarily related to the individual disciplines of athletic pentathlon. The ratio of the relative and absolute number of methodical units is revealed and we also present their dynamics over time. Total volume of used athletic means during the preparation period was also determined. The individualities of the record holder define the competitor as a jumper-runner type athlete, according to the given highest scores of the disciplines high jump and 800 m running using the IAAF scoring table. Estimating of specific features of structure and content of the training process reveals reserves for optimizing its characteristics in order to develop some parameters of the training model, according the given age and specific characteristics of the athlete. Such a parameter is the number of training sessions. Mainly one training session a day is made. With an appropriate increase of the number of sessions made, it will be possible to increase the number of methodical units in those pentathlon disciplines which have not been sufficiently affected in the training process, which will inevitably improve the sporting results.

Introduction

The current report provides profound study of structure and content of the preparation cycle of the current national record holder U18. The aim of the study is to reveal the specifics of the training model. The main tasks are: reveal the individual model of competition and the specifics of the sports training, concerning the structure and distribution of training means. The analysis is based on the orientation of the training methodical units, which are primarily related to the individual disciplines of athletic pentathlon. The ratio of the relative and absolute number of methodical units is revealed and we also present their dynamics over time. Total volume of used athletic means during the preparation period was also determined. The individualities of the record holder define the competitor as a jumper-runner type athlete, according to the given highest scores of the disciplines high jump and 800 m running using the IAAF scoring table. Estimating of specific features of structure and content of the training process reveals reserves for optimizing its characteristics in order to develop some parameters of the training model, according the given age and specific characteristics of the athlete. Such a parameter is the number of training sessions. Mainly one training session a day is made. With an appropriate increase of the number of sessions made, it will be possible to increase the number of methodical units in those pentathlon disciplines which have not been sufficiently affected in the training process, which will inevitably improve the sporting results.

AIM: To reveal the main directions and milestones determining the specificity of the training model when placing the pentathlon national record for girls under 18 years of age.

Objectives

1. To estimate the athlete's type according her competitive activity as a criteria.
2. Disclosing the specifics of the athlete's sports training process, concerning the structure and the distribution of the arsenal of used athletic means.
3. Establishing the type of the used athletic means according (special, specialized, auxiliary[5]).

Key words: pentathlon, national record, model of training, U18

Introduction

Pentathlon is an athletic discipline that combines disciplines from the group of running, jumping and throwing. Combined events are very interesting to watch and although a competitor is whether first, second or last in the different disciplines, the aims is to collect the maximum number of points that are determined by standardized scoreboards.

Without having mastered and improved the technique of any discipline, it is inconceivable to achieve high sporting results. While in individual track and field athletics disciplines in training and competitive activity are more concentrated and purposfully, in combine events this effort is distributed into several directions. Moreover, the character of the pentathlon is a prerequisite for the emergence of com-

plex situations in preparation of the athletes [6].

The training process in combined events is very complex, prolonged and very tiring for the athletes. Often, more than one discipline is combined in the training session so that the training methodology to be fully developed at the good level for all the five or seven events. In recent years, as methodological recommendations, athletes focus on disciplines in which the current athlete has greater potential for development. However, the controversial outcome largely depends on the mental and moral values of the athletes [1]. Key factors for selecting good combined events'athletes are anthropometric indicators, age, endurance to heavy workloads, anteriorly development of force and technique in the later stages [2]. The pentathlon athletes are with very well-developed body, but still there are different types of athletes in the combined events, such as a runner type, jumper type, or a combined jumper-sprinter type and sprinter-thrower. Although these definitions are often used in training and competitive practice, they are not an exact criteria on which to classify individual types of competitors. According to Bäumlér, a science-based system is needed to avoid inaccuracies and the use of pseudo-terms [3]. Scientific publications recommend that for the best profile of universal athletes to use a relationship with the world's elite and thus can be evaluated the most promising structure of athletes for realizing their full potential [4].

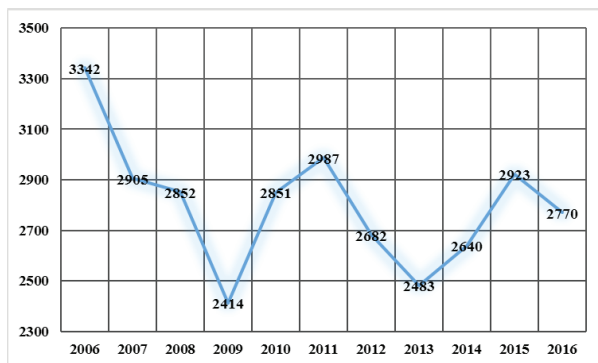


Figure №1 Dynamics of the sport results in the discipline for the period 2006-2016.

The competitor Iva Dimova managed to achieve an achievement of 3342 points in the pentathlon

for girls under 18 years during the winter championships in 2006. The impressive number of points stays up to now, remaining unattainable for current athletes in one of the toughest athletic disciplines. Figure 1 depicts the dynamics of the sporting result in recent years since the year of the record - 2016.

Methodology

To achieve the goal and the tasks assigned for the current article, information from the competitor's training books was registered and analyzed through the record-breaking macrocycle. The following data was formulated from training book.

- Methodological units, denoted by numbers as follows for disciplines: 1-60 m; 2-high jump ; 3-shot put; 4-long jump; 5-800 m). The structure, duration and focus of the training process as well as the arsenal of training means for the realization of the given result, were established; Their dynamics over time also.
- Ratio of the absolute and relative number of methodological units;
- Number of training sessions;
- Set of athletic means

Discussion and analysis

The unbeatable result of the competitor has been preserved until 2016, when a new record was set, in 2017, but this was due to a slight change in evaluating achievements in the IAAF scoring tables, resulting in a new national record. The new record for the age group equals to 2932 points. But if we compare the athlete's achievements to this year's winner in the combined event, we see results that are weaker (Table 1). There is have superiority in 3 of the 5 disciplines. Nevertheless, I. Dimova's record remains in the history of track records at a national level. Table 2 depicts the top 5 contestants in the year of placing the record, where the contestant is only beaten in two of the five disciplines – shot put and long jump. This is somehow explicable, because these two disciplines were not enough included in the training process (Figure 2).

Table №1

year	name		club	60 m h	HJ	SP	LJ	800 m	points
2006	IVA DIMOVA	90	Hebros-Harmanli	9,96	171	8,32	4,85	2:20,57	3342
2017	Viktoria Jordanova	1	SK Kostenev	9,53	1,54	9,44	4,79	2:49,61	2932

Table №2

Results of the first five athletes in the year of setting the national record for pentathlon

place	Name	club	60 m hurdles		high jump		shot put		long jump		800 m		points	
			result	points	result	points	result	points	result	points	result	points		
1	IVA DIMOVA	90	Hebros-Harmanli	9,96	720	171	867	8,32	420	4,85	519	2.20.57	816	3342
2	Milena Milkova	90	Levski-Sofia	10,05	703	135	460	7,46	365	5,17	606	2.33.34	652	2786
3	Aleksandra Ribarova	90	Dunav-Ruse	10,38	643	147	588	8,90	458	4,94	543	2.58.72	377	2609
4	Elina Georgieva	89	Athletic-Haskovo	10,41	637	150	621	7,66	377	4,77	498	2.48.84	476	2609
5	Maria Dundarova	91	Obosirshte-Panagurishte	10,90	553	141	523	7,36	358	3,98	303	2.59.29	372	2109

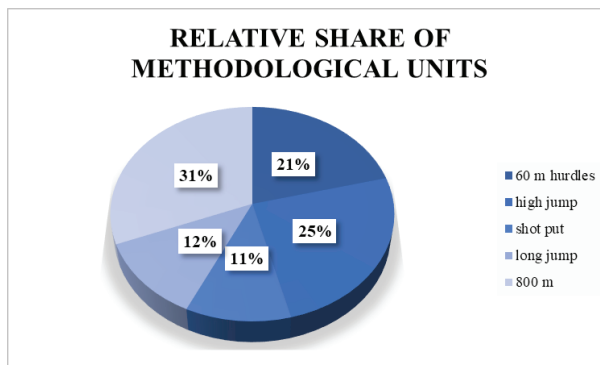


Figure № 2 Relative parts of methodological units through the whole training period

The structure of the competitor’s preparation consists of 1 macrocycle, which includes 5 meso-cycles. The training process lasts 22 training weeks (from September to mid-February). During this time

the competitor has done a total of 135 workouts, and two training sessions a day being a rare occurrence. The total set of athletic means used for each one of the disciplines in the pentathlon is 49.

Table №3

Distribution of methodological units in mesocycle and microcycle during the preparation.

september				october				november			
1	2	3	4	5	6	7	8	9	10	11	12
5	5	5	5,2	2,5	5	5,2	2,1,5	2	5,3	2	2,5
2,5	5	1,2	2,1	1,4	1,4	1	1	3,4	2,1	3	1
5	1	1	8	5	5,2	5,2	1,3,5	1	2	3,5	5
5	2	5	1	1,4	1	1	1,3,2,	2,1	1	1	3,4
4	4	5	2,3	4	5,2	5		5	5		4
5		2	4		5	2,3					
MU per mesocycle: 26 training sessions: 23				MU per mesocycle: 32 training session: 21				MU per mesocycle: 26 training session: 19			
december				january				february			
13	14	15	16	17	18	19	20	21	22		
4,5	3,5	3,5	1,2	2,5	1,4	5	5	5	5		
1,2	5	2	5	1	5,1	1	1,2	1,2	4		
1,2	2	3,5	1	1,4	3,5	5,4	2	1	1		
5	5	2,1	2	2,1	2	1	2,3,5	5	2,3		
3	3,5	5	2	1,2	2	2		1,4			
MU per mesocycle: 32 training session: 20				MU per mesocycle: 30 training session: 19				MU per mesocycle: 12 training session: 9			

In Figure № 3 the absolute values of the orientation of training sessions according to the different disciplines in combined events are presented. The lowest values were recorded in the long jump ranging between 2 to 4 times in the mesocycle. Shot put also varies in low values, and in November

and December the work done marks its peak. In November, we observed a drop in the values of all disciplines, except MU shot put, which slightly increased compared to the previous mesocycle. Undoubtedly the realized MU for 800 meters have the highest values.

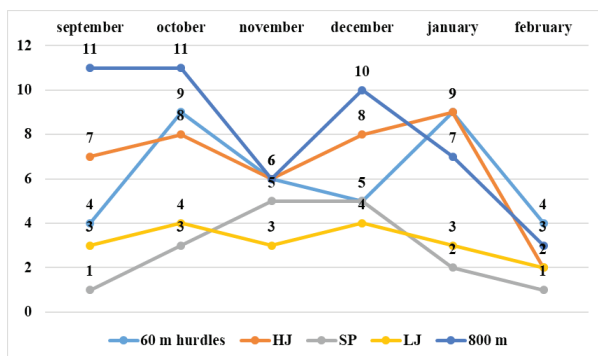


Figure № 3 Dynamics of methodological units distribution

The means used in the competitor’s training, classified on the basis of similarity and the difference to the main competition exercise (Special (SPC) Specialized (SPC) and Auxilary (SMP)), are represented on Fig. 4 by their relative percentages. The largest share is justifiably received by special funds, which are equivalent to 47%. Auxilary means are 33%, specialized means have the lowest percentage value of 20%.

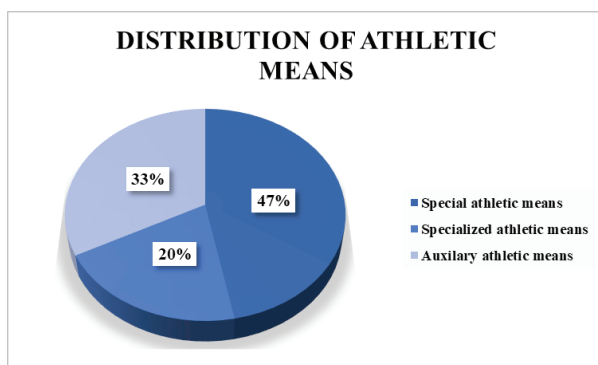


Figure №4 Distribution of the type of athletic means according to the theory Specialized diversity (M. Бъчваров)

Conclusions:

The competitor can be designated conditionally as a runner-jumper type, achieving highest scores in

800 meters and the high jump, and according to the IAAF scoring tables, the two achievements exceed the limit of 800 points. Sports achievements in the womens combined events in Bulgaria above this limit are not found among the other athletes, both in the year of record and in the years since then.

Concerning the content of the training preparation, we can claim that there are reservations about the number of training sessions. Adding same more second training session a day in the training process would definitely make it possible to increase the number of MU used, especially in disciplines which are less trained.

Thoroughly investigation of the content of the training preparation would provide further clarification on the specificity of the type of diversity of athletic means used, their volumetric values and their distribution during the sport training process. Such data would be of great scientific application value

References

Bilić, M. Determination of taxonomic type structures of top decathlon athletes. Acta Kinesiologica 9(S1), 20-23,2015.

Pavlović, R. et al., STRUCTURE OF THE ATHLETIC ALL-AROUND COMPETITION OF STUDENTS Ratko Acta Kinesiologica 10 Issue 2: 13-20,2016.

Stemmler, M. & Bäumlner, G. The Detection of Types among Decathletes using Configurational Frequency Analysis (CFA). Psychology Science, 47(3-4), 447-466, 2005.

Wang, Z & Lu, G. The Czech Phenomenon of Men’s Decathlon development. International Journal of Sports Science and Engineering, 1(3), 209-214., 2007.

Бъчваров, Д., Тренировка в седмобоя за жени, София,1984

Бъчваров, М. ,Спортология, София, 2000.

JUDO LEGENDS LOSE FROM OUTSIDERS

Konstantin Atanasov, Zshivka Zsheliaskova-Koynova

Abstract

Introduction. Since Judo first showed up in the Olympic Arena (Tokyo, 1964) we have observed many top-ranked Judokas losing from athletes classified as “Outsiders”. How exactly did these famous athletes lose to someone who is not considered to be at the same level as them? Since there are no published studies on the subject, we planned a study whose aim was to discover the causes of “Judo legends” defeats against “outsiders” in Olympic Games – 2016. *Methodology.* The methods of the study were: analysis of match documentation in all 7 Olympics’ Men categories and analysis of video records of judo matches. As an “outsider” we classified a Judoka who is: 1. Not in the top 8 of the World Ranking list before the Olympic Games (WRLBOG), but ends up being in the top 7 Olympic athletes; 2. At least 10 positions below (in WRLBOG) the Judoka with whom he competed. 3. Not a former Olympic champion. All 256 Judo matches of men during the OG-2016 were analyzed; 24 of them met all of these 3 criteria and were submitted for further analysis by observational criteria. *Results and discussion.* Three main reasons for defeat of famous Judokas were identified: 1. The “outsider” is using an unorthodox technique or grip which cannot be classified as traditional, i.e., he is performing a movement a little bit different from the traditional or known way so far. 2. The “Judo legend” is doing a “fatal mistake”. 3. The “Outsider” is following a tactical strategy leading to penalizing the opponent. Ideas similar to our finding were discussed by Sterkovicz & Maslej (1999) in a study on Polish Judokas and Sacripanti (2014) in his biomechanical analysis of Judo throws. Based on the results of our study, coaches can establish new training methodologies for enhanced effectiveness against superior opponents.

Key words: Judo, victory, defeat, causes, superior opponent

Introduction

Judo is explained best by Angus (2006) as a “multi-faceted sport” thus meaning there are many aspects to it. Angus (2006) further states that the sport “requires the fast hands of a boxer for obtaining a grip, the explosive power of an Olympic lifter for executing a throw, and the agility of a gymnast for maneuvering into and out of various attacking situations”.

Since Tokyo Olympics in 1964 when Judo first showed up in the Olympic arena we have seen many Judo legends and top rank Judokas in World & Continental Championships and in the Olympics, who lost. How exactly did these famous athletes lose the game? What had happened in these cases besides physical trauma or physical fatigue from previous matches?

Can we locate some of the factors which actually define who will win and who will lose? Why is it that there are so many cases reported in which great and famous Judokas lose by someone who is not considered to be at the same level with them? How common is that actually? Is it possible to explain these significant “surprises” that happen in Judo? Is it a matter of technique, strategy/philosophy or physical abilities? Is it the combination of all the above? What are the possible explanations?

Since there are no published studies on the subject,

we designed a specific study focused on the Judo Olympic Championship–2016 which aim was to identify the main causes of “Judo legends” defeats against “outsiders”.

Judo is a very philosophical and individual discipline which is an Olympic sport and a martial art at the same time. We should consider seriously the fact that we are trying to find an explanation which may not cover all possible subjects (top judo athletes) but it’s the best-case scenario according to the latest standards for scientific research.

Methodology

In order for us to be more scientifically correct, we decided that we should set up our own criteria and define who is considered to be an “Outsider” and after that move on to the analysis of match documentation and video.

As an “outsider” we classified a Judoka who is:

1. Not in the top 8 of the World Ranking List before Olympic Games (WRLBOG), but ends up being amongst the top eight Olympic judokas ranked 1-7 place (because the Repechage system).
2. At least 10 positions below (in WRLBOG) the Judoka with whom he competed
3. Not a former Olympic medalist.

All 256 Judo matches of men during the Rio Olym-

pic Games in 2016 were analyzed. Out of 256, the phenomenon of “outsiders” winning against judo legends” was identified in 24 matches which were found to match exactly the above 3 criteria and were submitted for further analysis mostly based on observational criteria. 13 videos from the 24 matches were found online and analyzed in depth. For the rest 11 matches data about scores and information about the athletes was collected online from the site of IJF - Live judo results of Rio 2016 Olympic Games (2016), Judo Inside portal (2017) and World Judo Today (2016).

Results and discussion

The average difference between the ranks in WRLBOG of the studied Judokas was 20 places (Minimum 10 – between Iliadis and Cheng, and Maximum 43 - between Mateo and Olenic). All Judo categories were represented in our study.

The hypothesized influence of younger age did not help outsiders because the average difference between the ages of “Outsiders” and “Legends” was 0.04 (ranging between -10 (Van Tichelt and An) and +7 (Bouchard and Puliaev). We have seen that it is possible to win an Olympic medal at 32 years old (Van Tichelt) and become Olympic Champion at 30 years old (Mudranov), playing against opponents who were placed in WRLBOG quite higher than them.

The most important result of our video analysis was the high frequency of so called “Unorthodox techniques”. Under this term we integrate the terms “Innovative Throws” and “Chaotic Throws”, introduced by Sacripanti (2014): “Innovative Throws” are all throwing techniques that keep alive the formal aspect of Classic Judo throws, and differ in terms of grips and direction of applied forces only” (Sacripanti, 2014, p.14); “Chaotic Throws” are characterized by the application of different grips positions which apply force in different (nontraditional) directions, while simultaneously applying stopping points in non-classical position, or utilizing “no rational” shortening trajectories (longer than the usual) between athletes” (Sacripanti, 2014, p. 15). Or, as he noted, “the “Innovative throws” are “variations (henka) of classical Kodokan throwing techniques”, while “Chaotic throws” are “non-classic” solutions applied in competition and which are different from “Innovative”(henka) throws” (p. 14).

In 9 (69.2%) out of the 13 matches which were video analyzed, it was found that the “Outsider” Judoka used an “unorthodox”, or non-traditional technique, - which allowed him to win against the “Judo legend” (Table 1). This means that the “Outsider” Judoka didn’t use Japanese traditional grip (Tsurite - Hikite) or during the execution he used a slightly different kind of motion/variation, either in Kuzushi (breaking of balance), Tsukuri (entering in the technique) or in the Kake (throwing) phase. In some cases, it’s even a combination of unorthodox gripping (Kumikata) and unorthodox/ varied movements. Of course, the application of these surprising techniques is pre-planned and well-practiced during the “Outsiders” preparation. Sacripanti (2010) states that “The most intriguing part of the fight preparation is the research of new techniques and tricks. This part is very often developed taking in account other fields or other type of wrestling. Normally also a simple variation of the throwing technique often can be considered as a new technique but the variation biomechanically speaking may require different direction of force and/or body placement” (Sacripanti, 2010, p. 210).

Out of the 13 matches which were video analyzed, in 7 of them (53.8%) we noticed that the “Legend” has done a fatal mistake while leading his opponent in scoring (Table 1). In some cases, we are talking about counter attacks which were unexpected by the “Legend” Judoka but were very well executed by the “Outsider”. What happens is that the “Legend” Judoka goes into attack and at the same time he is demolished by the counter-attack (Gaeshi-Waza) of his opponent. Two such examples were demonstrated both in the matches of Bouchard Antoine (CAN) vs Davaadorj Tumurkhuleg (MGL) and Marconcini Matteo (ITA) vs Ivanov Ivaylo (BUL). In both matches the Judo “Legend” is attacking with a Daki Kosoto gake and he is counter attacked with an “Unorthodox” (as far as it concerns the grip) Ouchi gari. In other cases, a fatal mistake may be described as a wrong reaction. For this, a very good example is the athlete Cheng Xunzhao (CHN) in -90kg. When watched in slow motion, Cheng pulls his opponents a little bit forward so that his opponent resists backwards and after that he executes a throw in that direction. Cheng did this trick 4 times (using an “Unorthodox” Osoto Gari in the direction where his opponent is resisting) in the last Olympics. This resistance may be considered as a fatal mistake of the “Legend”. He doesn’t know what

Table 1. Successful tactical solutions of “outsiders”.

Full name of the outsider Judoka	Full name of the legend Judoka	Classification of the technique used to win (Outsider)	«Legend» Judoka has done a fatal mistake	Strategy of “Outsider” leading to penalizing the opponent
BASILE, Fabio - Italy	AN Baul - Korea	Unorthodox Kata Guruma	-	-
MUDRANOV, Beslan - Russia	SMETOV Yeldos - Kazakhstan	-	Fatal mistake	-
BOUCHARD Antoine - Canada	DAVAADORJ Tumurkhuleg - Mongolia	Unorthodox Ouchi Gari	Fatal mistake (Kosoto Gake)	-
VAN TICHELDT, Dirk - Belgium	AN Changrim - Korea	Unorthodox Counter - Technique	-	-
MARCONCINI, Matteo - Italy	IVANOV Ivaylo - Bulgaria	Unorthodox Ouchi gari	Fatal Mistake (Kosoto Gake)	-
MARCONCINI, Matteo - Italy	BOTTIEAU Joachim - Belgium	-	-	YES
CHENG, Xunzhao - China	ILIADIS, Ilias - Greece	Unorthodox left Osoto gari with right Kumikata	Fatal Mistake	-
CHENG, Xunzhao - China	TOTH, Krisztian - Hungary	Unorthodox left Osoto gari with right Kumikata	Fatal Mistake	-
CHENG, Xunzhao - China	NYMAN, Marcus - Sweden	Unorthodox left diagonal Osoto gari with right Kumikata	Fatal Mistake	-
CHENG, Xunzhao - China	LKHAGVASUREN, Otgonbaatar - Mongolia	Juji Gatame and unorthodox reverse from the Ippon Seoi Nage	Fatal Mistake (Drop Seoi Nage)	-
MEHDIYEV, Mammadali - Azerbaijan	DENISOV, Kirill - Russia	Unorthodox - Ni Dan Kosoto gake	-	YES

is going to happen and that is why he is attacking in a “wrong” way or he is reacting to a motion not the way he should have, which leads to his defeat. Of course, in Cheng’s situation someone could say that the coaches’ scouting is responsible for the defeat of their athletes. They had the opportunity to see what happened in previous matches but they didn’t do anything to prevent it; everyone except the Japanese athlete who changed his Kumikata and stance in order not to let Cheng use the same technique against him.

In 2 matches (15.4%) out of the 13 matches video analyzed we can clearly observe that the “Outsider” is following a tactical strategy leading to penalizing his opponent. As stated by Sacripanti, “Judo competition is a fight under referee regulations, between two athletes who aim a same goal: to grasp the victory” (Sacripanti, 2010, p. 216). So, by tactical strategy leading to penalizing the opponent we mean that the “Outsider” is using, in a sort of way, the rules in order to penalize the opponent. We know that Judokas are penalized with shido if they don’t attack, so the “Outsider” is attacking continuously all the time thus not giving the opportunity to his opponent to attack. Also, shido may be given to a Judoka during the fight if he steps out of the mat. The “Outsider” is using this second rule in his benefit, he sometimes leads the fight just where the

mat (tatami) ends and tries to take out his opponent without throwing him or in some cases even without pushing him, just leading him where he wants (everything for the shido).

According to our video analysis, in 8 out of 13 matches (61.5%) the outsiders who won were left handed. The advantage of left-handed athletes was well recognized in sport sciences (Hagemann, 2009; Loffing, Hagemann, 2016; Mikheev et al., 2002; Ziyagil et al., 2010), so it is not a new finding. It always helps if you are left-handed and your opponent has not practiced enough against left-handed athletes.

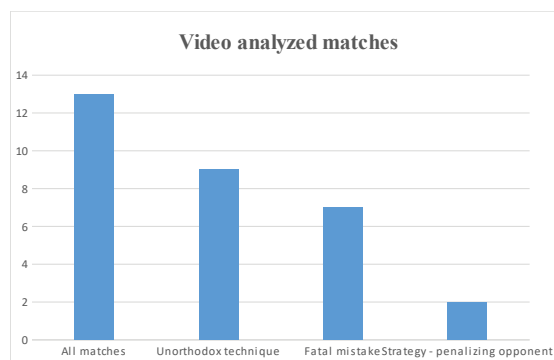


Fig.1. Frequency of the successful tactical solutions of Outsiders.

The general conclusion from our analysis is that in the studied matches we can observe carefully

prepared and well-practiced combinations of: development of surprising unorthodox techniques; related to them feints provoking “fatal mistakes” of estimation and decision; and strategy leading to penalizing the opponent (Table 1, Fig. 1). The observation and scouting during the current competition (in this study: Olympic Judo tournament) is of utmost importance as most of these unorthodox techniques and feints are prepared especially for this competition and kept in secret before that.

Even though no similar researches were found in scientific literature on judo, there are some ideas about techniques and attacks which are discussed by Sterkowicz & Maslej (1999) in a study on Polish Judokas. They noted that “Techniques counted as “OTHER” are 100% effective. These are techniques that do not belong to the traditional GO-KYO classification system. Despite low overall frequency of attempts (6 attacks out of 798 attempts, i.e. less than 1%) each resulted in received points. Without a doubt this is related with lack of developed counter measures against unorthodox moves.” (Sterkowicz & Maslej, 1999; citation according the English translation of the article, p. 3). Sacripanti (2010) also mentioned that “unorthodox” or “unspecified techniques”, sometimes take place and have a great results that no one expects.

Both studies underline the main factor influencing the high effectiveness of unorthodox throws – the surprise resulting by the unpreparedness of the Judoka. Thus the solution for the prevention of the problem and preparation of our Judoka is the intellectual preparation of both athletes and coaches.

As the Olympic champion Ilias Iliadis (2016) stated in his interview in Rio, just after the end of the Olympics, “In Judo everything can happen”. So, as he said, Judo is a sport in which you cannot define who the winner will be, and this is why it is so attractive.

Conclusion

In our study we found that people defined as “Outsiders” can stand up and win against famous athletes which we call “Legends”. We discovered 3 main different reasons for this phenomenon: development of surprising unorthodox techniques; related to them feints provoking “fatal mistakes” of estimation and decision; and strategy leading to penalizing the opponent. There is a lot to be investi-

gated furthermore in order to complete the picture of the “Outsiders” and their techniques and strategies against stronger or higher-level opponents.

Here we must state that the findings of our research could be useful to coaches who strive to develop a methodology for the development of “unorthodox” techniques for their athletes or even competition strategies for victories against stronger or higher-level opponents. Also, these findings should encourage athletes to practice better and smarter, because in Judo, as proven, everything can happen. As stated by Syd Hoare (2006) “One should regard champions or those with a reputation as a challenge. So, what if they have won a gold medal – let’s see if you cannot take them down”.

The development of methodological strategies, techniques and tricks against superior opponents will probably change the way of thinking of the coaches and also sport specialists as a whole and, hopefully, open a new era in Judo.

Bibliography:

- Angus, R. (2005). *Competitive Judo: Winning, Training and Tactics*. Human Kinetics
- Hagemann, N. (2009). The advantage of being left-handed in interactive sports. *Attention, Perception, & Psychophysics*, 71(7), 1641-1648.
- Hoare, S. *Reasons for losing* (2006). A lecture given to the European Judo Union Foundation Degree course at Bath University, UK
- Iliadis, I. (2016). Interview in Rio, broadcasted live in the Greek national channel after the Olympics.
- Loffing, F., Hagemann, N. (2016). Performance Differences Between Left- and Right-Sided Athletes in One-on-One Interactive Sports. In: Loffing, F., Hagemann, N., Strauss, B., & MacMahon, C. (Eds.), *Laterality in Sports: Theories and Applications*. Academic Press, 249-277
- Mikheev, M., Mohr, C., Afanasiev, S., Landis, T., & Thut, G. (2002). Motor control and cerebral hemispheric specialization in highly qualified judo wrestlers. *Neuropsychologia*, 40(8), 1209-1219.
- Sacripanti, A. (2010). *Advances in Judo Biomechanics Research: “Modern Evolution on Ancient Roots”*, VDM Verlag Dr. Müller
- Sacripanti, A. (2014). How to enhance effectiveness of Direct Attack Judo throws. Research paper available at: <https://arxiv.org/vc/arxiv/papers/1401/1401.1102v1.pdf> (Last Access: 30.09.2017)
- Sterkowicz, S. & Maslej, P. (1999), *Działania techniczno-taktyczne stosowane w walce judo*. *Sport Wyczynowy*, vol. 9-10, p. 47-53 (An evaluation of the Technical and Tactical Aspects of Judo Matches at the Seniors level.). Research paper available at: <http://www.judoamerica.com/ijca/sterkowicz/sterkowicz.pdf>

(Last access: 02.05.2017)

Ziyagil, M. A., Gursoy, R., Dane, Ş., & Yuksel, R. (2010). Left-handed wrestlers are more successful. Perceptual and motor skills, 111(1), 65-70.

Live judo results of Rio 2016 Olympic Games (2016)

http://judolive01.lb.judobase.org/www.judo-world.net/world/olympics/2016_rio/tta_menuue.php?sprache=english&modus=1024

(Last Access: 30.09.2017)

Judo Inside portal (2017)

<http://www.judoinside.com/>

(Last access: 30.09.2017)

World Judo Portal (2016) http://www.worldjudoday.com/medias/fichiers/olympic_list_by_category.pdf

(Last Access: 30.09.2017)

Address of the corresponding author:

Konstantin Atanasov, Student at NSA, Coach Faculty, 0888091446, atanasov.kons@gmail.com

CHANGES IN ANAEROBIC POWER OF YOUTH SOCCER PLAYERS IN AN ANNUAL TRAINING CYCLE

Petar Peev, Marin Gadev, Borislava Petrova

Abstract

Introduction: It is a well-known fact that short high intensity actions are decisive for football game. The energy for these actions is ensured from anaerobic energy system. The lack of information about this subject defines the aim of our research which was set as research of changes of indicators which characterize anaerobic power of youth football players. Methodology: It includes the following methods of research: anthropometry, chronometry, test of exercise bike and statistical analysis. Results: The data from Wingate test are proof for increasing of the average values of the most informative signs of this test. We found out statistical improvement of the values of the signs such as Peak power (PP), Average power (AP) and Minimal power (MP). Their values increase from 539.96 to 721.54 watts for PP; from 410.58 to 514.07 watts for AP and from 277.23 to 339.15 watts for MM. The same improvement of 1.66 seconds we can see from the data of the field test "3x50 m shuttle". Discussion and conclusions: As a whole this research found out improvement of the informative signs from laboratory and field tests in the annual training cycle. Statistical non-significant improvement was found only in the indicator MM from second to third test. This fact leads us to the conclusion that this indicator is not good enough to detect changes in a short period of time. We also found improvement of the PP and AP respectively with 33.63 and 25.20%. Our study is in unison with the conception that the period of 13-14 years is suitable for development of the speed and speed endurance abilities.

Key words: anaerobic power, anaerobic characteristics, dynamics, annual training cycle, youth soccer players

Introduction:

It is well-known fact that high intensity action are crucial for football game (Бъчваров et al., 2005, Nikolaidis, 2011, Stølen et al., 2005, Reilly & Williams, 2003). The energy for these actions is supplied from anaerobic energy system. Throughout human development the abilities for these actions are being increased and their peak is through puberty. Despite these facts we don't know the rates of their increments also there is lack of information about changes in the annual training cycle. Accumulation of knowledge about these processes could help us to optimize the training process.

The lack of information about this problem defines the aim of this research. It comes down to research of changes in anaerobic indicators that characterize anaerobic power of 13-14 years old soccer players.

The implications of this goal are the research tasks that are:

1. First task is to define changes of indicators that characterize anaerobic power which are derived from laboratory and field tests;
2. Second task is to define level of significance of cumulative values of these indicators throughout the three testing periods in annual training cycle.

Methods:

It includes the following methods of research: anthropometry, chronometry, exercise bike test (30-seconds Wingate test), statistical processing of the results (descriptive statistics and repeated descriptive statistics with Student's t distribution). The research was proceeded in three stages with length of one football season. The testing procedures were done: in the end of the first preparation period (first half of the season); in the end of the second preparation period (second part of the season) and in the end of the competitive period (the end of the football season).

Results:

The data from changes of "Wingate" test, testify for the increasing of the most informative indicators of anaerobic power throughout of the annual training cycle. They can be seen at Table 1 (Пеев, 2017). We found statistical significance of increasing of the values of the indicators "peak power" (PP) in the range of 539,96 to 721,54 watts and "average power" (AP) - from 410,58 to 514,07 watts. The last indicator, that is "minimal power" (MP) is being increased with the smallest one range (277,23 to 339,15 watts). In addition of the data of the changes of the anaerobic characteristics from laboratory test we did the field test "3x50 m shuttle run" that characterizes level of development of the speed endurance of 13-14 years old football players. (Пеев, 2017). We found out improvement of the average time for running the test from 26,56 to 24,90 seconds (Table 2).

Table 1
Variability of the changes in the anaerobic characteristics in an annual training cycle

Indicator	PP	AP	MP	PP 2	AP 2	MP 2	PP 3	AP 3	MP 3
X	539,96	410,58	277,23	643,21	488,68	334,40	721,54	514,07	339,15
m0	20,87	12,54	7,65	15,83	13,10	14,41	16,83	14,95	15,00
S	80,84	48,59	29,65	61,30	50,73	55,82	65,19	57,90	58,10
Me	550,08	421,02	277,11	639,81	490,36	339,98	704,68	517,57	360,40
As	-0,716	-0,532	-0,022	-1,076	0,009	0,282	0,228	-0,237	-0,773
Ex	-1,107	-1,452	-1,283	1,136	0,083	0,063	-1,078	-1,534	-1,238
R	206,18	126,35	82,95	207,88	173,34	181,29	193,66	148,37	143,38
Xmax	410,69	339,97	234,55	514,99	403,05	255,12	629,67	439,61	247,83
Xmin	616,87	466,32	317,50	722,87	576,39	436,41	823,33	587,98	392,21
V%	14,97	11,83	10,69	9,53	10,38	16,69	9,03	11,26	17,13

Table 2
Variability of the indicator time for running the test
"Shuttle running 3x50 m"

Indicator	t 3x50 M	t 3x50 M 2	t 3x50 M 3
X	26,13	24,95	24,67
m0	0,31	0,30	0,30
S	1,12	1,09	1,08
Me	26,30	24,80	24,30
As	-0,007	0,201	0,309
Ex	-0,532	-0,835	-0,990
R	3,70	3,50	3,30
Xmax	24,30	23,30	23,20
Xmin	28,00	26,80	26,50
V%	4,29	4,36	4,38

The data of the indicators that were received from Wingate test show that there is steady increasing of the anaerobic abilities of the youth soccer players. In the same time the coefficient of variations (CV%)

vary in the limits of 9,03 to 17,13%, which defines the sample as homogeneous for some of the indices and relatively homogenous for others. The test of normality shows that the skewness and kurtosis are smaller than 1 so we can conclude that the variables have normal distribution. These two conclusions allow us to do a repeated descriptive statistics of the data. Exception of this made just the indicator MP which coefficient of variation (16,69 and 17,13) and skewness and kurtosis (bigger than 1) don't allow us to do a descriptive statistic.

The same conclusions are applicable for the shuttle run test, where the CV% is around 4,5% and in the same time skewness and kurtosis are under 1.

Discussion:

We found from the research that PP is increased in the two researched periods. The difference between them is that the increase is bigger in the first period than in the second one (table 3).

Table 3
Significance of the increase of the indicator PP for the researched period

Indicator ↓	Sequence of the tests ↓				d	d%	temp	P (t)
	x ₁	s ₁	x ₂	s ₂				
PP (1-2)	539,96	80,84	643,21	61,30	103,25	19,12	6,50	100,00
	x ₂	s ₂	x ₃	s ₃				
PP (2-3)	643,21	61,30	721,54	65,19	78,33	12,18	8,32	100,00
	x ₁	s ₁	x ₃	s ₃				
PP (1-3)	539,96	80,84	721,54	65,19	181,58	31,30	10,76	100,00

The increase of results for the researched period is 31,30%. The similar increment is observed in other cases (Swilowski et al, 2006, Пеев et al., 2016) with similar research methods and one of the reasons is the increased muscle mass (Gareth Jr. et al.. 1996).

This is due to the fact that inherently the indicator PP is indicator that discloses the development of the anaerobic alactic energy system which potential is increased in the process of growth (Inbar et al., 1996).

The second indicator that we researched (Average Power) characterizes anaerobic lactic energy system (Inbar et al., 1996). Again we observe significant increase of the results in the two researched periods (respectively 19,02% and 5,20%) (table 4). The bigger increase in the first researched period is due

to implicated methodology for speed endurance development (Пеев, 2017). In support of this statement are the researches of Swilowski et al. (2013) and Dragijsky et al. (2017) who point out that the trainings influence the results of these kind of researches.

Table 4

Significance of the increase of the indicator AP for the researched period

Indicator ↓	Sequence of the tests ↓				d	d%	t _{emp}	P (t)
	x ₁	s ₁	x ₂	s ₂				
AP ₍₁₋₂₎	410,58	48,59	488,68	50,73	78,10	19,02	10,29	100,00
	x ₂	s ₂	x ₃	s ₃				
AP ₍₂₋₃₎	488,68	50,73	514,07	57,90	25,39	5,20	3,72	99,77
	x ₁	s ₁	x ₃	s ₃				
AP ₍₁₋₃₎	410,58	48,59	514,07	57,90	103,49	24,22	21,15	100,00

Laboratory test data show increase in all of the researched indicators and as we mentioned earlier this increase is bigger in the first researched period. This tendency is also maintained in the case of field

test “3x50 m shuttle run” (Table 5), that serves us to define the level of development of the speed endurance ability (Гъдев, 2013 и Peev et al., 2017).

Table 5

Significance of the increase of the indicator time for “3x50 m shuttle run” for the researched period

Indicator ↓	Sequence of the tests ↓				d	d%	t _{emp}	P (t)
	x ₁	s ₁	x ₂	s ₂				
t for 3x50 m ₍₁₋₂₎	26,56	1,93	25,32	1,75	1,24	4,67	7,58	100,00
	x ₂	s ₂	x ₃	s ₃				
t for 3x50 m ₍₂₋₃₎	25,32	1,75	24,90	1,35	0,42	1,66	3,53	99,57
	x ₁	s ₁	x ₃	s ₃				
t for 3x50 m ₍₁₋₃₎	26,56	1,93	24,90	1,35	1,66	6,25	8,51	100,00

The improve in time for running the distance of the test are accordingly 4,67% (P(t)=100,00%) and 1,66% (P(t)=99,57%). This makes an increment in total of 6,25% (P(t)=100,00%) that shows the cumulative effect of implicated training influences for development of the speed endurance ability.

In general our research found an increase of the most informative indicators of laboratory and fields test in the annual training cycle. We found that most of the indicators have significant increase throughout the researched period. Exception of this makes only the indicator MP. This fact suggests that this indicator is not reliable source of information for shorter periods of time. We found some discrepancies for the values of the increase of the indicators from

laboratory and field tests. Laboratory indicator PP and AP are increased accordingly with 33,63% and 25,20% but the time for “3x50 m shuttle run” is increased just with 6,25%. Of course these discrepancies were expected for two reasons: first of all it is consequence of the complexity of the different abilities that are needed for the running test and second reason is that the youngsters can't convert their current abilities at a maximum level.

Conclusions:

Our study is in unison with the conception of the authors Шишков et al. (1985), Антипов et al. (2008), Лапшин (2010), Гъдев (2013) that the period of 13-14 years is suitable for development of the speed and speed endurance abilities.

Acknowledgments:

We express our gratitude to Borislav Kiosev, head coach of Youth academy of PFC "Levski" Sofia for his help and cooperation.

Literature:

Dragijsky, M, T. Maly, F. Zahalka, E. Kunzmann, M. Hank (2017), Seasonal Variation of Agility, Speed and Endurance Performance in Young Elite Soccer Players, *Sports*, 5(1), 12

Gareth Jr., W. E., D. T. Kirkendall, S. R. Contiguglia (1996), *The U.S. Soccer Sports medicine book*, Baltimore, Williams and Wilkins, p. 504

Inbar, O. Bar-Or, J. Skinner (1996), The wingate anaerobic test, *Human kinetics*, pp. 110

Śliwowski, R., M. Laurentowska, E. Michalak, A. Wiczorek, J. Wiczorek (2006), Changes in anaerobic performance in young football players in an annual training cycle, *Studies in physical culture and tourism*, 13

Śliwowski, R., M. Andrzejewski, A. Wiczorek, A. Barinow-Wojewódzki, Ł. Jadczyk, S. Adrian, M. Pietrzak, S. Wiczorek (2013), Changes in the anaerobic threshold in an annual cycle of sport training of young soccer players, *Biology of Sport*, Jun; 30(2): 137-143

Антипов А., В. Губа, С. Тюленков (2008), Диагностика и тренировка двигательных способностей в детско-юношеском футбол, Москва, Советский спорт, с. 152

Гъдев М. (2013), Теоретични основи и методикотехнологични аспекти на неспецифична кондиционна подготовка в детско-юношеския футбол, С., Докторат, с. 311

Лапшин, О. Б. (2010), Теория и методика подготовки

юных футболистов, Человек, Москва, с. 174

Пеев, П. (2017), Изследване на методически подходи за въздействие върху развитието на скоростната издръжливост при 13-14 годишни футболисти, докторат, София, с.149

Пеев, П., Г. Иванова, С. Цветков, Борислава Петрова, Инна Иванова (2016), Вариативност на абсолютните стойности на Wingate test при 13-14-годишни футболисти, *Лека атлетика и наука*, 1(16): 70-74

Шишков А., Л. Димитров, М. Мадански, В. Генчев (1985), Обучение и подготовка на млади футболисти, София, Виф, с. 107

Бъчваров, М., Л. Димитров, А. Гигов (2005) *Футбол: Преса, кондиция, натиск*, София, НСА – Прес, с. 120

Nikolaidis, P. (2011) Anaerobic power across adolescence in soccer players, *Human movement*; 12(4): 342-347

Stølen, T., K. Chamari, C. Castagna, U. Wisløff (2005), Physiology of soccer: An update, *Sports Medicine*, 35(6): 501-36

Reilly, T., M. Williams (2003), *Science and soccer* Second edition, Routhledge, London, p. 326.

Peev, P. S. Tsvetkov, M. Gadev (2017) Reliability of field test "3x50 m Shuttle" to determine anaerobic power for football players aged 13-14, *Research in kinesiology*, 1(45): 105-108

Petar Peev, PhD

National Sport Academy "Vassil Levski"

Department: Track and field

Sofia, Studentski grad, 1700

GSM: +359878354911

pe60_dj@abv.bg

STRUCTURE OF THE POWER POTENTIAL OF ADOLESCENT RACERS IN RUNNING AT 800M.

Rukas Lambros, Dobrinka Shalamanova

Summary

A study of the overall strengths of 28 adolescents specializing in running 800m was presented. Variant correlation structure of force total force has been identified. Certain basic methodical postulates have been confirmed and relevant methodological conclusions and recommendations have been made.

Keywords: Power Opportunities, Running 800m, Adolescents

Modern sport is characterized by continuous "rejuvenation". The age to begin systemic sports training is decreasing. The age of the athletes who achieve high sports scores (Alabin,1986; Antonov, 1987; Aryamov,1950; Belberov, Dimitrov,1980; Bonov,2003; Balik,1974; Bolkov,1961; Lazarov, Popov,1972; Lidyad,1966; Rachev,1999; Rachev,1976; Slanchev,1998; Stoyanova,1976; Travin,1975; Filin,1979) is also falling. This phenomenon implies an increase in stressful situations and a risk of overloading the body of young athletes. In this sense, the disclosure of the complex multi-parametric characteristic of specific athletic activity is one of the perspective ways to solve the problem of optimizing the workloads of this category of athletes (Bonov,1984; Bonov,2003; Zelyazkov, Dacheva,2002; Lazarov,1965; Lazarov, Popov,1972; Lidyad,1966; Makarov, 1966; Filin,1979;). The effectiveness of these loads greatly depends on the level of muscle strength. According to Prof. M. Bachvarov, the strength of athletes is comprised in the following three main categories: local, regional and total. Each of these categories has a different attitude towards the improvement of the specific sports performance, respectively the level of the sporting result.

In the sense of these rations, we synthesized the following working hypothesis of our study:

By examining the structure of the power potential in medium-age adolescents aged 15-19 years from the Hellenic Republic, we can help to improve the training process for this category of athletes.

The purpose of this study is as follows:

Increasing the effectiveness of the training process in 15 - 19-year-old athletes from the Hellenic Republic specializing in medium distance running by identifying the interdependencies between the main indicators for monitoring their power potential and sports performance.

The achievement of the stated goal implies the following basic tasks:

1. Analysis of scientific and methodological literature on the problems of medium distance running.
2. Investigation of the correlation structure of the power potential in girls / 15-19 years old / athletes and medium distances.
3. Outline some basic methodological aspects related to the improvement of the strength training in the age of 15-19 years in girls specializing in medium distance running.

The subject of the survey is 28 mid - adult contestants aged 15-19. with an average score of 800m-2,15,36min. They are included in the rankings of the top 20 racers (girls / in Greece during the 2014 and 2015 races

The subject of the study is a structure of the power potential of 15-19 year old girls specializing in medium-distance running.

Experienced individuals were subjected to testing based on a set of tests based on sport theory and practice on the determination of total power capabilities. They are presented in Table 1.

1. Body weight (kg)
2. Stand force (kg)
3. Wide right wrist (kg)
4. Wide left wrist (kg)
5. Long jump from place (cm)
6. Triple jump from place (cm)
7. An average height of 30 vertical jump
8. Sum of 30 vertical jumps (meters)
9. K (coefficient) strength endurance (w/kg)
10. KN (load tolerance coefficient) (w/h/min)
11. Running speed at 800m. (m/s)

Table 1 Tests (general description)

Testing was performed under the same conditions for 5 days in laboratory and field conditions. A basic requirement was that individuals surveyed should approach the appropriate testing as highly

motivated and physically recovered. In view of this, the following sequence was followed:

- 1 day) Measurement of weight, strength and local force of the wrists (m 1, 2, 3)
- 2 days) Measurement of speed-force capabilities (m5,6)
- 3 days) Measurement of strength (p.7,8,9,10)
- 4 day) Pre-heating
- 5 days) Racing race at 800m.

The obtained results were subjected to mathematical and statistical processing, by variation and correlation analysis.

The variation analysis of the test results revealed some general and specific peculiarities in the level of the strength of the investigated persons. They are evident in Table 2.

Table 2 Variation analysis of the obtained results.

	M.U.	number studies	X min	X max	R	X	St	V%	Ac	Ex
Body weight	kg	28	39,8	64,4	24,6	52,40	6,21	11,84	0,16	-0,39
Stand force	kg	28	55	125	70	89,79	17,95	19,99	0,06	-0,89
Wide right wrist	kg	28	20	43	23	31,68	5,86	18,49	0,16	-0,35
Wide left wrist	kg.	28	20	42	22	29,87	6,25	20,93	0,24	-0,79
Long jump	cm.	28	192	256	64	223,08	13,31	5,97	-0,08	0,22
Triple jump	cm.	28	551	742	191	651,79	50,79	7,79	0,00	-0,59
Maximum vertical jump	meter	28	0,20	0,38	0,18	0,28	0,04	15,35	0,04	-0,29
Sum 30 jump	meter	28	2,98	6,14	3,16	4,37	0,80	18,40	0,21	-0,20
K	Wat/kg	28	510,38	1374,14	863,76	830,08	203,03	24,46	0,60	0,44
KN	W/h/min	28	3,28	7,63	4,36	4,92	1,04	21,05	0,65	0,38
800 meter	m/sek	28	5,57	6,36	0,79	5,91	0,18	3,09	0,43	-0,03

At $n = 28$, $a = 0.05$ $A_s = 0.621$ $Ex = 0.858$

Table 2 presents the results of the variation analysis of girls' data.

The values of the results in Test # 1 indicate that the body the weight of the tested girls is in the optimal range - 1 = 53.25 kg. The coefficient of variation - $V\% 1 = 9,47$ confirms the homogeneity of these data.

The results of the Dynamometric Tests 2, 3, 4 provide information on the level of total (m 2) and local strengths (m 3,4). of the girls. They have average values and widening widths as follows: $x_2 = 94.5$ and $R_2 = 30$; $3 = 32.6$ and $R_3 = 14$; $4 = 30.5$ and $R_4 = 10$. It is clear from this that the girls surveyed have certain differences within the results, which is confirmed by the coefficients of variation from 8.87% to 12.5%.

We determined the speeds of the lower limbs using test data 5, 6. The average values of the results and the width of the span are as follows: $5 = 220,3$ cm. at $R_5 = 36$; $6 = 638.5$ cm. at $R_6 = 139$. Here there is a marked uniformity of the results ($V\% 5 = 5.0$, $V\% 6 = 6.9$). This suggests that the speed-force capabilities of the lower limbs are an important feature of the specific driving capabilities of adolescent racers in running 800m. It appears to be a serious criterion for determining the genetic potential for development. The results in tests No. 7, 8, 9 and 10 characterize the strength of the tested males. Based on these indicators, the tested persons achieved the following mean values: $7 = 0.27$ and $R_7 = 0.13$; $8 = 417.13$ and $R_8 = 282.18$; $9 = 717.6$ and $R_9 = 493.51$; $10 = 4.6$ and $R_{10} = 3.99$. Significant differences in data homogeneity are observed here. This fact is

confirmed by the coefficient of variation which is as follows: $V\% 7 = 18.5$, $V\% 8 = 21.5$, $V\% 9 = 21.5$ and $V\% 10 = 28.7$.

The average level of achievement in the 800 meter run, Test No. 11 2: 15.23 min, is $x_{11} = 5.48\text{m} / \text{s}$. (average running speed at 800m measured in m / sec) at a width of $R_{11} = 0.6\text{m} / \text{s}$. The coefficient of variation from $V_{11} = 3.5$ confirms the uniformity of the sporting technical level of the study group. This is a serious reason to continue with the analyzes of intercorrelation interdependencies

between the studied power potential parameters. Revealing the structure of this potential would allow some methodological guidance to be drawn on the planning and management of the training of competitors in running 800.

From the correlation analysis table no. 3 and fig. 1 it is evident that the correlation structure of the sporting result in the 800 m running in the examined athletes is expressed by 28 significant correlation dependencies at $r = 0.05$, $P = 95\%$ and level of significance $\alpha \geq 0.330$.

Tab. 3 Intercorrelation Structure of Power Potential

	1	2	3	4	5	6	7	8	9	10	11
1	1										
2	0,755	1									
3	0,468	0,542	1								
4	0,630	0,589	0,703	1							
5	0,410	0,448	0,216	0,268	1						
6	0,633	0,573	0,312	0,435	-0,06	1					
7	-0,06	-0,02	-0,03	0,012	0,126	0,792	1				
8	0,585	0,513	0,330	0,330	0,053	0,695	0,786	1			
9	0,453	0,418	0,246	0,246	-0,01	0,614	0,740	0,522	1		
10	0,508	0,436	0,283	0,283	-0,06	0,655	0,755	0,508	-0,04	1	
11	0,226	0,122	0,102	0,100	-0,18	0,219	0,175	0,438	0,063	0,281	1

$N=28$; $\alpha=0,05$; $p=95\%$; $r=0,330$

There is a significant correlation between the sport result and the speed potentials of the lower limbs (test n °7) $r = 0.634$. It should be noted that the major correlations obtained with the local strengths $r_3 = 0,789$, $r_4 = 0,747$ (test n ° 3, 4) at expert level cannot be accepted as a significant factor regarding the level of the sport result in 800m running. However, they should be taken into account within the overall strength training curve in some preparatory meso and microcycles of preparation.

The analysis of other significant correlation dependencies is important as an objective tool for diversifying the training process on the basis of the so-called positive contribution of training.

Strength

Test No. 9 (Strength Strength Σ) has a high correlation with Test No 8 (Average Maximum Rebound) $r = 0.886$, No.7 (average height of 30 vertical bounces) $r = 0.964$ (very large), No.10 (coefficient of Load tolerance) $r = 0.772$.

These are indicators that are informative about the speed-strength endurance and are important to maintain the optimal frequency and length of the step.

Speed power options

The rapid power of the lower limbs test no. 5,6 correlate with the results in tests with numbers 1 (body weight), 2 (stative force), 7,8,9,10 (strength endurance) Correlation with tests 5 and 6 (jump in length and triple jump from place) $r = 0.727$, which is quite logical and suggests in some cases interchangeability in the control of the training effects. An interest is a link between the lower-extremity power-ups with a test n ° 1 (body weight) $r = 0.634$, which suggests the importance of optimal body weight for the performance of force quality. The girls' card shows that significant differences in strength and strength stamina determines differences in sporting outcomes. Training for these athletes should focus on raising the level of strength.

Conclusions and recommendations

The results and analysis of the conducted study allow to be summarized in the following conclusions and recommendations:

1. The power potential of adolescent racers in the 800 meters' race is determined by the optimal ratio of the local, regional and total strengths of the athletes.
2. Maintaining optimal body weight is one of the main tasks of the training process in the category of athletes surveyed.
3. Current testing of speed-power capabilities is the vehicle of up-to-date information on the momentary state of the specific force in adolescent racers in the 800 meters' race.
4. The tests for the assessment of the speed and the strength of the lower limbs have a markedly high factor weight in the planning and control of the training process in adolescent racers in the 800m race.

Literature

Alabin, VG, Organizational and methodological foundations of long-term training for young athletes, S., 1986.
 Antonov, N., co-authorship, physical training for athletes, ECNPKFKS-VIF „G. Dimitrov, S., 1987.
 Aryamov, IA, Age features of children and science for physical education, sp. „Theory and practice of physical culture“, 1950, 8.
 Belberov, D., D. Dimitrov, System for assessment of the obshchata and special preparation for the growth of sports in Bulgaria (from 10 to 18 years), S., CA on the

FSBS, 1980.

Bonov, P., Cand. diss., 1984.

Bonov, P. Bjugane for izdrazlivost and adaptation of book., Tiptop press 2003

Bonov, PI Bonova, D. Shalamanova, Methodology for the training of trainers in the Baganeto for the Middle and the Distortions of the Expansion Book. NSA Press 2009

Brogli, J., Statisticheski method in sports, S., 1977.

Valik, B.V., Trainers of young athletes, Fis, M., 1974.

Volkov, VM, In the collection. „Problems of Youth Sports“, L., 1961.

Zhelyazkov, Tsv., D. Dasheva, The basis of the sport training, the textbook for the NSA, S., 2002.

Lazarov, G., et al., Bjugane on the average and the distances of distances, Myth, S., 1965.

Lazarov, G., Il. Popov, Bjugane to the middle and the distance of the distance for young men, Myth, S., 1972.

Lydyard, A., For svjata the system for preparation when run on the averages and distances of distances, sp. News in sports, book. 3, 1966.

Makarov, AN, Running on medium and long distances, M., 1966.

Rachev, K., Optimizirane for training on young sports, textbook for student at the NSA, S., 1999.

Rachev, K., Abstract, Dissertation on the lek of athletics.

Rachev, K, In the book. Problems in training for young sports, S., 1976.

19. Slanchev, P., Sports Medicine, textbook for students from NSA, Sofia, 1998.

Stoyanova, V., Efektivnostta na nyakoi metodi na evstvenne na izdrazhlivosta vrhu lability on the central nervous system at the time of athletics, sp. „Trenjorskaya mysl“, br.1, 1976.

Travin, Yu.G., Study of the laws of age-related changes in endurance and the construction of long-term training of young runners at medium distances, Doct. Diss., Moscow, 1975.

Filin, VP, Developed on the physical quality of the young sports, Myth, S., 1979.

THE PREPARATION OF YOUNG BIATHLETES IN THE ANNUAL CYCLE

Konstantin Dunayev, Sergey Seyranov

Abstract. The paper discusses issues related to the volume of training load on the basic cyclic training facility in a year cycle of preparation in young biathletes. For of the total amount of the cyclic load as a monthly, and for periods of training. This article is intended for coaches, students and teachers of educational institutions of physical culture.

Keywords: periods of training, training tools, volume, intensity.

Introduction. The planning of the volume of the training loads, selection and distribution of the main training facilities, the ratio of types of training at different microcycles, mesocycles, macrocycles affect dramatically the quality of training of athletes, where the main goal is successful performance at the main competitions of the season. For the national team and the youth team of Russia it is participating in the World and Europe Championships. It is important to bring the athletes to the competitions in the best shape [1,4,5].

The purpose of the study is to identify the possibilities of improvement of sports and technical performance of athletes 18-19 years, through the rational construction of training process on the distribution of cyclic loads in the annual cycle of training.

Objectives of the study:

1. To develop the amount of cyclic exercise facilities at the biathlon 18-19 years in the annual cycle of training.
2. To determine the effectiveness of the developed technique training of athletes 18-19 years (results presented at important competitions).

The results of the study and their discussion. The achievement of high sports-technical results in biathlon depends on basic training, laying the foundation while training at a young age. And here a special role is played by the decision of the planning volume and intensity of training loads, selection and distribution of the basic means of training the ratio of types of training at different microcycles, mesocycles, and macrocycles. The quality of training of athletes depends mostly on it, where the main goal is successful performance at

the main competitions of the season [2,3, 6].

It is essential to bring the athletes to the competitions in the best shape [6, 7, and 8].

Well-written training plan for different stages of the annual cycle of preparation depends on the theoretical knowledge of the trainer, his experience in competition and its practice with the team (work experience).

Typical, a standard macrocycle used in the planning of the training load, developed for four years. The basis is the time between Olympic Games. The planning takes place over the years. At the end of each year the correction is made in the training process for such parameters as volume and intensity made on the basis of criteria of physical condition, and to a greater extent, the results of the main starts of the season. In addition, power tools training and the methods of use for the development of motor skills are reviewed.

Gradual increase in training loads throughout the annual cycle and in training all next years is planned in the training of young men, while the biathlon is not achieved the training parameters in adult sportsmen.

This article examines the implementation of training and cyclic loading of national team on biathlon of 18-19years old in Moscow region for two years of training.

In tables 1,2 there are key parameters of the training and cyclic loading in the annual cycle of training.

Table 1**The main parameters of the training and cyclic loading in the annual cycle of training 2015-2016**

	May	June	July	August	September	October	November	December	January	February	March	April	Total volume
Rollers,km		219	226	409	258								1112
Cross,km	86	179	96	186	130	38	52	35	75	40	45	85	1047
Bike,km	56	60											116
Skiing,km						247	430	246	432	309	301		1965
TOTAL km	142	458	322	595	388	285	482	284	507	349	346	85	4230

Table 2**The main parameters of the training and cyclic loading in the annual cycle of preparation, 2016/2017.**

	May	June	July	August	September	October	November	December	January	February	March	April	Total volume
Rollers,km		248	246	459	288								1241
Cross,km	106	171	116	215	160	78	72	55	85	70	65	35	1228
Bike,km	86	80											166
Skiing,km						277	480	286	442	349	335	256	2425
TOTAL km	192	499	362	674	448	355	552	341	527	419	400	291	5060

As seen from the figures in the table, the distribution of the cyclic training load was carried out by months of the annual cycle. The largest volume of cyclical load in the preparatory period were made in the month of August 2015 (595 km), and in the competitive period in the month of January 2016(507 km). The figures in the next year of training respectively were 674 km 527 and km.

In the annual cycle of training the general volume of cyclical load (OIN) is presented in kilometers (total), which is 4230 miles. This volume cyclic loading was performed by all members of the team biathlon-boys of the Moscow region sports season 2015-2016 academic year. The following annual cycle (2016-2017) the total amount of the cyclic load amounted to 5060 km.

As follows from the data of the indicators tables 46,5-48.0 % are for ski preparation of total cyclic load in the annual cycle of training.

The burden of movement on roller skis to the volume of running, walking and simulation, distributed approximately in equal shares.

In addition, it should be noted that the systematic increase in training load performed by Russian biathlon 18-19 age next year. This planning to increase the training load positively affects the achievement of high sports-technical results biathlon national team of the Moscow region.

The results of the competition period testified to the good sports-technical results which were shown by young athletes.

So, Tutmin E. and Sorokin, A., completed standard of master of sports of Russia in biathlon and Tutin E. took 3rd place at the world championship for young men in the composition of the relay of the Russian team. In addition, at the II youth Olympic games in Norway Tutin E. won 1 silver medal and 2 bronze ones (2015-2016)in the individual race. Zintsov K. performed the standard of candidate master of sports of Russia in biathlon and successfully competed at the Central district championship and superiority of Russia among young men.

Conclusions.

1.In the annual cycle in 2017-2018 the general volume of cyclical load training means training on

a monthly and annual cycle of training should be reviewed.

2. To increase the training volume of cyclical load in the preparatory period in such a facility, as cycling.

3. To sustain the concept of planning and distribution parameters of the training loads as a percentage in the annual cycle of training.

References:

Dunayev K. S. (2008) "Analysis of competitive activity as the factor of optimization of process of training of the Russian biathlons for responsible starts", Theory and practice of physical culture. M.: -№ 2. - P.40-43.

Dunayev K. S., Selifonov A. A., Baranova L. (2014), "Planning of training loads in junior biathlon national team of Russia in year cycle of preparation. The Olympic Games and modern society", Materials of the All-Russian scientific and practical conference with the international participation, October 30 -November 1, Malakhovka, P. 88-90.

Dunayev K. S., Selifonov A. A., Fedotov S. I. (2015) "Planning of training load in junior biathlon. The modern system of sports preparation in biathlon", Materials of the IV All-Russian scientific and practical conference. Omsk, p. 39-43.

Dunayev K.S., Aleksashin D.Y. (2013) "Conceptu-

al aspects of Russian biathlon training for the Winter Olympic Games in Sochi in 2014.", The final collection of All-Russian scientific-practical conference. The final stage of preparation of sports national teams to XXII Olympic Winter Games 2014 in Sochi., M., P. 40-43.

Dunayev K. S., Kriventsov A. L. (2014) "Modern problems of the Russian biathlon. «The Olympic sport and sport for everybody». 18 International scientific congress", Materials of the congress. October 14, 2014 2 vol., Almaty, , P. 155-159.

Farbey, V. V. , Dunayev K.S. (2011) "Experimental study of the influence of the orientation of the training process to increase the level of preparedness of athletes", scientific notes University. P. F. Lesgaft., №3 (73). P. 190-194.

Seyranov, S. G., Dunayev K.S. (2016) "Problems and the state of development of the Russian student biathlon", The modern system of sports training in biathlon. Materials of V all-Russian scientific-practical conference. by the general editorship of V. A. Aikin, N. With. Zagursky. Omsk., P. 204-209.

Seyranov, S. G., Dunayev K.S. (2017) "Actual problems of the student biathlon", Innovation-Education-Sport : proceedings of the world winter of the FISU conference / education and science of the Republic of Kazakhstan ; the international University sports Federation ; Federation of student sport of the Republic of Kazakhstan ; Kazakh Academy of sport and tourism., Almaty., P. 152-155.

DETERMINATION THE MAIN INDICATORS OF SAILING PERFORMANCE IN OPTIMIST SAILOR'S

Stoyan Bahchevanski

National Sport Academy „Vassil Levski”

The purpose of this study is to determine indicators of sailing performance of optimist sailors in Bulgaria by exploring the anthropometric, physical and motor coordination differences and factors that distinguish between elite and non-elite male optimist sailors. They performed a physical fitness test battery (EUROFIT), motor coordination test battery and the Bucket test. The sailors were divided into two subgroups (i.e. elites and non-elites) based on sailing expertise. The significant differences and factors distinguish between elite and non-elite optimist sailors were explored by means of multivariate analysis of covariance and discriminant analysis. Our results show us that 98.9% of elite optimist sailors could be classified by means of two motor coordination tests (i.e. side step (SS) and side jump (SJ)). These tests for strength- and speed-oriented motor coordination can be identified as indicators of sailing performance in young optimist sailors. Therefore, we believe that developing motor coordination skills is essential in training of optimist sailors.

Key words: Sailing, training, performance, strength, motor control

Introduction

Sailing is a sport where numerous factors such as morphology, physical fitness and well-developed technical and tactical skills determine performance (Bojsen-Møller, Larsson, Magnusson, & Aagaard, 2007). The basic actions for sailing include steering; hiking and sheeting (i.e. pulling on the ropes controlling the sails) and fitness requirements vary between boat classes. We found that in Bulgaria there are no studies have investigated influence of the anthropometric and physical characteristics to performance in youth sailors to get more light into the physical profile of young sailors and to improve training guidelines in youth sailing. From the theory of sailing sport is known, that the creation of an elite sailor is a long process with several stages of development. To evaluate the sailors' evolution from novice to high level elite, we use several validated test batteries to examine indicators of sailing performance throughout different stages of youth sailing. In order to get more insight into the characteristics of youth sailors and to improve the training guidelines, we aimed to determine indicators of sailing performance. This was done by investigating the anthropometric, physical and motor coordination differences and factors discriminating between elite and non-elite male optimist sailors.

The aim of our study is to determine indicators of sailing performance of optimist sailors in Bulgaria by exploring the anthropometric, physical and motor coordination differences and factors that

distinguish between elite and non-elite male optimist sailors.

Objectives of the study:

1. To investigate the anthropometric, physical and motor coordination differences.
2. To reveal the characteristics and factors discriminating between elite and non-elite male optimist sailors.

Methods

Sample and study design

Twenty six male youth sailors (aged 10–15 years) participated in this study. The sample was divided into two groups of youth sailors, i.e., elite optimist sailors ($n = 12$, mean \pm SD age = 13.2 ± 1.6 years with a range from 10 to 15 years) and non-elite optimist sailors, which includes ($n = 14$, mean \pm SD age = 11.4 ± 1.8 years with a range from 10 to 14 years). The youth sailors who were selected for the Bulgarian national team were assigned to the elite group. The subjects were instructed to perform no strenuous exercise 48 h before their visit to the lab. The visit to the lab, was organized as a rotation system, took 3 hour and started by filling in their training history. Anthropometric assessments were conducted followed by a standardized 10-min warming-up and evaluation of the gross motor coordination by the Körperkoordinationstest für Kinder (KTK) (Kiphard & Schilling, 2007). Further, overall physical fitness was evaluated by the EUROFIT test battery. About 4 min of recovery

was allowed between the different tests and at least 20 min of recovery was allowed before the Bucket test (Tan et al., 2006) and at least 20 min of recovery before the 20-m endurance shuttle run were performed.

Gross motor coordination (KTK)

Gross motor coordination was evaluated by the KTK (Kiphard & Schilling, 2007). The following KTK subtests were performed:

1. Walking backwards (WB) three times along each of three balance beams (3 m length; 6, 4.5 and 3 cm width, respectively; 5 cm height). A maximum of 24 steps (eight per trial) were counted for each balance beam, which comprises a maximum of 72 steps (24 × 3 beams) for this test. The number of steps were counted and summed over the nine travels.

2. Side step (SS): Moving across the floor in 20 s by stepping from one plate (25 × 25 × 5.7 cm) to the next, transferring the first plate, stepping on it, etc. The number of relocations was counted and summed over two trials.

3. Side jump (SJ): Jumping laterally as many times as possible over a wooden slat (60 × 20 × 5 cm each) in 15 s. The number of jumps over two trials was summed.

Physical fitness (EUROFIT)

The EUROFIT test battery (Council of Europe, 1988) was used to assess physical fitness. All tests were performed in bare feet (except the endurance shuttle run) following EUROFIT guidelines that are extensively described in the Council of Europe (1988).

Hiking endurance with incremental resistance (Bucket test)

This is a maximal incremental test of hiking endurance based on the protocol established by Blackburn and Tan (Blackburn, 2000; Tan et al., 2006). However, since we conducted this test to a pediatric population, starting load of the Bucket test was reduced from 15 kg to 0 kg. The subjects had to maintain a knee angle of >130° (the angle between the tibia and the bench) as 5 kg was added every minute until the subject could no longer hold it at the prescribed angle. The subjects braced

themselves by gripping the bench and were allowed to shift the load from one leg to another. The subjects' final endurance time was recorded to the nearest second.

Statistical analysis

Collected survey data were statistically processed with specialized program SPSS version 19.0. Multivariate analysis of covariance (MANCOVA) was used to identify the significant differences in the anthropometric, physical fitness and motor coordination parameters between elite and non-elite optimist sailors (Callewaert et al., 2014). For the sailing-specific Bucket test, a univariate analysis of covariance was used for the same purpose. Furthermore, we made a stepwise discriminant analysis with sailing level as the grouping variable and the significantly different anthropometric, physical fitness and motor coordination variables as the independent variables, was conducted to identify the most discriminating variables in classifying youth sailors by their sailing expertise level. The discriminating variables with their respective Wilks' lambda and p-value, canonical discriminant function coefficients, canonical correlation (rc) and classification percentages were denoted (Vandorpe et al., 2011). Significance level was set at $p < 0.05$.

Results

Elite optimist sailors were significantly older (13.2 ± 1.6 vs. 11.4 ± 1.8 years) ($p = 0.002$, $t = 3.462$) than the non-elite optimist sailors. Therefore, age were taken into account as covariate in the MANCOVAs. Results from the MANCOVAs are presented in Table I. It was indicated that elites sailed significantly more (hours per week) ($p = 0.036$). However, experience did not differ significantly between elites and non-elites. Furthermore, there were no significant differences between elites and non-elites in anthropometric variables and physical fitness. In addition, elite optimist sailors show a significant better score on the KTK SS ($p = 0.007$) and SJ test ($p = 0.015$), compared to the non-elite optimist sailors. As last, the sailing-specific Bucket test demonstrated that elite optimist sailors show a significantly higher knee-extension strength endurance time than non-elite optimist sailors ($p = 0.050$).

Table I. Significant differences of studied indicators between elite and non-elite optimist sailors.

Indicator	Mean \pm SD		MANCOVA	
	elite	non-elite	p	F
Experience (years)	4.3 \pm 1.4	3.6 \pm 1.8	n.s.	-
Practice (hours per /week) *	9.8 \pm 1.2	5.3 \pm 1.9	0.036	4.910
Height (cm)	156.8 \pm 7.6	146.5 \pm 10.9	-	-
Weight (kg)	45.7 \pm 6.5	37.6 \pm 7.3	-	-
Fat percentage (%)	13.3 \pm 2.5	16.3 \pm 3.8	-	-
Sitting height (cm)	80.8 \pm 3.4	75.4 \pm 5.1	-	-
Flamingo balance (n)	7.1 \pm 3.9	11.9 \pm 4.8	-	-
Plate tapping (n)	12.2 \pm 1.0	14.0 \pm 2.9	-	-
Sit and reach (cm)	28.1 \pm 3.0	19.9 \pm 5.4	-	-
Standing broad jump (cm)	175.7 \pm 13.4	157.5 \pm 22.5	-	-
Handgrip (kg)	31.4 \pm 4.0	25.5 \pm 8.1	-	-
Sit-up (n)	31.9 \pm 3.8	28.4 \pm 5.0	-	-
Bent arm hang (s)	27.9 \pm 16.9	15.1 \pm 13.1	-	-
Shuttle run 5 m (s)	20.6 \pm 0.8	21.9 \pm 1.4	-	-
Shuttle run 20 m (min)	8.1 \pm 0.8	7.3 \pm 1.2	-	-
Walking backwards (n)	56.1 \pm 9.1	53.3 \pm 12.7	-	-
Side step (n) *	62.6 \pm 5.3	48.4 \pm 6.9	0.007	8.896
Side jump (n) *	82.3 \pm 7.1	67.1 \pm 7.5	0.015	6.974
Bucket test (s)	409.4 \pm 51.1	301.3 \pm 67.7	0.050	3.212

*p < 0.05;

Table II shows the results of the stepwise discriminant analyses revealing the characteristics discriminating between elite and non-elite optimist sailors. 98.9% of the elite sailors could be correctly classified by means of the motor coordination tests SS and SJ.

Table II. Factors discriminating elite optimist sailors from non-elite optimist sailors (rc = canonical correlation coefficient)

	Wilks' lambda	p	Function coefficients	rc	Classification percentage
Side step	0.453	0.000	0.112	0.832	98.9% correctly classified
Side jump	0.309	0.000	0.097		+
Constant			-12.845		

Discussion

The present study aimed to determine indicators of sailing performance of youth sailors in Bulgaria by investigating the anthropometric, physical and motor coordination differences and factors discriminating between elite and non-elite male optimist sailors. The main results indicated that 98.9% of the elite optimist sailors could be correctly classified by means of two motor coordination tests (i.e. SS and SJ). As such, strength- and speed oriented motor coordination can be identified as indicators of sailing performance in young optimists.

Elite optimist sailors displayed a significantly older age than non-elite. Despite their age difference, it was surprising that they did not indicate more years of experience in comparison to non-elite. However, the elites reported to practice significantly

more hours per week (Table I), which suggests that elite youth sailors gained more sailing experience (boat handling, tactical skills and environmental knowledge) in the same time period than non-elite by spending more hours on the water. Therefore, we can suggest that "practice hours per week" is probably an important factor related to youth sailing success.

Because sailing is a weight-supported and weight dependent activity, specific height and body mass ranges for each Olympic class have been associated with success (Verdon, Lee, & Blackburn, 2012). However, our results do not reveal significant differences in height or weight between elite and non-elite youth sailors. Nevertheless, the elite optimist sailors tend to be somewhat taller and heavier than their non-elite peers.

Table III. Mean values \pm SD (and range) from literature compared to those found in our study

Reference	Sailing level	n	Age (years)	Weight (kg)	Height (cm)	Start age (years)	Parents Sailors.	Handgrip (kg)	Sit and reach (cm)	Sit-ups
Present study	Non-elite optimist sailors	14	11.4 \pm 1.8	37.6 \pm 7.3	146.5 \pm 10.9	8.1 \pm 1.1	40%	25.5 \pm 8.1	19.9 \pm 5.4	28.4 \pm 5.0
Present study	Elite optimist sailors	12	13.2 \pm 1.6	45.7 \pm 6.5	156.8 \pm 7.6	8.6 \pm 1.2	70%	31.8 \pm 3.5	25.1 \pm 4.0	30.4 \pm 4.2
The ideal size for the Optimist (2002)	2002 Worlds top 10	10	(12–15)	46.3 \pm 4.9	159.8 \pm 6.9					
Gonzalez Munoz (2003)	2003 Worlds top 20	16	13.9	48.6	159.8		50%	32.8	23	27.1
Top 10 at the 2007 worlds (2007)	2007 Worlds top 10	10	14.6 \pm 0.7	47.3 \pm 4.5	161.5 \pm 3.8	8.6 \pm 2.1	60%			
Top 10 at the 2011 worlds (2011)	2011 Worlds top 10	10	14.3 \pm 0.8	49.7 \pm 4.3	165.7 \pm 5.7	7.9 \pm 1.7	70%			
Margot Callewaert (2014)	Elite optimist sailors	24	13.6 \pm 1.2	46.4 \pm 7.4	157.1 \pm 8.7	9.3 \pm 1.0		31.4 \pm 4.0	28.1 \pm 3.0	31.9 \pm 3.8

It is important to mention that our elite Bulgarian optimist sailors are still quite young compared to world's top 20 elite optimists (Table III). Moreover, we can assume that years of experience is sufficient since earlier research showed that it is not too late to start optimist sailing at 10 or 11 years old (Top 10 at the 2007 worlds, 2007; Top 10 at the 2011 worlds, 2011). However, the Bulgarian elite optimist sailors clearly show too low practice amount (9.8 ± 2.2 hours per week) in comparison to the world's top 20 optimist sailors in 2003 (mean of 12.4 hours per week). This suggestion underlines once more the crucial role of practicing hours on the water for performance in optimist sailing. On the physical fitness tests, the elite optimist sailors did not score significantly better than their non-elite counterparts (Table I). This could be related with their general sports participation, although we did not dispose over this information. In comparison to the world's top 20 optimist sailors from 2003 (Gonzalez Munoz, 2003), these Bulgarian elite optimist sailors turned out to perform equally on the handgrip test and even better on sit and reach and sit-up test (Table III), indicating that the static strength, flexibility and core stability is well-developed in our elite optimist sailors. Furthermore, the significant differences in SS (i.e. a more coordinative task) and SJ (i.e. a more strength hand speed-orientated test) in our study indicate the importance of strength- and speed-oriented coordination for optimist sailing performance. Moreover, based on SS and SJ tests, it is even possible

to discriminate the better from the inferior optimist sailors, classifying the elite optimist sailors for 100.0% in the correct group. Therefore, we suggest that strength- and speed oriented coordination is an important indicator of optimist sailing performance.

As expected, elite optimist sailors outperformed non-elites on the Bucket test, measuring the knee-extension strength endurance capacity. Since the elite youth sailors clearly showed more practice hours per week than their inferiors, it could be argued that this is due to a training adaptation.

Conclusion

Resulting data give us grounds to assert, that the practice hours, knee-extension strength endurance and strength- and speed-oriented coordination are most important of factors that are related to performance in optimist sailing. Furthermore, the strength- and speed-oriented coordination can discriminate the elite from the non-elite optimist sailors and are therefore indicators of optimist sailing performance. Therefore, we believe that developing motor coordination skills is essential in training of optimist sailors in order to increase their isometric knee-extension strength endurance. In conclusion, we also recommend aerobic fitness training and core-stability training as these parameters are fundamental for the further development of an athlete's physical capacity up to elite adult sailor.

References

- Blackburn, M. (2000). Protocols for the physiological assessment of sailors. In *Physiological tests for elite athletes*. C. J. Gore (Ed.) (pp. 345–356). Champaign: Human Kinetics.
- Bojsen-Møller, J., Larsson, B., Magnusson, S. P., & Aagaard, P. (2007). Yacht type and crew-specific differences in anthropometric, aerobic capacity, and muscle strength parameters among international Olympic class sailors. *Journal of Sports Sciences*, 25, 1117–1128.
- Callewaert, M., Boone, J., Celie, B. De Clercq, D., Bourgois, J. (2014). Indicators of sailing performance in youth dinghy sailing. *European journal of sport science*. 15.. 10.1080/17461391.2014.905984.
- Council of Europe. (1988). Eurofit: Handbook for the EUROFIT tests of physical fitness. Rome: Secretariat of the Committee for the Development of Sport within the Council of Europe.
- Gonzalez Munoz, A. (2003). Profile of an elite level optimist competitor (pp. 1–4). Universidad de las palmas de Gran Canaria.
- Kiphard, E., & Schilling, F. (2007). Körperkoordinationstest für Kinder [Motor coordination test for children] (p. 78). Weinheim: Beltz Test GmbH, Göttingen.
- Tan, B., Aziz, A. R., Spurway, N. C., Toh, C., Mackie, H., Xie, W., ... Teh, K. C. (2006). Indicators of maximal hiking performance in Laser sailors. *European Journal of Applied Physiology*, 98, 169–176. doi:10.1007/s00421-006-0260-3
- The ideal size for the Optimist. (2002). Retrieved from <http://optiworld.org/idealsize.pdf>
- Top 10 at the 2007 worlds. (2007). Retrieved from <http://optiworld.org>
- Top 10 at the 2011 worlds. (2011). Retrieved from <http://optiworld.org>
- Vandorpe, B., Vandendriessche, J., Vaeyens, R., Pion, J., Lefevre, J., Philippaerts, R., Lenoir, M. (2011). Factors discriminating gymnasts by competitive level. *International Journal of Sports Medicine*, 32, 591–597.
- Verdon, A., Lee, H., & Blackburn, M. (2012). Sailing. In *Physiological tests for elite athletes* A. N. Tocco (Ed.) (pp. 411–419). Champaign: Human Kinetics. Indicators of sailing performance 7
- Stoyan Bahchevanski , Sofia, blvd. Ovcha Kupel 11 tel. +359893396385 e-mail: s_bahchevanski@abv.bg

QUANTIFICATION AND EVALUATION OF THE KATA PERFORMANCE IN SPORTS KARATE

Nazim Kurtovic

Abstract: The text explains the need for studying the peculiarity, the structures of the movements and their evaluation in the kata discipline of sports karate. The author points out that successful communication can not be achieved without quality feedback where the most important element is the relationship between the coach, the athlete and the achieved results.

Keywords: Kata, karate, individualization, mental training, evaluation.

Introduction

Katas are defined as a combat with imaginary opponents, where the motion structures are aesthetically shaped and choreographically given. Technically, they have a richer and more complex shape than the kumite, and belong to the group of aerobically-anaerobic activities (Doria et al 2009). For the needs of this study, a video analysis of the kata performances of several well-known instructors¹ and some of the most successful competitors² in the world was made in order to determine the particularity of this discipline. The analysis confirmed that competitors in relation to the instructors, but also in relation to the former champions, often modify the technical elements and the duration of the kata according to the current competitive trends. The primary technical perfection is not the focus of the performance, but the aesthetic shaping and choreography. The athletic performance, in particular, characterizes the expression of strength and speed. On the other hand, athletes have excellent control of the situation in the performance of the kata. The above conclusions served as a pattern in which we directed the research towards finding a method for a more objective evaluation of the kata performance. The karate experts participating in the interview with the author of this text, concluded that the research should be performed (Bompa 2000) with individual

treatment of each athlete through cybernetic management with long-term monitoring and permanent flow of information.

Methods and materials

Since the kata is characterized by a number of diverse technical elements (Doria et al 2009) and their assessment is a complex task, the research was conducted according to the WKF rules, where the efficiency of the kata is assessed on the basis of four main criteria: *Conformance, Technical performance, Athletic performance and Technical Difficulty of the kata*. We divided the subject of interest into two parts. The first part was analysis of the technical elements and the second part was an analysis of the athletic performance and kinesics (Ekman, 1964, 1965; Ekman, Friesen 1969). Also, we determined aesthetic, positional, performance, technical and compositional errors. Every single element was initially set at the level of an ideal performance to a perfect final position, where all deviations from the correct performance were considered as technical errors. Depending on the degree of deviation from the ideal performance, we determined the amount of deductions. For small faults (0.1), for medium (0.3), for large (0.5) and for fatal errors or significant loss of balance (0.7) and falls (1). We applied the same deductions for the same kind of error, regardless of the difficulty of the elements.

Sensei¹ Hitoshi KASUYA - Jion 1'22"; Goju shiho sho 1'45"; Unsu 1'20"; Sensei¹ Mikio YAHARA - Unsu 1'10" Sensei¹ Yoshiharu OSAKA - Unsu 1'05"; Sensei¹ Atsuko HIGAONNA - Suparimpei 2'05" ² Yuki Mimura Jion 1'12"; Kanku dai 1'40"; Goju shiho sho 1'35" ² Luca Valdesi; Jion 1'45"; Kanku dai 2'00"; Goju shiho sho 2'40"; Unsu 2'10"; ² Michael Milon - Unsu 1'50"; ² Abe Ryoki - Suparimpei 2'15"; ² Atsuko Wakai - Suparimpei 3'05"

Variable	Check points
Conformance (to kata) (C)	Excessively modified elements that significantly change the meaning and origin. of the kata
Stances (St)	Inadequate width, height, knee angle, hinge and foot rotation, center of gravity
Individual techniques (Tec)	Head position (Head restraint in relation to the vertical axis), shoulder position (Incorrect angle and tension in the shoulders), position of the hands and the manipulative part of the hands (Incorrect angle of the forearm in relation to the shoulder bone, the elbow in correlation of the trunk and the irregular trajectory, inadequate angle of the palm/fist in relation to the forearm, etc.), the method of lowering the feet on the surface (eg. false landing with the toe and fingers, the inner part of the foot, etc.)
Transition movement/Crossing from stance to stance (Tm)	Damaged vertical axis and the overall holding of the body, pulling the front foot toward itself in the event of <i>oi komi</i> or <i>suri komi</i> movement, or pushing the heel on the back leg when turning backwards or sideways. Position of the feet in relation to the knees and hips, angle of contact with the surface (Different segmental compensations due to incorrect rotation in the hips)
Timing/synchronization (T)	Performing technique prior to completion of the transition from one to another position
Breathing (B)	Performing parts of the kata in apnea, excessive loud exacerbation of the throat, mismatched breathing with the performance of the elements
Focus/Kime (F)	Levels of prolonged non-contractible time of the technical elements- Describing the instantaneous tensing at the correct moment during a techn. where certain finality is implied.

Table 1. Check points of the technical elements in the performance of the kata (Tp), with a coefficient of importance (0.6) according to Nazim Kurtovic

Variable	Check points
Strength (St)	General expression of strength
Speed (S)	General expression of speed
Enbusen (E)	For each kata, the enbusen is fixed and must be accurately monitored
Balance (B)	Improper holding of the support underneath (center of the body mass)
Rhythm (R)	Proper timing between techniques
Kinesics (K)	Expression of non-verbal communication - self-confident performance with a pronounced facial expressions, body posture, gestures, eye movement, and the use of space. Clear understanding of every movement and proper expression of the idea and fighting spirit,
Zanshin (Z)	State of full consciousness

Table 2. Check point of the level of athletic performance and kinesics (Apk) with a coefficient of importance (0.4) by Nazim Kurtovic

The next step was to create an evaluation criterion for the main mechanics in the performance. In the evaluation of the specific motor knowledge (technical performance) *Tp*, we determined the coefficient of importance 0.6 (*tab.1*), for the level of the specific motor abilities in karate (athletic performance and kinesics) - *Apk*, we determined

the coefficient of importance 0.4 (*tab.2*). Each expert, independently and on previously prepared forms, evaluated each segment separately allocating points from 5 to 10. Similar criteria were used in specific motor tests (*Kahrovic et al 2014*). During the evaluation the following standards were applied:

Evaluation rate	Evaluation criteria
10 points	For a harmonious and synchronized performance of the technical elements without errors
9 points	For a very good technique with one of the components slightly distorted – small error
8 points	For very good execution of techniques, occurrence of minor errors, where the basic structure of the elements is not compromised
7 points	For good performance of the technical elements, there is a slightly larger number of errors, but the basic principles are not significantly disturbed
6 points	Where the basic structure of the technique is partially disrupted and uncertain performance is noticed – presence of more medium and small errors
5 points	For poor performance, evidence of larger or fatal defects, the structure of the movement is substantially impaired, extreme uncertainty is noticed.

Table 4. Evaluation of the technical performance according to Nazim Kurtovic (2017)

Evaluation rate	Evaluation criteria
10 points	For excellent artistic interpretation of the kata with expressed mechanical energy and non-verbal communication.
9 points	For high level of interpretation, confident and conclusive, expressed mechanical energy, but there is still not enough expression of non-verbal communication.
8 points	For very good interpretation, but not enough conclusive and slightly unconfident, inappropriate breathing, and not enough expression of non-verbal communication.
7 points	For good interpretation, but there no proper timing between the techniques – inappropriate rhythm, no clear understanding of the movements, inappropriate breathing and no proper expression of the non-verbal communication
6 points	Uncertain athletic performance with inappropriate timing between techniques – inappropriate rhythm, no clear understanding of the movements, inappropriate breathing and no proper expression of the non-verbal communication.
5 points	For poor interpretation, not conclusive and very unconfident, it is missing maximum range of expression in strength and speed, incorrect enbusen, inappropriate breathing, inappropriate timing between the techniques – inappropriate rhythm and no proper expression of the non-verbal communication.

Table 5. Evaluation of athletic performance and the non-verbal communication according to Nazim Kurtovic (2017)

The average results of both segments, collected and multiplied by the corresponding coefficient of importance, formed the final grade for the general performance (GP).

$$Gp = (Tp \text{ mean} \times \text{Coefficient } Tp) + (Apk \text{ mean} \times \text{Coefficient } Apk)$$

In the next step, it was necessary to examine the level of knowledge and abilities of each individual, and then create the database of the model characteristics of the middle achievements of the group. The diagnosed condition was to be recorded in the personal files. The fourth step required an analysis of the linking and recording of the results of the individual athletes' performance in relation to the average values of the group's model characteristics. In the fifth step, according to the recorded initial condition, a short-term training intervention was planned. According to the results obtained, in the sixth step follows the programming

of the individual transformation process. In the seventh step was made an implementation of the training intervention. In the last eighth stage was the complete control testing in order to get a new condition. After the first round were set up new goals, planning, programming and realization of the training intervention until the next testing.

Training intervention

In the implementation of the training intervention, (Kurtovic, Savova 2016) the advanced model of karate training was used. To correct the technical performance according to the standards of the Shotokan technical organization (WSKF), the problematic key movement patterns should be first identified. Then (Jeffreys 2006), each technique is divided into a series of discrete moving patterns and separated into "target motion mechanics". Since the target mechanics of such movements is based on mechanical principles, the errors were

clearly perceptible. The exact execution of each individual movement, according to its function and for easier perception of errors, was classified in three phases: an initial phase (Fig. 1); a transitional phase (Fig. 2) and the third actualization phase (Fig. 3). In order to increase the effectiveness of the training, (Knudson, Morrison 1997), we developed a system for identifying the target mechanics for each moving pattern that should be corrected.

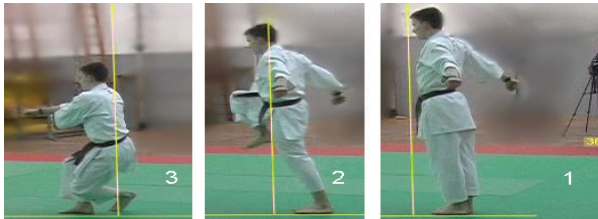


Figure 3

Figure 2

Figure 1

For illustration, when analyzing the individual movement, the “check-point” list included an area of observation - the whole posture, but also each segment separately and the target mechanics for each area separately. According to this example, we made a list for each target moving pattern in each of the analyzed kata. This analysis was a powerful tool that provided a model with which we could compare the performance of the athlete. Once the motion patterns were mastered (according to the expert opinion), the next step was to identify and integrate these discrete motion patterns into sequences that appear in the kata.

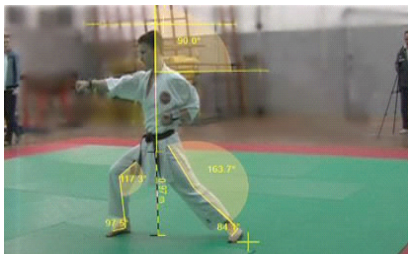


Figure 4

Visualization is the primary mental competence important for the kata, which should be possessed by every competitor. We used it in order for the athletes to be able to think effectively in images and to control the course of images and corrections in a positive direction for the mental intentions to be easily transformed into a motor reaction. In this direction, the model of kumite training (Kurtovic & Savova 2016) served as a pattern for creating an appropriate model for kata training. Once we introduced the athletes, in the first step, with the techniques and procedures of the training, after the activation phase, through the techniques of

progressive relaxation (Jacobson 1938) and KI meditation (K. Tohei 1976), they should have regulated their psychophysiological state. Using the video material with performances of world-class competitors, the athletes imaginarily studied various situations and exercises for performing katas in order to improve their technical and athletic performance with kinesics. Otherwise, in such cases, the brain regions known as the “mirror neuron system” show an increased activity when the performer sees the movements he has previously trained. Such findings (Daniel Glaser) suggest that the brain can simulate this movement he learned with a simple observation. In the next steps, the performance should have been projected without error aligned with the practical performance. The next task in the third step was to establish respiratory control and the focus. In the fourth step, for appropriately fulfilling the mechanical energy and in a suitable rhythm, the katas were to be imaginarily then practically drawn in the opposite direction (first in parts, then completely), and with the opposite side (mirror effect). The final fifth step followed the practical realization through a situational training, in conditions characteristic for the competition. Verbal support from the environment was involved, by ignoring them, occasionally criticizing or praising their performance. In this context, trainings with Kumite were included on a daily basis due to the realistic sense of the techniques. The demonstrated behavior and realization was a mirror of everything that was trained in the training sessions in the previous steps. After ensuring that in such circumstances “they are ok,” we left them alone to use these techniques during the training sessions, and later in the control matches as well. At all of these phases, athletes used mentioned techniques of excitement and relaxation.

Object of the research

All athletes (N4) were male, aged 19.4 ± 2.7 years, with 65.5 ± 6.5 kg weight and 172.0 ± 5.2 cm height. After obtaining consent to participate in the experiments, before each simulation, they were explained in detail the purpose and procedures, as well as the measures for their protection against injuries.

Equipment and stimulators

For the purpose were used specialized karate dojo-laboratory with tatami model bedding: SMAI 2 cm; 5 cameras Sony PMW-EX1; 4 Sony VCT 1170RM Tripod; Sony portable LCD Projector VPL-X1000 and VPS-120 FH Flat screen, Sony

HT-CT390 Sound Bar System, DELL Vostro 1720 Laptop PC with Dartfish software installed.

Procedure

athletes under our control, had a 90-minute training, nine times a week. An audience was provided to capture the competitive atmosphere. 5 video cameras, documented each performance from 4 different angles placed analogously, with the viewpoint of the corner judges. The fifth camera was in the hands of a cameraman focused on the face and torso of the performers, with which the performances and non-verbal communication of the athletes were closely observed (Figure 5). Immediately beside the cameras were located five karate experts, which evaluated and made notes in detail for each performance in previously prepared forms.

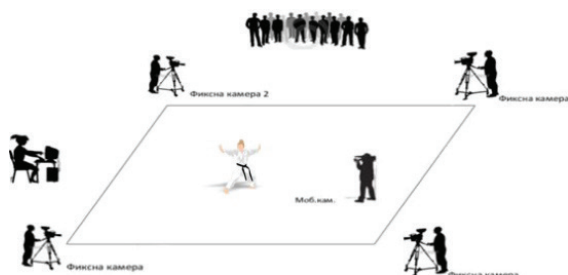


Figure 5. Atmosphere during the measurements

Each athlete had a task to perform five katas per day with a break of 15 to 25 minutes between rounds for breaks and meditative sessions. The recordings were later analyzed with the Dartfish software. In order to avoid subjectivity, the analysis was carried out by an expert team of experts who debated the possible controversial details. The experiment had an initial, control and final measurement with a distance of 6 months between the measurements.

Results and discussion

In order to prove the hypothesis that continuous individually modeled training influenced the ability for general performance in all tested athletes and from one measurement to another significantly reduced the errors in individual technical and athletic performances including non-verbal communication, we supported our results with comparative statistical analysis made with *Md Calc 2013* software where in all comparisons the *p* value was ≤ 0.05 .

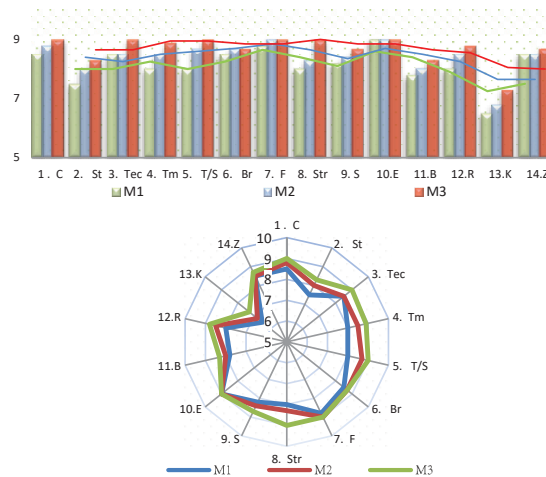


Figure 6 and Figure 7 Technically & Athletic and Kinetics performance Athlete N in first, second and third measurement

As an illustration of Figure 6 and Figure 7, individual results and progress in all variables of the selected athlete during the performance are displayed. The athlete improved its average score from 8.154 to 8.446 on the control measurement after 6 months. At the end of the measurement, the average score improved from 8.446 to 8.729. When training for the issues in question, the results obtained are illustrations from a relatively short research period, which is another proof that the applied methodology had a positive impact.

- 1.Conformance (C),2.Stances (St) 3.Techn. El. (Tec)
- 4.Trans.betw.stances (Tm) 5.Timing/Sinhronisat. (T/S)6.Breathing (Br) 7.Focus/Kime (F) 8.Strength (Str),
- 9 Speed (S),10.Enbusen(E),11.Balans (B)12.Rhythm (R),13.Kinesics (K)14.Zanshin (Z)

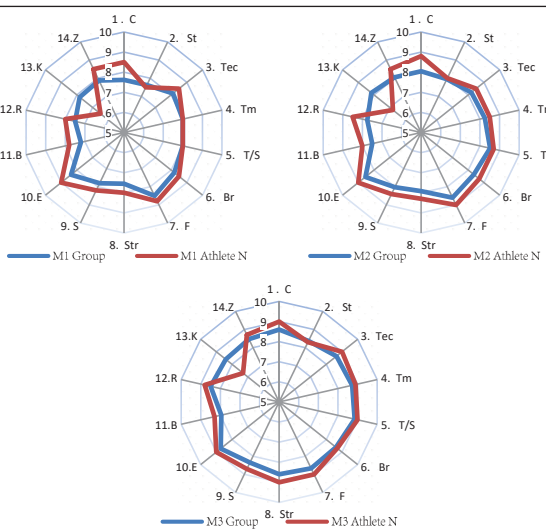


Figure 8, 9 and 10. Difference between average results of group and athlete N in first, second and third measurement

On Figure 8, 9 and 10 is presented the progress of the group as a whole, as well as the individual results and deviations of the athlete (N) in relation to the average results of the whole group in the three measurements. Among other things, in the regular athlete polls, there were also questions related to anxiety during kata performances in official competitions, the testimonies confirmed that the essential understanding of what they worked greatly helped them improve the quality of their performance during the training and increase their self-confidence in the competitions. The results of the detailed analysis with the Dartfish software were regularly presented to the athletes and they played a significant role in removing the eventual skepticism in the evaluation process. Namely, through the cinema projection they could realize argumentatively their own weaknesses, thanks to which they increased the cooperativity.

Conclusion

The presented text is a pilot study focused on the analysis and evaluation of the technical and athletic kata performance. The experience gained in the realization of this research has confirmed that, through the presented methodology, we can significantly influence the improvement of the kata performance in sports karate. Therefore, we believe that this study represents an experience plus and enrichment of the highly deficient literature related to the theory and methodology of sports training in the kata disciplines. It is especially important to note that in the individual treatment, the long-term observation and detailed video analysis enables us to objectively evaluate our work and effectively plan and implement the process of transformation. We believe that this text will be useful and applied by teams in sports karate who aspire to optimize their daily work and open new perspectives for the serious application of the combined method of mental and technical preparation in the training process. In the next period, our goal will be to explore the individual influence of the predictor system on the criteria system of the applied and quantified variables. We hope that this study will be an additional application for the WKF professionals responsible for creating the rules and that they will seriously consider how to objectify the very subjective and

unconvincing evaluation of the katas in future. Our recommendation is that in the future, the method of evaluation in kata disciplines should follow the example of already proven indicators in sports and rhythmic gymnastics, synchronized swimming, ice skating, ski jumping and sports jumping in water.

Reference

- Bompa, Tudor (2000) Total Training for Young Champions, Book pp 1-15 , Human Kinetics ISBN 0-7360-0212
- C.Doria, et All (2009) Energetics of karate (kata and kumite techniques) in top-level athletes Eur J Appl Physiol 107:603–610 DOI 10.1007/s00421-009-1154-y
- Ekman, P. (1964). Body position, facial expression and verbal behavior during interviews. *Journal of Abnormal and Social Psychology*, 68, 295–301.
- Ekman, P. (1965). Differential communication of affect by head and body cues. *Journal of Personality and Social Psychology*, 2, 725–735.
- Ekman, P., & Friesen, W.V. (1969). The repertoire of non-verbal behavior. *Semiotica*, 1, 49–98.
- I.Kahrovic et All; (2014) Differences between karate practitioners of varied competition orientations in specific motor test results *Facta Universities Series: Physical Education and Sport Vol.12,N3,2014*,pp. 227-239
- Jacobson (1938), *Progressive Relaxation*, University of Chicago Press, Chicago Book
- Jeffreys, I (2006) Optimising speed and agility development using target classifications and motor control principles Part One. *Professional Strength and Conditioning* (3) 11-14
- Jeffreys, I (2006) A motor development approach to enhancing agility Part One. *Strength and Conditioning Journal*.28 (5). 72-76
- Jeffreys, I (2006) Optimising speed and agility development using target classifications and motor control principles Part Two. *Professional Strength and Conditioning* (4) 12 - 17
- Jeffreys, I (2006) A motor development approach to enhancing agility Part Two. *Strength and Conditioning Journal*. 28(6).10-14.
- Koichi Tohei 1976. *Book of Ki*, Diorama, 1998. - 96 pp.; Zagreb -1998.UDK 133.52 (520) ISBN 953-6573-07-5 980911062) Book
- Kurtovic N, Savova N.(2016) Optimization of Performance in Top-Level Athletes during the Kumite in Sport Karate. *Journal of Sports Science*, David Publishing Company. 616 Corporate Way, Suite 2-4876, Cottage, NY 10989, USA
- Knudson D, Morrison C (1997) *Quantitative analysis of human movement* Champaign, IL: Human Kinetics. Book
- Monkey do, monkey Daniel Glaser <http://www.pbs.org/wgbh/nova/sciencenow/3204/01-monkey.html>

SPORT RESULTS DYNAMICS IN AGE ASPECT OF BULGARIAN 110M HURDLERS

Grigor Gutev

National Sports Academy "Vassil Levski"

Summary

The 110-m hurdle running is a key discipline in each athletic competition due to the facts that it is the first hurdle discipline in historic plan and the spectacular height of the hurdles – 106.7 cm. We assume that analyzing the best Bulgarian hurdlers of all time we can help improvement of selection and training processes control. The aim of the following study is to analyze the sport development of the best Bulgarian 110 m hurdlers. For the purposes of the study we gathered information regarding their best results during their sport careers – all record holders and hurdlers left trace in the discipline are included in the study. All data was processed using Microsoft Excel and SPSS 19.0 applying variance and correlation analysis. The study results present the specific model characteristics of the sport result valid for Bulgarian hurdlers, such as sport realization and talent development, etc. Based on research data we developed evaluation tables for sport result realization based on respondents – ready for immediate use in sport practice. Also as a help for practice we present regression models for sport results prognosis. Also, we present information which must be used as a role model for sport development of future world elite hurdlers.

Key words: 110 m hurdles, men, age, sport results, dynamics,

Introduction

The 110-m hurdle running is a key discipline in each athletic competition due to the facts that it is the first hurdle discipline in historic plan and the spectacular height of the hurdles – 106,7 cm.

Due to various anthropometric, climate, geographical, and sport-methodical differences in the different geographical regions we assume that there will be differences in sport realization in the discipline 110-m hurdlers for men. Based on our studies regarding the sport realization of world elite hurdlers we aimed our attention to the Bulgarian elite in the hurdle running to find its characteristics (Guteva, Gutev, Dimova, 2017).

We assume that analyzing the performance in age aspect of best Bulgarian hurdlers of all time we can help improvement of selection and training processes control and from there – hurdlers sport realization.

Aim and Objectives of the study

The aim of the following study is to analyze the sport development in age aspect of the best Bulgarian 110 m hurdlers. For the purposes of the study we gathered information regarding their best results during their sport careers – all record holders and

hurdlers left trace in the discipline are included in the study (including athletes with result better than 14,30 sec. – in total 37 respondents). In this study, we analyzed the sport result development of all Bulgarian national record holders and the athletes with visible trace in the discipline. All respondents finished their sport careers.

Methods

The information regarding the personal best results of all respondents is based on developments in this field of Vangelov (2007, 2011), „Leka Atletika” sport magazine from the period 2008-2016 and the official web page of Bulgarian Athletic Federation (BAF).

All data was processed using Microsoft Excel and SPSS 19.0 applying variance and correlation analysis. For developing evaluation tables, we used signal and T-scale statistical methods.

Results and Discussion

The study results present the specific model characteristics of the sport result valid for Bulgarian hurdlers, such as sport realization and talent development, etc.

Table 1
Research data variance analysis.

	age PB	age																
		16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
count	37	3	9	21	27	28	31	31	29	20	17	17	14	12	9	6	4	1
min	19	15,58	14,19	13,99	13,93	13,79	13,54	13,59	13,33	13,43	13,41	13,46	13,67	13,59	13,83	13,77	14,57	
max	29	15,99	15,73	15,45	15,53	15,20	14,97	15,05	15,35	14,64	14,98	14,77	14,86	14,88	15,37	15,87	16,08	
average	23,11	15,81	14,80	14,74	14,64	14,47	14,34	14,32	14,33	14,27	14,22	14,25	14,25	14,41	14,60	14,62	15,12	14,42
m \bar{x}	0,371	0,12	0,16	0,08	0,08	0,07	0,07	0,06	0,07	0,07	0,10	0,09	0,10	0,11	0,18	0,30	0,33	
S	2,26	0,21	0,47	0,38	0,43	0,39	0,37	0,36	0,40	0,31	0,39	0,38	0,39	0,39	0,54	0,74	0,67	
V%	9,77	1,33	3,18	2,58	2,96	2,72	2,55	2,51	2,81	2,14	2,77	2,64	2,72	2,67	3,73	5,07	4,41	
As	0,42		1,27	0,16	0,13	0,35	-0,22	-0,22	-0,16	-1,36	-0,13	-0,41	-0,01	-0,81	0,02	0,83	1,59	
Ex	0,11		1,65	-0,36	-0,78	-0,50	-0,64	-0,51	1,28	1,73	-0,03	-0,38	-1,15	0,10	-1,57	1,04	2,74	

On Table 1 we present the variance analysis for all respondents. We find best, weakest and average result for each age – from 16 to 32 years of age. Most cases we find for the period 18-28 years (range from 31 to 12 athletes per age). The best average values and from there the best period for setting personal best and revealing personal sport abilities in the hurdle running in Bulgaria is between 21 and 27 years. We must note that this is not mandatory and the sport development of each athlete has individual character. But the tendencies will be a good guide for the people working with youngsters. Based on the skewness (As) and kurtosis (Ex) indexes we found normal data distribution in the period 17-27, 29 and 31.

On Figure 1 we see graphic of the best, weakest and average result of best Bulgarian hurdlers in the age period 16-31 years. From this data it is clearly visible the dynamics of sport result thought different age periods.

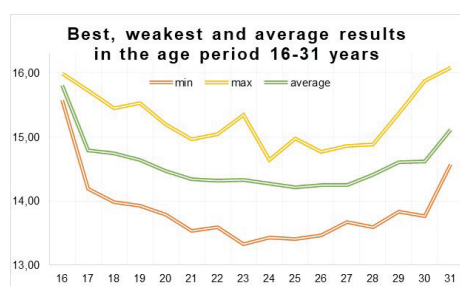


Figure 1.

On Table 2 and Figure 2 we see the correlation between the sport result for the certain age and athletes personal best result. Based on this we found the age result for 22, 24-28 have higher interrelations with the PB, and from there this age period is best for setting high level of sport results in the discipline 110 m hurdles.

Table 2
Correlation matrix – interrelations between PB and sport result for the certain age.

age	PB	number of cases	Correlation is	
			0,05 level	0,01 level
18	0,440	21	0,41	0,53
19	0,530	27	0,37	0,48
20	0,604	28	0,36	0,46
21	0,695	31	0,35	0,45
22	0,841	31	0,35	0,45
23	0,687	29	0,36	0,46
24	0,708	20	0,42	0,54
25	0,787	17	0,46	0,58
26	0,758	17	0,46	0,58
27	0,878	14	0,5	0,62
28	0,804	12	0,53	0,66

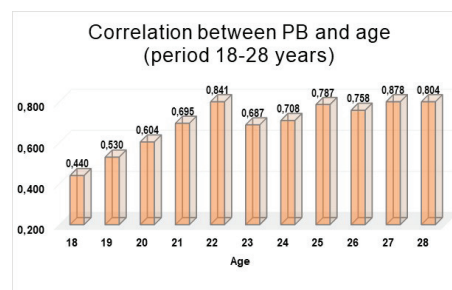


Figure 2.

Based on research data we developed evaluation tables for sport result realization based on respondents – ready for immediate use in sport practice. In the development of assessment tables, we included only age with normal data distribution based on the variance analysis.

On Table 3 we present the first way of assessment which can be directly implemented in sport practice. Using 7 level evaluation scale we can assess the evolution of sport result in age aspect based on the results of all Bulgarian hurdlers with PB result under 14,50 sec.

Table 3
Assessment using the Sigmal method based on 7 level evaluation scale.

assesment	17	18	19	20	21	22	23
very high	under 13,86	under 13,98	under 13,78	under 13,69	under 13,60	under 13,60	under 13,53
high	13,86-14,32	13,98-14,35	13,78-14,20	13,69-14,07	13,60-13,96	13,60-13,95	13,53-13,92
above average	14,33-14,56	14,36-14,54	14,21-14,42	14,08-14,27	13,97-14,15	13,96-14,13	13,93-14,12
average	14,57-15,04	14,55-14,93	14,43-14,86	14,28-14,67	14,16-14,53	14,14-14,50	14,13-14,53
below average	15,05-15,27	14,94-15,12	14,87-15,07	14,68-14,86	14,54-14,71	14,51-14,68	14,54-14,73
low	15,28-15,74	15,13-15,50	15,08-15,50	14,87-15,25	14,72-15,08	14,69-15,04	14,74-15,13
very low	over 15,74	over 15,50	over 15,50	over 15,25	over 15,08	over 15,04	over 15,13
	24	25	26	27	29	31	
very high	under 13,65	under 13,44	under 13,49	under 13,47	under 13,52	under 13,78	
high	13,65-13,95	13,44-13,82	13,49-13,86	13,47-13,85	13,52-14,05	13,78-14,44	
above average	13,96-14,11	13,83-14,02	13,87-14,05	13,86-14,05	14,06-14,32	14,45-14,78	
average	14,12-14,43	14,03-14,42	14,06-14,44	14,06-14,45	14,33-14,87	14,79-15,46	
below average	14,44-14,58	14,43-14,61	14,45-14,63	14,46-14,64	14,88-15,14	15,47-15,79	
low	14,59-14,89	14,62-15,00	14,64-15,01	14,65-15,03	15,15-15,68	15,80-16,46	
very low	over 14,89	over 15,00	over 15,01	over 15,03	over 15,68	over 16,46	

We offer another way for assessment of sport For example, in the age of 19 years a result close to development in age aspect using T-scale and Z-scores. 14,64 is average (Z score is 0,0 and T score is 50).

Table 4
Assessment using T-scale and Z-scoring.

P%	Z	T	17	18	19	20	21	22	23	24	25	26	27	29	31
99,87	3,0	80	13,39	13,60	13,34	13,28	13,24	13,24	13,12	13,35	13,04	13,12	13,08	12,97	13,11
99,38	2,5	75	13,62	13,79	13,56	13,48	13,43	13,42	13,32	13,51	13,23	13,31	13,28	13,24	13,45
97,72	2,0	70	13,86	13,98	13,77	13,68	13,61	13,60	13,52	13,66	13,43	13,50	13,47	13,51	13,78
93,32	1,5	65	14,09	14,17	13,99	13,88	13,79	13,78	13,72	13,81	13,63	13,69	13,67	13,79	14,11
84,13	1,0	60	14,33	14,36	14,21	14,07	13,98	13,96	13,93	13,97	13,83	13,88	13,86	14,06	14,45
69,15	0,5	55	14,56	14,55	14,42	14,27	14,16	14,14	14,13	14,12	14,02	14,06	14,06	14,33	14,78
50,00	0,0	50	14,80	14,74	14,64	14,47	14,34	14,32	14,33	14,27	14,22	14,25	14,25	14,60	15,12
30,85	-0,5	45	15,03	14,93	14,85	14,66	14,53	14,50	14,53	14,42	14,42	14,44	14,44	14,88	15,45
15,87	-1,0	40	15,27	15,12	15,07	14,86	14,71	14,68	14,73	14,58	14,61	14,63	14,64	15,15	15,78
6,68	-1,5	35	15,50	15,31	15,29	15,06	14,89	14,86	14,93	14,73	14,81	14,82	14,83	15,42	16,12
2,28	-2,0	30	15,74	15,50	15,50	15,26	15,08	15,04	15,13	14,88	15,01	15,00	15,03	15,69	16,45
0,62	-2,5	25	15,97	15,70	15,72	15,45	15,26	15,22	15,33	15,04	15,20	15,19	15,22	15,96	16,78
0,13	-3,0	20	16,21	15,89	15,94	15,65	15,44	15,40	15,54	15,19	15,40	15,38	15,41	16,24	17,12

Conclusion

Based on our study based, on the experience of best Bulgarian hurdlers (with result under 14,50 sec.) we analyzed the sport realization model and specific periods for reaching maximum of individual sport abilities.

Based on research data we developed two ways of sport result assessment and from there sport

specialists can make better plans and corrections of the training process and sport realization.

However, often sport realization is characterized by athlete individuality, so this must be taken in mind when applying the results of the following study.

References

Guteva, Hr., G. Gutev, I. Dimova, Sport results dynamics in age aspect in the discipline 110 m hurdles – men, Proceedings of XI International Scientific and Practical Conference of Students and Young Scientists “Modern University Sport Science”, May 17-18, 2017, Moscow, 2017. (page 90-96).

<http://bfla.org/> - Official web site of the Bulgarian Athletic Federation.

Vangelov, A. BFLA, Leka Atletika – Darjavni shampioni, Medalisti I Bulgarski ranglisti 1926-2006g. Es Print, Sofia, 2007g. // Вангелов, А., БФЛА, Лека атлетика – Държавни шампиони, Медалисти и Български ранглисти 1926-2006 г., Ес Принт, София, 2007 г.

Vangelov, A., Nai, nai, nai v Bulgarskata atletika, Тип-Топ Прес, Sofia, 2011g. // Вангелов, А., Най, най, най в Българската атлетика, ТипТоп Прес, София, 2011 г. Journal “Leka Atletika”, 2008-2016g. // Сп. Лека атлетика, 2008-2016 г.

Author information:

Senior lecturer Grigor Gutev, PhD, National Sports Academy “Vassil Levski”, Department “Track & Field”

Address: Sofia, Bulgaria, ZIP 1700, “Studentski gard”, NSA “Vassil Levski”, office 334 (Department “Track & Field”)

Mobile +359 889 503 604, e-mail: grigor.gutev@gmail.com

COMPARATIVE ANALYSIS OF THE CHANGES IN THE CARDIO-PULMONARY TEST FOLLOWING A PROLONGED INTERVAL NORMOBARIC HYPOXIC TRAINING OF TRACK AND FIELD MIDDLE AND LONG DISTANCE RUNNERS

Iveta Bonova, Yulian Karabiberov, Velizar Mihajlov,

Borislava Petrova, Georgi Maximov, Kostadin Kisiov
National Sports Academy "Vassil Levski"

The artificial normobaric hypoxia is ever more used for the preparation of competitors practicing disciplines for endurance. Its advantage is because there are no changes in the location, climatic conditions and barometric pressure. Thus it follows that the adaptation to the lack of oxygen passes easier in comparison with the real high mountain condition (Zelenkova et al 2016; Maleev D. 2016; Potapov, Maleev 2016) if the basic requirements for the combination of the two factors hypoxia and physical load are followed. Being a factor of life importance for the organism hypoxia can provoke functional and structural adaptation changes (Krastev, Iliev 1970; Baiely, Davies 1997; Bernardi L. et al 2001; Bonova I. 2016). Depending on the hypoxia degree and the intensity of the physical load appear as well the changes under supervision, which can be both general referring to the complete contingent of the persons under supervision and single referring to the separate individual. Most generally said, the changes can be immediate starting right after the organism is within the hypoxic media and lasting, called long-term ones (Chapman et al 2013; Chapman et al 1998; Flaherty et al 2016). This is the main theses of a range of authors for setting apart both stages of adaptation to the hypoxia known as: a stage of unstable adaptation (initial adapting) and the stage of stable adaptation (lasting adapting). Lung hyperventilation is observed during the unstable adaptation, alkaline-acid equilibrium shifts towards alkaline direction, which is due to the hyper ventilation and increased release of carbon dioxide, increase of the sub maximal cardiac frequency when the maximal cardiac debit is decreased or preserved (McCardle W. et al 1996; Randall W. 2007). Lung hyperventilation stays during the stage of the long term adaptation but the alkaline reserve is decreased, the sub maximal cardiac debit is decreased to the level prior hypoxia but the maximal cardiac debit is decreased, the concentration of hemoglobin and the number of the erythrocytes is increased. The authors mentioned presume that the number of the capillaries, of the mitochondria is increased; increased are the aerobe enzymes in the muscles too.

Purpose of the study

The aim of this study is to prepare comparative analysis of the functional indicators changes prior and after a six-week experimental methodology of training with normobaric hypoxia applied to track and field middle and long distance runners.

Tasks of the study

1. Study of the functional indicators changes at a level corresponding to the aerobe threshold prior the beginning and immediately after the end of a six-week normobaric hypoxic training;
2. Study of the functional indicators changes at a level corresponding to the anaerobe threshold prior and immediately after a six-week normobaric hypoxic training;

The authors realized the experimental study according to a scientific project of "Vassil Levski" National Academy of Sport during the months of April, May and June 2017; they compared the changes of the

indicators corresponding to various levels of intensity after a long hypoxic training.

Methodology

We have selected twelve higher students – middle and long distance competitors and divided them into two groups, experimental and control ones while each group covered equal number of persons. Prior the beginning of the experiment, we have tested both groups by a incremental cardio-pulmonary test up to refusal for defining the functional capacity. The experimental group have been training for six week according to specially developed methodology of the training. The speed of running is individual for each person under study and corresponds to seventy percent of the maximal oxygen consumption (VO₂max). The quantity of the hypoxic irritator increases each new week by simulated 500 meter height above sea level while the speed stays constant until the end of the experiment. The competitors have three training sessions per week and then pass

to new simulated height. The control group is also preparing for participation in the summer national championship for middle and long distance runs but without a normobaric hypoxic training. The experiment continued during the competitive period covering the stages of early competitions and basic competitions. Following the end of the six-week hypoxic training program, we have tested the competitors in both groups again by cardio-pulmonary test up to refusal for defining the changes.

The competitors are between 18 and 28 years of age, weight 61-71 kg and height of 167-183. We have acquainted each competitor participating in the scientific project with the coming procedures and entered into the list according to his own wish, signing informative agreement. We have planned the scientific project into three stages of complex studies: 1) incoming, 2) final and 3) post-experimental studies. The procedure of the study covers: complete blood test, anthropometry, electrocardiography, cardio-pulmonary test up to refusal and lactate recovery. All tests are made into the Scientific and Applied Activity in Sport Center to "Vassil Levski" National Academy of Sport. Oxycon- Jaeger и Treadmill-Cosmos hp, Germany is the trade mark of the gas analysis apparatus. The system is calibrated prior the test start. The cardio-pulmonary test up to refusal protocol is according to prof. I.Iliev's methodology. It starts with initial speed of 6 km/h, the duration of each step is a minute and a half, the speed of running is increased by 1,2 km/h without changing the inclination, the test goes on up to the individual refusal of the persons under study. We have acquainted each competitor individually with the test prior the testing while during the testing itself they were informed about the time reached and the basic functional indicators. The normobaric training was conducted through mountain air generator Higer-Peak, 2015 year of manufacture USA.

We have statistically processed the average values and the standard deviations by the Paired- Sample t-test, at a level of importance $p < 0,05$.

Analysis of the results

Comparative analysis of the cardio-pulmonary test results corresponding to aerobe threshold level (AeT):

- The comparative analysis of the changes for the Oxygen Consumption indicator measured

at aerobic threshold level (VO_2 ml. /kg. /min.) shows increase (14%) in the experimental group training with artificial hypoxia while in the control group the increase is by 1, 9% (fig.1). The increase of the VO_2 is related to the high levels of the aerobic abilities of the competitor in sports where endurance is a basic quality. The difference between the two groups proves the effect of the offered training methodology combined with artificial hypoxia.

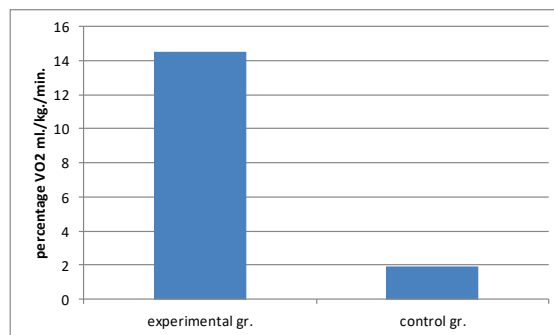


Fig.1 Percentage increase of VO_2 ml/kg/min on the level of Aerobic threshold

- Utilization ($F_{et}O_2$) measured at aerobic threshold level (AeT), following a six-week artificial hypoxia.

The experimental group shows increase of all persons under study while the average increase is 5, 7 %. Considerable change is not observed in the control group (fig.2). The changes under study are measured at mouth level at intensity corresponding to the aerobic threshold. Values of a complete step of intensity corresponding to the aerobe zone of workability are entered for the calculation.

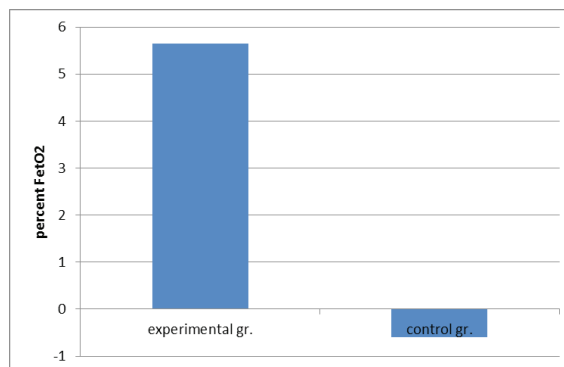


Fig.2 Percent increase utilization of oxygen after 6 week normobaric hypoxia in Experimental and Control group

- Oxygen heart rate (HR/ O_2 ml.) measured at aerobe threshold level. This indicator is a derivative one and its calculation is based on the

maximal oxygen consumption and the frequency of the cardiac contractions. The experimental group shows an increase by 10, 2 %, for the control group the increase is by 4, 2% (fig.3). During the post hypoxic study, a decrease of the frequency of the cardiac contractions is established for the group training with hypoxia. The decrease is individual for the various persons under study and varies from three to eight contractions. There is no change for the cardiac contractions frequency indicator for the control group.

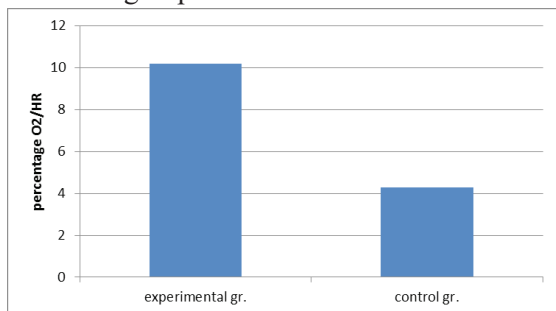


Fig.3 Percentage changes in O₂/HR achieved on the level of Aerobic Threshold

- Speed of running achieved at Aerobic threshold level. Fig.4 shows the comparison between the speed of running at aerobe threshold level prior the start of the experiment and immediately after its end as well as the percentage improvement of both groups (experimental and control ones).

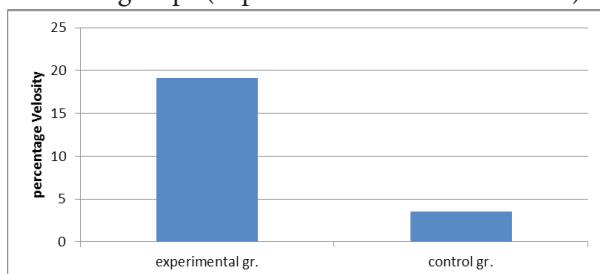


Fig.4 Percentage increase of running velocity achieved on the level Aerobic threshold

The experimental group having trained under artificial hypoxia shows increase of the speed of running by 19 % and decrease of the cardiac contractions frequency at the level of intensity studied. These changes show improved economy and effectiveness in the function of the respiratory mechanisms while providing the energy needs of the organism. For the control group the increase of the speed of running corresponding to the level of the aerobe energy exchange is 3, 5 %. Both groups have increased

the speed of running registered at aerobe threshold level while the percentage increase is definitely greater in the experimental group.

- Pulmonary ventilation (VE l. /min.) at aerobic threshold level. The group having trained under hypoxia shows decrease of the minute respiratory volume at a level corresponding to the aerobe energy exchange while in the control group there is no such a tendency (Fig.5) I.e. an improvement of the economy in the work of the aerobic mechanisms is again observed.

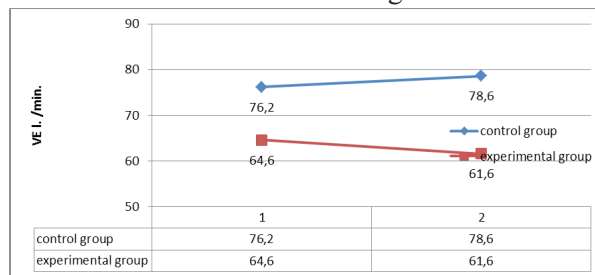


Fig. 5 Pulmonary ventilation on equal level to Aerobic Threshold

Comparative analysis of functional indicators at Ventilation threshold intensity level (RER1)

- We executed the post experimental study on the first day following the hypoxic training program. The experimental group shows prolonged time for reaching the Ventilation threshold (RER1), i.e. the ventilation threshold moves to the right side towards higher speed of running, which shows that the competitors have been running for a longer time at an aerobic and mixed regime of energy supply. The control group does not change substantially the time for reaching the ventilation threshold.
- Distinctive difference between both groups experimental and control one is registered for the equivalent of the oxygen indicator at a ventilation threshold level (RER1). The experimental group marks a decrease of the values for all persons under study while the control group registers a slight increase (Fig.6). The measured indicator bears information about the economy and effectiveness in the work of the respiratory system and shows how many liters of air should be ventilated in order to use one liter of oxygen.

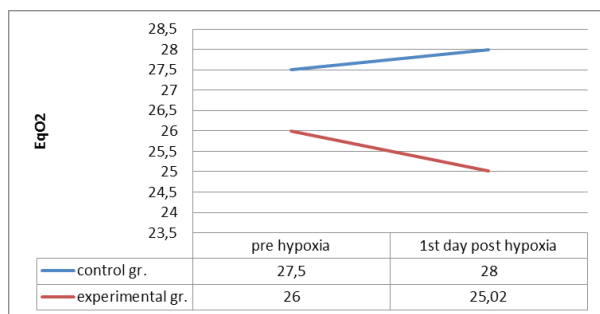


Fig. 6 Equivalent of oxygen on level of Ventilatory threshold (RER1)

- Comparative analysis of the changes for the Maximal Oxygen Consumption (VO₂max.) indicator measured at Ventilation threshold level (фиг.7).

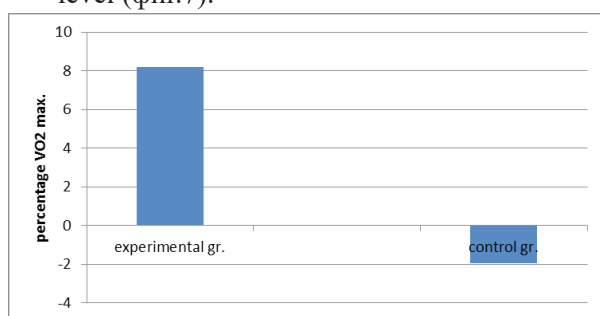


Fig.7 Percentage increase of VO₂ ml/kg/min on level Ventilatory threshold (RER1)

Experimental group show increase maximal oxygen consumption of 8, 2% in investigated level but control group – slight decrease.

Conclusions:

The training within an artificially created hypoxic conditions is an effective method for improving the functional economy in the activity of the energy mechanisms of the organism.

This basic conclusion is confirmed by the following results of the studies and analysis effected:

1. The comparison of the functional indicators at aerobic threshold level shows that the experimental group has increased the VO₂ max. indicator, which is related to the high levels of the aerobic abilities of the competitors practicing sports where endurance is a basic quality.
2. The experimental group shows statistically reliable increase of the lung utilization (FetO₂) indicator measured at aerobic threshold level, the zone of intensity studied corresponds to a stable steady-state.

3. Following the experiment, the speed of running at aerobic threshold level is increased for the experimental group. These changes show improved economy and effectiveness in the functioning of the respiratory mechanisms while providing the energy needs of the organism.

4. The experimental group having trained with hypoxia shows increase of the minute respiratory volume (VE 1.) at a level corresponding to the aerobic energy exchange, there is no such a tendency for the control group.

5. The comparison of the functional indicators at anaerobic threshold level shows that the experimental group has increased the VO₂ max. indicator, the control group does not increase the values of the indicator mentioned.

6. The equivalent of oxygen (EqVO₂) functional indicator measured at ventilation threshold (RER1) level notes a decrease of the values for all persons under study from the experimental group, while the control group registers slight increase.

7. The post experimental study executed on the first day following the hypoxic training program registers prolonged time to reaching the Ventilation threshold (RER1) i.e. the ventilation threshold moves to the right side towards higher speed of running.

8. The cardio-pulmonary test up to refusal covers the whole range of the training intensities of load and can be an objective means for establishing the effected changes in the organism of the competitors.

References

- Krastev K., I. Iliev. (1970) Visochina, hipoksia i sport. //Кръстев К., И. Илиев.(1970) Височина, хипоксия и спорт. Медицина и физкултура.
- Vonova I. (2016) Hipoksichna trenirovka v ravninni usloviq I neynite osobenosti.//Бонова И. (2016) Хипоксична тренировка в равнинни условия и нейните особености. Съвременни аспекти на височинната подготовка.
- Baiely D., B. Davies.(1997) Physiological implications of altitude training for endurance performance at sea level: a reviews. Br. Sports Med.
- Bernardi L., C. Passino, Z. Serebrovskaya, T. Sere-

- brovskaya and O. Appenzeller.(2001) Respiratory and cardiovascular adaptations to progressive hypoxia. Kiev.
- Chapman F. R., Stickford L. A., Lundby C., Levin D. B.(2013) Timing of altitude training and sea-level performance. *Journal Applied Physiology*.
- Chapman F. R, James Stray- Gundersen, and Benjamin D. Levine.(1998) Individual variation in response to altitude training. American Physiological Society.
- Flaherty G., Rory O'Connor, Niall Johnston. (2016) Altitude training for elite endurance athletes: A review for the travel medicine practitioner. Ireland.
- Mcardle W., Katch F., Katch V. (1996) *Exercise Physiology*. Williams&Wilkins.
- Randall W. Application of altitude/ Hypoxic Training by elite athletes. (2007) United states Olympic committee.
- Зеленкова И. Е., Зоткин С. В., Грушин А. А.(2016) Сравнительная оценка методов нормо и гипобарической гипоксии в подготовке спортсменов. Современная система спортивной подготовки в биатлоне.
- Малеев Д. О.(2016) Организационно-методические условия применения гипоксической палатки в подготовке лыжников- гонщиков высокой квалификации. Современная система спортивной подготовки в биатлоне.
- Потапов В. Н., Д. О. Малеев.(2016) Возможности нормобарической гипоксии в повышении функциональных резервов организма лыжников- гонщиков высокой квалификации. Современная система спортивной подготовки в биатлоне.

FORECAST MODEL TO OPTIMIZE THE PREPARATION ON BALANCE BEAM

Bonka Dimitrova, Neli Tankusheva, Marina Petrova

Summary

The selection in a multi-year aspect is an indelible part of the scientifically grounded organization and management of the preparation of the sports reserve (Nikitushkin, 2009; Rosin, 2007; Dimitrova, 2014). It is based on the comprehensive study and characterization of athletes' athletic abilities and creating of possible most realistic forecasting models (Sivash, 2012; Chernuhina, 2004). The purpose of our research is to create a competitive model of the balance beam for our best gymnast in girls. To achieve the goal, we have produced model features of elite athletes in Europe for the surveyed age in 2015-2017, based on their participation and presentation at major competitions during this period. On the basis of the discovered parameters with the testing method and the analyzed stage of our gymnast training, we have prepared an individual optimized predictive model for the balance beam. The research showed that the actual achievement of the desired level of technical preparedness requires a change in the planned load in the different countries of the sports training. The comparative analysis identified the weak points in our contestant's subtitle. This allowed the development of new realistically achievable parameters of the forecasting model and a new corrected preparation plan.

Key words: technique, difficulty, model characteristic

Introduction

The selection in a multi-year aspect is an indelible part of the scientifically grounded organization and management of the preparation of the sports reserve (Nikitushkin, 2009; Rosin, 2007; Dimitrova, 2014). It is based on comprehensive study and characterization of athletes' athletic abilities and the forming of possible most realistic forecasting models (Sivash, 2012; Chernuhina, 2004).

The comparative analysis of the difficulty of the routines of the Bulgarian national competitors and the world elite from OG'2012 in London (Dimitrova, 2015) showed that the exercises they have mastered and routines of different apparatuses, constructed according to their capabilities, are far from those of the best. This has led us to construct a competitive capable predictive model for an age group of women, of our gymnast who participated in the European Championship (EC) for juniors in 2016. The selection of this contestant had to be carried out according to the following criteria:

- Level of technical and physical preparation;
- Participation and ranking of international competitions;
- Psychological stability;
- Motivation and desire for victory.

The study showed that we do not have a complex competitor who meets our requirements. This led us to only one apparatus – the beam, where our representative would have been the best chance of success. In the process of multiannual preparation in artistic gymnastics increases the reliability and stability of performance of various gymnastic exercises, connection from them and competition routines (Smolevski, Gaverdovsky, 1999). The beam is a kind of gymnastic all around that symbolizes the accuracy and grace of the motion action on a small support area. Many authors point to this apparatus as a “checkpoint” for successful performance in various competitions (Dimitrova, 2002; Dondi, 2007).

Aim and Objectives of the study

The purpose of our research is to create a competitive model of the balance beam routine of for our best gymnast in junior, given its upcoming participation in women's competitions for 2018. In order to achieve this goal we have set the following tasks:

- To create model characteristics for the technical training of elite gymnasts in Europe for the test age in 2015-2017, based on their participation and presentation at major competitions during this period.
- To testing and analyze the physical and technical preparation of our gymnasts.
- To create an individual optimized forecast model for the apparatus beam

Methods

In our work, we used the methods of observation, testing, modeling and analysis. The subject of our study is the routines of the beam and the object are the exercises determining the technical difficulty. We have analyzed 36 beam routines of competitors from the world elite and in our country.

Results

We have analyzed the beam routines of the best competitors on this apparatus in 2015 and 2016, respectively – the European Youth Olympic Festival, 2015 (EYOF'2015) and the European championship for juniors – 2016 (EC'2016).

Table 1 Results of the C I – Qualifications on beam for juniors of the EYOF'2015

Ranking (place)	Name	Nationality	D-score (points)		E-score (points)		Final score (points)	
				Difference		Difference		Difference
1.	D. Skrypnik	RUS	5,80		8,500		14,300	
2.	A. Klinkaret	BEL	6,00	+ 0,20	8,300	- 0,200	14,300	0,000
3.	N. Derwael	BEL	5,60	- 0,20	8,400	- 0,100	14,000	- 0,300
4.	I.T.Crisan	ROU	5,90	+ 0,10	8,100	- 0,400	14,000	- 0,300
5.	Z. Kovacs	HUN	5,70	- 0,20	8,050	- 0,450	13,750	- 0,550
6.	M.R. Methuen	GBR	5,30	- 0,50	8,400	- 0,100	13,700	- 0,600
7.	M. Maggio	ITA	5,60	- 0,20	8,050	- 0,450	13,650	- 0,650
8.	A. Iliankova	RUS	5,40	- 0,40	8,100	- 0,400	13,500	- 0,800
Average EYOF'2015			5,663		8,238		13,900	

Table 2 Results of the C I – Qualifications on beam for juniors of the EC'2016

Ranking (place)	Name	Nationality	D-score (points)		E-score (points)		Final score (points)	
				Difference		Difference		Difference
1.	A. Iliankova	RUS	5,80		8,483		14,283	
2.	E. Eremina	RUS	5,40	- 0,40	8,866	+ 0,383	14,266	- 0,017
3.	L. Charpy	FRA	5,70	- 0,10	8,475	- 0,008	14,175	- 0,055
4.	I.T.Crisan	ROU	6,00	+ 0,20	8,133	- 0,350	14,133	- 0,150
5.	P. Borzykh	GEO	6,00	+ 0,20	8,033	- 0,450	14,033	- 0,250
6.	A. Kinsella	GBR	5,60	- 0,20	8,400	- 0,083	14,000	- 0,283
7.	M.R. Methuen	GBR	5,80	0,00	8,133	- 0,350	13,933	- 0,350
8.	H. Schaefer	GER	5,70	- 0,10	8,100	- 0,383	13,800	- 0,483
Average EC'2016			5,75		8,328		14,078	
52.	R. Ranchova	BUL	5,20	- 0,60	6,966	- 1,517	12,166	- 2,117

Table 1 and 2 show the results of the first eight of Competition I – Qualifications (C I). The model features of elite gymnasts from the C I, show that the difficulty score is within the range of 5.30 – 6.00 points and the average of the model is 5,663. The results are no different than these of the EC'2016. There, the average difficulty in routines is 5.75 points. This reveals the continuous growth in the level of technical readiness for excellence in gymnastics.

The difficulty score (D-score) of our competitor – 5.2 p. – comes close to the best, which shows us the potential of success. In the execution score (E-score), however, it is nearly two points lower than the aver-

age for the elite, which leads to a final score – 12.116 p. In Figure 1 shows the level of the Bulgarian participant in the EC'16 and the values of the model characteristics of the best for the studied competitions. The study showed that the actual achievement of the desired level of technical preparedness is possible given the difficulty, which has reached for the moment. Improving performance, in our opinion, is related to the level of the competitor's physical qualities. Therefore, to prepare the forecasting model we studied the level of physical and technical preparation during the transition to the age group - women. For this purpose, we analyzed the attestations for the national team in 2016-2017.

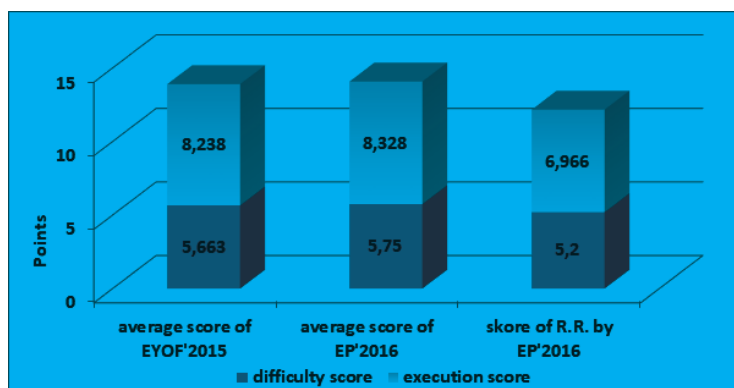


Figure 1 Average final score of the beam from Competition I - Qualifications of the eight finalists from EMOF'2015 and EC'2016 and the R.R. - BUL, participant of the EP'16

The analysis of the results of the national team attestation (Table 3) of our competitor identified the weak units in its preparation. The technical readiness of the beam (Table 4) has the largest contribution to the overall excellent score on this side of the sport preparation.

Table 3 Results in points, from conducted national team attestation junior - 06-07.02.2017

Name	Competition II -AA	category	Technical preparation	category	Physical preparation	category	Trampoline preparation	category	Total	category
R. R.	48.300	III	91	I	95	IV	3	II	237.300	III

Table 4 Results in points, from conducted national team attestation junior - Competition II - AA - 06-07.02.2017

Name	[T]			[H]			[B]			[■]			Total scoring
	D-score	E-score	Final score	D-score	E-score	Final score	D-score	E-score	Final score	D-score	E-score	Final score	
R. R.	4.00	8.60	12.600	1.90	8.00	9.900	5.50	7.80	13.300	4.60	7.90	12.500	48.300

Table 5 Results of R. R. from the attestation of technical preparation for a national team of girls - 07.02.2017

Apparatus	[T]			[H]			[B]						Total scoring				
	D	E	Total	D	E	Total	D		E		Total	D		E		Total	
							G	A	G	A		G		A	G		A
Number of exercises	-	-	-	2	-	2	5	6	1	-	12	3	3	1	1	8	22
Number of points	-	-	0	8	0	8	20	24	5	-	49	12	12	5	5	34	91
							44		5			24		10			

Note: They are respected technically correctly executed exercises with difficulty D and more. Each vault with a value of 4.50 to 5.00 point by the Code of points - FIG is group D - 0.4 p.; E - 0.5 p. and etc. On the beam and floor ex. exercises can be gymnastic (G) and acrobatic (A).

Table 5* Evaluation table for level of technical preparation for national team – juniors.

Evaluation on technical preparation	excellent	very good	good	medium	poor
Number of points	more than 90	76 - 89	66 - 75	51 - 65	under 50

Table 6 Results of an attestation on physical preparation for national team juniors – 07.02.2017

Name	Physical preparation tests for national team junior																Total (points)
	Test № 1 20 m sprint race from standing start		Test № 2 High jump after jump from 50 cm height		Test № 3 flexibility in hip joints - with left / right leg, forward and sideways		Test № 4 Glide Kip to handstand		Test № 5 From straddle angular support force lifting to handstand		Test № 6 15 jumps, from lie on his back		Test № 7 hold in a handstand		Test № 8 climb rope in a straddle angular hang		
	sec	points	sm	points	degrees	points	number	points	number	points	sec	points	sec	points	sec	points	
R.R.	3,31	0	48	15	163,5	34	11	35	2	5	31,58	6	10	0	0	0	95

Note: The maximum value for each test is 50 points, i.e. for 8 tests - the maximum is 400 points

Table 6* Evaluation table for level of physical preparation for national team – juniors.

Evaluation on physical preparation	excellent	very good	good	medium	poor
Number of points	321 – 400	241 – 320	161 – 240	81 – 160	1 – 80

The advantage absorption of acrobatic and gymnastic exercises on beam and floor exercises, with great difficulty (D and E) and the lack of such or extremely insufficient of the other two apparatuses – vault and uneven bars, reveal gaps or unilateralities in preparation (Table 5, 5*). This is due, according to us, to the level of physical training of the gymnast. Its physical fitness does not correspond to the high aspirations for realization. From a possible 400 points, it has only 95 (Table 6, 6*), which according to the rating scale gives her average grade at the physical preparation. The table shows that with a maximum of 50 test points, R.R. has a relatively good set of points 34-35 in just two tests - for flexibility and for force. That is why we consider one of the requirements for the gymnast’s entry in the world elite is the better physical preparation, especially work for speed, force, explosive force and endurance.

The analysis of performance of routines in a competitive environment of our gymnast shows that she makes more mistakes on more responsible competitions. This reveals a lack of psychological stability in a more complex setting. We suppose that the ex-

istence of competition, poor physical training lead to greater uncertainty and implementation mistakes. Unlike these competitions, the presentation of state championships and national attestations of the apparatus beam in most cases is an indicator of stability, confidence and high technical level. This gives us reason to build a predictable model competing with the world’s elite.

Discussion

According to the obtained results of the conducted study, we compiled a forecast model presented in Fig. The proposed beam’s routine, consists of 17 exercises (Figure 2).

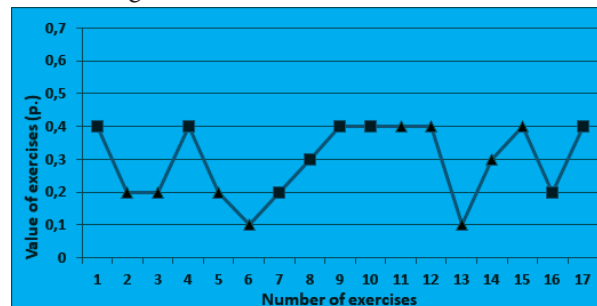


Figure 2 Composite Structure of the Projected Model of the routine of a beam for R. R. – BUL for 2018

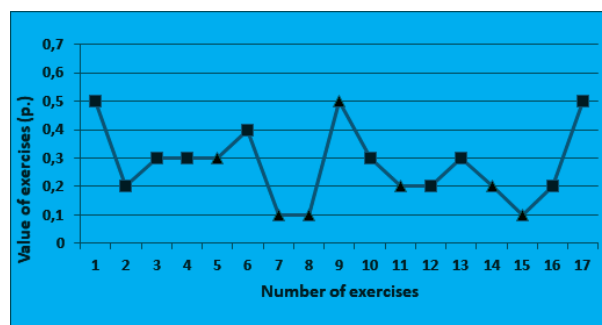


Figure 3 Compositional structure of the beam routine of K. Ponor – ROU from the EC'2017 for women

According to the FIG rules, for difficulty are considered only 8 exercises (3 gymnastic and 3 acrobatic and 2 optional), usually those that have the highest value. The estimated difficulty is 3.2 points. In this way, the combination fulfills the composition requirement, which adds another 2.0 points and is represented possible connections from exercises of value – 0.8 points. Thus, the estimated D-score is 6.0 points. The model characteristic of the best gymnast of the beam for the period under consideration (Figure 3) gives us the parameters of the sought-after sporting perfection. The comparison of the two models shows that our competitor has a higher initial score of 0.1 point. The individual gifting of our gymnast to this model is an essential prerequisite for the success. Finally, we can draw the following conclusions:

- The individual forecasting model thus constructed by us is an objective consequence of the mastered volume of acrobatic and gymnastic exercises from R.R.

- The proposed compositional structure of the beam routine and suggested connections from exercises is actually achievable and competitive for the 2018 competitive year.

References

- Dimitrova, B. (2002), Gimnasticheska greda – metodika, ravnovesie, sporten rezultat, B-INS, Sofia, in Bulgarian
- Dimitrova, B. (2014), Teoriya na podbora, sportna gimnastika – zheni, B-INS, Sofia, in Bulgaria
- Dimitrova, B. (2015), Sistema za podgotovka I optimizirane na obuchenieto v sportnata gimnastika, B-INS, Sofia, in Bulgaria
- Dondi, A. (2007), Nadezhnost vipolneniya gimnasticheskikh prizhkov na brevne, Disertacia, St. Petersburg
- Nikitushkin, V. G. (2009), Sovremennaya podgotovka yunih sportsmenov, Moscow
- Rozin, E. Y. (2007), Metodicheskie aspekti otbora I problem sportivnogo otbora, Fizitsheskaiya kultura, Moscow
- Sivash, I. S. (2012), Sportivnij otbor I orientaciya v sisteme mnogoletnego sovershenstvovaniya gimnastok v grupovih uprazhneniyah hudozhestvennoi gimnastiki, V.F.S., № 1
- Smolevski, V., Gaverdovski, Y. (1999), Sportivnaiya gimnastika, Olimpiiskaiya literatura, Kiev, 462
- Chernuhina, O. V. (2004), Otkor sohraneniya detei v sporte, Fizitsheskaiya kultura, 1, Moscow
- Prof. Bonka Dimitrova, PhD
 Assoc. Prof. Neli Tankusheva, PhD
 Head Assist. Marina Petrova, PhD
 National Sports Academy
 Department of Gymnastics
 Studentski grad, 1700 Sofia, Bulgaria
 E-mail: boni07@abv.bg

EXPERT ANALYSIS OF THE FLOOR EXERCISE TRAINING SYSTEM

Marina Petrova

Summary

The routines of floor exercise are a combination of choreography, acrobatic and gymnastic exercises. A research by S. Borissenko (2000) reveals the percentage ratio between these interconnected parts. Predominantly the highest percentage is the choreographic movements – 71.4%. The latest changes in the gymnastics rules direct attention to the specialists to the attractiveness and artistry of the gymnastic combinations of this apparatus. When the gymnast performing her routines, she has to demonstrate her abilities and turn the well-composed composition into a “performance”. In this performance, she has to demonstrate good choreography, artistry, expressiveness, musicality and perfect technique. The positions of Bulgarian athletes in this gymnastics discipline in recent years are not very good. This has directed us to study the causes of the weak results and optimize the preparation in a multi-annual aspect, according to the new global trends. The analysis of the routines of the best gymnasts in Bulgaria and in the world showed that the results of our athletes are logically related to our whole system of training for floor exercise, which needs to be optimized.

Key words: floor exercise, difficulty, technical regulations

Introduction

The floor exercise is one of the most difficult disciplines of the female gymnasts. It is characterized by progressive development in three directions: difficulty in exercises and combinations, composition and performance. The contents of the combination include acrobatic exercises in series, relations from gymnastic exercises and movements (Dobрева, Ts., 2007a). A research by S. Borissenko (2000) reveals the percentage ratio between these interconnected parts. Predominantly the highest percentage is the choreographic movements – 71.4%, in which authors includes the jumps, leaps, turns and spins, connecting elements such as poses and movements with the body and limbs. According to the same study, 25% used the acrobatic exercises, which are the basis of the difficulty and the requirements for composition of the routines. The quantity of the exercises on the floor exercise are these with which every gymnastics training begins. It is necessary to accumulate a volume of basic motor actions on which depends the level of technical training (Dimitrova, B., 2015b). The latest changes in the gymnastics rules direct attention to the specialists to the attractiveness and artistry of the gymnastic combinations of this apparatus. When the gymnast performing their routines, she has to demonstrate her abilities and turn the well-composed composition into a “performance” (Smolevskiy, V, Gaverdovskiy, 1999). In this performance, she has to demonstrate good choreography, artistry, expressiveness, musicality and perfect technique (Dobрева, Ts., 2007b). The positions of Bulgarian athletes in this gym-

nastics discipline in recent years are not very good (Dimitrova, B. & Petrova, M., 2013, Dimitrova, B., 2015a).

Aim and Objectives of the study

Therefore the aim of our study is to establish objective criteria reasons for the poor performance of this apparatus and to optimize the training system. To achieve the goal we set ourselves the following tasks:

1. To record and analyze the combinations of Bulgarian gymnasts and those of the global elite
2. To make a comparative analysis of volume material utilized for different age groups.
3. To suggest changes in training program in multi-aspect.

Methods

In the course of our work we used the methods of recording and observation, expert analysis, comparative analysis and statistical methods. The objective of our study is 207 combinations covering five age groups - junior girls, senior girls, girls, and cadets completed in the state championships in 2017 and the finalists' combinations of this apparatus of the European Championship for Girls in 2016 in Bern. The subject of the study is the difficulty and the selected exercises included in the composition and performed by the athletes.

Results

In the first age group – girls up to 9 years of age, gymnasts perform a compulsory combination. It includes 8 acrobatic exercises – round-off and two flic-flac in connection, walkover backward, handstand, handspring, walkover and flic-flac to one leg. These exercises formed the difficulty of the combination. The gymnastic exercises include – 1/1 turn (360°), stretched hop with 1/1 turn (360°), leap with alternate leg change and two split leap fwd (leg separation 180°). They are not involved in the difficulty, but if they are not met, it takes 0.5 p. for each. The analysis of 74 executed combinations shows that 52.7% of gymnasts perform all requirements others have included only some of the difficult exercises (Figure 1). The largest percentage – 24.33% have executed 5 of the requirements, with two flic-flac and flic-flac to one leg missing, while 10.81% do not include in the combination handspring or handstand.

The technical training standards for this age according to our Single Program (Dimova, Tsv. et al., 1988) are as follows:

1. For 7-8 year olds:
 - Round-off;
 - Handspring;
 - 1/1 turn (360°);
 - Flic-flac;
 - Handstand (keeping).
2. The 8-9 year olds are added;
 - Round-off, Flic-flac;
 - Power lifting to handstand an outwardly open angle;
 - Leap with maximum amplitude.

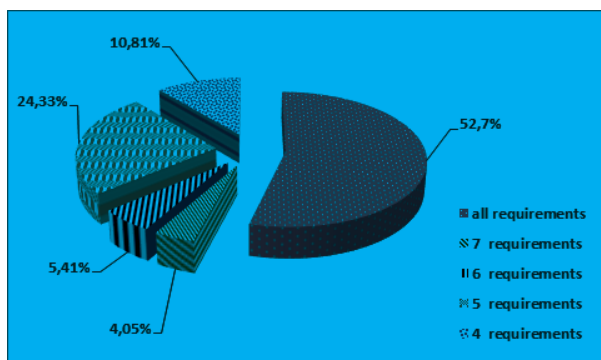


Fig.1 Performed requirements – girls up to 9 years old

Comparing the compulsory combination according to the ordinance of the Bulgarian Gymnastics Fed-

eration for 2017 and the Single Program, it seems that the requirements correspond to the volume of material that should be studied at that age.

The next age group is senior girls (10-11 year olds) who also play a compulsory program, but the difficulty is greater. The exercises that form the difficulty (9 pieces) are round-off, flic-flac and salto backward stretched in series, power lifting to handstand, handspring-salto forward tucked, round-off, flic-flac and salto backward tucked. Only 46.15% of the 52 combinations studied play with the full age requirements (Figure 2). The remaining gymnasts do not execute all the difficult exercises, with 17.3% perform 8 requirements, most of which do not make the power lifting to handstand. At 11.54%, 2 difficult exercises missing – salto backward stretched and handspring or salto backward tucked. The same percentage of gymnasts 11.54% plays only 3 of the requirements they are two round-off and flic-flac or handspring. For most gymnasts the problem is mainly the salto backward and forward. This could be corrected the attention by focusing on mastering the trampoline volume material presented in the unified program.

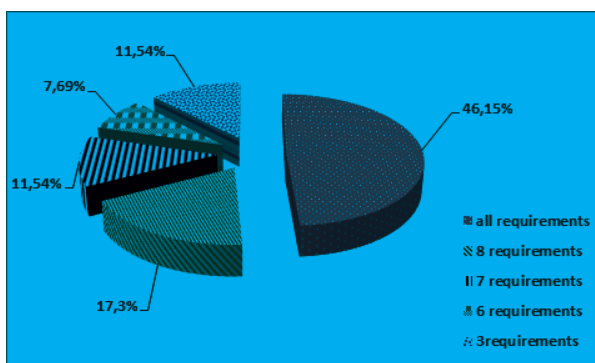


Fig.2 Performed requirements – girls 10-11 years old

In the comparative analysis of the technical norm provided in the single program and the compulsory combination for this age, we note that the requirements do not differ significantly, which is a prerequisite for the growth of young gymnasts. Whereas, less time to master volume of material than 10-year olds leads to a failure to meet the higher requirements.

In the group of girls younger (12-13 year old) gymnasts execute a voluntary program with compulsory requirements. There are two leaps, one of them cross/side split position (180°), 1/1 turn (360°) on one leg, salto forward and backward, a type of salto

with difficulty at least „C“, a group „B“ final exercise. The analysis of the executed combinations shows a reduction in the percentage of gymnasts mastered the prescribed technical requirements under an ordinance. Only 27.27% of the gymnasts play with all requirements (Figure 3), and a small part of them are included in difficult exercises. At 24.24% of the competitors lack one of the requirements – group „C“ salto (eg. salto forward stretched with 1/1 twist-360°, salto backward stretched with 1 ½ twist-540°). The highest percentage – 30.3% have executed 3 of the requirements, as well as salto from „C“, there is also missing a group „B“ finals (eg. salto forward stretched, salto backward stretched with ½ twist-180° or 1/1 twist-360°). The percentage of the exercises executed by difficulty groups is the following: the highest percentage is the exercises of groups „C“ and „A“ – respectively 46.95% and 36.64%. Exercises from group „C“ are present in the combinations of 14.88% of the gymnasts, with 9.92% of them being gymnastics and only 4.96% acrobatic. It gives the impression, that with each subsequent age the number of gymnasts participating in competitions decreases, which makes competition weaker and is probably the reason for the shown poor results. This requires us to change the system of competition. It would be good to include different levels of training for adolescents. This will reserve those competitors who acquired the volume material more slowly and will not progressively reduce the number of sports gymnasts.

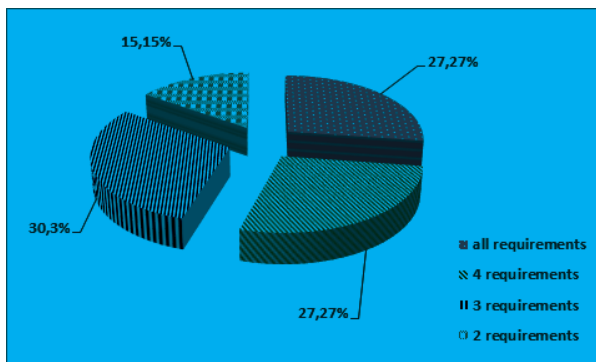


Fig. 3 Performed requirements – junior girls 12-13 years old

The analysis of the difficulty of routines senior girls and cadets showed that the mastered exercises by our gymnasts and composed the combinations according to their ability are not competitive and promising to enter the world elite. This, in our opinion, is due to program gaps analyzed for precedent ages. The average difficulty of the routines of the

finalists on floor exercises of the European Championships for junior 2016 in Bern is 4,837 points and our contestants in the state championship in 2017 are 2,536 points as our best gymnasts for this age rating is 4,075 points. The shown difference is very large and reveals the lack of perspective of our gymnasts.

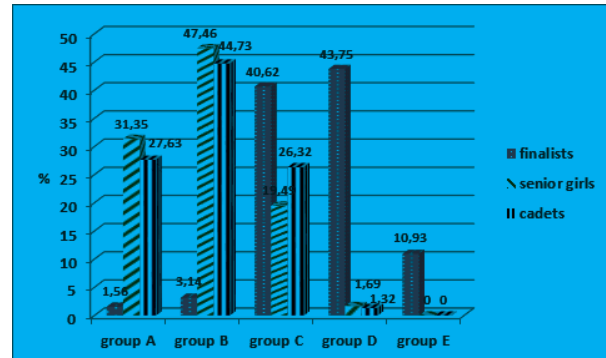


Fig. 4 Exercises in groups of difficulty

The tracking of the group difficulty in our juniors and cadets and the world elite at the studied age confirms the established weaknesses in the mastered of volume material. In our gymnastics, the exercises used are mainly of the „A“ groups – 31.35%, „B“ – 47.46% and „C“ – 26.32% (Figure 4), while the finalists are the highest of group „D“ – 43.75% and „C“ – 40.62%. At routines to gymnasts of the world elite, there are also exercises of group „E“, which are of higher value and make up 10.93% of their compositions. This is very indicative of the technical level of this apparatus of Bulgarian competitors.

Discussion

The analyzed routines and the research of the difficulty of the acquired the volume material of the exercises at the stage of the multi-year preparation on floor exercises device revealed the available weaknesses as well as the reasons for them. This allowed us to offer adjustments to the system of preparation to achieve the desired result. Changes should be directed to both the organization of the preparation and the system of selection that are interrelated. The study showed that the requirements of ordinance and a unified program allow the construction of a gymnast who is ready for high sporting results. The gradual reduction of competitors who successfully absorb the volume material and reach the required technical level for age requires changes. These will be achieved with the following adjustments in the training system:

- Increase the number of children involved in gymnastics by adding new age groups – seven and eight year olds;
- In the following ages, to be included in competitions gymnasts at different racing levels according to certain technical requirements in accordance with their capabilities;
- Increase volume material from groups of difficulty C, D and E at our best gymnasts in the age of junior and cadets.

References

Borisenko, S. (2000), *Povishenie izpulnitel'skogo masterstva gimnastok na osnove sovershenstvovaniya horeograficheskoi podgotovki*, Disertacia, Sankt-Peterburg.

Dimitrova, B. (2015a), Expert analysis of the training system of the beam, *Activities Physical Education and*

Sport, Vol. 05, № 1, pp. 50-52.

Dimitrova, B. (2015b), *Sistema za podgotovka i optimizirane na obuchenieto v sportnata gimnastika zheni*, B-INS, Sofia

Dimitrova, B., Petrova, M. (2013), Actualizirane na sistematata na podgotovka na smesena usporedka, *Sport & Nauka (extra issue №2)*, Sofia, s. 112-118.

Dimova, Tsv. et al. (1988), *Edinna programa I metodika za obuchenie I trenirovka*, Bulgarska Federatsiya Gimnastika, Sofia.

Dobrev, Tsv. (2007a), *Podgotovkata v sportnata gimnastika (v pomosht na treniora)*, B-INS, Sofia

Dobrev, Tsv. (2007b), *Sistema za podgotovka na gimnastichkite v sportnata gimnastika*, Bulgarska Federatsiya Gimnastika, Sofia.

Smolevski, V., & Gaverdovski, Y. (1999), *Sportivnaya gimnastika*, Olimpiiskaya literatura, Kiev.

Head Assist. Marina Petrova, PhD

National Sports Academy

Department of Gymnastics

Studentski grad, 1700 Sofia, Bulgaria

E-mail: maripet@abv.bg

WORKOUT DYNAMICS OF NATIONAL TEAM IN RHYTHMIC GYMNASTICS WOMEN'S ENSEMBLE

Daniela Velcheva

National Sports Academy "Vassil Levski", Sofia, Bulgaria

Summary: The excellent performance and the bronze medal won by the national team of rhythmic gymnastics, women's ensemble of the Republic of Bulgaria at the Olympic Games held in Rio de Janeiro in 2016, gave us the opportunity to look at and analyze the means and the methods, the steps and the algorithm to achieve this high sports result. Solving objectively the problems, related to the processes of control and management of sports training, is of crucial importance for the theoretical knowledge in this relatively young, but increasingly popular Olympic sport. How the load exercises have been done as quantitative-quality and time processes, what training and non-training impacts are being used, what is their combination, and by what methods are implemented, including how the competition activity was built. We offer to your attention a complete record and analysis of the realized and registered voluminous material in the training conditions of the competitors during the two macro-cycles of the Olympic year. The processed data gave us information about the accumulated term and cumulative effect. Especially important and informative for us was to track the security performance in percentages of the competition program of the ensemble in the combination with five ribbons and with two hoops and six clubs and compare their values as the percentages from previous racing years. The comparative analysis of the difficulty of this program compared to the main competitors the teams of Russia and Spain is sufficiently informative about the complexity of the combinations and has a direct bearing on the sporting result.

Key words: Rhythmic gymnastics, general indicators of the load exercises, specific indicators of the load exercises, ribbon, hoop, club, security performance in percentages.

Introduction:

The high sport results in the modern rhythmic gymnastics is a function of the continuous improvement of the training process, the continuous increase in the amount of training work done, by increasing the amount of training indicators and improving the internal structure of the load exercises (Hadzhiev N. 1991). One of the main criteria for achieving high sport results is well-organized training and its proper planning and management (Dobrova T. 2007, Gateva M. 2008).

The complexity of the training of rhythmic gymnastics ensemble stems from the fact that methods and means with a common uniformity of influence are applied to the five gymnasts forming the group, but the final result is not always unique. This depends on the individual characteristics of the athlete. When we are analyzing the magnitude of the training effect and its relation to the load exercises, we must note the complexity of referring the general impact to the individual performance (Lisitskaya T. 1984).

The question as to what proportion the quantitative side of each parameter should be is particularly relevant in today's rhythmic gymnastics training (Krúcek E., Wiener-Usmanova I., Terekin R. 2017). The technology for the use of training and non-training means is the most important because it reflects the main methodical direction of the training as a

purposeful adaptation process and qualifies the different coaching schools. One of the most important ways for the formation of modern technologies is the specialization of the training (Bachvarov M. 2003).

Aim and Objectives of the study:

The main aim of this work is to trace the dynamics of the general and specific workloads (exercises) in the sports training of a women's ensemble in rhythmic gymnastics for a period of one year. The main tasks that we have set are:

- ✓ Analysis of the quantitative values of the individual parameters of the training load - general and specific.
- ✓ Calculating the percentage of security of performance in the Olympic game program.
- ✓ Comparative analysis of the difficulty of the composition compared to the main competitors.

Methods:

The methodological sequence of the study was conducted in several main directions during the two macrocycles of the competition year:

- First macrocycle with five mezzo-cycles, from January to June ending with participation in the European Championship in Holon - Israel.
- Second macrocycle with two mezzo-cy-

cles, July and August, ending with Olympic Games held in Rio de Janeiro, Brazil.

- Pedagogical observation - Daily recording data of the work done in all types of training.
- A video analysis of the performance of the competition program during control exercises and competitions.
- Statistical processing of the obtained quantitative values by different parameters.
- Comparative analysis of the competitive forms of difficulty (number and type) of the combinations of main competitors Russia and Spain.
- Determination of the security percentage of the competition program of the two compositions, and for this purpose was calculated the number of non-error performed combinations compared to the total number of played combinations in the training and competition mode for the two periods.

Results:

The analysis of the common training means presented in Figure 1 shows a reduction in the number of training hours and keeping the maintenance of the number of training sessions and days in the competitive mezzo-cycles. The holiday days are evenly distributed over the months, their number being higher in the short recovering microcycles between the two major macrocycles and before the sports camp at Belmeken's high-altitude base.

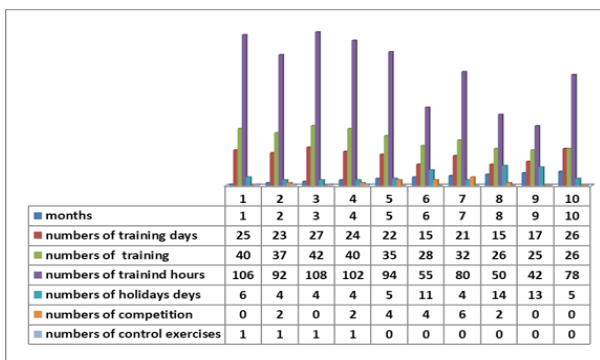


Fig.1 General indicators of the load exercise

The Analysis of the common training data presented in Figure 2 shows an even distribution of the hours for general and specific physical abilities, with the prevalence of specialized training, except for the training regime implemented at the Belmeken camp. There is a large timeframe for choreographic training as an indispensable part in the daily training process.

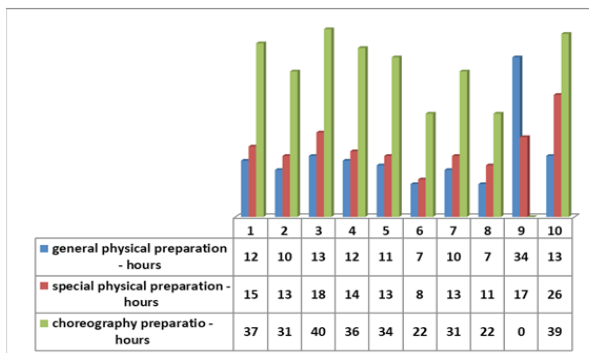


Fig. 2 General indicators of the load exercises

Figure 3 (five bands) and Figure 4 (two rings and six bats) show the specific training indicators. Performing a number of exercises with difficulty with body 1639 on ribbons and 1504 on hoops / clubs, the difference about the larger volume of ribbons is due to the specifics of the apparatus. The large overall length of the ribbon makes it more difficult to work without a mistake in performing the exercises. Performing a number of exchanges of 6394 ribbons and 7229 of hoops / clubs most of the exercises made in the second composition are due to the different technical approaches typical for the two different apparatus and their more complicated interaction. For the indicators, the number of quarters of the combination and the number of whole combination were performed, the number of exchanges performed on the two compositions were similar.

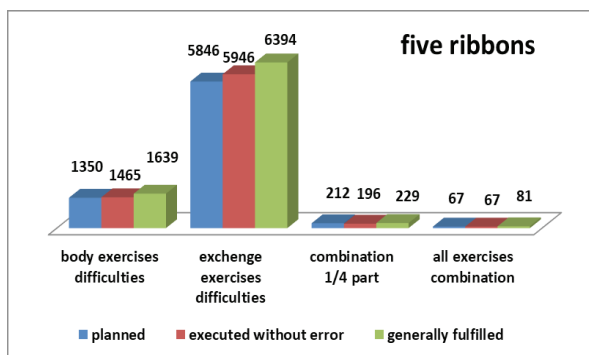


Fig.3 Specific load performance in practice - five ribbon

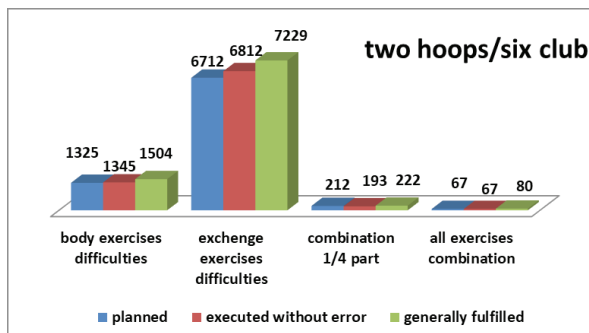


Fig.4 Specific load performance in practice - two hoops end six clubs

The safety percentage and analysis results for the both combinations are shown in Figure 5 and Figure 6. It is of particular interest to us that this percentage for accomplished goals - 83% ribbons and hoops / clubs 84% and the comparison of these data with the available ones since 2014. when the ensemble won the first place in the world championship in Izmir, then at a combination with ten clubs the security rate was 84% and the ribbons / balls 88%

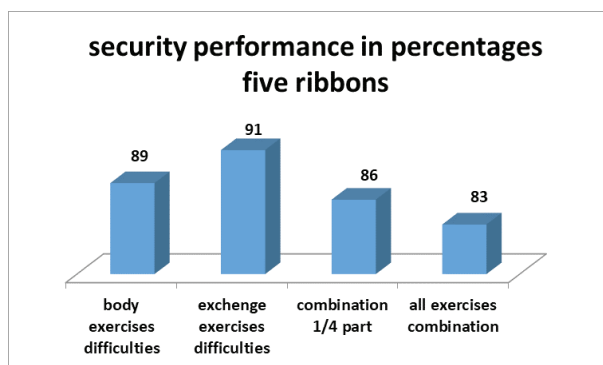


Fig.5 Security performance in percentages five ribbons

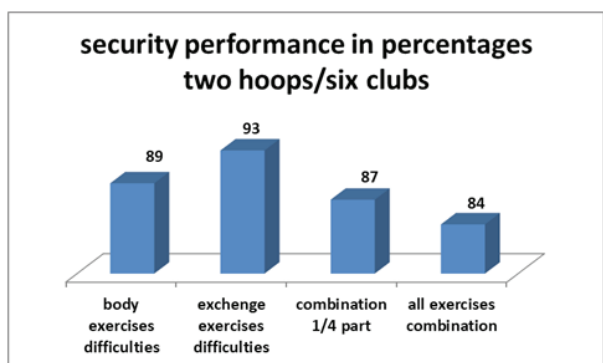


Fig.6 Security performance in percentages two hoops end six clubs

The comparative analysis of the difficulty of the combinations of the three ensembles led to the following results. The starting rating of the difficulty of the combinations of the teams of Russia, Spain and Bulgaria, who won the first three places in the Olympic games is 10.00 points. Differences are in the particular components of difficulty - Russia relies on the use of complex exercises with body – 5 pcs. with average value of 0.6 pts, exchanges – 4 pcs. and sophisticated collaboration with the instruments, Spain rely on high scores for performance and artistry of 9.2 pts. the highest one at the games, while the Bulgarian ensemble has a homogeneous distribution of difficulty with body – 4 pcs. with an average of 0.5 pts, exchanges-5 pcs, and risk work with the apparatus.

We can summarize the more general conclusions we have reached:

- ✓ The sport-competition year begins with a high number of training hours and a gradual reduction of this overall indicator before each competition in the two macrocycles, but the number of training sessions is maintained.
- ✓ A saturated, constant and evenly distributed sports calendar is observed.
- ✓ sports camping (adaptive) training days (4.08-19.08) in the second Macrocycle, held in Florianapolis - Brazil, have been successfully fulfilling their role for the good acclimatization of the team.
- ✓ There is a high number of difficulties and exchanges in both compositions.
- ✓ Characteristic of the specific training indicators is the approximately equal and high percentage of security of performance of the two combinations.

Discussion:

The problems with planning and implementing the optimal ratio of general and specific indicators applicable in the training process remain, because a common scheme or framework is impossible to implement without taking into account the individual qualities and functionalities of the contestants forming the ensemble. This is of great importance when replacing one or another player in the team or changing the whole team. The percentage of security is a very accurate indicator of the quality of the work done in the training process, and planning of complete goals without error will contribute to raising the level of training.

References:

- Dobrova T. (2007), *Podgotovka v sportnata gimnastika, v pomosht na treniora*, Bolid-Ins, Sofia
- Bachvarov M. (2003), *Sportologiy*, Publishing House, Bolid – INS, Sofia
- Krúcek E., et al (2017), *Hudojestvenna gimnastika istoria, sustoianie i perspectiva na razvitie*, *Sport i Recreation1*
- Lisitskaya T. (1984), Load group exercise on precompetitive stage www.cnopm.ru/gymnastics/training1984
- Gateva M. (2008), *Izsledvane na trenirovachnoto natarvane v hudojestvenata gimnastika i usavarhsenstvane na metodikata na obuchenie*, Sofia
- Hadzhiev N. (1991) *Optimizacia i upravlenie na sportnata podgotovka v gimnastikata*, NSA-PB, Sofia

RHYTHMIC GYMNASTIC MOVEMENTS AND FOLKLORE DANCES IN STUDENTS' COORDINATION ABILITIES

Giurka Gantcheva, Magdalena Damjanovska
National Sports Academy "Vassil Levski"
First private University FON, Faculty of Sport Management

Summary

Introduction

Rhythmic gymnastics requires a four-way coordination of movements: the movements of the gymnast, the apparatus manipulation, the musical accompaniment and the four partners.

The aim of the study is to perfect the coordination abilities of rhythmic gymnasts by means of some exercises and folklore dances, with musical accompaniment.

Methodology

The methods of the research include implementation of the following gymnastic movements and dances in the training: Dancing combinations – 1. Straight horo, 2. Ruchenitza, 3. Balkan peoples' dances.

Rhythmic gymnastics movement with apparatus – hoop, ball, clubs.

Testing: 1. Frontal feet and hands hitting against a wall, 2. Feet and hands hitting (in a corner), 3. Jumps in four squares, 4. Cross jumps in four squares.

Results

When studying the statistically significant results of the differences, we can notice the absolute increase of the results which is $d = 4.20; 4.62; 3.64; 3.96$ for the respective tests. The relative increase $d\% = 86.30\%; 83.87\%; 64.06\%$ and 71.77% shows a good result as well.

Discussion

The chosen dancing steps and gymnast movement combinations correspond to the motor abilities of the researched individuals, to their spirit and culture. The musical accompaniment used conforms to the characteristic features of the dancing movements, and their combination with the movements with the rhythmic gymnastics apparatuses is a suitable method for coordination of body-apparatus-music.

Conclusions

The coordination tests show that after the implementation of the methods the greater part of the researched individuals has improved their coordination abilities. The application of the exercises and dances should be in accordance with the pulsations of the musical accompaniment.

Key words: gymnastic, dances, coordination abilities

Introduction

There are changes in rhythmic gymnastics in every Olympic cycle determined by the competitive rules which are being constantly improved. Generally, they are aimed at the development of a particular side of the competitive routines but very often their interaction practically leads to unexpected changes. In the recent years there has been a trend towards inclusion of more dance and artistic elements (Viner-Usmanova, 2015). However, the number and the difficulty of the exercises and combinations in the routines are the crucial factor for receiving high score, good ranking and medals (Gantcheva, G. 2017). The consecutive execution of a number of exercises with or without apparatus of different dynamic and cinematic structure will certainly increase the requirements to the gymnasts' coordination abil-

ities (Hadjiev at al., 2011, Damjanovska at al, 2015, 2016). Moreover, the qualities speed and accuracy of execution are very important for the final score in modern rhythmic gymnastics (Hafe, 2016). In order to improve the coordination abilities in rhythm the gymnastics specialists employ the means of the folklore dance art and musical accompaniment which correspond to the gymnasts' motor abilities, to their mentality and culture (Zachopolou, et all 2004).

Aim and Objectives of the study

The aim of the study is 1) to improve the coordination abilities of rhythmic gymnasts by means of some exercises and folklore dances, with musical accompaniment; 2) to create combinations of dance steps with musical accompaniment of different rhythmical structure; 3) to combine the dance movements with

rhythmic gymnastics exercises with apparatuses.

Methods

The methods of the research include implementation of the following gymnastics movements and dances in the training:

Dancing combinations: 1. Straight horo; 2. Ruchenitza; 3. Balkan peoples' dances.

Rhythmic gymnastics movement with apparatus – hoop, ball, clubs.

Short dance combinations with simultaneous play with the apparatuses were performed.

The research was done among 45 female students.

Testing: The following tests were used: (Damjanovska, Gontarev, Radisavljevic, 2013)

Frontal feet and hands hitting against a wall;

Feet and hands hitting (in a corner);

Jumps in four squares;

Cross jumps in four squares.

Math-statistical methods:

Variation analysis

T-criterion of Student, d and d% - for statistical significance of the differences.

perform simultaneous actions with upper and lower limbs because this is one of the characteristics of the motor activities they practise. The obligatory rhythm of the performance, due to the observance of the rhythmical structure of the musical accompaniment when performing dance steps, supports significantly the synchronization of the motor actions. The values of X mean = 9.07 at the end of the research are indicative of a good result. But probably the circumstance that the movements are executed in the opposite manner is troublesome when performing the test. The gymnasts have skills and habits to work with both arms, but the possibilities of the two sides (left and right) remain different.

The sample in both tests is homogeneous since the coefficient of variation in the first test is $V = 28.26\%$, and in the second $V = 24.48\%$. The results from the statistical significance of the differences are shown in table 2. The value of the absolute increase of the results is $d = 4.20$, and the relative share - $d\% = 86.30\%$. These are two results which confirm the positive sides of the methods we used.

Results

Table 1

Variation analysis of the results

Research	n	Xmin	Xmax	R	X	S	V	As	Ex
Test - 1									
Beginning	45	3	14	11	4.87	1.38	28.26	0.251	-0.989
End	45	6	14	8	9.07	2.22	24.48	0.434	-0.729
Test - 2									
Beginning	45	2	16	14	5.51	1.22	22.10	-0.383	0.422
End	45	6	16	10	10.13	2.27	22.42	0.703	-0.009
Test - 3									
Beginning	45	4	12	8	5.69	1.18	20.81	0.386	-0.943
End	45	7	12	5	9.33	1.41	15.15	0.381	-0.42
Test - 4									
Beginning	45	2	13	11	5.51	1.22	22.10	-0.383	0.422
End	45	7	13	6	9.47	1.55	16.33	0.509	-0.556

Table 2

Statistical significance of the increase in the results

Index	n	Beginning		End		Statistical significance of the results			
		X1	S1	X2	S2	d	d%	t	P(t)
Test - 1	45	4.87	1.38	9.07	2.22	4.20	86.30	14.63	100.00
Test - 2	45	5.51	1.22	10.13	2.27	4.62	83.87	15.75	100.00
Test - 3	45	5.69	1.18	9.33	1.41	3.64	64.06	13.41	100.00
Test - 4	45	5.51	1.22	9.47	1.55	3.96	71.77	20.76	100.00

The results from the variation analysis for Test №1 – Frontal feet and hands hitting against a wall are presented in table 1. The minimum values change their number but the maximal ones remain stable at the end of the research. The improvement of the results is due to the increased number in the minimum values. The range ($R=11$, $R=8$) confirms this conclusion. The researched individuals find it easy to

The minimum value in the first research is $X_{min} = 2$ cycles, and the maximal value is with 14 cycles more than the minimum one, therefore $X_{max} = 16$ cycles. This result determines the coordination of the researched individuals as good. The coefficient of variation is $V = 22.10\%$ which enables us to determine the sample as sufficiently homogeneous.

The results from the variation analysis of test №2 – Feet and hands hitting – show the minimum value $X_{min} = 6$ cycles and we can say that the increase of the result, compared to the first research, is due to the methods we used. The motor movements of the arms are subjected to the rhythm of the movements of the lower limbs. The work with small portable apparatuses assists their improvement both from technical point of view and from coordination point of view regardless of the difference in the amplitude of the movements. The maximum value remains the same $X_{max} = 16$ cycles. The mean value is $X_{mean} = 10.13$, which is a 4.62 times better achievement than the initial testing. The increase of the result can be also seen in the value of the range $R=4$, which means that the difference between the minimum and maximum – value in the second research is lower. This is indicative of the better results of the researched individuals who had moderate results at the beginning of the period of the

research. We cannot report for a significant change in the coefficient of variation $V = 22.42\%$. Although the dispersion of the sample is bigger than that of the first test, this result shows once again that the sample is sufficiently homogeneous.

When analysing the results from the statistical significance of the differences (shown in table 2), we can see the absolute increase in the results, which is $d = 4.62$. The result for the relative increase is also good $d\% = 83.87\%$. According to t-criterion of Student $P(t) = 100.00\%$ which means the increase in the result is statistically significant.

The results from the variation analysis of test № 3 – Cross jumps in four squares – are presented in table 1 and show that the gymnast with the lowest result has $X_{\min} = 4$ cycles, and the value of the best result is $X_{\max} = 12$ cycles. The minimum and maximum values are insignificantly different – $R = 3$ cycles. The mean value is $X_{\text{mean}} = 5.69$, which shows that the results of most of the gymnasts are closer to the minimum values than to the maximum ones. The coefficient of variation is $V = 20.81\%$, which is indicative of the sufficient homogeneity of the sample. When analysing the results from the second testing, we found out that the achievements were better since the requirements of the test were met and the methods we used had influenced positively most of the researched individuals.

The statistical significance of the differences is confirmed by the absolute increase in the results $d = 3.64$. The reported relative increase in the results is $d\% = 64.06\%$. The guarantee probability $P(t) = 100.00\%$, which means that the increase in the results is statistically significant. When we take into account the values of d , $d\%$ and $P(t)$, which determine the statistical significance of the results, we can conclude that the methods we used have a positive effect.

The results from the variation analysis of test № 4 – Cross jumps in four squares – show that some of the results at the beginning of the research are of low values and do not meet the expectations. The minimum values are $X_{\min} = 2$ cycles, the maximum values are $X_{\max} = 7$ cycles. The range ($R = 11$ cycles at the beginning of the experiment and $R = 6$ in the end) shows that the improvement is due to the low initial results and is a consecutive result with equal value at the end of the research. In the first testing the mean value is 5.51, which enables us

to conclude that most of the researched individuals showed results close to the minimum value. There is an increase in the mean value in the second testing - $X_{\text{mean}} = 9.47$, which is a 3.96 times better achievement. The sample is sufficiently homogeneous in both testings due to the mean coefficients of variation - $V = 22.10\%$ in the first testing and $V = 16.33\%$ in the second testing.

When analysing the results from the statistical significance of the differences (shown in table 2), we can see the absolute increase in the results, which is $d = 3.96$. The efficiency is also confirmed by the relative increase $d\% = 70.77\%$ and is probably due to the use of cross steps and back cross steps included in the dance movements of the applied methods. According to the t-criterion of Student the guarantee probability is $P(t) = 100.00\%$, which determined the statistical significance of the increase.

Discussion The folklore dancing steps and combinations we chose correspond to the motor abilities of the researched individuals, to their spirit and culture. The musical accompaniment used conforms to the characteristic features of the dancing movements. Their combination with the movements with the rhythmic gymnastics apparatuses is a suitable method for coordination of body-apparatus-music. Its further complication can be achieved through performance of the combinations in pairs, by three people or a bigger group. This will allow reaching an additional coordination among the participants in the group as a characteristic performance for rhythmic gymnastics. The coordination tests show that after the implementation of the methods the greater part of the researched individuals has improved their coordination abilities.

References

- Gantcheva, G. (2017), Survey of the difficulty-composition relation with the ensembles in Rhythmic gymnastics, Research in kinesiology, International Journal of Kinesiology and Other Related Sciences, Federation of the Sports Pedagogues of the Republic of Macedonia, Skopje, 7-9.
- Damjanovska, M., S. Gontarev, L. Radisavljevic (2013). Determination of measurement characteristics for rhythmic skills assessment tests. Conference proceedings, Effects of Physical Activity Application to Anthropological Status with Children, Youth and Adults. Univezzitet u Beogradu, Fakultet sporta I fizickog vaspitanja, 11-12 December, Beograd.
- Damjanovska, M., Gontarev, S., Rhedzepi, A., Gantcheva, G. (2015). Comparing reliability and validity of

- some tests with classic and image model of assessment rhythmic ability. Sborník příspěvků z mezinárodní vědecké konference. Evropské Pedagogické Fórum, 23-27.11. Vol. V. ISBN 978-80-87952-11-5 HardekKrálové, Česká Republika.
- Damjanovska, M., Gantcheva, G. Gontarev, S. (2016). The relations among Rhythmic abilities, agility, age, and sport experience length in female students of „Vasil Sport's Academy of Sofia. International Scientific Conference, Effects of Physical Activity Application to Anthropological Status with Children, Youth and Adults. Univrzitet u Beogradu, Fakultet sporta I fizichkog vaspitanja.
- Hadjiev, N. at. All (2011). Gimnastika – fizicheska podgotovka. NSA Pres, Sofia. // Хаджиев и колектив, 2011. Гимнастика – физическа подготовка, [Gimnastika – fizicheska podgotovka], НСА ПРЕС, София.
- Hafe, R., A. (2016). Impact of coordination abilities program on accuracy and speed in rhythmic gymnastics. Science, Movement and Health, Vol. XVI, ISSUE 16 (2), 141-146.
- Zachopolou, E., Tcapakidou, A., Derri, V. (2004)._e effects of a developmentally appropriate music and movement program on motor performance. Technological Educational Institution of Thessaloniki, Department of Early Childhood Care and Education, Early Childhood Research Quarterly 19, p. 631–642.
- Viner-Usmanova, I. (2015), Teoria i metodika hudojstvennoi gimnastike – artistichnost i puti ee formirovania], SPORT, Moskva. // Viner-Usmanova, I. 2015. Теория и методика художественной гимнастике – артистичность и пути ее формирования. SPORT, Москва.

SURVEY OF FEMALE FOOTBALL REFEREES ABOUT THEIR PHYSICAL CONDITION

Hristiyana Guteva
National Sports Academy "Vassil Levski"

Summary

The referees appreciate the importance of the physical training so they consider the assistance of a fitness coach as necessary, yet a small number of them use the services of such a coach. Emphasis on the physical training during the pre-season preparatory period, which is a good basis for success at the upcoming matches and passing the fitness tests. The female referees pay attention to the warming up before match and training nevertheless is not the same with the cooling down, which is a bad practice that could result in negative consequences such as traumatism. The majority of respondents have no problems passing the fitness tests but they consider the yo-yo test as most difficult compared to the others.

Key words: football referees, women, physical preparation, training

Introduction

Modern football game has high requirements regarding players' physical abilities and condition. These requirements are valid with full force for football referees. In recent years, both women football and refereeing undergo dynamic development. The development of the women football increases the demands on Referees and Referees Assistants due to shorter rest periods and increased ball in play during games. The optimal positioning for decision making is vital and this requires a sound level of football specific fitness. Hence our interest in the female football referees and the level of physical condition.

Aim and Objectives of the study

The aim of the following study is to analyze the level and attitude of Bulgarian female football referees towards their physical training and fitness tests. The tasks of the survey are:

1. Conducting a survey among Bulgarian female football referees.
2. Analysis of the results of the survey regarding the opinion of referees on their physical condition and fitness preparation.
3. Forming conclusions and recommendations.

Methods

For the purpose of the study, we made a survey (of 12 questions regarding physical preparation and fitness tests) among 29 referees. Respondents filled out questionnaires with closed questions, some of

which had an alternative response, and other menu responses.

All results were presented as percentage.

Results and Discussion

On the first question "How many times a week do you train?" 62% from the respondents answered that they train three times a week, 24% train two times, 7% one time and 7% don't train. (Figure 1)

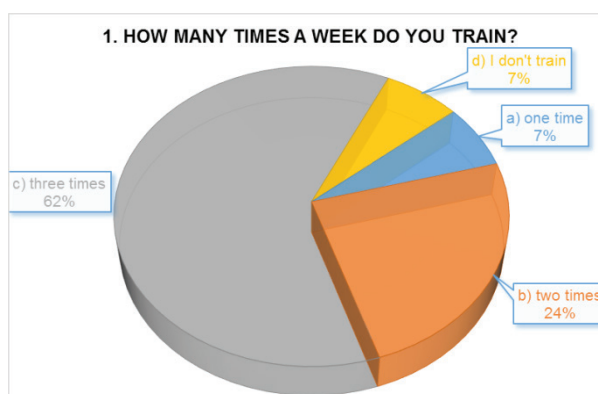


Figure 1.

The next two questions are about the need and use of conditional training coach for football referees.

On the question "Do you use the assistance of a conditional training coach?" 79% of respondents answered "yes" and 21% said "no" as a response. (Figure 2)

On the next question regarding conditional training coaches: "Do you need the assistance of a con-

ditional training coach?” a positive response was given by 62% of the referees and negative 38%. (Figure 3)

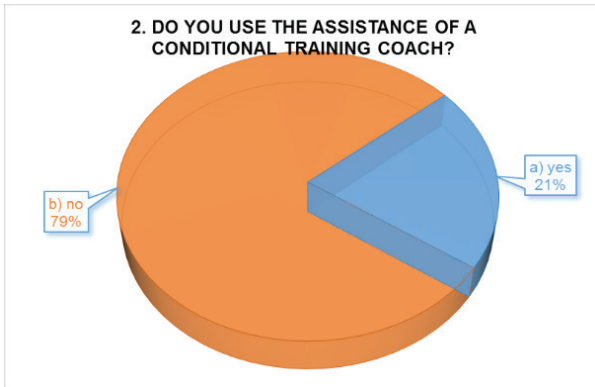


Figure 2.

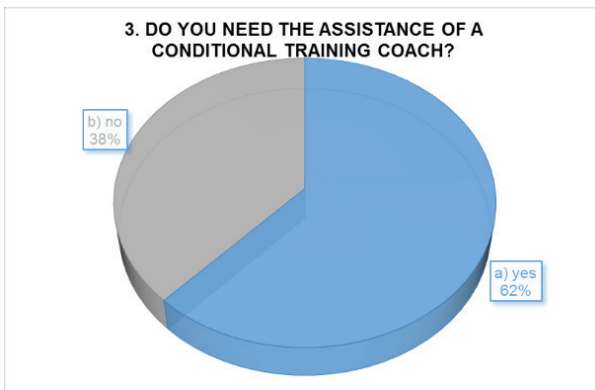


Figure 3.

On the question regarding the average durance of referees' workout, the most frequent answer is one hour, 31% of the referees' train more than one hour and only 7% have a workout of less than half an hour. (Figure 4)

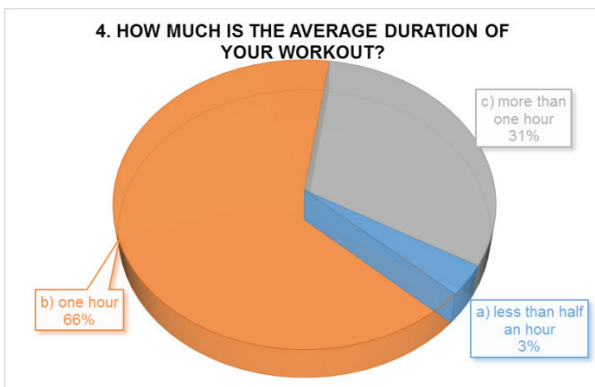


Figure 4.

Question five is “In which period do you spend the most time for physical preparation?” the majority of respondents 73% answered before the season,

17% spend most time for physical preparation during the season and 10% between the half seasons. (Figure 5)

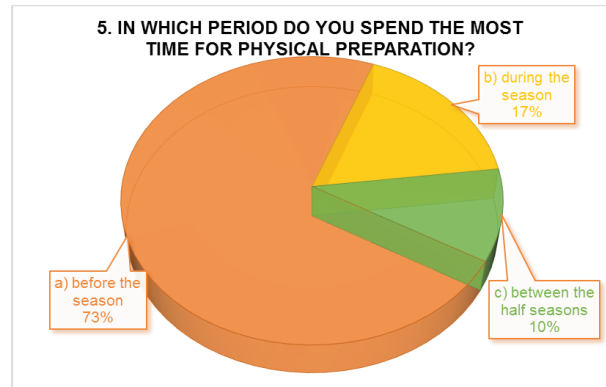


Figure 5.

Question number six is about the duration of the warm-up before match or workout 52% of the referees answered 15 minutes, almost similar number of respondents has a warm-up more than 15 minutes and 10 minutes, only 7% do not warm up. (Figure 6)

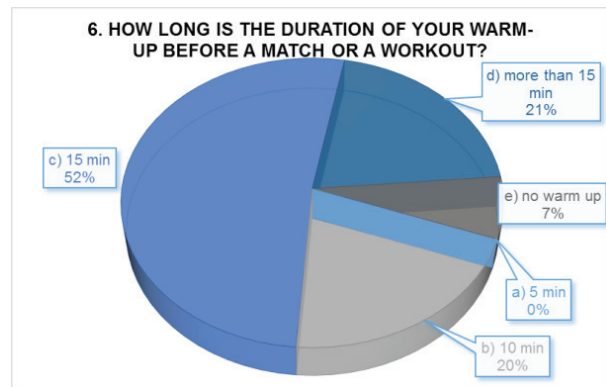


Figure 6.

“What does your warm up contain?” is question number seven and it is possible to indicate more than one answer. The answers jogging and stretching are with close percentage- 26% and 25%. The running exercises are being used by 23%, 17% also do accelerations but only 9% do exercises for the movement of the referee and the assistant referee on the field of play. A summary of the answers to the question is presented graphically in Figure 7.

The next question, “What is the focus of your warm up?” has a similar menu of answers like question number seven. The female referees mostly focus on running exercises and stretching with equal percentage 36%. The answer acceleration is selected from 13% and jogging from 11%. As in the previ-

ous question the lowest percentage is option e) exercises for the referee and the assistant referee on the field of play, only 4%.

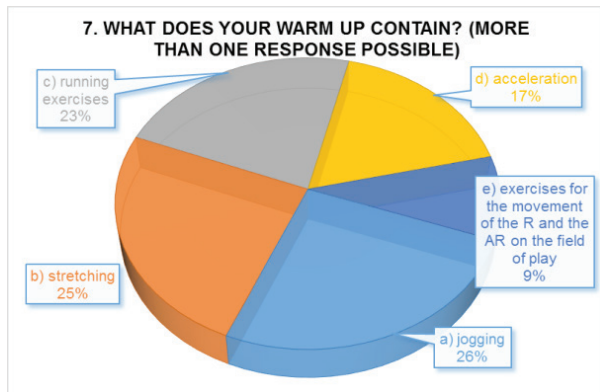


Figure 7.

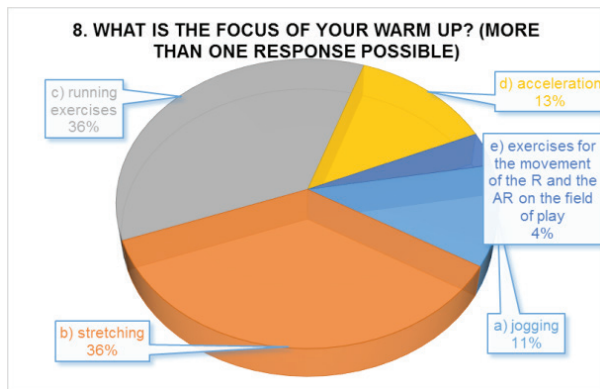


Figure 8.

The next two questions are aimed at workout cool down. On question number nine “Do you cool down after workout?”, 90% of the respondents answer yes, only 10% of them do not cool down after workout. (Figure 9)

The next question is regarding the cooling down after match. Here 17 referees or 59% answer with no and 12 referees or 41% answer with yes. (Figure 10)



Figure 9.

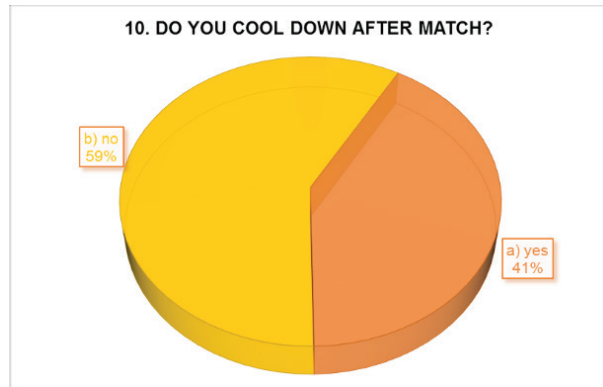


Figure 10.

The last two questions give information about the fitness tests. Question number eleven is “Which is the hardest fitness test?”, for 66% or 19 respondents the yo-yo test is the hardest one, the other 34% or 10 respondents have chosen the Cooper test. None of the female referees point Test1 and Test2. (Figure 11)



Figure 11.

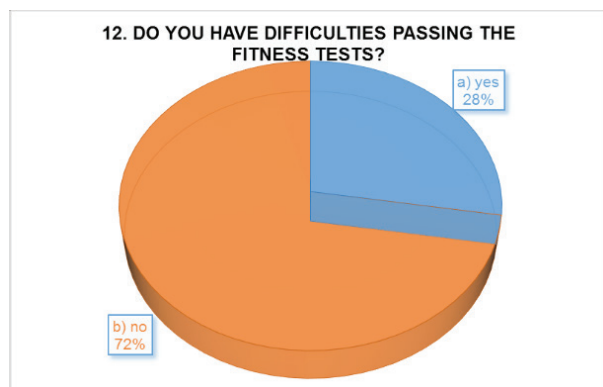


Figure 12.

The last question is “Do you have difficulties passing the fitness tests?”. Negative answer is given by 28% of the referees, the majority 72% answer negative. (Figure 12)

Conclusion

Applying the following survey we revealed the opinion regarding conditioning training and the way Bulgarian women referees prepare physically.

Most of the referees' train three times per week, most of them do not use the help of physical training coach but they answered that such specialist will be very useful. Regarding the duration, most of the respondents' train around one hour. Most women referees highlight the training process before the season, and do not take in mind the training process during the season and between the seasons.

In our opinion more time must be spent for warm-up before the main part of the training session and must include more various exercises. Also negative is the lack of cool down after official matches, which must change.

In respondents' opinion the toughest fitness test is Yo-yo test, but 2/3 of the women referees do not have problem with passing it.

In summary women referees must take into account their physical training during all periods and use wider sets of physical exercises.

References

- Aladjov, K., (2001), *Atletizmat vav futbola – vtoro pre-raboteno izdanie*, Tip Top Pres, Sofia.
- Aladjov, K., (2007) *Morphofunkcionalna sushtnost na fizicheskata podgotovka v sporta*, Tip Top Press, Sofia.
- Aladjov, K., (2011), *Fizicheskata podgotovka v sportnite*

igri, Simolini 94, Sofia.

Buchvarov, M., L. Dimitrov, A. Gigov, (2008), *Futbol – presa, kondicia, natisk*, NSA Press, Sofia.

Buchvarov, M., (1999), *Futbol – integralna fizicheska kondicia*, Sofia.

Chervenyakov M., (1997), *Aktivizirane dvigatelna efektivnost na futbolistite*, izd. Medicina i fizkultura, Sofia.

Davies, J. A., Brewer, J., (1993) *Applied physiology of female soccer players*. *Sports Med.*, September, 16(3):180-9.

Godik, M.A., A.S.Shishkov, (1983), *Kontrol i upravlenie na trenirovuchnoto i sustezatelnoto natovarvane vuv futbola*, Medicina i fizkultura, Sofia.

<http://gdfra.org.au/4411RefFitnessGuide.pdf>

http://www.ffacoachingresource.com.au/media/153215/13078_FOOTBALL_Womens-Football-Development-Guide_Final-for-web_single-pages.pdf

http://www.fitness4football.com/fitness4_referees/introduction.htm

Krustrup, P., Mohr, M., Ellingsgaard, H., Bangsbo, J., (2005), *Physical Demands during an Elite Female Soccer Game: Importance of Training Status*, Institute of Exercise and Sport Sciences, Department of Human Physiology, University of Copenhagen, Denmark, 2 Sports Medicine Research Unit, Copenhagen University Hospital, Denmark., July, 37(7):1242-8.

Author information:

Hristiyana Guteva, PhD student, National Sports Academy "Vassil Levski", Department "Track & Field"

Address: Sofia, Bulgaria, ZIP 1700, "Studentski gard", NSA "Vassil Levski", office 334 (Department "Track & Field")

Mobile +359 889 503 602, e-mail: hris.guteva@yahoo.com

MODELLING ANTHROPOMETRY OF TENNIS PLAYERS (AGE 17-18-YEARS)

Rumiana Karapetrova, Georgi Stoykov, Stefan Stoykov
National Sports Academy "Vassil Levski"

Summary: Tennis is complex sport demanding serious requirements towards the complex development of the player and his training process, including his anthropometry. Everyone who starts to practice tennis goes on the way of the best players. The focus is on their anthropometric, physical and technical abilities. Compliance with this is a guarantee of well-planned selection and training process – guaranteeing a complete sport realization afterwards. The aim of the study is to model the anthropometry of tennis players in the age period 17-18 years. The subject of the study are 30 Bulgarian players (age 17-18 years), ranked among the top 35 in the National rank list. For the purpose of the study are analyzed 14 anthropometry indexes. Results variance suggests that respondents group is homogeneous. All studied indexes are above the average values for this age group in Bulgaria except the weight. On the basis of this analysis we propose a normative table for assessing the level of development of each anthropometric indexes. We recommend as a leading index to differentiate height and weight. Comparing the data of respective training player with those of the elite Bulgarian players in his age group helps us determine the level of development of his anthropometric signs. The proposed evaluation tables provide the opportunity to differentiate the most talented for tennis.

Key words: tennis, anthropometry, modelling, physical abilities

Introduction

Tennis is complex sport demanding serious requirements towards the complex development of the player and his training process, including his anthropometry.

Everyone who starts to practice tennis goes on the way of the best players. The focus is on their anthropometric, physical and technical abilities. Compliance with this is a guarantee of well-planned selection and training process – guaranteeing a complete sport realization afterwards.

Sport selection sets the start of organized sport activities. Some specialists (Shestakov, M, A. Nazarov, I. Mironenko, M. Baibah, H. Jumarov, B. Veshekidze, E. Nazadze – 1989) define it as the most difficult part of the sport theory and methodology.

For M. Buchvarov (2004) the medical and biological characteristics – as height, weight, body structure, functional capacity of cardiovascular system, state of the analyzers – are good prerequisite for “initial selection of candidates for organized sport activities”, as well as the selection – selection in the process of preliminary and initial training process”.

Wrong selection leads to loss of time for training, traumatization of psyche of young athletes – in practice this is bad promotion of sport itself and for the high-performance sport (Siris, P., P. Gaydarska, Kr. Rachev, 1983; St. Stoykov, 2007).

Great number of sport specialists and coaches examining the problems of sport selection find anthropometrical indexes as height, upper and lower limbs measurements, torso length, chest circumference, shoulder diameter, weight and etc. as such of great importance (Bril, M. 1980; Gujalovskiy, A. 1986; Dorohov, R., V. Guba, V. Petruhin, 1994; Karapetrova, R. 2009; Mos, V. 1976; Penchev, A. 1986; Stoykov, G. 2012; Hem, I. 1976; Durand, P. 1987; Merhautova, I., M. Maček 1966).

Very often in sport practice children who are not noticeable at first glance are overlook at the expense of the children with accelerated growth, with premature development of both anthropometric and motor abilities (Zelenichonok, V., V. Nikityoushin, V. Guba, 2000). Subsequently, it turned out that the first were the future champions. The same authors form the following positions of the sport selection:

1. It is multi-stage process, for long-term period, covering all aspects of the sport training.
2. It is based on the comprehensive study of the capabilities of athletes.
3. Its objectives are to create the most favorable prerequisites for the formation of these abilities as well as their refinement in the chosen sport.

Tz. Jeliakov (1998) identifies the three main scientific and methodological problems of the sport selection:

1. Morpho-anatomic signs and indicators of

the health status.

2. Motor abilities – characterizing the genetic capacity of motor and vegetative functions.
3. Psychological signs – intellectual, emotional, etc. Components of the mental status.

Modelling as a main tool for controlling and managing the training process is a way to give more specific attention to the problem of sport selection (Kuznetsov, V. 1975; M. Buchvarov, 1991).

In our case, we apply modeling to develop models regarding anthropometric characteristics of young tennis players at certain stage of their development – the age period 17-18-years.

Aim and Objectives of the study

The aim of the study is to model the anthropometry of tennis players in the age period 17-18 years. The subject of the study are 30 Bulgarian players (age 17-18 years), ranked among the top 35 in the National rank list.

Methods

For the purpose of the study are analyzed 14 anthropometry indexes (see Table 1). All gathered research data was analyzed using variance analysis (applying SPSS computer software). Based on the results of the variance analysis, using sigmal method we developed evaluation tables for assessment of anthropometric indexes.

Table 1
Anthropometric indexes.

signature	name of the index	measured in:	accuracy
X1	Height	cm	1
X2	Weight	kg	1
X3	Upper limbs combined length	cm	1
X4	Upper limb length	cm	1
X5	Armpit length	cm	1
X6	Forearm length	cm	1
X7	Lower limb length	cm	1
X8	Thigh length	cm	1
X9	Shank length	cm	1
X10	Torso length	cm	1
X11	Foot length	cm	1
X12	Shoulder diameter	cm	1
X13	Playing armpit circumference	cm	1
X14	Non-playing armpit circumference	cm	1

Explanation: The length of the forearm includes the length of the hand; the length of the shank includes the length of the foot.

Results analysis

Table 2 presents the variance analysis of the research data for the age period 17-18-years.

Table 2
Variance analysis.

signature	X	±Mx	S	Ex	As	R	Min	Max	N	V%
X1	180,92	0,64	3,12	-0,51	-0,56	12	174	186	24	1,72
X2	72,29	0,92	4,51	0	0,12	18	63	81	24	6,23
X3	182,29	0,94	4,59	1,13	1	18	177	195	24	2,52
X4	80,88	0,49	2,38	-1,3	-0,11	7	77	84	24	2,95
X5	33,96	0,29	1,43	-1,34	-0,02	4	30	37	24	4,47
X6	48,67	0,55	2,68	0,6	-0,75	12	42	54	24	5,51
X7	103,79	0,47	2,32	-0,87	0,07	8	100	108	24	2,24
X8	47,96	0,48	2,33	-0,49	0,3	9	44	53	24	4,86
X9	55,79	0,58	2,83	1,08	-1,33	13	47	60	24	5,07
X10	55,54	0,51	2,52	2,25	1,17	10	52	62	24	4,54
X11	29,54	0,07	0,33	-0,42	-0,08	1	29	30	24	1,11
X12	44,38	0,31	1,5	1,14	0,73	7	41	48	24	3,38
X13	29,33	0,37	1,83	-0,19	-0,26	7	25	32	24	6,25
X14	27,54	0,38	1,86	-1,09	-0,18	6	24	30	24	6,77

The height (X1) has average value of 180,92 cm, with relatively wide range (R) – Xmin is 174 cm, and Xmax – 186 cm. The results show higher level compared to the average values for this age period in Bulgaria.

Weight (X2) vary between 63 and 81 kg (average values is 72,29 kg).

Upper limbs combined length (X3) has average value slightly above the average height (178,63 cm), ranging from 157 to 186 cm.

The length of the upper limb (X4), armpit (X5) and forearm (X6) show values that can only be ascertained, due to the fact that we do not have similar data and age period to compare with. The same is valid for the lower limb length (X7), thigh (X8) and shank (X9).

The torso length (X10) has average value of 55,54 cm, ranging from 52 cm to 62 cm.

The respondents foot length (X11) varies between

29 and 30 cm, with average value of 29,54 cm.

The shoulder diameter (X12) has wide range from 41 cm to 48 cm, average value is 44,38 cm.

High circumference we find in the paying armpit (X13) compared to the non-playing armpit (X14) – 29,33 cm vs. 27,54 cm.

Results variance suggests that respondents group is homogeneous. All studied indexes are above the average values for this age group in Bulgaria except the weight.

On the basis of this analysis we propose a normative table for assessing the level of development of each anthropometric index. We recommend as leading indexes to differentiate height and weight.

The numerical and verbal expression of the assessment is as follows: very high (6), high (5), good (4), average (3) and below average (2).

Table 3
Studied indexes assessment table.

index	2	3	4	5	6
Height (cm)	under 175	175 - 177	178 - 183	184 - 187	over 187
Weight (kg)	under 63	63 - 67	68 - 76	77 - 81	over 81
Upper limbs combined length (cm)	under 173	173 - 177	178 - 186	187 - 191	over 191
Upper limb length (cm)	under 76	76 - 77	78 - 84	85 - 86	over 86
Armpit length (cm)	under 29	29 - 30	31 - 33	34 - 35	over 35
Forearm length (cm)	under 43	43 - 45	46 - 51	52 - 54	over 54
Lower limb length (cm)	under 99	99 - 100	101 - 106	107 - 108	over 108
Thigh length (cm)	under 43	43 - 45	46 - 50	51 - 53	over 53
Shank length (cm)	under 50	50 - 52	53 - 58	59 - 61	over 61
Torso length (cm)	under 51	51 - 52	53 - 57	58 - 61	over 61
Foot length (cm)	under 29	29 - 29,5	30 - 30,5	30,5 - 31	over 31
Shoulder diameter (cm)	under 41	41 - 42	43 - 45	46 - 47	over 47
Playing armpit circumference (cm)	under 26	26 - 27	28 - 30	31 - 32	over 33
Non-playing armpit circumference (cm)	under 24	24 - 25	26 - 28	29 - 30	over 31

Conclusion

Comparing the data of respective training player with those of the elite Bulgarian players in his age group helps us determine the level of development of his anthropometric signs. The proposed evaluation tables provide the opportunity to differentiate the most talented for tennis.

Subsequent findings based on study results can be

a basis for making adjustments to the construction and planning of the training process.

References

Durand, P, (1987) – L'enfant et le sport, Press Universitaires de France.
 Bril, M, (1980) - Otbor v sportivnykh igrakh, FiS, M.
 Buchvarov, M, (2003) - Sporttologiya, S.
 Velchev, L, (1997) - Haide da igraem tenis, S.

Dimov, Iv, (1994) - Optimizirana metodika za podgotovka na visokokvalifitsirani tenisisti, Disertatsiya, NSA, S.
Zakharieva, Tsv, (2008) - Disertatsiya, NSA.
Zelenichonok, V., V. Nikityoushin, V. Guba (2000.) - Legkaya atletika, Kriterii otbora, M,
Mos, V, (1976) - Otkrivaneto na talanti i nasŭrchavaneto im da ostanat v tenisa, Met, pomagalo, BFT, S.
Penchev, A, (1986) - Edinna programa za obuchenie i trenirovka po tenis, S.
Todorov, T, (1998) - Fizichesko podgotovka na sŭstezatel po tenis ot naŭ-ranna do mladezhka vŭzrast, (7 - 17

godini), S.

Hem, I, (1976) - Belezhki po problema za otkrivane na talantite v tenisa, BFT, S.

Author information:

Senior lecturer Rumyana Karapetrova, PhD, National Sports Academy "Vassil Levski", Department "Track & Field"

Address: Sofia, Bulgaria, ZIP 1700, "Studentski gard", NSA "Vassil Levski", (Department "Track & Field")

Mobile +359 892 299 866, e-mail: rumyanakar@abv.bg

RELATIONSHIP BETWEEN JOINT MASTERY AT ONE HAND AND THE ANTHROPOMETRIC, KINEMATIC AND STABILOGRAPHIC CHARACTERISTICS OF SELECTED SPORTS TECHNIQUES IN SHOTOKAN-KARATE

Dimitar Zagorsky, Maria Gikova, Ognian Tishinov

National Sports Academy "Vassil Levski"

Key words: kinanthropometry, biokinematic analysis, Shotokan-Karate

Introduction

Shotokan is a martial art requiring strength and coordination. Anthropometric characteristics and morphological indicators are essential in assessing athlete's achievements for Keogh J. (1999), Wilmore J.H.

and Costill D.L. (1999). Physical parameters such as body composition, size, type and structure are considered key factors for excellence in various sport events (kinanthropometry).

Compared to the general population, Karate players are characterized by a morphological complex optimized for achieving the best results in martial arts: an emphasized higher percentage of muscle mass relative to a higher height and optimal adipose tissue depots. According to Katic R.'s team (2005), disproportionate physics with emphasized extremities musculature is characteristic of the elite Karatekas.

Apart from the morphological parameters the effectiveness of a fighting technique depends on the correct trajectory and speed of the movement. Our own team-Gikova M., Zagorsky D. and Tishinov O. (2013), has proven that through analysis of this kinematic characteristics an indirect assessment of the skeletal-muscular system is allowed [6]. The execution and duration of the impact, as well as the kinematics of the lower extremities, are of particular importance for the performance of a Shotokan Karate athlete.

According to Claessens A. et al. (1987), the relationship between body structure and its function is very important and representative of the opponent status in elite sport bouts. Two teams are working in this direction: Katic R.(2005), and Kopanovski N. (2011), proving that Karate training leads to the adjustment of the morphological sub-segment in the anthropological complex, optimizing the physique according to the requirements of the specific sport. Based on the distinctive set of motor tech-

niques with their kinematic and kinetic models, distinct anthropometric and physical performance profiles will be developed in elite Karate athletes. Such a position is justified by the requirement for the development of motor skills (techniques) in karate and their effective use in combat, to undergo long-term and exhaustive training. That is the point that reasons the need for Karatekas to undergo long-term and exhaustive training as a requirement for the development of specific motor skills (techniques) effective in combat conditions.

Based on the findings of Arriaza R's (2005), and Jovanovic S's (2002), teams, blows with upper extremity are more natural than kicks-they are faster, easier to control, more difficult to block or avoid, which easily explains why they are more commonly used in Karate bouts than kicks. Therefore, the choice of both researchers: Pozo J. (2011), and Ginano C. (2010), are focused on kinematic analysis of the skills at performing Karate techniques, and specifically on the ability to execute a high-velocity kick, will be note-worthy precisely because of the inherited deficiencies and the ability of a highly trained competitor to turn a technique based more on disadvantage to his advantage while competing.

Aim of the study

The aim of this study was to reveal the relationship between morphological parameters and technique effectiveness compared to the fighting proficiency and acquired degree of the experimental group of elite Karate-Shotokan athletes through specialised measurement equipment and methods and subsequent trajectory and velocity analysis of the selected techniques.

Methods:

Using derivate indicators of body composition (body mass, active body weight/percentage of muscle mass, body mass index (BMI), body fat percentage, index of fat around the internal organs, assessed general physical condition, bone mass, basic metabolism and metabolic age) determined by analyzer of body composition (Tanita BC-533). Anthropometry: Leicester measuring ruler used for measuring linear dimensions (cm) with a maximum height of 2.0 meters. Description of the measured morphological parameters can be found in our previous work.

Kinematics Analysis: Shot with high-speed CASIO-EX-ZR200 video camera recording in frequency mode of 120 fps and consecutive framing procession for obtaining kinematic parameters using SkillSpector software. The experimental group is of 18 athletes executing Gyako-Zuki punch with upper extremity, Mae-Geri straight front kick and Yoko-Geri side kick.

Variance and correlation analysis of the results was made with the statistical software package SPSS v.19

Results and analysis:

In determining the dependencies between anthropometric indicators according to the athletic proficiency, two groups were selected: 9 highly qualified ath-

letes from I Dan and up, and second group with little sports practice and lower qualifications (1-3 Kyu).

As means to represent in percentage the distribution between our Karate competitors based on qualification's profile a pie diagram is shown in Fig. 1

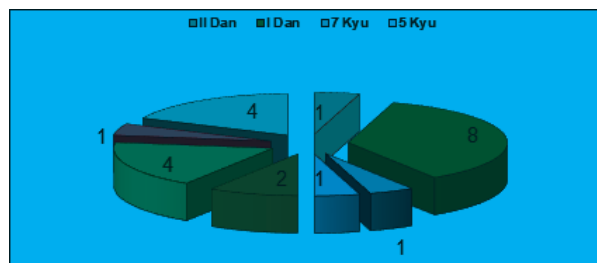


Figure 1. Visual representation of the athletic ranking in the experimental group, based on the Dan-Kyu system;

Once again, it is remarkable that the sample contains a high percentage of high class I and II Dan competitors (41%), followed by the same percentage of the 1-3 Kyu group, illustrating once again the predominance of high qualification Karate athletes. The remark in the above lines about the lack of prominent effect of age as factor between the two groups and the forming of very well-tuned high and athletic contestants in the group participating in international and national championships comes from precisely those 82% highly profiled Karatekas according to the Kyu-Dan system

Table 1. Average values of derived anthropometric parameters of both high- and low-ranking athletes:

Dan-Kyu ranking	Years of practice	Height (cm)	Weight (Kg)	BMI	Water content (%)	Adipose tissue (%)	Visc. Adipose deposite	Muscle mass (Kg)	OPFI	Bone mass (Kg)	Metabolic rate (Kcal)
3-1 Kyu	10	165,33	67,7	24,28	59,04	17,18	1	23,34	5,4	2,8	1684
I-II Dan	14,5	170	75,1	24,6	59,74	14,26	2,8	28,54	5,8	3,28	1937

For the I Dan and above group, the average value of athletic qualification is 14.5 years, and for the low-qualified is of 10 years, based on calculated average for the traineeship.

It should be noted that in Karate athletes abnormally high levels of BMI are explained by the increased amount of muscle mass rather than accounting for larger amounts of adipose tissue. Differences are revealed too in the weight parameters: elite Karatekas score 28.5 kg compared to 23.3 kg muscle mass for less-experienced athletes, which is not surprising

taking into account a higher average height of 1.70 m versus 1.65 m at the average, when body weight is also in favor of the elite group: 75 kg compared to 68 kg. It is also noteworthy the additional similarities in both groups: we have a Body Mass Index (BMI) oriented around 24 both, and a practically uniform body water content: 59.04 vs. 59.74%, showing a balanced body composition. Compared to the studies of Stepkowitz-Przybycień K.L. team (2010), the BMI for Polish Karatekas varies between 20 and 30 kg/m² (22.9 to 31.0 kg / m²), with adipose content between 12.9 and 20.8%. And in their experimen-

tal group, although international class participants scored mean BMI values higher than 25 kg/m² (24.8-28.8, supposedly overweight) compared to the novice group (students) where BMI was in the range of 25, 12 of the elite and 6 of the national contestants score BMI \geq 25 kg/m², precisely because of the high percentage of muscle mass (% MM).

It is logical that with a reduced body fat content, high-level fighters will be less physically burdened by this passive component (only 14.3% compared to the 17.2% adipose tissue for the novice Karate competitors), from where and the Overall Physical Fitness Index (OPFI) will be higher (5.8 vs. 5.4 for lower class competitors). It is noteworthy that the values of some of the measured parameters are relatively close - especially the average age: for lower ranking competitors, its median is 21.7 years, ranging from 19 to 27 years, while high profile athletes with over 10 years of athletic experience also mark close: the average age is 22.3 years, and is in a similar range 19-29 years. Yet, a simple analysis of this age difference shows us that the elite Karatekas begin their training in childhood, while in the lower-class this is at the beginning of puberty. Age changes between the two groups do not have the same gravity and as result produce better fit, high and athletic players in the group participating in international and national championships.

The findings once again confirm the expected changes in the body composition of long-time and successful competitors in martial arts, and Karate in particular, leading to an optimized and balanced for speed, power and endurance body type.

Based on multiple studies, proximal-distal muscle activation during a Karate strike is considered a factor in enhancing effective achievement of high movement velocity and power generation. The aimed analysis shows that when the agonist and antagonist muscles are simultaneously used, better movement control and stabilization of the joint are achieved.

Within our own experiments we drew the average value for punch measured at impact of 13.2 m/s, with the range of velocity varying within the sample between 5.1 m/s to 21.2 m/s. Those values do not differ from Gianino's experiments, whose experimental terminal punch speed before contact was also 13 m/s, with the marginal acceleration of the forearm and fist having a uniform acceleration of 63 m/s [5]. As expected among our own experiment sub-

jects, the highest values of 16.1 m/s were developed by high qualification competitors, and especially among I Dan specialists. The above-mentioned values of literary review and within our own experience suggest that the so-called „close-to-distant“ activation of multiple muscle groups starting from lower extremity and rising to the upper extremity in the executed punch not only provides the condition for generating effective force but also the achievement of necessary acceleration and terminal velocity as to execute a successful attack with upper extremity.

Again, it is remarkable that in our own Karate athletes there is almost a fourfold velocity differential when inexperienced fighters with only a 1-2 year combat training are compared to the most rigorous black belts, once again bringing fore the achievement of effective body control and execution of fast and powerful techniques by athletes who have a longer and more successful career.

So far, few studies have focused specifically on the analysis of lower extremity movements in Karate. The Belgian scientists, in the face of Poso J. at al., turn their attention to the kinetics in the hip and knee joints and the activity of Mai-Geri knee flexor/extensor muscles, aiming to determine adaptation of neuromuscular control in elite Karate athletes in this particular front kick. With respect to the Mai-Geri stand-alone technique, the study points out: international athletes are expected to perform a Mai-Geri kick in a shorter time, with greater impact force and a higher repeatability of kinetics and kinematics of lower extremity than athletes at national level, although there was no significant difference in the maximum impact of the kick between the two groups.

Based on his study, Gianino C. gives us an effective velocity of the foot before impact of the phenomenal 19 m/s, emphasizing on extraordinary acceleration of the thigh by hip joint muscles up to 108 m/sec² and of the lower leg resulting from the thigh and calf muscles up to 78 m/sec². Due to the already mentioned delay mechanism in the Mai-Geri kick (in order not to consciously hurt the opponent), this disproportion between the acceleration of the thigh from the muscles around hip joint and the reached acceleration of the knee joint is expected and can be explained. It is noteworthy that in our elite Karate competitors, the Mai-Geri kick is executed at a lower average velocity of 12.3 m/s, with a

maximum and minimum values of 6.8 to 19.8 m/s. What is noticeable is that the reached lower extremity velocity ranges from those closest to those of Gianino for our elite athletes, up to three times lower for the less experienced competitors (inevitable consequence of better control and effective use of body segments and their acceleration in order to reach the opponent faster yet still controlled).

Practical experience shows that the side directed Yoko-Geri kick, whether through ejection, coming from the knee or thigh, is very difficult to execute in combat conditions, mainly due to: the complexity of movements and consecutive intramuscular coordination, the limitations in flexibility of hip, knee and ankle joints, limited flexibility or particular weakness in lower extremity muscles (both ad- and ab-ductors) and those of abdominal wall. According to Feld M.S. and his team (1979), Yoko-Geri's average speed is in the range of 9.9-14 m/s with two phases: of thigh acceleration to Hiki Ashi position reaching to a „coiled“ state of lower extremity muscles, and then Yoko-Geri Kekomi „ejection“ movement through launch of the leg and foot attached to it as the striking surface. According to Giannino C., terminal foot acceleration decreases

due to the two-phase technique described above, reaching the effective 2m/s in the phase immediately before impact. In our experiment, Yoko-Geri's average kicks were 10.9 m/s, with a range of maximum and minimum values from 6.7 to 18.1 m/s. What is unique in our experiment is the already highlighted predominance of high-ranked athletes in the Dan-Kyu system, resulting both the inferior velocity values for the inexperienced and slower Karatekas with low Kyu and the superior values for our elite athletes at 18 m/s compared to Feld's kick speed.

Table 4 shows the characteristic impact velocity values and the angle at which this value is achieved for Gyaku-Zuki's punch, Mai-Geri and Yoko-Geri kicks by our competitors. Low values of variation, asymmetry and excess coefficients allow us to assume a normal distribution of the experimental data values for the studied statistical sample. The research we conducted yields results that are close to the comparative literature sources, yet the average values of fluctuation in the achieved angles for each of the three techniques in our study group are lesser, which is acceptable due to the lower qualification level by our inexperienced fighters.

Table 2. Average velocity and effective angles values in the execution of Gyaku-Zuki punch and Mae-Geri and Yoko-Geri kicks by Bulgarian Karate athletes;

Individual technique	V Gyaku-Zuki	V Mai-Geri	V Yoko-Geri	Angle Mai-Geri	Angle Yoko-Geri
X	13,2	12,3	10,9	70,8	64,0
S	3,6	3,6	4,1	13,2	13,9
V	27%	29%	38%	19%	22%
As	-0,1	0,0	1,9	0,2	-0,2
Ex	0,6	-0,7	5,3	-1,4	-0,6
Max	21,2	19,8	24,8	94,0	89,0
Min	5,1	6,8	6,7	53,0	38,0
R	16,1	13,0	18,1	41,0	51,0

Table 3. Experimental average velocity values in execution of strikes with upper and lower extremity by elite athletes

	V Gyaku-Zuki	V Mai-Geri	V Yoko-Geri
average	14,0	12,0	9,5
max	21,2	16,8	12,8
min	9,9	6,8	6,8

The highest number of athletes are those of I Dan, whose average speed of Gyaku-Zuki is within 14 m/s and ranges from 9.9 to 21.2 m/s, while kicks with lower extremity the average speed of Mae-Geri respectively falls down to 12 m/s, ranging from 6.8 to 16.8 m/s, and marks the lowest mean value for Yoko-Geri kick at 9.5 m/s in the range between 6.8 to 12.8 m/s. Several dependencies are seen after the primary analysis: Gyaku-Zuki's right-hand punch creates the most heterogeneous group, but also with the highest absolute velocity-factor we have already drawn attention to, for which the difference from the slowest to the fastest fighters is over 2 times. This trend is not only preserved, but also enhanced in the next Mae-Geri straight-kick, in which although the average terminal velocity is lower, has the largest intra-group variance - our best fighters of national and international rank are more than 2.4 times faster compared to their slower counterparts from the I Dan and higher qualification group. In this subgroup we find another feature - the performance of the slowest of the executing straight-kick Elite Karate athletes is even inferior to that of the more unexperienced competitors (in the encoding of biometric measures we find that those are the heaviest and with a highest BMI and percent adipose fighters).

Because of the mentioned "charging" and "ejection" features of muscle contraction as two separate and demanding phases, it is not surprising that even by the high-ranking Karate athletes Yoko-Geri Kekomi is one of the most smoothly executed kicks: the execution speeds does not reach the target limit of 2 times faster performance among the fastest and most successful athletes from the elite Karatekas, to the extent that even the slowest Gyaku-Zuki punch is faster than the average executed Yoko-Geri. The interpretation of those differences has already been extensively dealt with in the mechanics behind the two strikes, and yet: the side kick contrasts not only based on the expediency of its performance but also on the experimental results and proves its intricacy, from where we can assume its values to be an example of the mastery of body's muscle synergy and balance in our Elite Karate athletes. This approach will be particularly informative when applied to our lower-ranked and less experienced competitors:

Table 4. Experimental average velocity values in execution of strikes with upper and lower extremity by low-ranking athletes;

	V Gyaku-Zuki	V Mai-Geri	V Yoko-Geri
average	10,4	10,6	9,1
Max	17,0	14,3	13,4
Min	5,1	7,4	6,8

Here, for competitors of and below the 3 Kyu, who participated in our experiment, the results were expected to be inferior: lower average values are observed (most pronounced in the drop of 30% to 10.4 m/s for the Gyaku -Zuki punch, and with a evening out of the average velocity of arm and leg strikes), lowered maximum values compared to elevated minimums for the sample range which is fully understandable from the point of view based on the qualification level. Again most impressive is our most representative in combat practice Gyaku-Zuki punch: variation in velocity range from the slowest to the fastest more than 3.4 times - on its own this is a huge difference marking the measure of the muscle control in the event of a stimuli, and as such can not only help for unveiling deficiencies in performance of the more unexperienced fighters, but also competitors with greater readiness for rapid attack or effective counter-attack to stand out when screening for higher qualification level athletes.

Within the experimental data stands out the evening of the average velocity of the two kicks: the presented as direct and rapid forward strike of Mai-Geri and the more complicated side motion Yoko-Geri, even further-reaching paradox leveling among the slowest and less experienced low-rank athletes when executing those two strikes, up to a moment when Yoko-Geri kick becomes even faster (13.4 vs. 12.8 m/s Mai-Geri). At one hand, part of the results can be explained by fighting style choice of the already well-practiced athletes who spend a small part of their time maintaining their readiness to perform swift and accurate side-kicks, while on the other is the fact that the novices are still not that specialized and as they seem-to be able to control at the limit of their capabilities the execution of both kicks! An additional aspect is that the slowest among the elite Karatekas are the heaviest and with the highest BMI, so lifting the leg to Hiki Ashi will be inevitably more difficult and therefore slower.

This readiness of the muscles to perform specific techniques and controlled recoil time are some of the most marked indicators that distinguish high qualification Karate athletes from those with less than 9 years of experience.

Conclusion:

Based on the analyzed anthropometric parameters is confirmed that the elite Bulgarian Karate athletes exhibit the expected body composition modifica-

tions/alterations: long-time and successful athletes in combat sports are with body type optimized for balance between speed, strength and endurance. Our measurements of the chosen techniques produce relatively closer to international fighter's results, although the average speeds achieved for each of the three techniques in our group are lesser, inevitably due to a proportional percentage of the competitors with lower qualifications among the sample group. In the midst of the more unexperienced group Gyaku-Zuki punch has proven itself as a measure for muscle control after stimuli, not only revealing the shortcomings in performance for the more unprepared and thus- their subsequent improvement, but even for screening competitors with greater readiness for quick attack or effective counter-attack execution for the higher qualification levels. Not less important is the side kick Yoko-Geri, whose close value to those of Mai-Geri is an example of mastery of muscle coordination and balance of the body to the limits of our lower qualification Karate fighters without additional specialization and a guideline for improvement of rapid and fight-efficient techniques that are typical for our elite contestants.

BIBLIOGRAPHY:

- Arriaza R., Leyes M. Injury profile in competitive karate: prospective analysis of three consecutive World Karate Championships. *Knee Surg. Sports Traumatol. Arthrosc.* 2005; 13:603-607.
- Claessens A., Beunen G., Wellens R., Geldof G. Somatotype and body structure of world top judoists. *J. Sports Med. Phys.Fitness* 1987;1:105-113
- Feld M.S., Mc Nair R., Wild S. The physics of karate. *Sci. Am.* 1979;4:240
- Giampietro M, Pujia A, Bertini I. Anthropometric feature and body composition of young athletes practicing karate at high and medium competitive level. *Acta Diabetol* 2003; 40: p.145-8
- Gikova M. „Complex methodology for registration and analysis of equilibrium balance and kinematic parameters in various sport techniques”, „*Sport and Science*” magazine No.6 / 2013 p. 34-45
- Jovanović S.; Koropanovski N. Items for observing and analysis sport fight in karate. *Annual of Faculty of Sport and Physical Culture in Belgrade* 2002;10:85-94
- Katić R, Blazević S, Krstulović S, Mulić R. Morphological structures of elite Karateka and their impact on technical and fighting efficiency. *Coll Antropol.* 2005 Jun; 29(1):79-84
- Keogh, J., (1999). The use of physical fitness scores and anthropometric data to predict selection in elite under 18 Australian rules football team. *J Sci Med Sport.*, 2, 125–133
- Koropanovski N, Berjan B, Bozic PR, et al. Anthropometric and physical performance profiles of elite karate kumite and kata competitors. *J Hum Kinet* 2011; 30: 107-14
- Pozo, J., Bastien, G. & Dierick, F. (2011). Execution time, kinetics, and kinematics of the mae-geri kick: comparison of national and international standard karate athletes. *J Sports Sci.* Nov; 29(14), 1553-1561.
- Sterkowicz-Przybycień K.L Body composition and somatotype of the top of Polish male karate contestants *Biol. Sport* (2010); 27:195-201
- Wilmore, J. H., & Costill, D. L. (1999). Champaign: Human Kinetics. *Physiology of Sports and Exercise* 9, 490–507.
- Zagorski D., Gikova M., Penov R. (2014) Morphological characteristics of professional Shotokan karate athletes as a form of specific adaptation, 7th *International Scientific Congress „Sport, Stress, Adaptation”* p.83

CORRESPONDENCE ADDRESS:

Dimitar Zagorsky, Ass , MD
 Gikova Maria, Assoc. Prof., MD, PhD
 Anatomy and Biomechanics Department
 Sofia 1710, Studentski grad, block 70
 Telephone: (00359 2) 4014 289
 e-mail: dimzigzag_solo@yahoo.com

PHYSICAL AND TECHNICAL READINESS OF 12 YEAR OLD BOYS FROM BASKETBALL CLUB SHUMEN

Yanko Yankov, Teodora Simeonova
Konstantin Preslavsky University of Shumen

Summary

Basketball is one of the most widely practiced sports. Practicing basketball creates conditions for the development of qualities such as speed, strength, agility, quickness, endurance, flexibility and accuracy. The modern perception of the game requires a high level of physical preparation, brilliant technique with and without the ball and an extensive tactical training consistent with the individual characteristics of the players. The present research studies the changes in the physical and tactical preparedness of the boys basketball players, 12 years of age, who are members of basketball club "Shumen". The dynamics of the indicators through which the boys are tested will be of good help for the development of the physical and technical preparedness of the boys from the sports club.

Key words: basketball, physical qualities, technical preparedness, boys 12 years

Introduction

Various pieces of information can be found in the literary sources in reference to the matter of dynamics of the development of physical qualities. All ages between 7-12 coincide with the preliminary sports training stage, when the learning process has a highly complex character. This means that all sides of the training are connected to each other. The main goal of the training is forming a specific motor base, necessary for the game. Some exercises are being used for learning the technique and for developing the physical qualities.

Sports games affect the development of all motor-functional abilities but to a different extent. Above all, speed is one of the main factors. At many times, speed is crucial to the effectiveness of a specific move and the result from it. Also, this quality is valuable to sports games because of the elements it consists of. For example, among the elements that are extremely important in handball, football and basketball are the speed of performing the move, the quick change of movements, the pace of movement, the speed of reaction, etc.

Another important factor is the development of high endurance in players. Since the duration of the games is considerable, sustaining intensive motor activity requires high endurance. The development of this quality implies strengthening of the physical resistance of the organism to the increasing fatigue. Strength in games is not as important as

some other qualities. Its development contributes to the improvement of other motor skills such as speed and jumping abilities. The constantly changing conditions in sports games require an accurate and quick analysis of the game situation, selecting the most effective means for reaction and their perfect execution. (see Dobrev, Georgiev, Gavriyski, Stefanova, 1987)

According to Simeonova (2012), an essential precondition for the quality education in the technical elements and the complex technical methods is the good general and special physical training. On the basis of the motor skills acquired in children, the training process builds the good technique.

Basketball shooting as a motor action is one of the elements discussed by many authors. Thanks to its improvement, the results and rates have significantly improved as well.

The precision and accuracy of shooting is the most important technical element that helps us achieve the main aim in basketball – to score into the basket. According to Tsenich (2002) the most important aspect for the shooting improvement is the number of repetitions, the qualifications of the player and for the conditions in which a shot is performed to be as close as possible to those in a real game.

Another important shooting type performed during competitions and a criterion for the possession of

good technical skills is shooting from the free throw line or performing a free throw shot in the game.

Almost all specialists hold the opinion that performing free throw shots must be a part of every practice. For the purpose of improvement of this type of shooting, Cousy, Power, 1975 suggest that every player should determine his own most effective method of performing a shot; Tomic, 2003 suggests using the most successful shooting technique of all practiced, Dorzhevic, Marinkovic, 2007 believe that it is particularly important for breathing and the technique of performing shots to be defined before the shooting; J. Hutchison states that the ability to overcome the influence of negative factors and concentrating on the techniques of performance predetermine the end result, and Simeonova, Tsvetkova, 2003 use the principle of anticipation and working on the increase of shooting accuracy from the free throw line.

Methods

The dynamics study of the physical qualities and technical training among 12-year-old boys from the basketball club "Shumen" was conducted from February 2015 to September 2016, that was done by submitting 38 contestants to two evaluations during two competing years. The indicators by which we evaluate are diagnosed with eight tests. The dynamics of the indicators by which the kids are tested, will serve for the development of the physical and technical training of the boys from the sports club.

Test 1 - 20 m - Performed on the basketball court. From first position standing start, after the commands "Ready, Set, Go" the distance of 20 meters is run at maximum speed. The task is performed two times and the best attempt is recorded, with accuracy up to 0,01s.

Test 2 - Shuttle run - Performed on the basketball court within the marked 20m zone. The test starts with quick walking or slow running and ends with running at a speed that the tested could keep. The pace of walking and then of running is determined by signals recorded on a music player. After about one minute, a sound indicates an increase in speed, and the beeps will be closer together, this continues each minute. The tested must hear the beep sound whenever he steps on the start or final line. Inconsistencies of 1-2m are permissible. The ath-

lete's score is the number of shuttles (20m) reached before they were unable to keep up with the recording.

Test 3 Triple jump –A swing of the hands is performed, first forward, down, backward, combined with spring of feet followed by another swing of the hands the other way round and a jump from both legs (at the same time). The athlete lands onto one foot, then a step is taken onto the other foot, then the jump is performed by finally landing on both feet. Measurement is taken from the take off line to the back of the closest heel on landing, with accuracy of up to 0,01m. Two jumps are performed. The better attempt is recorded.

Test 4 - Standing vertical jump. The athlete stands side on to a measurement scale and reaches up with the hand closest to the wall. The point of the fingertips is marked or recorded. The athlete then leaps vertically as high as possible using both arms and legs to assist in projecting the body upwards. The difference in distance between the standing reach height and the jump height is the score. The best of two attempts is recorded, with accuracy of up to 1,0cm.

Test 5 – Figure eight dribble. The performance starts after a signal with a right-hand dribble, on the side of the right leg, followed by a cross dribble swinging the ball to the front and to the back between the legs, passing it to the left hand behind the body, dribble on the side of the left leg, cross dribble to the front and to the back between the legs and passing the ball between the legs back to the right hand, etc. The athlete's score is the number of dribbles performed without breaking the sequence of moves. The duration of the exercise is 30s. Test 6 - Ball handling – Ball handling index - That is the difference (in seconds with accuracy of up to 0,01s) between the results submitted when passing the distance handling a ball (dribble) and the one without a ball (running – indicator 2).

Test 7 – Shooting on the move – First position – standing start behind the base line (under the basket) holding a ball. Going round while leading the ball, followed by shooting on the move (after two steps), consecutively at each of the three stands placed on the 3-point line (opposite the basket and at a 45 degree angle on both the left and the right side)

Test 8 - Shooting from a standing position - Free

throw shots. Work in pairs. 10 series of 2 free throw

shots are performed (total 20 shots) with another player passing the ball. The number of successful free throw shots is estimated.

Results

The results from the tests carried out over the first year of the research are summarized in Table 1 and Table 2.

Table №1
Statistical data of boys first year, first research

№	Indicator	n	X min	X max	X average	S	V%	As	Ex
1.	20 m	38	4,45	3,21	3,92	0,81	20,66	0,25	0,60
2.	Shuttle run	38	16,00	25,00	20,20	3,93	19,45	0,17	-0,17
3.	Triple jump	38	4,44	6,46	5,10	1,77	34,70	0,52	-0,11
4.	Standing vertical jump	38	23,00	31,00	28,78	6,14	21,33	0,06	-0,44
5.	Figure eight dribble	38	20,00	45,00	30,01	10,52	35,05	0,65	1,56
6.	Ball handling	38	4,46	9,11	6,59	2,37	35,96	-0,35	0,94
7.	Shooting on the move	38	30,00	39,00	34,94	5,67	16,22	0,17	-0,48
8.	Static shooting	38	14,00	24,00	18,22	3,50	19,17	0,39	0,44

Table №2
Statistical data of boys first year, second research

№	Indicator	n	X min	X max	X average	S	V%	As	Ex
1.	20 m	38	5,05	2,81	3,43	0,57	16,62	-0,49	-0,73
2.	Shuttle run	38	20,00	31,00	25,60	4,88	19,06	-0,36	-0,78
3.	Triple jump	38	4,51	5,78	5,31	1,83	34,46	-0,31	-0,92
4.	Standing vertical jump	38	27,00	38,00	33,39	7,09	17,94	-0,12	-0,91
5.	Figure eight dribble	38	21,00	42,00	33,34	8,11	24,32	0,63	-0,41
6.	Ball handling	38	6,47	4,48	5,12	6,64	12,96	0,09	-0,02
7.	Shooting on the move	38	34,00	39,00	37,01	4,04	10,92	0,80	0,18
8.	Static shooting	38	17,00	26,00	21,87	3,36	15,39	-0,34	-0,55

Whether the changes that have occurred in the process of training the boys, and the obtained differences for the first competitive year are confirmed with the required reliability ($Pt > 95.0\%$), we estimate through Student's t-criterion (see table №3).

Table №3
Significance of differences between the average levels from the first year

№ Test	Beginning		End		d	t	Pt %
	X	S	X	S			
1.	3,92	0,81	3,43	0,57	-0,49	-1,37	75%
2.	20,20	3,93	25,60	4,88	5,40	-1,18	70%
3.	5,10	1,77	5,31	1,83	0,21	1,48	83%
4.	28,78	6,14	33,39	7,09	4,61	2,91	95%
5.	30,01	10,52	33,34	8,11	3,33	1,33	79%
6.	6,59	2,37	5,12	6,64	-1,47	1,52	84%
7.	34,94	5,67	37,01	4,04	2,07	-3,24	95%
8.	18,22	3,50	21,87	3,36	3,65	3,83	95%

Tables 4 and 5 show the results from the tests carried out during the second year.

Table №4
Statistical data of boys second year, first research

№	Indicator	n	X min	X max	X average	S	V%	As	Ex
1.	20 m	38	4,00	2,82	3,71	0,55	14,82	-0,03	-0,82
2.	Shuttle run	38	18,00	33,00	24,22	4,88	20,14	0,19	-0,67
3.	Triple jump	38	4,12	6,01	5,16	0,90	17,44	0,87	1,21
4.	Standing vertical jump	38	23,00	41,00	31,98	6,80	21,26	0,29	-0,39
5.	Figure eight dribble	38	21,00	36,00	30,61	5,11	16,69	0,02	0,90
6.	Ball handling	38	7,32	4,33	5,89	0,86	14,60	-0,40	-0,40
7.	Shooting on the move	38	31,00	38,00	37,90	4,04	10,65	0,40	0,78
8.	Static shooting	38	14	21	19,92	3,09	15,51	0,68	0,58

Table №5
Statistical data of boys second year, second research

	Indicator	n	X min	X max	X average	S	V%	As	Ex
1.	20 m	38	4,25	3,52	3,43	0,38	11,07	0,19	-0,79
2.	Shuttle run	38	28,00	36,00	25,60	4,55	17,77	0,68	0,46
3.	Triple jump	38	3,78	6,06	5,51	0,86	15,60	0,04	-0,54
4.	Standing vertical jump	38	24,00	49,00	37,39	6,22	16,63	0,46	0,52
5.	Figure eight dribble	38	27,00	41,00	36,66	5,44	14,83	0,21	-0,73
6.	Ball handling	38	6,54	4,38	5,02	0,80	15,93	0,05	-0,63
7.	Shooting on the move	38	31,00	45,00	43,01	5,10	11,85	0,01	0,58
8.	Static shooting	38	17,00	29,00	22,97	2,92	12,71	0,95	0,06

The estimated values of Student's t-criterion on the significance of the obtained differences are presented in Table 6.

Table №6
Significance of differences between the average levels from the second year

№ Test	Beginning		End		d	t	Pt %
	X	S	X	S			
1.	3,71	0,55	3,43	0,38	-0,28	1,83	89%
2.	24,22	4,88	25,60	4,55	1,38	1,66	85%
3.	5,16	0,90	5,51	0,86	0,35	4,03	95%
4.	31,98	6,80	37,39	6,22	5,41	3,21	95%
5.	30,61	5,11	36,66	5,44	6,05	1,53	79%
6.	5,89	0,86	5,02	0,80	-0,87	3,32	95%
7.	37,90	4,04	43,01	5,10	5,11	-3,24	95%
8.	19,92	3,09	22,97	2,92	3,05	3,17	95%

Discussion.

The test 20m. gives us information about the motor-functional skill speed (the speed of a simple

motor reaction and the speed of starting a separate movement). Making a comparison of the results from tables 1 and 2, and tables 4 and 5, we will no-

tice that the changes which have occurred during both years do not have great significance – Pt % = 75 for the first year, and Pt % = 89 for the second year. There is a positive decrease in the variance factor for both years, which gives proof for the homogeneity and identical capabilities of the players.

The duration of one game quarter or a school game (10 or more minutes) requires good physical fitness. The game situations involve not so much long runs, but movement forward and backward on the court. The test «*Shuttle run*» gives information for the evaluation of the general (cardiorespiratory) endurance. Resisting the growing fatigue is extremely important for the training process. The average measurements done at the beginning of the experiment, respectively $X_1 = 20,20$ times for the first year, and $X_1 = 30,69$ times for the second year, rise to $X_2 = 25,60$ times and $X_2 = 33,82$. This proves that the abilities of the boys have improved in terms of continuous practice at average intensity (power), involving the functioning of a big part of the muscle apparatus.

The special physical training in basketball education cultivates and improves the specific motor-functional skills in line with the special features of the motor habits that are formed through the practice of basketball techniques. (Margaritov, 2003) An essential condition for the mastering and improvement of a number of technical skills – jump shot, shooting on the move etc., is the explosive power of the lower body. The vertical pressure is determined through the test “Standing vertical jump”. The differences estimated between the average values from the two seasons observed are confirmed by 95% guarantee probability, which speaks of positive results from the sports-pedagogical process.

Another thing that provokes great interest in the present research is the changes which occurred as a result of the training process in terms of technical preparedness of the boys. The ability to move on the court handling a ball is highly important in modern basketball. The tests “Figure eight dribble” and “Ball handling” are indicators that give us information on the individual technique of the players. A mark of a good choice of means and methods of effectiveness and amount of exercise for boy players is the high reliability of the differences received for the second year – 95% for the second test.

Through the information from the applied tables,

we can track down the changes in shooting on the move and shooting from a standing position, such as a free throw shot. These types of shooting are performed with priority during the training time, and as a factor of tactical skill we have chosen the execution of a free throw shot. Shooting on the move is the most commonly used method for finishing an attack close to the basket. The high values of Pt % for both observed years (analyzed in table 3 and table 6), as well as the observed increase could be taken as a result of the sports-preparatory exercises and games that are included in the training methodology.

The majority of sports specialists believe that the free throw shot is not only a way of scoring points, but also a means of psychological influence over the players of the rival team. However, in order to be successful, this type of shooting requires systematic practice. The estimated values of Student's t-criterion on the received statistical differences show a high reliability rate (95% for both years). Free throws belong to the so called “special shots”. In order to receive them, they are discussed and paid special attention in the theoretical, psychological and tactical preparation applied in our programs for increasing the accuracy of the boy players.

Conclusion

The well-thought-out choice of resources and methods in the applied curriculum leads to the desired progress during the second school year. We can see a statistically authentic and significant improvement in five of the researched indicators. The level of the physical and technical training is increased, especially in regards to jumping, precision and dexterity.

Confirmation for that are values for keeping a ball and shooting in motion. An indicator of a positive impact of the training methods is also the increased accuracy from position – the execution of a penalty shoot. The distraction on this indicator significantly decreased at the end of the observed period. The pedagogical desirable result was achieved and the boys results were averaged.

References

- Dobrev, D. et all (1987) *Fiziologia na choveka*. M i F // Добрев, Д. и кол. 1987 *Физиология на човека*. М и Ф. Coase, B., F. Power. 1975 *Basketball Concepts and Analysis*. Gym & Sport, // Коузи, Б., Ф. Пауер. 1975 *Баскетбол*

- концепции и анализ. Физкултура и спорт,
V. Margatirov et all (2003) Rakovotstvo po basketbol
PUI, Plovdiv//В. Маргаритов и др., 2003 Ръководство
по баскетбол. ПУИ, Пловдив,
Simeonova, T Dissertation 2012 Modeli i metodika
za usavarshenstvane tehnikata na strelba v basketbola
na osnovata na sposobnostta na uchenicite za antici-
paciya// Симеонова, Т. Дисертация 2012 Модели и
методика за усъвършенстване техниката на стрелба
в баскетбола на основата на способността на
учениците за антиципация.
Simeonova, T., N. Svetkova 2003 Anticipaciyata v bas-
ketbola- Fizicheska kultura, fizicheskovo vazpitane,sport
– SHU “Episkop Konstantin Preslavski”, Shumen //
Симеонова, Т., Н. Цветкова. 2003 Антиципацията
в баскетбола – Физическа култура, физическо
възпитание, спорт – ШУ “Епископ К. Преславски”,
Шумен
Hutchison, J Basketbol rezultatno trenirane, NSA //
Хъчисън, Дж. Баскетбол резултатно трениране.
НСА,
Cenich, B 1992 Kosharka tehnika i taktika. Visha
kosharkashka shkola. Beograd 2002 \\Ценич, Б. 1992
Кошарка техника и тактика. Виша кошаркарска
школа. Београд, 2002
Dordevic, B.,M. Marinkovic 2007 Kosharka ABC.
BONART , Beograd //Dordevic, B.,M. Marinkovic. ,
2007 Kosarka ABC. BONART, Beograd
Tomic, M. 2003 Kosharka. Publik Praktikum //Tomic,
M. 2003 Kosarka. Publik Praktikum..

EXAMINING THE EFFECTS OF STRENGTH BUILDING EXERCISES ON THE STAGE PERFORMANCE OF PROFESSIONAL FOLK DANCERS

Yiğit Hakan ÜNLÜ

Summary: *Introduction: Turkish folk dances require dynamic, rhythmic and systematic movements of the body which lead to many positive physical and physiological changes. In order to be examined the form of these changes it is required an application of scientific approach which examines the dance as a form of physical activity with its athletic features. Most of the Turkish folk dances require high performance of muscle strength. This is the reason why we assume that development of the muscle strength of the dancers would result in better stage performance.*

Methodology: The study is applied on 18 female and 20 male dancers, randomly divided into experimental and control group. The groups are equal in terms of number of participants and gender. The experiment requires pre and post testing (EG-R O₁ x O₂ and CG-R O₃ O₄). Before the application of the program all of the participants were informed about its purpose. In order to avoid any negative effects, the pre and post assessments have been done at the same place, at the same time of the day and following same stretching program.

Results and Discussion: The results of the study show statistically significant positive differences between the results of pre and posttests of the experimental group which give us reason to consider it as a positive effect of the application of the 6-week experimental program. The changes are observed not only in the means but also in the minimal, maximal values and the range (the difference between the largest and lowest result).

Conclusion: The results of this study could be used for further application of training programs aiming development of physical fitness and stage performance.

Keywords: exercises; dancers; dance education; strength; injuries

Introduction: During the past few decades, has been noticed a trend of professionalisation of the dance art in the Republic of Turkey and its orientation towards the scientific approach. This trend requires also a specialised training of the dancers, due to the increased artistic and aesthetic requirements demanded from them. According to Vladova and Ünlü (2017) the good dance performance depends also on the optimal development of the motor qualities and not only on the respective dancer's talent and flair. Zl. Kostov (2005) suggests that the needed set of athletic, performing and artistic qualities should be built gradually. The dances also have their proper influence on the development of the motor skills.

Nowadays, professional dance art is very close to the sport of excellence. In many aspects, the training of dancers is similar to the training of athletes, while from pedagogical point of view dance and sport activity/practice are identical (Ünlü and Vladova, 2016).

This study deals with the issue of the quality strength of Turkish folk dancers and the process of its improvement, because the optimal development

of this quality is a factor for attainment of performing mastery.

Strength as a motor quality is at the foundation of good dance technique, which in its turn shall lead to the improvement of the performance. This quality is developed through systematic and purposeful training of a particular type muscular activity. In dance practice, like in sports training, are included self-weight exercises (through overcoming of the own weight) that are included mainly in the dance exercise when performing: Plie; Battement tendu; Jete; Rond de jambe par terre; Battement fondu; Battement frappe; Sauter.; external resistance exercises using weights, elastic bands, springs, etc. or structured special strength exercises (Nikolov, 2014; Vladova and Ünlü, 2017).

The development of strength by the dancers, especially in the lower body part (LBP) serves the purpose of trauma prevention and it is also necessary for the improvement of the dance performance, e.g. improvement of the balance during dancing and for the successful execution of jumps (Golomer et al., 2004; Kraemer, et al., 2004; Wyon et al., 2006;

Ambegaonkar et al., 2014).

Turkish folk dances demand dynamic, rhythmic and systematic body movements. And it is for this reason that we consider these dances as a form of a physical activity, possessing athletic traits. The good performance of most of the Turkish folk dances (like Bar, Halay, Horon, Karşımla Zeybek, Kasik). requires a high degree of development of the muscle strength of the lower body part (limbs). For this reason, we suppose that the development of this physical quality shall lead to a better stage performance.

Methodology: The aim of this experimental study is to optimize the strength is to optimise the strength of the lower body parts of dancer who practice Turkish folk dances.

Object of the study is the development of strength of the LBP among 38 dance students from Sakarya University, Republic of Turkey. They are students at Sakarya University State Conservatory, Department of Turkish Folk Dances, Esentepe Campus Serdivan/ Sakarya, who participated in stage performances for the 2015/2016 season. Of the participants in the project 18 were female and 20 male dance students. They were divided into an experimental group (EG=19) and a control group (CG=19), which were balanced in terms of number of participants and gender distribution but no triage according to the year of study of the students (Table 1).

Table 1 Number of Participants

	Female students	Male students	Total
Experimental Group	9	10	19
Control Group	9	10	19
Total:	18	20	38

The median age of the participants from the EG is M=22,2 years (Min=19; Max=28, SD=2,29). The average age of the participants from the Control Group is M=21,1 years (Min=19; Max=23, SD=1,45). The experimental study was implemented according to a plan, comprising entry level and final testing of both groups participating students:

EG – R O₁ x O₂ and CG – R O₃ O₄

(Legend: R – randomised; O₁ - first test of the members of the EG before the start of the experiment; x – impact; O₂ -test after the experiment; O₃ u O₄ - are respectively the entry and final testing of the members of the Control group where no impact was applied) (Campbell, D, 1980).

The participants in the study were randomised to one of the two groups – experimental and control according to the criteria under study (applied strength tests on the LBP), i.e. selection in pairs. The groups were not balanced in terms of age, dance experience or anthropometric indicators, but were balanced in terms of the results from the tested indicators. The comparative analysis of the results before the experiment (Mann-Whitney test) show that there no statistically significant difference between the two groups in regard of the respective indicator could be noticed for all three tests. When selecting the groups, we have taken into account the correctness requirements to avoid the formation of quasi-experimental groups where errors usually occur (Kentawitz, Rowdiger III & Elms, 2011). The participation in the experiment of each dance student is voluntary and the participants were informed in advance about the aims of the study. The participants were tested twice – once before the start and the second time – after the end of the experiments program. Both tests were performed in the same hall, during the same time range and after the implementation of the same warm-up exercise program. The training is performed by the same trainer in the same terms and conditions of the environment. It was mandatory, that the participants had no other physical activity on the day of the test nor on the previous day. During the testing, all participants in the survey were healthy and free of trauma.

Methodology of the Experiment: A specially elaborated work methodology has been applied to the experimental group for 6 weeks. When working with the control group this methodology was not applied. The experimental program includes: a characteristic Turkish dance exercise specially developed by the author on the base of the physical requirements demanded from the dancers who perform the basic Turkish folk dances; standard stretching complex performed after the rehearsals; specially elaborated complex for development of strength executed 3 times in the week. For enhancement of the strength of the LBP is used a combination of squats with the application of different weights which load has been progressively increased during the implementation of the project. Although the main focus of this study is the development of strength of the LBP in the combination of exercises were included abdominal and dorsal presses and push supports so that a balanced improvement of the strength qualities of the participants. The participants in the ex-

periment continued with the regular performance of their standard dance practice.

The timing of the experiment was scheduled for the period before the first concert of the academic year.

Tests: Three tests were developed for assessment the dynamics of the development of strength of the LBP (Table 2). The data from the test results served as a criterion for the development of the strength of the LBP:

Table 2 Sports-Pedagogical Tests

No	Name of the Test	Focusing Factors	Measuring Unit	Direction
1.	Standing Long Jump (Test1)	Explosive force of the lower limbs (LBP)	CM	-/+
2.	Standing Vertical Jump/ Static Jump (Test2)	Explosive force of the lower limbs (LBP) – muscles of the foot	CM	-/+
3.	Squat Vertical Jump (Test3)	Explosive force of the lower limbs (LBP)	CM	-/+

The testing of the explosive force of the dancers was implemented using Newtest Powertimer 300-series, which is one of the commonly used systems for testing and measuring of vertical jumps of athletes (Hennessy et al, 2001; Kyrolainen et al., 2001, 2003; Balciunas, et al., 2006). It is a reliable instrument for testing because the random errors during the measurement is insignificant (Enoksen, Tønnessen, & Shalfaw, 2009). The data obtained with this type of measurement is easily converted into numerical values. The choice of these tests is due to the specifics of the Turkish folk dances and the need of sufficient explosive force of the LBP when performing the jumps (70-80% of the stage dance performance require a well-developed strength of the lower limbs). The tests were selected after consultations with the colleagues from the Faculty of Physical Education at the Sakarya University.

In this study alongside the testing we use expert assessment as a research method. The idea is to review the independent opinion of the experts – dance pedagogues, about eventual changes of the dance performance of the participants in the pro-

ject. The team of experts is made of 4 professors to the Conservatory. Each of the experts receives a Performance Assessment Card by which 6 performance indicators are evaluated: performance of dance figures and choreography; dance movements performance technique; rhythm; coordination (coordination in terms of one’s own movements and coordination within the group; aesthetic attractiveness and artistry. The assessment of the performance is based on a subjective comparative analysis of video recordings, made before and after the experiment, of stage performances of dancers from both groups – the control and the experimental. The rating by the individual criteria is done on scale of 0 to 5, where by “0” is marked “No positive change reported” and by “5” – “Significant positive change reported”.

Results and discussion: After the 6-week experimental program it has been found that there is a statistically significant difference in the performance of the participants from the Experimental Group (EG) during all 3 tests (before the start and after the end of the project) (Table 3).

Table 3 Comparative Analysis Results (Wilcoxon Test)

	Test1_2-Test1_1	Test2_2-Test2_1	Test3_2-Test3_1
T	-2.965	-3.638	-3.413
α	.003	.000	.001

In order to verify the course of the difference we made a variation analysis of the data, presented in Table 4.

Table 4 Variation analysis of the test for assessment of the level of development of motor skills results (EG).

No of the Test	Number of Participants (n)	Median (M)	Spread	Min	Max	SD
Test1_1	19	160,4	65	125,00	190,00	17,76
Test2_1	19	22,3	20	12,00	32,00	6,36
Test3_1	19	29,4	36	12,00	48,00	10,57
Test1_2	19	165,0	33	127,00	198,00	20,2
Test2_2	19	24,8	20	14,00	34,00	6,49
Test3_2	19	31,3	35	14,00	49,00	10,00

Changes are found not only in the average but also in the minimum and maximum values and the spread (the difference between the best and the

worst result of the trial). Based on the Wilcoxon's criterion about the dependent samples it has been found that the improvement of the indicators, subject of the research (i.e. strength of lower limbs), has a statistically credible level of significance $\alpha \leq 0,01$.

The results of the variation and comparative analysis allow us to assume that during the 6-month experimental period an improvement of the strength of the LBP is observed and that is valid for all three tests. Alongside the positive trend dynamics of improving the indicators with respect of the median values (M) of all participants of the EG we find an increase of the indicators in respect of the minimum and maximum values as well.

In this study, the role of the Control Group (CG) is to verify the effectiveness of the development of the strength of the LBP after the implementation of the experimental program. The data from the comparative analysis of the results of the dance students from the CG during the second testing, implemented at the end of the experiment, shows that only for Test 2 (before-after) there is no statistically significant difference (Table 5).

**Table 5 Comparative Analysis (Wilcoxon test)
CG**

	Test 1 After - Before	Test 2 After - Before	Test 3 After - Before
T	-2,750	-1,384	-2,970
α	,006	,166	,003

The results of the variation analysis show that unlike the dance students from the EG among the tested students from the CG no improvement of the studied qualities is observed and that even there is an opposite trend.

The results of the implemented expert analysis show that in regard of the expert assessment for artistry, aesthetic and rhythmic impact, both tested groups encountered similar development of the stage skills. It is worth noting that the result of improvement the overall performance of dance figures and choreography demonstrated by the members of the EG has been scored higher than that of the CG, i.e. the score of the EG is with 2 units higher than that of the CG. Unimprovement of the two types of the coordination of the dancers from the EG has been found.

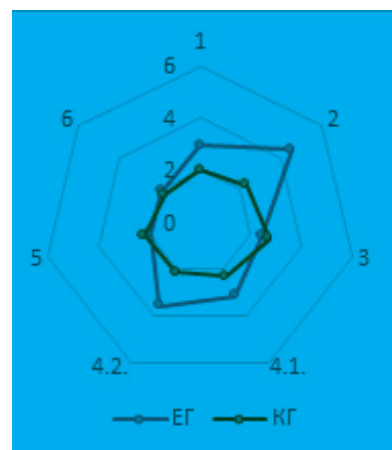


Figure 1. The Generalized results of the medial values of the assessed indicators related to the stage performance of the members of the experimental and control groups

Conclusion:

The achieved results allow to conclude that due to application of the experimental methodology there is a positive impact on the development of strength of the LBP. Considering the fact that the members of both groups participated also in the standard rehearsal program, i.e. the rehearsal conditions for all dancers were equal, we could conclude that the suggested experimental program has had a significant impact on the stage artistic performance of the dancers who took part in the project. The results of this study could be used for the further introduction of training programs aimed at the development of the physical fitness and the stage performance.

References:

- Ambegaonkar, J., Caswell, S., and Cortes, N. (2014). Relationships among lower body power measures and balance in female collegiate dancers. Paper presented at the 24th Annual Meeting of the International Association for Dance Medicine & Science. Basel, Switzerland.
- Balciunas, M., Stonkus, S., Abrantes, C., and Sampaio, J. (2006). Long term effects of different training modalities on power, speed, skill and anaerobic capacity in young male basketball players. *Journal of Sports Science and Medicine*, 5, 163–170
- Enoksen, E., Tønnessen, E., and Shalfaw, S. (2009). Validity and reliability of the Newtest Powertimer 300-series testing system. *Journal of Sports Sciences*, 27(1), 77-84.
- Hennessy, L. and Kilty, J. (2001). Relationship of the stretch-shortening cycle to sprint performance in trained female athletes. *Journal of Strength and Conditioning Research*, 15, 326-331
- Golomer, E., Keller, J., Féry, Y., and Testa, M. (2004). Unipodal performance and leg muscle mass in jumping skills among ballet dancers. *Percept Motor Skills*. 98(2), 415-418.
- Kyrolainen, H., Belli, A., and Komi, P. V. (2001). Biome-

chanical factors affecting running economy. *Journal of Medicine and Science in Sports and Exercise*, 33, 1330–1337

Kyrolainen, H., Kivela, R., Koskinen, S., McBride, J., Andersen, J. L., Takala, T., et al. (2003). Interrelationships between muscle structure, muscle strength, and running economy. *Journal of Medicine and Science in Sports and Exercise*, 35, 45–49

Kraemer, W., Nindl, B., Ratamess, N., Gotshalk, L., Volek, J., Fleck, S. and Hakkinen, K. (2004). Changes in muscle hypertrophy in women with periodized resistance training. *Journal of Medicine Science and Sport Exercise*, 36(4), 1124-1131.

Wyon, M., Allen, N., Angioi, M., Nevill, A. and Twitchett, E. (2006). Anthropometric Factors Affecting Vertical Jump Height in Ballet Dancers. *Journal of Dance Medicine & Science*, 10(3 & 4), 106-110.

Ünlü, Y. H., and Vladova, I. (2016). Dance lesson as a pedagogical process. E - Bildiriler Kitabı. 2 Uluslararası Müzik ve Dans Kongresi, (355-362). Muğla.

Vladova, I. and Ünlü, Y. H. (2017). On the Importance and the Need of Refinement of Flexibility and Strength

as an Element of the Training of Dancers. *Journal of Applied Sports Sciences*, Vol. 1, pp. 31-45

Кэмпбелл, Д. (1980). Модели экспериментов в социальной психологии и прикладных исследованиях. Прогрес, Москва (Kempbel, D. Modeli eksperimentov v socialnoi psichologii i prikladnih issledovaniyah. Progress, Moskva)

Костов, Зл. (2005). Теория и практика в учебно-тренировъчния процес по спортни танци. Ръководство за студенти IV курс специалност „Спортни танци“ ТФ. НСА, София (Kostov, Zl. Teoria i praktika v учебно-trenirovachnia process po sportni tanci. Rukovodstvo za student IV kurs, specialnost “Sportni tanci” TF, NSA, Sofia)

Николов, Е. (2014). Силата като фактор на спортното постижение. От С. Стойков (Ред.), Лека атлетика. София: НСА ПРЕС. (Nikolov, E. Silata kato factor na sportnoto postijenie. Ed. St. Stoikov. Leka atletika. Sofia, NSA PRES)

Contact information: Yiğit Hakan ÜNLÜ, PhD; Sakarya University, Turkish Folk Dance Department; tel.:+905323514147; E-mail: yhunlu@sakarya.edu.tr

DETERMINATION OF MOTOR MOBILITY SPEED ZONES FOR PLAYERS FROM AGE GROUPS U16 AND U17

V. Tsvetkov, M. Gadev, Peter Peev

Keywords: junior football, speed, speed zones, GPS;

Introduction

As is known, the football game falls into the group of poly-structural sports. The motor activity in this sport discipline is defined as varied and variable in intensity.

There are many studies in the field of football. The public review of literary sources reveals dozens of editions related to the specificity and methodology of the preparation. All this experience is mostly related to the profile of male and female football, and the child-teen period of sports improvement remains relatively intact from a scientific point of view. Here is a big aspect of child-teen football, which reveals opportunities for improvement and development – defining the profile of the account for a certain age period.

Knowledge in this direction would help to improve the qualitative and quantitative improvement of the players' training during this period of their sport-technical improvement.

What is more, the optimization of the sport-pedagogical process by adequately defining the account profile in the respective age period enables us to implement modern technologies in the training process. For example, we can take ever-wider use of GPS-based load tracking systems. In short, to base absolute data accuracy on GPS systems to improve the conditional training of competitors, you must first be sure that the profile of the individual movements during the football game is clear.

It is these considerations that lead to the need to explore the various forms of movement of the players during the game.

Aim and objectives of the study

All of this also dictates the purpose of our research, namely – the determination of the speed zones of the motorized activity in the youth football for the U16–17 age range.

From the so-called goal, two main tasks emerge from the realization of the study:

1. Investigation of the literary sources on the problem of the speed zones and the methodology for their determination.
2. Determine their boundaries for the specific age range using an affordable and adequate test battery.

Methods

In the course of the study, for the solving of the problems we focused on the review of the literary sources regarding the methods for determination of speed zones in football.

As we can see from Carling and Colleagues (2008) – there are a variety of methods for determining the speed zones:

Goto and Team (2015a), Goto and Team (2015b) offer the use of a 5m flying start with 5m reinforcement. Based on the determination of the average travel speed of this segment, five working areas are defined, each of which is calculated on the basis of the standard deviation: first zone –2 standard deviations; second zone –1 standard deviations; third zone average speed; fourth zone +1 standard deviations and fifth zone +2 standard deviations.

Mendez-Villanueva and Team (2012) offer a totally different approach to determining the areas, namely the basis of the 10m flying start test, measured over a 40m track and the Vamevall test, calculates the maximum anaerobic and maximum aerobic velocity and the reserve anaerobic velocity, after which 5 working zones of activity are determined. Harley and colleagues (2012) suggests using the following equation ($V_{\text{peak SNR}} / V_{\text{peak GRP}}$) * TH-S to identify 6 travel speeds that are standing, walking, jogging, running, high-speed running and pattern spraying proposed by Bradley and colleagues (2009). Measurements are made on the basis of a 10m flying start, taken from a 20m run.

Brendan Chaplin (Meeting of the Minds Conference – 2017) offers a reverse approach to exploring the areas of motor activity. It recommends the use of GPS systems to analyze the speed of each individual movement in a racing environment and then analyze and distribute the movements in five areas – standing, low-intensity, high-intensity, sprint, re-sprint.

The variety of approaches and methods for identifying areas of motor activity lead to numerous contradictions. For the purpose of our study, we refer to the experience of Abt et al. (2009), which presents the need to use different mobility areas for each age range. Taking into account the trends in the development of football game preparation, it should be noted that although some authors find differences in motor mobility in individual posts (Molinos, 2013, Bradley and colleagues, 2009, Bloomfield and colleagues, 2007, Buchheit and colleagues, 2010), we find it inappropriate for a collective game to individualize the workload in posts. Moreover, the practice of individualizing the workload in male and female football is not included in the training programs (source – FIFA), which gives us grounds to reject such assumptions as irrelevant for the purpose of the study.

Going to the real part of the study, we used the method of sport-pedagogical testing. Taking into consideration the experience of previous research mentioned in the literature, we have approached the development of its methodology and model for the determination of mobility speed ranges for 16–17 year old players. It is based on specially selected tests for compliance with the major mobility speed zones during an official match.

We have identified five speed zones:

3. *I speed* – walking;
4. *II speed* – low-intensity running (light running);
5. *III Speed* – Medium-Speed Journey (Temporal Journey);
6. *IV speed* – high-intensity running (speed endurance encountered in literary sources such as *RSA* – Repeated Sprint Ability)
7. *V speed* – sprint (maximum speed); Taking into account these speeds, we have also selected the appropriate tests. Their choice is dictated by the five areas of energy supply – aerobic, aerobic-anaerobic, anaerobic-aerobic, anaerobic glycolytic and anaerobic alactate.

To determine the maximum *walking speed, low-intensity running and sprinting*, we measured the time that the 16–17 year-old footballers overcome the 20-meter distance. To confirm the choice of the particular stretch are Bangsbo and colleagues (2006) and Thomas Haugen (2015), according to which the average length of sprinters in football is in the order of 10–15 m. According to Chamari Team (2004), studies based on 10m segments are not sufficiently informative.

In terms of walking we will make it clear that it is the first velocity of the main motoring activity in football, although a number of authors also use standing as such (Bradley et al., 2009, Reilly et al., 1976), quoted by Stoyer and colleague, 2004).

In determining *V-th* speed – sprint (maximum speed), we used the test 20 m from a flying start, providing an area of 10 m for pre-amplification and 20 m for the result.

The tests were carried out on artificial grass. The time to overcome the segments was measured using a *Newtest Powertimer, Newtest Oy* – Finland electronic photo system, with an accuracy of 0.01 s.

The determination of the *III-rd* speed – medium-intensity jogging was achieved through a 600-meter test of smooth running. It was carried out on a field with artificial grass along a trail marked with cones every 10 m.

The determination of the *IV-th* speed – high-speed jump (RSA) was performed by a 3x50m shuttle test. The test was carried out on a football field with artificial grass. It consists of 3 runs of 50 meters, without interruption.

The determination of *II-nd* speed – low intensity jog, we determined after the result of a given player in the test 600 smooth running, we took the result of the same player for the 20m walking test. The resulting difference allowed us to digitally visualize the boundary speeds of this zone.

We processed the data from the field trials using a variation analysis using a statistical program (SPSS Inc. v. 19, Chicago, USA).

In the overall survey participated a contingent of 40 football players aged 16–17 years (2000 and 2001) by the Youth Academy of PFC “Levski” – Sofia.

Results and discussion

The last method we applied to carry out the study is statistical variation analysis. Through it, we ana-

lyzed the results obtained, which allowed us to distinguish the speeds determining the five areas of mobility.

TEST	n	X min	Xmax	R	C	S	V	As	Ex
20m walk	40	9.19	12.55	3.36	11.01525	0.78	7.12	-0.088	-0.431
600m running	40	94.54	115.82	21.28	104.0265	5.80	5.57	0.247	-1.152
3x50m shuttle run	40	21.15	24.86	3.71	23.5625	0.93	3.96	-0.74	0.389
20m flying start	40	2.38	2.75	0.37	2.563	0.11	4.17	0.091	-1.235

Table 1

In Table 1, we see the summarized data from the test results. We see that coefficients of variance (V) determine the contingent of the tested individuals as very homogeneous – V% of 3.96–7.12. From the following follows the conclusion that the sample is statistically reliable.

In order to convert time values into motion velocities, we used the well-known formula which characterizes the relationship between path, velocity and time – $S = Vt$. The normal distribution allows us to use the magnitude (R) as an area that we can claim to represent the corresponding area of mobility. The resulting speed zones are summarized in Table 2.

Type of movement	Speed zones			
	m/s		km/h	
Sprint	above 7.2		above 25.9	
High intensity running	6.06	7.1	21.8	25.8
Medium intensity running	5.18	6.05	18.6	21.7
Low intensity running	2.19	5.17	7.9	18.5
Walking	up to 2.18		up to 7.8	

Table 2

Conclusions

1. The methods used so far to distinguish areas of mobility in the childhood period do not carry the necessary amount of information. That is why we cannot fully rely on the existing models when introducing the respective areas into the training process.
2. The methodology we offer is more practical than theoretical, allowing for ease of application in field conditions as well as simpler extraction of the necessary amount of information. It (the methodology) fully reflects the level of physical performance of the team.
3. Due to the proposed model, the problem of using GPS-based load-determination

systems at the stage of children’s and teen football is solved.

References

Abt, G. & R. Lovell (2009), The use of individualized speed and intensity thresholds for determining the distance run at high-intensity in professional soccer, *Journal of Sports Sciences*, July 2009; 27(9): 893–898

Aguiar, M., C. Abrantes, V. Maças, N. Leite1, J. Sampaio & S. Ibáñez (2008), Effects of intermittent or continuous training on speed, jump and repeated-sprint ability in semi-professional soccer players, *The Open Sports Sciences Journal*, 1, 15–19 15

Anolli, L., S. Duncan Jr., M.S. Magnusson & G. Riva (2005), *The hidden structure of interaction: From neurons to culture patterns*, Amsterdam: IOS Press, 283 pp

Aughey, Robert J. (2011), Applications of GPS Technologies to Field Sports, *International Journal of Sports Physiology and Performance*, 6, p. 295–310

Bangsbo, J. (2014), Physiological demands of football,

- Sports Science Exchange, 27(125), 1–6
- Bangsbo, J., M. Mohr, & P. Krstrup (2006). Physical and metabolic demands of training and match-play in the elite football player, *Journal of Sports Sciences*, 24: 665–674
- Bradley, P.S., W. Sheldon, B. Wooster, P. Olsen, P. Boanas & P. Krstrup (2009), High-intensity running in English FA Premier League Soccer Matches, *Journal of sports sciences*, January 15;27(2):159–68
- Buchheit, M., A. Mendez-Villanueva, B. M. Simpson & P. C. Bourdon (2010), Match Running Performance and Fitness in Youth Soccer, *International Journal of Sports Medicine*, Nov;31(11):818–25.
- Bundle, M.W., R. W. Hoyt & P.G. Weyand (2003), High-speed running performance: a new approach to assessment and prediction, *Journal of Applied Physiology* 95: 1955–1962
- Casas, A. (2008), Physiology and methodology of intermittent resistance training for acyclic sports, *Journal of Human Sport & Exercise* 2008; 3(1), 23–52
- Chamari, K., Y. Hachana, Y.B. Ahmed, O. Galy, F. Sghaier, J-C. Chatard, O. Hue & U. Wisløff (2004), Field and laboratory testing in young elite soccer players, *British Journal of Sports Medicine*, 38:191–196
- Di Salvo, V.R. Baron, H. Tschan, F.J. Calderon Montero, N. Bachl, F. Pigozzi (2007), Performance characteristics according to playing position in elite soccer, *International Journal of Sports Medicine*, 28: 222–227
- Garrett Jr, W.E., D.T. Kirkendall & S.R. Contiguglia (1996), *The US soccer medicine book*, Williams and Willkins, 489 pp
- Goto, H., J. Morris & M.E. Nevill (2015a), Match Analysis of U9 and U10 English Premier League academy soccer Players using a Global Positioning System, *Journal of strength and conditioning research*, April; 29(4):954–63

ASYMMETRY IN THE DEVELOPMENT OF THE MOTOR QUALITIES

Vesela Ivanova

Summary:

The rhythmic gymnastics is a sport associated with beauty and grace (Gantcheva, G., 2013), including a large variety of exercises, which continually complicated by the increased requirements to the performance and justified the possession of motor qualities largely within maximum human capabilities (Gantcheva, Loquet, 2012). The purpose of this study was to determine to what extent there is synchronization in the development of the physical qualities of the left and right side, does it work in practice evenly on both sides. We consider that the results of the study are very important for achieving high sports achievements and as a factor determining health of locomotors system and the future sports development of young rhythmic gymnasts.

Key words: rhythmic gymnastics, left, right side.

Introduction:

An important place in the structure of sports training takes physical preparation. It is the main factor for the realization of movements and actions. Through it not only develop, but also improve the mobility of human (Aladzhov, 1992).

The evolution of gymnastic sports, which is a natural process (Dimova, Dobрева, 1985) and the changes in the rules, specifically for the rhythmic gymnastics, require precise and flawless performance during a competition, a higher difficulty of the exercises a high level of development of motor skills, such as the need for better ranking and winning a medal (Gantcheva, 2002). The development of motor skills and the formation of motor skills are closely interrelated. The development of new qualities is accompanied by the improvement of motor skills (Kotz, 1998). Different abilities selectively affect human movement, but it is essential that their balanced development of both the right and the left side. In practice, however, this is a rare occurrence. Most gymnasts, regardless of their age group, have asymmetry in the development of individual motor skills, with increasing age being more pronounced. Probably the reason for this is the work of mostly the comfortable side, and this process is impossible to avoid in the training program (the gymnasts play their combinations on one side only). It is important to trace how much the physical training methods compensate for these differences in the asynchronous development of motor skills on the both sides.

Let us not forget that these differences not only influence the improvement of the technical training,

the beautiful and difficult game, where the exercises are performed with ease, but also with the most valuable in the life of the human being – health. Asymmetry in the development of motor skills is a major factor in spinal distortion, with almost every gymnast having it to a greater or lesser extent. This defines the aim and the objectives of this study:

Aim: The aim of this study was to determine to what extent there is synchronization in the development of the physical qualities of the left and right side, does it work in practice evenly on both sides.

Objectives:

1. To determine the degree of asymmetry in the development of speed between the left and right arm.
2. To determine the degree of asymmetry in the development of speed between the left and right lower limb.
3. Determine the degree of asymmetry in the development of flexibility in hip joints between left and right lower limb.
4. Determine the degree of asymmetry in the development of balance and coordination between the left and right side.

Methods:

Methods, which are used for the aim of the study, are monitoring, testing, statistical procession of the results with SPSS Statistics, a comparative analysis of results between left and right leg, left and right hand.

Results:

Speed of upper limbs:

T1- "Temping" test.

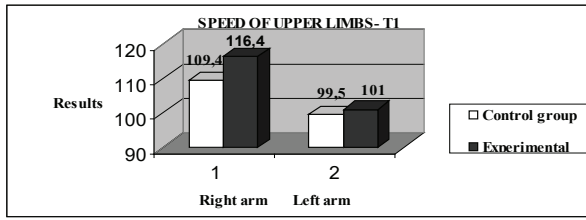


Fig. 1 Speed of upper limbs - T1

Fig. 1 shows that the experimental group coped much better than the control group, by showing higher average values for both arms (116.4 against 109.4 for the right arm, and 101 against 99.5 for the left arm). The difference in the average results for left and right arm (15.4 – experimental group) is bigger than the average results for both arms with the control group (9.9) which leads to the conclusion that the achievements of the control group are closer to the mean value. This is not proven by the statistical processing, where the deviation from the average results with the experimental group are S right arm =11.96, S left arm =11.98, and with the control group – S right arm = 14.02, S left arm =16.36. From the differences in the results for the two arms (15.4 and 9.9) for both groups it can be seen that the left arm lags behind as regards speed in comparison with the right arm. These differences could be explained by the fact that bigger part from the kids in both groups work mainly with the ‘convenient’ (right) arm, in the majority of cases the movements of the left arm are difficult and less coordinated, and the tiredness in it occurs faster.

Speed of the lower limbs:

T6- Raising one’s leg to 180°.

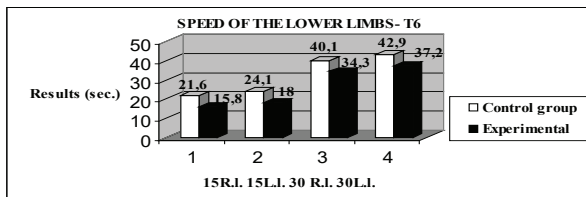


Fig. 2 Speed of the lower limbs - T6

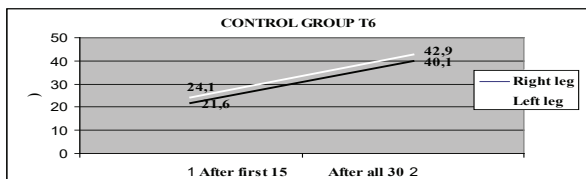


Fig. 3 Control group T6

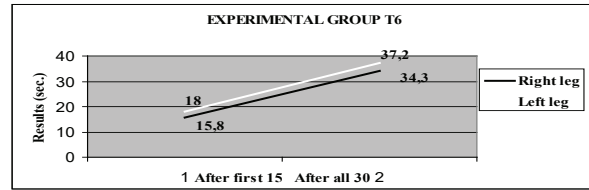


Fig. 4 Experimental group T6

With T6, the smallest numeric value is the best result. Two measurements of the time were made with this test:

1. After the first 15 raisings
2. After all the 30 raisings

It can be seen on fig. 5 the experimental group has better results after the first 15 raisings, compared with the control group. This makes us believe that the researched individuals from the experimental group start with higher speed and quickness of reaction and less latent time. After all the 30 raisings the experimental group has again better results for both legs (34.3 sec. and 37.2 sec). Fig. 6 and 7 show the graphs of the time and the way it changes during the execution of the exercise. The numeric results are counter proportional of the duration – the higher the duration, the lower the achievement. The difference in the times after the first 15 raisings and all the 30 raisings show how the speed endurance changes (Fig. 7). With the experimental group it is 18.5 sec. for the right leg, and 19.2 sec. for the left leg, which shows that the left leg has lower time values and maintains the speed harder than the right leg. With the control group the difference in times for the right leg is 18.5 sec., for the left leg –18,8 sec. The obtained results lead to the conclusion that despite the better values of the experimental group, the control group shows the same level of speed endurance for right leg and better endurance for left leg. We consider this a normal phenomenon, since the speed start in the beginning leads to the faster appearance of tiredness with the individuals from the experimental group, unlike those from the control group who start in moderation and maintain this level.

Flexibility of coxofemoral joints.

T8- Raising legs from a standing position.

T9- Raising the leg from the first position – back-bend.

T10- Transverse straddling sitting position from two chairs.

With T8, T9 and T10 (the minimum numerical result is the best achievement only for T10) the experimental group has performed better than the control one with greater mean values for both legs (Fig. 5).

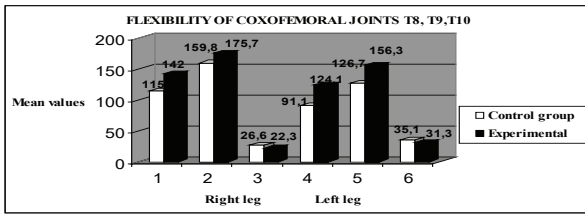


Fig. 5 Flexibility of coxofemoral joints T8, T9, T10

With both groups the difference in the results for both legs for T8, T9, and T10 is impressive (Fig. 6). Although the flexibility of coxofemoral joints has been surveyed with three non-identical tests, the mean values confirm one and the same, namely the great differences in the development of the motor quality in left and right leg for both groups. The right leg does not reach 180° which is a necessary minimum according to the requirements of the modern rhythmic gymnastics, and the left leg lags behind in the results.

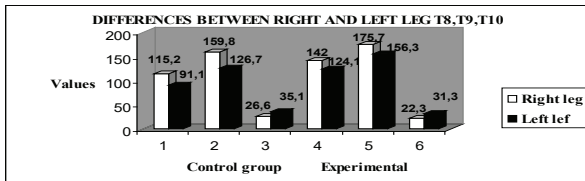


Fig. 6 Differences between right and left leg T8, T9, T10

Balance and coordination:

1. Test for balance on one leg.

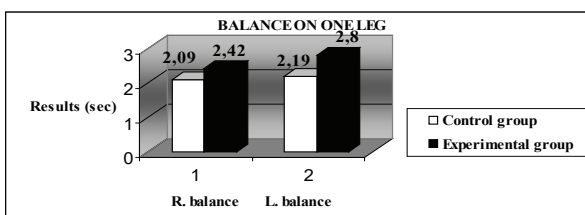


Fig. 7 Balance on one leg

From fig. 7 it becomes clear, that the gymnasts in both groups maintained a stable balanced position longer in the left leg (2.19 sec.; 2,8sek vs. 2.09 sec.; 2.42 sec. for the right balance). This is explained by the fact that for the most of researched person raised right leg is convenient, therefore left balance

in raised clenched leg is more comfortable side, although the differences between the two legs are not big and it gives reason to believe that the results for a comfortable supporting leg are unsatisfactory. The coefficients of variation for both groups in right balance (29%; 28%) and left balance (24%; 26%) indicate that dissipation is middle and the sample is approximately homogeneous for this test. T-criterion of Student for independent samples, showing, that at the right balance between the two groups there were no statistically significant differences ($P = 87.8\%$), but at the left balance results show, that the difference between the control and the experimental group is significant ($P = 99.49\%$). The difference in right balance is accidental and it can be assumed, that the two groups have approximately the same level of development of balanced stability of this leg, however, does not refer to balance of the left (comfortable side), where the differences are significant.

2. Test for total-motor coordination.

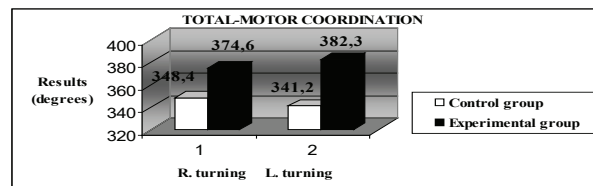


Fig. 8 Total motor coordination

Fig. 8 presents the difference in the averages of the two groups of test for total-motor coordination at the maximum right and left rotation in stretched jump. The results are in favor of the experimental group, as its average for left rotation is better, and the control group was better average for right rotation. The differences between the two sides of the rotation at the time of jump (C.G. – 7,2°; E.G. – 7,7°) of the two groups are small and approximately identical, which could be considered as a lack of sharp boundary between the performances of left / right. Experimental group and both sides perform the test with higher achievements than control one. This can be attributed to the fact that most of the children in the control group trained in a club and work, using the same methods. It is possible to they do the same flaws and this to prevent the group to surpass the results of the experimental children, working with different methodologies. Aggregation of individual methods in an orderly system for developing of the quality coordination could

fill gaps and in this way the experimental group to both sides. shows better average.

Discussion: The results of motor tests for speed of upper limb and numerical differences between left (101.1 pcs.) and right arm (113.1 pcs.) show that, the left arm is lagging behind in terms of speed compared to the right. According to most experts in practice this is normal in view of the fact that children write training and work mostly with his right arm. It is important, nonetheless, to seek to unify in the development of the motor quality speed of the both arms. For this purpose, the Code of Points (2017–2020) imposed the requirement for a uniform playing with the apparatus for right and left arm. Test results for speed of lower limb of right leg (37.1 sec) and left leg (39.6 sec) show, that the difference in speed of the two legs is not large and can be regarded as normal, given that the gymnasts play their compositions only “comfortable” side, the time for the development of speed of “uncomfortable” side is significantly less. The differences in the results of right (24.5 cm) and left leg (33.3 cm) give reason to believe, that in the practice lacks harmony in the work for flexibility in the hips, the development of quality is not complex and markedly one-sided. This gives reason to believe that work in practice is contradictory to the methodologies proposed in the specialized literature for the symmetrical development of flexibility in hip joints for left and right legs or the methodologies are ineffective. Tests for balance (2.2 sec for right leg; 2.5 sec left leg) and total motor coordination (right side 361,5°; left- 361,7°) prove, that the motor skills are developed comparatively harmonious on

Acknowledgements: Special acknowledgements go head to research contingent of 43 gymnasts in rhythmic gymnastics aged 10–12 years, divided into two groups control (16 pieces) and experimental (27 pieces). We also thank the coaches of the children who have dedicated and supported the idea of carrying out the research.

References:

- Aladzhev, K. (1992), Physical preparation of athlete, Nsa-ibp, Sofia.
- Dimova, Ts., Ts. Dobrova (1985), Trends in the development of gymnastics in women, Gymnastic meridians, M.and F, Sofia.
- FIG-TC/RG. (2017–2020) (2017) *Code of Points RG*. Laussan: (International Federation Gymnastics).
- Gantcheva, G. (2002), Comparative analysis of assessments in rhythmic gymnastics – Coll. “Sport and Science”, issue 2.
- Gantcheva, G. (2013). Specific exercises in rhythmic gymnastics – balances, rotations, flexibilities, NSA Press, Sofia.
- Gantcheva, G., M. Loquet (2012), Rules in rhythmic gymnastics, the relationship between technique and artistry, The sporting rule – Bordeaux University Press. Ivon Leziart, Genevieve Tsabagno and others.
- Kotz, Y. M. (1998), Sports physiology. Textbook for institutes of physical culture, Moscow.

Contact information:

Vesela Ivanova Ivanova, PHD
Bulgaria, Sofia, post code-1000, “Studentski grad”, NSA “Vassil Levski”, cab. 427
Mob.:+(359) 897593988
E- mail: veselaivanovaivanova@abv.bg

MAIN TRENDS IN ORGANIZING THE ATTACK OF THE BRAZILIAN NATIONAL VOLLEYBALL TEAM ON MEN'S WORLD CHAMPIONSHIP POLAND 2014

Vladimir Kotev
NSA"Vassil Levski"

Summary

Typical trend for modern volleyball is the big variety of combination of both individual and collective techno-tactical actions. The potential and level of a team are directly related to the potential and level of the setter. The aim of the study is to analyze the main sides of Bruno Rezende's play in organizing the Brazilian attack on the Men's World Volleyball Championship in Poland 2014. The subject of the study is the competitive process for elite volleyball teams. The subject of the study are the specific for the setter parameters and game parameters that determine his efficiency. The game efficiency analysis has been realized with the modern software „Data Volley“, using an alternative and graphical analysis of the results. Having all options in attack available, the Brazilian attack is very variable and unpredictable. As a trend in Bruno Rezende's game, is the frequent use of the middle attackers. When organizing the counterattack of his team, he stays unpredictable in cases when 1st tempo attack is available. In the other cases, the Brazilian setter prefers to set the balls for attack in zone 4.

Key words: volleyball, the team of Brazil, World championship, setter, organizing the attack

Introduction

Certainly with the development of the volleyball game, the requirements for all players, and especially for the one charged with the organizational functions on the court, the setter, are also increasing. Just setting the ball to the attackers is not enough to reach high sporting-technical level (Ivanov N., Kotev V., 2016)

Game analysis plays an important role in the development of several collective sports modalities, presenting itself as a determinant factor in the choice of pertinent indicators regarding players' performance in specific contexts (Mesquita I., 1996). It also aims to prepare the team for confrontation with the opponent, improve the quality of training and analyze the game structure (Lames M., Hansen G., 2011).

Game analysis in Volleyball, regarding the effects of procedures that constitute it (serve, reception, set, attack, block and defense), is not recent. The game is characterized by two complexes: complex I (KI) or side-out, consisting of the sequence of actions formed by the reception, setting and attacking, and Complex II (KII) or transition, the sequence of actions formed by the serve, block, defense and counterattack (Stutzig N. et al., 2015)

Analysis of the playing activity of the setters allows to see the tactical concept of the team in attack. Thinking in volleyball is a psychological process of searching and revealing the connections and interactions between the components creating the volleyball activity and the actual conditions of its implementation (Bozhilov, G., 2003). Each setter has to carefully assess each situation and make the most appropriate decision for scoring a point. He must be able to analyze in a short time which attacker is in best position to score a point and which of the attackers can put 100% of his ability to outplay the ball.

The high quality receptions led to attack strategies using the attackers in the attack zone, that is, in positions 2, 3 and 4, probably due to the greater probability of scoring, since these athletes were closer to the net (Costa, G. et al., 2016; Marcelino et al., 2014, Millán-Sánchez et al., 2015). The most used tempo was the 2nd, followed by the 3rd and the 1st tempo (Panfil R., Superlak E., 2012). Men's teams are increasingly seeking to perform a faster game in order to overlap the opposing defense system. In addition, it can also be said that the type of game practiced in Brazil has different characteristics from the game played in other countries (Costa, G. et al., 2016; Silva M., Lacerda D., João P., 2014).

The present study will allow us to trace the main features of organizing the attack of one of the most successful national teams in the world – the Brazilian men’s team, and will answer the question: „Why does this team win medals and titles from any championship that participates?“

Aim and Objectives of the study

The aim of the study is to analyze the main features of Bruno Rezende’s play in organizing the Brazilian attack on the World Volleyball Championship for Men in Poland in 2014. The subject of the study is the competitive process for elite volleyball teams. The subject of the study are the specific for the setter parameters and game parameters that determine his efficiency. Contingent of study are a total of 698 game actions of the setter – 487 in organizing 1st tempo attack and 211 in organizing the counterattack of the Brazilian national team.

Methods

The game efficiency analysis has been made with the modern software „Data Volley“, using an alternative and graphical analysis of the results. The game activities of the setters were recorded in the organization of the attack after receiving (in the case of a side out) and after a successful defense game (counter-attack) in a technical-tactical aspect. In the tactical direction of analyzing the efficiency of the setter’s play, the following indicators were examined:

- General distribution of the setter
- Distribution of the setter after excellent reception (#)
- Distribution of the setter after positive reception (+)
- Distribution of the setter after negative reception (!)
- Distribution of the setter on counter-attack after defense
- Distribution of the setter on counterattack after free ball

At present, 95% of national and club teams use the “Data Volley” video-statistical analysis system. The use of this analysis system provides valuable information about the actions of the setter during the game:

- ✓ Whom he prefers setting the ball to;
- ✓ how he organizes the attack after reception away from the net;
- ✓ how much skills he has to pass behind his head
- ✓ Does he move quickly when coming from back court;

- ✓ Watches the opponent block

The system of attack organization depends very much on reception the service. In today’s volleyball, several grades have been highlighted for the quality of the reception. All leading teams use this rating system.

1. Excellent reception (#) the ball is passed next to the net in the middle of the court (Figure 1). Between the setter and the net no other player can stand. The setter is not moved to zone 2 or zone 4. Perfect position for organizing variation attack. So passed ball gives the setter possibility to include all the players in different combinations. Allows first tempo attack to be used, where the attacker always has the advantage over the blocker in speed and knows where the ball will be passed from the setter.

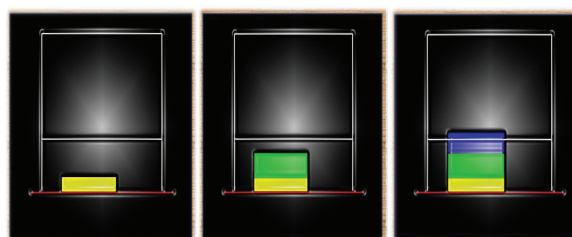


Figure 1 Excellent reception (yellow zone) Figure 2 Positive reception (green zone) Figure 3 Negative reception (blue zone)

2. Positive reception (+) – the ball is passed close to the net, but 1,5–2m from it. Between the setter and the net, other player can stand (Figure 2). The first tempo attacker’s jump is changed.
3. Negative reception (!) – the ball is passed around the attack line. First tempo attack is impossible to be played (Figure 3). This type of reception significantly reduces the possibilities for combinative play. The options of the setter for outplaying organized opponent’s triple block are fast ball for outside hitters or attack from zone six (Pipe).

***Used volleyball terminology:**

- ✓ **Distribution** – the balls passed to the attackers
- ✓ **First tempo** – fast speed attack close to the setter with the middle attacker
- ✓ **Calling** – specifying variation of interaction between the setter and the first tempo attacker

- ✓ **Pipe** – combination in attack, where the ball is passed for attack to a player from back court, located in zone 6

Results

The results obtained after the statistical processing of the data shows that the Brazilians prefer speed in organizing the attack. Bruno Rezende has a great variety. Unlike other setters who use callings to the central attackers only to mislead the opponent block, and in order to stretch the front of the attack, he cleverly and rationally uses his middle attackers. Many of the points are made after organizing

an attack at the center of the net. From the data shown in Table 1, it can be seen that the total number of balls passed to the middle attackers is 147, of which 100 points were scored and only 7 errors were made. The effectiveness of the center attack is 68%, which is extremely high, against the backdrop of equal opportunities for competitors and strong competition in modern volleyball. An impression makes Saatkamp's heavy workload, to who 92 balls for attack were distributed from a total of 487 first tempo attacks. This seems completely logical, as he shows extremely high effectiveness of side out attack – 72%.

Table 1 The effectiveness of the Brazilian team in playing first tempo

Skill	Type	Player	Tot	=	%	/	%	-	%	!	%	+	%	#	%
	First														
Attack after reception	tempo	Team	147	7	5%	6	4%	22	15%	8	5%	4	3%	100	68%
		Saatkamp	92	3	3%	4	4%	10	11%	5	5%	4	4%	66	72%

Legend

- = Error
- / Opponent block
- Continuity (with counterattack option)
- ! Covering the attack
- + Free ball
- # Point

In the different positions of the setter on the court (Figure 4) there are several features, which depends on the first tempo calling:

- Well-balanced balls distribution of the balls to the attackers and predominant play with middle attackers – between 35% and 40% gameplay in the center of the net;
- When setter is in zone 6, the first option for distribution is zone 4–42% of the balls are passed there. However, most of them is when the middle attacker is called to play ball behind the setter's head. At 62% on such approach in the center, the Brazilian setter prefers to turn the attack front and to pass the ball to the outside hitter in zone 4.
- In the same position, Bruno's preference for high speed ball in the center is also noticeable, with 56% of the time playing with the central attacker.
- When in zone 3 he also often targets the attack to the middle attackers, again playing 47% with a fast ball in. It is noticeable that in this position Bruno Rezende did not use the gameplay with the central behind the head.
- In zone 1 is noticeable preferable play on first tempo – 41% of all balls in attack. Also, the attack often is targeted to the center behind setter's head. In this position the Brazilian setter did not use high-speed ball in the center.

Fig.4 Bruno Rezende distribution in zones

Back calling			Low ball calling			High-speed ball calling			Total			
2	34		1	34		7	1		TOT	85		P1
.			.			.			.			
.			.			.			.			
	15%			18%			.			14%		
	5			6			.			12		
18%	35%	32%	15%	41%	26%	.	.	100%	15%	40%	31%	
6	12	11	5	14	9	.	.	1	13	34	26	
2	29		1	23		7	9		TOT	71		P6
.			.			.			.			
.			.			.			.			
	7%			.			.			4%		
	2			.			.			3		
10%	21%	62%	39%	43%	17%	22%	56%	22%	20%	34%	42%	
3	6	18	9	10	4	2	5	2	14	24	30	
2	1		1	28		7	17		TOT	55		P3
.			14%			0%			9%			
.			4			0			5			
	.			21%			12%			15%		
	.			6			2			8		
.	.	100%	36%	25%	4%	24%	47%	18%	31%	31%	15%	
.	.	1	10	7	1	4	8	3	17	17	8	

These data show that Bruno Rezende feels comfortable when playing a fast and cobinative game. It is also noteworthy the good synchronicity between the attackers and the setter.

Setter distribution on excellent and positive reception

These are the situations when the ball is passed close to the net and allows the setter to trigger all of its attackers in attack or when a ball is within 1.5 meters of the net. Such balls are a problem for some setters to play first tempo with, but not for Bruno Rezende. The general plan shows that he has no problem playing with the central attackers when the ball is 1.5 meters from the net. Analysis of the results of Figure 5 shows that in the cases where the Brazilian setter is in zone 6, after calling the middle attackers for first tempo low ball, he passes to them at a total of 48%. In the same rotation there is another interesting trend – when called for a fast ball he passes in 50% of the cases

Fig.5 Bruno Rezende distribution after excellent and positive reception, setter in zone 6

Low ball calling			High speed ball calling			
1	21		7	8		P6
.			.			
.			.			
	.			.		
	.			.		
38%	48%	14%	25%	50%	25%	
8	10	3	2	4	2	

Distribution of the setter after defensive actions and free ball

The results obtained from the statistical processing with the Data-volley program show the affinity of the Brazilian setter for a play on first tempo when there is a precondition for the counter-attack (Figure 6). In a counter-attack in over 30% of the time

he plays with his middle attackers. At the same time he skillfully distributes the game along the ends of the net, which further difficult opponent block. Out of a total of 144 digs after which the distributor had a chance to play with first tempo, with 38% attack is targeted to the central attackers, 26% to zone 2 and 24% to zone 4. When there is no possibility to play with the first tempo in 86% of the time, the ball was passed to zone 4.

Fig. 6 Bruno Rezende distribution when organizing counterattack

with 1 st T			without 1 st T			free ball		
144			7			60		
2%			.			2%		
3			.			1		
10%			.			10%		
14			.			6		
26%	38%	24%	14%	.	86%	27%	30%	32%
38	54	35	1	.	6	16	18	19

After a free ball, Bruno Rezende very skillfully distributes the attack among all attackers, including a second line from zone 6 (Pipe). Out of a total of 60 balls for the entire championship, 30% of them he preferred to play in the center, 27% of the attacks are in zone 2, 32% in zone 4 and 10% in zone 6.

Discussion

Bruno has underhand pass technique to perfection, giving him safety and calmness at the court. He has the ability to direct the ball from any position on the court, regardless of the type of movement to it. He has a look at everything happening on the playing field, both in his team and in the opponent’s one. With all the attack options available, the Brazilian attack, skillfully led by Bruno Rezende, is very varied and unpredictable. In many crucial moments, the Brazilian setter takes non-standard solutions, as the analysis shows. In organizing the Brazilian attack, Bruno Rezende’s distribution to the attackers

is equitable which makes organizing opponent’s block much more difficult. Main trend in Bruno Rezende’s play is the frequent use of the middle blockers in both organizing side out attack and counterattack.

References

Bozhilov, G. (2003). Takticheski aspekti na motivite u volejbolistki pri opredelqne resheniqta v ataka // Божилов, Г. (2003). Тактически аспекти на мотивите у волейболистки при определяне решенията в атака. Спорт и наука, Изв.бр.3, София, 177–182.

Costa, G. et al. (2016), Men’s high level volleyball: association between game actions on the side-out, available at: http://www.scielo.br/scielo.php?pid=S2448-2455201600100148&script=sci_arttext, (accessed 10 June, 2016).

Ivanov N., Kotev V. (2016). Osnovni tendencii v igra-ta na razpredelitelq na bulgarskiq nacionalen otbor po volejbol pri organizirane na napadenieto. // Иванов, Н., Котев, В. (2016). Основни тенденции в играта на разпределителя на българския национален отбор по волейбол при организиране на нападението. Спорт и наука, бр.5–6, 61–70.

Lames M., Hansen G (2011), Designing observational systems to support top-level teams in game sports. International Journal Perform Anal Sport 2011; 1(1), pp. 83–90.

Marcelino et al. (2014), Determinants of attack players in high-level men’s volleyball. Kinesiology; 46(2) pp. 234–241.

Mesquita I., (1996), Estudo descritivo e comparativo das respostas motoras de jovens voleibolistas de diferentes níveis de desempenho nas situações de treino e competição., Estudos CEJD, Portugal: FCDEF-UP; pp. 32–56.

Millán-Sanchez et al. (2015). Participation in terminal actions according to the role of the player and his location on the court in top-level men’s volleyball. International Journal Anal Sport; 15 pp. 608–619.

Panfil R., Superlak E. (2012), The relationships between the effectiveness of team play and the sporting level of a team. Human Movement; 13(2); pp 152–160.

Silva M., Lacerda D., João P. (2014), Game-related volleyball skills that influence victory. J Human Kinetic; 41; pp 173–179.

Stutzig N. et al. (2015), Analysis of game variables to predict scoring and performance levels in elite men’s volleyball. International Journal Perform Anal Sport; 15(3), pp. 816–829.

RESEARCH OF THE PRESSING APPLIED BY THE NSA „VASSIL LEVSKI“ FOOTBALL TEAM, DURING THE NATIONAL STUDENT CHAMPIONSHIP OF BULGARIA

Georgi Ignatov, Emil Atanasov

Abstract

The present development of the football game inquires searching for mechanisms to improve the athletes' preparation in all of its aspects – technique, tactics, psyche. In this sense, good knowledge of each player's peculiarities in the implementation of the press actions would significantly contribute to the improvement of the tactical training of football players. Implementation of sports-pedagogical monitoring and video shooting of the NSA matches against the teams of the Sofia University "St. Kliment Ohridski" and University of Mining and Geology "St. Ivan Rilski". Games were a part of the 2016/2017 Bulgarian National Football Championship. Frequency analysis is used to process and analyze the results. The basic direction of this report is to examine and analyze the characteristics of the pressing application during two matches of the National Sports Academy's student football team. Basic part of the report is the characterization of the performing pressing by the types of football areas, as well as tracking the efficiency and dynamics of the football matches. Studying the specifics of performing pressing in the football game would help to improve the use of tactical training for football players.

Key words: football, pressing, students, specifics, effectiveness, analysis

Introduction

The typical features of modern football – intellect, creativity, athleticism and a high level of technical and tactical skills – present a number of challenges for the players and coaches. During the current stage of the game development it is no longer enough for players and coaches to have just practical experience. Serious and in-depth knowledge of all components of the game (including technique, tactics, physical ability, mental ability, physical recovery, etc.) is required. Since football is a team sport, tactical knowledge becomes extremely important. Taking this into account, knowing the specifics of applying pressing actions against the opponent would significantly help in improving the tactical preparation of the footballers.

Pressing in football is a tactical behaviour of the team which has lost the ball and is trying to get it back as fast as possible by limiting the time and space where the opponents play in (Ангелов и кол., 1987; Шишков и кол., 1992).

Pressing i.e. actively pressing the player with ball is a powerful method for recovering possession of the ball and organising attacks. It has a very powerful emotional effect on the players and the audience (Гигов, 2002, 2004).

The author (Гигов, 1999, 2004), informs us about the

strategy and the tactics of the game of football, the defence tactics, as well as about pressing, one of the main defensive actions in football. He offers ways for applying pressing and a method for improving it in competitive conditions, as well as a method for its registration. According to him the defence strategy is one of the most important factors which determine the sport result in football. The results of his study clearly show the importance of pressing for achieving effective and attractive modern football (Гигов, 2002). Another study (Гигов & Гигова, 2000) determines the quantity and the effectiveness of the pressing actions of the elite European club teams which participate in the UEFA club competitions. In another paper (Гигов и кол., 2004), the authors explain the impact of activity and effectiveness of the use of pressure on the final position of the teams which qualified for the 2002 World Cup Finals. Other authors (Бъчваров, Димитров & Гигов, 2008), competently inform us about the typical features of modern football and offer training drills for pressing and for pressing actions during set pieces.

The authors (Червеняков & Цолов, 1999, 2000, 2001) inform us in a very detailed and methodical manner about the tactics necessary for playing good football, including pressing as a method for taking the ball from the opponent and coverage as a preparation for recovering the ball from the opponent.

The study of the pressing used by the Bulgarian Women's National Football Team is explored in two research papers: one about the 2005 Albena International Tournament (Атанасов, 2005), and one about the Women's World Cup qualifiers during 2009/2010 (Атанасов, 2010).

The factors listed above were the reason we did this multi-component study intended to describe in detail the tactical preparation, including applying pressure, by the students of the football team of the Vassil Levski National Sports Academy (NSA).

The goal of the research paper is to study and analyse the specific characteristics of the use of pressing in two matches of the team of the National Sports Academy which takes part in the Bulgarian Student Football Championship.

To reach our goal we set the following **tasks** for ourselves:

1. To perform sport-pedagogic observation and to record the matches of the Vassil Levski National Sports Academy (NSA) team against the teams of the Sv. Kliment Ohridski Sofia University (SU) and the Sv. Ivan Rilski University of Mining and Geology (MGU) played in the National University Football Championship of Bulgaria during the 2016/2017 season;
2. to characterise the distribution of the pressing actions by type, by zones of execution, by effectiveness and by the dynamic during the matches;
3. Based on the results reached, to make an attempt to optimise the training and competition processes.

Methods

This study was conducted as follows: sport-pedagogic observation and video recording of the match between the NSA and the SU teams played on 27 March 2017 from 14:00 at the NSA stadium in Sofia, as well as the match between the MGU and the NSA teams played on 17 May 2017 from 18:00 at the Dragalevtsi stadium in Sofia. The two matches were played as part of the National University Football Championship of Bulgaria during the 2016/2017 season, organised by Academic Association for University Sport (AUS) with the support of the Bulgarian Football Union (BFU), in which 16 teams took part during the same 2016/2017 season.

The subject of the study were the athletes from the representative student football teams of the NSA, the SU and the MGU.

The topic of the study was the use of pressing during the two matches by the players from the football teams of NSA, SU and MGU.

33 players took part in the study – 11 each from the teams of NSA, SU and MGU, they were the ones who played in the matches in question between these teams.

In order to find and classify the pressing actions by type, zone of execution, effectiveness and dynamic within the course of the matches, the results of the study were processed using variation analysis and the index method.

Results and discussion

In tables 1, 2 and 3 we have presented the results of the study of the pressing in the matches which were observed by us. Pressing was used most often by the MGU team against the NSA team (62 times). The NSA team used this tactic the least against the SU team (40 times). We think that these facts can be explained by the tasks set by the coaches, on one hand, and the level of the opponent, on the other.

The main goal and the most effective end of the pressing is taking the ball from the opponent (Table 1). The NSA team recorded the highest number of these by taking the ball from the opponent 16 times (30.8%) during its match against the MGU. The SU team did this 15 times (27.3%) in their game against the NSA, while the MGU recorded the worst number in this area in its match against the NSA team by taking the ball from its opponent 8 times (12.8%).

Slowing the attack of the opponent is also considered a successful result of the press. This allows the team to disrupt the organisation of play of the opposing team and also eliminates the element of surprise and helps the defending team to organise its defence better. In this area the most active teams were SU – it did it 7 times (12.7%) and MGU – 6 times (9.6%) in their matches against NSA. The NSA team did this 1 time (1.92%) and 4 times (10%) in its matches against SU and MGU respectively which shows it did not successfully use pressing to achieve this goal (Table 1).

Table 1. Distribution of press types

Team	Meeting	Take a ball		Knocking in the corner		Tapping into touch		A slow ball		Foul		Overcome with dildo		Overcome with a blow		Override with a pass		Override with centering		Overcoming goals		In general
		Num.	%	Num.	%	Num.	%	Num.	%	Num.	%	Num.	%	Num.	%	Num.	%	Num.	%			
NSA	NSA-SU	12	30	2	5	6	15	4	10	6	15	2	5	1	2.5	3	7.5	4	10	0	0	40
	NSA-MGU	16	30.8	3	5.77	10	19.4	1	1.92	7	13.6	3	5.8	2	3.6	4	7.7	6	11.5	0	0	52
SU	NSA-SU	15	27.3	4	7.28	18	32.7	7	12.7	5	9.09	1	1.82	3	5.46	2	3.65	0	0	0	0	55
MGU	NSA-MGU	8	12.8	8	12.8	20	32.3	6	9.6	12	19.7	2	3.2	0	0	6	9.6	0	0	0	0	62

In regards to forcing the opponent to clear the ball outside the field for a throw-in, the most active teams were MGU – 20 times (32.3%) in their match against NSA, and SU – 18 times (32.7%), also in their match against NSA (Table 1).

One of the main features of the play of MGU is making plenty of tactical fouls – it was done 12 times. (19.7%). The NSA team committed 7 such fouls (13.6%) in their match against MGU and 6 such fouls (15%) in the match against SU. The SU team committed only 5 fouls (9.09%) in their match against NSA (Table 1).

The tactical maturity of the teams was shown by the fact that the number of unsuccessful pressing attempts were relatively few and harmless – they were mostly bypassed by means of a dribble or a pass.

Table 2 shows the distribution of the pressing of the studied teams by effectiveness and by zones of the field. The NSA team showed the highest effective-

ness – 90.4% in the match against MGU and 85% in the match against SU. The NSA team showed low activity in terms of pressing attempts – it made 52 such attempts against MSU and 40 against SU. The play of MGU featured a large number of failed pressing attempts (22.6%) in their match against NSA.

Several things in regards to the distribution of pressing by zones deserve highlighting. First, the play of NSA is characterised by focusing the pressure over the opponent mostly in the middle of the field (zone 2) – 62.5% against SU and 63.5% against MGU respectively. The SU team prefers to press in its own third of the field – 52.7% (zone 1), while the MGU team shows similar figures for pressing in its own half (53.2%) and in the middle of the field (45.2%) (Table 2). The NSA team was the one which pressed the most in Zone 3 – it executed pressing 7 and 8 times in its matches against SU and MGU respectively, or 17.5% and 15.4%. The MGU team was the one who used pressing the least times in this zone – 1.6% (Table 2).

Table 2. Area distribution and efficiency

Team	Meeting	Zone 1		Zone 2		Zone 3		Successful		Unsuccessful		In general
		Num.	%	Num.	%	Num.	%	Num.	%	Num.	%	
NSA	NSA-SU	8	20	25	62.5	7	17.5	34	85	6	15	40
	NSA-MGU	11	21.1	33	63.5	8	15.4	47	90.4	5	9.6	52
SU	NSA-SU	29	52.7	21	38.2	5	9.1	43	78.2	12	21.8	55
MGU	NSA-MGU	33	53.2	28	45.2	1	1.6	48	77.4	14	22.6	62

Our main criteria for successful execution of pressing is the ability of the teams to maintain a high pressing activity throughout the whole football match.

Table 3 shows the distribution of the pressing exe-

cuted in each of the matches during the 6 time periods into which the duration of the match has been divided for this study, as well as the aggregate results for the first and the second half of the matches.

Table 3. Distribution of the press in the course of the football matches

Team	Meeting	Up to 15 minutes		From 15 to 30 min.		From 30 to 45 min.		From 45 to 60 min.		From 60 to 75 min.		From 75 to 90 min.		First Half		Second half-time		In general
		Num.	%	Num.	%	Num.	%	Num.	%	Num.	%	Num.	%	Num.	%	Num.	%	
NSA	NSA-SU	8	20	7	17.5	7	17.5	6	15	7	17.5	5	12.5	22	55	18	45	40
	NSA-MGU	10	19.2	9	17.3	8	15.4	8	15.4	9	17.3	8	15.4	27	51.9	25	48.1	52
SU	NSA-SU	11	20	9	16.4	8	14.5	10	18.2	10	18.2	7	12.7	28	50.9	27	49.1	55
MGU	NSA-MGU	17	27.4	10	16.1	8	12.9	12	19.3	9	14.5	6	9.8	35	56.5	27	43.5	62

During the first 15 minutes of the studied games there were between 8 (during the NSA – SU game) and 17 pressing attempts (NSA – MGU). Compared to the total number of pressing attempts, these are 20% – 27.4% (Table 3). During the second 15 minutes the pressing activity of NSA decreases a bit and is around 17%. We see the same trend in the teams of SU (16.4%) and MGU (16.1%). The data show that the teams of SU and MGU decrease their level of pressing just a bit to 14.5% and 12.9% respectively, while the NSA team maintains the tendency of pressing the opponent from the second 15 minutes. After the half-time break the team again start with higher pressing activity, especially MGU in the match against NSA – 19.3%. It is notable that between the 45th and 60th minutes and between 60th and 75th minute the NSA and SU teams press with the same frequency, while the MGU team lowers the frequency of pressing halfway through the second half compared to its beginning. The data for the final 15 minutes shows that depending on the result and their physical conditioning the teams reduce the amount of pressing they do to the opponent. An exception to this is the NSA team in the match against MGU where it maintained its pressing frequency throughout the whole of the second half.

The aggregation of the cited values for the two halves of each match show that in the beginning of the matches all teams executed a lot of pressing actions, but as the matches went on their frequency decreased. An exception to this is the NSA team which tries to press steadily from the 1st to the 90th minute (Table 3).

Conclusions

In our opinion pressing is one of the decisive fac-

tors for achieving high sport results in football. The data gathered from registering the pressing used by footballers who play at all kinds of levels, allow us to characterise in detail the defensive actions of the respective teams. The observed differences prove that the effectiveness of the pressing is a factor which impacts the end result of the games and may be use to evaluate the level of performance of a certain team.

The play of the NSA team is characterised by a lot of pressing activity, performed mostly in the middle of the field – 62.5% and 63.5% respectively in the matches against SU and MGU. The SU team prefers to press in its own third of the field – 52.7%, while the MGU team shows similar figures for pressing in its own half (53.2%) and in the middle of the field (45.2%).

The main goal and the most effective end of the pressing is taking the ball from the opponent. The NSA team had the highest number of these by taking the ball from the opponent 16 times (30.8%) during its match against the MGU and 12 times during its match against SU (30%). The teams of SU and MGU were forced to clear the ball for a throw-in, 32.7% and 32.3 respectively, as well as for a corner kick, 7.27% and 12.8% respectively. A main feature of the play of MGU is making plenty of tactical fouls – it was done 12 times (19.7%), while the NSA and SU teams do not use this tactic much.

In regards to pressing during the different time periods of the two halves, it should be noted that only the NSA team pressed steadily from the 1st to the 90th minute, which indicates that its players are very well prepared physically. The NSA team is also the best example of good use of the pressing be-

cause of its high effectiveness of pressing throughout the whole match against MGU – 90.4%.

Based on the study we conducted, we would like to recommend an increase in the number of practical sessions for the players of SU and MGU in order to improve the functional condition of the students from their representative football teams. By optimising and directing the training process towards improving the pressing actions of the footballers from the two teams they may achieve better homogeneity and tactical discipline during their future matches of the National University Football Championship.

References

- Ангелов, В. и кол. (1987). Футбол. [Football.] С.
- Атанасов, Е. (2005). Изследване на пресата, прилагана от Българския национален отбор по футбол – жени на Международния турнир „Албена, 2005 г.“. [Research of the press applied by the Bulgarian national football team – women at the International Albena Tournament, 2005.]. Първа научна конференция за магистри и докторанти – 13-ти май 2005 г. Науката на младите специалисти. НСА „Васил Левски“. Център по ОКС „Магистри“. Отдел „Докторанти“. Сборник доклади, 73–80, С. НСА ПРЕС.
- Атанасов, Е. (2010). Изследване на пресата, прилагана от Българския национален отбор по футбол – жени, в Световните квалификации. [Research of the press applied by the Bulgarian National Women's team in the World Qualifications.]. Пети международен научен конгрес. Спорт, стрес, адаптация. НСА „Васил Левски“. Спорт и наука. Извънреден брой. 87–91, Част II.
- Бъчваров, М., Л. Димитров, А. Гигов (2008). Футбол, преса, кондиция, натиск. Кратка история и много упражнения. [Football, press, condition, pressure. Brief history and many exercises.]. С. Издателство: НСА-Прес, НСА „Васил Левски“.
- Гигов, А. (1999). Пресата във футбола. [The press in football.]. Спорт и наука, 4,5, 109–111, Vol. XLIII.
- Гигов, А., В. Гигова (2000). Изследване на плътното персонално покритие (пресата) като основно защитно действие във футбола. [Investigation of tight personal cover (press) as a major protective action in football.]. Спорт и наука, 3, 13–24, Vol. XLIV.
- Гигов, А. (2002). Изследване и усъвършенстване на пресата, прилагана от елитни футболисти. [Research and improvement of the press, implemented by elite players.]. Дисертационен труд. С. НСА „Васил Левски“.
- Гигов, А. (2004). Пресата във футбола. [The press in football.]. С. Издателство „Авангард Прима“.
- Гигов, А., В. Гигова, Л. Кръстев, В. Гаврилов (2004). Влияние на пресата върху класирането на отборите, финалисти на световното първенство по футбол в Япония и в Южна Корея. [Impact of the press on the ranking of the finalists of the World Cup in Japan and South Korea.]. Спорт и наука, 1, 55–62, Vol. XLVIII.
- Червенияков, М. & Цолов, Б. (1999). Тактика за добрия футбол. Пресирай – отнемай топката! [Tactics for good football. Press – Remove the ball!]. Книга 1. С. Издателство „Спокон“.
- Червенияков, М. & Цолов, Б. (2000). Тактика за добрия футбол. Подсигурявай – съдействай за отнемане на топката! [Tactics for good football. Secure – help to remove the ball!]. Книга 2. С. Издателство „Спокон“.
- Червенияков, М. & Цолов, Б. (2001). Тактика за добрия футбол. Покривай – подготвяй отнемането на топката! [Tactics for good football. Cover – Prepare the removal of the ball!]. Книга 3. С. Издателство „Спокон“.
- Шишков, А. и кол. (1992). Футбол – учебник за студентите от НСА. [Football – A textbook for the students of the National Sports Academy.] С. Ми Ф.
- For correspondence:
 Assoc. Prof. Georgi Ignatov, PhD
 Assoc. Prof. Emil Atanasov, PhD
 Sofia University “St. Kliment Ohridski”
 National Sports Academy „Vassil Levski”
 Department of sport
 Department “Football and tennis”
 E-mail: gochev730626@abv.bg
 E-mail: atanasov78@abv.bg

COMPARATIVE ANALYSE OF BASIC PHYSICAL MARKS WITH MEN AND WOMEN – RUNNERS OF MIDDLE AND LONG DISTANCES

Ivaylo Lazarov
National Sports Academy “Vassil Levski”

Summary

The purpose of this study is to increase the effectiveness of the training process by showing of optimal basic physical parameters in athletes in middle and long distance running. 73 runners of middle and long distances were researched, which was examined this marks: high, weight, body fats, muscle mass, VO₂max, maximum speed. The researched anthropometric measurements were part of functional exam in competitors. To increase the efficiency of the training process in competitors in middle and long distance we have developed optimal value of basic marks. It clearly shows theoretically optimal ranges of each mark. Therefore, when a significant disparity between different marks could be purposefully affect on some anthropometric parameters such as to reduce body fat and increase muscle mass. Periodic monitoring of the levels of anthropometric marks has important information for the ongoing monitoring of the effects of the applied training approaches. We concluded that the influence of anthropometric marks on sporting achievement in middle and long distances running is higher in men than in women. The values of the researched indicators provide opportunities for individual assessment of the relevant levels on each mark as itself and in the context of basic correlations with the others.

Key words – athletics, anthropometric, VO₂max, maximum speed

Introduction

The development of modern sport with its increasingly specialization required to deepen the knowledge about the structure of the human body. The modern world practice and research in the field of athletics convincing evidence that the role of anthropometric marks is extremely important, regardless of the sport level, age and gender [S. Fleck 1983, S. Hollings 1991, T.J. Housh 1984, M. Marfell-Jones 2006, J.L. Pacheco 1996; G. Pastor 2009, T. Stellingwerff 2007). This requires more detailed disclosure of relationships between body composition and functional capabilities of human to improve their methods of research, creation of model morphological characteristics in different sports disciplines.

The purpose of this study is to increase the effectiveness of the training process by showing of optimal basic physical parameters in athletes in middle and long distance running.

Methods

Object of research are 40 men (22 runners of middle distance (MMDR) and 18 runners of long distances (MLDR)) and 33 women (20 runners of middle distance (WMDR) and 13 runners of long distances (WLDR), which been examined this marks: high, weight, body fats (by measuring the skin folds using regression equations J. Parizkova (1977) muscle mass, active body mass, BMI. The researched anthropometric measurements were part of functional exam in competitors. Later of the results of functional researching has been used the individual maximal speed (S_{max}), achieved during the research and VO₂max. The received data were subjected to statistical analysis by programs SPSS and Microsoft Excel.

Results

Tables 1, 2, 3 and 4 shows the variation analyze of the results.

Table 1. Variation analyze men middle distance running (MMDR)

Men MDR	n	Xmin	Xmax	R	X	S	V	As	Ex
High	22	172.5	183.0	10.5	178.3	2.8	1.58	-0.52	-0.73
Weight	22	57.2	78.4	21.2	67.5	6.0	8.92	0.07	-1.00
Fat%	22	6.5	13.7	7.2	9.1	1.6	17.71	0.92	0.98
MM%	22	44.6	52.4	7.8	48.0	2.2	4.53	0.04	-0.92
S max	22	18.4	20.4	2	19.6	0.6	3.16	0.35	-1.32
VO2max/kg	22	51.4	76.6	25.2	63.8	5.9	9.22	0.16	-0.39

Table 2. Variation analyze men long distance running (MLDR)

Men LDR	n	Xmin	Xmax	R	X	S	V	As	Ex
High	18	164	182.5	18.5	172.2	3.2	6.54	-0.43	-0.67
Weight	18	53.6	66.2	12.6	60.3	6.4	9.42	0.32	-0.13
Fat%	18	7.2	13.2	6	9.8	2.5	5.67	0.76	-0.76
MM%	18	44.0	49.2	5.2	46.8	2.8	5.12	0.11	-0.87
S max	18	18.2	20.1	1.9	19.4	2.2	2.78	0.23	-0.89
VO2max/kg	18	51.0	72.4	21.4	61.4	4.6	11.24	0.21	0.21

Table 3. Variation analyze women middle distance running (WMDR)

Women MDR	n	Xmin	Xmax	R	X	S	V	As	Ex
High	20	159.0	171.5	12.5	167.5	3.6	2.15	-0.97	-0.28
Weight	20	45.8	57.0	11.2	53.0	3.1	5.79	-0.80	0.24
Fat%	20	6.0	13.3	7.3	10.1	2.0	19.81	-0.19	-0.86
MM%	20	40.1	45.9	5.8	42.9	2.0	4.61	0.20	-1.64
S max	20	16.8	20.0	3.2	17.7	0.9	5.22	0.69	-0.21
VO2max/kg	20	51.0	64.3	13.3	57.4	4.0	6.98	-0.09	-1.17

Table 4. Variation analyze women long distance running (WLDR)

Women LDR	n	Xmin	Xmax	R	X	S	V	As	Ex
High	13	157.8	170.9	13.1	164.2	3.1	4.34	-0.65	-0.54
Weight	13	43.6	53.1	9.5	48.0	3.4	6.34	-0.54	0.23
Fat%	13	8.0	16.3	8.3	12.9	4.2	17.54	-0.52	-0.65
MM%	13	38.8	44.1	5.3	41.4	4.5	6.42	0.65	-0.87
S max	13	16.0	18.6	2.6	16.9	3.2	7.42	0.12	-0.56
VO2max/kg	13	50.3	61.1	10.8	55.9	5.1	5.24	-0.34	-1.01

High is the basic and permanent mark of the physical development of man. His values are mostly genetically determined and have the age and gender specificity. Affected are also systemic and specific training activities. The average value in the examined men (MMDR) is 178.3 cm ± 2.8 cm. The growth of the MLDR ranged from 164.0 cm to 182.5 cm and the average value of the index is 172.2 centimeters.

The high of the examined (WMDR) ranged from 159.0 cm to 171.5 cm, and the average value of the

analyzed mark is 167.5 cm. WLDR are with high between 157.8 and 170.9 cm. The coefficients of variation shows that the variance of the values is small. Distribution of values is normal kurtosis and asymmetry of frequency, as the majority of the values observed about Xmax.

Weight characterize the total mass of the human body (muscle, bones, internal organs, subcutaneous fat, etc.). Keeping in optimal range is crucial for the realization of high sports result in middle and

long distance running. The average weight of the MMDR is 67.5 kg ± 6 kg. There is a large amount of waving R = 21.2 kg. This is explained by the fact that some athletes are more gracile and others – with more advanced and massive musculature (sprint type). The weight of researches MLDR ranged from 53.6 kg to 66.2 kg, and the average value is 60.3.

Weight of the researched WMDR variates from 45.8 kg to 57.0 kg and the average value is 53.0. The mass of the examined WLDR ranges between 43.6 and 53.1 kg.

In anthropology it is known that body weight has two basic components – body fat and free fat mass. This separate is based on the most highly applied anthropology model – the model Behnke (1974). Body fat had two characteristics: absolute amount of body fat and proportion (%) of body weight. More objective information about body composition gives mark of the proportion of body fat – body fat percentage, because through it immediately gave the impression so, what is the share and the free fat mass. The average value of contingent research MMDR is 9.1% ± 1.6%. Body fat in MLDR ranged between 7.2% and 13.2%. The arithmetic mean of the mark is 9.8.

Body fat in the researched WMDR varyate between

6.0% and 13.3%. The arithmetic mean is 10.14% and the spread R = 7.30. We can say that the sample is approximately uniform as the coefficient of variation V = 19.81. Coefficients of skewness and kurtosis indicates that the distribution of the variable is normal. WLDR have body fat between 8.0 and 16.3%. The average value is 12.9%.

Muscle mass is a major anthropometric mark with big importance to the sport result. Durability in running in middle distances in track and field is expressed by the relationship between muscle strength and time to maintain her (W. Thorland, 1981). From the results it is clear that middle-distance runners have high values of this mark – an average of 48% ± 2.2%. The coefficient of variation V = 4.533, which indicates homogeneity of the sample. MLDR logical have less muscle mass – 46.8%.

Our research showed that the tested WMDR have high values of this mark – values ranged between 40.1% and 45.9%, the average is 42.86% and the spread R = 5.8. WLDR also like MLDR have less muscle mass than WMDR.

Tables 5, 6, 7 and 8 shows the dependencies between all tested marks.

Table 5. Correlation matrix of the marks (MMDR)

MMDR	High	Weight	Fat%	MM%	VO2max/kg	S max
High	1	0.79	0.58	0.69	0.57	0.49
Weight		1	0.88	0.51	0.72	0.43
Fat%			1	-0.55	-0.33	-0.52
MM%				1	0.61	0.39
VO2max/kg					1	0.61
S max						1

Table 6. Correlation matrix of the marks (MLDR)

MLDR	High	Weight	Fat%	MM%	VO2max/kg	S max
High	1	0.84	0.51	0.58	0.44	0.32
Weight		1	0.96	0.42	0.59	0.39
Fat%			1	-0.67	-0.39	-0.57
MM%				1	0.54	0.45
VO2max/kg					1	0.57
S max						1

Table 7. Correlation matrix of the marks (WMDR)

WMDR	High	Weight	Fat%	MM%	VO2max/kg	S max
High	1	0.58	-0.39	-0.27	-0.34	-0.25
Weight		1	0.70	0.72	-0.44	0.15
Fat%			1	0.41	-0.44	-0.20
MM%				1	-0.47	-0.19
VO2max/kg					1	0.55
S max						1

Table 8. Correlation matrix of the marks (WLDR)

WLDR	High	Weight	Fat%	MM%	VO2max/kg	S max
High	1	0.51	-0.25	-0.05	-0.04	-0.31
Weight		1	0.56	0.64	-0.14	0.32
Fat%			1	0.02	-0.39	-0.16
MM%				1	-0.34	-0.22
VO2max/kg					1	0.41
S max						1

The high at women has meaning correlation with body weight. This is logic and good for the athletes, because the taller competitors have longer bars of witch they work. Missing of high correlation depending of maximal speed of running and muscle mass could be explained by the fact that well trained athletes reach and keep high speed of running witch is not so different with heavy and light athletes, so the best interrelation of realizing speed potential is achieving at runners with lower body mass.

The weight correlated most highly with overall strength of the body muscles. Higher strength allows athletes to run with a bigger step, without reducing significantly the frequency. This leads to later onset of fatigue during the competition, when the long length hardly reduced. This is evidenced by the concentration of lactate in blood, which increases significantly more gradual than in competitors with less length and with a higher frequency of the step (W. Thorland, 1981).

Missing of high correlation depends of the maximum speed of running with body mass can be explained by the fact that high qualified athletes could reach and maintain high speed of running, which is

not very different in heavy and light athletes which means that the best relation for realizing speed potential is obtained in athletes with low body mass.

The high has highly correlation with body weight. On one hand, it is logical, on the other hand, and advantageously, because the higher competitors have longer levers, on the acting muscles. Therefore in the equally longer levers provide bigger amplitude of movements (and the length of the running step), but also require less frequent moves for economical running, which is important for long running distances in athletics.

Like the women, the body mass correlating most highly with basic strength of the body muscles (muscle mass). The bigger strength allows the athletes to run with a bigger step, without reducing significantly the frequency. This leads to later onset of fatigue during competition when the stride length hardly reduced.

To increase the efficiency of the training process in competitors in middle and long distance we have developed optimal value of basic marks (table 9 and 10). It clearly shows theoretically optimal ranges of each mark.

Table 9. Optimal ranges of marks (men)

		High	Weight	Fat%	MM%	VO2max/kg	S max
OPTIMAL RANGE	MMDR	175.5–181.1	61.5-73.5	7.5–10.7	45.8–50.2	62.2-74.8	18.8–20.2
	MLDR	169.5–179.2	56.7-61.2	9.6–11.3	44.1–47.7	54.2-70.4	18.2–19.4

Table 10. Optimal ranges of marks (women)

		High	Weight	Fat%	MM%	VO2max/kg	S max
OPTIMAL RANGE	WMDR	163.9–171.1	49.9-56.1	8.1–12.1	40.9–44.8	51.5-63.8	17.0–19.2
	WLDR	162.2–170.4	47.2-52.2	8.8–14.6	40.2–43.6	51.0-61.2	16.3–17.8

Discussion

Compared to men, muscle mass in women does not have a major impact on motor and functional performances. This phenomenon is also observed in the other studied morphological marks. In our opinion, this means that women's training approaches must maintain a constantly and stable level of anthropometric parameters, while in men the increasing in muscle mass (preferably lower limbs) is essential for the improvement of specific physical capacity.

The maximum speed of running does not have high correlation correlations with our morphological marks. This can be explained by the fact that well-trained (highly qualified) athletes reach and maintain a high speed of running, which is not very different in heavier and lighter athletes. This means that the best ratio to realize the speed potential is obtained with lower body weight competitors, unlike men where maintaining high levels of muscle mass, as well as the reduction of body fat is a matter for increasing the speed of the athletes.

The main performance mark ($VO_2\max$) in man has significant correlations with weight. These high marks gives us reason to determine the maintenance of an optimal body weight that is at the expense of high levels of muscle mass as a basic factor in increasing the functional capabilities of competitors in medium and long distance running.

Therefore, when a significant disparity between different marks could be purposefully affect on some anthropometric parameters such as to reduce body fat and increase muscle mass. Periodic monitoring of the levels of anthropometric marks has important information for the ongoing monitoring of the

effects of the applied training approaches.

Conclusion

1. The influence of anthropometric marks on sporting achievement in middle and long distances running is higher in men than in women.
2. Muscle mass is a basic anthropometric mark which impacts directly on the maximum speed of running in men.
3. The effectiveness of the training process of women could be explained by a stable level of some of the anthropometric marks: muscle mass and fat mass.
4. The values of the researched indicators provide opportunities for individual assessment of the relevant levels on each mark as itself and in the context of basic correlations with the others.
5. The created models could be helpful for sports theory and practice in the following areas:
 - assessment the effectiveness of the training process;
 - changing the nutrition.

References

- Behnke, A. R., J.H. Wilmore. (1974). Evaluation and regulation of body build and composition. New Jersey, Englewood Cliffs.
- Fleck, S. J. (1983). Body composition of elite American athletes. American Journal of Sports Medicine, 11, 398–

403.

Hollings, S. C. & Robson, G. J. (1991). Body Build and performance characteristics of male-adolescent track and field athletes. *Journal of Sports Medicine and Physical Fitness*, 31(2), 178–182.

Housh, T. J.; Thorland, W. G.; Johnson, G. O.; Tharp, G. D. & Cisar, C. (1984). Anthropometric and body builds variables as discriminators of event participation in elite adolescent male track and field athletes. *Journal of Sport Sciences.*, 2(1), 3–11.

Marfell-Jones, M. Olds, T. Stewart, A. & Carter, J. E. L. (2006). *International Standards for Anthropometric Assessment*. Potchefstroom, South Africa: ISAK.

Pacheco, J. L. (1996). Valoración antropométrica de la masa magra en atletas de élite. In MEC–CSD (Ed.), *Metodos de estudio de composición corporal en deportistas*. Madrid: MEC–CSD.

Parizkova, J. *Body fat physical fitness*. The Hauge: Martinus Nijhoff, 1977.

Pastor, G. G., M.S. Quintana, A. García, Aparicio, A. C. Moreno, S.M. Sánchez. Dietary intake and anthropometry in elite Spanish athletes. *New Studies in Athletics*, 24:4, 47–61, 2009.

Stellingwerff, T.; Boit, M. K. & Res, P. T. (2007). Nutrition strategies to optimize training and racing in middle-distance athletes. *Journal of Sport Sciences.*, 25(S1), S17-S28.

Thorland, W. G.; Johnson, G. O.; Fagot, T. G.; Tharp, G. D. & Hammer, R. W. (1981). Body composition and somatotype characteristics of Junior Olympic athletes. *Medicine & Science in Sports & Exercise*, 13(5), 332–338. 12. Tittel, K., H. Wutscherk (1972). *Sportantropometrie*. Barth, Leipzig.

DIFFERENCES IN THE MOTOR ABILITIES OF FOOTBALL PLAYERS IN RELATION TO THEIR POSITION ON THE TEAM

Živković Mladen, Jovanović Vladan, Herodek Katarina, Milanović Zoran, Antić Vladimir

Faculty of Sport and Physical Education, University of Nis, Serbia

Summary

The aim of this study was to determine if there are differences in the motor abilities of players relative to their position on the team. A total of 27 participants of the football club "Car Konstantin" from Nis, male, age 17 ± 6 months participated in this study. The players were divided into three different groups according to their positions: defense ($n=9$), midfield ($n=9$) and attack ($n=9$). The study examined the differences in the explosive strength of the lower extremities, speed and endurance between the players in relation to their position on the team. In order to carry out the research, the following tests were used: for strength –the countermovement jump, 30m sprint speed and for endurance –the shuttle run test. The obtained results were processed by the T-test for independent samples. After the overall analysis it was shown that there were no statistically significant differences in the motor abilities of the players in relation to their position on the team. The main contribution of this paper is to point to the necessity of monitoring the motor skills of players to be able to respond to the demands of modern football. Future research, which deal with the same topics, can based on this study compare the results obtained on the same tests, or focus on other motor skills.

Key words: explosive strength, speed, endurance

Introduction

There are over 240 million people actively involved in football in more than 200 countries worldwide (Hillis, 1998). It is a collective sports game which is characterized by poly-structural movement. Contemporary football requires excellent technique from the players, mutual cooperation, a high level of motor abilities, pronounced cognitive and conative characteristics, all with the aim of achieving the best possible result (Špirtović et al., 2012). Well-developed motor skills are a precondition for the quality performance of technical-tactical elements (Joksimović, 2008). The motor skills which mostly affect the speed of the game of football and limit the movement ability of football players are explosive strength, speed and endurance (Pivovarniček et al., 2013). Explosive strength in football has a direct influence on the performance of quick movement, since it represents the ability of short-term mobilization of muscle tissue for the increased speed of body movement (Joksimović, 2008). The speed of the football players represents a complex ability which consists of various components that influence the success of the game, and some of them include: short and quick movements, quick move-

ments in all directions, the ability to make a quick start and stop, reaction speed, speed of activity with a ball (Gardašević, Bjelica, 2014). Football requires that the players manifest a high level of functional abilities, technical-tactical effectiveness, or in other words morpho-functional universals, in order to act successfully in various situations of the game, often with a lack of time, in limited space and with active intrusions on the part of the opponents. Only a good level of endurance enables the football players to have such a physical state (Stojanović et al., 2015).

Aim and Objectives of the study

The aim of this study was to determine if there are differences in the motor abilities of the players relative to their position on the team. The main contribution of this study is that it indicates the necessity of monitoring the motor skills of soccer players so that they could meet the demands of contemporary football. Future research, which deal with the same topics, can based on this study compare the results obtained on the same tests, or focus on other motor skills.

Methods

The sample of participants in this study consisted of

football players involved in the training process. A total of 27 male players aged 17 ± 6 months took part in this study and were divided into three groups. The first group ($n=9$) consisted of defense players, with an average body height of 177,44cm, and average body mass 69,11kg. The second group ($n=9$) consisted of midfield position players, with an average body height of 178,22cm, and average body mass of 66,55kg. The third group ($n=9$) consisted of attack players, with an average body height of 176,22cm, and average body mass of 64,77kg. The anthropometric characteristics of the players were measured in the following manner: body height was measured to a precision of 0,1 cm (with an anthropometer, according to Martin) and body mass with a precision of 0,1 kg (Tanita BWB800, Japan). The participants voluntarily agreed to participate in the study which was conducted in accordance with the Helsinki Declaration.

Measuring of the motor skills included the testing of explosive strength of the lower extremities, running speed and endurance.

To evaluate the explosive strength of the lower extremities, the *countermovement jump* (CMJ) test was used. This test was often used in similar studies so as to evaluate the explosive strength of the lower extremities of football players (Gil, Gil, Ruiz, Irazusta, & Irazusta, 2007; Lago-Peñas, Casais, Dellal, Rey, & Domínguez, 2011). Equipment for the evaluation of explosive strength of the lower extremities which was used in this study was the *Myotest* (Myotest SA, Sion, Switzerland), which provides the technology and methodology for the evaluation of explosive strength. The validity and reliability of the *Myotest* for the evaluation of jump height was confirmed in the study carried out by *Casartelli, Müller, & Maffiuletti* (2010). Of the four obtained values, which the device indicates, only the variable of jump height (cm) was included in further study.

To evaluate speed, the 30 m sprint speed test was used. This test is often used in studies to evalu-

ate the speed of football players (Pyne, Saunders, Montgomery, Hewitt & Sheehan, 2008; Spencer, Pyne, Santisteban & Mujika, 2011; Taşkin, 2008; Kaplan, Erkmén, & Taskin, 2009). The necessary equipment which was used in this study included photo cells (Witty, Microgate, Bolzano, Italy) which were positioned on the starting line and at the 30 m mark. The validity and reliability of the photo cells for the evaluation of speed among football players was confirmed in the study of *Waldron, Worsfold, Twist, & Lamb* (2011). The result of the test is the time (s) which is needed to cover the set distance.

To evaluate the endurance of football players, the *shuttle run test* (SRT) was used. This test is often used in similar studies to evaluate the endurance of football players (Lemmink, Verheijen & Visscher, 2004; Pyne, Saunders, Montgomery, Hewitt & Sheehan, 2008). The equipment used to perform this test consisted of a computer which emitted a sound signal. The validity and reliability of the *shuttle run* test was confirmed in the study of *Léger & Lambert* (1982). The result of the *shuttle run* is the achieved level of intensity and the number of covered sections on the achieved level. In order to obtain the value of maximum oxygen uptake ($\text{ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$), the following formula was used:

$$\text{VO}_2\text{Max} = 3.46 * (\text{L} + \text{SN} / (\text{L} * 0.4325 + 7.0048)) + 12.2$$

The statistical analyses included descriptive statistics, the Kolmogorov-Smirnoff test to evaluate the normality of distribution, and to the study of the results between the groups of participants, the T-test for independent samples was used. The statistical significance was set at the $p < 0,05$ level. All of the data were processed using the statistical package SPSS22.0 (SPSS, Chicago, IL).

Results

The descriptive statistical indicators and results of the Kolmogorov-Smirnoff test (K-S) of the variables of explosive strength, speed and endurance on the CMJ test, the 30m sprint speed test and SRT for participants in all three groups are shown in table 1.

Table1. Descriptive statistics and the K-Stest

Variable (unit)	First group			Second group			Third group		
	Mean	SD	p	Mean	SD	p	Mean	SD	p
CMJ (cm)	39.78	3.54	0.20	35.87	3.48	0.20	37.13	3.29	0.20
30m (s)	4.47	0.17	0.20	4.54	0.17	0.20	4.57	0.18	0.20
SRT (ml/kg/min)	49.10	5.28	0.20	50.93	7.72	0.15	51.24	2.39	0.06

Legend: Mean – arithmetic means; SD – standard deviation; p – statistical significance of the Kolmogorov-Smirnoff test

Table 1. shows that the results of the descriptive statistics in relation to the players' positions on the team,

including arithmetic means and standard deviation. Based on the displayed data and the significance of the normal distribution of the K-S it can be concluded that the distribution of values for all the tested variables is normal. As a result, it is justifiable to use a parametric analysis.

Tables 2., 3. and 4. show the results of the T-test for independent samples which were used to study

the differences in the values of explosive strength and endurance between the participants of all three groups. The results shown in the tables were presented in the form of a comparison of the differences between the groups on one test. In table 2. we listed the results of explosive strength obtained on the CMJ test. Table 3. lists the results for speed obtained on the 30msprint speed test. Table 4. lists the results of endurance obtained on the SRT test.

Table2. The results of the T-test for independent samples for the values of the CMJ

Variable (unit)	Group	N	Mean	Std. Dev.	Sig.
CMJ (cm)	First	9	39.78	3.54	0.59
	Second	9	35.87	3.48	
CMJ (cm)	First	9	39.78	3.54	0.84
	Third	9	37.13	3.29	
CMJ (cm)	Second	9	35.87	3.48	0.45
	Third	9	37.13	3.29	

Legend: N – number of participants, Mean – arithmetic means, Std. Dev.– standard deviation, Sig.– statistical significance

Table3. The results of the T-test for independent samples for the 30msprint speed

Variable (unit)	Group	N	Mean	Std. Dev.	Sig
30m (s)	First	9	4.47	0.17	0.61
	Second	9	4.54	0.17	
30m (s)	First	9	4.47	0.17	0.36
	Third	9	4.57	0.18	
30m (s)	Second	9	4.54	0.17	0.35
	Third	9	4.57	0.18	

Legend: N – number of participants, Mean – arithmetic means, Std. Dev.– standard deviation, Sig.– statistical significance

Table4. The results of the T-test for independent sample for the values of the SRT

Variable (unit)	Group	N	Mean	Std. Dev.	Sig
SRT (ml/kg/min)	First	9	49.10	5.28	0.10
	Second	9	50.93	7.72	
SRT (ml/kg/min)	First	9	49.10	5.28	0.60
	Third	9	51.24	2.39	
SRT (ml/kg/min)	Second	9	50.93	7.72	0.90
	Third	9	51.24	2.39	

Legend: N – number of participants, Mean – arithmetic means, Std. Dev.– standard deviation, Sig.– statistical significance

Based on the obtained results, by comparing the results of all three groups for each test individually, we can conclude that there are no statistically significant differences for the obtained values. The position on the team does not have a statistically significant impact on the differences in the studied motor skills of the football players.

Discussion

Many studies had the aim to evaluate explosive strength, speed and endurance depending on the players’ positions on the team. This kind of study was carried out by Pivovarniček et al. (2013) and involved the football players of the Slovakian national team of players under 21. They reached the conclusion that there were no significant dif-

ferences in the studied parameters between the groups divided based on the players' positions on the team. In their study, Nilsson, Cardinale (2015) tested football players of the Swedish league, but the CMJ did not indicate a significant difference between the defensive players, midfield players and attackers, and the same results were reached on the endurance tests. The studies carried out by James (2007) and Swapan, Nabanita, Parthasarathi (2010) also confirm that there are no statistically significant differences in jump height compared to the players' positions on the team. Coelho et al. (2007) compared the success of football players of various positions on the 30m sprint speed test and reached the conclusion that the position on the team does not affect this ability. That were no statistically significant difference between the players of various positions in terms of speed was also determined by the authors Milanović et al. (2011), who carried out their research on players from the national team of Serbia of players under the age of 16.

The cited studies undoubtedly indicate that positions on the team do not influence the development of explosive strength, speed and endurance. The research results from this study support these claims since it was proven that there were no statistically significant differences between defense players, midfield players and attackers for the CMJ, 30m sprint speed and SRT tests used to evaluate precisely these motor areas.

Acknowledgements

We gratefully acknowledge the Ministry of Education, Science and Technological Development of the Republic of Serbia support and financing of the current research within the project № 179024.

References

Casartelli, N., Müller, R., and Maffiuletti, N. A. (2010). Validity and reliability of the Myotest accelerometric system for the assessment of vertical jump height. *The Journal of Strength & Conditioning Research*, vol. 24, no. 11, pp. 3186–3193.

Coelho, B. D., Braga, M. L. P., Campos, P. A. F., Condessa, L. A., Mortimer, L.C. F., Danusa, D. S., Paolucci, A., and Garcia, E. S. (2007). Performance of soccer players of different playing positions and nationalities in a 30 – meter sprint test, In: Menzel, H., and Chagas, M., H. (Eds), *25 Internacional Symposium on Biomechanics in sport in Ouro Preto,*

Brazil, August, 23–27, 2007, pp. 362–365.

Gardašević, J., and Bjelica, D. (2014). Efekti rada u pripremnom periodu na brzinu vođenja lopte petnaestogodišnjih fudbalera (The effects of the training in the preparation period on the dribbling speed with fifteen years old football players). *Sport mont*, vol. 40–42, pp. 160–166.

Gil, S. M., Gil, J., Ruiz, F., Irazusta, A., and Irazusta, J. (2007). Physiological and antropometric characteristics of young soccer players according to their playing position: relevance for the selection process. *The Journal of Strenght & Conditioning Research*, vol. 21, no. 2, pp. 438–445.

Hillis, S. (1998). Preparations for the World cup. *British Journal of Sports Medicine*, vol. 32, pp. 95.

James, R. K. (2007). Positional assessment and physical fitness characteristics of male professional soccer players in South Africa. *African journal for physical, health education, recreation and dance*, vol. 13, no. 4, pp. 453–464.

Joksimović, A. (2008). *Mali fudbal (Futsal)*. Niš: GIP „TIMOK“ D.O.O.

Kaplan, T., Erkmen, N., and Taskin, H. (2009). The evaluation of the running speed and agility performance in professional and amateur soccer players. *Journal of Strenght & Conditioning Research*, vol. 23, no. 3, pp. 774–778.

Lago – Peñas, C., Casais, L., Dellal, A., Rey, E., and Domínguez, E. (2011). Anthropometric and physiological characteristics of young soccer players according to their playing positions: relevance for competition success. *The Journal of Strength & Conditioning Research*, vol. 25, no. 12, pp. 3358–3367.

Léger, L. A., and Lambert, J. (1982). A maximal multistage 20 m shuttle run test to predict VO_{2max} . *European Journal of Applied Physiology*, vol. 49, pp. 1–5.

Lemmink, K. A. P. M., Verheijen, R. & Visscher, C. (2004). The discriminative power of the interval shuttle run test an the maximal multistage shuttle run test for playing level of soccer. *Journal of Sports Medicine and Physical Fitness*, vol. 44, no. 3, pp. 233–239.

- Milanović, Z., Daly, D., Trajković, N., and Sporiš, G. (2011). Razlike u brzini, ubrzanju i agilnosti kod mladih fudbalera u odnosu na poziciju u timu (Differences in speed, acceleration and agility of young footballers in relation to the position in team). In: Živanović, N. (Ed.), *XV međunarodni naučni skup Fis komunikacije u sportu fizičkom vaspitaњу i rekreaciji (XV International Congress Fis Communications'9 in Sport, Physical Education, and Recreation) in Nis, Serbia, October, 20–22, 2011*, Niš, pp. 261–266.
- Nilsson, J., and Cardinale, D. (2015). Aerobic and anaerobic test performance among elite male football players in different team positions. *Lase Journal of Sport Science*, vol. 6, no. 2, pp. 73–92.
- Pivovarniček, P., Pupiš, M., Tonhauserova, Z., and Tokárová, M. (2013). Nivo sprinterskih sposobnosti, eksplozivne snage i specijalne izdržljivosti vrhunskih mladih fudbalera na različitim pozicijama (Level of sprint and jump abilities and intermittent endurance of elite young soccer players at different positions). *Sport Logia*, vol. 9, no. 2, pp. 186–200.
- Pyne, D. B., Saunders, P. U., Montgomery, P. G., Hewitt, A. J., and Sheehan, K. (2008). Relationships between repeated sprint testing, speed, and endurance. *Journal of Strength & Conditioning Research*, vol. 22, no. 5, pp. 1633–1637.
- Spencer, M., Pyne, D., Santisteban, J., and Mujika, I. (2011). Fitness determinants of repeated-sprint ability in highly trained youth football players. *International Journal of Sports Physiology and Performance*, vol. 6, pp. 497–508.
- Stojanović, T., Goranović, S., Šakanović, A., and Stojanović, D. (2015). Nivo specifične izdržljivosti i tehničko – taktičke efikasnosti mladih fudbalera različitog stepena takmičenja (The level of specific endurance and technical and tactical efficiency of young football players of different level of competition). *Sports science and health*, vol. 5, no. 2, pp. 141–150.
- Swapan, K. D., Nabanita, K., and Parthasarathi, D. (2010). Antropometric, motor ability and physiological profiles of indian national club footballers: A comparative study. *South African journal for research in sport, physical education and recreation*, vol. 32, no. 1, pp. 43–56.
- Špirtović, O., Aćimović, D., and Joksimović, A. (2012). Razlike u nivou situaciono – motoričkih sposobnosti fudbalera različitog ranga takmičenja (Differences in the level of situational – motor abilities of football players of different level competitions). *Sport mont*, vol. 34–36, pp. 391–394.
- Taşkin, H. (2008). Evaluating sprinting ability, density of acceleration, and speed dribbling ability of professional soccer players with respect to their positions. *Journal of Strength & Conditioning Research*, vol. 22, no. 5, pp. 1481–1486.
- Waldron, M., Worsfold, P., Twist, C., and Lamb, K. (2011). Concurrent validity and test–retest reliability of a global positioning system (GPS) and timing gates to assess sprint performance variables. *Journal of Sport Sciences*, vol. 29, no. 15, pp. 1613–1619.

Contact information with the corresponding author:

Živković Mladen, PhD, Assistant Professor

Faculty of Sport and Physical Education, University of

Niš

Čarnojevića street 10 a

18000 Niš

Serbia

Tel: [+381 63 1045845](tel:+381631045845)

Fax: [+381 18 242-482](tel:+38118242-482)

E-mail: profzile@gmail.com

FACTOR STRUCTURE AND BASIC FACTORS OF THE SPORTS PREPAREDNESS OF 15-16 YEARS OLD NATIONAL BASKETBALL COMPETITORS

Mariana Borukova, Milena Kuleva, Asya Tsarova

Introduction

It is often needed in the basketball practice to evaluate the stage of the young basketball players' preparedness. In this way the necessary information is received which serves as a landmark about the level of their development – whether they have the necessary physical qualities and basketball skills, whether they go forward within the educational and training process and whether there is a perspective for their development as highly qualified competitors in the future (Karalejič M., Jakovljevič S. 2001).

The complex development of the motive qualities sets up the issue about the evaluation and control on the specific functional preparation of the competitors. For this purpose many researchers are developing specific basketball tests and indicators (Giosheva, K., K. Tzarov, R. Tzarovaa, 1990, Gigova, V., 2002, Dasheva, D., 1991, Zhelyazkov, Tz., 1978, Zhelyazkov, Tz., Koyle, V., 1993, Coysi, B., Power, F., 1975, Wilkes, G., 1968, Borukova, M., 2014).

It is indisputable that one of the main factors of the game effectiveness is the skill of the competitors to materialize their motor potential into rational technical and tactical activities. The studies in that field cover huge factual material (Auerbach, R., 1978, Wilkes, G., 1968, Tzarov, Kr., 2001, Tzarov, Kr., 2008, Tzarova, R., 2013, Coysi, B., Power, F. 1983, Bompa, O. T. 2000).

The contribution of each of the indicators under study to the sport result of a given person or totality depends to the greatest degree on 3-4 basic factors. The disclosure of the factor structure of the physical development and the specific workability of growing up basketball players has high informative value for the optimization of the educational and training process (Tzarova, R., Borukova, M. 2012).

Depending on the importance of the separate indicators for the sports achievement, their factor weights represent greater or smaller significance for the optimization of the training from strategic aspect. The evaluation of the results by normative tables provides the possibility for tactical (current) optimization of the training depending on the moment development level of each of the competitive effectiveness symptoms (Dasheva, D., 1991, Tzarov, Kr., 2001, Tzarova, R., 2013).

It is established during studies executed in the sports schools (Borukova, M., 2014). that for the 15-16 years old pupils practicing basketball in these schools, the high effectiveness of the speed shooting while moving, the explosive strength of the lower limbs, the speed endurance and the skill of managing the ball while standing have the greatest contribution to the general physical and technical-tactical preparedness of the players.

Key words: *growing up basketball players, optimization, educational and training process*

The purpose of the study is the optimization of the education-training process for coming up basketball players by revealing the factor structure and identifying the basic factors of the sports preparedness during the age range of 15-16 years old players..

Subject of the study is the sports preparedness of coming up basketball players.

Object of the study are the symptoms of the physical development, the special physical and specific technical-tactical preparedness of the players.

The contingent of the study are 125 basketball players (of 15-16 years of age) entered in the national team of Bulgaria during the period 2009-2016.

The following methods of study are applied for executing the research: review study and theoretical analysis of the specialized literature, anthropometric and sports-pedagogical tests.

The tests entered into the test lot are distributed into 3 groups:

- *for physical development - 6 indicators;*
- *for specific physical preparedness - 8 indicators;*
- *for specific technical-tactical preparedness - 8 indicators.*

The following methods are applied for the needs of the study: mathematical-statistical methods, variation, alternative and factor analysis and the index method.

Analysis of the results:

The basic research task relates to the disclosure of the factor structure of the sports preparedness and the identification of the basic factors establishing that structure.

It is known from the factor analysis Borukova, M., (2014), theory that the dispersion of a mass of indicators can be explained by a more limited number of latent symptoms, called factors (Tzarova, R., Borukova, M. 2012) too. They are taken to the front on the base of the general, similar characteristics,

which to a certain degree exist objectively between the indicators under study related to a certain ability (quality) of the object (here the totality of the best 15-16 years old Bulgarian basketball players).

The disclosure of the factor structure and the identification of the basic factors of the individual competitive effectiveness is an important strategic task of our study.

Table 1 presents the results of the initial data processing.

Table 1.**Factor structure of the sports preparedness**

№	I	II	III	IV	V	VI	VII	VIII	h ²	1 - h ²
1.	0,894	0,182	0,130	-0,038	0,064	0,107	-0,081	-0,022	0,873	0,127
2.	0,894	0,158	0,186	0,027	0,094	0,083	-0,045	0,014	0,878	0,122
3.	0,175	0,027	0,879	-0,125	-0,037	0,101	-0,018	-0,168	0,860	0,140
4.	0,164	-0,063	-0,333	0,116	0,054	0,008	-0,165	0,657	0,617	0,383
5.	0,602	0,158	0,729	0,034	0,128	0,106	-0,065	-0,011	0,952	0,048
6.	0,043	0,050	0,927	0,107	0,134	0,048	-0,005	0,010	0,895	0,105
7.	-0,054	0,204	0,050	-0,801	0,058	-0,045	-0,115	-0,088	0,714	0,286
8.	0,308	0,860	0,039	-0,077	0,035	-0,071	-0,085	0,203	0,896	0,104
9.	0,182	-0,230	0,045	0,593	0,006	-0,160	0,011	0,392	0,619	0,381
10.	0,047	-0,691	-0,209	0,188	-0,158	-0,020	0,057	0,299	0,676	0,324
11.	0,328	-0,267	0,175	0,395	0,172	0,104	0,286	-0,410	0,656	0,344
12.	0,077	-0,151	-0,012	-0,022	-0,310	-0,478	0,465	-0,029	0,572	0,428
13.	0,078	-0,150	0,129	-0,797	0,149	0,131	-0,188	0,097	0,765	0,235
14.	-0,177	0,239	0,163	0,635	-0,109	0,052	-0,199	-0,088	0,581	0,419
15.	-0,362	-0,060	-0,002	0,174	0,041	-0,410	0,349	-0,021	0,456	0,544
16.	0,291	0,774	0,115	-0,079	0,003	0,410	0,059	0,147	0,896	0,104
17.	0,147	0,136	0,168	-0,017	-0,017	0,843	0,152	-0,002	0,803	0,197
18.	0,029	0,694	-0,097	0,357	0,151	0,171	-0,038	-0,037	0,674	0,326
19.	0,192	0,130	0,058	-0,068	0,781	0,026	0,127	-0,100	0,698	0,302
20.	-0,006	0,064	0,068	-0,131	0,805	0,007	-0,096	0,031	0,684	0,316
21.	-0,135	-0,024	-0,037	0,096	0,052	0,087	0,807	-0,021	0,691	0,309
22.	-0,358	0,154	0,184	-0,079	-0,141	0,119	0,231	0,572	0,607	0,393
Σα	12,39 %	12,37 %	11,56 %	11,25 %	7,03 %	6,52 %	5,99 %	5,91 %		

The analysis of the table shows that the factor structure of the sports preparedness of the best 15-16 years old Bulgarian basketball players is established by 8 factors which explain comparatively high percentage of the initial dispersion of the phenomenon under study – 73,02 %.

The table and figure 1 show as well that the first four factors have neighboring relative shares – the difference in percentage of the dispersion explained by the first and fourth factor is hardly 1,14 %. The same dependence is observed for the other four factors – the difference of the dispersion explained by the fifth and the eighth factors is 1,12 %.

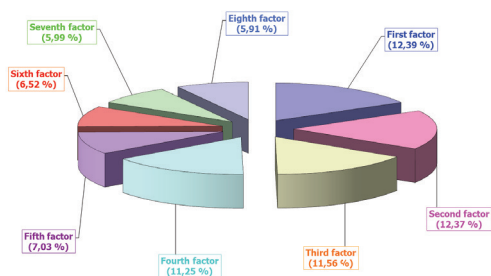


Fig. 1 Relative shares of the initial dispersion of sports preparedness explained by each factor

The graphs presented in figure 1 allow getting an idea about those symptoms, which have the highest factor weights and define the essence of the first two factors.

The first factor explains the highest percent of the initial dispersion of the phenomenon under study (the sports preparedness) – 12,39 %. Here indicators 1, 2 and 5 (respectively height, stretch and weight) which bear information about the physical development of the basketball players under study are of highest factor weights. That gives the reason to identify the factor as a “morphological factor showing the high importance predominantly of the linear sizes of the body”.

The second factor is very close to the first one by the percent of the explained dispersion. It is related to both the special physical preparedness and the specific basketball skills of the competitors. It can be defined as “specific skill for moving along the playground both in attack (without and with a ball) and in defense which depends on the development level of the lower limbs explosive strength at horizontal muscle efforts”.

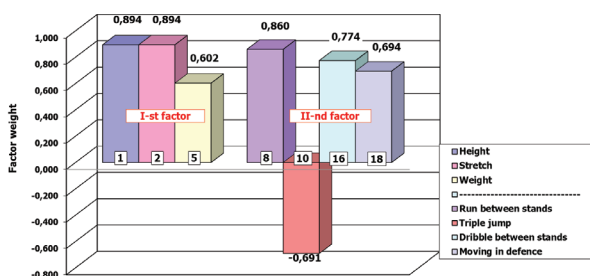


Fig. 2 Factor structure of the sports preparedness I-st and II-nd factors

Third factor (11,56 %) – It is again a morphological factor but it defines the place of the body mass and the degree of fat in the body (figure 3) in the factor structure.

The fourth factor (11,25 %) – As it can be seen in figure 3, all the four indicators which high factor weights here relate to the physical preparedness of the players. That gives the reason to identify that factor as “basketball athleticism”.

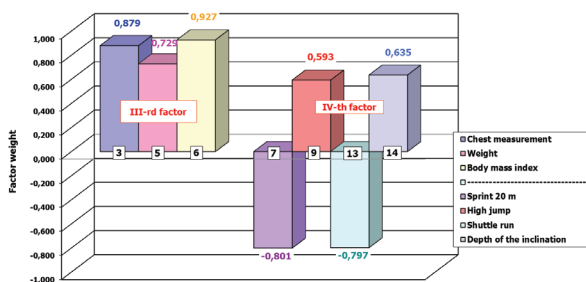


Fig. 3 Factor structure of the sports preparedness III-rd and IV-th factors

The coming four factors relate to the specific skills of the basketball players.

The fifth factor (7,03 %) can be identified as “effectiveness of the speedy shot while moving” (figure 4).

The sixth factor (6,52 %) shows the importance of “the skill to lead the ball with high speed” (figure 4).

The seventh factor (5,99 %) defines the place of the “effectiveness of the shot from middle distance after the ball is received by a partner” (figure 4) in the factor structure of the 15-16 years old basketball players.

The eighth factor (5,91 %) can be identified as “functional capacity of the chest” which is an important prerequisite for the effective execution of free throws which usually are executed in a state of fatigue (figure 4).

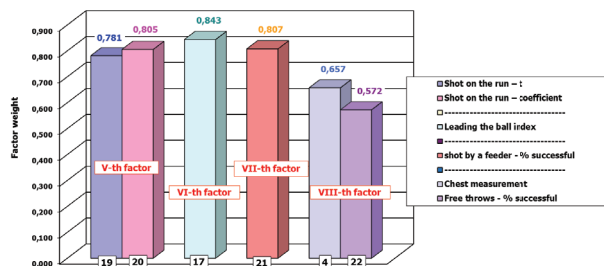


Fig. 4 Factor structure of the sports preparedness – V-th, VI-th, VII-th, VIII-th factors

According to Tsarova, R. (2013) the results of the factor analysis can serve as an individual criterion for the optimization. This means that the symptoms of low level of development for each competitor be rearranged depending on each symptom read according to the place of that symptom in the integral factor structure of the sports preparedness.

Conclusions and recommendations

The analysis of the results and the general view on the factor structure of the physical development and the specific workability of 15-16 years old basketball players give us the reason to formulate the following **conclusions**:

1. The so-called morphological factor, showing the high importance predominantly of the linear sizes of the body is the most important about the general preparedness of the 15-16 years old basketball players.
2. The second factor can be defined as : specific skill for moving along the playground both in attack (without and with a ball) and in defense which depends on the level of development of the lower limbs explosive strength at horizontal muscle efforts.
3. The body mass and the degree of the body fat are defined as the third factor in the factor structure of the 15-16 years old basketball players.
4. The indicators related to the physical preparedness of the competitors identify the forth factor as the so-called “basketball athleticism”.
5. The rest four factors are complimentary and relate to the specific skills of the basketball players.

Reference

Auerbach, R., (1978). Basketball, Медицина и физкултура, София, стр.18-26.

Borukova, M., „Factor structure and basic factors of the physical development and the specific workability of growing up basketball players (12-19 years old) “. – In Physical Education and Sport – Completeness for life 9-12 October 2014.p.287-296.

Borukova, M., (2014). Improve the system for reception and control of basketball talent in the system of sports schools in Bulgaria/Усъвършенстване на системата за прием и контрол на баскетболни таланти в системата на спортните училища в България Дис. труд, НСА. София., стр. 69 – 77.

Gigova, V., (2002). Statistical processing and data analysis/Статистическа обработка и анализ на данни. In Bulgarian] . София:НСА – ИПБ.

Giosheva, K., K. Tzarov, R. Tzarovaa, (1990). System for monitoring, evaluation and optimization of sports training of girls and boys - 13-15 years In Bulgarian/ Система за контрол, оценка и оптимизиране на спортната подготовка на момичета и момчета – 13-15 години. София, ЕЦНПКФКС – ИПБ. стр.122-128.

Dasheva, D., (1991). Stress and stress effects in the preparation of basketball players In Bulgarian/ Стрес и стресови въздействия в подготовката на баскетболисти, Дис. Труд. ВИФ. София..

Zhelyazkov, Tz. (1978), Methodological foundations of management and optimization of sports training with highly skilled basketball players In Bulgarian./Методологични основи на управлението и оптимизирането на спортната подготовка при висококвалифицирани баскетболисти Дисерт. труд – дпн, София, ВИФ.

Zhelyazkov, Tz., Koyle,V., (1993). Investigation of specific functional load skilled basketball players. In Bulgarian/Изследване на специфичното функционално натоварване при високо квалифицирани баскетболисти,Sport and Science, vol.7, p. 5-9.

Coysi, B., Power, F.,(1975), Basketball, concepts and techniques/Баскетбол-концепции и анализи, Москва, Физкултура и спорт.

Wilkes, G.,(1968), Basketball for coaches/Пълно ръководство за треньора по баскетбол, София, Медицина и физкултура, p.9-15.

Tzarov, Kr. (2008) Selection in basketball. In Bulgarian/ Подборът в баскетбола, София, НСА Прес.стр. 56-72.

Tzarov, Kr.(2012), Competitive efficiency in basketball. In Bulgarian/Състезателната ефективност в баскетбола,София: Бolid инс.стр. 120-131.

Tzarov, Kr., (2001), Factors race performance of elite basketball teams In Bulgarian/Фактори на състезателната ефективност на елитни отбори по баскетбол Автореф. на дис. Труд. НСА. София. стр. 16-18.

Tzarova, R., (2013), Problems of control in basketb In Bulgarian/ Проблеми на контрола в баскетбола], София. Бolid инс. стр. 83-86

Tzarova, R., Borukova, M. (2012), Study on the level of preparedness of students applying to schools with sports basketball profile.In Bulgarian In Bulgarian, Sport& Sciences, 2011/2,p. 89-97/Изследване върху нивото на подготвеност на учениците, кандидатстващи в

спортните училища с профил баскетбол, Спорт и наука, С., 2011/2, стр. 89-97

Вомпа, О. Т. (2000), Total Training for Young Champions. Champaign, IL: Human Kinetics.

Coysi, B., Power, F. (1983). „Basketball-concepts and techniques“. Allyn and Bacon. Boston, p. 56-67.

Karalejić M., Jakovljević S. (2001), Fundamentals of Basketball., Beograd, Fakultet sporta i fizičkog vaspitanja Beograd, Viša škola za sportske trenere Beograd, p.80-93.

Karalejić M., Jakovljević S. (2007). Faktorska struktura košarkaških vestina, [Factor structure of basketball

skills. In Serbia], Zbornik radova sa medunarodnog skupa „Analitika I dijagnostika fizičke aktivnosti“, Beograd, Fakultet sporta i fizičkog vaspitanja, p.117-125.

Miller, S. & Bartlett, R. (1996). The relationship between basketball shooting kinematics, distance and playing position. Journal of Sports Sciences 14, (3), p. 243 -253.

Correspondence address:

Chief ass. Mariana Borukova, doctor – NSA

“Basketball, volleyball, handball” dept.

marianaborukova@gmail.bg

1700 Sofia, Studentski grad (Students' city)

STUDY OF THE DYNAMICS OF PHYSICAL QUALITIES OF STUDENTS OF BASKETBALL IN THE ANNUAL MACROCYCLE

B. Zauranbekov, L. Kudashov, N. Kaefer,

ZT Andreyushkin, I. L., Kudashov, E. S.

Kazakh Academy of sports tourism, the country of Kazakhstan, Almaty

Summary

The relevance of the chosen topic. The article considers the problem of training basketball players in high school that is actual that requires special scientific developments and approaches to training and team building of the University subject to the time limit of their study at the University and on exercise, while the proposed scientific and methodological literature approaches to the training process is not always suitable for these teams. Analysis of the performance coaches at the University showed that the focus they concentrate on technical and tactical training of students, and the questions of development of physical qualities is usually sidelined. The composition of the student basketball team changes all the time, making it difficult to pick the team on the field.

Given the urgency of the problem was implemented following the aim is to justify the effectiveness of management training for basketball players in training at the University on the basis of testing in the training process of exercises for development of physical qualities of basketball players and to evaluate their dynamics in the annual macrocycle, depending on the characteristics of the periods of training and physiological capabilities of the organism.

In the experimental group in accordance with the annual schedule of the training process is composed of sets of exercises for speed-strength training, which was included in the structure of the annual macrocycle. Was developed by exercises that affect the development of weak muscle groups and to master the technique of special strength exercises.

During the period of experimental training occurred the greatest increase in running 20 meters, at 60 meters and 20 meters with dribbling the ball, when moving into a protective stance, long jump, high jump, Shuttle run 2x40, test of Cooper, serial jumping, throwing the medicine ball.

Key words: basketball, dynamics, physical preparation, exercises

Introduction: Basketball is one of the popular team sports have received wide recognition both in the world and in Kazakhstan, which requires a manifestation of high physical, functional and emotional activity of the body of basketball player. For the game, characterized the work of variable intensity with a variety of cyclic motions walking, running, uniform and variable intensity. It is known that the basketball player in the game runs up to 4 miles, with performance of up to 150 accelerations and acyclic movements, stops, turns, jumps, for a total of up to 100 movements associated with fishing and shooting and dribbling, carried out in single combat with opponents that develop agility and coordination. All these features of the movements in basketball require a high anaerobic capacity in conditions of significant lack of oxygen and the development of a large bioenergy potential, as for the game, an athlete can lose up to 2–3 kilograms in weight.

Student age is the time when is most likely to implement sports performance in basketball [humeny V. S., 1; S. S. Yermakov, 2]. The highest results in student age are making basketball players, both in

Kazakhstan and abroad.

The problem of research is that the management of sports training in basketball requires the development of scientifically defensible indicators and the factors determining a potentially promising students – basketball players, able to acquire proficiency in a relatively limited period of a student's years of study at the University.

Modern basketball imposes extremely high requirements on the level of sporting achievements, requires continued improvement in the various forms of work with athletes at all stages of their athletic mastery [Egorychev A. O. et al. 3]. For achievement of high sports result, the underlying importance is the physical fitness level of the student, development of motor qualities (strength, speed, endurance, agility) and statistically significant combination of these qualities in accordance with the characteristics of the sport – basketball.. To solve this problem it is necessary to explore the factors that contribute to the achievement of high results in basketball, and in particular, to determine models for the respective

stages of preparation and to evaluate the influence of levels of General and special physical fitness on the sport performance of students-basketball players.

It is known that exercise is more effective for the expansion of motor skills [Kaefer N. E., Solomeev S. A. Daurenbekov B. Z., 4] if they are used with regard to individual adaptation abilities of the organism, which determined the chosen direction of our research.

This article presents research and scientific study of the question of the influence of the training process subject to the control of the levels of physical training of student basketball teams in 2 mesocycles of speed-power orientation in the annual cycle of training.

The hypothesis of the study. It is expected that when included in the training process of students engaged in basketball, specific exercises speed-power orientation, can affect the development of physical qualities.

The purpose of the research is to investigate the dynamics of development of physical qualities in two mesocycles of the annual cycle to justify the rationality of a technique of development of speed-power qualities of students – basketball players

Objectives of the study:

1. Study of the dynamics of development, maximum speed, speed-strength and coordination qualities, a General and speed endurance basketball players are students in the annual macrocycle under the influence 2 mesocycles containing special exercises speed-strength character.
2. The rationale of rationality methods of development speed-power qualities of students who play basketball under the influence 2 mesocycles of special exercises speed-strength character.

Research methods. To solve the set goals and objectives, we have following methods were used: analysis of literature data, pedagogical observation, testing; method of mathematical statistics.

The results of the research. To implement the hypothesis and aims of the work in the experimental group investigated the effects of special complexes of exercises of speed and power focus on the development of physical qualities of students in the training process in basketball. For the control group training was carried out according to conventional standard program.

In the experimental group, in the first mesocycle, applied a complex of exercises directed on development of certain motor skills lagging muscle groups, and mastering the technique of special strength exercises with squats, jumps with a lightweight neck, work with dumbbells and weights. This complex means of speed-strength training was directed at the formation through the effect on the body exercises a mixed bio-energy intensity, primarily on the speed of a holistic motor skills development and special jumping.

The second mesocycle included the complex effects of the physical culture concentrated on the development of “specialized” physical qualities with emphasis on power training, which was aimed at improving the efficiency of game actions performed in the conditions of active confrontation.

The study of dynamics of development of physical qualities was conducted on 32 basketball players of high qualification (16 in the control and 16 in experimental group). This article presents two series of studies for the experimental group on the impact of the two mesocycles with a basic set of exercises with emphasis on developing speed and power qualities, lactate-anaerobic focus.

Pilot test was carried out every 2 months, after completing the training period a series of exercises of speed-power orientation, which was varied, based on the body's ability to adapt. The original data in the control and the experimental group was received in September 2016.

Subsequent tests were conducted after use of the recommended methodology for the development and improvement of power-speed players in the first microcycle, in November, and the second, in the month of January. The results of the test have been mathematics – statistical processing of finding the average value, percentage indicators of reliability of differences. Comparative analysis of statistical data was conducted between the experimental and control groups.

A study of baseline data on physical preparation at the beginning of the experiment in September 2016 showed that all the parameters of the control and experimental groups had average values of statistically significant differences.

Control of physical fitness in the experimental group of basketball players (table 1, figure 1) after

1 mesocycle 2 months after the start of the experiment (November 2016) showed that players developed complexes of exercises of speed-power orientation was accompanied by a statistically significant increase of all studied traits.

Table 1 – Dynamics of indicators of physical readiness of the two mesocycles of speed-power orientation in the semiannual training cycle of students-basketball players of experimental group

Tests Source	indicators (September)	1st mesocycle (Nov)	2nd mesocycle (January)	1st mesocycle, %	2nd mesocycle, %
Running 20 meters, with	3,58	3,52	3,43	1,78	4,19*
Running 60 m, from	8,19	8,12	8,06	0,85	1,56
Running 20 m with dribbling, with	3,63	3,56	3,48	1,93	4,13*
Move in defensive positions, with	21,57	19,81	19,83	8,16*	8,07*
Long jump, cm	233	239	250	2,56	9,30*
Jump height, cm	50	54	53	8,0*	6,0*
Shuttle running over 40 m	252	259	267	2,78*	5,95*
The Cooper test, m	2210	2220	2225	0,45	0,67
Serial jumping,	13,05	12,00	11,20	8,05*	14,18*
Throwing the medicine ball, m	8,76	9,06	9,34	5,42*	6,62*

Note- * – significant growth rates in percent

A significant increase of the average data in the test, moving into a protective stance, reflecting the special physical speed and coordination ability, was 1.76 seconds or 8, and 16% (p <0.05); in the jump length of 6 cm or 2.57% (p <0.05); in throwing the medicine ball 0.3 meters or 3.42% (p <0.05); Shuttle run for 40 seconds 7 meters, or 6.7% (p <0.05); in the high jump of 4 cm or 8.0% (p <0.05); serial jumping the 1.05 or 8,05% (p <0.05) and false differences test Cooper – 10 m or 0.45%; in run on 60 m with – s or 0.07 to 0.85%; in run on 20 m with dribbling – 0.07 with or 1.93%.

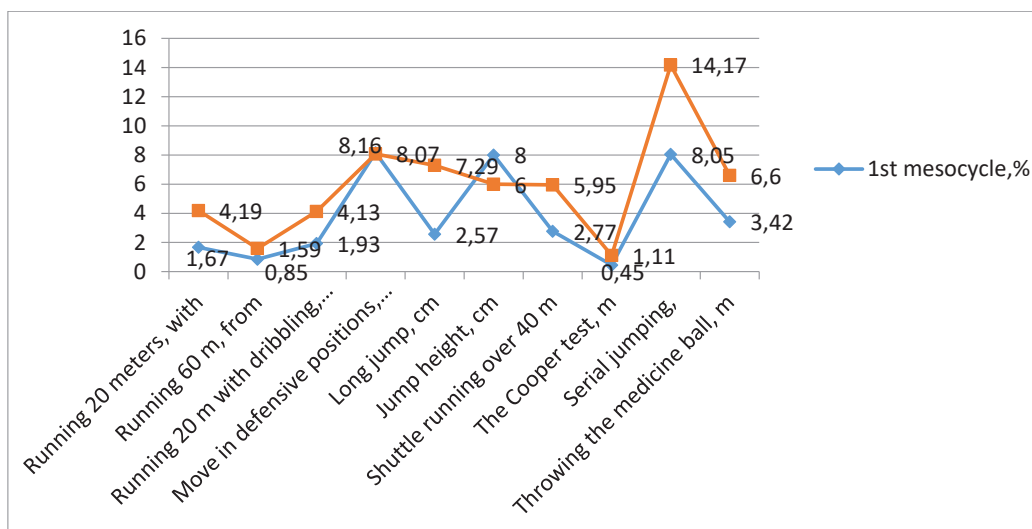


Figure 1 – Percent differences in levels of physical fitness of the students’ basketball players of experimental group after 2 mesocycles of training of speed-power orientation

Thus, after mesocycle 1, in the experimental group, using a combination of technical – tactical exercises with speed and strength training led to more significant changes in 50% of studied parameters particle velocity strength training.

After the 2nd mesocycle in the experimental group had improved results in 80% of tests, such as: running on 20m – 0.09 (4.19 percent); run for 20m with dribbling – 0.08 s (4,13%); move into protective stand – by 0.98 C (8,07%); long jump – 9 cm

(7,29%); Shuttle run for 40C – 8m (5,95%); in repetitive jumping by 0.8 C (14,17%) and throwing the medicine ball – 0.28 m (6.6%).

In the control group (table 2, figure 2), after 1 mesocycle during the same periods as that for the experimental group, there was an increase, \ indicators of physical fitness level of speed-power orientation only 50% tests performance: travel time in defensive – 0.68 with an or of 3.52% (p <0.05);

Table 2 – Dynamics of the control group average values of physical fitness in the semi-annual macrocycle preparation of students – basketball players

Tests Sep, source	indicators (September)	1st mesocycle (November)	the 2nd mesocycle (January)
Running 20 meters, with	3,66	3,55	3,54
Running 60 m, from	8,17	8,16	8,17
Running 20 m with dribbling, with	3,75	3,69	3,73
Move in defensive positions, with	21,50	20,82	20,50
Long jump, cm	230	236	240
Jump height, cm	50	52	52
Shuttle running over 40 m	250	255	263
The Cooper test, m	2201	2208	2220
Serial jumping ability, with,	13,00	12,90	11,59
Throwing the medicine ball, m	8,71	9,00	9,26

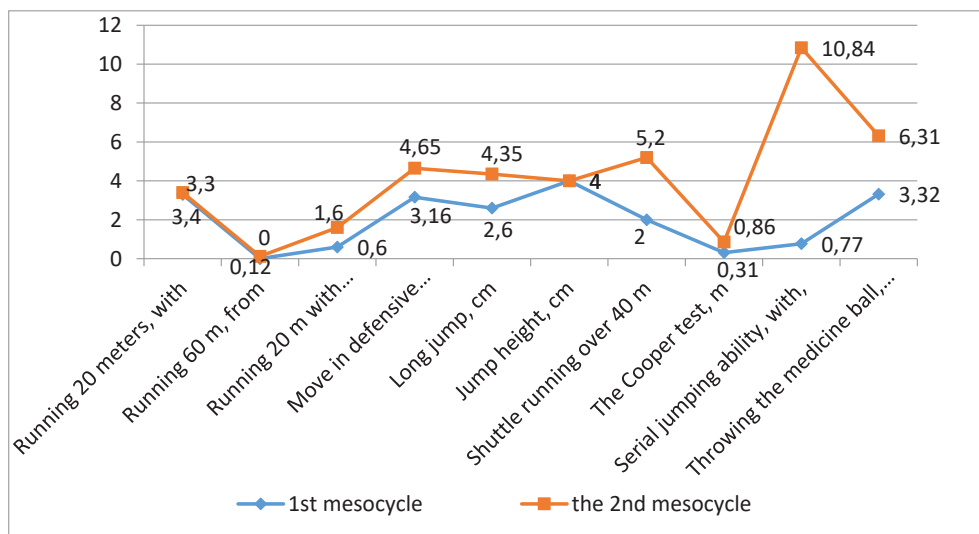


Figure 2 – Percentage differences of the levels of physical fitness of the students' basketball players of the control group

after 2 mesocycles of training of speed-power orientation throwing the medicine ball to 0.29 m, which amounts to 3,31% (p <0.05); in the long jump by 6 cm or 2.57% (p <0.05) and a height of 8.0 percent; Shuttle run – 5 m (6.7 per cent).

indicators were lower in 70% of controlled tests.

At the end of mesocycle 2 a significant increase was observed in the indicators of serial jumping to 10.15% and Shuttle running over 40 3.14% Other

Table 3 presents the percentage changes in the dynamics of the average indices of physical fitness of control and experimental groups in the semi-annual macrocycle preparation of students – basketball players.

Table 3 – Changes in percent of the average indices of physical fitness of control and experimental groups in the semi-annual macrocycle preparation of students – basketball players

Tests	1st meso-cycle%	2nd mesocycle,%	1st mesocycle,%	2nd mesocycle,%
	control group		experimental group	
Running 20 meters, with	3,00	3,00	1,67	4,19*
Running 60 m, from	0,31	0,12	0,85	1,59
Running 20 m with dribbling, with	1,6	-1,08	1,93	4,13*
Move in defensive positions, with	3,16	1,53	8,16	8,07*
Long jump, cm	2,6	1,69	2,57	7,29*
High jump, cm	4,0	0	8,0	6,0
Shuttle running over 40 m	2,0	3,14*	2,77	5,95*
The Cooper test, m	0,31	0,54	0,45	1,11
Serial jumping ability, with,	0,77	10,15*	8,05	14,17*
Throwing the medicine ball, m	3,33	2,69	3,42	6,6*
Note – * increased				

The analysis of the presented data showed that in the control group positive dynamics of growth of indicators identified in 20% of tests and in the experimental group 80% of the tests, which confirms the greater efficiency of the applied exercises of speed and power orientation in comparison with a control series of studies.

Thus, the results of studies of the effectiveness of an improved method revealed a positive effect of experimental training on many of the indicators of physical development of students involved in basketball.

Insights

1. The use of special complexes of exercises of speed-power orientation with alternating volume and intensity in accordance with the specific planning of weekly training cycles, with three sessions per week has led to positive results.

Research conducted after the pilot trainings in 2 training mesocycles showed the greatest increase of speed strength training in the experimental group. Significant increase in speed-strength, coordination scores ranged from 4,13 to 14.17% ($p < 0.05$), 80% of the tests: running at 20 meters, 60 meters and 20

meters with dribbling the ball, when moving into a protective stance, long jump, high jump, Shuttle run 2x40, except for indicators running on Cooper, reflecting the overall speed endurance, and in running on 60m, which was not observed statistically significant changes.

2. The results of the pedagogical experiment proved the effectiveness of used in the experiment methods of speed-strength training of students engaged in basketball, the mid-year macrocycle.

References:

- Egorychev A. O., Pencic B. N., Bondarenko K. A., Smirnova, Y. A. Health students from a position of professionalism // Theory and practice NAT. culture.– 2003.– N2.– P. 53–56.
- Humenny V. S. To the problem of optimization of physical education of students of Polytechnic universities / V. S. humenny // Physical education of students of creative specialties / KSADA (hhpi).– Kharkov, 2002.– N7.– Pp. 63–72.
- Iermakov S. S. Substantiation of pedagogical training shock movements in sports / S. S. Ermakov // Physical education of students of creative specialties / hhpi.– Kharkov, 2001.– N3.– P. 24–29.
- Kaefer N. E., Solomeev S. A. Daurenbekov B. Z. Special training of young basketball players 14–15 years. // Theory and methods of physical culture.– 2015.– No. 2.– S. 91–102.

MORPHOLOGICAL MODEL RELATIVE INDICATORS OF STUDENTS – BASKETBALL PLAYERS IN PRE-CONTEST PERIOD

¹M. Akhmetkarim, ¹Rositza Tzarova, ²L.R. Kudashova,

²N. E. Kefer, ²I. L. Andryushkin

¹ National Sports Academy Vassil Levski, Bulgaria, Sofia

²Kazakh Academy of Sport of Tourism, Kazakhstan, Almaty

Summary. *Training management of basketball players represents an actual and insufficiently developed problem in basketball, which is based on the creation of model characteristics of athletes for each preparation stage. This article explores the model indicators, which typical for the pre-contest period, the elucidation of which allows us to replenish the database about morphological capabilities and reserves of basketball players. The novelty of the research is that the scientific problem of the work was focused on the substantiation of the sports training content of basketball players, the choice of effective means and methods of training, in particular, taking into account the morphological models and their connection with physical preparation of basketball players. The development of model levels of morphological characteristics in the pre-contest period preparation allows us to optimize the training work and search for capable talented athletes who could show the high results. The article describes the application technology of fat and lean body mass evaluation, tests, intended for used to evaluate the effectiveness of basketball techniques and the development of motor education of female students. Absolute and relative components of the body weight of basketball players are established, which have high rate and can be a reliable criterion or determining the morphofunctional status of athletes. The features of constitutional models of female athletes for the pre-contest period are revealed, the knowledge of which helps the trainer to individualize the training process by reference to specific features of constitution.*

Keywords: national team of KazAST, testing, relevant indicators, moving abilities, pre-contest period.

Introduction. The study of the influence of training loads on the growth of sports results, and also, on physical development degree of athletes are caused by the vital requirements of the current level of sporting achievements, in as much as the sports indicator is the eventual result of the manifestation of the motor apparatus function. Numerous scientific data show that in the body of training athletes there are positive morphological changes in response to the impact of physical activity, herewith these changes are specific in nature depending on the type of sport activity.

The question of the influence of intense sports loads on morphofunctional parameters of the basketball body requires the future research for creating a bank of model data for different preparation stages. The study of literary sources showed that the work on the study of morphofunctional structure features of student basketball players of different sports qualifications is not enough, which is an actual problem, restraining the management process

of the basketball players training. The solution of this problem served as the basis for carrying out the present study.

The purpose of the scientific work was aimed to create a database of morphological indicators based on the study of model levels in female basketball students. To solve this purpose, an object of our study this year, was to examine the body weight of students-basketball players of various game role.

Methods and organization of research.

In accordance with the task, research methods were used: biopedagogical (somatometric – anthropometry); pedagogical (observation, response measurement, analytic – quantitative and qualitative analysis, interpretation of findings, drawing conclusions and recommended practices) and statistical.

Anthropometric method determined somatometric signs – the parameters of body measurements of female students engaged in basketball, members

of the national team KazAST by R. Martin classical method 2014.

Body composition calculation of female students was carried out according to

Y. Matejka method 2009.

In assessing the human physical development, great importance is attached to the body quantity of a surface. It is considered, the more this indicator, the better the physical development of the test person. The body surface was determined by the calculation method in terms of total dimensions (length and weight). The body weight was determined at the maximum exposure of a person on a medical balance within the accuracy of 50g in 2–3 hours after a meal.

Total body area was determined from the formula of Izakson:

$$S = 1 + \frac{P + (Z)}{100}, (1)$$

where: S – total body area (V); P – body weight, kg; Z – standing height, cm; Z – (160 + Z) the difference in body height of the test person from 160 cm with a plus or minus sign.

Body composition. As a method of assessing the physical development of basketball players and controlling the training regime in sports morphology, the body composition was determined, which allowed to differentiate the body weight into its separate components: fatty, muscular, bone.

To determine the absolute count of fat component (D), we used the formula of Y. Matejko:

$$D = d * S * k, (2)$$

where: D – absolute body fat mass (kg); S – total body area; k is a constant equal to 1.3, available from experiments; d – mean corpuscular average thickness of subcutis along with the skin, equal to half the sum of seven (in women) or eight (in men) skin fat roll.

To determine the absolute amount of the muscular component of the body weight using the formula:

$$M = L * r^2 * k, (3)$$

where: M – the absolute count of muscular tissue (kg); L is the length of the body (cm); r – the mean value of the radii of the shoulder, forearm, hip, and shin in the places of the greatest amount of musculature, minus the skin-fat layer (cm); k is a constant equal to 6.5.

The absolute amount of bone component in body weight was calculated by the formula:

$$O = L * O^2 * k (4)$$

where: O – absolute mass of bone tissue (kg); L is the length of the body (cm); O² is the mean square diameter of the distal parts of the shoulder, forearm, hip, and lower leg (cm); k is a constant equal to 1,2.

Research results. The researches were conducted on 10 basketball players of the KazAST national team, whose age averaged 21.5 years. Researches were conducted during the preparation for the competition.

Regular physical exercises and sports affect on absolute weight of the body, which can undergo significant changes in the direction of increase or decrease. At the same time, it is of definite scientific interest to know at the expense of which tissue, mainly muscle or fat, the body weight is maintained. In our study, the body weight of female basketball players was studied by Y. Matejka method.

Table 1 presents the absolute and relative parameters of bone, fat and muscle components of body weight in the tested basketball players. These data indicate of stable rate of absolute and relative bone component on average equal to 10.88 and 14.8 percent. The absolute and relative values of the muscular component that have reached a high level of development in athletes have the most pronounced positive changes.

Table 1 – Components indicators of the body weight of female students – the KazAST team basketball players

№	Name	Age, years	Height, cm	Weight, kg	Body surface		Bone component		M u s c l e r component		Fat component	
					A. m2	R,%	A kg	R %	A kg	R %	A kg	R %
		1	2	3	4	5	6	7	8	9	10	11
1	B-na S.	22	177	71,5	1,89	0,026	10,4	14,5	39,37	55,06	5,72	13,0
2	T-ya T.	22	192	81,5	2,14	0,026	11,69	14,34	41,84	51,34	11,26	13,8
3	K-va T.	21	189	69,3	1,98	0,028	11,92	19,13	37,56	54,19	6,72	6,5
4	M-va N.	22	175	67,2	1,82	0,027	10,65	15,84	36,69	54,59	10,5	6,1
5	B-va G.	21	187	87,5	2,14	0,024	12,20	13,94	37,57	42,93	14,62	8,0
6	G-va L.	21	186	84,5	2,10	0,024	10,62	12,56	43,88	51,93	17,59	20,8
7	S h - k o O.	23	177	75,0	1,92	0,025	10,40	13,86	41,97	55,96	11,92	7,4
8	B-va V.	23	185	70,4	1,95	0,027	10,49	14,90	37,63	53,45	6,75	9,6
9	M-ar A.	19	182	73,0	1,95	0,026	10,70	14,65	38,83	53,20	10,14	13,8
10	I-va M.	21	178	65,0	1,83	0,028	9,73	14,97	36,41	56,01	5,54	8,2
\bar{O}		21,5	182,8	74,79	1,972	0,026	10,88	14,87	39,18	52,87	10,08	10,74
% of body weight								19,8		70,7		14,3
r			-0,2	0,6	0,9	-0,2	0,7	0,1	0,3	-0,5	0,3	0,3
r					0,9	-0,9	0,6	-0,6	0,6	-0,8	0,8	0,5

The conducted studies allowed to establish the average values of the absolute level of the muscular component, which amounted to 39.18 kg, and the relative – 52.87%, which averages over half of their body weight 74.49 cm to their body weight. These data indicate a high level of their muscle mass by 13.9%, which is the result from the workout session and reflects a good level of model, providing a basis for physical preparation.

In relation to the two previous components (bone and muscle), the fat component has the greatest lability, as it is the measure of energy resources of the female athlete's body. The fat component in our studies on absolute average data was at the level of 10.08 kg, and in percentage terms was 10.74%, which is below standard for individual fluctuations from 6.5 to 20.8%.

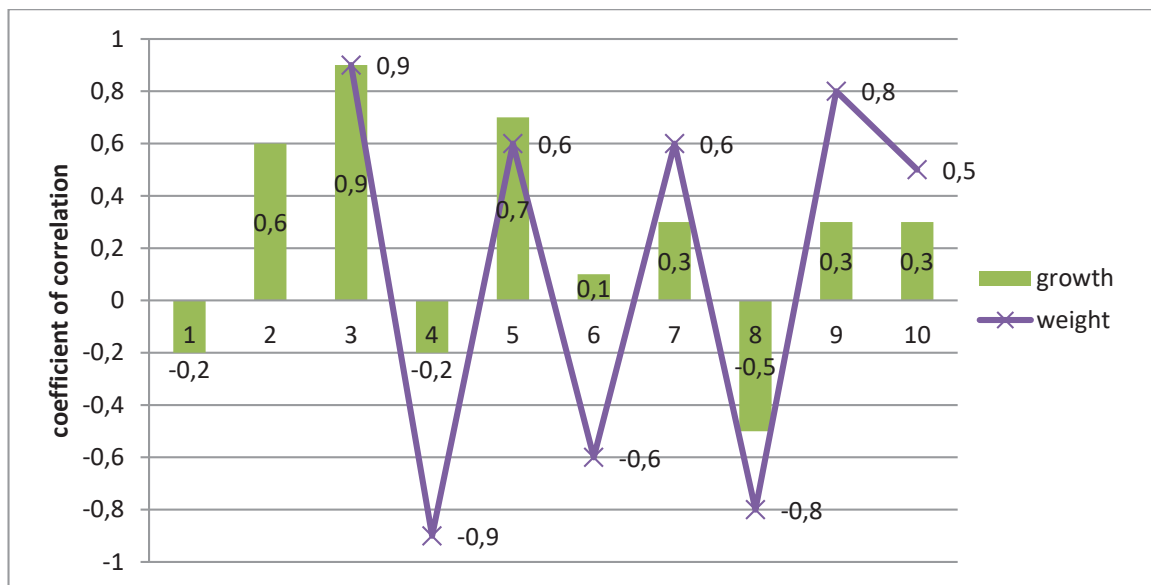
These levels of anthropometric research can serve as a model, for the pre-contest period for coaches of basketball-educated gigantoid physique (asthenic).

Selection of athletes on the components of their physique formed by the training process allows us to specify the tasks and methods of training, to determine the tests for monitoring its results for basketball players of different soma types, and to individualize the training process.

Calculation of the coefficient of correlation between the body mass index and mofofunctional components of the basketball players' body in the pre-contest period of preparation is shown in Picture 1.

The analysis showed that a high positive dependence is characteristic for body weight index and surface parameters with absolute value, and high negative with relative level of the body surface, muscle and fat component. The average positive dependence was found with the relative size of the body surface, bone and fat components.

Growth rates are highly dependent on body weight, body surface component, average negative values are marked with a muscle component.



Note: 1- growth, 2 weight; 3- body surface absolute value, m²; 4- body surface relative value, M²; 5 - , bone component, absolute value kg; 6 – bone component, relative value kg; 7 muscle component, absolute value kg; 8 – muscle component, relative value, kg; 9-fat component, absolute value%, kg; 10 – fatty component, relative value,%;

Figure 1- Indicators of the correlation coefficient between body mass index and morphofunctional components of basketball players' body in the pre-contest period of preparation. In scientific literature it is determined that the basketball players of the Olympic tournament participants in 2000 in Sydney had a relatively large body length, low weight values and a longer length of individual segments compared to age norms, which influenced the high performance of the competition activity. The average growth of basketball players was within 179.0–184.6 cm [9]. In our studies, they approximated by average data to 182.8 cm with fluctuations of 177–192 cm. The constitutional structure features of the body of young basketball players in our studies can be considered optimal.

Conclusions:

Absolute and relative components of the body weight of KazAST team basketball players have high model indicators for the pre-contest period and can be a reliable measure for their use in the selection of athletes in team.

Models knowledge of athletes' constitutional features will help to individualize the training process, taking into account the constitution.

References:

D.I. Nesterovsky: Basketball. Theory and methods of teaching. – Moscow: Academy, 2008.

D. Wooden. Modern basketball. – M: Physical Culture and Sports, 2006. – 256p.

V.M. Zatsiorsky. To the theoretical substantiation modern methods of training the speed movements // Theory and practice of physical culture. – 1987. – № 6. – P. 23–27

B.Z. Zaurenbekov, L.R. Kudasheva, N.E. Kefer Analysis of special endurance of basketball players of various qualifications at the beginning of the preparatory period // Theory and Methods of Physical Culture. – 2017 № 1 (47) C. 96–103.

E. G. Martirosov. Methods of research in sports anthropology / E. G. Martirosov. – M.: Physical Culture and Sports, 1982. – 199 p.

Sports morphology: Textbook / [G. D. Aleksanyants, V. V. Abushkevich, D. B. Tlekhas, and others). – M.: Soviet Sport, 2005. – 92 p.

Tests in sports practice / H. Bube, H. Fack, H. Stubler, F. Trogsh. – M.: Physical Culture and Sports, 1968. – 239 p.

L.P. Sergienko Sports metrology: theory and practical aspects: Pidruchnik /L.P. Sergienko. – K.: KNT, 2010. – 776 c.

T. Khutsinsky. Sports training of female basketball players in the aspect of gendered dimorphism. Author's abstract. PhD in Pedagogy – St. Petersburg, 2004. – 16s.

FORMATION OF THE CULTURE OF INTERNATIONAL COMMUNICATION OF PHD DOCTORS OF THE SPECIALTY “PHYSICAL CULTURE AND SPORTS”

R. Dyussupova, L. Kudashova, Zh. Dyussupova
Kazakh Academy of Sport and Tourism

Annotation. *The article gives an analysis of the expediency of the inclusion of the discipline “Pedagogical foundations of the culture of international communication” in the compulsory component of the educational program of the doctorate of the specialty “Physical Culture and Sport”. The actual competences acquired by doctoral students have been developed, examined and scientifically substantiated. The issues are discussed on the subject and content of the training curriculum, which are necessary for the preparation of doctoral students in this case, which enable them to manage problems and make decisions that arise in the formation of a culture of international communication. The introduction of this discipline makes it possible to expand the abilities and skills of using pedagogical bases of the culture of international communication in the process of professional activity by doctoral students.*

The purpose. *To scientifically justify the necessity of introducing the specialty 6D010800 – “Physical Culture and Sport” discipline “Pedagogical bases of the culture of international communication” into the compulsory component cycle of the educational program for PhD students to improve the competencies of doctoral students in solving problems of international communication in the specialty “Physical Culture and Sport” in Kazakhstan.*

Methodology. *Analysis and systematization of scientific and methodological literature, state standards of postgraduate education, development of the content of the curriculum, approbation of the developed program and content of the discipline, generalization of pedagogical experience.*

Results. *The design of the educational technology of discipline was based on the principles of the problem modular content of the educational process; transition from educational activity to an independent scientific-cognitive and research. The study of the course “Pedagogical foundations of the culture of international communication” contributes to the formation of the following key competencies for the doctoral candidate: to have knowledge and practical skills in the discipline “Pedagogical bases of the culture of international communication”; be able to set and solve problems, to make non-standard decisions; to study, to plan, to model, to regulate and organize the activity of students; to apply multimedia and Internet technologies in teaching and coaching activities in the culture of international communication. Subject competencies presuppose knowledge of the basic principles and laws of the theory of the culture of international communication; knowledge of the national diversity of cultures in the modern world; the ability in practice to apply the knowledge gained about the culture of international communication. Special competencies include the knowledge, skills and skills of applying theoretical knowledge in professional activities; the ability to find non-standard and alternative solutions in the event of problems on the issues of the culture of international communication; willingness to apply pedagogical methods and technologies for scientifically based formation of a culture of international communication.*

Key words: culture of international communication, culture of international communication in the field of physical culture and sport, doctorate of the specialty “Physical culture and sport”, competences of doctoral students.

Introduction. At the present stage of the development of education in Kazakhstan, a special role is assigned to the training of highly qualified specialists, which is ensured by training on the basis of awarding a state and targeted grant to doctoral studies at higher educational institutions of the Republic of Kazakhstan in the specialty “Physical Culture and Sports”.

There are several directions in the literature in interpreting the essence of the culture of international communication. Firstly, the culture of international communication was reflected at the level of ethical problems, where it is viewed through the correlation of categories and laws of this discipline. Secondly, the culture of international communication is viewed from the point of view of the specifics of the values that make up its composition. In

this direction, the main attention is drawn to such issues as the development of subjects of international communication. And, thirdly, the culture of international communication is studied as an integral part of political culture.

Special attention should be paid to the point of view on the problems of international nature and the formation of a culture of international communication among such scientists as Dzhunusov MS, Likhachev DS, Abdulatipov RG and others, who devoted most of their scientific work to these problems.

Dzhunusov M. S. [1] argued that national cultures, distinct in nature, constitute a world civilization, while all nations are equal carriers of universal human values. World culture cannot be full if it lacks the “sound” of the culture of representatives of all nations and nationalities, and at the same time, the mutual influence, interaction and mutual enrichment of unique national cultures form the essence of world culture.

Abdulatipov RG [2] considering the problems in the field of national and international relations, believes that every person, regardless of belonging to one or another nationality, has the right to freely study his language, develop a national culture, obtain full information about it, and assert its identity. The concept of national relations, according to the author, is based on two principles: parity of all nationalities and partnership, cooperation.

The need to study his own national culture was considered in his works by D. Likhachev. [3], who said that only the knowledge of one’s own culture makes it possible to respect a different culture, to accept and recognize the existence of different cultures.

In the literature there is the use of this category in a wide and narrow significance. In a wide significance the culture of international communication means: first, the development of people’s understanding, assessment of national and international processes from the dialectical positions; secondly, scientific management, regulation of national and international relations; thirdly, the formation of an internationalist consciousness in each individual, a feeling of friendship among peoples. In a narrow sense, the culture of international communication is considered in more detail and is defined as the

ability of the individual to behave in interpersonal contact with people of different nationalities, showing respect for language, life, and traditions.

In recent years, there has been a tendency to study the culture of international communication through the prism of solving the didactic tasks of various disciplines, as well as in the educational process both in the general education school and in higher education institutions, and an attempt to explore the content side of this phenomenon

In general, the scientific literature covers the theoretical prerequisites for studying this phenomenon, and methodological approaches to the solution of the phenomenon are determined.

The introduction of the discipline “Pedagogical foundations of the culture of international communication” is aimed at raising the level of theoretical and practical mastering of doctoral students with knowledge, skills and abilities in the field of formation of intercultural and international interaction; analysis of the system of knowledge about trends and directions of socio-cultural development; mastering knowledge about the cultural and ethnic specifics of the peoples living in the republic; mastering the methods of managing the culture of international communication in classrooms.

The objectives of the discipline course are mastering the doctoral students in the basics of the theory of the culture of international communication; system of knowledge about trends and directions of personality development within the framework of knowledge of culture, history of native people and peoples of the Republic of Kazakhstan; pedagogy of international communication.

Formation of competencies of doctoral students occurs in the study of pedagogical technologies on international interaction and intercultural communication in social and professional activities; analysis of patterns of development of national culture; interpersonal relationships between people of different nationalities; assessment of cultural, confessional and ethnic specifics on the example of the native culture and cultures of the peoples of Kazakhstan, which is reflected in the following modules:

module 1. Theoretical and methodological ap-

proaches to the study of the culture of international communication, which address issues of the history of the problem, the formation of a culture of international communication and international harmony in the sport, modern approaches to the content of the culture of international communication, methods of pedagogical research;

module 2. The culture of international communication as a pedagogical problem includes the study of such topics as priority areas of modern education in the formation of a culture of international communication, pedagogical technologies for the formation of the culture of international communication, physical culture and the sport as a factor in the formation of a culture of international communication, the role of the physical education teacher in shaping the school culture, the basis of cultural communication and primary value orientations in school and higher education, the interaction of teachers and parents in education of the culture of international communication.

Particular attention is paid to the study by doctoral students of the methods of scientific research, which reflect the real situation on the problem of the culture of international communication, which contributes to the formation of research competence.

In the process of studying the discipline, doctoral students consolidate knowledge of the diversity of cultures in the modern world; expand the range of theoretical knowledge in the sphere of international communication; acquire practical skills in the use of active means, in the process of interpersonal communication, in socio-cultural situations and their solutions; form practical skills and ability to regulate the situation in society in accordance with the national, multinational and multicultural problem in the region and the country.

Discipline reflects the integration of special knowledge and skills, adequate actions and actions, manifested in interpersonal contacts and interactions of representatives of different nationalities, allowing them quickly and without any problems to achieve mutual understanding and harmony in the common interest.

Pedagogy of international communication as an obligatory university academic discipline entered

the Russian State Educational Standard of Higher Professional Education [4], on the basis of which a curriculum and teaching aids were developed. The pedagogy of international communication has become an institutional component of the state pedagogical policy. For example, in Rostov-on-Don city the course "Culture of international communication" was introduced, in the program of Tomsk State University – the course "Pedagogy of international communication in the context of pedagogical sciences", it is proposed to build a technology for implementing the culture of international communication by introducing the discipline "Psychology and pedagogy of international communication". The introduction of these courses in the education system of the Russian Federation testifies to the availability of the developed scientific and methodological support of the culture of international communication problem.

To clarify the level of international relations, a questionnaire was conducted for students of the specialty "Physical Culture and Sport", which showed that insufficient attention is paid to the process of formation of a culture of international communication in higher education, as evidenced by the answers of respondents who feel negative attitude of others due to nationality up to 12.4%).

The results of the questionnaire with the 1st year students (18–23) of the specialty "Physical Culture and Sport" revealed the following problems: 75.6% of students show friendly and trusting attitudes toward representatives of other nationalities, 19.2% noted that they characterize relations as "Neutral", 5.2% believe that they had a hostile attitude towards themselves and others because of their nationality. At the same time, with participation in sports competitions with a representative of a different nationality, 69.8% of athletes are well-wishers, 8.2% of respondents said that nationality does not matter, 22.0% consider it the main achievement of victory. At the same time, 83.4% of students believe that sports contribute to the development of friendliness and respect for representatives of another nationality; 100% of respondents confirmed the need to know their native language; At the same time, 8.5% do not consider it necessary to study the state language, because they do not plan to live in Kazakhstan; 78% of students recognize the need to learn English as an international language, but do not plan to study it in the near future; 13.5% do not

consider it necessary to study nonnative language, linking their future with work in a mono-national environment.

Identified doubts of respondents confirm the necessity of conducting educational work in higher educational institutions to cultivate a respectful attitude of ethnocultural tolerance and understanding the value of each language and each culture.

Taking into account the obtained results will allow expanding the skills and skills of using doctoral the pedagogical bases of management of problems of international communication in the university and in the field of physical culture and sports.

Conclusion.

The questionnaire survey showed the relevance of the culture of international communication problem and the lack of formation in a significant part of the students of the correct social orientation towards this issue, which indicates the need to raise the educational level of curators and advisors to such a sensitive sphere of human relations, with

cultivating respect for ethno-cultures and understanding the value of each individual, each language and of each culture, which can be realized as a special training in the culture of international communication through this discipline, as for undergraduates, and doctoral students in the sphere of "Physical Culture and Sport".

Given the urgency of the problem at the present stage of development of Kazakhstan society, we consider it necessary to introduce this course "Pedagogical foundations of the culture of international communication" in the cycle of compulsory PhD studies of all specialties.

Literature

- Dzhunusov M. S. On the measure of the identity of national cultures // Sociological research – 2002 – № 5 – p. 125–127.
- Abdulatipov R. It is not necessary to establish ethnic dictatorship // <http://svpressa.ru>
- Likhachev D. S. Memory overcomes time // Our heritage – 1988. – Volume I – p.1–4.
- Russian State Educational Standard of Higher Professional Education. Federal Law "On Higher and Post-Graduate Professional Education" // <http://www.electorat.info/encyclopedia>.

COMPARATIVE ANALYSIS OF THE PHYSICAL DEVELOPMENT AND SPECIFIC EFFICIENCY OF STUDENTS-BASKETBALL PLAYERS FROM TURKEY

Ilkay Yazarer, Mariana Borukova, Asya Tsarova

Key words: students, dispersion analysis, basketball, university sports

Introduction

The universities in the Republic of Turkey which provide physical education and sport usually contribute to the development of the sport and public health in the country. In order to prepare specialists in this sphere the young students are given academic and pedagogical information so that they can gain the necessary skills (Yazarer, I., 2016).

The improvement of the education-training process of the groups of students from the different sports disciplines is closely related to the study of the peculiarities of the various motor activities. It is necessary that research be done constantly and the major factors and trends of this development be revealed, which is an objective premise for deeper understanding of the phenomenon and aims at improving young people's preparation and increasing the effectiveness of the training (Tzarova, A., L. Petrov, 2011).

At the universities, both in the Republic of Bulgaria and the Republic of Turkey, the sports disciplines (basketball in particular) are an excellent way of influencing students' physical development and physical capacity (Kasabova, L., A. Dimitrov, (2003), Kostov, K., Z. Zlathev, (2005), Nikolov, R., S. Tzankova, (2004), Tzarova, A. (2012), Yazarer, I. (2016).

Basketball is one of the most preferred sports among students and this makes it an object of a number of studies.

Abbas Bakurdju (2012) finds out that the plyometric exercises are efficient when applied in the development of the dynamic strength of the lower limbs in the weekly training program. They are considered to be efficient also in determining the intensity of the maximal load.

Fatih Okur et al. (2013) survey the relation be-

tween high jump and the teams' ranking. He determines that the winner's results from the high jump are higher than those of the other teams. The measurements of the last team in the ranking are lower in comparison with those of the other teams. The individual analysis of the players shows that basketball players who can jump higher do this on the basketball court as well.

In their research Sibel Tetik et al. (2012) want to establish whether the values of the anaerobic strength influence the amateur teams' ranking in the league.

Aliye Manevesh (2012) studies the anaerobic strength of basketball players depending on their position on the court – point guards, centers and forwards. The research was done among basketball players from university teams with over 5 years of experience. The anaerobic strength was evaluated through the participants' high jump measurements. The results show that there is a difference in the values of the high jump and anaerobic strength among point guards, shooting guards and centers.

Hamsa Kyuchuk et al. (2012) make a comparison of the physical capacity of the basketball players again in relation to their position in play. The aim of the research is to compare the bio-motor qualities of athletes and their position in play.

A comparison of physiological and anthropometrical values of university basketball and football teams was made by Shirzat Chogalgil et al. (2002). The results from the measurements show that the values of the body fat in the region of scapula, chest, midaxilla and abdomen of basketball players are higher than those of the football players (respectively $p < 0.01$, $p < 0.001$, $p < 0.05$, $p < 0.001$). Besides, the strength of the lower limbs of football players is greater than that of basketball players ($p < 0.05$).

Revealing the peculiarities of the physical development and sports preparation among students who practice basketball at the universities in the Republic of Turkey will help the improvement of the education process in physical education and sport. The results from the comparison allow for drawing conclusions about the degree of influence of a certain factor (expressed on a nominal or ordinal scale) – in this case this is each group, on the researched indexes.

Methodology of the study

The aim of the research is to reveal the peculiarities of the physical development, physical preparation and the specific technical-tactical training of the students who practice basketball.

Subject of the research is the physical development and specific efficiency of the students-basketball players from the universities of the Republic of Turkey.

Object of the research is the symptoms of physical development, special physical and specific technical-tactical preparation of the students from the universities in Turkey who practice basketball.

The research was done among 69 students from 5 Turkish universities where basketball is practiced.

In order to fulfill the aim and the tasks of the research, we applied the following methods: *comprehensive study and theoretical analysis of the specialized literature, anthropometrics, and sports-pedagogical testing.*

The tests used were separated in 3 groups:

- for physical development – 9 indexes;
- for special physical preparation – 7 indexes;
- for specific technical-tactical training – 8 indexes.

To do the research we used the following **statistical methods**: *variation analysis, single-factor dispersion analysis and index method.*

It is known that due to the representativeness of the samples, the decisions taken when verifying the statistical hypotheses are of probable character [2]. The acceptance or rejection of the zero hypotheses is made at a certain level of security; at the same time, a statistical error is admissible.

After the applied variation analysis there are no deviations from the normal distribution of all indexes, as regards both asymmetry (As) and excess (Ex).

In order to check the zero hypotheses about the significance of the observed differences between the mean levels of the researched indexes in the different samples (student basketball teams from different universities in the Republic of Turkey), we applied single-factor dispersion analysis. We calculated the F-criterion of Fisher at high level of statistical reliability ($Pt \geq 95\%$). The results from the comparison allow for making conclusions about the degree of influence of a certain factor (expressed on a nominal or ordinal scale) – in this case this is each group, on the researched indexes.

The first step when using the single-factor dispersion analysis is connected with determining the number and character of the so called inner-group and inter-group dispersions along each index at the same degree of freedom, respectively $\kappa_1 = m - 1$ (where m is the number of researched samples) and $\kappa_2 = n - m$, on which base we calculated the values of F- criterion of Fisher and the corresponding levels of significance α and $P_{(F)}$.

The dispersion criteria, which we obtained when we compared the researched indexes, are shown in **Table 1.**

The analysis of the results shows that the calculated values for F-criterion of Fisher (F_{emp}) are higher than the critical value with most of the indexes ($F_{tabl} = 2.52$). This enables us to reject with high guarantee probability the zero hypotheses for these indexes and to accept the alternative hypotheses according to which the observed differences between the mean values of the researched indexes of the different teams are significant. This fact is confirmed by the level of significance α , which is below 0.05.

Table 1.

Dispersion criteria ($F_{tabl} = 2,52$)

Nº	Indexes	$F_{(emp)}$	Sig.	$P_{(F)}$
1.	Height	2,314	0,067	93,00
2.	Weight	3,171	0,019	98,00
3.	BMI (body mass index)	2,692	0,039	96,00
4.	Horizontal stretch	2,193	0,08	92,00
5.	Length of upper limb	22,621	0	100,00
6.	Length of lower limb	7,309	0	100,00
7.	Length of palm	4,762	0,002	100,00
8.	Length of foot	4,456	0,003	100,00
9.	Breathing difference	2,663	0,04	96,00
10.	Sprint 20 m	3,056	0,023	97,70
11.	Running between stands	10,066	0	100,00
12.	Vertical jump off	1,842	0,132	86,80
13.	Triple jump	2,524	0,049	95,10
14.	Throwing compact ball – backwards	2,824	0,032	96,80
15.	Sit-ups	3,974	0,006	99,40
16.	Shuttle running	2,016	0,103	89,70

17.	Eights with dribble	5,033	0,001	99,99
18.	Dribbling between hurdles	5,562	0,001	99,00
19.	Index of dribbling	1,931	0,116	88,40
20.	Moving in defence	5,398	0,001	99,00
21.	Shooting in motion – t	0,377	0,824	27,60
22.	Shooting in motion – coefficient	0,602	0,663	34,00
23.	Shooting from pass –% successful	3,217	0,018	99,20
24.	Free throws –% successful	12,842	0	100

As seen in Table 1, seven of the indexes here are an exception. The values of F range between 0.377 (in index 21 – shooting in motion – t) and 2.314 (in index 1 – height). And α is between 0.824 and 0.067.

This enables us to accept with high guarantee probability ($P_f \leq 95\%$) the zero hypotheses according to which the differences between the mean values of these indexes are not statistically significant and can be explained with fortuitous reasons. Therefore, there are no essential differences between the researched teams as regards:

- ✓ players’ height;
- ✓ horizontal stretch;
- ✓ speed endurance;
- ✓ dribbling at high speed;
- ✓ explosive power of the lower limbs in vertical muscle strain;
- ✓ speed shooting in motion – speed and effectiveness.

There are statistically reliable differences between the groups’ mean levels along all the other indexes.

In order to determine the exact differences between the different samples, we applied the second step of the dispersion analysis which is related to the calculation of the so called Tukey’s Honestly Significant Difference. This allows us to compare each single pair of samples. The number of the possible combinations for every index is calculated with the formula: $A = n(n-1) / 2$. The number of the compared samples is 5; therefore the possible combinations here are 10.

The results from the comparison of the indexes, for which the alternative hypothesis is the valid one, are presented in special matrixes, where the rejection of the zero hypotheses is marked with a star (.).

As an illustration, in the group of the morph-functional indexes in table 2 and table 3, we present the existing differences between the mean values of indexes 5 and 6 (length of upper limb and length of lower limb) of the university teams.

Table 2.

Significant differences in the mean levels – length upper limb (index 5)

university	Amasya	Ataturk	Erciyes	Gaziosmanpasha	Gaziantep
1. Amasya	=====		*	*	*
2. Ataturk	*	=====	*	*	*
3. Erciyes	*	*	=====		
4. Gaziosmanpasha	*	*		=====	
5. Gaziantep	*	*			=====

Table 3.

Significant differences in the mean levels – length lower limb (index 6)

University	Amasya	Ataturk	Erciyes	Gaziosmanpasha	Gaziantep
1. Amasya	=====		*	*	*
2. Ataturk		=====			*
3. Erciyes	*		=====		
4. Gaziosmanpasha	*			=====	
5. Gaziantep	*	*			=====

As an illustration, in the group of indexes of special physical preparation in table 4, we present index 11 (running between hurdles) where there is statistically reliable difference between the university teams.

Таблица 4.

Significant differences in the mean levels – running between stands (index 11)

University	Amasya	Ataturk	Erciyes	Gaziosmanpasha	Gaziantep
1. Amasya	=====	*			*
2. Ataturk	*	=====	*	*	
3. Erciyes		*	=====		*
4. Gaziosmanpasha		*		=====	*
5. Gaziantep	*		*	*	=====

This index provides information about the students' abilities to move down the court fast without a ball. The analysis shows that the universities of Ataturk and Gaziantep significantly surpass the other universities as regards the level of development of this physical quality, but between the two of them there is no reliable difference in the achievements.

The analysis of the results shows that the greatest number of statistically significant differences is observed with the indexes connected with the technical-tactical training.

In *table 5* we illustrate the differences in the achievements along index 17 (eights with dribble).

Table 5.

Significant differences in the mean levels – eights with dribble (index 17)

University	Amasya	Ataturk	Erciyes	Gaziosmanpasha	Gaziantep
1. Amasya	=====				
2. Ataturk		=====	*	*	*
3. Erciyes		*	=====		
4. Gaziosmanpasha		*		=====	
5. Gaziantep		*			=====

The results show that the students from Ataturk significantly surpass all the others as regards their dribbling skills in one spot. There are no statistically significant differences among the other universities.

Conclusions

The analysis of the results and the inferences made in the text allow us to draw the following **conclusions**:

1. There are no exact differences between the mean values of the researched university teams in the Republic of Turkey as regards both physical development and special physical and specific technical-tactical training of the basketball players:

- the students from “Gaziosmanpasha” have the highest level of development of their sped abilities;
- the competitors from “Amasya” have high level of speed when moving down the court without a ball, combined with a constant change in the direction of the movement;
- the boys from “Ataturk” have the highest level of development of the explosive power of lower limbs in vertical muscle strain;
- as regards the level of development of the explosive power of lower limbs in horizontal muscle strain, the differences are in favor of the teams of “Gaziosmanpasha” and “Erciyes”;
- the boys from the teams of “Erciyes” and “Gaziosmanpasha” have the highest level of development of the explosive power of

upper limbs in muscle strain backwards and upwards;

- among the last ones, as regards the level of development of the core muscles, we should include the team of “Gaziantep”.

2. There are no exact differences between the researched teams as regards:

- ✓ players’ height;
- ✓ students’ horizontal stretch;
- ✓ speed endurance;
- ✓ dribble with high speed;
- ✓ explosive power of lower limbs in vertical muscle strain;
- ✓ speed shooting in motion – speed and effectiveness.

Recommendations:

1. The efforts, aimed at increasing the functional capacity of the chest, will influence positively the whole process of sports preparation and will lead to a training-process of higher quality.
2. In the future, special attention should be paid to the preparation of those players who have problems with their dribbling down the court with high speed. In addition, the individual approach should be applied when working for the development of this skill.

Literature

Kasabova, L., A. Dimitrov, (2003). Изменения в някои основни показатели на физическата дееспособност

при студенти, прекъснали редовни занимания по ФВС, "Физическото възпитание и спорта в образователната система", НК – Благоевград/ Changes in some major indexes of physical capacity among students who have dropped their P.E. classes, NK – Blagoevgrad

Kostov, K., Z. Zlatev, (2005). Физическото възпитание във висшите училища – реалност и възможност, С&Н, С., Изв.брой 1./Physical education at universities – reality and possibility, S&N., S. Extra Issue 1.

Mavrudieva, N., Y. Yangos, P. Mavrudiev, (2011). Физическо развитие и дееспособност на студенти от Република Кипър, Кинезиология` 2011, Ай анд Би, В. Т. 233–239 /Physical development and capacity of students from the Republic of Cyprus, Kineziology 2011. I&B, p.233–239.

Nikolov, R., S. Zankova, (2004). Анализ на основните антропометрични показатели на студентите, участващи в заниманията по баскетбол от СА "Д.А. Ценов" – гр. Свищов, С&Н, Изв. брой 2, стр.45–51/Analysis of the main anthropological indexes of the students practicing basketball at University of Svishtov, S&N, extra issue 2, p. 45–51.

Tzarova, A., K. Vasileva.(2006). Оценка на физическото развитие и специфичната работоспособност на отбора по баскетбол на Техническият университет – София, участник в Националната студентска група, С&Н, С., Изв. брой 3стр.108–115/Evaluation of the physical development and specific efficiency of the Technical University basketball team in Sofia, participant in the national students group, S&N, S. extra issue 3, p.108–115.

Tzarova, A. (2012). Влияние на различни видове двигателна активност върху физическата дееспособност на студенти, Дисертационен труд, Велико Търново/Impact of different kinds of physical activities on the physical capacity of the students. Dissertation, Veliko Turnovo.

Tzarova, A., L. Petrov, (2011). Промени във физическото развитие и дееспособност на студенти от ТУ-София, под влияние на специфичните тренировъчни въздействия със средствата на баскетбола, С&Н, С., Изв. брой 2, стр. 186–195/ Changes in the physical development and efficiency of students from the Technical university in Sofia, influenced by specific training with the means of basketball, S&N, S. extra Issue 2, p.186–195.

Bakurdjur, A., Kulunch, F. (2012) Impact of the applied combined trainings during the preparatory period on the achievements of the university basketball team. Journal for research in sport and sports achievements.

Chogalil, Sh., Kischal, F, Bash, M. (2002). Üniversite basketbol ve futbol takımlarının fizyolojik ve antropometrik değerlerinin karşılaştırılması. Spor ve spor araştırmaları dergisi, pages 22–25/ Comparison of physiological and anthropometric values of university basketball and soccer teams. Journal of sports and sports research, pages 22–25.

Kyuchuk, H., Doğan, E., Tashkemtepigil, M. Yalchan (2012). Basketbol oyuncularının başarılarıyla ilgili fiziksel uygunluğun, oynadığı yere göre karşılaştırılması. Spor ve spor araştırmaları dergisi- pages 65–71/ Comparison of physical fitness of basketball players according to their achievements. Sports and Sports Research Journal – pages65–71

Menevesh, A. (2012). Anaerobik gücün oyunun konumuna göre karşılaştırılması. Spor ve spor araştırmaları dergisi, pages 33–37 Comparing anaerobic power according to game position. Journal for research in sport and sports achievements, pages 33–37

Okur, F., Thetic, S., Koch, H., (2013). Basketbolcularda yarış sırasında yüksek atlama ve performans arasındaki bağlantıyı keşfetmek. Spor ve spor araştırmaları dergisi/ Survey of the connection between high jump and competitive performance of basketball players. Journal for research in sport and sports achievements, pages 111–12.

Yazarer, I. (2016). Особености на физическото развитие на студенти-баскетболисти от Република Турция, С &Н бр.5/6 стр. 221–232, С. /Peculiarities of the physical development of students-basketball players from the Republic of Turkey, S&N, issue 5, Sofia, p. 221–232.

Yazarer, I. (2016). Система за контрол на физическото развитие и специфичната работоспособност на студенти-баскетболисти от Република Турция, Дисертационен труд, София/System of control of the physical development and specific efficiency of students-basketball players from the Republic of Turkey, Dissertation, Sofia

Correspondence address:

Chief ass. Mariana Borukova, doctor – NSA

“Basketball, volleyball, handball” dept.

marianaborukova@gmail.bg

1700 Sofia, Studentski grad (Students’ city)

THE INFLUENCE OF FLEXIBILITY ON THE SPECIFIC MOTOR SKILLS IN BOY-SWIMMERS AGED 10–12

Marko Đurović¹, Tomislav Okičić¹, Dejan Madić¹, Milivoj Dopsaj²,

Vassilios Thanopoulos³, Gina Rozi³, Milan Pešić¹, Milomir Trivun⁴

¹Faculty of Sport and Physical Education, University of Nis, Serbia

²Faculty of Sport and Physical Education, University of Belgrade, Serbia

³National and Kapodistrian University of Athens, Department of Aquatics, Athens, Greece

⁴Faculty of Physical Education and Sports, University of East Sarajevo

Summary:

Flexibility is one of the basic motor skills. Flexibility has an impact on the development of swimming skills in young swimmers which can help them achieve maximum results. The aim of this study is to determine the influence of flexibility on the specific motor skills of boy swimmers. Twenty-one boy swimmers (aged 11,1±0,9 years, height 148,8±7,7 cm, weight 39,4±5,6 kg) with two years of competitive experience were tested by using three flexibility variables (Sit and Reach, Shoulder flexibility with yardstick and Arm retroflexion), and three specific motor skills variables (Time on 10 m, Time from 10 to 20 m and Turn time). A regression analysis was used to determine the influence of predictor variables (flexibility skills) on criterion variables (specific motor skills). The results indicated that the system of flexibility variables had a statistically significant influence at the $p = .001$ level, with a multiple correlation coefficient of .77 ($R = .77$), and multiple correlation squared of .59, explaining approximately 59% ($R^2 = 0.59$) of the variance for the criterion variables Turn time. Based on the results, we can conclude that the predictive variable Sit and Reach ($p = .005$) had a statistically significant influence on the criterion variable Turn time.

Key words: swimming, freestyle, time on 10 m, time from 10 to 20m, turn time.

Introduction

Swimming belongs to the group of cyclical sports in which based on the form and manner of performance is dominated by relatively simple movements, which are consistently the same and which alternate when swimming a particular technique (Okičić et al., 2007). The sports techniques include the freestyle, backstroke, breast stroke and butterfly (Madić, Okičić, & Aleksandrović, 2007). The basic aim in sports swimming is rationality which enables an individual to swim a predetermined distance in an economic, steady manner, following straight, using a particular swimming technique (Volčanšek, 1996). The effectiveness of any type of sports activity depends on five basic factors: 1. the proper performance of movement (sports technique); 2. energy abilities; 3. contractile abilities of the muscles; 4. joint mobility and 5. tactics (Milišić, 2003). According to Malacko (1991), the aim of every sports training is the development of anthropological characteristics on which competitive success depends the most in a certain type of sport or discipline. In the case of swimming, competitive success influences morphological characteristics, motor abilities, functional abilities as well as psy-

chological characteristics (Volčanšek, 1996).

Specific motor skills have the greatest connection to sports success, since their structure as well as the intensity of the load is closest to the activities which are performed at competitions. They are acquired and conditioned by the specific nature of the training process of a particular type of sport (Aleksandrović, 2005).

There are a large number of parameters of specific motor skills which can be developed and monitored in swimming, such as: time of the start and turn, absolute duration of the swim, swimming step, tempo of the stroke, swimming only with the hands or only with the legs, etc. (Ahmetović, 1994; Maglischo, 2003). Monitoring the development of specific motor skills is important in the sense of achieving a rational swimming technique. There are many studies in which the authors studied the influence of specific motor skills on swimming results (Jurimae et al., 2007; Latt et al., 2010).

Small children are very flexible, but with time there is a decrease in flexibility. That is why it is impor-

tant to implement exercises for its increase through all the phases of development of young athletes (Bompa, 2005) and so also among young swimmers. In accordance with the aforementioned, from the beginning when young swimmers start taking part in swimming, exercises which are meant to increase flexibility should be a component part of each of their training sessions. The very training in water (active cyclical work which includes alterations between tonus and relaxation during changes in the phase of the stroke, decreased muscle tonus in the horizontal position) leads to an increase in the flexibility of the joints in the shoulder area, pelvis and ankles (Volčanšek, 1996). The influence of flexibility on the results in swimming among young swimmers has been confirmed by Zenić, Antulov & Čavar (2007) and Jorgić, et al. (2010) in their studies.

The aim of this study was to determine the influence of the implemented tests for the evaluation of flexibility on three specifically motor skills in swimming among young boy swimmers.

The method

In this study the sample of participants consisted of 21 swimmers of an average age of 11 ± 6 , who have been training in the swimming club "Nis2005" for at least two years. The average height and weight of the swimmers who participated in this study was 147.2 ± 8.4 cm and 39.2 ± 5.8 kg.

To evaluate flexibility, three tests were used (Okičić, 2007):

- **Sit and Reach** (This test is used to evaluate the flexibility the lower back and hamstring muscles. The participant sits on the

floor with his legs stretched out straight ahead. The feet are placed flat against the sit and reach box (Picture 1.). Both knees should be stretched and pressed flat on the floor. The participant has the goal to reach forward along the measuring line as far as possible. To avoid negative values we rely on Okičić (1999) who suggests there be a distance 20 cm at the level of the feet. Repeat two times, and the best attempt is used for analysis),

- **Shoulder flexibility with yardstick** (This is a shoulder rotation flexibility test. The participant holds a yardstick in front of the body, hands wide apart and palms facing downwards. He lifts the yardstick over his head behind his back, maintaining a hand grip on the object (Picture 2.). He repeats the test protocol, moving the hands closer together each time until the attempt cannot be completed. Repeat two times, and the best attempt is used for analysis),
- **Arm retroflexion** (This test is used to evaluate the flexibility of the muscles of the shoulder belt. The participant stands with his arms straight forward. The invigilator positions a stationary part of the goniometer along the torso so that it follows the middle line of the body while the mobile part follows the movement of the hands of the participant (Picture 3.). The participant has the task to perform as many hand movements backwards as possible in an outstretched position, and without moving the remaining parts of the body. Repeat two times, the best attempt is used for analysis).

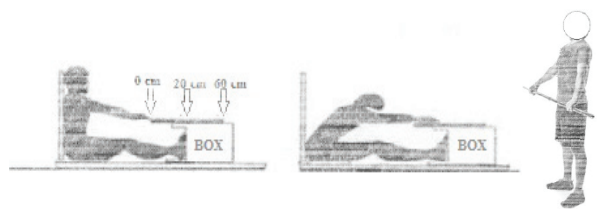


Figure 1.
Sit and Reach test



Figure 2.
Shoulder flexibility with yardstick test



Figure 3.
Arm retroflexion test

And three tests for the evaluation of specific motor abilities (Okičić, 2007):

- **Time to 10 m** (time elapsed from the starting signal until the swimmer's head reaches the 10 m mark, respectively),
- **Time from 10 to 20 m** (time elapsed from the 10 m until the swimmer's head reaches the 20 m mark, respectively),
- **Turn time** (the time needed for the swimmer to swim a distance of five meters prior to performing a turn and a distance of up to five meters after performing a turn).

At distances of 10 and 20 meters from the starting block along the vertical edge of the pool, markers are placed in the form a line of a different color than the color of the edge of the pool. Two invigilators with stopwatches stand by the pool, one at the marker at a distance of 10 meters from the start, and the other at the marker at a distance of 20 meters from the start, hands outstretched above the pool (Picture 4.). When the starter gives the mark, they turn on their stopwatches, and stop them as soon as the head of the swimmers pass an imaginary line at the level of the mark. The swimmers swam 30 m (25 m + 5 m), the test was repeated twice, and the better attempt at the overall swim at a distance of 30m was taken for further analysis (Okičić, 1999).

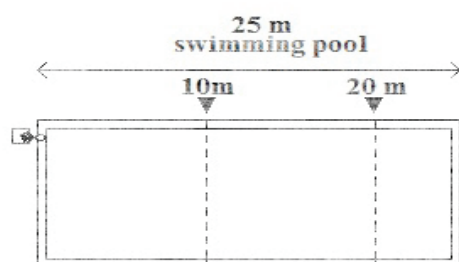


Figure 1. Specific Motor Skills tests

In order to determine the influence of the overall predictor system of variables on the criterion variables, a regression analysis was used, where the following statistical parameters were calculated: the multiple correlation coefficient (R), the coefficient of determination (R^2), the result of the F-test (F) and level of statistical significance (p). In order to determine the influence of each individual variable in the regression analysis, the following was

calculated: the coefficient of the partial correlation (part-r), the correlation coefficient (r), standardized coefficients of a partial regression (Beta), the results of the t-test (t) and statistical significance (p). For the statistical significance, we used a level of significance of 0.05 ($p \leq 0.05$) (Bala, 1990).

Results and discussion

Table 1. Descriptive statistics

Variables	N	Mean	Std. Dev	Min	Max
Sit and Reach (cm)	21	23.00	5.76	13.00	35.00
Shoulder flexibility with yardstick (cm)	21	44.32	16.65	.00	70.00
Arm retroflexion (degrees)	21	18.14	14.25	2.00	62.00
Time to 10 m (s)	21	5.95	.79	4.34	7.35
Time from 10 to 20 m (s)	21	8.04	.95	6.76	10.91
Turn time (s)	21	4.99	.82	3.55	6.59

Legend: N – number of participants, Mean – mean, Std. Dev – standard deviation, Min – minimal result, Max – maximal result

Table 2. Regression analysis of Flexibility and Time to 10 m

R= 0.54, $R^2= 0.29$, F= 2.3, p= 0.111					
	Beta	r	Part-r	t	p-level
Shoulder flexibility with yardstick	.235	0.35	0.20	.821	.423
Sit and Reach	-.437	-0.50	-0.40	-1.788	.092
Arm retroflexion	.023	-0.38	0.02	.072	.944

Table 3. Regression analysis of Flexibility and Time from 10 to 20 m

R= 0.56, $R^2= 0.32$, F= 2.6, p= 0.085					
	Beta	r	Part-r	t	p-level
Shoulder flexibility with yardstick	.271	0.46	0.23	.966	.348
Sit and Reach	-.274	-0.44	-0.27	-1.141	.270
Arm retroflexion	-.148	-0.49	-0.11	-.467	.647

Table 4. Regression analysis of Flexibility and Turn time

R= 0.77, $R^2= 0.59$, F= 8.1, p= 0.001					
	Beta	r	Part-r	t	p-level
Shoulder flexibility with yardstick	-.117	-0.42	-0.13	-.538	.597
Sit and Reach	-.599	0.73	0.61	3.211	.005
Arm retroflexion	.175	0.58	0.17	.709	.488

Table 1. shows the values of basic parameters of descriptive statistics for all the studied variables. The results of the regression analysis in Table 2. and 3. indicate that the entire system of predictor variables for the evaluation of flexibility does not have a statistically significant influence on Time for 10 m ($p= 0.111$) and Time from 10 to 20 m ($p= 0.085$) for the tested group of swimmers. Thus, there is no statistically significant influence of any of the individ-

ually studied variables. However, it might be said that the p value ($p=0.085$) is on the borderline level of statistical significance and it can be concluded that the entire system of predictor variables has an influence on the evaluation of flexibility for Time from 10 to 20 m even though it is not statistically significant. The results of the regression analysis in Table 4. indicate that the entire system of predictor variables used to evaluate flexibility have a statistically significant influence on Turn time for the tested groups of swimmers ($p=0.001$), where the multiple correlation coefficient (R) has a value of 0.8. The coefficient of determination (R^2) has a value of 0.59, which means that the shared variability is explained only by 59%. Studied individually, the statistically significant influence on turn time was determined for the variable Sit and Reach at the level of significance ($p=0.05$). The negative sign, or positive influence of the variable of deep hyperextensions on turn time indicates that in this study the swimmers with a higher value of flexibility in the hip joint have a shorter turn time, that is, that they are able to perform the flip turn more quickly. The Sit and Reach test is valid for the evaluation of flexibility of the lower back and hamstring muscles (Hui & Yuen, 2000). The results of the realized research have confirmed the existing claims that flexibility has a significant influence on the swimming results (Okičić et al., 1996; Zenić et al., 2007; Jorgić et al., 2010). Leko (2001) in his extensive study in which he relied on a great number of anthropometric characteristics and motor skills, a factor analysis, determined that in addition to the dynamometric force, endurance and explosive strength, flexibility as well represents the most important factor of success in swimming for the 50, 100, 200 and 400 freestyle. In addition, Okičić, 1996 concluded that among younger swimmers flexibility of the shoulders, knee and hips has a great influence on swimming results and that it is possible to perform swimmer selection based on the parameter of flexibility. Okičić (2007) determined that flexibility has a relevant influence on swimming technique and other swimming motor skills. Also, flexibility of the hips has a relevant influence on the assessment of the quality swimming techniques (Rađo & Pivač, 1996).

Conclusion

The results obtained by means of a multivariate and univariate regression analysis suggest that boy swimmers who possess a high extent of flexibility

of the hip joint perform the flip turn with much greater efficiency than swimmers with decreased hip joint flexibility. It was also determined that the entire system of flexibility variables (*Sit and Reach, Shoulder flexibility with yardstick and Arm retroflexion*) at the multivariate level has a statistically significant influence on Turn time. We can conclude that younger age boy swimmers, in addition to regular swimming training sessions, should implement flexibility training on dry land so as to achieve the best results possible in swimming.

References

- Ahmetović Z. (1994). *O treningu plivača*. Novi Sad: Zavod za fizičku kulturu Vojvodine.
- Aleksandrović M. (2005). *Struktura i relacije antropološkog statusa vaterpolista i učenika uzrasta 12 godina. Neobjavljena doktorska disertacija*. Skoplje: Fakultetu za fizičku kulturu.
- Bompa, T. (2005). *Cjelokupni trening za mlade pobjednike*. Zagreb: Gandalf
- Hui, S. S., & Yuen, P. Y. (2000). Validity of the modified back-saver sit-and-reach test: a comparison with other protocols. *Medicine and Science in Sports and Exercise*, 32(9), pp. 1655–1659. <https://doi.org/10.1097/00005768-200009000-00021>
- Jorgić B., Okičić T., Aleksandrović M. & Madić D. (2010) Influence of Basic and Specific Motor Abilities on Swimming Results. *Acta Kinesilologica*, 4(2), pp. 73–77.
- Jurimae J., Halljaste K., Cicchela, A., Latt E., Purge P., Leppik A. & Jurimae T. (2007). Analysis of swimming performance from physical, physiological, and biomechanical parameters in young swimmers. *Pediatric Exercise Science*, (19), pp. 70–81.
- Latt E., Jurimae J., Maestu J., Purge P., Ramson R., Halljaste K., Keskinen K.L., Rodriguez F.A. & Jurimae T. (2010). Physiological, biomechanical and anthropometrical predictors of sprint swimming performance in adolescent swimmers. *Journal of Sports Science and Medicine*, 9 (3), pp. 398–404.
- Madić D., Okičić T., Aleksandrović M. (2007). *Plivanje*. Niš: SIA.
- Maglischo E. W. (2003). *Swimming fastest*. Champaign: Human Kinetics.
- Malacko J. & Popović D. (2001). *Metodologija kineziološko antropoloških istraživanja*. Leposavić: Fakultet za fizičku kulturu.
- Milišić, B., (2003). *Upravljanje treningom*. Beograd: SIA.
- Okičić T. (1999). Uticaj treninga plivanja na brzinu kao i na promene nekih dimenzija antropoloških karakteristika plivača mlađih kategorija. *Neobjavljeni Magistarski rad*, Niš: FSFV.
- Okičić T., Ahmetović Z., Madić D., Dopsaj M., Aleksandrović M. (2007). *Plivanje – praktikum*. Niš: SIA.
- Okičić, T. (1996). Uticaj fleksibilnosti na rezultate u plivanju [Influence of flexibility on swimming results]. U N. Živanović (Ur.), *Zbornik radova VI nacionalnog naučnog skupa sa međunarodnim učešćem „FIS komu-*

- nikacije 1995“, (pp. 202–204). Niš: Filozofski fakultet – Serija Fizička kultura.
- Rađo, I., & Pivač, M. (1996). Uticaj bazično-motoričkih sposobnosti na uspešnost u savladavanju sportskih tehnika plivanja [Influence of basic-motor skills on success in sport-swimm techniques achievment]. N. Živanović (Ur.), *Zbornik VI nacionalnog naučnog skupa sa međunarodnim učesćem „FIS komunikacije 1995“*. (155–158). Niš: Filozofski fakultet – Serija Fizička kultura.
- Volčanšek B. (1996). *Sportsko plivanje: plivačke tehnike i antropološka analiza*. Zagreb: Fakultet za fizičku kulturu sveučilišta u Zagrebu.
- Zenić N., Antulov J., & Ćavar M. (2007). Biološka dob kao temeljna antropološka pretpostavka treninga u sportskom plivanju. U: V. Findak (Ur.), *Zbornik radova 16. Letnja škola kineziologa Republike Hrvatske* (str. 270–273). Poreč: Hrvatski kineziološki savez.

CHARACTERISTICS AND ADVANTAGES OF THE EDUCATIONAL AND TRAINING PROCESS IN CHESS OF CHILDREN-TWINS

Veneta Petkova, Sasho Yordanov
National Sports Academy "Vassil Levski"

Abstract

Introduction: *The current level of sport development is characterized by the early involvement of children in intensive training. In this connection, there is a need for a more sophisticated system of early sports selection. The training process with twins at an early age is poorly addressed in the scientific literature, but also allows new opportunities in sports selection and preparation.*

Methodology: *pedagogical experiment, expert evaluation, survey, sports pedagogical testing and mathematical-statistical methods.*

Results and discussion: *Based on the practical results of children-twins practicing chess we might judge, that their genetic conditionality allows optimization of the training process and hence for the improvement of their racing results.*

Conclusions: *The increasing of the popularization of the children and youth chess in Bulgaria is connected with the use of a similar contemporary general methodology.*

Key words: children-twins, chess, educational and training process

The theme of sports training of twins is on the border between psychology and sport. Studies of identical and dizygotic twins were carried out in the early 20th century by Carl von Holzinger. In the 20s and 30s, Alexander Luria, founder of neuropsychology in Russia, has a particular contribution in this area. As Luria emphasizes, selection of assignments is of great importance for the proper conduct of the study, as they should determine both – the volume of memory (considered to be genetically predestined), and the way children organize their memory (socio-cultural factor). (Luria, 1993) Based on the same considerations, for the proper conduct of the tests associated with the chess training process, were used not only assignments, related to the with a direct memorizing of information – theoretical variants, endgame positions, but also those in which twins must use acquired knowledge to solve a job without specifying what kind of knowledge they should use. Based on the assumption, that the family environment, education and habits of the twins are similar, our expectations were for less similarity at to the results of the first type tests – related to the direct memorizing of information, and for a large matching at the results of the second type tests. These assumptions were proven unequivocally.

Examined group of athletes – four pairs of dizygotic twins at the age from 6.5 to 9.5 years at the beginning of the study.

Period of the study – 16 months.

Purpose of the study – identifying similarities and differences in the preparatory and competitive results and developing a proper strategy for the training plan for the surveyed players.

Method of study: sports-pedagogical testing and analysis of racing results based on changes in their individual coefficients. (FIDE rating).

In the course of the study, all pairs of twins were trained identical two by two and took part in the same races (each pair in their age group), were doing the same homework (two by two).

The sports-pedagogical testing was carried at intervals of three months between four separate test groups. A detailed description of this methodology is set out below.

Tests used by **first group:** (mostly related to direct memory of information):

- **Test № 1.** Studying debut for black – Scandinavian defence, Portuguese variation

1.e4 d52.exd5 Nf63.d4 Bg44.f3 [4.Be2 Bxe2 5.Qxe2 Qxd5 6.Nf3 e6 7.0–0 Nc6,,] **4...Bf5 5.c4** [5.Bb5+ Nbd7 6.c4 e6 7.dxe6 Bxe6 8.d5 Bf5 9.Nc3 Bb4 10.Nge2 0–0 11.0–0 Nb6] **5...e6 6.dxe6 Nc6 7.exf7+** [7.Be3 Nb4 8.Na3 Bxe6] **7...Kxf7** (Fig. 1)



Fig. 1

Assignment No 1 from Test No 1
Key position for this variation

8.Be3 Bb4+ 9.Nc3 Re8 10.Kf2 Rxe3 11.Kxe3 Qe7+ +-

Here we point out only one of the debut variants that twins tested during the experiment had to remember. In total they were five – two for white figures and three for black, but due to the limited volume of this material, we only give an illustrative example of the essence of the test.

- **Test No 2.** Theoretical endgame positions: “Philidor position”, a mat with a knight and bishop, mat with couple of bishops, pawn breakthroughs and using a distant pass pawn. Tests used by **second group** (tactical and strategic decisions in unfamiliar positions based on the acquired knowledge and skills in the course of the training).
- **Test No 3.** Tactics – eight assignments per theme “Attack of the king at one-sided castlings. Attack on the lady’s flank. Defense and counterattack.” (Fig. 2)



Fig. 2

Assignment No 1 from Test No 3 White to move

- **Test No 4.** Strategy – eight assignments per theme “Backward pawn at semi-open file. Pass pawn. reserve pass pawn. Mem victim of the pawn. hg – fg. Vanishing move”. (Fig. 3)



Fig. 3

Assignment No 1 from Test No 4
White to move

Fig. 4 shows, that that there is a clear similarity in the results of the second group of tests and a certain difference in those of the first group. Based on these results we can state, that the chess training of the twins, with respect to material related to memorizing of a volume of information, it is preferable not to be held in group. Also, it is not correct to assign identical home assignments of this nature.

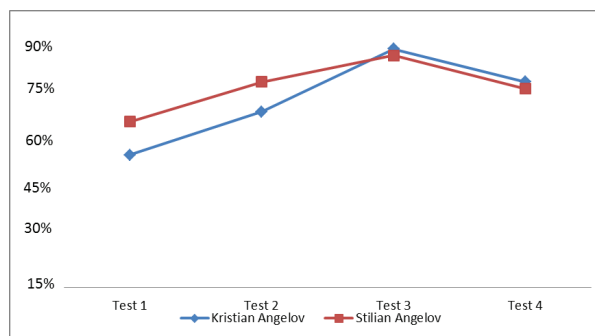


Fig. 4

Results from tests 1–4

As far as the chess preparation related to the formation of a debut repertoire is concerned, these differences should be taken into account. As Lev Vygotski highlights – „the more elementary the motor processes are, the lower the coefficient of similarity will be... and the more complex they are, the more, on equal terms, this ratio will be greater”. (Vaygotskiy, 1983) In our research so far, our results through chess tests have confirmed thesis, which were done in the past, using other method. The conclusions

which we reach regarding methods for chess training, are different from those generally accepted among chess trainers.

Comparative analysis of sports achievements, measured by the change of the twin individual rating, is also interesting.

Period	RTNG	GMS	RTNG	GMS
2017-Aug	1418	13	1540	11
2017-Jul	1287	0	1510	0
2017-Jun	1287	2	1510	5
2017-May	1296	9	1518	9
2017-Apr	1302	0	1431	0
2017-Mar	1302	0	1431	0
2017-Feb	1302	4	1431	4
2017-Jan	1340	0	1451	0
2016-Dec	1340	4	1451	6
2016-Nov	1330	5	1431	7
2016-Oct	1368	9	1400	8
2016-Sep	1330	9	1365	8
2016-Aug	1240	0	1260	0
2016-Jul	1240	3	1260	8
2016-Jun	1270	1	1183	3
2016-May	1297	0	1176	0
Total games	Kristian Angelov	59	Stilian Angelov	69

Fig. 5

Changes in the ratings of the surveyed athletes over a period of 16 months

From Fig. 5 can be seen, that twins trained totally identical and participating in absolutely the same races, not only show very different results, but have a completely different graphic change at their rating. (Fig. 6 and Fig. 7)

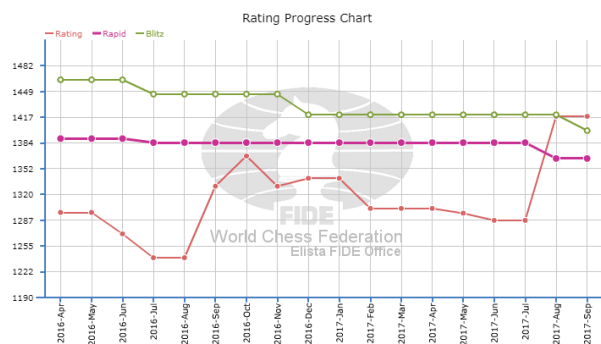


Fig. 6

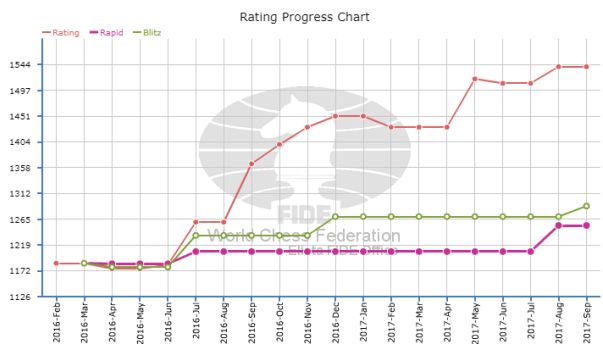


Fig. 7

Kristian Angelov Stilian Angelov

Graphs of the rating changes of surveyed contestants

Similar results were observed in three pairs of examined twins. The following regularity is observed: despite the approximately identical coaching with training material, based on strategic and tactical principles in chess, the differences in the ability to store information (genetically determined) lead to a different end result in both – the tests and the race results.

An interesting example in this respect, is given by Vladimir Issurin in his capital work “Podgotovka sportsmenov XXI veka. Nauchnaye osnovay i postroenie trenirovki”. (Issurin, 2016) He considers the issue of twins as part of a bigger issue of sports training – sports dynasties, the inheritance of sports qualities. One of the examples that illustrates his thesis is about two twin sisters, swimmers. One was a national athlete and the other one – at the time of the research had terminated a few years ago her career, but continues her sporting activities, albeit not professional. The maximum aerobic power in both of them nonetheless has been identical. Here we should note the important difference between chess and other sports, because in twins the similarity of physical predestination is great, but they differ intellectually. The second one is of greater importance for the chess training and therefore it is necessary for the chess-making training process to conform to this feature. The examples that we examine in our dizygotic twins’ study show, that they have a different “chess style”, different preferences for standard middle-game positions. In general, the approach to their training should be the following – they should be treated as different and not as very similar players. Also, from the dynamics of the change in their individual coefficients, we found that their periods of progress and retention in the development differ considerably.

The conclusion that we came to, is that the preparation of twin athletes in chess should not be different from the preparation of other athletes, it should be responsive to their individual characteristics, with the differences in their ability to memorize a certain kind of chess information, and hence their individual plans for preparation after the initial stage of training must be differentiated.

References

Issurin, V. 2016. Podgotovka sportsmenov XXI veka.

Nauchnaye osnovay i postroenie trenirovki. Moskva. (in Russian)

Luria, A. 1993. Etapay proydenogo puti: Nauchnaya avtobiografiya. Chapter 5. Umstvennoe razvitie bliznetsov. Moskva, "Pedagogika-Press" (in Russian)

Rating Progress Chart for Kristian Angelov <https://ratings.fide.com/id.phtml?event=2927209> (registration needed)

Rating Progress Chart for Stilian Angelov <https://ratings.fide.com/id.phtml?event=2927217> (registration needed)

Vaygotskiy, L. 1983. Sobranie sochineniy. Moskva, "Pedagogika", T. 5, page. 781. (in Russian)

ANTHROPOMETRICAL CHARACTERISTICS AND SOMATOTYPE OF YOUNG MACEDONIAN SOCCER PLAYERS AGED 11–18

Zikica Tasevski, Nebojsa Markovski, Serjoza Gontarev
Ss. Cyril and Methodius University

Abstract:

The success of a sports play is closely connected to the physical state of the athletes. In the evaluation of the physical status, aside from the physiological and fitness parameters, the anthropometric parameters have a significant influence. The aim of the study is to evaluate the changes of the anthropometric characteristics and somatotype components of young soccer players aged between 11 and 18.

The introduction discusses some assumptions and expectations. The measurements of 486 young soccer players who play in the teams of the First State League, with an average age of 15.8 ± 1.4 , have been analyzed.

The methodology includes the sample having their height, weight, BMI index, diameter, size and skin folds measured, as well as their body composition and somatotype. The results show that the 14-year-old boys were shorter and had weighed less than the rest of the age groups. The 16-year-olds and older ones had no differences in the measurements, which means that the participants slowly grow into what the older soccer players look like. All of the skin folds of the young Macedonian soccer players (except for the skin folds of the scapula) lessen as the players grow older. Another point that is discussed is the mesomorphic component that is dominant for the young players of every age group.

It can be concluded that the results can be used as a model for comparison of the anthropometric and somatotype data of the young players on a similar level in different countries.

The discussion can serve as normative anthropometric markers for regular sports medical check-ups of the young soccer players in our country.

Key words: soccer, performance, measures, growth, age

Introduction

Soccer has been the most popular sport in the world for more than twelve years, regardless of whether it is viewed from the aspect of the number of spectators or from the number of active sports players. During that whole period, soccer has been continuously developing, especially in the direction of increasing the physical demands and loads which soccer players are exposed to during the training sessions or matches. In contemporary soccer, there is a faster game, shorter time for reaction, less thinking, and more demands placed, combined with highly developed cognitive, functional, and of course, motor skills (Marković, Bradić, 2008).

Anthropometry is widely used in many scientific disciplines, such as ergonomics and health-related sciences. Due to its practical use, anthropometry is also used for understanding the physical characteristics (performances) of sports people in the field of sports science, which targets the improvement of one's athletic performance (Meszaros et al., 2000).

The assumption that anthropometrical characteristics affect the physical performance of soccer players has been proven in many types of research (Bell, Rhodes, 1975). The reported results provide evidence for sports officials (coaches, managers) as well as for soccer players about the importance of anthropometry (ACSM, 2009).

It is expected from the soccer players to possess certain morphological and physiological attributes in order to be continuously successful in their career. A significant correlation among the body mass, muscle mass, and work-rate profile has been established (Rienzi et al., 2000). Conducted research among young soccer players shows that age and physical characteristics are important indicators for identifying talented players and selecting them for a game (Gil et al., 2007). Besides the recognition of the importance of anthropometrical parameters in the process of selection and training of the soccer players, there are deficiencies regarding the precise and accurately published informa-

tion about the anthropometrical characteristics of athletes, especially young soccer players in the national league of our country. There is also a lack of comparative studies of anthropometrical characteristics, body composition and somatotypes between the Macedonian athletes and the athletes of other countries.

The aim of this paper is to determine the differences in some anthropometrical characteristics and somatotype components among the young soccer players between the ages of 11 and 18. The results from this research can provide useful information for sport experts in order to create a successful training model for their soccer players and to identify young talented players.

Methods

Subjects:

The sample consists of 486 young soccer players, who play in the best clubs in the Macedonian first league, between the ages of 14 and 18, with an average age of 15.8 ± 1.4 years. The sample is divided into five different age groups: 14 years ($n = 111$); 15 years ($n = 111$); 16 years ($n = 100$); 17 years ($n = 88$); 18 years ($n = 78$). This study includes all the soccer players whose parents have agreed to participate in the research. The respondents were treated in accordance with the Helsinki Declaration.

Protocols and equipment:

All the measurements were carried out by senior experts, trainers and experienced technicians. Height and body weight was measured using a ste-

nometer (Seca, Leicester, UK) and electronic scales (HD-351, Tanita, Illinois, USA). The cutters were measured with auxiliary John Bull calipers. The volumes were measured with standard elastic mercury tape, as long as the diameters use a hexagonal hexagon (GPMc). Apart from height and weight, the following anthropometric measures were measured for calculating the somatotype components: biceps girth, calf girth, femoris breadth, humeral breadth, triceps skinfold, subscapular skinfold, supraspinale skinfold, and calf skinfold. Somatotype components (endomorph-mesomorph-ectomorph) were calculated in accordance with the Carter and Heath method (1990), using the somatotype software (Somatotype V.1_2_5).

Statistical methods:

The data were analyzed using the Statistical Package for Social Sciences software (SPSS, v. 22.0 for WINDOWS; SPSS Inc., Chicago, IL, USA), and values of $p < 0.05$ were considered statistically significant. Individual age groups were evaluated using a one-way analysis of the variance (ANOVA). Scheffé's test was used as a post-hoc test when equal variances were assumed and the Games-Howell test when equal variances could not be assumed.

Results

The 14-year-old players are shorter and have lower body weight in comparison to other age groups ($p < 0.001$). Their BMI index is also the lowest (Table 1). The weight of the 15-year-old players is lower in comparison to other players at the age of 17 and 18 ($p < 0.05$) and their BMI index is significantly statistically lower than the players aged 18 ($p < 0.01$).

Table 1. Weight (kg), height (cm) and BMI. The values are shown as the mean \pm standard deviation.

Age group (years)					
	14	15	16	17	18
Soccerplayers					
Height	170,648,05 \pm ^a	174,986,14 \pm ^b	176,386,77 \pm	175,996,74 \pm	177,086,46 \pm [*]
Weight	60,0510,89 \pm ^a	65,538,16 \pm ^b	68,707,51 \pm	69,657,78 \pm	70,087,46 \pm [*]
BMI	20,133,69 \pm ^{a*}	21,372,12 \pm ^c	21,852,92 \pm	22,182,92 \pm	22,311,66 \pm [*]

Differences between soccerplayers^a – 14 years vs. 15, 16, 17 and 18-year-old groups, $p < 0.00$; ^b – 15 years vs. 17 and 18 years, $p < 0.05$; ^c – 15 years vs. 18 years, $p < 0.01$.

Table 2 shows the average values of ectomorphy, mesomorphy and endomorphy components. In all of the age groups, the mesomorphy component of the somatotype is dominant. Among the youngest players the average values of the ectomorphy component are

statistically and significantly higher in comparison to the players of all the other age groups ($p < 0.05$). Players at the age of 15 have statistically and significantly higher values of the ectomorphy components in comparison to players at the age of 17 ($p < 0.05$).

Table 2. Scores (mean \pm standard deviation) of the three components of the somatotype of soccer players by age

Age group (years)	14	15	16	17	18
Soccer players					
Endomorphic	2,740,94 \pm *	2,630,88 \pm *	2,580,75 \pm *	2,540,72 \pm *	2,440,72 \pm *
Mesomorphic	4,371,18 \pm *	4,381,10 \pm *	4,761,13 \pm *	4,761,10 \pm *	4,681,08 \pm *
Ectomorphic	3,481,15 \pm ^a	3,281,05 \pm ^b	3,010,99 \pm	2,780,81 \pm	2,910,85 \pm

Differences between soccerplayers^a – 14 years vs. 15, 16, 17 and 18-year-old groups $p < 0.05$; ^b – 15 years vs. 17-year-old groups $p < 0.05$.

Discussion

There is a large body of research which explores the anthropometrical characteristics and somatotypes among the top soccer players, as well as comparative research among the elite and non-elite players. The advantage of this study is that the anthropometrical measurements are conducted among the relatively great samples of young elite players in R. Macedonia from the best clubs of the first Macedonian league. The results of this research can serve as normative values for comparing the anthropometric and somatotypic data of young soccer players in our country and abroad.

The results of this study suggest that players at the age of 14 years, compared to all other age groups (15 to 18-year-olds), have lower body height and weight BMI index. Based on this, it can be concluded that boys aged 14 and 15 did not complete their growth process. From 16 years onwards, the progression of height decreases, which suggests that these players gradually reach the height and weight. The average height of Macedonian adult soccer players (over 20 years) is 178 cm, while the weight ranges from 72 to 77 kg. (Pluncevic-Gligoroska et al., 2014).

If we compare the results of our research with young players from other countries, we can conclude that the height and weight is similar to the young Croatian players (Jankovic et al., 1993), as well as Bulgaria, Portugal (Capela et al., 2003), and Brazil (Neto et al., 2007). Somewhat higher are the players from Switzerland (Tschopp et al., 2003), Norway (Helgerud et al., 2001), and Spain (Tschopp et al., 2003).

One of the greatest studies of the morphological and physical characteristics of young elite players was realized by Hulse (2010). The research was conducted on a sample of 2,252 respondents from U9 to U19. Comparing the results of our research with

the results obtained in this study, it can be concluded that Macedonian players from the age of 14 to 16 are higher and heavier compared to English young players who are members of English professional soccer academies. On the other hand, English players at the ages of 17 and 18 are higher and heavier than Macedonian players.

Observations about the height and the weight of the players from different geographic regions show that players vary considerably in that sense. Such differences can also be due to ethnic and cultural influences or they could be the result of a different style of soccer, with teams from different leagues preferring different types of players for certain positions (Bloomfield et al., 2003). However, with a general comparison between the players of the sports games and the general population, it can be concluded that soccer players are on average similar in height to the general population (Norton, Olds, 2001; Matkovic et al., 2003). In a certain number of studies it has been found that physical activity does not affect body measurements, growth-velocity, bone maturation (Beunen et al., 1992; Damsgaard et al., 2001; Malina, 1994) or adult height (Malina, 1994).

When it comes down to the somatotype, the main component of this sample of young soccer players is mesomorphic. It is logical that muscle structure is beneficial in performing various activities during the competition because those activities define the final result of the competition, for example, starting an opponent, acceleration, shooting and conducting a ball. Given the nature of the game, the expressed muscle development is more obvious on the lower part of the body than on the upper part. The group at the age of 14 showed the highest values of the ectomorphy component compared to all the other age groups. This is due to the fact that at this age players have less weight in relation

to height. Similar results were obtained in the general population (Rosique, 1992) and among young players (Viviani et al., 1993).

Conclusions

The anthropometrical characteristics of the players can be an indication of the physical fitness of the athlete and therefore anthropometrical examination is an important segment of the athletes' physical (sports) examination. The youngest group of players (at the age of 14) showed significant differences in many parameters compared to all the other age groups. The obtained results can serve as normative anthropometric indicators for the regular sports medical examinations of young soccer players in our country. The data can also be used as a form for comparing the anthropometrical and somatotypical data of young players on a similar level from different countries.

References

- American College of Sports Medicine Position Stand (ACSM) (2009), Nutrition and Athletic Performance, in *Medicine and Science in Sports and Exercise*, 41, pp. 709–731.
- Bell, W. and Rhodes, G. (1975), The Morphological Characteristics of the Association Football Player, in *British Journal of Sports Medicine*, 9(4), pp. 196–200.
- Beunen, G., Malina, R., Renson, R., Simons, J., Ostyn, M. and Lefevre, J. (1992), Physical Activity and Growth, Maturation and Performance: A Longitudinal Study, in *Med. Sci. Sports Exerc.*, 24, pp. 576–585.
- Bloomfield, J., Polman, R. and O'Donoghue, P.G. (2003), Analysis of Elite Player Height and Body Mass from Four Major European Leagues, in *Book of Abstracts from the World Congress on Science and Football 5*, Gymnos Editorial Deportiva, p. 159.
- Bojadzieva, S. B. (2015), *Somatotype and Morphological Characteristics of Adolescents Aged 11 to 18 Years in the Republic of Macedonia*, Unpublished doctoral dissertation, Ss. Cyril and Methodius University, Faculty of Medicine, Skopje, Macedonia.
- Cacciari, E., Mazzanti, L., Tassinari, D., Bergamaschi, R., Magani, C., Zappulla, F., Nanni, G., Cobianchi, C., Ghini, T., Pini, R. and Tani, G. (1990), Effects of Sport (Football) on Growth: Auxological, Anthropometric and Hormonal Aspects, in *European Journal of Applied Physiology and Occupational Physiology*, 61, pp. 149–158.
- Capela, C., Fragosol, I., Vieira, F., Charrua, C., Gomes-Pereira, J. and MilHomens, P. (2003), Physical Performance Tests in Young Soccer Players with Reference to Maturation, in *Book of Abstracts from the World Congress on Science and Football 5*, Gymnos Editorial Deportiva, pp. 196–197.
- Carter, J.E.L. and Heath, B.H. (1990), *Somatotyping- Development and Applications*, Cambridge University Press, Cambridge.
- Casais, L., Salgado, J., Lago, E., Pefias, C. (2013) Somatotype and Body Composition in Portuguese Youth Soccer Players, available at: sigarra.up.pt/fadeup/publs_web.show_publ_file?pct_gdoc_id=2350
- Damsgaard, R., Bencke, J., Mathiesen, G., Petersen, J. and Muller J. (2001), Body Proportions, Body Composition and Pubertal Development of Children in Competitive Sports, in *Scand. J. Med. Sci. Sports*, 11, pp. 54–60.
- Gil, S., Gil, J., Ruiz, F., Irazusta, A. and Irazusta, J. (2007), Physiological and Anthropometric Characteristics of Young Soccer Players According to their Playing Position: Relevance for the Selection Process, in *J Strength Cond Res*, 21 (2), pp. 438–445.
- Helgerud, J., Engen, L.C., Wisloff, U. and Hoff, J. (2001), Aerobic Endurance Training Improves Soccer Performance, in *Medicine and Science in Sports and Exercise*, 33(11), pp. 1925–1931.
- Heyward, V. and Wagner, D. R. (2004), *Applied Body Composition Assessment*, Human Kinetics, Champaigne IL.
- Hulse, M. A. (2010), *Physical Development and Progression to Professional Soccer of Elite Child and Adolescent Academy Players*, Unpublished doctoral dissertation.
- Jankovic, S., Heimer, N. and Matkovic, B.R. (1993), Physiological Profile of Prospective Soccer Players, in *Science and Football II*. Reilly, T., Clarys, J., and Stibbe, A. (Eds). E & FN Spon, London, pp. 295–297.
- Le Gall, F., Carling, C., Williams, M. and Reilly, T. (2010), Anthropometric and Fitness Characteristics of International, Professional and Amateur Male Graduate Soccer Players from an Elite Youth Academy, in *Journal of Science and Medicine in Sport*, 13, pp. 90–95.
- Malina, R. (1994), Physical Activity and Training: Effects on Stature and the Adolescent Growth Spurt, in *Med. Sci. Sports Exerc.*, 26, pp. 759–766.
- Marković, G. and Bradić, A. (2008), *Nogomet: Integralni kondicijski trening*, Udruga Tjelesno vježbanje i zdravlje, Zagreb HR.
- Matkovic, B.R., Matkovic, B., Jankovic, S., Ruzic, L. and Leko, G. (2003), Morphological Characteristics of Elite Croatian Soccer Players According to the Team Position, in *Book of Abstracts from the World Congress on Science and Football 5*, Gymnos Editorial Deportiva, p. 172.
- Meszaros, T., Mohacsi, J., Szabo, T. and Szmodis, I. (2000). Anthropometry and Competitive Sport in Hungary, in *Acta Biol Szeged*, 44 (1–4), pp. 189–192.
- Neto, L.G.S., Nunes, C.G., Hespanhol, J.E. (2007). Fitness Profile of Under-15 Brazilian Soccer Players by Field Position, in *Journal of Sports Science and Medicine*, 6(Supplementum 10), p. 118.
- Norton, K. & Olds, T. (2001), Morphological Evolution of Athletes Over the 20th Century: Causes and Consequences, in *Sports Medicine*, 31, pp. 763–783.
- Pluncevic-Gligoroska, J., Todorovska, L., Dejanova, B., Maleska, V., Mancevska, S. & Nikolic, S. (2014), Anthropometric Parameters in National Footballers in the Republic of Macedonia, in *Prilozi*, 35(2), pp. 147–154.
- Reilly, T., Bangsbo, J. and Franks, A. (2010), 'Accuracy' – Detection of High Fatness-Co- Morbidities Compari-

son, in *Obesity Review*, 11.

Rienzi, E., Drust, B., Reilly, T., Carter, J. E. and Martin, A. (2000), Investigation of Anthropometric and Work-Rate Profiles of Elite South American International Soccer Players, in *J Sports Med Phys Fitness*, 40(2), pp. 162–169.

Rogol, A., Roemmich, J. and Clark, P. (2002), Growth at Puberty, in *J. Adol. Health*, 31, pp. 192–200.

Rosique, J. (1992), Estudio transversal del crecimiento en escolares vizcaínos. Lavariación Antropométrica Como Componente de la Estructura Biológica de la Población, Doctoral thesis, University of the Basque Country, Leioa, Spain.

Tabara, Y., Moji, K., Tsunawake, N., Fukuda, R., Nakayama, M., Nakagaichi, M., Komine, T., Kusano, Y. and Aoyagi, K. (2006), Physique, Body Composition and Maxi-

mum Oxygen Consumption of Selected Soccer Players of Kunimi High School, Japan, in *Journal of Physiological Anthropology*, 25, pp. 291–297.

Tschopp, M., Held, T. and Marti, B. (2003), Four-Year Development of Physiological Factors of Junior Elite Soccer Players Aged Between 15–16 Years, in *Book of Abstracts from the World Congress on Science and Football 5*, Gymnos Editorial Deportiva, p. 307–308.

Van Lenthe, F., Kemper, H., Post, G., Twisk, J., Welten, D. and Snell, M. (1996), Biological Maturation and the Distribution of Subcutaneous Fat from Adolescence into Adulthood: The Amsterdam Growth and Health Study, in *Int. J. Obes. Rel. Metab. Dis*, 20, pp. 121–129.

Viviani F., Casagrande, G. and Toniutto, F. (1993), The Morphotype in a Group of Peripubertal Soccer Players, in *J. Sports Med. Phys. Fitness*, 33, pp. 178–183.

MULTILAYERED EFFECTS OF NEW MEDIA AND SOCIAL NETWORKS ON CONTEMPORARY SPORTS

Uroš Mitrović, Danijela Bjelja

Introduction

Over the past decade, new media based on digital online platforms, just like the omnipresent social networks, have experienced dramatic development and global expansion. You could say that they have taken the leading place in contemporary culture of communication among people, and have significantly changed the way we use them and experience them in everyday use.

Today's sports, as an open global activity, abundantly use the benefits of contemporary scientific knowledge and technology in the way of communication (Nešić, 2007).

Traditional, print, and electronic media, in particular new, online, and digital forms of mass communication and increasingly popular social networks have become an inevitable factor in the exchange of information, the transmission of messages, and overall in communication between athletes, clubs, and organizations dealing with sports activities and the most diverse targeted public.

Aim and Objectives of the study

The subject of the paper is defined based on the theoretical setup of the research problem, and it relates to the impact of the contemporary sports industry on society through media. The aim is to determine and explain in what way the new media networks contribute to the increased interest in contemporary sports by considering multiple aspects.

Methods

The descriptive and theoretical-analytical methods were applied in this paper when analysing the relationship between the media and sports.

Results and discussion

Media as a Catalyst for the Success and Popularity of the Sports Industry

Relying on traditional media – press, radio and television – new digital online platforms allow users

to follow sports events and competitions in real time, or simply whenever they want, online or using mobile applications, interactive social networks and/or specialized sports programs and channels, of which there is an increasing number on the market in line with the increased global demand.

Bearing in mind that traditional mass communication media has had a key role in the global promotion of sports, the new channels of communication and numerous social networks have additionally accelerated and improved the popularization of sports around the world.

Electronic media – television, radio, and digital computer technology – have completely changed the sports industry and its public relations. Before the development of radio broadcasts in 1920 and television broadcasts after 1930, the only people who witnessed a game were people who were at the stadiums (Masteralexis et al., 2005).

Today's most successful athletes have become global superstars and walking ads, whose personal wealth is measured in the hundreds of millions of Euros, thanks to the development of television and the expansion of communications technologies. Sport in itself has a remarkable promotional power, but thanks to the media that broadcast the information, first and foremost, the image and sound, it has reached unprecedented global popularity (Šurbatović, 2014).

Today, almost every athlete, team, league or sports association has a profile on social media, mainly on Facebook, Twitter or Instagram. "From the pros to the minors and from the high school athlete to the retired athlete", states the analysis of the influential US magazine Forbes, "social media has been a force in the sports industry landscape" (DiMoro, 2015). For this reason, the communication and behavior of an athlete or team on social media can directly affect the perception that fans have of this individual or sports organization.

The Global Expansion of the Internet and New Social Media

In the late 1990s and in early 2000, the Internet grew from a specialized media mostly used by university staff and computer experts to the real mass media. In a study by the Pew Research Center (*The Pew Internet and American Life Project*, 1995, 1998, and 2002; <http://www.people-press.org/>) it was established that before 1995, only 14 percent of Americans were online. Just three years later this percentage rose to 36 and by 2002 the number of Americans using the Internet rose to 62 percent (Craig, 2010).

Some 15 years later, the data from a specialized Internet statistics website (<http://www.internetworld-stats.com>) show that today around 4 billion people (3,885,567,619) worldwide use this global network, and in North America alone this figure exceeds 320 million, with a percentage of use of over 88 percent. By far, Asia has the largest number of users with almost two billion people online.

As far as social networks are concerned, their development may have taken a shorter amount of time, but in the last decade alone the global expansion of the most diverse types of social networks has seen an incredible boom in the market.

Two marketing and consumer relations experts, Andreas M. Kaplan and Michael Haenlein, who in their research paper published in a scientific journal *Business Horizons* took to classification of social media (2010), state that there are six different types of social media:

1. Collaboration Projects – such as Wikipedia;
2. Blogs and Microblogs – Twitter;
3. Content Communities – YouTube;
4. Social Networking Sites – Facebook;
5. Virtual Game Worlds – World of Warcraft;
6. Virtual Social Worlds – Second Life (Kaplan, Haenlein, 2010).

A specialized portal Statista reports that Facebook, the most popular social network, already exceeded the number of 2 billion active monthly users in mid-2017. Active users are those who logged in on Facebook at least once in the last 30 days. The speed at which this social network has spread globally is best illustrated by the fact that Facebook (founded in 2004) needed less than eight years to reach a

figure of one billion active monthly users, and less than five years to double the number of its users to the current 2.047 billion.

Virtual Reality as a New Media Revolution

In this modern, digitized world, communication and sports-media landscape are changing rapidly. Just as consumers continue to move away from traditional television, sports leagues, their broadcasters, and advertising partners must find creative ways to stay ahead of their consumers. The influential US web portal Business Insider correctly states that “the screen of choice isn’t the only moving part in this sports-media revolution.”

Viewers and those who follow sports are increasingly inclined to switch to specialized digital options to watch their favorite TV sports channels, either on demand or through streaming instead of classic television or cable subscriptions. The case of the famous US sports network ESPN, which had to find new solutions to deal with the decline in the traditional subscription to its program is a good example. “To combat this,” according to a *Business Insider* analysis, “ESPN has focused in on digital, ramping up content on the WatchESPN app and ESPN3, ESPN’s digital-only network” (Jason, 2017).

The development of technologies, such as virtual and augmented reality (VR/AR), and the advancement of digital platforms that allow for immersive viewing of 360-degree content, which is recorded with a multi-camera system, so the viewer can watch the video from all angles by shifting the image are quickly changing consumer expectations about how the content is displayed.

In line with market trends, but also out of the desire to survive in an increasingly competitive (and more expensive) market, many media networks have chosen to partner up with digital channels to broadcast the most famous sports events simultaneously and online. The UK’s BT Sport network, for example, has found a partner in Google’s *YouTube*, which allows viewers to watch the UEFA Champions League and the Europa League Final on YouTube for free. “Both soccer championships will be available both in the 4K ultra-high definition, and in virtual reality, allowing the users to watch a 360-degree display or choose the viewing angle” (Jason, 2017).

In the near future, the virtual reality will also lead to completely new experiences of watching sports competitions. *NextVR's* executive director, Brad Allen, graphically described how virtual reality will enhance the experience of attending a game. The viewer will watch the game at home together with a friend who is watching it in his home, and the virtual reality will make them feel like they were at the stadium. "We're talking to each other, and it's like we're on the field and watching the game," Allen said. "That's where this is going" (Jason, 2017).

By investing enormous resources in the virtual reality industry, the heads of Facebook, the largest social network, are also announcing a real virtual revolution that will enable their future users "to be wherever they want, with whomever they want, regardless of geographical boundaries" (Mitrović, 2016). These are the words of Technical Director of Palo Alto's giant, Michael Schroepfer, who announced the ambitious Facebook's plan to create a functional teleporting device by 2025, based on the Oculus Rift virtual reality system.

According to the announcement, it would allow the "mental transportation" of individuals, so that people would have the feeling that they could go anywhere and do whatever they wanted regardless of where they were in the world. To create their own virtual 3D worlds, if necessary. Therefore, it is not difficult to predict what kind of marketing and sales potential we're talking about here (Mitrović, 2016).

The Sports Industry and Sports Broadcasts in a Symbiotic Relationship

Authors Cutlip, Center, and Broom, who work in communications and public relations, are in agreement that the Internet is "the most widespread exponent of the communication revolution," and that "advanced technology has changed the production, distribution, presentation and storing of information" (Cutlip et al., 2003).

In the sports industry, the fact is that live broadcasts have altogether changed the way fans experience sports, and they have also completely changed the entire sports business. Television networks and Internet companies from around the world "pay billions of dollars for the broadcasting rights for sports events, and sports organizations get valuable promotion, exposure in the media, and status through their broadcasts in electronic media"

(Masterlexis et al, 2005).

Also, it is indicated that the sports industry and business related to TV broadcasting rights for the games have an almost symbiotic relationship, which is further strengthened by a number of innovative ways to meet the needs of viewers who are not able to watch desired sports events live in the arena or at the stadium.

While sports organizations rely on broadcasters for revenue and publicity, the electronic media know that sports events are a sure way to attract viewers for which the companies that are being advertised will pay to address them (Masterlexis et al, 2005).

A particularly important aspect is that with the accelerated development of new digital media and social networks, the significance, impact, and value (media, financial, market, etc.) of athletes grow as well. One of the best soccer plays of the day, Cristiano Ronaldo, for example, is the leading star not only on the soccer field, but also on the social networks "field". The Portuguese player has 112 million followers on Instagram, 60 million followers on Twitter, and nearly 123 million followers on Facebook.

For example, the most popular Serbian athlete Novak Đoković is followed by 7.2 million people on Facebook, almost 8 million people on Twitter, and 3.5 million followers on Instagram.

The New Media Intertwined Impact On Sports

Unique for all online networks of this kind are tools and methods of visitor communication who share their own experiences, spend time with people who have the same interests, and find old friends and business partners. In any case, all these networks use similar methods to attract and retain visitors, and on the other hand contain different approaches to the integration of information and the interpretation of communication tools (Comer, 2001).

In addition, the impact of new media and social networks in contemporary civilization is becoming more pronounced, and in the modern sports industry information, marketing, sales, and even political impact can be distinguished. This was especially visible recently, when US athletes almost "went to war" with US President Donald Trump because they kneeled, sat or held a raised fist during the US

national anthem, thus protesting against the way the police treat African Americans, and against the increasingly pronounced discrimination and social injustice in the United States.

Numerous mainstream media did not show the “rebellious” acts of US athletes in detail, but the social networks immediately assumed the function of a “public broadcaster”, and spread information about athletes who refused to stand at the flag raising event before the start of the match.

US President Donald Trump even called on club owners to fire the players who did not standing calmly during the national anthem, and said that the National Football League (NFL) should introduce stringent rules to ban kneeling. On Twitter, his favorite online herald, among other things he wrote, “Facebook has always been anti-Trump. The Networks have always been anti-Trump”¹.

The Internet and digital communication channels have also made possible the up until recently unseen marketing and sales potential, manifested in the increase in the profits of the entire sports industry. E-commerce has launched merchandizing, and product selection and related services management in sports (selling jerseys, equipment, tickets, etc.) into a dimension the income and profit margin of which is practically impossible to determine.

Athlete and Fan Tweets

Social networks have become an indispensable online tool for athletes, their clubs and/or sports organizations. Facebook, Twitter, and Instagram are the most popular digital communication channels for global sports stars to address the public and their fans. Equally, the fans gladly use these interactive online services to communicate with their sports “idols” on a large scale.

Nielsen, one of the leading companies in the United States that examines the media and the media market (Nielsen, founded in 1923 in Chicago), in line with the new digital trends in its diverse portfolio offers research into the use of social networks by sports fans.

One of the research studies of this influential agency has shown that in the past several years the influ-

¹ <https://twitter.com/realDonaldTrump/status/913034591879024640>

ence of Twitter has increased, especially among the audience watching sports events. It turned out that sports fans obviously like to share their impressions about the games with others online. For example, in 2013 as much as 50 percent of tweets about television in the US, a total of 492 million sent tweets, were related to sports events [Nilsen, 2014].

Nielsen’s research also showed that 12 out of 20 of “the most tweeted” TV shows in the US that year were about sports events.

Keeping in mind that almost every sports event has a specific character, the so-called “hashtag” related to it, that allows the users to easily find messages about a specific sports (or another) topic or content, this allows for a new type of user engagement, creating a relationship with an audience that was not possible up until a few years ago.

Conclusion

The accelerated development of media and various forms of communication during the late 20th and early 21st century greatly contributed to the enormous popularity and development of sports, and consequently of the entire sports industry. Traditional electronic media – television and radio – as well as new digital media based on online platforms have completely changed not only the sports industry, but also the way in which it communicates with the targeted public.

Also, the contemporary sports industry spreads its global influence thanks to the media, for the most part, and at the same time the means of mass communication develop their significance, distribution, and influence on the public by covering these very sports and the whole of the accompanying industry.

Social networks, such as Facebook and Twitter, and advanced technologies, such as virtual and augmented reality, have also changed the way fans communicate with teams, players, sports people, and colleagues. The impact of new media on the sports industry will undoubtedly continue to evolve in the years to come.

References

- Comer, D.E. (2001), *Povezivanje mreža TCP/IP – principi protokoli i arhitekture*, CET, Beograd, pp. 57
 Craig, R. (2010), *Onlajn novinarstvo*, Clio, Beograd, pp. 24
 Cutlip, M.S, Center, H.A and Broom, M.G. (2003),

Odnosi s javnošću, MATE, Zagreb

DiMoro, A. (2015), The growing impact of social media on today's sports culture, available at: <https://www.forbes.com/sites/anthonydimoro/2015/07/02/the-growing-impact-of-social-media-on-todays-sports-culture/#49b7803331a2> (accessed 16 September 2017)

Jason, D. (2017), Learn how sports media is changing, available at: <http://www.businessinsider.com/ignition-2017-learn-how-sports-media-is-changing-2017-5> (accessed 15 September 2017)

Kaplan, A. M., Haenlein, M. (2010), Users of the world, unite! The challenges and opportunities of Social Media, *Business Horizons*, Volume 53, Issue 1, January–February 2010, pp. 59–68

Masteralexis, L.P, Barr, A.C, Hums, M. (2005), *Principles and Practice of Sport Management*, Jones & Bartlett Publishers, Burlington MA

Mitrović, U. (2016), Faustovska borba za dušu potrošača, *Nacionalna poslovna revija*, broj 8, Maj, pp.75

Nešić, M. (2007), *Sport i menadžment*, Tims, Novi Sad, pp. 235

Nilsen (2014), available at: [/http://www.nielsen.com/us/en/insights/news/2014/sports-fans-amplify-the-action-across-screens.html](http://www.nielsen.com/us/en/insights/news/2014/sports-fans-amplify-the-action-across-screens.html)

Šurbatović, J. (2014), *Menadžment u sportu*, Zavod za udžbenike, Beograd, pp. 286

Corresponding author

Uroš Mitrović, PhD, assistant professor

Faculty of Sports, Union – Nikola Tesla University, Belgrade, Narodnih heroja 30/I

T: +381 11 404 40 62

E: uros.mitrovic@fzs.edu.rs

SPORT FOR PERSONS WITH DISABILITIES AND INCLUSIVE PHYSICAL EDUCATION

EATING HABITS AND PHYSICAL ACTIVITY OF GRADE9 AND12 STUDENTS IN BALIKESİR SCIENCE SCHOOL

¹Fahri Akcakoyun, ²Vedat Mutlu, ¹Zekine Punduk,

³Yusuf Alper, ¹Zekeriya Göktaş

¹Physical Education and Sport, University of Balikesir, Balikesir, Turkey

²Physical Education and Sport, University of Siirt, Siirt, Turkey

³Balikesir Science High School, Balikesir, Turkey

Summary

In this study was to investigate the effect of the nutrition and physical exercise habits change on overweight in Balikesir Science High School students. Eighty-five volunteered students (46 girls and 39 boys), were participated in this study. The participants' nutrition habits and physical characteristics were analyzed in 15 years old (grade 9) then compared to 18 years old (grade 12) values. The study results showed that increased in body weight, height and body mass index (BMI) in grade 12 compared to grade 9., whereas waist/hip ratio was not significantly increased. The participation in physical activity and physical activity duration was declined in grade 12 ($p=0.000$, $p=0.004$ respectively). When evaluated the questions scores, the nutrition habit risk score was increased except question 2 and 5. In addition, boys more participated in physical activity than girls ($p=0.001$) while in grade 12, this physical activity participation level more than decreased in girls compared to boys ($p=0.04$). In conclusion, this study results indicated that in grade 12 or 18 years old, bad nutrition habits increased and physical exercise participation level decreased with school and exam factors.

Key words: Nutrition habits, Physical activity, Risk of adolescent obesity

Introduction

In adolescence period, the majority of young people are at risk of developing excessive weight gain due to unhealthy and unbalanced feeding. Especially between the ages of 15–17, psychological and cognitive developmental imbalances and poor nutrition/malnutrition seen in young people lead to serious health problems such as overweight and obesity (Önder et al., 2000). With the influence of urbanization, the type of fast-food (fat-rich) diet has been increased and with the decrease in physical activity the prevalence of obesity has been increased. At the same time, such factors: industrialization in food production and consumption of ready-made food has become widespread and has superseded traditional food consumption, and the reduction of natural farming, has led to uniform and unhealthy eating habits. In addition, socio – economic conditions and other demographic factors affect the eating habits and preferences during childhood and also play an important role in increasing the body-mass index. In previous studies, it has been seen that those who had depression in childhood had higher Body-Mass Index (BMI) values than those who had not depression (Pine et al., 2001).

When studies have been analysed/examined, nutrition style and habits in childhood increase the risk of weight gain and obesity in adolescent and adult period. In this study that we have planned taking this into consideration, feeding habits of 15 (9th grade) and 18 (12th grade) years students of Balikesir Science High School have been evaluated. In this process, the possible effects of changing dietary habits on body-mass index (BMI) and risk of weight gain have been investigated.

Methods

85 students ((46 girls and 39 boys [15 years]) who study at Balikesir Science High School attended the study voluntarily after getting the necessary permission from their school management and their parents. The participants' nutrition habits and physical characteristics were analyzed in 15 years old (grade 9) then compared to 18 years old (grade 12) values. The nutrition habits data were evaluated via questionnaire and dietary pattern were evaluated with the Dietary Pattern Index (DPI). DPI was developed by Demirezen et al., 2005. The participants body weight, height, body mass index (BMI) and DPI was evaluated in grade 9 then compared to

in grade 12 values. Also, the physical activity habits were determined by the interview method. In the evaluation of the data was made with SPSS program and *paired-sample t-test* was applied in comparison of grade 9 and grade 12 differences. Comparison of two groups were used *independent-sample t test*. The significance level was taken $p \leq 0.05$.

Results

When the results of the study have been evaluated, it has been detected that the risk scores for height, weight, BMI and eating habits is increasing as the age of the students increasing ($p = 0.001$) (Table 1). On the other hand, there is no significant increase in waist and hip ratio index has been found, however it has found that there is an important decrease in participation in any sport activity and activity participation time at the 18 age ($p = 0.000$, $p = 0.004$, respectively) (Table 2). The answers of the questions on the nutrition scale is examined, it has been noted that the risk scores of the age 18 has increased significantly in the other questions, except from the 2nd and the 5th questions, when compared to the age of 15. When the percentage answers given to the questions examined, it has been detected that the biggest change has been in the preference of food groups such as hamburgers, fries and pizza with “fatty and sugary foods”, which has become more popular; whereas consumption of red meat, fruit, vegetables and legumes is less preferred (Table 2). When sex-specific differences are compared (Table 2), it has been seen that boys participated more in activities than girls ($p = 0.001$), However, at 18 years of age this participation was significantly decreased both in girls and boys ($p = 0.001$), especially in girls, participation in physical activity decreased more than boys ($p = 0.04$). BMI values were not significantly different at 15 years of age for girls and boys, but significantly higher for boys at 18 years of age than girls ($p = 0.04$). No statistically significant

difference was found when comparing diet and food preferences in girls and boys.

Discussion

In this study, according to the nutrition profile of the students, male and female students have been found to be in the moderate risk group in terms of their nutrition profile, but this risk score has been found to be close to upper ratio at 18 years of age. It has been found that when adolescents reach the age of 18, their diet preferences change, with sugary and fatty foods, fried potatoes, hamburgers and so on, however; they consume less healthy food groups. At the same time, while there is no change in the number of students' main meals, the number of snack time has increased to 4. Another important finding of the study is that while at age 15, participation in physical activity is 82% for males and 52% for females, this ratio decrease 42% and 7% respectively at age 18. The World Health Organization (WHO), defines the 10–19 age as an “adolescent period”. According to 2008 Turkey Demographic and Health Survey data, 29% of our population has been constituted by adolescent age group (Pekcan, 2012; Tezcan et al., 2009). Also, we found that the boys more participated to physical activity than the girls in this study. In consistent with other studies found that the physical activity level was low compared the boys (Chen et al., 2003; Geçkil, Yıldız, 2006; Bebiş et al., 2015;). Giulliano et al. 2016)

Conclusion

The frequency of adolescent obesity in our country is lower than in other countries. However, the deterioration of eating habits in this period has led to the increase of high-calorie, oily, fast-food, snacking and sedentary behaviours, increase of eating frequency and development unhealthy eating behaviours.

Tables

Table 1. Physical and nutrition characteristics of the subjects

	15 years old (n=85)	18 years old (n=85)	p
	Mean (Sdt)	Mean (Sdt)	
Height (cm)	1.66 (0.07)	1.69 (0.09)	0.001
Weight (kg)	63.7 (13.3)	68.6 (15)	0.001
Body Mass Index (kg/m ²)	22.8 (3.8)	23.6 (3.9)	0.001
Waist/hip ratio (cm)	0.79 (0.06)	0.79 (0.05)	0.77
Nutrition risk score	9.42 (2.94)	11.04 (3.74)	0.001
Main meal a day	2.87 (0.33)	2.90 (0.29)	0.32
Snack a day	3.83 (0.91)	4 (0.89)	0.004

Table 2. Distribution of the nutrition and exercise habits of the subjects

	15 years old (n=85)		18 years old (n=85)	
	Often	Always	Often	Always P
Consuming oily and sugary foods,	%30	%3.5	%39	%8.2 0.009
I add salt to food,	%27	%7.1	%26	%7.1 1.000
Consuming more than 3 cups of cola per day,	%2.4	%3.5	%10.6	%14.1 0.001
Beef, mutton and made from them, salami, sausages and etc. I eat,	%21	%5	%26	%9 0.01
Hamburger, french fries, pizza, etc.,	%19	%2.4	%22.4	%6 0.18
Fruit and vegetable dishes, bulgur, dry beans, chickpeas, lentils, such as dry legumes with the food consumed,	%2.4		%8.2	0.01
Exercise habits				
	15 years old		18 years old	
	Yes	No	Yes	No
Participating of physical activity	%66	%34	% 22	%77
Duration of physical activity (hour)	3.66 (1.81)		1.88 (1.23)	
	Girl	Boy	Girl	Boy
Participating of physical activity	%52	% 82	%7	% 41
Duration of physical activity (hour)	2.58	3.40	1.00	2.18

References

- Bebiş, H., Akpunar, D., Özdemir, S., Kiliç, S. (2015). Bir ortaöğretim okulundaki adölesanların sağlığı geliştirme davranışlarının incelenmesi. *Gülhane Tıp Derg*, 57; 129–135.
- Chen, M.Y., Wang, E.K., Yang, R.J., Liou, Y.M. (2003). Adolescent health promotion scale: development and psychometric testing. *Public Health Nursing*, 20; 104–110.
- Önder, F.O., Kurdoğlu, M., Oğuz, G., Özben, B., Atilla, S. (2000). Gülveren Lisesi Son Sınıf Öğrencilerinin bazı beslenme alışkanlıklarının saptanması ve bunun malnütrüsyon prevalansı ile olan ilişkisi. *Hacettepe Toplum Hekimliği Bülteni*, 21(1) <http://www.thb.hacettepe.edu.tr/2000/20001.shtml#1>
- Pekcan H (2012). Adölesan (Delikanlı) Sağlığı. In: Güler Ç, Akın L (eds). *Halk Sağlığı Temel Bilgiler*. Genişletilm-

iş 2. Baskı. Ankara: Hacettepe Üniversitesi Basımevi, 486–537.

Pine, D.S., Goldstein, R.B., Wolk, S., Weissman, M.M. (2001). The association between childhood depression and adult body mass index. *Pediatrics*, 107; 1049–56.

Tezcan, S., Yiğit, E.K., Tunçkanat, F.H. (2008). Çocuk Sağlığı. In: Hacettepe Üniversitesi Nüfus Etütleri Enstitüsü (eds). *Türkiye Nüfus ve Sağlık Araştırması 2008*. 1. Baskı. Ankara: Hacettepe Üniversitesi Basımevi, 159–165.

Corresponding author

Assoc.Prof.Zekine Punduk

University of Balikesir

Physical Education and Sport

Balikesir/Turkey

Email: zkn1938@gmail.com

WHAT SHOULD BE MINDED WHEN FAMILIES WITH DISABLED CHILDREN ARE PLANNING A SUMMER VACATION?

Erkan GÜLGÖSTEREN¹, Pervin TOPTAŞ DEMİRCİ², Ali DEMİRCİ¹,
Nevzat DEMİRCİ¹

¹Mersin University, Dept. Of Physical Education and Sport Sciences, Mersin/Turkey

²Mersin University Department of Tourism Animation, Mersin/Turkey

Corresponding author: Okt. Erkan GÜLGÖSTEREN¹

Abstract

Introduction: Many people with disabled children living in Turkey are affected by psychological, sociological, economic and emotional disabilities due to their children's disabilities. In this respect, the well-planned free time periods outside of the training period give children with disabilities the freedom to move freely.

Aim: In this research, it is aimed to investigate what matters to pay attention to when planning vacation for children with disabilities.

Method: A structured interview form with 34 items was prepared in order to plan summer vacation about families with disabled children in the research. The field survey was conducted and interview questions and the content of the survey were generated. In Mersin province, private rehabilitation was discussed individually with 130 volunteer mothers in the training and application centers for the disabled. With the prepared questions, it was tried to investigate the expectations of the expectant mothers who have children with disabilities while planning a summer holiday.

Results: According to the interview data, it was observed that the mothers were more difficult to construct the holiday content, but showed more protective behavior tendencies. According to the information provided, it is stated that the children who take part in the mothers' tours will take care of the age groups, the girls and boys separately and the importance of accompanying specialists, educators, health personnel and caring individuals. The different types of obstacles and accompanying diseases of each child are the other issues that are emphasized. Other information reported by the family includes information about eating and sleeping habits, special behaviors, favorite toys, drugs used, fears, allergic conditions, underbelly, and being aggressive.

Conclusion: It should be emphasized that When choosing a summer vacation program, it is important for families to consider the child's age, interests and personality. It should also be considered how the holiday activities will support children's learning throughout the year.

Keywords: Disabled Children, Families, Holiday Planning, Independent Living, Self-Confidence

Introduction

The European population ages from day to day. There are approximately 37 million disabled and 120 million disabled elderly individuals living in Europe (EU (2004). It is estimated that 74% (116 million) of this community, consisting of a total of 157 million individuals, are travelable individuals (Metin, 2013). It is foreseen that by 2050 Europe will be over 65 years old and over three times more than in 2003 and will be five times as high as the population aged 80 years (EU2013). There are more than 8.5 million people with disabilities in our country (Eryilmaz, 2010). It is important to continue uninterrupted rehabilitation and training with appropriate programs in all disability groups. Holiday programs to be planned after training are necessary in this respect. The necessity of being a contemporary society and ensuring that every individual who lives in society as a fundamental human right has equal

access to all services and facilities (Eryilmaz, 2010). In a disability life, they face different challenges and generally have limitations in participating in some activities. Whether disabled or not, traveling is a situation that everyone desires (Yau, et al., 2004) and is a right according to Article 23 of the Constitution in our country (Resmi Gazete, 1982). Achieving full participation of people with disabilities in the life of society and raising their living standards is a requirement of contemporary society (Okur, 2001). From this point of view, an increase in the participation of children with disabilities in holiday organizations is observed in our country. Many local governments produce social projects for disadvantaged groups or make free use of children with disabilities by making their own budgets and summer holiday planning (Interview, 2016).

The well-planned free time periods outside the train-

ing period give children with disabilities the freedom to move. Having fun with the game, education is an important time for children with disabilities. Child movement and play are most needed in the first stage of kindergarten and primary education. In this period, the child's tendencies should be considered and all activities should be considered within the context of gaming and gaming movements (Demirci, 2004). Played events can be tools for improving the child's learning ability. A child who develops positive attitudes and attitudes towards learning can participate more actively in learning interactions. This participation makes the receptors that influence the perception of the child more selective and motivates them to learn the relevant topic. This will make the child ready (Koca, 2012).

The well-planned free time periods outside the training period give children with disabilities the freedom to move. It therefore opens the way for the disabled child to become an independent, self-sufficient individual by giving them daily skills (Gür, 2001). Having fun with the game, education is an important time for children with disabilities (Şahin, 2001). Child movement and play are most needed in the first stage of kindergarten and primary education. In this period, the child's tendencies should be considered and all activities should be considered within the context of gaming and gaming movements (Demirci, 2004). Played events can be a tool for improving the child's learning ability (Özer, 2010). A child who develops positive attitudes and attitudes towards learning can participate more actively in learning interactions. Thus, the basic motor skills (Demirci, 2013, Demirci, 2006), such as strength, speed and durability, which are the aim of motor development, are developed. This participation makes the receptors that influence the perception of the child more selective and motivates them to learn the relevant topic. This will make

the child ready (Çamlyar, 1987, Koca, 2012). It is known that play, physical education and sports activities which will take place in the summer holiday programs contribute to the survival of the disabled people with physical, mental, psychological and social structure in a way that is compatible and integrated with itself and society (Okur, 2001, Öztürk, 1998). Children with disabilities in gaming and sporting activities provide a good understanding, initiative, development of integration, and development of love, self-respect, and life (Hazar, 1997). Rehabilitation, freedom of movement and freedom to exercise live in programs designed to edited them (Okur, 2001). At the beginning of these programs are holiday programs. In the light of this information; it is aimed to investigate the points to be taken into consideration when planning vacations for children with disabilities.

Methodology

A meeting was held in order to learn about a holiday plan that the families with children with disabilities wanted to do in the research and a structured interview form with 34 items was prepared by evaluating the results of these meetings. The field survey was conducted and the content of the interview questions and the research was established (TR62-09-02/04, 2009). For each item in the interview form that was created, the families were asked to grade between 0 and 100 points. In Mersin province, private rehabilitation centers and state-owned disability centers were individually interviewed with 136 mothers voluntarily at the training and application centers. "Informed Consent Form" was received from the participating mothers in accordance with Helsinki. In the prepared questions, it was tried to investigate the expectations of the mothers by planning the holidays by taking the information that the children can not make holiday alone.

Results

Table 1. Opinions of Mentally Handicapped Children about Vacation Planning for Family about

Family expectations	n	%
Age groups are close to each other	111	81.6
Care must be taken to ensure that boys and girls are separated	104	76.9
There must be health personnel	129	95.6
Expert trainers in the field must be	129	95.6
There should be maintenance staff	131	96.3
My child's accompanying disease should be considered	121	88.9
The habits of eating and obeying must be known	88	65.4

Special behaviors of children should be taken into account (fear of kidnapping, aggression, loving toys, and things they like)	125	91.8
Drugs used, allergic conditions should be listed ratio of diarrhea	133	98.2
It is important for our children that the swimming pools, parks, natural beauty, entertainment center in the facility to be visited are accessible while vacation planning is done for children with disabilities	101	74.3
Vacation planning for children with disabilities should be done at least three times a year	88	65.5
Vacation planning for disabled children should be done at least twice a year	98	72.1
Vacation planning for disabled children should be done at least once a year	63	46.4
Games and sports activities should be included when planning holidays for disabled children	125	91.8
My child gets tighter after death and gets happier	129	94.8
My child can not holiday without me	110	80.9
My disabled child needs my protection in every part of my life	128	94.2,
My disabled child can not be happy without me even if he makes a holiday on a regular basis	92	67.6
I do not think my disabled child will be happy after the holidays	66	48.5
No institution takes risks by planning holidays with children with disabilities	46	33.9
It may be possible for a child to have a holiday with his teachers teaching throughout the year	121	89
Regular holiday planning will help my child's quality of life	128	% 94.1
It would be better if all members of the family had a regular holiday on their own without being dependent on any institution	122	% 89.7
Due to economic conditions, we have not had the opportunity to holiday until now	122	89.7
Our child can not adapt to holiday conditions and can not adapt	92	67.6
The proportion of parents who will not be able to reach the purpose of our holiday	54	39.7
Other brothers are negatively affected while vacationing with disabled children	62	45.6
The spaciousness of the family will increase the quality of the holiday and make it more enjoyable as each party decreases the load during the holiday	96	70.5
In the care of the handicapped child, when the family said that the whole burden was on them	122	89.8
The spaciousness of the family does not diminish the burden of the mother in the care of the child during the holiday	92	67.6
the father is as effective as the mother in the care and education of the child	104	76.5
Other people at the resort are uncomfortable with us because of our disabled children	83	61
People are uncomfortable affecting us	119	87.5
We can not relax wherever we go with our disabled child	76	56

According to the table, the rate of the mothers who stated that the age groups of the children who will attend the holiday are close to each other is expressed as 81.6%. It was observed that 76.9% of the mothers participated in the expression of the need to pay attention to the separate groups of girls and boys when planning vacations for disabled children. When planning vacations for disabled children, 95.6% emphasized the necessity of health personnel. The planning of holidays for children with disabilities should be done at least 3 times a year. 65.5% of mothers should be done at least 2 times a year, 72.1% of them should be done at least once a year and 46.4% of them are born. 91.8% of children said that games and sport activities should be included in planning holiday for disabled children, while 94.8% of the children said that they are more closely connected with their life after holiday and they are happier. I do not think my handicapped child will be happy after the holiday, the rate of the

mother is 48.5%. 33.9% of the mothers said that no institution would take risks by planning vacation with children with disabilities, 66.1% of mothers received this expression positively. Our child can not adapt to holiday conditions and the proportion of mothers who can not adapt can be 67.6%. 39.7% of the mothers who say that they will not be able to reach the holiday goal and 45.6% of the mothers who say that the siblings will be adversely affected when they are vacationing with disabled children. Other people at the holiday place are 61% of the mothers who think they are disturbed because of our children with disabilities, 87.5% of the mothers who are uncomfortable because of people are uncomfortable and 56% of the mothers who say that we can not relax with our disabled children.

Discussion and conclusion

Early diagnosis and training for children with disabilities is important for future independent life. In May 1980 UNICEF adopted a policy of expanding existing work to prevent and rehabilitate disabilities in childhood (Karatepe, 1998). The essence of this new strategy, prepared by "Rehabilitation International" for UNICEF, encompasses all of the existing health, nutrition, education and social welfare programs for children and their families to live better (Karatepe, 1998). This program included the principles of "prevention of disabilities, early identification of physical, mental and emotional disorders, measures to be taken by society and the family, maximum treatment and rehabilitation" (Karatepe, 1998). Many of the people with disabled children who live in our country where adequate measures can not be taken, are affected by psychological, sociological, economical and emotional negative effects due to the obstacles of their children. First, they refused to have children with disabilities, had mixed emotions, felt guilt, embarrassment, and resentment (Gür, 2001).

Families who find a way to rearrange their experience by accepting the current situation with expert support have integrated their lives into society by planning their lives according to the disabled child. In this respect, it is important that children with disabilities have to make use of education and rehabilitation services sufficiently to develop their independent lives. In the course of child rehabilitation activities, he is able to do a lot of exercises. Moving is the nature of human life (Demirci, 2013). Movement is life. Everything we do in our work and in our game covers movement (Yörükoğlu, 1981). It is important to plan the training and prepare the games in many forms of movement suitable for the development of the child. If developmental stages are well known, the origins of personality, the origins of positive and negative behaviors can be explained (Kephart, et al., 1973) and successful programs can be made in this direction. The movement patterns of the child's daily activities are collected in two major categories. These include: large muscle movements (using body) and small muscle movements (using objects) (Özer, 2009). Organized games are especially valuable for developing large and small muscle groups. In this regard, educational games are good organizations that provide good behavior and habits that provide healthy development of the child's soul and body,

playful joy and pleasure (EU, 2004). Participation in well-programmed summer camps for children with disabilities allows rehabilitation and education to continue throughout the year if considered in this framework. Children with disabilities who continue to be educated in the same environment throughout the year participate in different camps in different settings and enjoy more positive mental, spiritual, emotional, academic and motorial developments and have more positive attitudes.

The number of people with disabilities is increasing day by day in our country, the problems that people with disabilities are experiencing. Due to these problems in life, integration with society becomes difficult and individuals feel unhappy because solutions are not produced to problems. In this context, within the framework of the equal opportunity principle, it is necessary to make use of the same conditions as other individuals in the obstacles to the possibilities of social life (Gallahue, et al., 2014). The most important condition for achieving full participation is availability (Gallahue, et al., 2014, Eryılmaz, 2010). In this way, however, the quality of life of disabled people increases and it is possible to benefit as much as possible from all the opportunities offered by each individual, from opportunities, to planning. And in this way equal living standards are achieved.

According to the interview data, it was observed that the mothers were more difficult to construct the holiday content and showed more protective behavior tendencies. According to the information provided, it is stated that the children who will participate in the mothers' tours pay attention to age groups, girls and boys separately and the importance of accompanying specialists, educators, health personnel and caring individuals. The different types of obstacles and accompanying diseases of each child are other issues that are emphasized. Other information reported by family members has been observed as information to be taken into consideration when planning a holiday, such as eating and sleeping habits, special behaviors, favorite toys, drugs used, fears, allergies, underbelly, and being aggressive. It has been determined that it is important for parents to build a kitchen work schedule to make sure that all the necessary food is provided during the holiday, and to make a meal plan by specifying meal times. The facilities to be visited include swimming pools, parks, natural beauty, entertainment center accessibility, roads suitable for

wheelchair use, door and elevator widths, washbasins, toilets and other necessities.

It would be useful to come together with families with all disabled children who will attend the vacation before planning a vacation, to discuss all the anticipated problems and concerns. Each participant is required to submit a copy of all information, identity documents, vaccination certificate, clothing list, allowance, physician report on inconvenience to travel, physician report on disabled and accompanying disease, family permission document, family doctor for emergency cases and parents' is recommended.

As a result; for a planned holiday, for good time. If the means of transport (bus, train, tram, airplane, etc.) are to be selected, and if public transport is preferred, the connections on the route should be planned. Taking out a list of worth seeing places will benefit from good time. It is recommended to take security precautions against danger that may occur from the beginning to the end of the holiday. Having a doctor and a nurse to accompany and having an experienced professional background is beneficial. During the holidays, it will be useful to allow plenty of movement in open air, to use bicycles for it, and to walk freely in the mountains and on the water, making it possible for children with mental disabilities to move freely. In addition to these, it is suggested that organizations such as handicrafts for developing hand skills, giving opportunities to talk freely in front of the society, theater, drama and theoretical lesson applications are suggested. Providing self-discovery, self-care (self-care skills), gaining everyday experiences and sporting activities should be seen as important in organizing everyday life to independent living. It is suggested that such holiday organizations should be held at least once a year for 10 days in terms of self-reliance, independent action, reduction of spiritual burden imposed on families and increase awareness of disabled people in society.

References

Akandere M (2006). Eğitici okul oyunları, Nobel yayın, Ankara.

Çamlıyar H ve Çamlıyar H (1987). Çocuk hareket eğitimi ve oyun, Can Ofset, Manisa.

Demirci A (2006). İlköğretimde beden eğitimi uygulamaları, değişim yayınları, 2006 İstanbul.

Demirci A (2013). Beden eğitimi ve spor öğretiminde öğretim teknolojileri ve materyal tasarımı, Nobel yayın, Ankara.

Demirci A, Demirci E, Demirci N (2013). Oyunlarla beden eğitimi ve spor öğretimi, Nobel yayın, Ankara.

Demirci N (2004). İlköğretim birinci kademe sınıf öğretmenlerinin görüşleri çerçevesinde oyunla eğitimin önemi. Kafkas üniversitesi, sosyal bilimler enstitüsü, yayınlanmamış yüksek lisans tezi, Kars.

Eryılmaz B (2010). Yüksek Lisans Tezi "Turizmde Engelli Pazarının Değerlendirilmesi ve Bodrum Örneği", Sakarya Üniversitesi Sosyal Bilimler Enstitüsü, Sakarya.

EU (2004). Improving Information on Accessible Tourism for Disabled People, http://ec.europa.eu/enterprise/sectors/tourism/files/studies/improving_information_on_accessibility/improving_accessibility_en.pdf.

EU (2013). Accessible Tourism, http://ec.europa.eu/enterprise/sectors/tourism/accessibility/index_en.htm.

Gallahue D L, Ozmun J C, Goodway J D (2014). Understanding Motor Development. Infants, Children, Adolescents, Adults. Çeviri Dilara Sevimay Özer-Abdurrahman Aktop, Nobel Akademisi, Ankara.

Gür A (2001) Özürlülerin Sosyal Yaşama Uyum Süreçlerinde Sportif Etkinliklerin Rolü T.C. Başbakanlık Özürlüler İdaresi Başkanlığı, Ankara.

Hazar M (1997). Beden eğitimi ve sporda oyunla eğitim, Tutibay yayınları, Ankara.

Karatepe H (1998). Özürlü Çocuklar Buldukları Toplum İçinde: Eğitimleri, Sakatlığın Önlenmesi Ve Rehabilitasyonu" (Çeviri), Karatepe Yayınları Ankara.

Kephart C. N, Godfrey B. B (1973). Movement Pattern and Motor Education. Prentice Hall, Inc. New Jersey.

Koca C (2017). Beden Eğitimi ve Spor Öğretiminde yeni yaklaşımlar sempozyumu 6, 21-22 Ocak, Hacettepe Üniversitesi.

Mersin Metropolitan Municipality Disabilities Department Presidency Mersin Disability Opportunities (Interview) 22.11.2016 Mersin.

Metin, A (2013). Engelsiz Turizmde Ulaşılabilirliğin Önemi ve Ulaşılabilirlik Kriterleri, http://worldhealthand3rdagetourism.org/PDFs/Ayhan_METIN.pdf

Resmi Gazete (1982). Türkiye Cumhuriyeti Anayasası, <http://www.tbmm.gov.tr/anayasa.htm> Erişim Tarihi: 24.09.2013.

Okur, N (2001). Özürlülere Yönelik Örgütlenmenin İncelenmesi, T.C. Başbakanlık Özürlüler İdaresi Başkanlığı, Ankara.

Özer D, S. Özer M, K (2009). Çocuklarda motor Gelişim, Nobel yayın, Ankara.

Özer D, S (2010). Engelliler için beden eğitimi ve spor, Nobel yayın, Ankara.

Öztürk F (1998). Toplumsal boyutlarıyla spor, Bağırhan Yayınevi, Ankara.

Şahin F (2001). İlköğretim fen öğretiminde oyunların yeri ve önemi, MÜ, fen bilimleri eğitimi sempozyumu, İstanbul

TR62-09-02/041 Nolu Zihinsel Engelliler Spor Eğitim Merkezi Proje Kapsamında Mersin Üniversitesi Engelli çocuklarda tatil planlaması yapılırken nelere dikkat edilmelidir? Başlıklı 2009 yılı mersin üniversitesi bünyesinde ailelerle görüşmeler

Tütüncü Ö. Aydın İ (2013). Ulaşılabilir Turizm T.C. Do-

kuz Eylül Üniversitesi Spor Bilimleri ve Teknolojisi Yüksekokulu Rekreasyon Bölümü Anatolia: Turizm Araştırmaları Dergisi, Cilt 24, Sayı 2, Güz: 261-263, İzmir
Yau M. K. McKercher B. Packer T. L (2004). Traveling with a Disability: More Than an Access Issue, *Annals of*

Tourism Research, 31 (4): 946-960.

Yörükoğlu A (1981). Gelişim ilkeleri ve çocuk ruhsal gelişimi. Ruh sağlığı ve hastalıkları. Öztürk O (Ed.) Türkiye sinir ve ruh sağlığı derneği yayınları, Ankara

ADAPTED SWIMMING FOR CHILDREN WITH DOWN SYNDROME

Velichka Alexandrova

Every human being is born with the right to develop himself and his capabilities in the society. Sometimes, however, for one reason or another, one finds himself burdened with physical and mental illnesses that block his full development. Every child born with Down syndrome has the real opportunity to lead a full and fairly independent life as long as he is given this opportunity. Recently we are facing increasing base of evidences about the successful realization of these people in all areas of life – children successfully advancing in school, young persons with Down syndrome reaching university education, successful professional work and excellent achievements in sport. The application of adapted motor activities programs for persons with Down syndrome result in physical strengthening, development of motor skills and abilities, mental, social and cognitive development. Through sport participation, their personal development, self-confidence and integration into their peers' environment are strengthening. The aim of this study is to apply adapted swimming techniques to persons with Down syndrome in order to monitor the effects on their physical, functional and psycho-emotional abilities. Adapted swimming program was applied. Pre and post measures were recorded. To analyze the obtained data, we used sigmal method for evaluation and variation analysis. The analyses of the results are showing that the application of adapted swimming program on children with Down syndrome is influencing positively the following of the observed indicators: physical ability and psycho-emotional status.

Key words: children, Down syndrome, adapted swimming

Introduction

Swimming is a means for physical education and physical activity and when we speak about it, we associate it with an aquatic environment. Aqua activities lead many benefits for participants such as increasing adaptation skills, improving physical development, functional and physical condition. The significance of swimming can be considered in the following aspects: social, health, educational and applied (Nikolova, 2010; Lekina, 2003). Recent trends in complex rehabilitation have forced adapted swimming as a therapy and rehabilitation instrument for people with Down syndrome. Adapted physical activities in aquatic environment are used in purpose to facilitate significant acceleration in recreation and participation process of children with Down syndrome (Williams & Wright, 2004)

Aims and Objectives

The purpose of our study was to identify the changes in physical development, physical capability and psycho-emotional state of children with Down syndrome under the influence of specific means of adapted swimming.

Methodology

The research *subjects* are physical development, physical capability and psycho-emotional state of children with Down syndrome.

The research *objects* are the parameter of physical development and physical capability and their im-

pact of specific means of adapted swimming over these parameters.

The adapted swimming education program was conducted over 8 months. Ten children with disabilities (all boys) age 10 to 12 years with Down syndrome (**trisomy 21** nondisjunction) and without any preliminary swimming skills were selected to participate in the study. All swimming lessons occurred indoors (controlled environment) at school swimming pool sized (18 x 5 meters and average depths 1.0 meters) and water temperature 30.0 °C ± 1.5 °C. All tests were done by principal investigator in this study. We perform an assessment for effectivity of training process throughout the period of sports-pedagogical experiment. Testing method was based on 6 tests separated in 3 groups: test for reporting specific indicators, physical capability test and psycho-emotional development test.

We used the following methods to improve our aims and purposes: survey of specialized literature, diagnostics and testing, sports-pedagogical experiment.

To process the result of output data we used the following statistical and mathematical methods: analysis of variance, comparative analysis and a Sigma assessment method.

Results

The assessment was performed before and after the 8 months' period.

The initial assessment of testing group shows the entry level of their physical capability.

At the end of the researching period under the impact of the applied specific adapted methodology the tested parameters increased.

At the same time the average value of coefficient of variation (V) decrease. This is sign for decreasing of dispersion around the average level and improving the group's homogeneity over the surveyed indicators.

We applied Student's *t*-distribution to determinate the impact on ability of children surveyed on under the influence of used adapted methodology and to compare the credibility of the differences in the average values, with a high statistical credibility level $P_t \geq 95\%$.

- *Face submersion (s)*

Figure 1 shows indicator "Face submersion". The output average data for this indicator shows significant differences between output levels of the children. At the beginning $X=5,6$ s and at the end $X = 7,3$ s. At the end of the testing period, we can see that there is a tendency for increasing of average values according to the beginnings values with increment 1,7s.

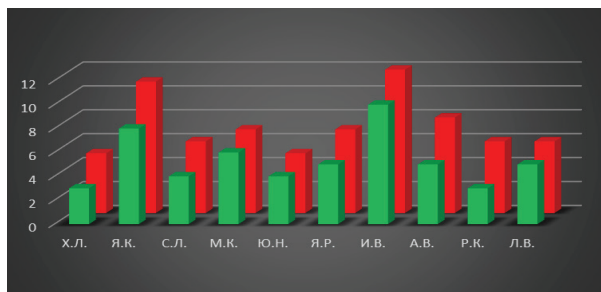


Figure 1. Increment of indicator "Face submersion"(s) of testing children - start-end.

- *Vital capacity (cm³)*

The output average data for "Vital capacity" shows significant differences between output levels of the children. At the beginning of survey $X= 678,00$ cm³ and at the end $X = 790,00$ cm³.

At the end of the testing period we can see that there is a tendency for increasing of average values with increment 112,00 cm³. (Figure 2)

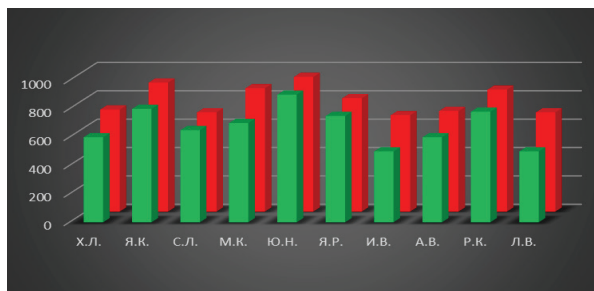


Figure 2. Increment of indicator "Vital capacity" (cm3) of testing children - start-end.

- *Static lumbar-endurance testing (s)*

The output average data of testing dynamometrical parameter shows significant differences between output levels of the children. At the beginning of survey $X=11,1$ s and at the end $X = 12,7$ s.

At the end of the testing period, we can see that there is a tendency for increasing of average values with increment 1,6s. (Figure 3)

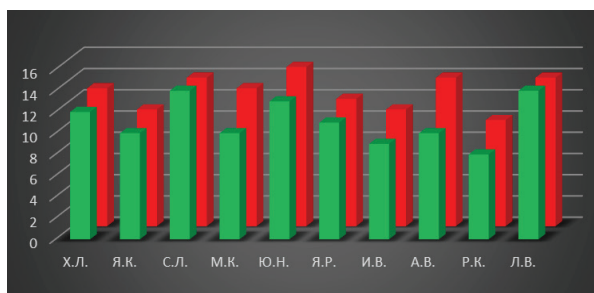


Figure 3. Increment of indicator "Static lumbar-endurance testing" (s) of testing children - start-end.

- *Static abdominal endurance testing (s)*

The output average data of testing dynamometrical parameter shows significant differences between output levels of the children. At the beginning of survey $X=14,2$ s and at the end $X = 16,2$ s.

At the end of the testing period, we can see that there is a tendency for increasing of average values with increment 2,0s. (Figure 4)

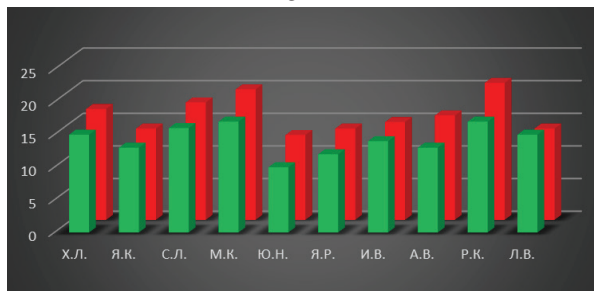


Figure 4. Increment of indicator "Static abdominal endurance testing" (s) of testing children - start-end.

Lower limb explosive power testing

The output average data of testing parameter “Lower limb explosive power” shows significant differences between output levels of the children. At the beginning of survey $X=66,50\text{cm}$ and at the end $X = 76,70\text{cm}$.

At the end of the testing period, we can see that there is a tendency for increasing of average values with increscent 10,20cm. (Figure 5)

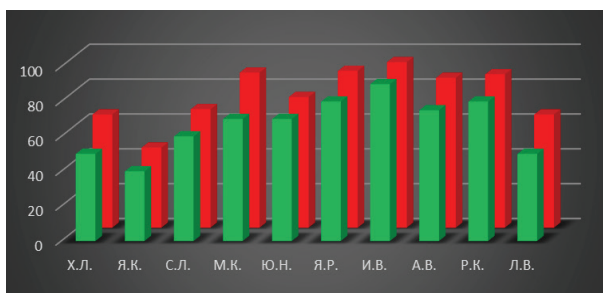


Figure 5. Increment of indicator “Lower limb explosive power testing” (cm) of testing children - start-end. To revealed unique ability of each child, its results were assessed by Sigma method of assessment.

The estimates are immeasurable values but they enable us: a) to make a comparison of results of every single child in each tested parameter and b) to make a comparison of results of every single child in all tested parameters. Maximal assessment is 50points, average 25p., and minimal 0p.

Discussion

The result of applied adapted swimming methodology for children with Down syndrome shows that swimming activities are effective for increasing levels of physical capabilities and physical fitness. Similar statement is given by Winnick (1995). Also we observed improvement in their psycho-emotional state, brought by the joy from the swimming practices, increases self-confidence and facilitate the process of social integration. According to the results of our research, we suggest that adapted swimming methodology can be valuable tool in physical rehabilitation because of the satisfactory results achieved with children with Down syndrome.

References

- Lekina, D I kol. 2003, “Plvaneto kato element ot kompleksnata rehabilitaciq na deca s DCP” Tom 8. Sport, Obshtestvo, Obrazovanie Sbornik s dokladi ot nauchna konferencia na NSA, NSA Press. // Лекина, Д. И кол. 2003, „Плуването като елемент от комплексната рехабилитация на деца с ДЦП“, Том 8 Спорт, Общество, Образование. Сборник с доклади от научна конференция на НСА, НСА ППЕС.
- Nikolova, M. 2010, “Ozdravitelno-rehabilitacionno pluvane”, NSA PRESS, S. // Николова, М. 2010, „Оздравително -рехабилитационно плуване“ НСА ППЕС, С.
- Chris Williams and Barry Wright. 2004. HOW TO LIVE WITH AUTISM AND ASPERGER SYNDROME. Translated in 2013 as Уилямс, К., Бари Райт „Как да живеем с аутизъм и синдром на Аспергер“
- Winnick, J. 2000. Adapted Physical Education and Sport, Published Champaign, IL; Leeds: Human Kinetics. ISBN: 0736033246

SURVEYING THE INFLUENCE OF THE KINESITHERAPEUTIC COMPLEX ON THE SOCIAL AND MENTAL STATUS OF STUDENTS WITH VISUAL DISTURBANCES

Albert Evald¹, Mariana Albert², Evgenia Dimitrova¹

¹National Sports Academy- Sofia, Bulgaria

²MU-Sofia, Bulgaria

Summary: Young people with visual disturbances during the first semester encounter serious difficulties in adapting to the new life style and the unfamiliar environment. This is a prerequisite for worsening their psycho-emotional state. The researches of a number of authors have suggested that complex rehabilitation leads to the restoration of the social and psychological status of the person.

The study was conducted with students from the "Vision – impaired Massagers" specialty, students from the 1st to 3rd year at "J. Filaretova" Medical College.

The sensor profile was studied by the Dunn test questionnaire (1997).

The analysis of the results has shown that systematic training with specially selected exercises for coordination, equilibrium, qigong and yoga contribute to improving the equilibrium resistance and concentration in students with visual impairment. Apparent growth and mental maturity have been observed in both groups.

Key words: psycho-emotional state, kinesitherapy, students with visual disturbances

Introduction

The newly enrolled students with visual impairment face a number of difficulties during the first days of their studies. The unfamiliar environment, the new routes they have to use in the city in order to get from point A to point B or from the dormitories to the Campus put their psychic endurance through the mill and provoke complicated experiences and negative reactions.

In order to learn the education material in the various subjects one has to be concentrated and alert. It has been determined that the balance between the processes of arousal and detainment is impaired by the visual disturbances and the memorizing speed is reduced (Radulov, 2010). This leads to difficulties in mastering different motor habits and quick forgetting of the learnt material due to the bad quality of the stored visual images. As a result of these difficulties, the subjects often experience insecurity, strong irritability leading to aggression or passivity, apathy and self-isolation. (Dunn, W., & Bennett, D.2002).

The research of a number of authors (Lyudmilova, Dimitrova, 2010), (Marinov, 2013) (Radulov 2010), (Deniskina, 2014) shows that in case of visually

disabled people the implementation of a complex rehabilitation leads to recovery in the psychic status. The person who practices sports cultivates a renewed adjustment of their auditory perceptions and vestibularis. They control their posture through development of sense of touch, muscle and joint sensibility which compensate for the loss of visual afferent and efferent (Radulov 2010), (Zakirov, Naborstikova, 2009). Sports activities create a premise for faster adaptation and overcoming social isolation of visually impaired people (Marinov, 2013). It increases the abilities of approval in the society of the people with normal vision (Deniskina, 2014). The regular activities improve their overall health condition; help them at their homes and at their working place (Marinov, 2013).

The implementation of an individual and differentiated approach to the regulation of the physical load should consider the physical fitness and sensory possibilities of the visually impaired.

The aim of the present study is to survey the influence of kinesitherapeutic complex, applied in the sports classes, on the mental status of students with visual disturbances.

Tasks:

To examine the influence of the complex kinesitherapeutic program on the psychic condition of the students with the use of Dunn questionnaire (1997).

Methodology of the research

The present study was conducted in the period 2002–2014 with students from the Medical College „Jordanka Filaretova”, Sofia.

The research was done among 105 first- to third-year students with visual impairment from both genders, divided into two groups:

I group – experimental group (EG) – 75 students (35 women and 40 men)

II group – control group (CG) – 30 students (15 women and 15 men)

EG consists of students who practice sport regularly in the form of kinesitherapeutic schemes combined with elements from yoga and qigong, modified and enriched by us. All students have presented their medical files and doctor's permission to take part in the experiment.

The average age of the women in both groups is twenty years. The men's mean age is twenty-two years.

All students have a degree of disablement. In the EG 27.9% of the men and women have first degree of disablement and 71.9% – second degree. In the CG 26.6% have the first degree of disablement and 73.3% – second degree. The distribution of first and second degree of disablement in the groups is even. This calls for an individual approach, differentiated work and consideration of the different degree of visual impairment of each of the subjects.

Organization of the research

The activities were held *twice a week* – the regular two sports classes in the curriculum. The *duration* of the different activities was 45–60 minutes.

The research period was 3 years for each of the students – their entire course of study at the college.

Results and discussion

These subjects have difficulty in controlling their appearance. The answers to the question, „Is your attire twisted” confirm the positive influence of the academic environment.

The movement of the visually impaired is directly dependable on the degree of disablement and the age it appeared. The deficit of visual afference leads to disturbances in almost all high-handed movements. When asked whether they moved stiffly, the EG answered in the following way during the first testing: 4% never”, 21.3% „rarely”, 20% „sometimes”, 25.3% “often”, and 29.3% „always”. The results of the CG are the following: 6.7% „rarely”, 26.7% „sometimes”, 23.3% “often”, and 43.3% „always”. Both groups together marked 72% of this serious problem during the first semester. After five semesters of regular activities with specially chosen physical exercises included in the kinesytherapeutic complex, the results of the EG are the following: 10.7% „never” 32% „rarely”, 49.3% „sometimes”, 6.7% „often”, and 1.3% „always”. The results of the CG are the following: no one marked the answer „never”, 10% „rarely”, 16.7% „sometimes”, 40% “often”, and 33.3% „always”. We believe that the achieved results with the EG are due to the various complex of specific exercises for flexibility, stretching, Chinese healing gymnastics qigong, elements from yoga suitable for people with visual impairment which improve their physical qualities.

The coefficient of variation of the EG is $V = 1.52$, and of the CG $V = 0.99$ in the initial testing. During the second testing the coefficient of variation of the EG is $V = 0.68$ and of the CG $V = 0.93$. Wilcoxon Test shows a statistically significant difference of the indexes of the two surveys of the EG (table 1) and (diagrams 1, 2).

When there is a limitation of the visual afference, the sense-motor organization of motor activity is disrupted sharply. The most obvious disturbances are observed in the direction and speed of movement. There is a dominant hyperdynamics in all muscle groups. Most of the visually impaired students find it difficult to move and are characterized with low endurance. The EG answered this question in the preliminary testing in the following way: 9.3% „never”, 9.3% „rarely”, 21.3% „sometimes”, 40% “often”, and 20% „always”. The CG did not give „never” and „rarely” answers, but 10% marked „sometimes”, 30% “often”, and 60% „always”. Both groups show low endurance in the initial testing.

The fact that most of the respondents have low physical endurance and some of them had not attended any physical education classes is alarming.

The results of the CG in the second testing are the

following: 23.3% „sometimes”, 50% “often”, and 26.7% „always”; the answers „never” and „rarely” were not marked, which allows us to conclude that the problem with low physical endurance had not been overcome.

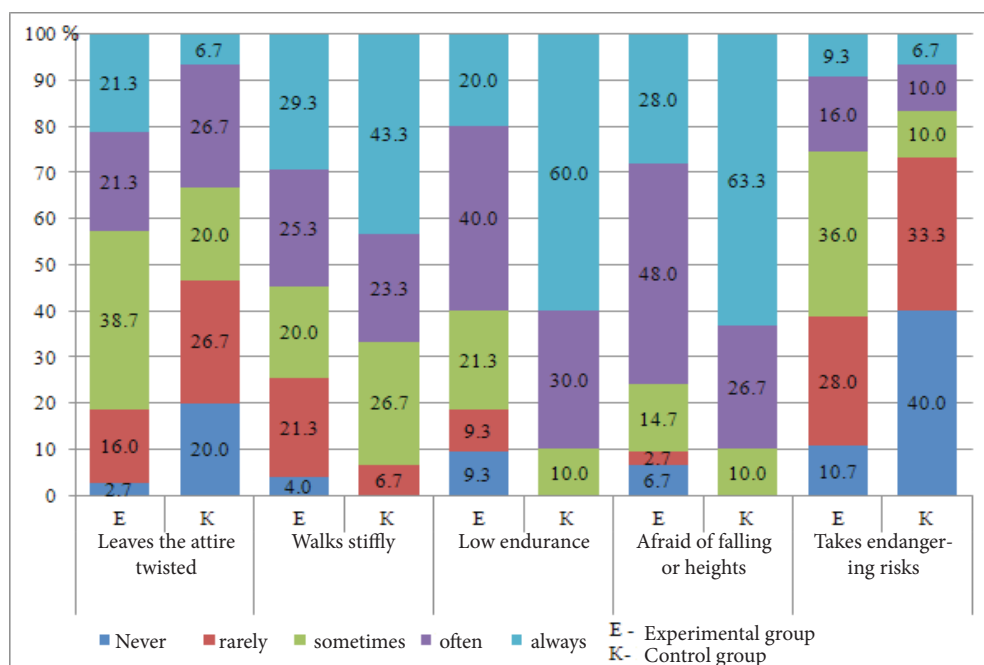


Chart 1. Distribution of the answers of the EG and CG during the first semester in percentage

We applied kinesytherapeutic complex with duration of five semesters with strict observance of its stages. The main physical qualities strength, speed, flexibility, endurance, balance and coordination were developed continuously and consecutively during each stage. In the end, the EG showed the following results: 25.3% „never”, 29.3% „rarely”, 28% „sometimes”, 13.3% „often”, and 4% „always”. The coefficient of variation of the EG is $V = 1.42$, and of the CG $V = 0.46$ in the initial testing. In the second testing the coefficient of variation of the EG is $V = 1.27$, and of the CG $V = 0.51$.

Fear of falling of heights is the most common with the visually impaired. In their daily routine, especially in the cities, their most serious problem is getting to the university or to the hospital because of the many obstacles they face such as cars parked on the pavement, rough roads and excavations.

During the first semester the CG answered this question in the following way: „never”, „rarely” were not marked, 10% „sometimes”, 26.7% „often”, and 63.3% „always”. The answers of the EG were: 6.7% „never”, 2.7% „rarely”, 14.7% „sometimes”, 48% „often”, and 28% „always” (chart1).

The percentage of the students in both groups who are always afraid of falling or heights is significant. During the second testing the groups showed the following results: the CG did not mark „never” and „rarely”, 33.3% „sometimes”, 33.3% “often”, and 33.3% „always”. The results of the EG were the following: 38.7% „rarely”, 14.7% „sometimes”, 38.7% „often”, and 4% „always” (Chart 2). The coefficient of variation of the EG is $V = 1.13$, and of the CG $V = 0.46$ in the initial testing. During the second testing the coefficient of variation of the EG is $V = 1.34$, and of the CG $V = 0.69$ (Tables 1, 2).

Table 1. Dunn test data of the CG from first and fifth semesters

CG question	N	Range	Min.	Max	Mean	Std. Deviation	Var	Sk	Kurtosis		
Moves stiffly	30	3	2	5	4,03	,999	,999	-,514	,427	-1,013	,833
Moves stiffly 2	30	3	2	5	3,97	,964	,930	-,672	,427	-,362	,833
Weak endurance	30	2	3	5	4,50	,682	,466	-1,047	,427	-,034	,833
Weak endurance 2	30	2	3	5	4,03	,718	,516	-,050	,427	-,954	,833
Afraid of falling or heights	30	2	3	5	4,53	,681	,464	-1,179	,427	,229	,833
Afraid of falling or heights 2	30	2	3	5	4,00	,830	,690	,000	,427	-1,554	,833
Takes endangering risks	30	4	1	5	2,10	1,242	1,541	1,073	,427	,235	,833
Takes endangering risks 2	30	4	1	5	1,83	1,020	1,040	1,610	,427	2,651	,833

Table 2. Dunn test data of the EG from first and fifth semesters

EG question	N	Range	Min.	Max	Mean	Std. Dev.	Var	Sk	Kurtosis		
Moves stiffly	75	4	1	5	3,55	1,23	1,52	-,31	,28	-1,11	,55
Moves stiffly 2	75	4	1	5	2,56	,83	,68	-,05	,28	,28	,55
Weak endurance	75	4	1	5	3,52	1,19	1,42	-,72	,28	-,24	,55
Weak endurance 2	75	4	1	5	2,41	1,13	1,27	,40	,28	-,62	,55
Afraid of falling or heights	75	4	1	5	3,88	1,06	1,13	-1,2	,28	1,53	,55
Afraid of falling or heights 2	75	4	1	5	2,92	1,16	1,34	-,16	,28	-1,23	,55
Takes endangering risks	75	4	1	5	2,85	1,11	1,23	,24	,28	-,48	,55
Takes endangering risks 2	75	3	1	4	2,05	1,05	1,11	,54	,28	-,98	,55

As a result of the adaptation processes and regular participation in the sports classes there are also some changes in the results of the CG. It is indicative there were no answers „never” and „rarely”, which showed that the main problem had not been solved. To some extent, there was a partial overcoming of this problem with 63.3% of the students who marked the answer „always” in the second testing, and 33.3% of them marked the answers „always”, „often”, and „sometimes”. The EG group marked all answers unlike the CG.

Due to the balance and coordination exercises, as well as the special exercises taken from qigong and yoga, the students had developed better orientation and sense of the spatial position of their body; their reactions had improved and this helped them to overcome the obstacles on the road easily. Last but

not least, during their studies, their mobility had increased significantly. The results from the statistical analysis with the test of Mann-Whitney and T-criterion of Wilcoxon justify this fact (table 1).

The last question in Dunn test concerns the occasional infantile behaviors of the visually impaired who take risky actions. Sometimes they tend to show their desire they are complete people and can cope in difficult and dangerous situations. The results of the two groups during the first semester were: EG – 10.7% „never”, 28%, „rarely”, 36% „sometimes”, 16% often”, and 9.3% „always”. CG – 40% „never”, 33.3 „rarely”, 10% „sometimes”, 10% „often”, and 6.7% „always”.

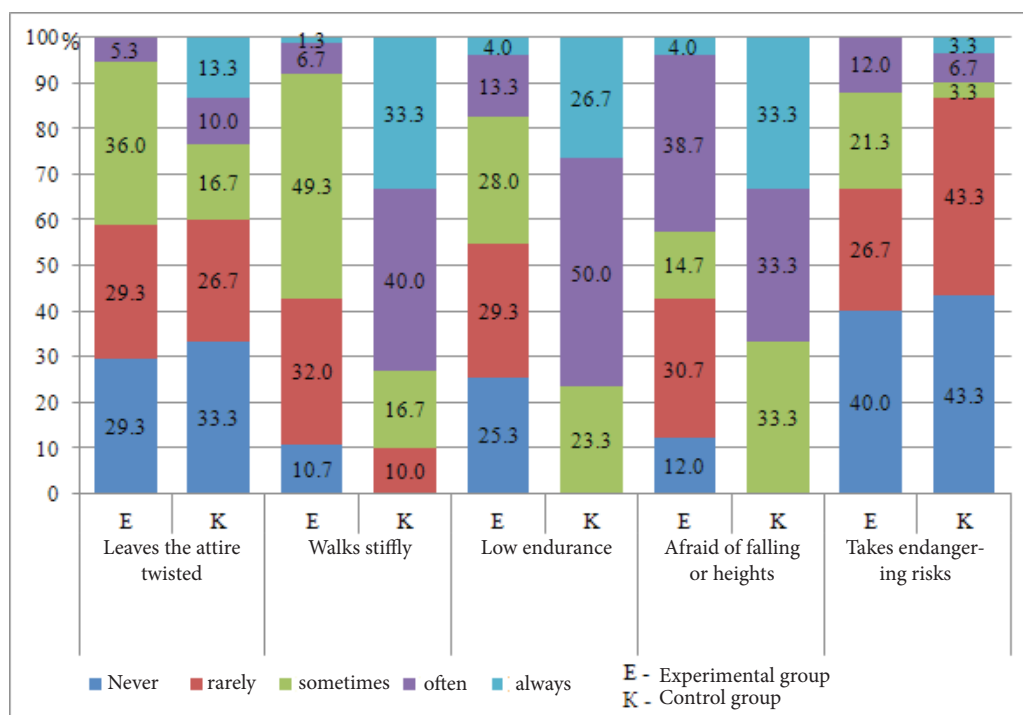


Chart 2. Distribution of the answers of the EG and CG during the fifth semester in percentage

At the end of the fifth semester the CG showed the following results: 43.3% „never”, 43.3% „rarely”, 3.3% „sometimes”, 6.7% „often”, and 3.3% „always”, and the EG marked the following: 40% never”, 26.7% „rarely”, 21.3% „sometimes”, 12% „often”; no one marked the answer „always”. The coefficient of variation of the EG is $V = 1.23$, and of the CG $V = 1.54$ in the initial testing. In the second testing the coefficient of variation of the EG is $V = 1.11$, and of the CG $V = 1.40$ (table 2). We have to point out there is visible growth and psychic maturity of the two groups. In the CG there is a small percentage of people who are willing to risk „always” in extreme situations, unlike the students in the EG.

The increase in the percentage of the students who reject extreme behavior is significant – from 10.7% to 40%, with the EG, while with the CG the change is from 40% to 43.3%. The positive results, in our opinion, are due to the beneficial influence of the exercises taken from the eastern practices which balance the nervous system and urge the players to harmony and balance.

The comparative analysis of the results with the T-criterion of Wilcoxon shows that the indexes characterizing the physical endurance in the final testing are with high guarantee probability ($P \geq$

95%). So, we can reject the zero hypotheses and accept the alternative one. According to it, the results of the EG, after the implementation of the kinesitherapeutic complex, are significantly higher than the ones of the CG along the researched index and are indicative of its efficiency. The values of T-criterion, presented in tables 1 and 2 and charts 1 and 2, justify this.

Conclusion

The proposed kinesitherapeutic complex has positive influence on the psychic-emotional condition of the visually impaired students and helps them to overcome the difficulties. Thanks to the regular physical activities, the percentage of the students showing psychic maturity and social adaptation has increased. The students have developed better spatial orientation, their reactions have improved and this helps them to avoid the obstacles on the road to a certain extent. Last but not least, their mobility has increased significantly during the period of their studies.

References:

Ljudmilova, I., Dimitrova, D., 2010, Vliyanie na sportnata aktivnost varhu silovata izdrajlivost na deca s uvredeno zrenie. Sports, stress, adaptaciya. 1, Peti Internationalen Nautchen Congress Olimpiiski Sport i Sport za

- Vsichki, Sofia p. 398. // Людмилава, И., Димитрова, Д. Влияние на спортната дейност върху силовата издръжливост на деца и младежи с увредено зрение. // Спорт, стрес, адаптация. ч. 1, Пети международен научен конгрес Олимпийски спорт и спорт за всички., С., 2010, с. 398.
- Marinov, E. Rehabilitacia I ergoterapia pri deca sas specialni obrazovatelni potrebnosti. Sofia, UI "Sv. K. Ohridski", 2013, s. 135 // Маринов, Е. Рехабилитация и ерготерапия при деца със специални образователни потребности. С., УИ „Св. К. Охридски“, 2013, с. 135
- Radulov, V. Manieristichno povedenie pri zritelno zatrudneni. Obuchenie I rehabilitacia na zritelno zatrudnenite. 2010, tom XXIII, p. 10–26 // Радулов, В. Маниеристично поведение при зрительно затруднени. Обучение и рехабилитация на зрительно затруднените., 2010, том XXIII, с. 10–26.
- Deniskina, V., 2012 Educational Needs, Substantial Disorders and Secondary Impacts. *Defectology*, 5, pp. 56–64. // Денискина, В. Особые образовательные потребности, обусловленные нарушениями зрения и их вторичными последствиями. // Дефектология. 2012, 5, с. 56–64.
- Zakirov, R. Naborshnikova, Y. Korekcionnaia napravlenosti procesa obuchenia tehniko-takticheskimi podgotvitelnimi destiam unih dziudoistov s narusheniem zrenia. Fizicheskaia kultura: vospitanie, obrazovanie, trenirovka. Moskva, 2009, 6, p.70 // Закиров, Р., Наборщикова, Ю. Коррекционная направленность процесса обучения технико-тактическим подготовительным действиям юных дзюдоистов с нарушением зрения. Физическая культура: воспитание, образование, тренировка, М., 2009, 6, с. 70.
- Dunn, W., & Bennett, D. Patterns of sensory processing in children with attention deficit hyperactivity disorder. *Occupational Therapy Journal of Research*, 2002, 22, p. 4–15.
- Dunn, W. The impact of sensory processing abilities on the daily lives of young children and families: A conceptual model. *Infants and Young Children*, 1997, 9, 23–25.

SPORT PSYCHOLOGY, PHILOSOPHY

RELATIONSHIPS BETWEEN PSYCHOLOGICAL CHARACTERISTICS AND SPORT PERFORMANCE IN ORIENTEERING

Zshivka Zsheliaskova-Koynova
NSA "VassilLevski", Sofia, Bulgaria

Summary

Introduction. *Despite the fact that orienteering is one of the very popular individual sports in Bulgaria and all over the world, there is a lack of research on personality characteristics related to the competitive performance in orienteering. This is why the aim of the present study was to explore the relationships between some psychological characteristics (personality characteristics, sport motivation, sport confidence) and sport performance in orienteering.* **Method.** *The subjects were 35 Bulgarian orienteers (21 males, 14 females) who compete in Elite group. They completed 5 psychological tests (the Bulgarian versions of EPQ, STAI-Y, SMS, AMS-Sport, TSCI), measuring a total of 19 psychological characteristics. Sport performance in orienteering was operationalized as the average number of points earned from National competitions (by BFO rules) during 2 consecutive years.* **Results.** *The results of the correlation analysis indicated that the psychological characteristics with highest level of association with sport performance in Elite group were trait sport confidence, striving for success (SS), fear of failure (FF), hope (SS - FF) and amotivation.* **Discussion.** *High level of trait sport confidence, high hope and low amotivation correspond to higher level of sport performance in orienteering. Similar findings are reported by Bund (2001); Elbe & Beckmann (2006), Coetzee, Grobbelaar & Gird (2006), Zuber & Conzelman (2014) in other sports.* **Conclusion.** *The results of the study demonstrate the necessity to modulate psychological preparation of young orienteers by means of encouraging self-confidence and approach motivation, simultaneously creating conditions for decreasing avoidance motivation in sport.*

Keywords: performance, orienteering, personality, motivation, confidence

Introduction

Despite the fact that orienteering is one of the very popular individual sports in Bulgaria and all over the world, there is a lack of research on personality characteristics related to the competitive performance in orienteering. In fact, there is only one publication related to personality characteristics of orienteers (Zsheliaskova-Koynova, 1991). This is why the aim of the present study was to explore the relationships between some psychological characteristics (personality characteristics, sport motivation, sport confidence) and sport performance in orienteering.

Method

The subjects were 35 Bulgarian orienteers (21 males, 14 females) who compete in Elite group (aged 20–43, M=27.5). They completed 5 psychological tests – the Bulgarian versions of EPQ (Eysenck & Eysenck, 1975; Bulgarian version by Паспаланов, Щетински и Айзенк, 1984), STAI-Y (Spielberger, Gorsuch, & Lushene, 1970; Bulgarian version by Щетински и Паспаланов, 1989), SMS (Pelle-

tier et al., 1995; Bulgarian version by Муховски, 2004), AMS-Sport (Elbe, Wenhold, & Müller, 2005; Bulgarian version by Желязкова-Койнова, 2012), TSCI (Vealey, 1986; Bulgarian version by Желязкова-Койнова и Савчева, 2008), measuring a total of 19 psychological characteristics:

1. Eysenck's Personality Questionnaire (EPQ) – *extroversion, neuroticism, psychoticism and lie (social desirability);*
2. State and Trait Anxiety Inventory – form Y (STAI-Y) – *trait anxiety;*
3. Sport Motivation Scale (SMS) – *amotivation, extrinsic motivation (external, introjected and identified) and intrinsic motivation (intrinsic motivation – to know, intrinsic motivation for accomplishment and intrinsic motivation for stimulation).*
4. Achievement Motives Scale – Sport (AMS-Sport) – *striving for success (SS), fear of fail-*

ure (FF), hope (SS-FF), and total achievement motivation (SS+FF).

5. Trait Sport Confidence Inventory (TSCI) – trait self-confidence in sport.

Sport performance in orienteering was operationalized as the average number of points earned from National competitions (by the rules of Bulgarian Federation of orienteering – БФО, 2010) during the year of the study. According these rules, for every position above 21th it is given certain amount of points, and for lower placement it is given zero points.

Results

The descriptive statistics is presented in Table 1.

The comparison of the data to the norms of the tests shows that the measured values are in the average range according to the norms of the Bulgarian versions of the EPQ, AMS and TSCI (Паспаланов, Щетински и Айзенк, 1984 и Пенев, 2012; Желязкова-Койнова, Савчева, 2008; Желязкова-Койнова, 2012). The level of trait anxiety in elite orienteers is low, compared to the norms of the Bulgarian version of STAI-Y (Щетински и Паспаланов, 1989).

The intrinsic motivation in this sample is stronger than the extrinsic motivation, which is typical for amateur sport. Especially low are the values of external regulation of behavior. The highest value is the value of Intrinsic motivation for stimulation. All this represents sport motivation that is self-determined in very big extent. At the same time, the introjected motivation is quite strong in the sample, it is the second strongest type of motivation and its value is higher than the values of the other two types of intrinsic motivation. This means that the self-imposed duty and moral obligations represent very important motivation for the Bulgarian elite orienteers. Many of them are members of the National team and all of them are the most important competitors who earn the financing of their clubs (according to the rules of the Ministry of youth and sport and BFO). Similar are the findings of Домусчиева-Роглева, Мутафова-Заберска и Янчева (2013) who studied wrestling competitors and registered heightened level of introjected motivation amongst top ranked female wrestlers; and of Losa Iglesias et al. (2016), who studied Spanish Ultramarathon runners and showed that the level of introjected motivation was the highest point of their motivational profile in both males and females.

Table 1. Descriptive statistics of the sample data.

Variables	MEAN	SD	Minimum	Maximum	Range
Trait sport self-confidence	85.66	15.27	49	113	64
Motive to achieve success	34.89	6.17	16	45	29
Motive to avoid failure	11.37	8.26	1	39	38
Hope	23.51	13.4	-23	44	67
Total achievement motivation	46.26	5.76	27	57	30
Need for approval	8.12	3.85	1	15	14
Extroversion	14.12	4.83	1	20	19
Neuroticism	7.82	6.62	0	19	19
Psychoticism	3.79	2.85	0	10	10
Trait anxiety	36	8.15	21	53	32
Amotivation	1.66	0.69	1	3.5	2.5
External regulation	3.19	1.59	1	6.75	5.75
Introjected rmotivation	5.96	1.2	3	7	4
Identified rmotivation	5.49	1.16	2.75	7	4.25
Intrinsic motivation – to know	5.09	1.02	3	7	4
Intrinsic motivation – to accomplish	5.47	1.07	3	7	4
Intrinsic motivation for stimulation	6.12	0.79	3.75	7	3.25
Extrinsic motivation	4.88	1.03	2.33	6.92	4.59
Intrinsic motivation	5.50	0.89	3.33	6.67	3.34
Orienteering performance	29.18	11.60	0	49.33	49.33

The results of correlational analysis are presented in Table 2.

The results of the correlation analysis indicate that the psychological characteristics with highest level of association with sport performance in Elite group are *hope* (SS - FF) – $r=0.529$ (strong association), *trait sport confidence* – $r=0.489$ (moderate association) and *amotivation* – $r=0.417$ (moderate association). That means that higher hope (i.e., high striving for success *simultaneously* with low fear of failure) corresponds to better performance in orienteering; also, higher sport confidence and lower amotivation are related to higher sport performance.

Table 2. Results of correlational analysis.

Variables	Correlation with performance
Trait sport self-confidence	0.489**
Motive to achieve success	0.471*
Motive to avoid failure	- 0.474*
Hope	0.529**
Total achievement motivation	-0.119
Need for approval (Lie)	0.006
Extroversion	0.133
Neuroticism	-0.053
Psychoticism	-0.050
Trait anxiety	-0.215
Amotivation	-0.417*
External regulation	0.183
Introjected rmotivation	0.130
Identified rmotivation	0.041
Intrinsic motivation – to know	-0.091
Intrinsic motivation – to accomplish	0.062
Intrinsic motivation for stimulation	0.226
Extrinsic motivation	0.163
Intrinsic motivation	-0.048

* $p<0.05$, ** $p<0.01$

Discussion

The results of the study show that *high level of trait sport confidence, high hope* (combination of high level of striving for success and low level of fear of failure) and *low amotivation correspond to higher level of sport performance in orienteering*. Orienteers that are characterized by high hope, high self-confidence and low amotivation show higher competitive performance through the year and orienteers that are characterized by low self-confidence, low hope and higher amotivation compete worse.

It is well recognized that the self-confidence influences significantly and positively sport performance (Craft et al., 2003; Feltz, 1988; Moritz et al., 2000; Woodman & Hardy, 2003). Moritz et al. (2000) in their meta-review report average correlation of $r=0.26$ between domain-specific measures of self-efficacy, such as self-confidence, and sport performance. Craft et al. (2003) report mean effect size of $r=0.25$. Woodman and Hardy (2003) – of $r=0.24$. Our results show similar trend but twice as big size effect, which could be explained by the size of the sample and by the fact that the subjects are elite athletes. As showed by Craft et al. (2003), the relationship of self-confidence and sport performance in elite European club athletes are much closer than in American college athletes and in PE students.

Thomassen and Halvari (1996) reveal significant positive relationship between striving for success and sport performance while at the same time the fear of failure correlates negatively with sport performance. Striving for success and fear of failure are important predictors of the training frequency – higher fear of failure and low striving for success are related to reduced frequency of practice (Gabler, 1981). The positive influence of striving for success and hope on the sport performance is showed by Elbe & Beckmann (2006), Coetzee, Grobbelaar & Gird (2006), Zuber & Conzelman (2014). Similar findings – positive relationship between striving for success and sport performance and negative relationship between fear of failure and sport performance, – are presented in other studies on Bulgarian orienteers (Желязкова-Койнова, Стоянова, 2014), handball- and basketball players (Желязкова-Койнова, Върбанов, 2012; Желязкова-Койнова, Тодорова, 2014).

Many studies identified significant negative relationship between trait anxiety and sport performance (Kleine, 1990; Spielberger, 1990; Eysenck & Calvo, 1992; Eysenck et al., 2007). In our sample this relationship is negative but nonsignificant – a results that is not surprising if we take into account that the level of trait anxiety is low in the sample.

And, at the end, significant negative relationship between amotivation and sport performance indicates that engaged, motivated orienteers who do not intend to quit sport, showing very low levels of amotivation, compete better than the orienteers

who have doubts and some amount of demotivation. Similar results obtained Брънзова (2015) in basketball players.

Conclusion

The results of the study demonstrate the necessity to modulate psychological preparation of young orienteers by means of encouraging self-confidence and approach motivation, simultaneously creating conditions for decreasing avoidance motivation in sport. Psychological work with parents and coaches should allow to organize the best possible conditions for development of appropriate motivational atmosphere.

References:

- Брънзова, А. Изследване на мотивацията на елитни състезатели по баскетбол. (2015). Дисертация, НСА, С. БФО (2010)
- Наредбата за точкуване на състезателите като критерии за разпределение на годишните финансови средства от МФВС, утвърдена от УС на БФО с Решение № 7, Протокол № 1/23.01.2010, available at: <http://orienteering.bg/get.phpile=%D0%9A%D1%80%D0%B8%D1%82%D0%B5%D1%80%D0%B8%D0%B8%20%D0%B7%D0%B0%20%D1%82%D0%BE%D1%87%D0%BA%D1%83%D0%B2%D0%B0%D0%BD%D0%B5.pdf&id=428> (accessed 28.08.2017).
- Домусчиева-Роглева, Мутафова-Заберска, Ю., Янчева, М. (2014). Вътрешна и външна мотивация при спортисти. Сборник научни доклади от Седми национален конгрес по психология, София, Дружество на психолозите, 1501–1513.
- Пенев, С. (2012). Нова стандартизация на теста на Айзенк. Научни трудове на Русенския университет, т. 51, серия 10, 35–38
- Желязкова-Койнова, Ж. Адаптация на тест за изследване на мотивацията за постижение при спортисти (Elbe, Wenhold & Müller, 2005). Личност. Мотивация. Спорт. Т. 17, НСА-ПРЕС, С., 2012, 186–196.
- Желязкова-Койнова, Ж., Е. Савчева. Адаптация на теста на Р. Вийли (Vealey, 1986) за изследване на личностната спортна увереност В: Личност, мотивация, спорт, т. 13, НСА Прес, С., 2008, 66–73
- Желязкова-Койнова, Ж., Върбанов, И. (2012). Влияние на мотивационни и темпераментови характеристики върху спортното постижение при хандбалисти. В сб. „Съвременни тенденции на физическото възпитание и спорта“, Университетско издателство „Климент Охридски“, 291–297.
- Желязкова-Койнова, Ж., Стоянова, К. (2014). Влияние на темпераментови и мотивационни особености върху спортното постижение при състезателите от възрастова група Мъже 21 по спортно ориентиране. Спорт и наука, Извънреден брой 1, 51–57.
- Желязкова-Койнова, Ж., Тодорова, В. (2014). Влияние на темпераментови характеристики, мотивация за постижение и психологически умения върху игровата ефективност при висококласни баскетболистки. Съвременни тенденции, проблеми и иновации във физическото възпитание и спорта във висшите училища. Издателски комплекс УНСС, 150–165.
- Паспаланов, И., Щетински, Д., Айзенк, С. (1984). Българска адаптация на личностния въпросник на Х. Айзенк. Психология, 5, 279–292
- Щетински, Д., Паспаланов, И. (1989). Методическо пособие за работа с българската форма на въпросника за оценка на тревожността на Ч. Спилбъргър (STAI – форма Y). С., БАН, 1989
- Coetzee, V., Grobbelaar, H. W., & Gird, C. C. (2006). Sport psychological skills that distinguish successful from less successful soccer teams. *Journal of Human Movement Studies*, 51(6), 383–402.
- Craft, L. L., Magyar, T. M., Becker, B. J., & Feltz, D. L. (2003). The relationship between the Competitive State Anxiety Inventory-2 and sport performance: A meta-analysis. *Journal of sport and exercise psychology*, 25(1), 44–65.
- Elbe, A.-M., & Beckmann, J. (2006). Motivational and self-regulatory factors and sport performance in young elite athletes. In D. Hackfort & G. Tenenbaum (Eds.), *Essential processes for attaining peak performance*. Aachen: Meyer & Meyer Sport, 137–157.
- Elbe, A.-M., Wenhold, F., & Müller, D. (2005). Zur Reliabilität und Validität der Achievement Motives Scale-Sport: Ein Instrument zur Bestimmung des sport-spezifischen Leistungsmotivs [The reliability and validity of the Achievement Motives Scales – Sport: An instrument for the measurement of sport-specific achievement motivation]. *Zeitschrift für Sportpsychologie*, 12, 57–68.
- Eysenck, M. W., & Calvo, M. G. (1992). Anxiety and performance: The processing efficiency theory. *Cognition & Emotion*, 6(6), 409–434.
- Eysenck, M.W., Derakshan, N., Santos, R., Calvo, M.G.(2007). Anxiety and cognitive performance: Attention control theory. *Emotion*, 7, 336–353.
- Eysenck, H. J., & Eysenck, S.B.G. (1975). *Manual of the Eysenck Personality Questionnaire*. London: Hodder & Stoughton
- Feltz, D. L. (1988). Self-confidence and sports performance. *Exercise and sport sciences reviews*, 16(1), 423–458.
- Gabler, H. *Motivationale Aspekte sportlicher Handlungen*. In: H. Gabler, J.R. Nitsch & R. Singer. *Einführung in die Sportpsychologie*. Hofmann, Schorndorf, 1995, 64–102
- Kleine, D. (1990). Anxiety and sport performance: A meta-analysis. *Anxiety research*, 2(2), 113–131.
- Losa Iglesias, M. E., Vallejo, B., Rodriguez Vazquez, R (2016). The Motivation of Spanish Ultramarathon Runners Sports Coaching: Peak Performance (Goal Setting, Motivation, Skill Acquisition). *Annals of Sports Medi-*

cine and Research, 3(4), 1072.

Moritz, S. E., Feltz, D. L., Fahrbach, K. R., & Mack, D. E. (2000). The relation of self-efficacy measures to sport performance: A meta-analytic review. *Research quarterly for exercise and sport*, 71(3), 280–294.

Pelletier, L. G., Tuson, K. M., Fortier, M. S., Vallerand, R. J., Briere, N. M., & Blais, M. R. (1995). Toward a new measure of intrinsic motivation, extrinsic motivation, and amotivation in sports: The Sport Motivation Scale (SMS). *Journal of Sport and Exercise Psychology*, 17(1), 35–53.

Spielberger, C.D. (1990). Stress and anxiety in sports. In: Hackfort, Dieter, and Charles D. Spielberger, eds. *Anxiety in sports: an international perspective*. Taylor & Francis, 3–17.

Spielberger, C.D, Gorsuch, R.L., Lushene, R.E. (1970). *Manual for the State-Trait Anxiety Inventory*. Consulting Psychologist Press, Palo Alto, California

Thomassen, T.O.& Halvari, H. (1996). Achievement motivation and involvement in sport competitions. *Percep-*

tual and Motor Skills, 83, 1996, 1363–1374.

Vealey, R. S. (1986). Conceptualization of sport-confidence and competitive orientation: Preliminary investigation and instrument development. *Journal of sport psychology*, 8(3), 221–246.

Woodman, T., & Hardy, L. (2003). The relative impact of cognitive anxiety and self-confidence upon sport performance: A meta-analysis. *Journal of sports sciences*, 21(6), 443–457.

Zsheliaskova-Koynova, Z. (1991). Some Personality Characteristics of Elite Orienteers. *Scientific Journal of Orienteering*, 7, 18–33.

Zuber, C., & Conzelmann, A. (2014). The impact of the achievement motive on athletic performance in adolescent football players. *European journal of sport science*, 14(5), 475–483.

Contact information with the corresponding author:

Associate Professor Zshivka Zsheliaskova-Koynova, PhD, zshivka@gmail.com, 0892299850

COGNITIVE STYLES OF ELITE FOOTBALL REFEREES IN BULGARIA

Ivan Ivanov, Georgi Ignatov

Abstract

In the game of football the referee is one of the most important figures. His role is an integral part of the game. The modern game has very fast and complicated situations and the referee has to be equipped with professional skills and responsible for enforcing the laws of the game. Every second there is a lot of information on the pitch which has to be integrated. Psychologists are trying to describe this processes and to separate the different styles of information receiving and decision making. Kirton Adaption/Innovation Inventory, KAI (Kirton, 1976), adapted by S. Vasileva, 2003. The questionnaire contains 33 items: hree scales – originality, efficacy, conformity. The cognitive styles are part of the complete adaptation to the game and the preferred way of thinking in most of the game situations. The basic direction of this report is to carry out theoretical and empirical research on the cognitive styles of elite referees in Bulgaria. The main part of the report is a comparison between referees in first league, second league, U17 and U19 league. Typically the number of the referees in that study is 116. We suggest that the three styles (conformity, originality, efficiency) in this study could be different according to the experience, age and gender characteristics of the referees.

Key words: cognitive styles, football referees, football, information processes

Introduction

The football refereeing is an area with strategic meaning, on one side in the policy of the European and World Football Federations, and on the other in all national football association. It is a center and important part of the game. The refereeing is exclusively current problem in its theoretical and practical aspects. In the modern football the referee is the only individual who has full rights to enforce the rules of the game. He has direct responsibility to conduct every match according to the requirements and spirit of the game rules. In this multi-dimensional activity the referees must behave like good leaders, competent, objective and fair judges, with knowledge about the game of football, and to practice in a creative way the game rules and the principles of the sport morale. Meanwhile they are working with people and have to be equipped with well developed psychological and pedagogical skills.

The term cognitive style is a psychological category which represents consistency in the way that people use and analyze information (Ausburn & Asburn, 1978). Messick (1976) defines the cognitive style as stable attitudes and preferences or learned strategies, which determine the individual way of perception, memorising, thinking and problem solving. Witkin et. al., (1977) describe the cognitive

style as individual differences in the way that people perceive, think, solve problems and learn. There are many interpretations and theories, but most of the authors often use descriptions which define the cognitive styles as a preferred way of perception and information use, as well as problem solving in different complicated situations.

There is a lot of research on cognitive styles in football, but most of it is with players. Thelwell (2005) carried out a study to evaluate the psychological strength in players from English Premiere League. The cognitive ability of the players to recognize the situation is one of the most important factors which determine the performance. The highlight of Witkin's theory – (dependence – independence of the field) is based on a lot of research with different athletes (Kane, 1972; Drouin et. al., 1986; Cano & Marquez, 1995). A large number of the researchers find that participants with field dependence style have the advantage in collective sports. On the other side the competitors with field independence have more success in individual sports. Later, there were surveys which confirmed the hypothesis that there is no difference in cognitive styles in the different sports (Drouin et. al., 1986; Brady, 1995). Suda (1999) researched cognitive styles of football players and tried to find correlation with their sport performance. His data show that from the perspective of the theory for dependence – independence

of the field, the elite players have a clearer tendency to have a dependence field style. T. Yancheva & I. Ivanov (2014) in their research with football players show that the styles of attention which are associated with a positive game effect have higher results.

Football refereeing is highly related to the football game. According to Yancheva and Ignatov (2007) the elite football referees have higher security urges. They have anxiety, intensive emotional reactions and need support from others in situations of stress and risk. In another survey of the same authors (Yancheva and Ignatov, 2012), they compiled a psychological profile of football referees and bring up important ideas for the referees' preparation. There is a difference between elite and non-elite referees. Some of them have an internal locus of control and others have an external one (Ignatov, 2007).

The following research is based on all this factors, questions and problems about the psychological aspects of Bulgarian football referees. We try to find out the importance of styles and their role in game situations.

The **aim** of the research is to explore the cognitive styles of elite referees in Bulgaria.

To achieve that **aim** we set following tasks:

1. To find out and measure cognitive styles of football referees;
2. To find out how the factors such as gender, age, professional experience and qualification level influenced the cognitive styles.
3. To find, explore and compare the styles between referees and assistant-referees.

Methods

The following research was realized during the winter seminar of professional football referees in Sliven, Bulgaria – February 2017. Firstly with referees and assistants from FPFL (First Professional Football League) – 6–8 February; referees and assistants from SPFL (Second Professional Football League) – 11–13 February; referees and assistants from Elite youth groups – 13–14 February. Every referee completed a test (questionnaire) – Kirton Adaption/Innovation Inventory – KAI (Kirton, 1976), adapted from S. Vasileva, 2003. The questionnaire contains 33 items spread out in three scales – Originality, Conformity and Efficiency.

Ivan Ivanov (2017) summarizes that:

- **Originality** is related to a tendency to move away from the consensus by breaking the ordinary styles of thinking with new ideas;
- **Efficiency** means consistency, workability, precision and good performance;
- **Conformity** is the tendency of people to seek in the group authority, rules, security and norms.

The topic of research are cognitive styles – conformity, originality and efficiency of elite football referees in Bulgaria.

The object of the research is the influence of gender, age, professional experience, qualification level and international experience on the cognitive styles of referees.

The subjects of the research are 116 football referees: 12 referees of FPFL (5 of them – international); 22 assistants from FPFL (7 of them international), 14 referees and 24 assistants from SPFL; 20 referees and 16 assistants from Elite youth groups, 2 women referees (1 international) and 6 women assistants (2 of them international).

The data from the research are processed with statistical software SPSS19 and variance and comparative analysis. The distribution of the data was determined by the test of Kolmogorov – Smirnov.

Results and discussion

The results of the average values show that originality ($M= 2,70$) is the style with the highest score – Figure.1. This style is typical for persons who like and try to be creative, to accumulate new experience and to progress with little information about the tasks.

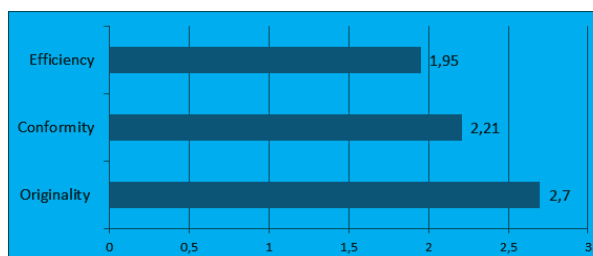


Figure 1. Average values for the cognitive styles of surveyed referees

The comparative analysis of the data by gender does not show any statistically significant differences be-

tween these three cognitive styles. In this research we can't be sure about the results, because the female referees are only eight, and men and women are not equally represented. The data from this survey can be analyzed for futures hypothesis and ideas.

have much more responsibilities. They need to react very quickly and correctly in frequently changing situations. The originality style helps them to perform well, during the game, there are no two same moments on the pitch.

The comparative analysis of data by position shows that referees have higher level of the cognitive style Originality than their assistants – Table 1. They

In this research there is no statistically significant differences in the other two cognitive styles – conformity and efficiency.

Table 1. Results from the comparative analysis of data by position of the pitch

Cognitive styles	position	N	M	SD	t	α
Originality	Referees	48	2.89	.39	2,66	0,03
	Assistants	68	2.60	.47		
	Total	116				
Conformity	Referees	48	2.22	.26	-1,22	0,22
	Assistants	68	2.08	.63		
	Total	116				
Efficiency	Referees	48	1.95	.39	-1,22	0,22
	Assistants	68	1.98	.47		
	Total	116				

The next variable which we take is age (Table 2). For the goals of the research we separate the people in three groups – from 20 to 26, from 27 to 33 and from 34 to 42.

referee profession requires specific skills. Every one individual has to observe and react to quick situations and to make decisions in less than a second. Sometimes he or she has to be flexible and react differently in different game episodes, and in this case the professional experience is very important. The conclusion is – the best referees have a higher level of original thinking and very well developed skills for movement on the pitch. There are statistically significant differences between age categories – $F=2,31, \alpha = 0,01$ (Table 2).

Table 2. Results from the comparative analysis of data by age category

Cognitive styles	N	Mean	SD	F	α
Originality	20–26	18	2.53	2,31	0,01
	27–33	64	2.68		
	34–42	34	2.79		
	Total	116	2.69		
Conformity	20–26	18	2.25	2,00	0,04
	27–33	64	2.14		
	34–42	34	2.03		
	Total	116	2.21		
Efficiency	20–26	18	1.90	4,23	0,15
	27–33	64	1.98		
	34–42	34	1.92		
	Total	116	1.95		

The styles are a characteristic which can be developed through individual experience and the specifics of activity and profession. The results show that originality increases with the age of the referees. One of the reasons here is social and life experience. In other words, the football

The next scale is conformity, the feature of people who are with high agreement with the group and very rarely resist other opinions. The results in our research show that this characteristic exists in lower levels in older referees. The young professionals are still uncertain about their skills and need more help and support and still don't have enough authority. There is a significant difference between younger and older referees – $F=2,00, \alpha = 0,04$. The age is a predictor for conformity level – older age means lower conformity and agreement. In many cases the older professionals have higher qualifications and that's related to the individualism.

The referee is the most important person during the course of a match, he (she) has to have leading skills and autonomy.

The scale efficiency has the highest level in the 27–33 age range, but the differences are not statistically significant.

Professional experience is the next independent variable in our research (Table 3).

Table 3. Results from the comparative analysis of data by professional experience

Cognitive styles		N	Mean	SD	F	α
Originality	3–9	44	2.58	.32	3,00	0,04
	10–17	58	2.61	.32		
	18–25	14	2.75	.33		
	Total	116	2.69	.32		
Conformity	3–9	44	2.29	.33	4,23	0,01
	10–17	58	2.21	.41		
	18–25	14	2.15	.49		
	Total	116	2.21	.39		
Efficiency	3–9	44	1.95	.58	0,23	0,771
	10–17	58	1.96	.65		
	18–25	14	1.92	.66		
	Total	116	1.95	.62		

The results show statistically significant differences for two scales (Table 3). First, originality increases with the years in the profession ($F=3,00$, $\alpha = 0,04$). In this table we have higher levels of originality with increasing experience. The practice is important for creative decisions, progressing with little information and quick information processing. The success of the referee depends on his original thinking, there is a close relationship between psychological skills and experience.

The scale conformity is lower in the more experienced professionals – $F=4,23$, $\alpha = 0,01$. The agreement with the group is not so important when you follow the rules and judge in right way. The referees with only one or two years’ experience are still uncertain, with high anxiety and expectations for mistakes and the consensus with others gives them more peace of mind.

The efficiency scale has the highest level in the period of 10 to 17 years in the profession, but we can’t draw conclusions, because there is no statistically significant difference between different categories of experience.

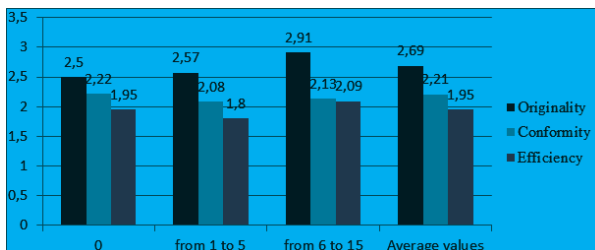


Figure 2. Average values of cognitive styles by international experience

To become an international referee is the goal of every one who chooses this profession. In our survey we tries to find the most valuable cognitive styles. And after we have described these qualities, the referees can use this information to develop their psychological skills. The results point out that the originality style has the highest level in participants with the greatest international experience – from 6 to 15 years (Figure 2). There are significant differences – $F=3,00$, $\alpha = 0,04$.

Conclusions:

- The obtained results support the hypothesis that the originality cognitive style is leading in elite referees in Bulgaria;
- The oldest and the most experienced referees have the highest level of originality, creativity, quick decision making and use of information;
- The style conformity goes down with the increase of age and experience;
- The elite professionals with high level of international experience prefer individual mental and behavioral strategies and decisions (originality cognitive style);
- In our research we did not find statistically significant differences of cognitive style efficiency by gender, age category or professional experience;
- The obtained results can be an important direction for football referees, their mentors and sport psychologists for better understanding and development;
- This article is a basic level for future studies in field of Bulgarian football refereeing.

References

- Ausburn, L. J. & Ausburn, F. B. (1978). Cognitive styles: Some information and implications for instructional design. *Educational communication and Technology*, 26, 337–354.
- Brady, F. (1995). Sports skill classification, gender, and perceptual style. *Perceptual and Motor Skills*, 81, 611–620.
- Cano, J. E. & Marquez, S. (1995). Field dependence-independence of male and female Spanish athletes. *Perceptual and Motor Skills*, 80, 1155–1161.
- Drouin, D., Talbot, S., & Goulet, C. (1986). Cognitive styles of French Canadian athletes. *Perceptual and Motor Skills*, 63, 1139–1142.
- Ignatov, G. (2012). Experimental validation of training method for young football referees. Dissertation. NSA „Vassil Levski“, department „Football and tennis“.
- Ivanov, I. (2017). Cognitive styles and game efficiency in football. Dissertation. NSA „Vassil Levski“, department „Psychology, pedagogy, sociology“.
- Kane, J. E. (1972). Personality, body concept and performance. In J. E. Kane (Ed.), *Psychological aspects of physical education and sport* (pp. 91–127). London: Western Printing Services.
- Kirton, M., J. (1976). Adaptors and innovators, a description and measure. *Journal of Applied Psychology*, 61, 622–629.
- Messick, S. (1976). Personality consistencies in cognition and creativity. In S. Messick (Ed.), *Individuality in learning*. (pp. 4–23). San Francisco: Jossey-Bass.
10. Sadler-Smith, E. & Badger, B. (1998). Cognitive style, learning and innovation. *Technology Analysis and Strategic Management*, 10, 247–265.
- Suda (1999) The relationship between cognitive style of soccer players, *Bulletin of institute of Physical Education, Keio University*, 38, 1–9.
- Talbot, R. P. (1989). Valuing differences in thinking style to improve individual and team performance. *National Productivity Review*, 9, 35–50.
- Thelwell, R. (2005). Defining and understanding mental toughness in soccer. *Journal of Applied Sport Psychology*, 17, 326–332
- Witkin, H., A., Moore, C. A., Goodenough, D. R., & Cox, P. W. (1977). Field dependent and field independent cognitive styles and their educational implications. *Review of Educational Research*, 47, 1–64.
- Yancheva, T., Ignatov, G. (2007). Psychology of football refereeing. *Medicine and sport*, 4, 25–28.
- Yancheva, T., Ignatov, G. (2013). Psychological profile of football referee. Fifth international scientific conference. *Vol. „Modern tendency of physical education“*. University publishing house „St. Kliment Ohridski“. P. 515–523.
- Yancheva, T., Ivanov, I. (2014). Bulgarian adaptation of Test of Soccer Attentional Style” (TSAS, A. C. Fisher & A. H. Taylor (1980), *Personality, motivation, sport*. Volume 19. NSA- PRES, 314–322.

For correspondence:

Assistant Ivan Ivanov, PhD
 Assoc. Prof. Georgi Ignatov, PhD
 National Sports Academy „Vassil Levski“
 Sofia University “St. Kliment Ohridski”
 Department „Psychology, pedagogy and sociology”
 Department of sport
 E-mail: ywan13@abv.bg
 E-mail: gochev730626@abv.bg

ATTITUDES OF YOUNG HOCKEY PLAYERS OF 6–7 YEARS TO COMPETITIONS

Liudmila Rogaleva*, **Valerii Malkin***, **Alla Kim****, **Natalya Khon****

*The Ural federal University named after the first President of Russia B. N. El'tsin,

**al-Farabi Kazakh National University, Almaty, Kazakhstan

Summary: The study was aimed at studying the impact of the first competitions on young athletes. The aim of the research was to study the subjective attitude of young hockey players of 6–7 years to participate in competitions. A total of 20 young hockey players took part in the study, where mostly projective methods were used. The study revealed the peculiarities of the emotional states of young athletes, which can be both positive and negative. It is established that the desire of young athletes to win creates a strong mental strain, causing frustration, which prevents children from fully using their skills during competitions. It is revealed that not all young athletes can correctly respond to failure, and also can not see the relationship between the training process and the competition. The data obtained can be put in the development of the strategy of the trainer's and parents' behavior in the preparation and participation of children aged 6–7 in competitions.

Keywords: Attitude, competition, hockey, young athletes

Introduction

In recent years, in a number of sports, such as hockey, football, figure skating, artistic gymnastics, there has been a significant decrease in the age at which sports began to take place (often from 4–5 years), which is associated with an early specialization in these sports. Participation in competitions of 6–7 year olds is becoming the norm, at the same time, the process of including pre-school children in competitions is not sufficiently studied.

Organization of classes often takes place under the guidance of trainers who have not received the appropriate psychological and pedagogical preparation for work with preschool children, are not ready to work with parents who have little idea about sports activities, but at the same time high ambitions and a desire to see as soon as possible successes of their children. Often, as the main criterion for assessing the success of young athletes after 2–3 years of playing sports, parents and coaches choose a victory in competitions or a high place in the standings. In this regard, it becomes evident the need to study more deeply the problem of forming a subjective attitude of young athletes to competitions. There are two aspects to studying this problem. The first is connected with the study of the condition of young athletes before, during and after the competition. According to a number of studies, the participation of young athletes in competitions is always a significant stress, which, without the correct psychological work of the trainer-teacher and

reasonable behavior of parents, can cause development of symptoms in children such as fear of defeat, fear of punishment, reduction of self-esteem and formation of self-doubt (Khvatskaya E., 2010, Weinbegr R., 2011, Sobkin V., 2006, Bomba T., 2000), and others. And as noted by Bomba Tudor, (2000) a stressful condition associated with competitive activity can manifest itself in children both before the start of the competition, during participation in them, and after their completion. The second aspect has applied significance and is connected with the psychological preparation of young athletes for the first competitions. It can be noted that both aspects remain not sufficiently developed, as indicated by the some authors (Rogaleva & Malkin, 2016, Shields D., 2005, Platonov., 2013, Sullivan O., 2013).

The aim of the research was to study the subjective attitude of young hockey players of 6–7 years to participate in competitions. Experimental base of the research of the school “Youth”, hockey department of Yekaterinburg. The study involved 20 young hockey players of preschool age, an average age of 6.6 years, who have had an ice hockey experience of 3 to 4 years, as well as experience of participating in competitions for one to two years. According to our hypothesis, the knowledge of subjective perception by young athletes of competitions and their reaction to participating in competitions is a necessary condition in the organization of psychological and pedagogical work with young hockey players of 6–7 years. Analysis of the subjective experiences of

young hockey players arising in the course of and after the competition, the evaluation by children of the reaction of adults to their possible mistakes, the expectations of young athletes related to the forthcoming competitions, as well as the presence or absence of fears in children can contribute to the development of a correct strategy for the behavior of coaches and parents.

Methods

As the main methods of research, projective methods are chosen. To identify the experiences that arise during the competition, a technique was developed that includes 6 smiley pictures with positive and negative emotions (a cheerful smile drawing with a cup for the first place in the hands, a smiling smiley figure, an evil smiley pattern, a winking figure- smiley, frustrated smiley picture, crying smiley picture). To study the subjective attitude to the competition, we used the structured questionnaire method, the method of unfinished sentences, drawing tests ("I'm in training and I'm in competition)..

Results and Discussion

The results of the projective methodology of the emotional states of young hockey players associated with the competitions revealed that in most cases (45%) are positive emotions associated with the expectation of victory and a well-deserved award (cups, medals, etc.) or joy of 15%. At the same time, 30% of young sportsmen revealed states of anger, aggression or frustration, because hockey implies confrontation, the achievement of a result is always fraught with difficulties and struggle with the rival, which leads to the consolidation of negative experiences for young sportsmen. Conversations with the coach confirm the fact that young athletes often experience frustration, which manifests itself in the form of increased activity, excitement with equal rivals, or in the form of complete apathy when playing with a stronger opponent. The results of the questionnaire on the attitude of young athletes to the competition gave additional information about the reasons for the emotional conditions of young athletes arising during the competition (Table 1).

Table 1. Results of answers of young sportsmen of 6–7 years about the first competitions

Question	Answers
1/ The most complex and difficult part in participating in the competition? (2–3 answers)	I did not want to lose (75%), Not to fail the coach (50%), Not to fail the team (50%) Strong opponents 10% To play good 30% Not to let my parents down 15%
2/ Are the competitions different from training?	Yes, but not very different (67%), Yes, they are very different (33%) No, they do not differ 0%
3/ The most important thing in the competition, I think is... (2–3 answers are possible)	win (92%), to receive medals, certificates, prizes (67%), to earn something new, gain experience (67%)
4/ Who should always be present at the competitions?	Coach and players (100%) Parents (0%)
5/ The results at the competitions ...	made us happy, but there is much to strive for (67%) grieved us (33%)
6/ Would you like to participate in the competition in future?	Yes, I want to test my strength (100%)
7/ Choose one option	Competition with others is interesting (75%), Competition is just a holiday (7%), Competition with others is difficult (18%)

As can be seen from Table 1, for most young hockey players, there is a high desire to participate in competitions, while 33% of children note that the competitions are very different from training. This means that competitions cause young athletes strong emo-

tions and feelings, in contrast to training activities. At the same time, some of the young athletes perceive competition and training as different types of activities, while they do not associate the result in the competitions with training activities. Another obvi-

ous fact is the dominant attitude of young athletes for winning, win (92%), receiving medals and certificates (67%). It should be noted that this is a natural and unconscious attitude of children. At the same time, it is an attitude, as practice shows, that creates a strong mental tension in young hockey players, which leads to the fact that it destroys and disorganizes the activities of children on playground. At the same time, the difficulties of the competitions are not so much connected with rivals, with the game, as with the final result (we did not want to lose 75%).

Thus, the conclusion is natural that the actions of parents and coaches should be aimed at forming in young athletes the perception of competition from the standpoint of their technical and physical growth, increasing the desire to train.

With the help of the methodology of unfinished sentences, we have identified how the young athletes perceive the reaction of the coach and parents to their performances in competitions (table 2).

Table 2: The perception of young athletes on the reaction of coach and parents to their performances in competitions

Question	Answers of young hockey players
1/ If I'm wrong during the competition, then the coach ..	will make a remark, he will say: "I expected more from Zhenya" will scold me must teach us more will be upset
2/ If my parents find out that I lost in competitions, then they...	will be offended will scold me will be sorry will ask me: «Why?», will be upset will say that sometimes everyone can loose
3/ If I lose, then I ...	do not do anything They scold me I will train more will be sorry and upset will make my team fail will train better. will be more focused next time

The analysis of the results showed that young athletes associate their loss in most cases with the experience of negative emotions ("I will be sad" or "upset"), or with negative emotions from the coach and parents ("they scold me") that only 10–15% children have an adequate understanding of what they should do in case of a loss (for example, more and better to train, be focused and attentive).

Thus, our study proves the unavailability of coaches and parents to respond psychologically properly to the competitive activity of young hockey players, though it is adults who are responsible for the psychological support of young athletes, especially in the situation of loss, as well as the formation in young athletes of constructive attitudes to overcome the emerging difficulties in competitive activities.

Conclusion.

Proceeding from the conducted research, it is possible to draw the following conclusions:

1. Beginning with the first performances, young athletes develop attitude towards the competition, which is associated with both positive and negative experiences.
2. The leading motive for participating in competitions for most young athletes is to win, which creates a strong mental strain among young athletes, causes frustration and does not allow children to demonstrate their skills, so that most children do not associate the competition with the training process.
3. The role of the coach and parents is to provide psychological support to young athletes in situa-

tions of loss as well as in the development of adequate attitudes to overcome the situations of failure.

Further research involves the study of effective strategies for the behavior of the coach and parents in the preparation and participation of children aged 6–7 in competitions.

References

- Bompa, T.O. (2000). *Total Training for Young Champions*. Human Kinetics. US.
- Khvatskaya, Y.Y. (2010). Bases of Child Sports Psychology. *Health as a National Asset*, St. Petersburg, pp. 223–243. (In Russian).
- Khvatskaya, Y.Y., Latysheva N.E. (2015). Prevention of fears of young athletes in the learning process at Children's and Youth Sports School (CYSS) and CYSS of the Olympic Reserve. *Collection of proceedings on the results of an international scientific and practical conference. Pedagogy and psychology: trends and development prospects*. Volgograd, Russia, pp. 114–116. (In Russian).
- Platonov, V., Bolshakova, I. (2013). Forcing long-term training of athletes and the Youth Olympic Games. *Science in the Olympic sport*. Kiev. pp. 37–42. (In Russian).
- Rogaleva, L., Malkin, V. (2016). System of psychological work in sport. *International Journal of Psychology*, 31st

International Congress of Psychology, 24–29 July 2016, Yokohama, Japan. p.1114.

Shields, D.L., Bredemeier, B.L., LaVoi, N.M., Power, R.C. (2005) The sport behavior of youth, parents, and coaches: The good, the bad, and the ugly. *Journal of Research in Character Education*, 3 (1), pp. 43–59.

Sobkin, V.S., Abrosimova, Z.B., Adamchuk, D.V. (2006). Age and Gender Characteristics of Adolescents' Attitudes Toward Sports. *Russian Education&Society*, 48 (3), pp. 60–77.

Sullivan O.J. (2013). *Changing the Game: The Parent's Guide to Raising Happy, High Performing Athletes, and Giving Youth Sports Back to our Kids*. Morgan James Publishing. US.

Weinberg R. S. (2011). *Foundations of sport and exercise psychology*. Robert S. Weinberg, Daniel Gould. Human Kinetics. US.

Corresponding author:

Rogaleva Liudmila*, Ural Federal University, Institute of Physical Education, Sport and Youth Policy, 14 Komintern st., Ekaterinburg, 620078, Russia.

E-mail: l.n.rogaleva@urfu.ru

Mobile: +79826927938

USE OF PSYCHODIAGNOSTICS IN THE WORK OF A COACH

Valerii Malkin, Liudmila Rogaleva, Irina Mamaeva
Ural Federal University, Ekaterinburg, Russia

Summary: The purpose of the study was to assess the effectiveness of the use of psycho-diagnostics in the practical work of the coach. In total, the study involved 7 coaches (3 women and 4 men, the average age was about 24.5), young athletes (158 people, the average age of athletes was 13.5 years.) The received facts confirm the importance of information received with the help of psycho-diagnostics about motivation and the objectives of the young athletes, the relationship in the sports team, as well as the attitude of young athletes to the upcoming competitions. It is proved that the coach's work with young athletes on the basis of data of psycho-diagnostics allows improving the organization of psychological work with young athletes.

Key words: psychodiagnostics, coach, sportsmen.

Introduction

The leading role in the management of the training process belongs to the coach, because the success of his/her sportsmen largely depends on his professionalism, ability to analyze and predict the behavior of the athletes during the competition.

Psychological testing has long established itself as an effective tool in the work of a sports psychologist (Giessen, 1973; Khanin, 1980; Malkin, 2008; Gorbunov, 2006). But it could be no less effective tool in the coaching, helping him/her to properly evaluate and predict the behavior of athletes in extreme conditions, to make adjustments in its precompetitive preparation, based on objective data, to build individual work with athletes, specifically to solve specific problems in the psychological preparation of an athlete and in team management.

Psychological diagnostics is particularly important in the work of the trainer on the stage of advanced sport specialization, in the period of adolescence of young athletes, as it is just this period when a stable system of personal qualities of young athletes is formed, and important mental mechanisms of regulation of activity, such as motivation, personal orientation, self-esteem and level of claims, are being laid.

Despite the obvious benefits of the use of psycho-diagnostics in sport, currently in Russia it is not actually used (Rodionov, 2004; Malkin et. al., 2015; Sivitsky et. al., 2014). This is due, firstly, to the fact that in most sport schools there is no position

of a sports psychologist, and secondly, due to the unwillingness of the coaches to use the available psychological tools in their work.

In our opinion, this leads to low efficiency of the psychological work of coaches with young athletes. As a result, the athletes acquire different psychological complexes and problems which either cause considerable psychological difficulties in later stages of a sports career, or lead to withdrawal of talented athletes from sports. Therefore, we consider, it is necessary to introduce effective and affordable methods of psycho-diagnostics in the practice of the trainer's work in compliance with ethical standards.

The aim of the study was to evaluate the efficiency of the methods of psycho-diagnostics in the work of a coach.

Methods

The first phase of work was devoted to defining psycho-diagnostic Toolkit for trainers. Selection of methods was carried out in accordance with the basic approaches to psychological support for young sportsmen, and also taking into account the age characteristics, by selection of the most significant personality indicators, which are critical for psychological readiness of young athletes to sport activities, and as a consequence, to the achievement of sports mastery.

As a result, basing on the method of deduction and induction, we have allocated three units of psycho-diagnostic instrumentation which the train-

er can use for specific psychological information about the athletes.

Unit 1 – motivational. We have included In the motivational unit psycho-diagnostic techniques that allow coaches to obtain more objective information about how the young athlete applies to sports, about the prevalence of external or internal motivation, about sports target of young athletes and their attitude to training and competition process.

Unit 2 – social. The social block includes techniques that can help the coach better understand interpersonal relationships in the team, satisfaction with the atmosphere in the group; can help obtain information about positive or negative role of leaders. These data are extremely important because they allow the coach to make a prediction about how solid is the team and on what is the psychological background of training and competition of young athletes. In addition, data on the social block can help the coach to develop an adequate strategy of building relationships with the athletes.

Unit 3 – personal. Methods of this unit focus on the diagnosis of personality indicators of young athletes, as well as their readiness for the upcoming competitions. The obtained data can help the coach to predict psychological problems and difficulties in young athletes, which can reduce the results of their competition; better understand the personal characteristics of young athletes, their level of confidence or insecurity, and therefore more adequately carry out psychological work with athletes, picking up such forms and methods of influence, which provide the formation of mental readiness of young athletes for competition.

At the second stage there was arranged and conducted the research on the use of methods of diagnostics in the work of the coach. The study involved 5 coaches in such sports as football, figure skating, synchronized skating, climbing, athletics, badminton. In the whole there were involved 7 coaches, 3 women and 4 men, the average age 24.5, with a master's degree, and their 158 athletes, the average age of athletes 13, 5 years. Organization of work of the trainer on the use of the methods of psycho-diagnostics was based on the following algorithm: the coach got a brief instruction on conducting psycho-diagnostics with athletes, then conducted the testing and data analysis and then developed a

program of work with young athletes. In the beginning of the study and before the end of it parents were informed about participation in the study and guaranteed the confidentiality of information.

The coach could consult a sports psychologist during his/her work. At the end of the performed work (within a year), the trainer conducted a re-test. In the process of the work, the coaches also evaluated the informativeness and usefulness of used methods of psychological diagnostics for practice. In this regard, in this article, we will focus on the consideration of those methods which were highly appreciated by the trainers. Firstly, it is the questionnaire "Motivation of sports activities" (modified version Teipel et al., 2007), which includes 31 possible answers to the question "I exercise because...". Athletes were asked to rate on a scale from 1 to 6 answers indicating either an external motivation ("many of my friends play sports", "parents convince me the benefits of sports", "I could be famous (get recognition) or internal ("the pleasure is all mine", "I particularly like this sport", "I would like to (a) check what I can achieve, what I'm capable of"). Secondly, the questionnaire "The goals of young athletes in sport" in which athletes indicated those goals that they target in the near future, and thirdly, methods of Fidler of emotional-psychological climate in the team (Fetiskin, et al., 2002), fourth, the technique of attitude to the upcoming competition" (Khanin, 1980).

Results and Discussion

Analyzing the results of the questionnaire "Motivation of sports activities" coaches were able to see how the motives of sports in young athletes are poorly differentiated. They could also get a better understanding of the causes of changes in the motivations of young athletes under the influence of external and internal factors. All coaches recognized the need to pay more attention to the development of the motivation of athletes, taking into consideration both common and individual data. As the basis of this work there was used a motivational strategy for the inclusion of young athletes in sports (Malkin et al., 2008). Deliberate coaching during the year led to positive changes in the motivation of young athletes, primarily in the direction of formation of internal motives over external, orientation on development of their abilities. These results are shown in table 1.

Table 1. The motives of sports in young athletes (%).

Questions	Study 1	Study 2
I enjoy doing sports	5.2	5.9
I like to win	4.7	5.2
I would like to check what I can achieve, what I'm capable of	4.3	5.8
I like our team	4.7	5.6
Doing sports, I can earn money	5.4	4.2
I could be famous (obtain recognition)	6.6.	5.0
I would like to make good money in the field of sports	5.5	4.5
I like the attention of the public	4.2	4.5
I like to overcome challenges set by the coach	5.1	5.7
I want to be successful	5.7	5.9
parents and coach convinced me in the benefits of sports	6,2	5.3

No less important for coach became the results of the questionnaire “The goals of young athletes in sport”, which are presented in table 2.

Table 2. The attitude of young athletes to the training process

How many times a week you must exercise to achieve good result?		
	Study 1	Study 2
4 times a week	20%	10%
5 times a week	50%	60%
6 times a week	30%	30%
To train additionally on your own	80%	100%
What can hinder you to achieve results?		
	Study 1	Study 2
Laziness	20%	10%
Complacency	20%	10%
The lack of will	10%	10%
The lack of self-control	30%	10%
Unforeseen external factors (illness, study, etc.)	20%	60%
What is missing to achieve the goal?		
	Study 1	Study 2
Physical conditions	20%	60%
Technical preparation	40%	20%
Other	40%	20%
What factors are necessary for achievement of high sports results?		
	Study 1	Study 2
To work over “I cannot”	60%	20%
To comply with the training regime	0%	80%

All coaches noted the receipt of new information about preferences of young athletes to the training process, to the number of ongoing training, to the

independent work, factors which, in the opinion of young athletes, assist in the achievement of high sports results. The data received by the coaches could help them make adjustments in the organization and methodology of the training activities to revise the program of work with young athletes and to expand the forms and methods of organization of independent work of young athletes. The work conducted by the trainers contributed to the awareness of the young athletes of the need for independence training to achieve the goals; also there has been a reorientation of the views of young athletes from the principle “work through “cannot” to the compliance with the training regime; and the reevaluation of its internal settings which may prevent to achieve sports results.

When using the methods to study the atmosphere in the team, the coaches were able to realistically assess various aspects of interaction of young athletes (table 3).

Table 3 – Dynamics of indicators of emotional and psychological climate

	Study 1	Study 2
compassion, understanding	2,6	3,8
the joy for the success of teammates	3,8	6,3
personal initiative is encouraged, freedom for the organization of team affairs	2,6	4,1
there is a sense of cohesion, unity	3,0	6,7
a friendly relationship	3,6	6,9

According to coaches, the interpersonal relationships of young athletes and the influence of these

relationships is the most difficult task, so the data obtained in the course of psycho-diagnostics, enabled them, first, to clarify if their point of view and objective information are the same, and more confidently manage the interaction of athletes and to influence children's team. The willingness of the trainers to conduct targeted psychological and pedagogical work on the incorporation and formation of the appropriate relations in children's sports team contributed to the strengthening of positive relationships in teams and team building. Coaches also noted the importance of methods "Attitude to the upcoming competition" for psychological preparation of young athletes for competition

Data for this method are presented in table 4.

Table 4 Study of the attitude of young athletes to competition

Parameter	Average point	
	Study 1	Study 2
Confidence	4, 4	6, 2
The perception of the capabilities of the opponent	7, 2	4, 7
The desire to participate and the importance of competition	6,6	6,8
The subjective perception of assessment from the coach, parents, team members	3,8	4, 8

The results of this technique allowed the coach to quickly obtain information about the perception of athletes of the upcoming competitions, if it is necessary to quickly adjust the setup of both individual athletes and the team as a whole. The coaches noted that one of the characteristic trends for all young athletes is that when comparing their own capabilities with the capabilities of opponents they evaluate themselves often below opponents, which greatly affects their emotional state during the competition. In this regard, the trainers specially paid more attention to the problem of the formation of an adequate perception of the rivals. The trainers called important the information about "the desire to perform in the upcoming competition", since at low values on the scale, as a result of fear or uncertainty, the probability of reducing the results of the competition is obvious. Therefore, the figure as an indication of the confidence of the athlete before the competition requires from the coach an individual approach when working with athletes. The coaches were convinced on the basis of the obtained data

that the desire to compete in young athletes was at a high enough level, but the idea of them, of their readiness to perform in the competition was different in different athletes. Some athletes may assume that the coach or parents don't believe in them and their successful performance, others on the contrary think that the coach is confident in them.

Basing on these data, coaches were able to reconsider their behavior before, during and after the competition. They were able to successfully adjust to improper installation by the parents before the start, to develop their methods of influence, increase the sense of confidence in young athletes during the competition. Thus, before competition coaches were more concentrated on the strengths of the athletes, refused to criticism, fixing attention not on winning, but on performing the tasks. Positive dynamics of the results according to the method in the second phase of the study confirmed the accuracy of the coach work.

Conclusion

The study proved that the use of methods of psycho-diagnostics in the work of the coach allows, on the one hand, getting useful and important information and in a more focused way organize psychological work with young athletes. We can recommend these methods of psycho-diagnostics for broader use in the practice of coaches, as well as the collaborative work of coach and sports psychologist. Further work in this direction involves testing these methods of psycho-diagnostics at different stages of the sports career.

References

- Carron, A., Widmeyer, W.N., Brawley, L.R. (1985). The development of an Instrument to Assess Cohesion in Sport teams: The Group Environment Questionnaire. *Journal of Sport Psychology*, 7, pp. 244–266
- Fetiskin, N.P., Kozlov, V.V., Manuylov, G.M. (2002). Methods for assessing the psychological atmosphere in the team (according to A. F. Fidler). *Socio-psychological diagnosis of personality development and small groups*. Publishing house of the Institute of Psychotherapy. Moscow, pp.190–191
- Giessen, L.D. (1973). *Psychology and psychohygiene in sports*. Sport. Moscow.
- Gorbunov, G.D. (2006). *Psychopedagogy of Sports*. Sport. Moscow.
- Khanin, Yu. (1980). *Psychology of communication in sports*. Physical culture and Sport. Moscow.
- Malkin, V. R. (2008). *Management psychological preparation in sports*. Physical culture and Sport. Moscow.

- Malkin, V.R., Rogaleva, L.N. (2015). *Sport is Psychology*. Sport. Moscow.
- Malkin V., Rogaleva L. (2008). Motivation strategy as factor development person of the school children. *International Journal of Psychology*, 43, 1. 3–4. p. 323.
- Martens, R. (2004). *Successful Coaching*. Human Kinetics. Champaign, IL.
- Rodionov, A.V. (2004). *Psychology of Physical Education and Sports*. Academic project. Moscow.
- Rogaleva L., Malkin V. (2016). System of psychological work in sport. *International Journal of Psychology*, 51, S1, p.1114
- Sivitsky, V. G., Melnik and Silich E. V. (2014). Monitoring of psychological readiness of athletes through the use of complex computer programs. *Information-analytical bulletin*. Vol. 19. *The results of execution of tasks of state programs of development of physical culture and sports, innovative projects of BSUPC*. Minsk, pp. 277–303.
- Teipel, D., Kemper R. (2007). Specific Motivational Aspects in Female Soccer Referees. *12 European Congress of Sport Psychology 4–9 september 2007, Halkidiki, Greece, Book of abstract*, p.362.
- Williams, J. M. (Ed.). (2006). *Applied sport psychology: Personal growth to peak performance (5th ed.)*. McGraw-Hill, Boston.
- Weinberg, R. S. Gould D. (2011). *Foundations of sport and exercise psychology*. Human Kinetics. Champaign, IL.
- Valerii Malkin, PhD, professor. Ural Federal University, Institute of Physical Education, Sport and Youth Policy, 14 Komintern st., Ekaterinburg, 620078, Russia.
E-mail: ValeryMalkin@yandex.ru

STUDY OF SITUATIONAL ANXIETY IN SNOW SPORT COURSES

Milena Zdravcheva, Krastyo Zgurovski

Summary: The efficiency of snow sports courses is determined by different methods of obtaining feedback on the perceptions of the students, establishing gender-based levels of anxiety and tracking their dynamics in the course of education. There is a clear tendency to reduce stagnation anxiety between the stages of this study. Data analysis will help us to create conditions for easier psychological adaptation of students.

Key words: training and stress, Ch. Spielberger's test, learning efficiency, anxiety dynamics

Introduction

Snow Sports Courses have a long tradition in the NSA. They represent an educational format with a wide-ranging educational impact aimed at building habits for safe high mountain behavior and ecological attitude towards nature, at mastery of skills in snow sports and key competencies necessary for organizing and conducting a large group training process people under specific conditions.

According to past studies on the problem at issue (Khavezova, Yancheva, 1996), the most significant factors causing anxiety among novice skiers, such as most snowboard students, are the slope of the terrain, the speed, the movement of other skiers along the track, the atmosphere in the mountains, the specific equipment, the presence of past injuries, the behavior and skills of the ski teacher (Khavezova, Yancheva, 1996), the domestic and social environment. We think that these studies have been relevant to their time, but education in snow sports is a dynamic educational form that requires such studies to be conducted periodically, depending on the changing material and technical base and the different physical, mental and social profile of the students.

The effectiveness of the learning process is linked to different methods of individual control and feedback on learner perceptions. In situations involving high mental tensions, personal and situational anxiety and the level of self-control skills are just some of the many factors that determine the behavior of the individual (Domuschieva-Rogleva, Petkova, 2002). In our view, these factors are key to the effectiveness of the learning process. Looking at the concept of Ch. Spielberger, which brings out two main types of anxiety – personal and situational (Spilberger, 1983), – we have focused on choosing several features that we consider appropriate in this work.

Since situational anxiety refers to dynamic mental

states, it occurs when a particular stimulus or situation is perceived as having actual or potential elements of danger, threat, and harm. In the context of the concept of genesis of stress situational anxiety is a function of the ratio of need – opportunities to satisfying the need. The low of satisfying the need combined with a high need, determined by internal or external factors, leads to an increase in situational anxiety (Spilberger, 1983).

The testing character of the ski course as a format largely determines similar processes. However, our assumption is that it has a positive impact on the level of anxiety in NSA students.

Purpose:

Research of the situation-related anxiety at the NSA students at the beginning and the end of the course in snow sports in the period 29.01.2017–24.02.2017

Tasks:

1. Establishing and analyzing the mean values by gender for 1st and 2nd studies.
2. Determining the mean value and percentage ratio of S-anxiety total for all subjects tested for each test individually
3. Analysis of the percentage distribution of S-anxiety at the beginning and end of the study for all subjects.

The data we receive will be useful for the effectiveness of snow sports courses, by enhancing the control of the learning process and improving student feedback. Ensuring an optimal psychological environment for conducting the form is essential to its performance and there are currently no current surveys related to the “Snow Sports” course. We consider that identifying levels of gender anxiety and tracking their dynamics in the course of learning will help us to create conditions for easier psychological adaptation of students. It is also a bold

basis for future studies of anxiety.

Methodology and methods

To solve specific tasks and to achieve the purpose of the study, we used a *comprehensive methodology* that includes:

1. *Investigating sources of information.*
2. *Psychological test to measure situational anxiety.*

Ch. Spielberger’s test was developed on the basis of his theoretical concept of anxiety. Differentiating the anxiety of the personality and the situational condition determines the creation of two forms for their evaluation STAY-Y-1 (for assessment of situational anxiety – S) and STAY-Y-I (for evaluation of personal anxiety – T). Each of the forms contains 20 statements and a 4-degree scale of the liqueur type to assess the intensity of anxiety. The range of scores ranges from 20 to 80, with the rise of the ball in the direction of increasing anxiety. S-scale testing is carried out first, followed by the T-scale, but only one form may be used according to the task of the study (Shtetinski, Paspalanov, 1989). For the purpose of our study, we conducted STAI-Form Y-1 tests at the beginning and end of each study period.

3. *Testing 142 students (36 women and 106 men) participating in the “Snow Sports” course.*
4. *Processing of test data for the period under review.*
5. *Comparative analysis.*

The survey was conducted in the period 29.01.2017–24.02.2017 during the “Snow Sports” course.

Results and discussion

the results for all subjects were obtained using the methodological tool for working with the Bulgarian version of C. Spielberger’s questionnaire for anxiety assessment.

In Table 1 lists the norms under which the results are calculated.

Table 1. Stable anxiety standards

anxiety	norm
low	to 30 p.
average	31–44 p.
high	over 45 p.

We categorized the data obtained for all 142 persons surveyed by gender and by shift. Table 2 presents the median results for both genders at the beginning and end of the study.

To better illustrate the differences, we converted the averaged results as a percentage to the maximum number of points in the test (Figure 1).

Table 2. Average test results, established by gender sign

	First study	Second study
Average score for women	38,88 p.	33,53 p.
Average score for men	34,36 p.	34,85 p.
Average for research	36,62 p.	34,22 p.

In a comparative study of the mean results reported by STAY-S in the first study, it was found that women at the start of the study had a mean anxiety level of 38.88 (48.60%), which was 5.65% higher than that of men – 34.46 points (42.95%). The male anxiety range also falls within the average norm (Figure 1). Most publications in the scientific literature show that women are at risk of developing high levels of anxiety (Nijkamp et al. 2004) which is explained by fluctuations in estrogen and progesterone levels – hormones involved in changes affecting anxiety and mood (Weinstock 1999), so the result obtained is in the direction of our expectations.

Situational anxiety is a condition that is greatly influenced by external factors and by the specific racing situations the athlete encounters (Domuschieva-Rogleva, Petkova, 2002).

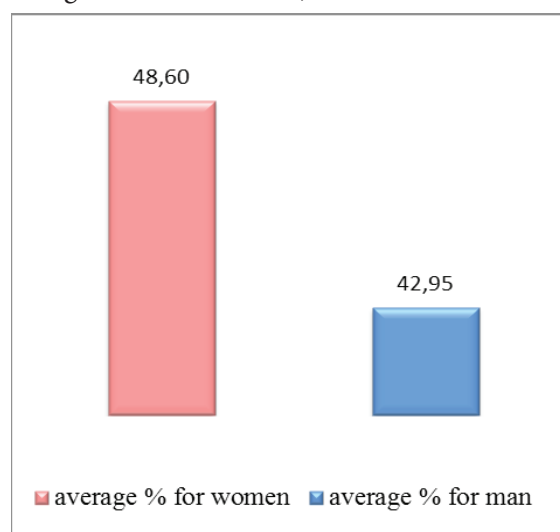


Figure 1. Average percentage of situative anxiety by gender for 1st study

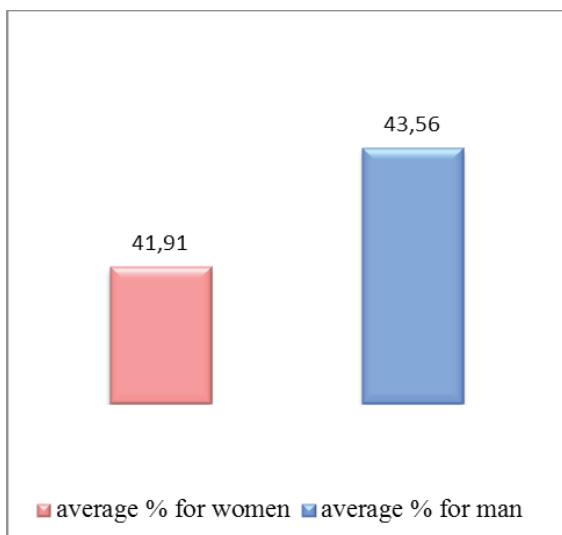


Figure 2. Average rate of site sexual anxiety for 2nd study

However, the analysis of the average results at the end of the study showed significant differences in women’s S-anxiety data – 33.52 (41.91%) or an anxiety decrease of 6.69%, which could be interpreted as projection of subjective experience related to the emotional side of the course.

In men, the results showed minor changes of 34.85 points (43.56%) and even showed an increase in anxiety by 0.61%. (Figure 2). This could also be due to emotional factors related to non-compliance with the established order, which would result in deserved sanctions and corrective remarks that leave a negative feeling.

Both experimental groups in the first study demonstrated an average level of situational anxiety with almost the same results – 36.31 and 36.93. The differences are almost negligible, from which we can conclude that the new stress environment affects the same gender.

The reported data in total for all subjects showed a decrease in the anxiety at the outcome of the conducted study by 2.4% – 34.22%, which is below the lower limit of the mean anxiety level (Figure 3) – despite the daily stress, caused by factors such as speed, pitch, risky situations, use of ski lifts, intensity and density of exercises and fatigue.

For greater visibility, we will analyze the research anxiety separately (Table 3):

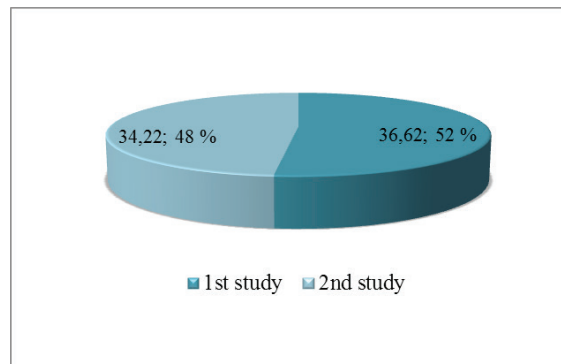


Figure 3. Mean value and percent S-anxiety ratio total for all subjects tested in the individual tests.

Table 3. Percentage of S-scale scores for anxiety by periods.

Anxiety level	1st study	2nd study
low	33,10%	35,92%
on average	53,52%	50,70%
high	13,38%	13,38%

Figure 4 shows the differences in percentages for all subjects who demonstrated a certain degree of anxiety in the 1st study.

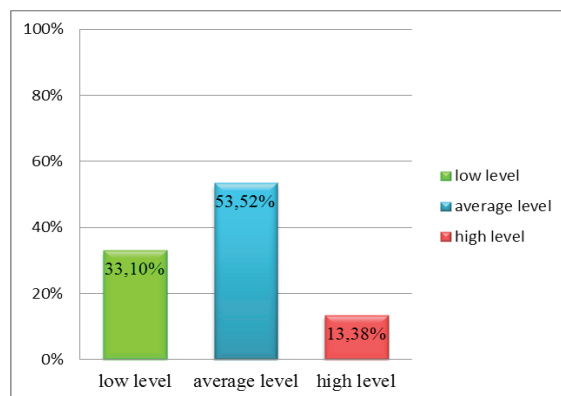


Figure 4. Percentage distribution of the degree of S-anxiety in 1st study.

The graph shows that students respond predominantly to the mean range of situational anxiety: as a percentage ratio in the mean range of 53.52% of the total number of subjects surveyed, with low S-anxiety 33.10% and high 13.38%. Consequently, the overwhelming majority of people surveyed show good social adaptation and show resistance to environmental stressors.

When comparing the percentage distribution of the results by period, we find a decrease in the mean rate and an increase in the low anxiety rate (Figure 5).

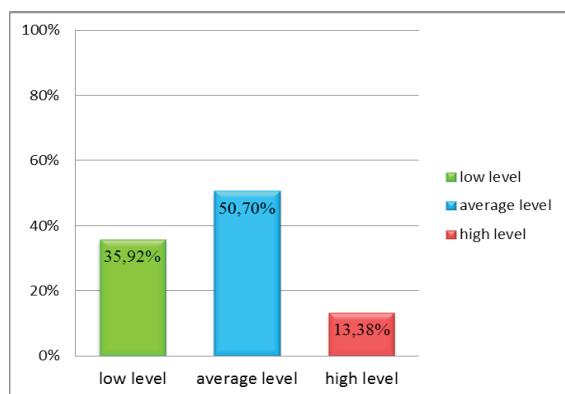


Figure 5. Percentage distribution of the degree of S-anxiety in 2nd study.

Given that high levels of S-anxiety in the second study remain unchanged (13.38%), we can conclude that the students who were at an average level of situational anxiety in the first test at the end of the study showed low levels of anxiety. A total of 19 people showed a high level of anxiety in the two tests (over 45 points), 9 of which were women (25% of the women surveyed) and 10 were men (9.43% of the men surveyed); in the second 6 are women (16,66%) and 13 – men (12,26%). This also coincides with the above-mentioned gender data.

Conclusion

There is a clear tendency to decrease stagnation anxiety over the two periods of the study: at the beginning of the snow sports training it is significantly higher and at the end it is lower. The collected data proves our hypothesis that, despite the probationary nature of the course, the positive emotional side of the course contributes to reducing the anxiety

of the significant part of the students. The snow sports course does not have a negative impact on them, but we still recommend minimizing the factors that contribute to anxiety.

References

- Domuschieva-Rogleva, G., K. Petkova, (2002) Nivo na samokontrolirashti umenia i trevojnost pri 14–16 godishni handbalisti, Lichnost, motivacia, sport. Sportat i lichnostta. Kniga 1, ProSPort. Sofia // Домусчиева-Роглева, Г., К. Петкова. (2002) Ниво на самоконтролиращи умения и тревожност при 14–16 годишни хандбалисти.– В: Личност, мотивация, спорт. Спортът и личността. Книга 1, ПроСпорт, София.
- Khavezova, K., T. Yancheva. (1996) Strakhüt pri nachalnoto obuchenie po ski. Lichnost, motivatsiya, sport. Tom 2. NSA PRES, Sofiya. // Хавезова, К., Т. Янчева. Страхът при началното обучение по ски. Личност, мотивация, спорт. Том 2. НСА ПРЕС, С., 1996.
- Nijkamp M., Kenens C., Dijker A., Ruiters R., Hiddema F., Nuijts R. (2004) Determinants of surgery related anxiety in cataract patients. The British Journal of ophthalmology
- Shtetinski, D., I. Paspalanov (1989). Metodicheskoto posobie za rabota s bulgarskata forma na vuprosnika za otsenka na trevozhnostta na CH. Spilburgur. Sofia. // Щетински, Д., И. Паспаланов. (1989). Методическо пособие за работа с българската форма на въпросника за оценка на тревожността на Ч. Спилбургър. София.
- Spilberger, CH. (1983) Kontseptualni i metodologicheski problemi issledovatelni trevogi.– V: Stress i trevoga v sporte. Moskva // Спилбергер, Ч. (1983) Концептуальные и методологические проблемы исследования тревоги.– В: Стресс и тревога в спорте. Москва
- Weinstock L. S. (1999) Gender differences in the presentation and management of social anxiety disorder. J Clin Psychiatry

GOAL ORIENTATION AND COPE WITH SUCCESS IN SPORT

Tatiana Iancheva, Milena Kuleva
NSA "Vassil Levski", Sofia

ABSTRACT

The subjective experience of success could lead to different kinds of behavior effects – from mobilization and psychic upheaval to self-reassurance, disorganization, and loss of activity. Regardless its great practical importance, the issue of cope with success is still not sufficiently explored.

The aim of the present study is to examine the connections and interrelations among goal orientation, definition, determinants and consequences of success and the coping strategies used. The research was done among 115 competitors practicing different kinds of sport, divided into groups according to their age, gender and qualification.

We used: 1) Specially developed scale for examining the attitude towards success; 2) Task and Ego orientation in Sport Questionnaire (Duda&Nicholls, 1992), adapted for Bulgarian conditions (Domuschieva-Rogleva, 2003).

The competitors define success mainly as confidence and self-proving. Mobilization and belief in one's abilities are dominant. The most significant factors for success are good preparation and input efforts. There are some negative consequences with some of the athletes – relaxation, insufficient efforts, and enhanced emotional reactions. The goal orientation towards the task and the cognitive engaged coping strategies are dominant. There are significant differences depending on gender, age and qualification. The relations between the researched indexes were outlined.

The obtained results, as well as the established regularities point at the possibilities of mastering and regulating the negative consequences in the process of preparation, with certain purposeful, scientifically grounded influence, part of which are coping strategies.

KEY WORDS: Success, Cope with success, Goal orientation, Task orientation, Ego orientation.

Introduction

In the last years the sports-psychological literature has often viewed the issue of coping with success – how it is defined and perceived, what the consequences of success are, how the coach helps the players to cope with their success, how athletes react to success (D. Haglind, 2003; Conroy, Poszwardowski and Henschen, 2001). Regardless its great practical importance, the problem of coping with success in sport has not been paid enough attention by specialists.

In most cases researchers direct their attention to the problems related to coping with loss and success seeking, to revealing the reasons, factors and conditions which complex influence determines success in sport. The other side of the problem – how we cope with success, remains underestimated. At the same time, our observations on the sports career of a number of elite players show that the way an athlete perceives, experiences, interprets and copes with success or failure significantly determines his/her future sports and professional career.

Most often success is viewed as a positive result from a preliminarily set intention, which is connected to achieving some objective, victory, social

recognition, approval, glory.

The effect from the subjective experience of success can lead to lots of behavior effects. Success inspires, motivates, and brings satisfaction to the athlete. But at the same time it can turn into his most challenging ordeal. The problems related to “the feeling of being very important” are most peculiar of the field of sport and art, i.e. the areas with the highest degree of publicity and social judgment. Sports fame could lead to certain deformities of one's Self which could give rise to a number of problems both during one's sports career and after its termination.

Lots of authors report about a relation between coping with fame, with success and the ensuing athletes' behavior (T. Strudwick, 2016, Millsetal., 2012), about some potentially debilitating psychological processes involved here such as arrogance, narcissism, and hubris (Carverand Johnson, 2011). Others point out the elite athletes usually face success with the desire for even greater success, realistic expectations and willingness to leave their comfort zone and look for fresh ideas on behalf of their coaches and other specialists (MacNamara Button and Collins, 2010a, 2010b).

The consequences of success direct researchers to-

wards surveying their relation with goal orientation in sport.

According to the goal orientation theory in sport (Duda, 1989) when there is high task orientation, success is determined as a result of improvement of the skills, self-perfection, positive and adaptive behavior aimed at achievement. Ego orientation is related to a kind of behavior aimed at domination, superiority or submission, comparison of one's own abilities with those of others. The achievement goal theory of Nicholls (1984, 1989) suggests that goal achievement and ability demonstration are a major motivation stimulus in the context of achievements. The followers of this theory outline two competence concepts which are displayed through two conditions – task orientation or ego orientation. When the participation is due to the task, the perceived ability is related to itself and the emphasis falls on the mastery, effort input and development of skills and knowledge in the activity. When ego is dominating, persons tend to demonstrate higher level of ability compared to the norm. In this case the ability is demonstrated when one's performance surpasses that of the others or is done equally well but with fewer efforts (Nicholls, 1984, 1989).

The cognitive interpretation of success and its secondary assessment determine to a great extent how an athlete will react under similar circumstances in future.

Purpose and objectives of the study

The aim of the present study is to examine the relation between goal orientation and coping with success – definition, interpretation, consequences.

Materials and methods

Participants

the research was done among 115 athletes practicing different kinds of sports, aged between 12 and 34 years, divided into four groups: 12–18 years; 19–24 years; 25–30 years and over 30 years. The average age of the subjects is 21.1 years. 66 of them are men and 49 – women. The researched individuals were divided into two groups depending on their qualification: 1) medal-holders from national and international competitions – 46, 2) engaged in sport without significant sports results – 69.

At the beginning of the research all participants were acquainted with the aim of the research and granted their approval to be involved.

Methods

In order to fulfill the aim of the research we used:

1. Task and Ego Orientation in Sport Questionnaire – TEOSQ, Duda&Nicholls, 1992), adapted for Bulgarian conditions by Domuschieva-Rogleva, 2003.
2. Specially designed scale for research the attitude to success, which consists of three parts – definition and experience of success, interpretation of the reasons for success, behavior after achieving success. Each of them comprises two scales, as follows:
 - Confidence, assertiveness
 - Prestige
 - Mobilization and belief in one's abilities
 - Emotional reaction, remissness
 - Preparation, efforts
 - Expectations

The scale includes 33 items. The assessment is given through 5-point Likert-type scale.

Statistical analysis

The data were statistically analyzed with SPSS21. Reliability analysis, alternative, regression and comparative analyses (U-criterion of Mann Whitney and Criterion of Kruskal Wallis) were applied.

Results and discussion

the results from the research of goal orientation (table 1) show that among the researched athletes the task orientation is predominant, and the mean value for the whole sample is $M=4.23$; $SD = .54$. Ego orientation is of a comparatively lower value ($M=2.62$; $SD = .92$). In this sense our results confirm the data in the literature. They allow us to suggest that the competitors do not strive for success at any cost and are not led only by the result, but by the satisfaction with the activity.

The obtained results from the research of the attitude to success reveal that the competitors define and experience success mostly as confidence and assertiveness ($M = 4.26$; $SD = .43$). Most of the athletes view success as a stimulus to prove themselves in the coming competitions (table 1), as confidence in their own abilities and skills, self-proving, a logical results from their efforts and gaining the necessary experience. It is interesting that success is least connected with chance.

Table 1. Results from the variation analysis of the data

Parameters	N	Min	Max	Mean	Std. Deviation	Variance
Confidence, assertiveness	115	2.33	5.00	4.26	.59	.301
Prestige	115	1.40	5.00	3.49	.77	.593
Mobilization and belief in one's abilities	115	2.60	5.00	4.16	.49	.239
Emotional reactions, remissness	115	1.00	4.25	2.08	.71	.505
Preparation, efforts	115	2.00	5.00	4.51	.58	.340
Expectations	115	1.00	5.00	3.18	.99	.979
Task orientation	115	2.43	5.00	4.23	.54	.293
Ego orientation	115	1.00	5.00	2.62	.92	.851

Part of the athletes define success as a source of prestige ($M = 3.49$; $SD = .77$). They believe this is the way to prove themselves before the others, to gain their confidence and this will lead to a psychic upsurge (table 1).

The highlight of our research is the consequences from success. The analysis of the results connected with the behavior after achieving success reveal that among most of the athletes mobilization and belief in their own abilities are dominant ($M = 4.16$; $SD = .49$). Success leads to mobilization, to greater desire to train and to a boost in the belief in oneself and one's abilities, to expectations for a series of wins. Among part of the athletes, however, success leads to strong emotional reactions ($M = 2.08$; $SD = .71$) – overestimation of oneself or remissness and insufficient efforts.

The survey of the reasons for success is interesting for sports practice and individual consulting, in so

far as the secondary assessment (explanation of success) determines to a great extent how the athlete will act under similar circumstances in future. The results show that the leading scale is "Preparation, efforts" ($M = 4.51$; $SD = .58$). Athletes consider good preparation, investment of efforts and mobilization as key determinants of success (table 1). Lower values can be observed with the scale "Expectations" ($M = 3.18$; $SD = .99$). Sports practice can benefit from the findings that the least significant for success are: too strong desire for success, too high expectations on behalf of the others, lack of expectations from the athlete. They reflect the attitude to view success as a temporary phenomenon, to relate it to chance which leads to a decrease in the activity.

The comparative analysis along the factor gender does not reveal significant differences among the different scales.

Table 2. Results from the comparative analysis along the factor qualification

	Confidence, assertiveness	Prestige	Mobilization and belief in one's abilities	Emotional reaction and remissness	Preparation, efforts	Expectations	Task orientation	Ego orientation
Mann-Whitney U	1317.500	1356.500	1234.000	1542.000	1192.500	1441.500	546.500	554.500
Wilcoxon W	3732.500	3771.500	3649.000	2623.000	3607.500	2522.500	1449.500	1457.500
Z	-1.547	-1.322	-2.033	-.259	-2.373	-.842	-1.572	-1.482
Asymp. Sig. (2-tailed)	.122	.186	.042	.796	.018	.400	.116	.138

There are significant differences along the factor qualification in the scales mobilization and belief in one's abilities (table 2) and preparation, efforts. Elite players view success as a stimulus to prove themselves, as confidence in their own qualities and abilities, and a way to gain the necessary ex-

perience. They consider success as a consequence of the good preparation, invested efforts and mobilization.

The data reveal specific age dynamics (figure 1).

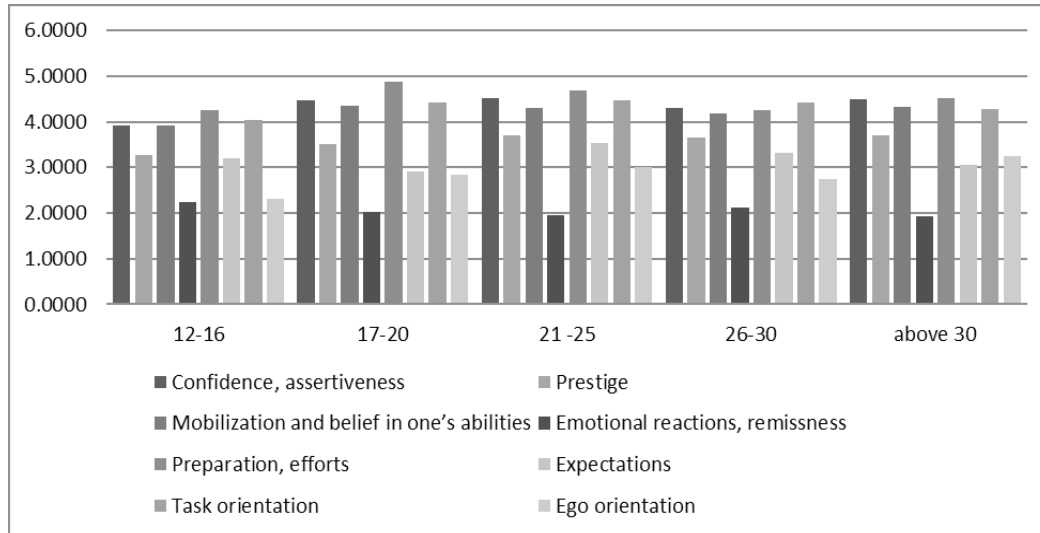


Fig. 1. Mean values of the age groups

There are significant differences depending on age along the scales confidence, assertiveness; mobi-

lization and belief in one's efforts; preparation, efforts, task and ego orientation (table 3).

Table 3. Results from the comparative analysis along the factor age.

	Confidence, assertiveness	Prestige	Mobilization and belief in one's abilities	Emotional reaction and remissness	Preparation, efforts	Expectations	Task orientation	Ego orientation
Chi-Square	28.305	8.071	18.413	2.965	24.082	4.875	11.157	9.830
df	4	4	4	4	4	4	4	4
Asymp. Sig.	.000	.089	.001	.564	.000	.300	.025	.043

The correlation analysis of the data reveals the existence of some significant relations between goal orientation and different scales of success. There is significant correlation between task orientation and the scales preparation, efforts (r = .555; p = .000), confidence, assertiveness (r = .543; p = .000), mobilization and belief in one's efforts (r = .646; p = .000) and prestige (r = .260; p = .024). These dependences are logical as far as task orientation relates success to the improvement of skills, self-perfection, positive and adaptive behavior aimed at achievements. Such dependences, although less slightly displayed, are found between ego orientation and the scales

mobilization and belief in one's efforts (r = .467; p = .000), confidence, assertiveness (r = .358; p = .002), preparation, efforts (r = 0.309; p = .007) and prestige (r = -0.234; p = .043).

It will be interesting to answer the question whether the components of success influence goal orientation. In order to assess the impact of these factors, we used step regression analysis. The results show that mobilization and belief in one's efforts (β = .646^{***}) and preparation, efforts (β = .238^{**}) stimulate task orientation (table 4).

Table 4. Results from regression analysis

Dependent variables	Task orientation		Ego orientation	
	B (t)	ΔR^2	B (t)	ΔR^2
Mobilization and belief in one's efforts	.646 (7.24)***	0.410		
Preparation, efforts	275 (4.66)**	0.454		

Conclusions

The results from our research confirm the data in the literature that task orientation is predominant among elite athletes. They are also characterized with high ego orientation.

The fact that most athletes perceive success as a stimulus to prove themselves in the coming competitions, as a logical result from their efforts and as a boost to their confidence is optimistic. They develop an optimal attribution style where success is a premise for mobilization of their efforts and aspiration for better future performance.

The determined negative consequences among some of the athletes – remissness, insufficient efforts could lead not only to negative influence on the efficiency of the sports-competitive activities but also, very often, to a refusal to participation in sports activities. This, in turn, influences the overall personal development and the future realization in life.

The fact that the excessive desire for success and excessive expectations on behalf of the others, which are often observed in the elite sport, are least significant for success and decrease the efficiency of sports activities is of great practical importance.

The big social expectations create additional premises for high psychic pressure in the field of sport. They can be controlled and regulated to a great extent in the process of preparation with the respective purposeful, scientifically substantiated influences.

References

Anshel, M.H., Kim, K-W., Kim, B-H., Chang, K-J., & Eom, H-J. (2001). A model for coping with stressful events in sport: Theory, application, and future directions. *International Journal of Sport Psychology*, 32(1), 43–75.

Carver, C., J. Weintraub, M. Scheier. (1989). Assessing coping strategies: a theoretically based approach. *Journal*

of Personality and Social Psychology, 56.

Carver, C., and Johnson, S., 2011. Authentic and hubristic pride: Differential relations to aspects of goal regulation, affect, and self-control. *Journal of Research in Personality* 44: 698–703.

Conroy, D., Poszwadowski, A., & Henschen, K. (2001). Evaluating criteria and consequences associated with failure and success for with athletes and performing artists.

Crocker, P.R.E., & Graham, T.R. (1995). Coping by competitive athletes with performance stress: Gender Differences and relationships with affect. *The Sport Psychologist*, 9, 325–338.

Crocker, P.R.E., & Isaak, K. (1997). Coping during competitions and training sessions: Are youth swimmer consistent? *International Journal of Sport Psychology*, 28, 355–369.

Eklund, R., Gould, D., & Jackson, S. (1993). Psychological foundations of Olympic wrestling excellence: Reconciling individual differences and nomothetic characterization. *Journal of Applied Sport Psychology*, 5, 36–47.

Duda, J., & Nicholls, J. (1993). The relationship of goal orientation to beliefs about success, perceived ability and satisfaction in sport. In: J.R. Nitsch & R. Seiler (Eds.). *Motivation, emotion, stress*. (pp. 43–47). Proceedings of the VIII European congress of sport psychology Academia, Verland, Sankt Augustin.

Georgiev, M., G., Domuschieva-Rogleva, I. Tosheva. (2003). Vtorichni faktori i optimizirane na testa za izsledvane na predpochitanite strategii za spraviane sys stresa – COPE – 1.– V: Lichnost, Motivaciia, Sport. Knigi 1–3. Prosport. S. (in Bulgarian).

Gould, D., Udry, E., Bridges, D., & Beck, L. (1997). Coping with season – ending injuries. *The Sport Psychologist*, 11, 379–399.

Haglund, D., (2004). Coping with success and failure – Among Swedish and Portuguese track and field athletes and coaches. (European Master dissertation in sport psychology). School of Social and Health Sciences. Halmstad University.

Iancheva, T., (2005). Zagubata I pobedata v sustezatelna ta realizaciya na sportista. [In Bulgarian]. Prilojna Psihologia I socialna praktika, S. 73–81.

Lazarus, R.S., & Folkman, S. (1984). *Stress, appraisal and coping*. Springer.

MacNamara, A., Button, A., and Collins, D.2010a, The

- role of psychological characteristics in facilitating the pathway to elite performance. Part 1: Identifying mental skills and behaviors. *Sport Psychologist* 24:52–73.
- MacNamara, A., Button, A., and Collins, D. 2010b, The role of psychological characteristics in facilitating the pathway to elite performance. Part 2: Examining environmental and stage-related differences in skills and behaviors. *Sport Psychologist* 24:74–96.
- Mills, A., Butt, J., Maynard, I., and Harwood, C. 2012. Identifying factors perceived to influence the development of elite youth football academy players. *Journal of Sports Sciences* 30 (15): 1593–1604.
- Ogilvi, B. (1968). The unconscious fear of success. *Quest*, 10, 35–39.
- Ogilvi, B., & Tutko, T. (1966). Problem athletes and how to handle them. London: Pelham.
- Strudwick, T. 2016. *Soccer Science*, Human Kinetics.
- Tracy, J., and Robins, R. 2007a. The psychological structure of pride: a tale of two facets. *Journal of Personality and Social Psychology* 92:506–525.
- Tracy, J., and Robins, R. 2007b. Emerging insights into the nature and function of pride. *Current Directions in Psychological Science* 16:147–150.
- Weiner, B. (1986). *An attributional theory of motivation and emotion*. New York: Springer-Verlag.
- Weiner, B., Frieze, I., Kukla, A., Reed, L., Rest, B., Rosenbaum, R. (1971). Perceiving the causes of success and failure. In *Attribution: Perceiving the causes of behavior*, E. Jones, D. Kanouse, H. Kelley, R. Nisbett, S. Valins, B. Weiner, eds. Morristown, NJ: General Learning Press.

PSYCHOLOGY OF LANGUAGE LEARNING – MOTIVATION AND LANGUAGE IDENTITY

Liliya Doncheva
NSA “Vassil Levski”, Sofia

Introduction: *The influence of globalization and the dominant role of English as lingua franca have provoked a critical discussion about the role of motivation in language acquisition in the recent years (Crystal, 2003; Jenkins, 2007). The traditional concept of integrative motivation (Gardner, Lambert, 1972) which is identification and willingness to integrate in the target language community has started losing its explanatory power (McDonough, 1981; Clement, Kruidenier, 1983; Doncheva, 2012). Nowadays English language has become an obligatory education skill and a must along the path of one’s professional realization. Moreover, there is no explicitly geographically defined English speaking community since the physical geographical borders dividing the different language users have become dissolved in the world of cyber-space and online telecommunication networks (Graddol, 2006). The computers and the internet change really quickly the abilities and skills needed to achieve success in one’s studies and job (Dimitrova, 2006). Consequently, the concept of motivation is being rebuilt in the context of the modern theories of the development of Self and identity in the global society – what people believe they are, how they interact with the others and what they would like to become in the future. In the last few years there have been a lot of surveys on the validity of the construct of possible Selves and their connection with the motivation for language studies (Csizér & Kormos, 2009; Ryan, 2009; Taguchi, Magid & Papi, 2009). The focus has been shifted from achievement motivation to motivation oriented toward identity (Dörnyei, Csizér, Németh, 2006). L2 motivation is connected with the objectives of one’s identity which are valued by the person and reflect the way one’s Self corresponds to the surrounding world (van Lier, 2007). The idea of Self and identity plays an important role in the way teachers engage their students’ motivation, interests and identities in their classes. It also explains why digital technologies, social networks and online communication should be implemented in the teaching process (Kuleva, 2014).*

Purpose and objectives of the study: The aim of the report is to make a brief review of the literature and the views of the authors from 1972 to present days and to outline some of the contributing factors which affect the development of “*language self*” and different identity in the process of foreign language acquisition.

Methodology: The survey is based on a systematic-structure and psychological analysis of the literature on the subject. A comparative analysis of the concepts of the different authors was made, and their critical opinions were presented together with the personal views and observations of the author based on her experience with Bulgarian students.

Results: It is important to point out that language is a means of self-expression and a way of conveying and constructing of what we are and what our attitude to the world around us is, i.e. to state our Self and our identity before the others.

Because of the strong connection between self-expression through language and self-perception of

an individual, Guiora (1972) talks about the existence of a different Self in the process of foreign language learning which is called a “*language ego*”. It is based on the psychic experience shared by lots of people who study a foreign language that a person feels as a different individual when conversing in foreign language and very often acts in a different way in identical situations (Guiora & Acton, 1979). According to Guiora (1972) foreign language acquisition requires that the individual obtain a new identity which is easier for some people and harder for others.

Rardin (1988) develops further this idea, suggesting that foreign language learning may produce an existential anxiety in learners. They are likely to develop the apprehension that by learning a different language they will lose themselves in one way or another “*I, the way I know myself, will cease to exist*”. In other words, learning a foreign language “*affects the essence of identity and self-perception of an individual*”.

In 1986 Markus and Nurius developed their theory

of the *possible future Selves* (Markus, Nurius, 1986) which is based on the individuals' ideas of what they may become, what they would like to become and what they fear to become. The possible future Selves function as guidelines and direct the motivated behavior, i.e. this is the connection between Self-concept and motivation. But not all possible future Selves affect motivation. Those which represent the *ideal Self* are more likely to do it because of our psychological desire to reduce the discrepancy between our current Self and the ideal Self. This is the main principle which lies in Higgins's theory (1987) of self-discrepancy and self-regulation.

On this base Dörnyei (2005, 2009) derives the two key constructs in his new motivation system, based on possible Selves: *ideal L2 Self* and *ought-to L2 self*. The first one represents the attributions the individual wishes to possess in order to meet the expectations and society pressure and to avoid negative consequences. The ought-to self refers to outer kinds of instrumental motives with preventive focus (e.g. to study hard to pass an exam, to meet your parents' expectations, etc.). Unlike it, the ideal Self has a promotion focus and the motivation is shaped by the desired image we want to obtain in social, personal and professional context when using the foreign language. Dörnyei's model also includes the experiences during the process of foreign language acquisition which shape the everyday motivation of learners. They are based to a very large extent on the teacher's influence and the education environment (Dörnyei, Csizér & Németh, 2006).

The possible *Language Selves* which represent imaginary future identities and may direct motivation include present identities and future objectives. While some of the identities are relatively stable, others are likely to be in a constant process of construction through our interactions with the others and because of our constantly changing relations with the world and our experiences. This fact places our current experiences in the center of our motivation to learn a language along with the objectives of the identity and future aspirations. If we want learners to visualize themselves as competent foreign language users in the future and to construct their ideal Self, they must be able to engage their current Selves and identity in their interactions when using the foreign language. In this way, they will have the possibility to engage their possible future Selves as foreign language users but

within the boundaries and the security of their current communicative abilities, interests and social context (Ushioda, 2009). This means that the way we engage students' social identities during their interactions in the foreign language in the classroom and outside it has important consequences on the way they visualize themselves as future users of the foreign language.

The foreign language is not simply something we add to our abilities, but a personalized instrument which enables us to extend and express our identity or our idea of Self in new and interesting ways with new people, to broaden our horizon, to gain access to new and alternative sources of information, entertainment and materials which we need, value or like.

From pedagogical point of view this means we should encourage our students to view the foreign language as a means of self-expression and self-development. In other words we have to engage their own identities and interest in the lessons and to ensure continuity of what they study in the classroom and what they are and are interested in outside it. Thus, as Little (2004) says, "*what they learn becomes part of what they are*".

These ideas were implemented in the new Dogme Language Teaching Method developed a few years ago (Thornbury, 2000; Meddings & Thornbury, 2009), which emphasizes on the dialogue interaction between the lecturer and the learners. Communication is authentic and initiated by the students, not contrived and controlled by the teacher. The choice of curriculum and materials is shaped regarding students' interests and the acquisition of language rules is done on the base of dialogues. The three principles of Dogme – conversation driven curriculum, light materials and focus on emergent language represent a new way of teaching and a new way of being a teacher. The focus in the classroom is on self-expression and identity of the learners.

Richards (2006) surveys whether "real" conversations are possible in the classroom. In this connection he distinguishes three aspects of identity: 1) situated identities, which arise from the context of communication, e.g. doctor/patient, student/teacher; 2) discourse identities when the participants are oriented towards particular roles in the interaction, e.g. initiator of the conversation, listener, asking questions; 3) transportable identities which are la-

tent or implicit but could be expressed in the interaction, e.g. when the teacher mentions her role as a mother or a keen gardener during the lesson.

The implementation of this method in the language classes of sports students shows very convincingly the powerful motivation influence of provoking their situated, discourse, and transportable identities. Engaging students' transportable identities (e.g. football fans, coaches, players, referees) leads to a higher level of personal involvement and participation. The curriculum organized around practical discourse and topics that the students find interesting and relevant to their own experiences improve their motivation to actively take part in the English classes. By provoking learners' situated and discourse identities the teacher may encourage a greater investment of efforts on behalf of the learners. Students believe the material is useful for them and even those who have basic knowledge of the language feel less apprehensive to communicate. The fact they have to use emergent language rather than draw upon strict preliminarily taught grammar and syntax rules places them in the role of generators of the lesson. This is very different from the regular situation where they are in the position of foreign language learners who just practice or demonstrate knowledge and do not express their own voice or identity through it.

Conclusions: The overall review of the literature and the conclusions drawn emphasize on the necessity of further studies and experimental surveys among the students learning English in Bulgaria in order to facilitate their language acquisition, particularly among sports students, who have already developed and expressed their *alternative Ego* in the field of sport.

Literature

Clement, R., B. Kruidenier. (1983). Orientation in second language acquisition: I. The effects of ethnic TY, Milieu, and target language on their emergence. *Language Learning*, Vol. 33, Issue 3: 273–291

Crystal, D. (2003). *English as a global language*. Cambridge University Press, UK

Csizér, K. and Kormos, J. (2009). Learning experience, selves and motivated learning behaviour: A comparative analysis of structural models for Hungarian secondary and university learners of English. In Z. Dörnyei and E. Ushioda (Eds.), *Motivation, language identity and the L2 self* (pp. 98–119). Bristol: Multilingual Matters

Dimitrova, L., (2006). The effect of chess practice on

the development of certain social characteristics among children and adolescents. IV National Scientific-practical Conference "Physical education and Sport at School", Varna, p. 358–389

Doncheva, L. (2012). Validation of the Bulgarian version of the Attitude/Motivation test Battery (Gardner, 1985). VI International Scientific Congress "Sport. Stress. Adaptation", Science and Art, 2012

Dörnyei, Z. (2005). *The psychology of the language learner: Individual differences in second language acquisition*. Mahwah, NJ: Lawrence Erlbaum.

Dörnyei, Z. (2009). The L2 motivational self system. In Z. Dörnyei & E. Ushioda (Eds.), *Motivation, language identity and the L2 self* (pp. 9–42). Bristol: Multilingual Matters.

Dörnyei, Z., Csizér, K., & Németh, N. (2006). *Motivation, language attitudes and globalisation: A Hungarian perspective*. Clevedon, England: Multilingual Matters

Gardner, R. C. & Lambert, W. (1972). *Attitudes and motivation in second language learning*. Rowley, Mass: Newbury House Publishers, Inc.

Graddol, D. (2006). *English next*. London: British Council.

Guiora, A. & Acton, W. (1979). Personality and language: A restatement. *Language Learning*, 29, 193–204.

Guiora, A. (1972). Construct validity and transpositional research: Toward an empirical study of psychoanalytic concepts. *Comprehensive Psychiatry*, 13, 139–150.

Higgins, E.T. (1987). Self-discrepancy: A theory relating self and affect. *Psychological Review*, 94, 319–340.

Jenkins, J. (2007). *English as a Lingua Franca: attitude and identity*. Oxford: Oxford

Kuleva, M., (2014). Education in sports specialty through electronic forms of distance education. *Proceedings Book 9th FIEP European Congress; 7th International Scientific Congress "Sport, Stress, Adaptation", Extra Issue, 2014*

Little, D. (2004). Democracy, discourse and learner autonomy in the foreign language classroom. *Utbildning & Demokrati*, 13(3), 105–126.

Markus, H., & Nurius, P. (1986). Possible selves. *American Psychologist*, 41, 954–969.

McDonough, S. H. (1981). *Psychology In Foreign Language Teaching*. (2nd Ed.). London: Unwin Hyman Ltd.

Meddings, L., & Thornbury, S. (2009). *Teaching unplugged: Dogme in English language teaching*. Peaslake: Delta Publishing.

Rardin, J.P., Tranel, D. D., P.L. Tirone and Green, B. D. (1988). *Education in a New Dimension*. East Dubuque, IL: Counseling-Learning Publications.

Richards, K. (2006). 'Being the teacher': identity and classroom conversation. *Applied Linguistics*, 27(1), 51–77.

Ryan, S. (2009). Self and identity in L2 motivation in Japan: The ideal L2 selves of Japanese learners of English. In Z. Dörnyei & E. Ushioda (Eds.), *Motivation, Language Identity and the L2 Self* (pp. 120–143) *Multilingual Matters*

Taguchi, T., Magid, M. and Papi, M. (2009) *The L2 Motivational Self System among Japanese, Chinese, and*

- Iranian Learners of English: A Comparative Study. In: Dörnyei, Z. and Ushioda, E., Eds., *Motivation, Language Identity and the L2 Self*, Multilingual Matters, Bristol, 66–97.
- Thornbury, S. (2000). A dogma for EFL. *IATEFL Issues*, 153 (February – March 2000), p. 2. University Press.
- Ushioda, E. (2009). A person-in-context relational view of emergent motivation, self and identity. In Z. Dörnyei & E. Ushioda (Eds.), *Motivation, language identity and the L2 self* (pp. 215–228). Bristol: Multilingual Matters.
- van Lier, L. (2007). Action-based teaching, Autonomy and Identity. *Innovation in Language learning and Teaching*, Vol. 1, pages: 45–65

IMPROVEMENT OF THE PSYCHO-EMOTIONAL STATE OF PARAOLYMPIC SHOOTERS

Tatyana Andonova

Summary

Successful performance of an athlete in the extreme conditions of the sports competitions depends to a certain extent on the individual psychological features and the ability to master one's own status.

One of the possible ways for psychoregulation of athletes is the combined methodology developed by us, which consists of three parts: massage of the head, massage of neurolimphatic reflexes, influence on neurovascular reflexes on the forehead and the initial and final points of the meridians on the face.

The aim of our study was to acquaint and train paralympic shooters with effective methods which they could use on their own for dealing with anxiety and regulating their emotional state.

The subject of our study were eight paralympic shooters within the framework of the scientific project with athletes with physical disabilities. The proposed methodology includes 5 procedures performed every other day with each of the athletes. In order to objectify its effects, immediately before and after the first and last procedure, the investigated subjects had to complete two psychological tests for Spitberg's situational anxiety and the emotional state of Wesman and Ricks. The second test included the following indicators – "Tranquility-anxiety", "Energy-fatigue", "High mood-suppressed", "Self-confidence- helplessness" and a total assessment of the emotional state.

The results of our study show an improvement of all the indicators we tested in both the first and the last procedure. Advantages of our combined method are that it takes a little time (7–10), it can be done on its own and in a pre-start situation only the third part is proposed to be performed for 1 to 3 minutes.

Key words: combined methodology, psychoregulation, paralympic athletes

Introduction

High sports achievements are associated with athlete's ability to prepare psychologically for showing one's highest result directly in competition. Sport competition is an environment which can elicit intense emotions. In shooting the requirement of good physical and psychological condition as well as technical perfection is highly demanded.

An important aspect of correct regulation of pre-start status is the use of self-regulation skills (Вяткин, Б. А., 1974, Платонов, В.Н., 1986). This ability provides the ability to withstand various confounding factors, not only biological nature – fatigue, but also, first of all, psychological – uncertainty and fear.

In psychological literature the question of mental regulation in athletes is widely developed. Various methods of impact are offered: development of self-assurance and self-confidence (Костянян, А. О., 1987), "Verbal-musical psychoregulation" (Горбунов, Г. Д., 1994, Некрасов, В. П., 1986), formation of the world outlook, suggestion and self-suggestion, control and self-control, as well as

opportunities for physiotherapy, psychopharmacology and electrostimulation (Попов, А. Л., 1998) О. В. Дашкевич (1970) divide the methods for the emotional adjustment into two groups: 1. Methods, with primary influence on mental functions: effects through inner speech and 2. Methods, with a primary effect on the physiological mechanisms of emotions, mainly through their muscular-motor component.

One of the possible ways for psychoregulation of athletes is the combined methodology developed by us.

Aim and Objectives of the study

The aim of our study was to acquaint and train paralympic shooters with effective methods for Self-regulation of the emotional state which they could use on their own.

The study was part of the scientific project "Tracking the Effects of Complex Interventional Effects in Sports Shooters" conducted at the NSA in June 2014. There were 8 paralympic shooters athletes involved with various motor disabilities. Their distribution by gender and age is given in table 1.

Table 1
Sex, age and sports experience of the persons studied

Sex	N	Age	Sports experience
Men	5	33,8	3,5
Women	3	44,7	6,7

Methods

Our combined methodology consists of three parts:

1. Massage of the head – reduces stress and mental stress, and has a local analgesic effect.

2. Massage of neurolymphatic reflexes (NLR) of the back (Thie, J., Thie, M., 2006) has a predominantly somatic effect, improving the lymph flow in the associated muscles and organs.

3. Influence on neurovascular reflexes (NVR) on the forehead (Walther, D., 2006) and the initial and final points of the meridians on the face – has a balancing effect on the emotional sphere.

The athletes were given 5 procedures every other day (by the author and by students trained by her), completing two questionnaires before and after the first and last procedure – Spitberg's *situational anxiety* (Angelova, Krastev, 1998) and the emotional state of Wesman and Ricks (Иванов, И., 1999). The second test included the following indicators –

“tranquility-anxiety” (T-A), “energy-fatigue” (E-F), “high mood-suppressed” (HM-S), “self-confidence- helplessness” (SC-H) and a total assessment of the emotional state.

For statistical processing of the results, the SPSS software product was used. Variational analysis of the data was made. To determine the statistically significant difference (level of significance $\alpha \leq 0,05$) in the results obtained, we used the Nonparametric statistics: Related samples Wilcoxon Signed Rank test and Independent Samples Mann-Whitney U test.

Results

Situational anxiety

Although there was no statistically significant difference in baseline with respect to reactive anxiety between the first and the second study, we can note that before the last procedure the anxiety of the athletes was lower (figure 1). In both studies, immediately after the massage, the values of situ-

ational anxiety reached almost the same low level. We found that the increase in this indicator in both studies was statistically reliable (first day – $\alpha=0,018$, last day – $\alpha=0,012$).

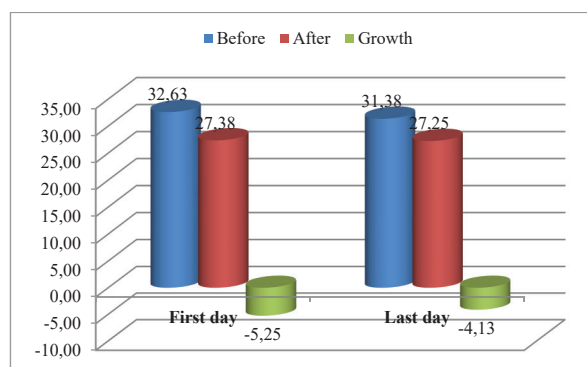


Figure 1. Situational anxiety

Emotional state

The emotional state of the athletes (figure 2) has credibly improved, both after the first ($\alpha=0,012$) and after the last procedure ($\alpha=0,012$). Although there was no statistically significant difference between the emotional states before the two studies, it is better before the second. After both studies, the values of this indicator reached high levels, with the emotional state being better after the second study again, but without a credible difference between them.

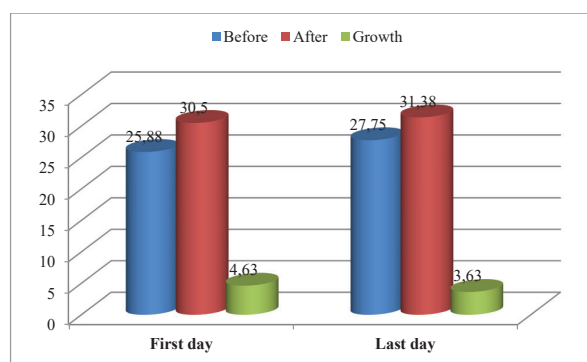


Figure 2. Emotional state

Tranquility-anxiety

The massage method applied by us, credibly improved the self-assessment of the competitors in the first ($\alpha=0,016$) and second ($\alpha=0,011$) measurements of this indicator, the growth in both being absolutely equal (figure. 3). Although there was no statistically significant difference in two baseline and two terminal statuses in this sign, we found a better baseline in the second.

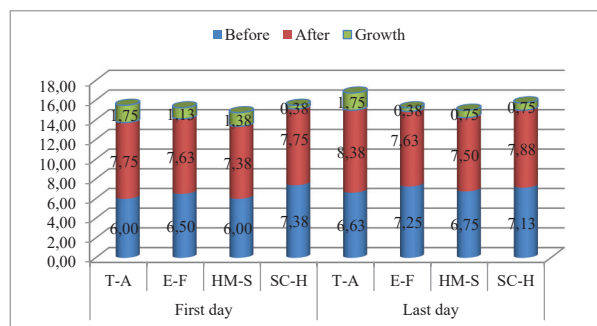


Figure 3. Subscales from the emotional state test

Energy-fatigue

Activity increased in both tests but statistically significant only in the first ($\alpha=0.02$). The values of this indicator at the end of the two measurements are the same (figure 3).

High mood-suppressed

The mood credibly improved in both tests (first – $\alpha=0.015$, second – $\alpha=0.034$), reaching higher values in the second (Figure 3). There was no significant difference between the two initial and the two final results.

Self-confidence- helplessness

Following our methodology, self-confidence increases both days of testing, but none is statistically reliable (Figure 3).

Discussion

The methodology was applied for the first time to students from the NSA “Vassil Levski”, which was with a positive influence on both the emotional state and the situational anxiety was found (Andonova, 2014). In the present study, an improvement of all tested indicators was found, with most of them being statistically significant.

Decreasing anxiety and increasing serenity is an important prerequisite for the athletes’ performance of all sports, and for shooters it is essential because it critically influences the accuracy and speed of the shots. In our study, we found a significant decrease in situational anxiety following the application of our methodology in both tests. Of the 4 tested subscales from the emotional states test, the highest values were reached for the indicator “Tranquility-anxiety” in the second study. The greatest improvement was found in the same index in both the first and second tests.

The lack of a statistically significant increase in the fourth indicator “Self-confidence- helplessness”

can be explained by the fact that it characterizes not only the emotional state but also the cognitive sphere, for which a longer impact is needed.

None of the metrics we’re examining reach high-boundary values, indicating an optimal improvement in psychic adaptation capabilities.

Conclusion

The effectiveness of the methodology proposed by us can be explained by its complex influence – the emotional and the somatic sphere.

The procedure does not take much time (7–10 minutes) and can be performed independently, because the NLR on the back corresponds to those on the front surface of the body, available for self-massage. In the pre start situation, it may be sufficient to perform only the third part of the procedure, which takes 1–3 minutes.

References

- Angelova, R. L. Krastev (1998) Psihologicheski testove. Blagoevgrad, p. 107–109 // Ангелова, Р., Л. Кръстев (1998) Психологически тестове. Благоевград, с. 107–109.
- Andonova, T. (2014) Metodika za namaliavane na stresa I trevojnosta, Sport I nauka, 4, s. 103–107 // Андонова, Т. (2014) Методика за намаляване на стреса и тревожността. // Спорт и наука, 4, с. 103–107.
- Вяткин, Б. А. (1974) Диагностика и регулирование психического состояния спортсмена в соревнованиях. Пермь, с. 59.
- Горбунов, Г.Д. (1994). Психодиагностика физического воспитания и спорта: автореф. дис. Санкт-Петербург, с. 58.
- Дашкевич, О.В. (1970) Эмоции в спорте и их регуляция. автореф. дис. М., с. 24.
- Иванов, И. (1999) Методики за изследване на функционалните състояния. Шумен, 31–33.
- Костанян, А.О. (1987) Об особенностях психического состояния в спорте высших достижений. Тезисы. 16 республ. науч. – метод. конф, Ереван, с. 110–111.
- Некрасов, В.П. (1986). Всегда в хорошем настроении: методы психорегуляции. Физкультура и спорт, с. 31.
- Платонов, В.Н. (1986) Подготовка квалифицированных спортсменов. Физкультура и спорт, с. 286.
- Попов, А.Л. (1998) Спортивная психология: учебное пособие для физкультурных вузов. Флинт, с. 152.
- Thie, John, M. Thie (2006). Touch for health. CA, DeVoss & Company, p. 50–52.
- Walther, D. Applied Kinesiology. Sinopsis. (2000). Colorado, Systems DS, p. 48–49.

Contact information

Tatyana Andonova, Asist. prof., Department of “Sports Medicine and Massage», National Sports Academy “Vassil Levski”, Studentski grad, 1700, Sofia, taniaandonova@yahoo.com.

STRUCTURAL MODEL OF BURNOUT DETERMINING FACTORS WITH ATHLETES

Mihail Georgiev, Nadya Mladenova,, Liliya Doncheva

Abstract

Introduction: In the context of structural equation modeling we analyzed the influence of stress and recovery factors, emotional intelligence, and a burnout on the athlete's satisfaction. The model is recursive and contains 11 observed variables and two not observed. The analysis reveals the degree of influence of the variables included in the model on the athlete's satisfaction, the direct and indirect impact of the variables, and their role as mediators in the survey model.

Methodology: The research was done among 60 athletes practicing individual and team sports. We used: Athlete Burnout Questionnaire; Athlete Satisfaction Questionnaire; Recovery Stress Questionnaire for Athletes (RESTQ-sport); Emotional Intelligence Test.

Results: The results of the analysis show that stress and recovery, emotional and physical exhaustion and a decline in personal achievement have the greatest impact on satisfaction. These variables also play the role of mediators between emotional intelligence and athlete's satisfaction.

Conclusions: The study provides considerable insight into the problem of the influence of stress and recovery, emotional intelligence and burnout on athletes' satisfaction. It substantiates and adds to previous studies in the field and provides practical solutions which could be implemented in the sports-educational process.

Key words: emotional intelligence, stress, recovery, satisfaction

Introduction

In the recent years burnout has become a major issue in sports theory and practice. The research has been aimed at revealing the factors which determine it – physical and psychic stress loads, social stress, interpersonal relations in the sports team, personal characteristics. The peculiarities in the burnout structure and the consequences of its manifestations have been revealed (Dale & Weinberg, 1990; Vealey et al., 1998; Price & Weiss, 2000; Readeke et al., 2002).

It has been established that burnout could be seen among athletes with different sports experience, including children and adolescents (L. Straus, 2014). The idea of burnout in the field of children and adolescents' sport has been presented very exactly and exhaustively by the American Medical Society for Sports Medicine (DiFiori, J., H. Benjamin, J. Brenner, A. Gregory, N. Jayanthi, G. Landry, A. Luke, 2014).

The number of research on burnout in sport has become more numerous. But the results bring up lots of questions for discussion instead of adding to and building on a more complete image of its nature. The main reason for that is the lack of scientific theoretical models which can be used as a base for particular empirical studies.

On the base of critical analysis and summary of the achievements of the foreign authors in the field, M. Georgiev, I. Tosheva and D. Fenerova (2010) made an attempt to reveal the manifestations of burnout in sport and its peculiarities. Regarding burnout in sport the authors outlined a few major practical guidelines.

The manifestations of burnout in sport are specific. That is why the term should be made more operational. One of the most peculiar characteristics of sport is the exceptionally high physical and psychic loads among athletes and coaches, which is not characteristic of the other spheres of social activities.

On the base of comparative theoretical analysis, the authors accept that the definition given by Raedeke (1997) outlines most exactly the characteristics of the researched phenomenon. According to this definition burnout is a syndrome which could be observed after physical and emotional exhaustion, sports devaluation, and a decrease in achievements. This definition comprises the understanding of the manifestations of burnout in other professional fields as well, but it reflects the sport specific high physical and psychic loads, tiredness and fatigue.

The research of burnout in sport requires an inclusion of additional parameters connected with

the public character of sports activities and its social significance. On the other hand, a number of psychic phenomena should be included in the research. Those are phenomena which are related to stress and coping with it – typological peculiarities, emotional intelligence, self-control and self-regulation, individual style of emotional reaction, stress coping strategies, stable motivation trends, etc. (M. Georgiev, I. Tosheva, D. Fenerova, 2010).

One of the consequences of chronic tension and stress among athletes is the occurrence of the negative psychic state – burnout. At the same time, sports activities are a source of significant and unique positive emotions and feelings for athletes. One of the manifestations of these affects is athletes' satisfaction with sport. This, in turn, influences the expected and achieved results, as well as dedication to sport (Chelladurai, 1984).

In the last two decades authors have researched the issues related both to burnout and to athletes' satisfaction, but one could hardly find many works which analyze their interaction. Altahayneh (2014) finds out there is a high negative correlation among all burnout components and the aspects of satisfaction.

A wide range of factors affect athletes' satisfaction. Chelladurai and Riemer (1997) offer a theoretical model comprising the main aspects and components of satisfaction, which are connected with the factors determining them: *Individual performance* (satisfaction with one's own work, improvement, achieved personal goals); *Team performance* (satisfaction with the overall team work, with the achieved goals, with the aspiration to constant perfection); *Development of abilities* (satisfaction with coach's work as regards the development of athletes' abilities and talent); *Strategy* (satisfaction with coach's strategy and tactics); *Coach's personal attitude towards athletes* (satisfaction with the social support and positive feedback); *Trainings and instructions* (satisfaction with coach's teaching, training and instructions); *Collective responsibility* (satisfaction with each member of the team's contribution to achieving the aims and tasks of the team); *Social responsibility* (satisfaction with the team's support and contribution to the development of each of its members); *Ethics* (satisfaction with the relationships in the team); *Integrity of the team* (satisfaction with the group integration, coordination and interactions for achievement of

the aims of the team); *Loyalty* (athletes' satisfaction with their own loyalty and contribution to the team's success); *Budget* (satisfaction with the financial conditions for the development of the team); *Medical staff* (satisfaction with the team's medical staff); *Academic support* (athletes' satisfaction with the academic services and support); *External agents* (satisfaction with the support on behalf of external for the team and club organizations).

The emergence of stress and burnout is caused by a number of personal characteristics: typological peculiarities, personal traits, psychic endurance, emotional reaction and activity style. The peculiarities of emotional intelligence also have a significant influence. The role of emotional intelligence in sport has been relatively slightly researched.

Emotional intelligence in sport has been a subject of intense studies in the last few years. But they are rather insufficient for revealing its specific characteristic manifestations, its role in sports career and in high performance sport. The surveys have been made in many directions; there is no unification among them, which impedes their systematization and the development of a common concept about emotional intelligence in sport.

In an exhaustive theoretical study, including 36 scientific surveys related to emotional intelligence in sport and motor activities, Laborde, Dosseville and Allen (2016) find out that it could be viewed as a personal trait. In the context of sport, it is related to emotions, to the physiological response to psychic pressure, and to the more effective training and competitive activities. On the base of the analyzed surveys the authors offer a three-rank model where emotional intelligence is viewed on three levels: knowledge, abilities, and personal traits. The components of these three levels are in constant interaction, and the model can be used to predict this interaction.

Emotional intelligence affects self-regulation and athlete's way of thinking (B. Vaibhav, 2014). When high activation is needed, athletes with high emotional intelligence achieve it more easily. It is determined as a key factor for success in individual and mostly in team sports.

Hypothesis of the research

The intense training loads and the insufficient recovery time lead to the syndrome of overtrain-

ing. The high levels of its manifestation determine burnout among athletes. Burnout is also influenced by emotional intelligence and athletes' satisfaction.

Methodology

The research was done among 58 athletes – 26 men and 32 women. Twenty-eight of them practice individual kinds of sports and thirty – team sports. They are aged between 15 and 26 years and have sports experience of 1 to 15 years.

– Athlete Burnout Questionnaire (Raedake & Smith, 2001). The test includes 23 items and a 5-point Likert type scale for assessment of their degree of manifestation. There are three subscales: emotional and physical exhaustion; devaluation of the interest towards sport, and a decrease in personal achievements. The test has been adapted for Bulgarian conditions by Tosheva, Georgiev, Fenerova (2011).

– Athlete Satisfaction Questionnaire (Riemer & Chelladurai, 1998). ASQ a multi-dimension questionnaire which includes 14 items and a 5-point Likert type scale. It assesses 4 components which determine satisfaction: trainings and instructions; team performance; individual performance; coach's personal attitude to athletes. We have used the Bulgarian version of the test in our research (M. Georgiev, D. Fenerova, I. Tosheva, 2011).

– Emotional Intelligence Test (Wood, Tolley, 2007). The test includes six items and three options to reply. It assesses the coefficient of overall emotional intelligence.

– Recovery Stress Questionnaire for Athletes (RESTQ-sport). The test includes 74 items and 19 subscales. A 4-point Liker type scale is used for assessment of their degree of manifestation. Four general scales are outlined, on the base of the nineteen subscales, as general factors: general stress; general recovery; stress in sport; recovery in sport (Davis, Orzeck, Keelan, 2006).

Results

The analysis of the empirical data was made with the method of structural equation modeling (SEM), with IBM AMOS Graphics 22.

The co-variation matrixes were analyzed with the criterion Mahalanobis Distance. When $df = 12$ (the

number of the observed independent variables included in the model), the critical level $\chi^2 = 19.67$. There were higher values with two of the researched individuals. They were excluded from the database in the further analys.

Several structural models were analyzed.

In the first model the variables, related to stress and recovery, are presented in two factors – Stress (general stress; sport-specific stress) and Recovery (general recovery; sport-specific recovery). This model cannot be identified. The problems arise exactly out of these two factors. The exploratory factor analysis shows that they are integrated into one common factor.

In the second structural model the observed variables, related to stress and recovery, are united in one factor – Stress (Fig. 1).

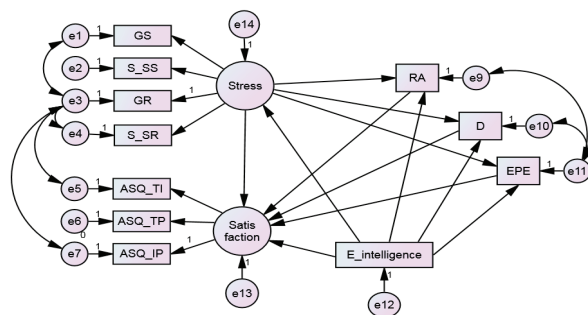


Fig. 1. Modified structural model of Burnout Determining Factors with Athletes

Legend:

- GS – general stress
- S_SS – sport specific stress
- GR – general recovery
- S_SR – sport specific recovery
- TI – training and instructions
- TP – team performance
- IP – individual performance
- PT – personal treatment of the coach
- RA – reduced sense of accomplishment
- D – devaluation of interest in sport
- EPE – emotional and physical exhaustion
- E_intelligence – common emotional intelligence

The factor loading analysis shows that the variable ASQ_PT (personal treatment of the coach) is of very low value – $\lambda=0,03$, and therefore it was excluded from the model. In order to improve the model we used the data from Modification Indices. Six correlation links were included between the measurement error associated with an observed variable.

Notes for Model

The model is recursive.
Sample size = 56

Chi-square = 32.733
 Degrees of freedom = 31
 Probability level = .382

The criterion Chi-square is greatly influenced by the size of the researched sample. It can determine some discrepancies between the observed and predicted co-variations and it can be assumed that the

model does not correspond to the empirical data and there are statistically significant differences between the observed and predicted meanings. In order to avoid the rejection of the analyzed model we used the following alternative indexes (differentiated into three groups): Absolute Fit Measures; Relative Fit Measures; Parsimonious Fit Measures (table 2).

Table 2

Fit Measures

Absolute			Relative			Parsimonious		
Test	Threshold	Value	Test	Threshold	Value	Test	Threshold	Value
χ^2	p > .05	.382	CFI	> .95	.993	PNFI	> .5	.502
GFI	> .90	.913	NFI	> .90	.891	PCFI	> .5	.560
RMSR	< .05	.025	IFI	> .90	.994			
RMSEA	< .10	.032	RFI	> .90	.806			

The indexes for evaluation of the model allow us to presume it as completely adequate of the really existing interrelations and interdependences between the researched phenomena.

A great number of direct and indirect directions of influence were presented in the analyzed structural model. In order to assess the power of indirect impacts, the degree to which a certain variable plays the role of a mediator of the influence of one factor on another, we brought out the criterion z (Standard Deviation) with critical significance level of 1.96. If z > 1.96 – the factor is a mediator between the other two factors (Zero, 2015).

The variables from the burnout structure do not play the role of mediators between emotional intelligence and satisfaction. The factor stress does not play this role either. The components of burnout structure have only a direct influence on satisfaction. The most influential one is RA ($\beta = -.56$); (EFE = β -.39; D = β -.1). The direct influence of stress on satisfaction is little ($\beta = -.23$). Its indirect influence through burnout components is more significant (Stress >> RA – $\beta = -.32$; Stress >> D – $\beta = -.67$; Stress >> EPE – $\beta = -.57$).

The high levels of general and sport specific stress and the low levels of general and sport specific recovery lead to an increase in burnout levels in the three components. High levels of burnout lead to a decrease in athletes' satisfaction.

The emotional intelligence does not affect signifi-

cantly satisfaction and burnout components. It affects more significantly the factor Stress – $\beta = -.39$.

In order to make a more profound analysis of the model we used feedback loops (Satisfaction >> Stress; Satisfaction >> RA; Satisfaction >> D; Satisfaction >> EPE. In this non-recursive model, the five co-variance matrixes are not positively definite. This solution is not admissible.

Conclusions

The study provides considerable insight into the problem of the influence of stress and recovery, emotional intelligence and burnout on athletes' satisfaction. It substantiates and adds to previous studies in the field and provides practical solutions which could be implemented in the sports-educational process.

References

Altahayneh, Z. (2014). Effects of Coaches' Behaviors on Athletes' Satisfaction and Burnout. Scholars' Press.
 Chelladurai, P. (1984). Discrepancy between preferences and perceptions of leadership behavior and satisfaction of athletes in varying sports. *Journal of Sport Psychology*, Volume: 6 Issue: 1, pp. 27–41
 Chelladurai, P., Riemer, H. (1997). A Classification of Facets of Athlete Satisfaction. *Journal of Sport Management*. 11, pp. 133–159
 Dale, J., & Weinberg, R. (1990). Burnout in sport: A review and critique *Journal of Applied Sport Psychology*, 2, pp. 67–83.
 Davis, H., Orzeck, T. and Keelan, P. (2007). Psychometric item evaluations of the Recovery-Stress Questionnaire for athletes. *Psychology of Sport and Exercise*, Vol.8 No.6 pp.917–938

- DiFiori, J., H. Benjamin, J. Brenner, A. Gregory, N. Jayanthi, G. Landry, A. Luke. Overuse Injuries and Burnout in Youth Sports: A Position Statement from the American Medical Society for Sports Medicine. *Clin J Sport Med*, 2014; 24(1), pp. 3–20.
- Freudenberger, H., Richelson, G. (1980). Burn-out: The high cost of high achievement. New York: Anchor Pres, Doubleday & Company, Inc.
- Georgiev, M., I. Tosheva, D. Fenerova. (2010). Бърнаут – специфична проява на стрес в спорта. Пети международен конгрес „Спорт, стрес, адаптация”. [Burnout – a specific manifestation of stress in sports]. Fifth International Congress “Sports, stress, adaptation”. -: Sport and Science, Extraordinary Number., 2010, Part II, pp. 420–424.
- Georgiev, M., I. Tosheva, D. Fenerova. (2011). Адаптация на теста за оценка на удовлетвореността на спортиста – ASQ (Riemer and Chelladurai, 1998). [Adaptation of the test to assess the athlete’s satisfaction – ASQ (Riemer and Chelladurai, 1998)].– In: Personality. Motivation. Sports. Volume 16, NSA PRESS, Sofia, pp. 121–125
- Laborde, S., Dosseville, F. and M. Allen. (2016). Emotional intelligence in sport and exercise: A systematic review. *Scand J Med Sci Sports*. 26(8), pp. 862–74
- Price, M., & Weiss, M. (2000). Relationships among coach burnout, coach behaviors, and athletes psychological response. *The Sport Psychologist*, 14, pp. 391–409.
- Raedeke, T. (1997). Is athlete burnout more than just stress? A sport commitment perspective. *Journal of Sport and Exercise Psychology*, 19, pp. 396–417.
- Raedeke, T., Lunney, K., & Venables, K. (2002). Understanding athlete burnout: Coach perspectives. *Journal of Sport Behavior*, 25, pp. 181–206.
- Raedeke, T., Smith, A. (2001). Development and preliminary validation of an athlete burnout measure. *Journal of Sport and Exercise Psychology*, 23, pp. 281–306.
- Riemer, H., Chelladurai, P. (1998). Development of the Athlete Satisfaction Questionnaire. *Journal of Sport and Exercise Psychology*, 20:2, pp. 127–156
- Straus, L. (2014). Burnout In Youth Athletes: Risk Factors, Symptoms, Diagnosis, and Treatment. <http://www.momsteam.com/burnout-in-youth-athletes-risk-factors-symptoms-diagnosis-treatment>. Created 03/21/2014
- Tosheva, I., M. Georgiev, M., D. Fenerova. (2011). Адаптация на теста за изследване на бърнаут при спортисти (ABQ – Raedeke and Smith, 2001). [Adaptation of the Athlete’s Burnout Test (ABQ – Raedeke and Smith, 2001)]. VI National Congress on Psychology – 2011. Collection of scientific papers. *Bulgarian Journal of Psychology*, vol. 3–4, pp. 233–236.
- Vaibhav, B. (2014). Emotional Intelligence: The Invisible Phenomenon in Sports. *European Journal of Sports and Exercise Science*, 3 (3), pp. 19–31
- Vealey, R., Armstrong, L, Comar, W., & Greenleaf, C. (1998). Influence of perceived coaching behaviors on burnout and competitive anxiety in female college athletes. *Journal of Applied Sport Psychology*, 10, pp. 297–318.
- Wood, R., X. Toly. (2007). Професионални тестове за емоционална интелигентност. [Professional Emotional Intelligence Tests]. “LOCUS”, Sofia.
- Zero, M. (2015). Structural Equation Modeling in AMOS – SEM ZODA guided homework. <https://www.youtube.com/watch?v=VUzxquMgADc>.
- Prof. Mihail Georgiev, PhD
National Sports Academy “Vassil Levski”, Sofia, Bulgaria, 1700
Department of Psychology, pedagogy and sociology
e-mail: miger@abv.bg

PERSONAL FACTORS DETERMINING THE EFFECTIVENESS OF SKILLED PLAYERS

Igor Presnyakov, Iossif Andruchshishin, Yury Denisenko,
Anatoly Geraskin, Denis Presnyakov

Abstract. *The purpose of article is studying of personal features of the Kazakhstan tennis players and identification of their interrelations with efficiency of technical and tactical actions. In tennis, as well as in other sports, the victory depends not only on the level of physical, technical and functional fitness of the athlete, but also considerably on his psychological readiness, from his ability to operate the actions and behavior in the most difficult conditions of competitive fight, from timeliness of the choice of the correct decision, from realization of technical and tactical potential, that is from specific mental and psycho physiological features of the tennis player. The comparative analysis of the indicators reflecting personal features of athletes of various qualification is carried out. 12 strongest tennis players of Kazakhstan aged from 17 up to 23 years have participated in a research. The most significant properties of the personality on R. Cattell, which have made a personal profile of the Kazakhstan tennis player are revealed. High rates of sociability (factor A), emotional steadiness (factor C), tendencies to domination (E factor), activities (factor H), Bohemianism (factor M), strong-willed self-checking (Q_3 factor), and also low indicators of a secondary factor of F_4 concern to them. Efficiency of technical and tactical actions: the quantity of aces, quantity of double mistakes on service hit percent in a square of the first service, hit percent in a square of the second service, the number of the won draws for a match, percent of the points realized a break, percent of the points won from the first service, percent of the points won from the second service, accepted service in a match, was determined by indicators. Average arithmetic has been revealed on all indicators. Reliable correlations of efficiency of game actions with factors G, H, M, F_3 , F_4 and TT (tendency to traumatism) are revealed.***Keywords:** *the technical and tactical actions, efficiency of activities, personal characteristics, personal profile and model characteristics.*

Introduction. The tennis in competitive execution of the best players of the world is the sport imposing the strictest requirements not only to various parties of training of athletes: physical, technical, tactical, integrated, psychological, but also to morphometric indicators. And it isn't casual, duration of matches of rivals, equal on forces, can reach till three and more hours. To sustain such tennis marathon are necessary an enormous stock not only muscular endurance, but also psychological stability, ability to cope with the ultra boundary mental tension which, as a rule, accompanies matches of this sort, ability to cope with the quantity of mistakes increasing by the end of a match and to adequately accept joy of a victory and bitterness of defeat after the end of a game. And it, first of all, a consequence of violation of activity of mental mechanisms of physical action, but not physical exhaustion and fatigue is as usual considered to be increase of number of mistakes. The researchers conducted in sport psychology demonstrate that earlier exhaustion of mental mechanisms is caused by the fact that they are less trained, than muscles. Training process is direct-

ed, first of all, for work with muscular system and purposeful impact on mental mechanisms doesn't assume. Therefore in the course of competitive activity failures (mistakes) begin to arise in the least trained system, i.e. in mental mechanisms of motive activity, and they, in turn, are connected with other psychological variables and including with personal properties [2, 3]. From told follows that the efficiency of competitive activity is definitely connected with properties of the identity of the athlete. Works where communications between efficiency of competitive activity of tennis players and properties of their personality would reveal, in psychology and pedagogical literature known to us aren't revealed and it defines relevance of the conducted research.

The purpose of article is studying of personal features of the Kazakhstan tennis players of high qualification and identification of their interrelations with efficiency of competitive technical and tactical actions.

Research methodology. In the course of the re-

search the following methods were used: calculation of number of the technical and tactical actions fixed in official protocols of a game. The efficiency of technical and tactical actions came was carried out on indicators: the quantity of aces (the balls won directly from service), quantity of double mistakes on service, percent of the first service, percent of the second service, the number of the won draws for a match, percent of the realized break points, percent of the points won from the first service, percent of the points won from the second service, quantity accepted service in a match. 200 protocols of a game of the Kazakhstan tennis players, from 20 to 23 official protocols of each player have been analyzed and average values are calculated. At foreign tennis players 15 official protocols on each player are analyzed and also average values are calculated. For studying of properties of the personality the computer version of the 16-factorial personal test of R. Cattell, developed by N. V. Tipatov was used (this decision is realized within the Excel on service of HR program).

Processing of results of a research was carried out with application of methods of mathematical statistics: calculation of arithmetic-mean size (\bar{x}), a standard deviation (σ) and the correlation analysis according to Pearson.

12 strongest Kazakhstan tennis players aged from 17 up to 23 years which are a part of the national and junior national teams of the Republic of Kazakhstan and participating in ITF tournaments and the Davis Cup, participated in a research.

Results of a research. From table 1 where indicators according to R. Cattell's test are presented, it is visible that in a personal profile of tennis players on primary factors high rates of the following lines most are considerably allocated: sociability (And - 7,2 points), emotional steadiness (With - 7,5 points), tendencies to domination (E - 7,3 points), activities (H - 7,8 points), Bohemianisms (M - 7,2 points), strong-willed self-checking (Q_3 - 7,3 points); on secondary factors - ekstraversiya (F_2 - 8,0 points).

Table 1
Indicators of age, experience of occupations tennis and personal properties of the strongest Kazakhstan tennis players according to R. Cattell's test

examinee	age	expsperience	A	B	C	E	F	G	H	I	L	M	N	O	Q ₁	Q ₂	Q ₃	Q ₄	F ₁	F ₂	F ₃	F ₄
L-n	18	11	8	4	9	9	6	4	8	8	7	9	6	3	1	7	8	3	2,3	8,2	4,3	7
E-v	17	12	8	5	8	7	6	7	7	8	7	5	5	3	6	6	9	1	1,7	7,3	4,3	6
G-v	16	13	6	5	8	10	8	4	9	7	8	10	4	3	5	5	6	3	2,9	9,8	6,1	9
D-v	17	11	6	8	6	5	5	5	8	5	9	8	2	6	6	6	7	10	7,2	6,4	5,5	7
S-v	18	12	7	9	8	5	4	5	6	6	4	1	7	4	9	6	6	5	3,8	5,2	5,7	5
P-o	20	13	7	4	8	7	8	4	10	8	6	9	3	4	1	5	9	3	2,0	9,6	4,9	6
Ev-v	23	17	10	9	8	7	9	5	8	6	3	7	3	4	9	6	10	3	1,6	9,4	5,1	6
K-n	19	13	6	6	8	7	7	4	7	3	3	8	6	3	4	5	8	3	1,9	7,5	7,7	6
M-o	18	13	8	8	5	5	6	6	7	7	7	6	2	8	6	7	9	10	7,4	6,5	3,7	6
A-p	21	15	7	2	8	10	8	4	9	8	7	10	3	3	4	5	6	4	3,1	10	5,1	8
H-n	21	15	7	4	7	6	9	2	6	5	7	7	3	4	4	3	5	6	5,2	8,1	6,1	6
K-a	21	16	6	2	7	9	7	5	8	4	8	6	6	3	6	6	4	5	4,5	8,4	7,9	8
	19,1	13,4	7,2	5,5	7,5	7,3	6,9	4,6	7,8	6,3	6,3	7,2	4,2	4,0	5,1	5,6	7,3	4,7	3,6	8,0	5,5	6,5
σ	2,11	1,93	1,19	2,50	1,09	1,86	1,56	1,24	1,22	1,71	1,97	2,52	1,75	1,54	2,54	1,08	1,86	2,81	2,05	1,52	1,28	1,34

Considering high expressiveness of average values, it is possible to believe that the marked-out properties of the personality can be relevant model characteristics of the identity of the Kazakhstan tennis players.

From table 2 where average values of efficiency of technical and tactical actions of the Kazakhstan tennis players and their foreign peers are presented, differences between them are visible. On two registered indicators from nine, advantage on the party of the Kazakhstan tennis players. It is percent of the hit from

the first service – 62,1%. Foreign tennis players have 56,6%, i.e. is 5,5% less. Less the Kazakhstan tennis players have also a quantity of double mistakes on service – 1,5 during the match. Foreign peers make 2,4 mistakes during the match. On other seven

Table 2

Average values of efficiency of technical and tactical actions of the strongest Kazakhstan (n = 9) and foreign tennis players (n = 10)

Examinee	Quantity of aces	Double mistakes, time	1-st service, %	2-nd service, %	The won points, time	Break -point, %	The points won with the first service, %	The points won from the 2nd service, %	Accepted service, times
Kazakhstan tennis players	1,0	1,5	62,1	90,2	28,0	20,8	59,0	40,3	29,2
Foreign tennis players	4,1	2,4	56,6	92,5	71,9	42,6	71,4	52,6	63,1

indicators (to quantity: aces, the won draws and the accepted service; to percent: the given second service, break points, the first and second service) advantage on the side of the peers who are in the ITF tournaments. Especially the Kazakhstan tennis players by the number of the won draws during the match lag behind. 71,9 points are won for a match by foreign tennis players and only 28 points tennis players of Kazakhstan. Proceeding from the submitted data on the number of the won draws, it is possible to say that significant improvement of this indicator will affect the world ranking not only certain players positively, but also all Kazakhstan tennis [4].

Discussion of results. The revealed interrelations between indicators of efficiency of technical and tactical actions and personal properties with application of the correlation analysis according to Pearson, are presented in table 3.

The following fact attracts attention. Such important indicators of game activity as percent hits of the first service in a zone of reception, the won break points and points won from the second service and also the number of the won draws haven't found interrelations with properties of the personality on P. Cattell. Most likely this circumstance can be explained with the insufficient volume of selection, considering that on other game indicators of correlation are available. If to speak about other five indicators of game actions, here the greatest numbers of correlation communications are revealed by double mistakes and the accepted service, in other words these two indicators are most closely connected with personal properties of tennis players. Analyzing these communications we see, the Bohemianism, pensiveness, a separation from reality and immersion in the internal interests (the M factor) is higher, the more tennis players makes double mistakes on service ($r = 0,740$; $P < 0,01$). Thus there are bases to claim that high values on the M factor, negatively affect efficiency of game activity. Desire to be independent, aggressive, sharp (a secondary factor of F_4), leads to increase in double mistakes on service, but at the same time reduces the number of the second service ($r = 0,629$; $P < 0,05$).

Table 3

Correlation communications between indicators of personal properties and efficiency of technical and tactical actions of the strongest Kazakhstan tennis players (n = 9)

Factors of the test of R. Cattell	Quantity of aces	Double mistakes, time	1st service, %	2-nd service, %	Won points, time	Break-points, %	The points of the first service, %	The points of the second service, %	Accepted services
A	-0,188	-0,332	0,505	0,193	0,261	0,019	0,167	-0,069	-0,277
B	-0,484	-0,063	0,448	0,005	0,194	0,286	-0,300	-0,422	-0,176
C	0,274	0,133	0,121	0,080	-0,284	-0,296	0,066	0,083	-0,292
E	0,093	0,469	-0,185	-0,401	-0,276	-0,180	0,022	0,380	-0,107
F	0,101	0,244	0,435	-0,058	0,221	-0,320	0,393	0,194	-0,071
G	-0,568	-0,454	-0,263	0,074	-0,198	0,710	-0,667*	-0,246	-0,109
H	-0,084	0,446	-0,060	-0,290	-0,170	0,311	-0,237	0,268	-0,643*
I	-0,160	0,059	-0,244	-0,363	-0,381	0,126	-0,066	0,143	-0,643*
L	-0,168	0,112	-0,418	-0,422	0,013	0,223	-0,066	0,094	0,129

M	0,160	0,740**	0,013	-0,531	-0,276	-0,247	0,102	0,421	-0,387
N	-0,237	-0,033	-0,259	0,328	-0,247	-0,346	0,084	-0,212	0,245
O	-0,237	-0,237	-0,005	-0,090	0,215	0,228	-0,109	-0,152	0,020
Q ₁	-0,761**	-0,260	0,417	-0,073	0,395	0,541	-0,204	-0,075	0,179
Q ₂	-0,194	-0,097	-0,119	0,029	-0,026	0,312	-0,377	-0,075	0,051
Q ₃	-0,186	-0,186	0,174	0,229	-0,213	0,211	-0,410	-0,164	-0,466
Q ₄	-0,131	0,022	0,020	-0,143	0,389	0,141	0,153	0,076	0,283
F ₁	-0,141	-0,001	-0,102	-0,192	0,349	0,129	0,174	0,047	0,308
F ₂	0,041	0,448	0,194	-0,288	-0,045	-0,122	0,165	0,374	-0,185
F ₃	0,235	0,164	0,050	0,197	0,170	-0,155	0,025	0,006	0,603*
F ₄	-0,237	0,629*	-0,128	-0,685*	-0,091	0,100	-0,050	0,406	0,027
F/d	0,199	0,026	-0,405	-0,064	-0,514	-0,154	-0,139	-0,037	-0,367
C/m	-0,202	0,032	-0,139	-0,254	0,281	0,224	0,094	0,030	0,206
P/h	0,198	0,084	0,108	0,095	-0,248	-0,252	0,046	0,061	-0,211
TT	-0,295	-0,623*	-0,067	0,422	-0,169	0,395	-0,483	-0,435	-0,079
T/t	-0,455	-0,292	0,090	0,120	-0,096	0,465	-0,553	-0,425	-0,242
SB	-0,352	-0,225	0,046	0,118	-0,257	0,356	-0,547	-0,228	-0,246

These are tennis players of the first service, who – the first service seek to solve at once a problem and therefore as much as possible invest in the first service, risk, by the principle “Win or lose”. From this it follows that excessively expressed aggression and sharpness interferes with improvement of efficiency of technical and tactical actions of players.

Also negatively increase in indicators of tendency to traumatism (a factor of the third order – TT) which is a consequence of risky behavior ($r = -0,623$ affects quality of game activity; $P < 0,05$), in other words, the less risks the tennis player, the less he allows double mistakes onservice.

What shakes the accepted service, here negative correlation communication demonstrates that high rates of activity, courage of the tennis player (H factor), will reduce efficiency of reception of service ($r = -0,643$; $P < 0,05$). The psikhastenichnost of players (a factor of I) will affect the same way efficiency of a game. The sensitivity and artistry of nature of the tennis player are higher, the worse he accepts service, each failure very strongly upsets him and he can badly gather for the next reception ($r = -0,643$; $P < 0,05$). At the same time the aspiration of tennis players to work quickly, resolutely, without any doubts (F₃ factor) promotes increase in efficiency of reception of service ($r = -0,603$; $P < 0,05$).

It is positively connected with winning of service (aces) property of conservatism (Q₁ factor). The more at the tennis player the tendency to conservatism is developed, the it is more at him than wonof-service. It is promoted by his conviction in correct-

ness of the principles and representations.

Improvement of efficiency of game actions is promoted by decrease in social dominance (G factor). The more originally and more freely, the tennis player acts and the less he is subject to influence of social norms and requirements, the points from the first service are won more ($r = -0,761$; $P < 0,01$).

High rates of a secondary factor of F₄ (independence, aggression, sharpness) have an adverse effect on quality of the second service ($r = -0,685$; $P < 0,05$), i.e. decreases percent of the second service.

It is necessary to pay attention to the next moment. From those factors which are connected with efficiency of technical and tactical actions only two (high rates of Bohemianism – M and activities – N) are among properties of the personality which belong to the relevant model characteristics of the Kazakhstan tennis players selected with us. According to V.E. Milman’s research if properties of the personality are connected with efficiency of activity, then they have to be special structure of the identity of tennis players [1]. It is necessary to notice that high values of these factors have negative effect on efficiency of activity of tennis players. In the same work Milman also claims that in acyclic sports there are properties of the personality, which positively influence activity of athletes, and there are those which have an adverse effect on motive activity in this or that sport.

Conclusions.1. Relevant model characteristics of the identity of the strongest Kazakhstan tennis players are defined. The following personal factors

have entered her with high values: sociability (A), emotional steadiness (C), tendency to domination (E), activity (N), Bohemianism (M), strong-willed self-checking (Q_3), ekstraversiya (F_2). 2. Superiority of the Kazakhstan tennis players in efficiency of the first service and smaller quantity of double mistakes on service, and lag from foreign peers in quantity is revealed: aces, the won draws and the accepted service and also on percent of second service, break points, the first and second service. The greatest lag is available for the Kazakhstan tennis players by the number of the won draws during the match that prevents them to achieve the same results as at foreign peers.

3. Positive correlation communications of efficiency of technical and tactical actions with such personal properties as jet steadiness (F_3), conservatism (Q_1), the reduced level of social dominance (G) and negative communications with Bohemianism (M),

independence of behavior (F_4), tendency to traumatism (TT), activity (H) and a psikhastenichnost (I) are found.

4. It is revealed that such properties of the personality as the Bohemianism (M) and activity (H) which are special structure of the identity of tennis players negatively influence efficiency of their activity.

Literature

Milman B. E. Stress i lichnostnye factory v regulyatsii deyatelnosti // Stress i trevoga v sporte: Mezhdunarodnyi sb. Nauchnykh statei / Sost. Y. L. Khanin. – M.: Fizkultura i sport, 1983. – S. 24–46.

Nemov R. S. Uchebnik dlya studentov vysshykh ped. uchebnykh zavedenii: V 3 Kn. Kn. 1. Obshchie osnovy psikhologii. – 3-e izd. – M.: Gumanit. izd. Tsentr VLA-DOS, 1997. – S. 8–12.

Psikhologiya sporta vysshykh dostizhenii: ucheb. posobie dlya ins-tov fiz.kult. / Pod red. A. V. Rodionova. – M.: Fizkultura i sport, 1979. – 144 s.

<https://www.SofaScore.com>.

TYPOLOGICAL CHARACTERISTICS IN NATIONAL FENCING ATHLETES

Evelina Savcheva
NSA “Vassil Levski”, Sofia

ABSTRACT

Introduction.

The success and realization of athletes in competitions is the ultimate result of the efforts made and the quality of the preparation. In this respect, knowing the typology of individual competitors in various sports would reveal greater opportunities for expanding the personal potential for the realization of sports, technical and tactical skills in a competitive environment.

Purpose and objectives of the study.

The aim of the study is to establish interrelations between personality characteristics of extraversion, neuroticism, psychoticism, trait anxiety, trait sport-confidence and resilience.

Methodology: *The survey presents the results of an empirical study among 22 athletes from the national fencing teams (13–19 years old) conducted in 2016 during a preparatory camp. The following psychological questionnaires were used: H. Eisenk (EPQ), Spielberger’s State-Trait Anxiety Inventory (STAI), Vealey’s Trait Sport-Confidence Inventory (TSCI), Ego-Resiliency Scale (ER89) Block & Kremen (1996).*

Results: *The influence of the trait anxiety on the trait sport-confidence was established. For athletes with higher level of trait anxiety, there is lower trait sport-confidence and vice versa ($\beta = -0.502$). Extraversion also affects ego-resilience ($\beta=0.636$). The more outward, active, communicative and interacting with the environment is the athlete, the better and more effectively he can cope with the stress situations and negative changes from the environment. Analysis showed statistically significant correlations between trait anxiety and psychoticism ($r= -.589$; $p<0.004$) trait anxiety and neuroticism ($r=-.503$; $p<0.017$); trait anxiety and trait sport-confidence ($r= -.522$; $p<0.013$); extraversion and ego-resilience (flexibility) ($r=.636$; $p<0.001$); trait sports-confidence and neuroticism ($r= -.431$; $p<0.045$) also.*

Conclusions: *In analyzing the psychological characteristics of athletes, take into account the relationships thus revealed and on the basis of the individual values (low or higher) to select the necessary means and methods of influence and mental training of the athletes.*

Key words: *trait anxiety, trait sport-confidence, psychological characteristics, ego-resiliency, fencing.*

Introduction

The success and realization of athletes in competitions is the ultimate result of the efforts made and the quality of the preparation. In this respect, knowing the typology of individual competitors in various sports would reveal greater opportunities for expanding the personal potential for the realization of sports, technical and tactical skills in a competitive environment.

Studies in the field of sports psychology reveal the typological characteristics of athletes practicing various sports. Athletes from different levels have been studied (Iancheva, 2004; Zshelyazkova, 1997; Domuschieva-Rogleva, 2009; Yancheva, M., 2015; Domuschieva-Rogleva, Yancheva, M. & Varneva, 2014; Lyubomirova, Fenerova & Georgiev, M., 2008); McKelvie, Lemieux & Stout, 2003; Egan &

Stelmack, 2003; Verduyn & Brans, 2012; Kirkaldy, 1982; Newcombe & Boyle, 1995). The interest of the authors is aimed at outlining the personal psychological profile of the athletes from a specific type of sport to establish the interrelationships and the influence of these typological characteristics on the performance and competitive realization of the athletes (Yancheva, M., 2014; Zhelyazkova-Koynova & Savcheva, 2005, Domuschieva-Rogleva, 2002; Allen, Greenlees & Jones, 2013; Gould, Petlichkoff, Simons & Vevera, 1987). Based on the results of these studies, a number of recommendations have been drawn up for the purposeful and qualitative doing of mental preparation taking into account of specific sports, the level of training and the age of the athletes.

The aim of the study is to establish interrelations

between personality characteristics of extraversion, neuroticism, psychoticism, trait anxiety, trait sports-confidence and ego-resiliency and their interrelations with cadets and youth national fencing contestants (13–19). On the basis of the results obtained, optimize psychological preparation implement effective psychological and pedagogical approaches in the training process according to the temperament characteristics of the athletes and to determine the impact of the individual characteristics on the trait sports confidence and the ego-resiliency which are at its core of successful performance in sport. Our research is valuable to coaches and specialists who work to develop elite sportsmen as it encompasses a significant number of (22) talented, teenage fencers – national competitors, but at the same time the results obtained are insufficient to make stronger conclusions for competitors involved in fencing in Bulgaria. This outlines the need to gather more data from fencing athletes outside national teams in the future, as well as other age groups (adults – men and women).

Methodology

The survey presents the results of an empirical study among 22 athletes (13 girls and 9 boys) from the national fencing teams (13–19 years old) conducted in 2016 during a preparatory camp in the village of Varbitsa (Shumen District).

The following psychological questionnaires were used in order to achieve the goals and objectives of this study:

H. Eisenk (EPQ), Bulgarian adaptation of Paspalanov, Shtetinski, Eisenk (1984).

Spielberger’s State-Trait Anxiety Inventory (STAI), Bulgarian adaptation by

Shtetinski and Paspalanov (1989).

Vealey’s Trait Sport-Confidence Inventory (TSCI), Bulgarian adaptation by

Zhelyazkova-Koinova & Savcheva E., (2008). Trait sport confidence is defined as the “belief or degree of security of individuals about their ability to succeed in sports” (Vealey, 1986).

Ego-Resiliency Scale (ER89) Block & Kremen (1996), Bulgarian adaptation by

Zhelyazkova-Koinova, Chervencova & Misheva-Aleksova (2010). The term

“ego-resiliency” is defined by Block (1965) as “ingenuity, adaptability, engagement with the world.” The opposite meaning is the “ego-brittleness” – the low degree of adaptive flexibility, the inability to react in a timely fashion to the dynamic requirements of the situation, a tendency towards rigidity or disintegration in the presence of tension (Block & Block, 1980).

The results of the study were processed with the statistical program SPSS16. We applied a stepwise regression analysis with variac rotation and correlation analysis (Spearman criterion).

Results

The regression analysis shows influence of the *trait anxiety* on the *trait sports confidence* ($\beta = -0.502$). For athletes with higher personal anxiety, there is lower *trait sports confidence* and vice versa (Table1).

Table 1

Influence of extraversion on ego- resiliency

Variable	Extraversion			
	β	T	Sig.	ΔR^2
Ego- resiliency	.636	3.686	.001	.405

Extraversion also affects *ego-resiliency* ($\beta = 0.636$). The more focused, active, communicative and interacting with the environment is the athlete, the better and more effectively he can handle and adapt to stress situations and negative environmental changes (Table 2).

Table 2

Influence of trait anxiety on trait sports confidence

Variable	Trait anxiety			
	β	T	Sig.	ΔR^2
Trait sports confidence	-.502	-2.598	.017	.252

Correlation analysis (Fig.1) showed statistically significant correlations between: *trait anxiety* with *psychoticism* ($r = - .589$; $p < 0.004$), *neuroticism* ($r = .503$; $p < 0.017$) and *trait sports confidence* ($r = -.522$; $p < 0.013$); between *extraversion* and *ego-resiliency* ($r = .636$; $p < 0.001$); between *trait sports confidence* and *neuroticism* ($r = -.431$; $p < 0.045$).

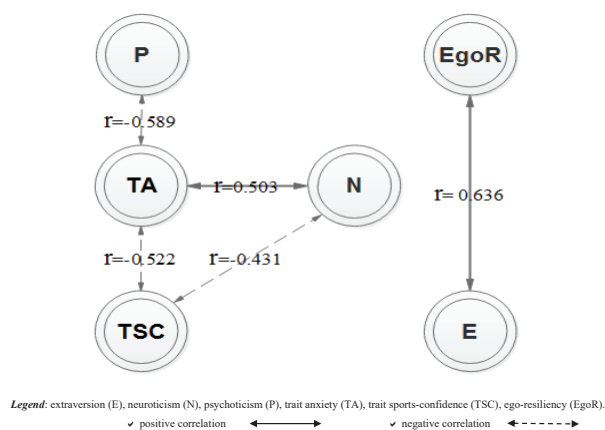


Figure.1. Correlational relationships between typological features

From the results so obtained, we can assume that athletes with higher extraversion, lower personal anxiety, and emotionally stable will exhibit higher trait sports confidence and better psychological resistance (ego-resiliency) to negative events in the sporting competition activity as well as in life as a whole. On the other hand, those athletes with higher levels of neuroticism and trait anxiety may be more prone to the stress they face, requiring more time to recover from strong unexpected experiences which will also result in less psychological resilience of the athletes.

Discussion

For the needs of sport-psychological and pedagogical practice we would make the following recommendations: in analyzing the typological characteristics of athletes, take into account the relationships thus revealed and on the basis of the individual values (low or higher) to select the necessary means and methods of influence and psychological training of the athletes. In those who have a higher emotional instability (neuroticism) and higher trait anxiety, emphasize the use of self-regulation techniques such as breathing exercises, changing the negative self-talk into a constructive, motivating and positive, focusing, etc. For athletes who have lower levels of extraversion and are more focused on their emotions, thoughts, etc. is important to develop coping skills to deal with various unexpected, negative situations and using mental rehearsal techniques for different tactical moments in the game. Since the typological features are considered to be characteristic of the individual, our research aims to seek mechanisms that compensate the individual characteristics unfavorable for competitive environment by expanding the range

of skills and techniques for self-regulation, as well as by selecting the appropriate psychological methodologies to influence the athletes' personality and their successful performance.

The success and realization of athletes in participating in competitions is the ultimate result of the efforts made and the quality of the training. In this respect, knowing the typology of individual athletes in various sports would reveal greater opportunities for expanding the personal potential for the realization of sport-technical skills in a competitive environment.

References

Allen, M. S., Greenlees, I., and Jones, M.V. Personality in sport: A comprehensive review. *International Review of Sport and Exercise Psychology*, 6,184–208, 2013. <<http://www.tandfonline.com/10.1080/1750984X.2013.769614>> (Accessed:15.09.2017)

Block, J. H., J., Block (1980). The role of ego-control and ego-resiliency in the organization of behaviour, In W.A. Collins (Ed.), *The Minnesota Symposia on Child Psychology*, Vol.13. Hillsdale NJ: Lawrence Erlbaum Associates (Wiley), 39–101.

Domuschieva-Rogleva (2009). *Predsastezatelna trevozhnost i stres v sporta*, IVOFORM, Sofiya.

Domuschieva-Rogleva, G., Petkova, K. (2002). Nivo na samokontrolirashti umeniya i trevozhnost pri 14–16 godishni handbalisti, V: *Lichnost, motivatsiya, sport*. Kniga 1, Tom. 6, 27–35, ProSport.

Domuschieva-Rogleva, G., Yancheva, M. i Varneva, M. (2014). Lichnostni determinanti na nivoto na samokontrol pri sastezатели po sambo. V: *Lichnost, motivatsiya, sport*. Tom 19, NSA PRES, 21–31.

Egan, S., Stelmack, R. M. (2003). A personality profile of Mount Everest climbers. *Personality and Individual Differences*, 34, 1491–1494.

Gould D., Petlichkoff L., Simons J. and Vevera M. (1987). Relationship between Competitive State Anxiety Inventory-2 subscale scores and pistol shooting performance. *Journal of Sport Psychology*, 9, 33–42. Google Scholar.

Iancheva, T. (2004). *Lichnost i sastezatelna realizatsiya*, NSA PRES, Sofiya.

Kirkaldy, B. D. (1982). Personality profiles at various levels of athletic participation. *Personality and Individual Differences*, 3, 321–326.

Lyubomirova, S., Fenerova, D. i Georgiev, M. (2008). Vliyanie na tipologichnite osobenosti varhu predsastezatelnata trevozhnost pri sportisti po tenis. V: *Lichnost, motivatsiya, sport*. Vtora chast, Tom 13, NSA PRES, 24–32.

McKelvie, S. J., Lemieux, P. and Stout, D. (2003). Extraversion and neuroticism in contact athletes, no contact athletes and non-athletes: A research note. *Athletic Insight*, 5(3), 19–27.

Newcombe, P. A., Boyle, G. (1995). High school students' sports personalities: Variations across participation lev-

- el, gender, type of sport, and success. *International Journal of Sport Psychology*, 26, 277–294.
- Paspalanov, I., Shtetinski D. i Ayzenk, S. (1984). Balgarska adaptatsiya na lichnostniya voprosnik na H. Ayzenk (EPQ), sp. *Psihologiya*, (5), 279–292.
- Shtetinski, D., Paspalanov, D. (1989). Metodicheskoto posobie za rabota s balgarskata forma na voprosnika za otsenka na trevozhnostta Ch. Spilbargar (STAI – forma – Y), Sofiya.
- Yancheva, M., *Psihologicheski faktori na sportnite pozitiveniya pri sastezatelni po sambo: doktor*, Sofiya, 2015, Disertatsiya.
- Vealey, R. (1986). Conceptualisation of sport-confidence and competitive orientation: Preliminary investigation and instrument development. *Journal of Sport & Exercise Psychology*, Vol. 8, Issue 3, 221–346.
- Verduyn, P., Brans, B. (2012). The relationship between extraversion, neuroticism and aspects of trait affect, *Personality and Individual Differences*, Vol. 52, Issue 6, April, 664–669.
- Zhelyazkova-Koynova, Zh. (1997). Vzaimovrazka mezhdu lichnostnite harakteristiki i osobenosti na atributivniya stil pri sportisti orientirovachi s razlichna sportna kvalifikatsiya, V: *Lichnost, motivatsiya, sport*. Tom 3, NSA PRES, Sofiya, 18–25.
- Zhelyazkova-Koynova, Zh., Savcheva, E. (2005). Model na vzaimodeystvieto mezhdu lichnostnite osobenosti, faktorite na sastezatelната sreda i sastezatelната realizatsiya pri fehtovachi (14–19 g.). V: *Lichnost, motivatsiya, sport*. Tom 10, NSA PRES, Sofiya, 77–82.
- Zhelyazkova-Koynova, Zh., Misheva-Aleksova, T. i Chervenkova, L. (2010). Balgarska adaptatsiya na skatlata ER89 (Block & Kremen, 1996) za izsledvane na ego-reziliientnost. Sp. *Psihologicheski izsledvaniya*, (2), 165–175.

Contact information with the corresponding author:

Chief Assistant, Evelina Savcheva, PhD
Adress: National sports academy “Vassil Levski”,
Phone: 00359 889 21 09 79
e-mail: esavcheva@gmail.com

SPORT AND TECHNOLOGIES

SWOT ANALYSIS OF MOBILE SOLUTIONS FOR HEALTH PREVENTION, PROMOTION, AND FITNESS ACTIVITY

Ivan Nedelchev

Summary

The need to understand and use modern information and communication technologies in the appropriate way is one of the successful key approaches to our health welfare in cooperation with modern services. Using a mobile phone today is of the utmost importance not only to communicate with people around us but also to personally collect and process information about our healthy surroundings.

This article aims to present a multidimensional approach – combination of SWOT analysis and survey between 200 mobile app users – for evaluation the use of mobile and wireless technologies, supporting health.

The hypothesis of the study aims to demonstrate Strengths, Weaknesses, Threats and Opportunities of mobile solutions that assist healthy and sports way of life. A cross sectional study was designed to analyse the relationship between app use and physical activity, health and lifestyle.

The analysis and the conducted survey show that this is the modern way to maintain and support good personal health and ensure prevention style. The variety of opportunities for consumers to constantly monitor their activity, authorize their fitness programs and regimes with the help of global experts, and manage load, type and number all their activities are just some of the challenges facing professional fitness trainers in the new technological age.

Key words: mobile solution, health prevention and promotion, fitness, swot analysis

Introduction

By definition, mobile health (mHealth) is the use of technology to deliver health-conscious activities via mobile communications. mHealth combines the use of all mobile telecommunication and multimedia technologies as they are integrated within the wireless configurations for health and are part of patient-centered systems for the provision of health services and care. mHealth services are based on a variety of mobile devices through which to register and collect health and clinical data, real-time monitoring of vital signs, as well as directly providing consulting care. (Mikalajunaite, 2015)

The growth of health-related applications, and in particular – sports and fitness solutions, in combination with the availabilities of the mobile device, drive the growth of mHealth. In 2010, only about 4,000 health-related applications were available and today they are more than 100,000. [3] The top 20 free applications for sports, fitness, and health have already been downloaded 231 million times worldwide. [4]

Aim and Objectives of the study

Mobile devices and Apps are the newest accessible version of ICT for personal health needs. They, through their functions and capabilities, are the mobile way to perform health prevention. This is the modern way to record, monitor, and process health information. [5,6]

Health and fitness related apps on mobile devices are often easy to use and appeal to many users. They allow

users to take measurements whenever they need to. The apps offer a lot of functionality, usually are free and provoke health and fitness professionals to start using the physiological data collected from these apps in their practice.

The study discusses benefits and opportunities that mobile apps present through the vision of sporting people.

It will be needed time to study the lasting impact of mobile applications on the health of users and whether they influence more in a positive direction.

Methods

We used a multidimensional approach – combination of SWOT analysis and survey between 210 mobile app users – for evaluation the use of mobile and wireless technologies, supporting health and fitness.

The survey was conducted for 30 days among professional bodybuilders and fitness amateurs.

The subsequent SWOT analysis presents strengths, weakness, opportunities and threats of using mobile application for sport practice and fitness training.

Results

The most significant data from the study is presented below. 50% of the inquired people use at least one mobile app for personal training and dietary. From 5–15 apps on the mobile phone 70% are sport and fitness solutions.

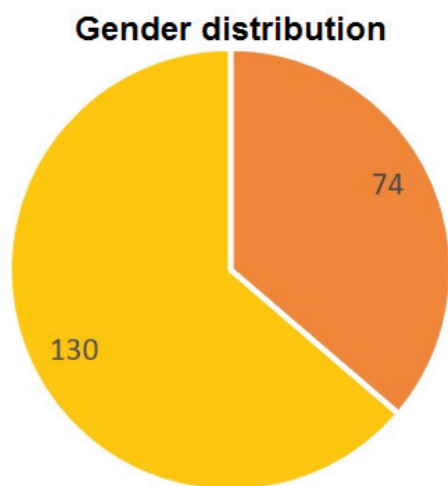
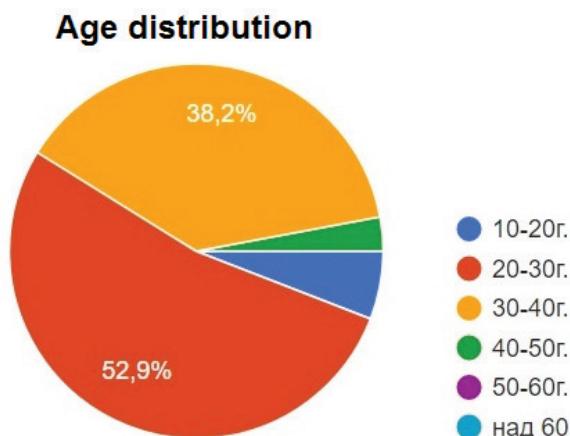


Fig.1. Age and gender distribution

9. Use of apps for personal training and dietary

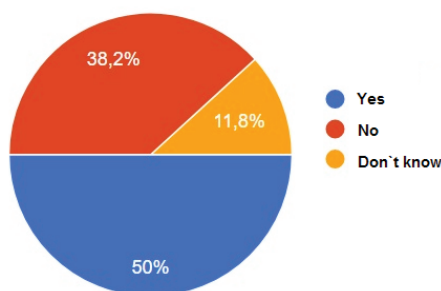


Fig.2. Apps for personal training

6. Average number of Apps on the personal mobile phone

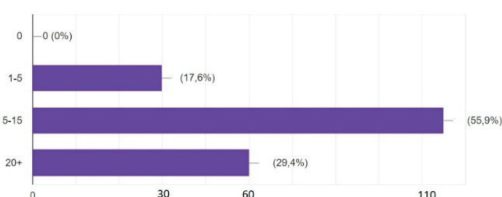


Fig.3. Average apps number on personal mobile device

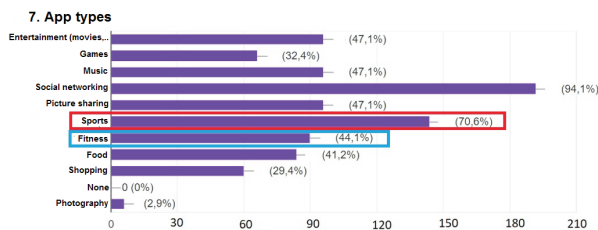


Fig.4. Apps types

Many frequent users of wellness and fitness apps are becoming increasingly dependent on this technology to give them information about their health and according to our results 75% of the interviewed participants point out that they use apps in combination with personal fitness trainer, who discusses their out fitness regime.

A 2015 study from Harvard Medical School and the RAND Corporation including 726 participants found that despite the drawbacks, health and fitness apps are far from being the worst technology on the market. It showed that current users of fitness apps were 27% more likely to self-report being active than participants who did not use fitness apps. (Semigran, 2015)

The study highlights that measurements recorded using mHealth apps are mainly entered manually by the user. This can lead to inaccurate data entries, which could compromise its reliability. Self-motivation to record data over a longer period also can be a challenge.

On the other hand, the growing awareness of health and fitness apps in the sport and fitness community as well as the growing proportion of sporting people using mobile devices will encourage the professionals to exploit, the opportunities, provided by smartphone technology and incorporate applications into their sport and dietary management plans.

The SWOT analysis below presents benefits, opportunities, and some factors that are negative for the application of mobile apps in sports and fitness.

Discussion

The need for understanding and use of modern ICT is the key to our health and well-being modern services. Mobile technologies are a constant contributor to our time, new cultural attitudes, and communication, just as health and personal fitness activities are transformed into particularly current practices to date.

Table 1 SWOT analysis

INTERNAL FACTORS	
STRENGTHS (+)	WEAKNESSES (-)
<ul style="list-style-type: none"> • A large market • Access to world-famous programs • Rapid exchange of information • Direct and immediate contact with the trainees and those who want to train • Allows access to different groups that interest the user – but are not necessarily friends • Building strong, long-term relationships through online social networks faster than simply relying on traditional networks • Free • Generated hundreds of applications daily • Organizations and companies use profiles and generate new products and services – the opportunity to exchange information between athletes, trainers and businesses • Real-time / live and 24/7 recordings • Best option for tracing the score of the trainee • Saves time to exchange information • Increases personal competences and knowledge, through exchange of experience and unrestricted access to specialized information 	<ul style="list-style-type: none"> • Requires constant updating and current uploading of updates in the field • It is difficult to train or persuade some people to apply mobile solutions in their sport activity • The unequal distribution of posts – 90% of them come from the top 10% of the most active users • Lack of resources to analyze results • Loss of information, responsibility, security and knowledge management • Efforts to achieve results: Even if they are more measurable than other channels, it is often difficult to prove the benefits of balancing the social media efforts against the results • Compatibility • Responsibility for entering the correct data manually
EXTERNAL FACTORS	
OPPORTUNITIES (+)	THREATS (-)
<ul style="list-style-type: none"> • Involvement of interested new members and strong public support • Allows to build short-term and long-term relationships with perspectives • Providing users with personal contact • A major marketing tool for popularizing the business • Fast delivery of desired services, branding opportunities, and better marketing opportunities • Access to certain groups that traditional media does not allow • Opportunity for feedback from trainees and their results 	<ul style="list-style-type: none"> • Privacy • Sharing information online leads to risks and strain • Danger of spam and malicious information from malicious users • No validated data measurement tools

Opportunities for users to constantly monitor their activity, authorize their fitness programs and regimes with the help of global experts, and manage load, type and number activities are just some of the challenges facing professional fitness trainers in the new technological age.

References

Mikalajunaite E., 500 m people will be using healthcare mobile applications in 2015: Global Mobile Health Market Report 2010–2015, <http://www.research2guidance.com/>

Semigran, H., et al. Evaluation of symptom checkers for self diagnosis and triage: audit study. *BMJ*. 2015; 351. doi: 10.1136/bmj.h3480

<https://mhealthinsight.com/2010/03/22/the-definition-of-mhealth/> [last visited on 23.08.2017]

<https://bmcpublihealth.biomedcentral.com/articles/10.1186/s12889-015-2165-8> [last visited on 14.08.2017]

<https://ec.europa.eu/digital-single-market/en/mhealth> [last visited on 24.08.2017]

<http://ebox.nbu.bg/medteach/ne14/Lekcia%207%20-%20Mobile%20applications.pdf> [last visited on 24.08.2017]

Contact information

Ivan Nedelchev, PhD

Head of Sport courses

New Bulgarian University, Montevideo 21 str., 1618, Sofia, Bulgaria

tel: +359898336394, email: inedelchev@nbu.bg

STUDY OF INDIVIDUAL TACTIS IN WATER POLO THROUGH VIDEO ANALYSIS

Salvatore Napolitano, Antonio Ascione
University of Naples "Parthenope"

Summary

Introduction

Water polo lacks a shared analysis for tactics chooses because of high influence of discretion. So, it could be useful to study on tactical aspects in competition.

Aim

Aim of the work is to verify the efficacy of different attack patterns, in order to start up an investigation water polo tactics.

Method

Method is integrated by 3 distinct approaches. 1 case study on descriptive, 2 action research method for coach contribution in order to give a relation tactics training and tactics in competition, 3 theoretical-argumentative approach to deduce a framework in which process the data to aim the correlation between outcomes and tactical aspects.. The data are collected by Kinovea system.

Results

For every athlete twenty have been selected frame, for total of 386. Data were compared to with the provided by coach and schemas for every athlete has been elaborate a sequence of image in order to determine the correct application indications dates in training. For each athlete based on the results obtained from the analysis of the data collected have been identified its strengths and weak points of their approach to tactical situations of the game, so it was possible to elaborate a methodology coded and personalized tactical training.

Conclusion

The results showed a general efficacy of tactical patterns, but showed significant differences within correlation coefficients of single patterns. A more consistent data base is needed, in order to establish direct, evident and general relationship between so calculated coefficient and pattern efficacy, and the research team is conscious of internal validity of this kind of qualitative analysis, which can't extend, without adjustments, to other teams.

Keyword: Tactic, water polo, video- analysis

Introduction

This pilot work represents an attempt to develop methods and consequential tools to analyze, and then train, tactical water polo side, knowing that

- "the coaches of team sports analyze matches and performances of team and opposing teams to get useful data in coaching" (M. D. Hughes&I. Franks, 2008) and that,
- "currently, the process of training, its organization, and teaching methodology need more knowledge on the qualitative aspects of sports performance (R. Schmidt, C. Wrisberg 2008)".

Eighteen women water polo matches, during season Italian Serie A1, have been analyzed by a water polo coach, helped by a statistician and a performance analyst.

Purpose of the analysis process was

- to identify single events during the matches,

- to examine the tactical patterns implemented in these events,
- to obtain by the coach an evaluation on tactical pattern compliance and then
- to put this compliance in relation to event's outcome.

Aim

Aim of the work is to verify the efficacy of different attack patterns, when they were well-performed, in order to create a codified methodology for teaching water polo through tactics. The data, collected via Kinovea system,

The results show a positive and statistically significant correlation coefficient between tactical compliance and events outcome, and highlight the need for developing a common methodology for teaching water polo through tactics, confirming once again that

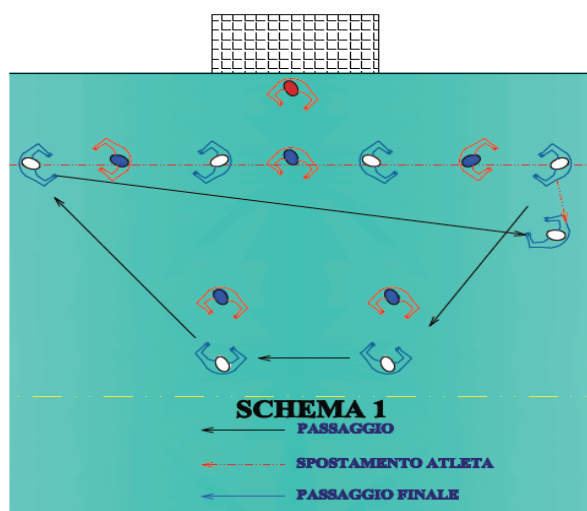
- "the practical value of performance analysis is that well-chosen performance indicators highlight good and bad techniques or team performances (Hughes)".

Method

- The research approach is integrated and consists of 3 distinct methods:
- case study (18 matches of the Italian Serie A1 Women's Championship, season, played by the Volturno s.c.) for the analysis of matches,
- action research method for coach contribution,
- and theoretical-argumentative method to deduce a theoretical framework in which define the data processing.

Participants

Team Volturno S. C. (18 matches of the Italian Serie A1 Women's Championship)



Procedures

The survey of data is entrusted to performance analysis, carried out with the help of a water polo coach, a statistician and a performance analyst.

The assessment of compliance for the tactical patterns is entrusted to the coach, on the basis of the video analysis-aided confrontation of attack pattern design against attack pattern effectively implemented during match. The research team examined matches with Kinovea system, isolating single key frames relative to attack events, identifying the implemented attack pattern, then the coach expressed an evaluation on attack pattern compliance



Figure 1 et frames 1: Confrontation between pattern design and effectively implemented pattern during match for attack pattern named "schema1"

A spreadsheet containing, for each row, the match id, the event id, the attack pattern id, the coach's evaluation (compliant/non compliant) and the event outcome (goal / non goal) was filled. This data sheet is processed through the "water polo Tactics analyzer software", which produces basic descriptive statistics and the correlation coefficient of each well-implemented attack pattern with events outcomes.

In total, 7 attack patterns on 125 events during 18 matches were analyzed. The analyzer software output is discussed by the research team, with consciousness of internal validity, allowed by action research method, of this kind of qualitative analysis.

Materials

Two cameras to film the games

One laptop for analyze end prepare video lessons

to show by projector to players during all meetings. Kinovea software was used for select most important part of videos and select the frames.

Results

An evaluation table was constructed by combining, for each single event, the evaluation of the coach on the compliance of patterns with the event final outcome.

Here are reported

Confrontations of pattern design with Dartfish screenshot of pattern implemented during game;
Basic descriptive statistics (occurrence of single patterns on events total, occurrence of "well-performed pattern" on events total, etc...);
Linear regression scatter plot for single patterns;
Confrontation between correlation coefficients of single patterns (referred only to "well-performed" patterns)

Statistics man up

Squadra	Tot s.n.	Gol s.n.	% s.n.	Tot Gol fatti	% Gol fatti in s.n.
Pro Recco	102	58	56,9	204	28,4
ASD Orizzonte	115	58	50,4	203	28,6
RN Imperia	119	52	43,7	167	31,1
Plebiscito Padova	104	41	39,4	132	31,1
Volturno SC	125	46	36,8	141	32,6
CC Ortigia	105	35	33,3	112	31,3
Fiorentina WP	134	43	32,1	127	33,9
Firenze Pallanuoto	144	44	30,6	146	30,1
WP Messina	90	24	26,7	112	21,4
RN Bologna	102	18	17,6	81	22,2

Table n. 1

Statistics man down

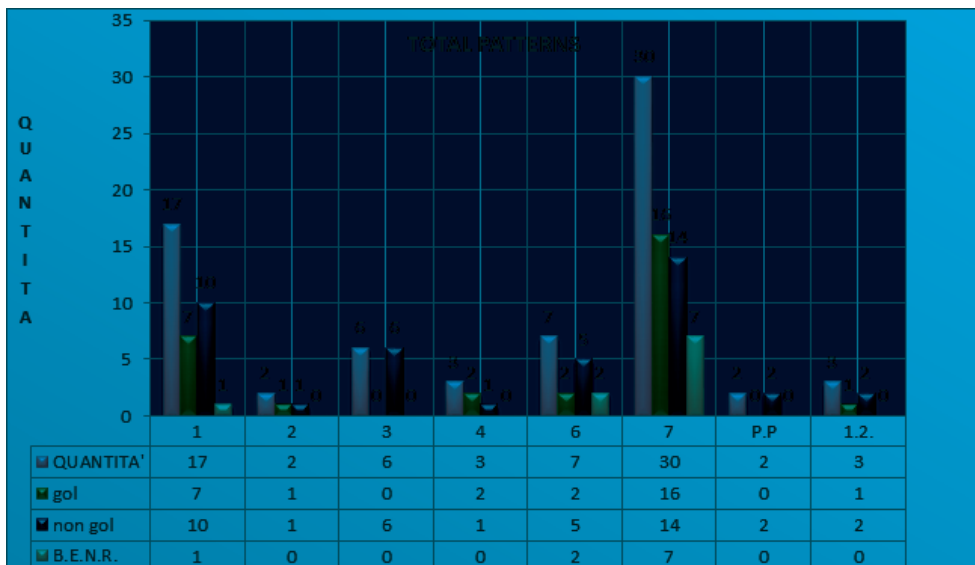
Squadra	Tot i.n.	Gol i.n.	% i.n.	Tot Gol subiti	% Gol subiti in i.n.
Plebiscito Padova	123	32	26,0	87	36,8
Fiorentina WP	120	29	24,2	113	25,7
RN Imperia	125	41	32,8	117	35,0
Pro Recco	109	35	32,1	83	42,2
Firenze Pallanuoto	120	44	36,7	177	24,9
ASD Orizzonte	82	30	36,6	135	22,2
RN Bologna	102	41	40,2	150	27,3
CC Ortigia	118	50	42,4	179	27,9
WP Messina	120	52	43,3	202	25,7
Volturno SC	117	63	53,8	182	34,6

Table n. 2

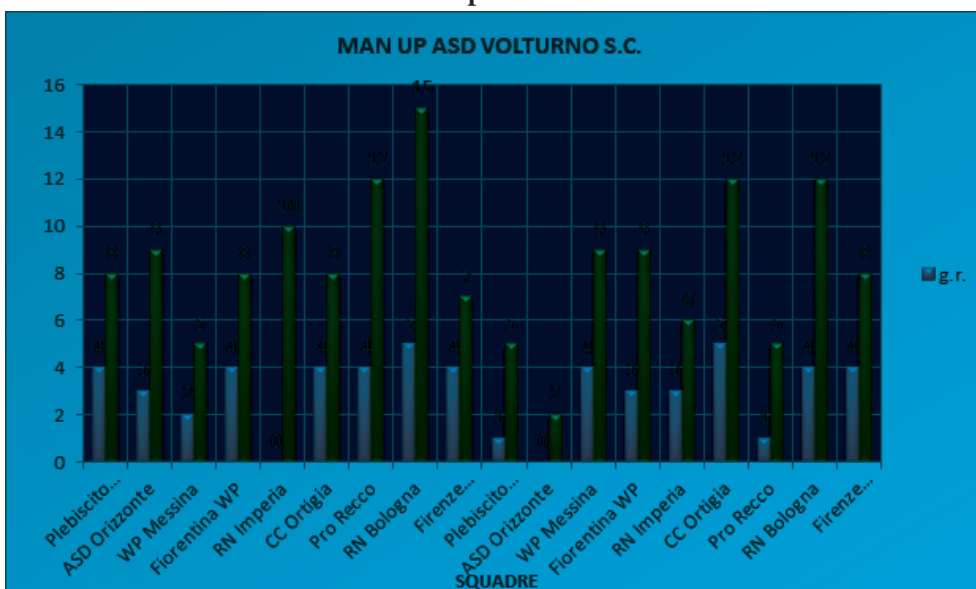
Statistics ASD VOLTURNO S.C.

SQUADRA AVVERSARIA	g.r.	s.n	%	g.r.	s.n	%	g.s.	l. N.
Plebiscito Padova	3	6	50,00%	4	8	50,00%	3	6
ASD Orizzonte	6	8	75,00%	3	9	33,33%	6	8
WP Messina	2	2	100,00%	2	5	40,00%	2	2
Fiorentina WP	4	6	66,67%	4	8	50,00%	4	6
RN Imperia	5	11	45,45%	0	10	0,00%	5	11
CC Ortigia	4	8	50,00%	4	8	50,00%	4	8
Pro Recco	5	9	55,56%	4	12	33,33%	5	9
RN Bologna	6	13	46,15%	5	15	33,33%	6	13
Firenze Pallanuoto	3	10	30,00%	4	7	57,14%	3	10
Plebiscito Padova	0	4	0,00%	1	5	20,00%	0	4
ASD Orizzonte	7	10	70,00%	0	2	0,00%	7	10
WP Messina	3	5	60,00%	4	9	44,44%	3	5
Fiorentina WP	6	9	66,67%	3	9	33,33%	6	9
RN Imperia	5	7	71,43%	3	6	50,00%	5	7
CC Ortigia	4	9	44,44%	5	12	41,67%	4	9
Pro Recco	3	8	37,50%	1	5	20,00%	3	8
RN Bologna	3	7	42,86%	4	12	33,33%	3	9
Firenze Pallanuoto	4	6	66,67%	4	8	50,00%	4	10
TOTALE	73	138	52,90%	55	150	36,67%	73	144

Table n. 3



Graphic n. 1



Graphic n. 2

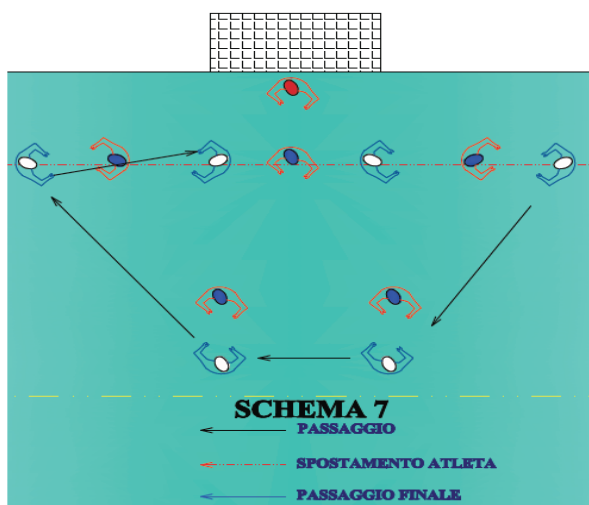


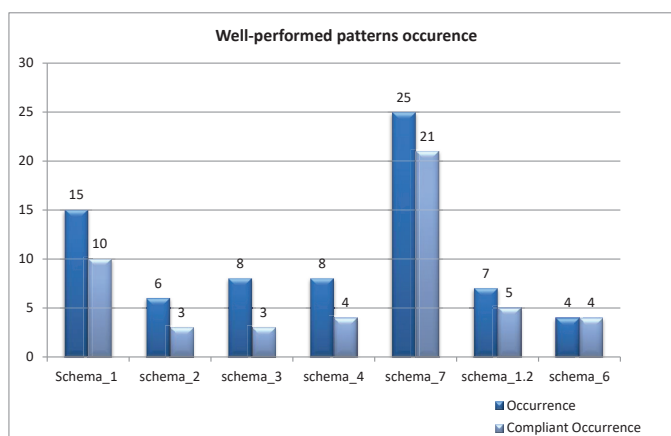
Figure 2 Design of pattern named «schema 7»



Frames 2 Pattern «schema7»Screenshot

PATTERNS	AMOUNTS	gol	non gol	B.E.N.R.
1	17	7	10	1
2	2	1	1	0
3	6	0	6	0
4	3	2	1	0
6	7	2	5	2
7	30	16	14	7
P.P	2	0	2	0
1.2.	3	1	2	0
TOTALE	70	29	41	10

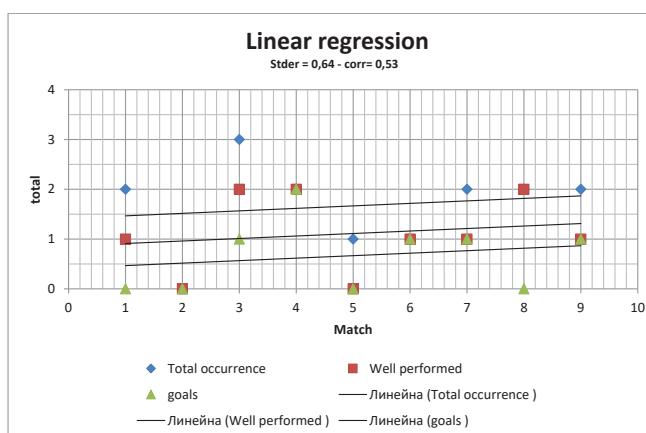
Table n. 4



Graphic 3

Pattern	stderr	correlation (well performed patterns /goals)
schema_1	0.43678760300431	0.76332253361379
schema_2	0	1
schema_3	0.30860669992418	0.75592894601845
schema_4	0.11624763874382	0.98810492932246
schema_7	0.54916964736528	0.22360679774998
schema_1.2	0.34684398780965	0.22941573387056
schema_6	0.37796447300923	0.5976143046672

Table n. 5



Graphic n. 4

Conclusion

The results showed a general efficacy of tactical patterns (when they are well performed), but showed significant differences within correlation coefficients of single patterns, knowing that

“the correlation coefficient indicates magnitude or amount of a relationship and the direction of relationship”

A more consistent data base is needed, in order to establish direct, evident and general relationship between so calculated coefficient and pattern efficacy, and the research team is conscious of internal validity of this kind of qualitative analysis, which can't extend, without adjustments, to other teams.

Although, analysis results represents a tool for the coach, in order to better train team in next season, which were an aim of action research, and showed a general trend on tactical pattern efficacy, which will be deeply investigated in future works

References

- Hughes, M., Franks, I., (2008) *Notational Analysis of Sport: Systems for Better Coaching and Performance in Sport*, Routledge
- Napolitano, S. (2014). Cliff diving: water impact and video-analysis. *Journal of Physical Education and Sport*, vol. 14; p. 93–97, ISSN: 2247–8051, doi: DOI:10.7752/jpes.2014.01015; © JPES
- Napolitano, S. (2015). Performance and correct posture: study in water polo women. *Journal of Physical Education and Sport* (JPES), 15(3), Art 57, pp. 384–390., 2015 online ISSN: 2247–806X; p-ISSN: 2247–8051; ISSN – L = 2247–8051 © JPES

Napolitano, S. (2015). Use of video analysis in youth football. *Journal of Physical Education and Sport* (JPES), 14(4), Art 74, pp. 488–492, 2014 online ISSN: 2247–806X; p-ISSN: 2247–8051; ISSN – L = 2247–8051 © JPES

Napolitano, S. (2016). The use of video analysis for self-assessment in aerobics. *Journal of Physical Education and Sport* (JPES), 16(4), Art 192, pp. 1207–1210, 2016 online ISSN: 2247–806X; p-ISSN: 2247–8051; ISSN – L = 2247–8051 © JPES

Napolitano, S., Di Tore, P.A., De Miro, C., Raiola, G. (2012). Technical analysis in high diving. *Buletin Stiintific – Universitatea din Pitesti. Seria Educatie Fizica si Sport*, vol. 16; p. 96–99, ISSN:1453–1194, doi: 10.7752

Napolitano, S., Tursi, D. (2013). The evaluation of the tactic in women's water polo: the experience of a team in the Italian championship premier league. *Buletin Stiintific – Universitatea din Pitesti. Seria Educatie Fizica si Sport*, vol. 17, p. 36–40, ISSN: 1453–1194, doi: 10.7752

Raiola, G., Parisi, F., Napolitano, S. (2014). Sports skills in youth volleyball by video analysis teaching method. *Procedia: social & behavioral sciences*, vol. 117; p. 436–441, ISSN: 1877–0428

Schmidt, R, Wrisberg, C. (2008) *Motor learning and Performance*, Human Kinetics.

Tursi, D., Napolitano, S., Di Tore, P. A., Raiola, G. (2012). Evaluation of influence of ball handling on swimming intensity in female water polo. *Buletin Stiintific – Universitatea din Pitesti. Seria Educatie Fizica si Sport*, vol. 16, p. 99–103, ISSN: 1453–1194, doi: 10.7752

Tursi, D., Napolitano, S., Raiola, G. (2013). Assessment the technical execution in archery through video analysis. *Buletin Stiintific – Universitatea din Pitesti. Seria Educatie Fizica si Sport*, vol. 17, p. 41–43, ISSN: 1453–1194, doi: 10.7752

Corresponding author:

Salvatore Napolitano PhD

Via Achille D'Orsi, 13

80131 – Naples – Italy

salvatore.napolitano2013@gmail.com

OPINION AND ATTITUDES OF CHILDREN HIGHER GRADES OF PRIMARY SCHOOL ON ELECTRONIC SPORTS

Dusan Stankovic, Marko Kostadinovic

Summary: *Electronic sport from day to day is becoming more popular and more interesting. Video games and gaming devices are designed to be as realistic as possible. Producers of video games want their games to be more interesting to players, to play in clans in order to connect more players, thereby is providing a difficulty in the game playing. The subject of research are opinions and attitudes of children on electronic sports, their basic knowledge and experience. The primary goal of the research is to create a realistic image of e-sports based on the conducted survey in order to objectively view further perspectives of the development of this sport. The tested subjects are middle school students. The total number of respondents is 100, of which makes up 50 girls and 50 boys. The results of the survey were processed by nonparametric statistics, using SPSS program. Besides the descriptive statistics and Chi-square test is shown, which were tested differences of expected and obtained frequency depending of gender. All research results are shown in graphs. General conclusion was that boys and girls have very difference opinions on e-sports, except for the future of ordinary and electronic sports.*

Key Words: electronic sport, e-sport, nonparametric statistics, Chi-square test

Introduction

An electronic sport known as an e-sport or video game competition, is a fun sport based on individual or team video games which are played against each other in order to get money prize or become popular and famous (Heaven, 2014). Today there are huge discussions about whether e-sport is really a sport or just a competition like chess (Tassi, 2014). The term e-sport has existed for several decades (Hope, 2015). During the 1970s and 1980s, video games, players and tournaments have started to appear in popular websites and magazines. E-sport events were broadcast on television between 1982 and 1984. A total of 133 episodes were broadcast. During the 1990s, many games began to play online. Most of these games were games for the computer. In 1993, the "Wired" magazine opened the "first store sports game". Oxford defines e-sport as a computer game that is played in professional competition, especially when it is watched by fans and broadcasting over television or the Internet. Wagner (2006) defines e-sport as an area of sports activity in which people develop and train mental and physical abilities by using information and communication technologies. E-sport can be considered a "sport", by definition, in the same way as chess or poker. There are many parallels between traditional sports and e-sport. However, the virtual environment and the lack of physical activity are questioning whether we can really define e-sport

as a regular sport or mental sport. A video game is an electronic game that involves interacting with a user interface to generate visual feedback on video devices such as a TV screen or monitor. Since the 2000s, the video game can be displayed on any type of device screen that can produce a two-dimensional or three-dimensional image. Some theorists categorize video games as an artistic form, but this label is controversial. The most famous global cyber game tournaments are the "Electronic Sports World Cup" which is happening in France. "World Cyber Games" which is happening all over the world and is otherwise called cyber sport Olympics. "Electronic Sports World Cup" is the leading international sport event in the world of games. This tournament combines the best players in the world and their fans. It is happening 3 to 5 times a year. "World Cyber Games", this event is a traditional sports tournament that strives to be like the Olympic Games, which includes the official opening ceremony, and players from different countries are competing for gold, silver and bronze medals. The main goal of the research is to get a realistic picture of the phenomenon of electronic sport on the tested sample based on the conducted survey in order to objectively look at the further perspective development of this sport in our environment and to determine differences in responses in boys and girls.

Methods

The sample of respondents are boys and girls of higher grades of primary school. The total number of respondents is N = 100. A measuring instrument in this research is a modified questionnaire composed of several questions. The obtained results of the survey were processed by nonparametric statistics using the SPSS program. In addition to descriptive statistics, a Chi-square test is also shown, which were tested the differences between the expected and the received frequencies for the response between boys and girls.

Results and Discussion

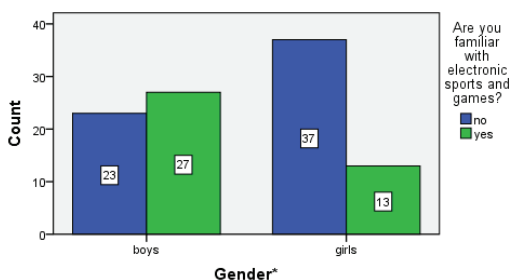


Figure 1 Are you familiar with electronic sports and games?

The first question was how many respondents are familiar to electronic sports and competitive games. Research has shown that 60% of respondents are not familiar to electronic sports while 40% are. The boys and girls are statistically significantly differ in answering this question.

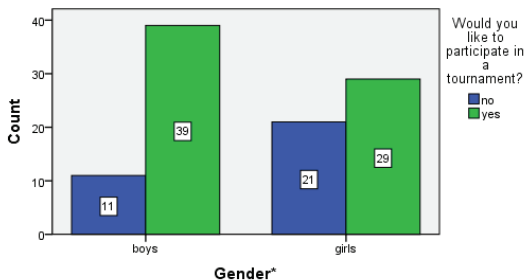


Figure 2 Would you like to participate in a tournament?

On question, “Would you like to participate in a tournament?”, respondents had a positive answer, 68% of respondents said they would like to participate in some of the electronic sports tournaments, while 32% of respondents are not interested in e-sport tournaments. And here is statistically significant connection between gender and desire to participate in tournaments. There are many more boys who responded positively to this question.

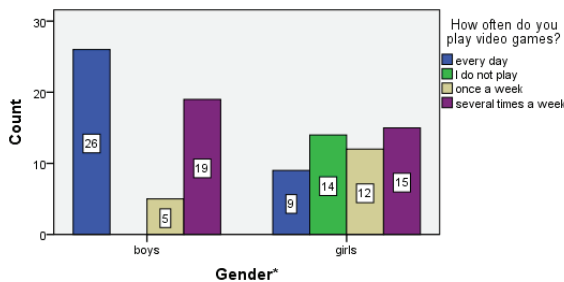


Figure 3 How often do you play video games?

On this graph we see that boys play more video games than girls, even 45 of them play every day or several times a week. No boy answered that he did not play the games, while 14 girls do not play. And here we have a significant difference in the answers between boys and girls.

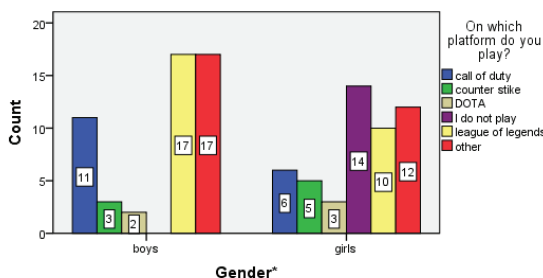


Figure 4 On which platform do you play?

On question “On which platform do you play”, the answers were very diverse. Definitely, even in boys and girls, the League of Legends prevails, even 27% of respondents, representing almost 1/3.

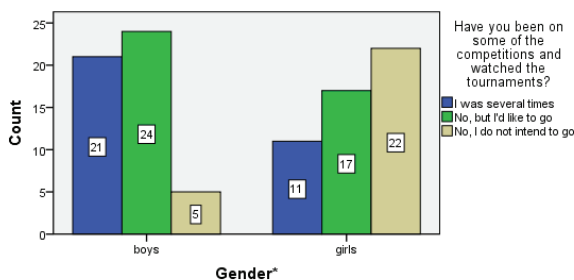


Figure 5 Have you been on some of the competitions and watched the tournaments?

The next question is shown in graph number 5. We see that 90% of boys have been several times or would like to go and watch e-sport tournaments. In girls, this number is much smaller, even 44%, almost half of respondents do not intend to go.

The answers of the respondents, as in the previous questions, statistically significantly depend on half of the respondents, namely they were different.

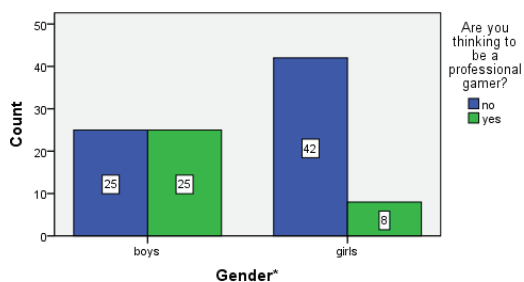


Figure 6 Are you thinking to be a professional gamer?

The graph above shows the results of the answer to the question “Are you thinking to be a professional gamer”? The responses of the boys are absolutely divided, while 84% of girls do not want to be. And here by analysis of the Chi-square test, the answers statistically significantly depend on gender.

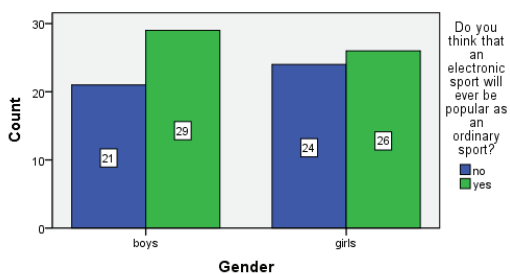


Figure 7 Do you think that an electronic sport will ever be popular as an ordinary sport?

On the last question, we received the only independence in the answers regarding gender. Namely, boys and girls in their answers also presented similar thoughts and attitudes. In a very approximate number, both genders consider that e-sport will never be popular as a classic sport.

Conclusion

With the development of Internet and gaming devices, video games are becoming more numerous, and electronic sport is becoming more serious and more popular. As the development of technology progresses, the games become more demanding and harder to play, thus players are getting better, regardless of whether they are amateur or professional gamers. Professionally dealing with this sport requires great disclaimers and constant renewal

of new technology. It can be said that electronic sport is not cheap at all. Based on this research, it was concluded that playing games is much more popular and familiar to respondents than dealing with professional gaming. Research also showed the great desire of the respondents to play games and to learn about the basics of electronic sports. The result of the research has shown that boys play more games than girls, and that they have a greater desire to discover and deal with electronic sports. The answers to the questions are mostly statistically dependent on half of the respondents, except in the last question, so we can hope that the future of classic sport may not be endangered.

References

B92 esports. Preuzeto 18.04.2017, sa <http://www.b92.net/esports/dota2.php?order=priority>
 Elektronski sport – video igrice kao nova sportska disciplina. Preuzeto 18.04.2017, sa <http://internet-zanatlija.com/2012/12/21/elektronski-sport-video-igrice-kao-nova-sportska-disciplina/>
 Esportovi popularniji od NBA finala. Preuzeto 18.04.2017, sa <http://www.klanrur.rs/2016/09/11/esportovi-popularniji-od-nba-finala/>
 Heaven, D. (2014). Rise and Rise of Esports. *New Scientist*, 223 (2982), 17
 Hope, A. (2014). The Evolution Of The Electronic Sports Entertainment Industry And Its Popularity. In *Computers For Everyone* [online] 1st edn. ed. by Sharp, J. and Self, R. 87–89.
 Tassi, P (2014). ESPN Boss Declares eSports “Not a Sport“ *Forbes* [Online] 9th July.
 Wagner, M. (2006). On the Scientific Relevance of eSports. In *International Conference on Internet Computing* [online] held 2006. 437–442.

BIOPEDAGOGICAL MODELING OF SPORTS PREPARATION OF VOLLEYBALL PLAYERS OF HIGH QUALIFICATION

Irina Kabulbekova, Ludmila Kudashova, Eugene Kudashov

Summary

Introduction. In modern volleyball, the achievement of high sports results is impossible without scientifically based management of preparation of volleyball players of high qualification, it demands creation of models of an object, the different parties of preparedness and preparation, the analysis of dynamics of their development and the forecast of achievements that is possible on the basis of data of bio pedagogical modeling.

Research objective – to define functional prospect of volleyball players of high qualification on the base of an assessment of level of their bio pedagogical models in the competitive period. The methodology of the researches was based on the scientific works of Yu. V. Verkhoshansky, A. I. Zavyalov, D. G. Mindiashvili, and others, linking the maximum training effect with the necessity of rational combination of pedagogical influences and biological control.

Results of a research and their discussion. Were determined the levels of relevant models of functional capabilities of volleyball players of team of higher League of Kazakhstan in the competitive period. A low assessment is given to physiological reserves of the organism, which influence on the technical actions of athletes, that requires systematic correction by bio pedagogical means.

Conclusions:

1. The average level of relevant models of physical working capacity at a pulse of 150 beats/min and 170 beats/min of volleyball players at the beginning of the competitive period has decreased to low values, that speaks about the low energy capacity of reserves of an organism.

2. Decrease of level of the general physical working capacity was followed by a decrease of efficiency of performance of technical and tactical elements, which speaks about low energy reserves.

Introduction. Achievement of high sports results in modern volleyball is impossible without scientific-well founded management of the preparation of volleyball players of high qualification, which should be based on modern theoretical and practical technologies in pedagogy and biology. It demands in sports science not of mechanical transfer of the stereotypical standard approaches and paradigms, which have developed five decades ago, but revision of all system of complex preparation. The coach should possess science-based information and techniques of management of the hidden biological reserves of the person, that are retained at the biological cellular level and the solution of tasks of their correction associated with the achievements of biopedagogics of sport and its introduction in preparation of coaches.

Absence of single conceptual approaches in regard to biopedagogics and her actual base of functional preparation with technology of her realization in a training process constrains scientifically-based process of management of sports preparation of athletes in general, and volleyball players in particular.

Characteristic features of modern conditions of the development of sport is the use in the training process of large volumes near maximum physical loads without regard the biological adaptive abilities of the organism. This puts the athlete's organism on the verge of overstrain and exhaustion, as a result is absent growth of reserve opportunities of organism and are shown not high sport results. All of this is the consequence connected with conservatism and insufficient creativity of thinking of many scientists and coaches adhering to old conceptions in preparation of athletes of high qualification and difficult perceiving innovative approaches in sport that affects not only effectiveness, but also physical health of athletes.

In this connection appears the necessity of more wide introduction to the theory and practice of sport of the long ago proposed direction in sport science, but not yet found wide implementation, it is science – biopedagogics of sport, the aim of which – rationally combine pedagogical and sporting orientations with biological reactions for the receipt of maximal training effect without violation of health of the athlete.

The biopedagogics of the sport as the scientific direction opens in the person additional opportunities and reserves, putting the healthy person in extreme conditions of sport, which in usual state is remained unsolved. The hidden reserves need to be open and used for deeper studying of regularities of formation of sports skill depending on the level of functional athlete's possibilities, and also factors influencing their interrelations. The medicine is busy with problems of recovery of health of the sick person to norm.

In base of the science the bio pedagogics of sport lie the problems of theoretical and practical bases about regularities of action and interaction of various training routines in programs of occupations, their biological mechanisms and opportunities to operate organism reserves at the level of the cells of organs and the systems of organism at the formation of training for maintenance a high level of work capability.

From the point of view of biopedagogics of sport, sports preparation – is a scientifically-based pedagogical process of the purposeful formation of means of physical culture and sport, biological morphological structures of cells of organs and tissues of man by means of physical culture and sports that promote the accumulation of reserves of bioenergetics potential and more effective manifestation of physical qualities and technical-tactical actions. Without knowledge of the above features, the training process and sports work capacity of a person in conditions of muscular activity is based on amateurish and incompetent approach, which leads to overtraining of the organism or to the lack of the desired training effect, injuries and occupational diseases in the physical culture and sports.

At the modern stage of the scientific substantiation of the development of sport, it is necessary to emphasize the attention of coaches and teachers of physical culture, that the training of athletes should be based on a new direction of science of biopedagogics with inclusion in it of biological laws of management. Sport is the management of the biological object of the human organism at the cellular, organ and systemic levels, therefore the management of its sports opportunities and abilities has to be based on bio-pedagogical knowledges.

To a great extent, it reveals the actuality of the process of considering a holistic theory and practice of sport and the biology of sport. It is necessary to

emphasize that the sports science, is, first, science about management of physical capabilities and human health on the basis of scientific substantiation of the theoretical, methodical and practical bases of formation the morpho-functional reserves of organism taking into account current trends of development of sport. Models of separate training routines and their complexes should be formed on the basis of taking into account the mechanisms of urgent adaptation and optimality of impacts at the longer exposures of pedagogical means, for the more purposeful improvement of various parameters of long effects of preparedness. Models of training loads, duration of separate exercises and their complexes, intensity of work, duration and character of pauses between exercises, determination of total number of exercises have to be selected taking into account the physiological, biochemical and bioenergetics reactions of the organism.

Comparison of individual characteristics of the competitive activity with the model data allows establishing the most general reserves of increasing the level of the athlete's preparedness, to determine the bioenergetics value of the applied loads and the effectiveness of using pedagogical means at preparation of the athletes.

The analysis of literature shows that coaches belong without the due understanding to the management by functional preparedness of athletes of its importance that requires actualization of this problem of bio pedagogical approaches and practical introduction in the training activity. It is necessary to prove need of inclusion of functional preparation and control of preparedness of athletes in the structure of sports preparation, as the important factors, limiting sporting achievements. Ignoring in training process of assessment of efficiency of functional preparation and the state of physiological readiness of organism often leads to breakdown of mechanisms of adaptation of organism and decrease of the sports results. Functional training it is a planned, multifactorial process of management of the individual biological reserves of the human organism with use of various pedagogical means and methods of physical, technical, tactical and mental training. The purpose of functional preparation in sport is expansion of borders of the functional adaptation, allowing without loss to health to transfer the increased volumes of training and competitive loads, reaching at the same time great sports

workmanship [L. Kudashova, 1]. The scientifically grounded management of preparation of volleyball players of high qualification supposes creation of models of the object and analysis of tendencies of its development, the forecast on the basis of modeling is a necessary component of any training process.

Actually fits into the biopedagogics of sport in our opinion sports and pedagogical adaptology (methodical achievements) proposed by V. Seluyanov [2]. According to his opinion, one of the main tasks of pedagogy is the development of new means and methods of education, taking into account their biological impacts. Instrument for the development of new pedagogical methods is the imitation simulation with the use of speculative or computer models of organism of man. With the help of imitation simulation, the most effective variants of performing physical exercises that solve the set aim are identified. Theoretical and imitation modeling with the definition of qualitative and quantitative impact assists prediction of modification in cells of tissues of athletes. Efficiency of biological modeling and the forecast has to be proved in researches in practice.

Taking into account the above, in the present scientific researches the following aim has been set: to determine the functional prospect of volleyball players of high qualification based on an assessment of the level of their bio pedagogical models in the competition period.

The methodology of the research was based on scientific works of Yu.V. Verkhoshansky [3, 4], V.N. Seluyanov [2], A.I. Zavyalov, D.G. Mindiashvili [5], L.R. Kudashova [1], and others, linking the maximum training effect with the necessity of rational combination of pedagogical influences and bio pedagogical control for more effective management of sports preparation. Not possession by coach of knowledges about influence of exercise stresses on the functional biological structures of organism, lies in the base of manifestation of physical working capacity do not allow scientifically-based to operate sports preparation.

Organization of research. Researches were conducted in the competitive period of the RK Championship on 13 volleyball players of women's club team of the highest league, at the age of 15–20 years. The competition period for volleyball players of the highest league lasts from November to April, and includes 5 rounds. We conducted research in the period of 2, 3 and 4 rounds of the RK Championship a week before the start of the next round, which took place in different cities of the Republic of Kazakhstan (Almaty, Pavlodar, Temirtau).

The analysis of relevant models of physical working capacity and the maximum consumption of oxygen of volleyball players of high qualification before the beginning the second and third round with assessment of their possible influence on results of competitive tours of Republican value is carried out.

Results of research and their analysis.

The level of physical working capacity (the value of PWC_{170}) by us was used as a method of objective assessment of the functional state and training of athletes. PWC_{170} corresponds to the first letters of the English term Physical Working Capacity (physical working capacity) and corresponds to that power of external mechanical work (kg/min), which results in the heart rate increasing to 170 beats per minute. The PWC_{170} level is connected with such important indicators as volume of a heart, quantity of hemoglobin, energy reserves of muscle cells, quantity of mitochondrions in the myofibrils, the maximum consumption of oxygen (MCO). To calculate the PWC_{170} and the MPC used the test of Karpman V.S. with co-authors [6]:

PWC_{170} – physical working capacity at pulse of 170 beats/min; W_2 – power of the second load; f_1 – pulse after first load; f_2 – pulse after second load. Calculation of the MPC was carried out according to the formula of V.L. Karpman with co-authors. [6], $MPC = 2.2 * PWC_{170} + 1070$. The relative values of indicators of the PWC, calculated per kilogram of weight, were determined at a pulse of 130, 150, 170 beats/min and MPC and were estimated at zones proposed by A. G. Zima and co-authors [6], Table 1.

Table 1 – Estimated zones of physical working capacity of a person in relative values at a different pulse rate at the women (A. G. Zima with co-authors, 1985).

Zone name	PWC, kg/min/kg, at a heart rate per minute					MPC, ml•min ⁻¹ •kg ⁻¹
	130	150	170	180	max	
For women						
Very high	12	16,7	22	25	29	63,4
Excellent	9,9	14,3	19	21,5	25	55,3
Good	8,5	12,3	14,5	16,3	18,5	Higher 43,3
Average	7,3	10,7	14,5	16,3	18,5	43,3
Reduced, below average	B e - low 7,3	B e - low 10,7	Below 14,5	B e - low 16,3	B e - low 18,5	Below 43,3
Low	6,5	9,6	13	15	17	39,8
Very low	6,7	8,7	11,5	13,5	15	36,6

The indicators of the level of physical working capacity at a pulse of 130,150,170 beats per minute and the MPC of the volleyball team, in the second round of the competition period are presented in Table 2. The statistics were calculated by the Excel program “Statistics”.

Analysis of results of own researches

In the first series of studies, the analysis of the games of the 2nd round was conducted, from which was found out that in this round from 5 games all were won, 2 of them with a score of 3:2, 2 games with a score of 3:1 and one with an account 3:0. Results of research of relative values of the general physical working capacity at pulse regime 130,150 and 170 beats/min (PWC, kg/min/kg) and the MPC (ml/min/kg) of team of volleyball players of high qualification, are presented in Table 2. The analysis revealed that prior to the beginning of the competition period of the second round, from 46.3% to 54% of athletes had low values of the general physical working capacity at a pulse of 130–170 beats/min and the ability to consume the maximum quantity of oxygen (MPO) at 61.5%.

Given that the team won all games in this round, but the result in the sets was low, it required to find out, which of the functional indicators studied are influenced in a greater extent on the results of the game. For this, calculations of the correlation coefficient between the number of the lost sets in 5 games of 2 round and the level of the general physical working capacity and the ability of maximum oxygen consumption were performed.

Calculation of coefficient of correlation between the level of the reserves providing the general physical working capacity at different pulse regimes and the maximum opportunities to consume oxygen, has shown that the efficiency of results of sports competitions of Republican importance, in a greater extent, influenced indicators of physical working capacity at a pulse of 150 beats per minute ($r = 0,944$, $p < 0.05$) (Table 3). It is established below the average values the dependence of the effectiveness of the results of sports competitions from the level of PWC_{170} and MPC and very weak from PWC_{130} . These features, obviously, are connected with the fact that up to 44% of athletes had low profitability of physiological reserves and MPC levels.

Table 2 – Percent of the volleyball players of high qualification having functional indicators in different zones of physical working capacity at the beginning of the 2nd round of the championship of the Republic of Kazakhstan.

Zone assessment PWC,	PWC ₁₇₀ , kg/min/kg	PWC ₁₅₀ , kg/min/kg	PWC ₁₃₀ , kg/min/kg	MPC, ml/min/kg
Percent of the volleyball players in zones				
High	15,4	15,4	23	7,6
Good	0	7,6	23	7,6
Average	38,5	23	7,6	23
Low	30,7	23	15,4	46,1
Very low	15,4	31	31	15,4

Table 3 – Coefficient of correlation between the level of physical working capacity at a pulse 130,150, 170 beats/min, maximum oxygen consumption (MPC) and the number of lost sets in the 2nd round of the Championship of the Republic of Kazakhstan.

the number of lost sets in the 2nd round	PWC ₁₇₀ , kg/min/kg	PWC ₁₅₀ , kg/min/kg	PWC ₁₃₀ , kg/min/kg	MPC, ml/min/kg
r _{2-2nd round}	0,399	0,944	0,169	0,377
r _{3-3 round}	0,544	-0,028	-0,268	0,484
r _{4-4 round}	0,536	0,490	0,746	0,490

High models in zone of aerobic power had less thirds of part of volleyball players of high qualification, namely 15.4%, they worked at high level in the zone mixed (aerobic and anaerobic) capacities and 15.4% in zone of anaerobic power, i.e. could stay a prolonged physical loads (for example, games from 5 rounds). Insufficient percentage of athletes having high and good physiological reserves of organism had led to loss up to 40% of points in technical-tactical activities.

According to the results of the study in the middle of championship, to beginning 3rd round were set, that the average values of PWC_{130, 150, 170} and MPC at all inspected volleyball players decreased to the low zone of physical working capacity, as compared to 2nd round (Table 4). It should be noted that before the 3rd tour there were no more volleyball players having reserves in high zone of physical working capacity, it says also about the low bioenergetics capacity and lack of its correction between tours and that the coach did not control functional preparedness and did not correct it.

Table 4 – Percent of the volleyball players having functional indicators in different zones of physical working capacity at the beginning of the 3rd round of the RK championship.

Zone level PWC	PWC ₁₇₀	PWC ₁₅₀	PWC ₁₃₀	MPC
Percent of the volleyball players in zones				
High	0	0	0	0
Good	15,4	30,8	38,5	15,4
Average	15,4	23	15,4	15,4
Low	30,7	7,7	7,6	46,2
Very low	38,5	38,5	38,5	23

In this third round from 5 games the team has won only 2 games (with the score 3–2 and 3–1) and have lost 3 (with the score 2–3, 1–3 and 0–3). The assessment of the correlation coefficient showed (Table 3) that communications of technical-tactical skills with the functional preparedness were in the middle zone with the PWC₁₇₀ and MPC indicators, and

were absent with the PWC₁₅₀ and ₁₃₀ levels. According to the results of the study, at the beginning of the 4th round of the Republican championship, the PWC_{130,150,170} level was reduced and the MPC compared with the second and third rounds, and besides there were no players with indicators in the high zone of physical working capacity (Table 5).

Table 5 – Percent of the volleyball players having functional indicators in different zones of physical working capacity at the beginning of the fourth round of the RK championship.

Zone level PWC	PWC ₁₇₀	PWC ₁₅₀	PWC ₁₃₀	MPC
High	0	0	0	0
Good	15.4	30.8	38.5	15.4
Average	15.4	23	15.4	15.4
Low	30.7	7.7	7.6	46.2
Very low	38.5	38.5	38.5	23

The decline of percent of players working in the good zone of physical working capacity was noted.

The analysis of interrelation of technical-tactical skill with functional preparedness in the 4th round of the volleyball championship has shown on growth of dependence to average values with all indicators of PWC_{170,150,130} and MPC. These changes testify that not taking into consideration of correction of functional preparedness by the coach of bio pedagogical means leads to deterioration of models of physical working capacity of athletes and decrease of levels of the athletes who are in high and good zones of working capacity that has caused instability of game results.

Conclusion

Analysis in the competitive period of the relevant models of functional capabilities of volleyball players of the club team performing in the higher league of Kazakhstan allowed asserting that the low level of physiological reserves of the organism influences the effectiveness of technical activities of female athletes, which requires systematic correction by bio pedagogical means.

Is established the average level of relevant models of physical working capacity at a pulse of 150 beats/min and 170 beats/min at volleyball players at the beginning of the competitive period, which decreases to low values by the end of round of the championship, that says about low energy capacity of the organism oxygen reserves, low quantity of mitochondrions, providing by the oxygen intense

competitive activity.

Decrease of the level of the general physical working capacity is interconnected with falling of efficiency of performance of technical-tactical activities as at the beginning, as and in the end of competitive tour that is explained not high energy reserves of volleyball players and the lack of management by this side of preparation by the coach, that is one of the reasons for the lost sets.

The modern sport of higher achievements demands preparation and retraining of coaches and teachers of physical culture and sport, taking into account development of the scientific direction of biopedagogics of physical culture and sport.

Literature

- Karpman V.L., Belotserkovskiy Z. B., Gudkov I. A. Testing in sports medicine.– Moscow: F&S, 1988.– P. 197.
- Kudashova L. R. Questions of management of functional preparedness of athletes /L.R. Kudashova//Physiology of muscular activity: thesis report of the international conference – M.: Physical culture, education and science.– 2000.–Page 84–85.
- Seluyanov V.N. Empirical and theoretical ways of development of the theory of sports preparation / / Theory and practice of physical culture.– 1998.– No. 3.– P. 46–50.
- Verkhoshansky Yu. V. Horizons of scientific theory and methodology of sports training. // Theory and practice of physical culture.–1998.– № 7.– P. 41–54.
- Verkhoshansky Yu. V. On the way to the scientific theory and methodology of sports training. // Theory and practice of FC.– 1998.– № 2.– P. 21
- Zavyalov A. I., Mindiashvili D. G. Biopedagogics or sports training.– Krasnoyarsk. MP “Polis”.–1992.– P. 58.

CONTENT BASES OF GAMES IN AGONISTICS IN KAZAKHSTAN

Zhanibek Kuderiyev

National Sports Academy of Vassil Levski, Bulgaria, Sofia

Introduction: *The article examines the problem of the study of sport as a phenomenon of culture that allows us to reveal the characteristics of modern civilization, which is characterized by an increase in the role of agonistic, playful, bodily principles. Kazakh game culture pays in itself as a spirit of competitiveness (for example: types of verbal competition), and the culture of victory in bodily competition. Kazakh sports games bear the features of a dionistic culture.*

The purpose of the article: *Given the urgency of the problem, the following goal was realized: to study the features of Kazakh game culture and analyze Kazakh sports games. Show the role of sport in the culture of Kazakhstan.*

The methodology: *For the solution of research problems in work the method of the theoretical analysis and generalization is used. The retrospective point of view and the analysis of last physical culture and sport on the basis of understanding of structure of its present was carried out by means of updating method. At disclosure of contents and essence of physical culture and sport as parts of the general culture were applied methods of analogy and comparison.*

Results: *All of us carry in ourselves a particular culture; express it in the manner of thinking and style of behavior, in a certain order of material and spiritual organization of our life. Culture develops continuously and every generation of people relies on what was created by their predecessors. But, the process of inheritance of cultural values is complex and contradictory, therefore, in this respect; culture should contribute to the spiritual and physical improvement of people. This is one of the important factors that determine the life of society.*

Conclusions: *Sport acts as an active social factor in formation, development and education of patriotism, the desire for unity and cohesion of various nations and nationalities. This social function is based on the use of sports, which is a single international, interethnic cultural basis for communication and interaction.*

Key words: Kazakh, national games, culture, people.

Introduction: Ethnographers, historians, travelers of pre-revolutionary Kazakhstan described Kazakh folk games. (A. Humboldt, A. Yanushkevich, T. Atkinson, A. Divaev). They collected the folk games of the Kazakhs, celebrated the national color, the originality of the people's self-expression, the uniqueness of the language, the form and content of the colloquial text. Almost in all studies, one can trace the idea that in the field of culture the forms of various types of creativity are the most stable, to which are mobile games, dances, whose roots go back into the centuries, they are characterized by national specifics, reflect the totality of those phenomena that surround the life of this or that people. So, A. Humboldt, describing the life and life of Kazakh nomads, their customs and traditions, said: «... I consider the time spent in the aul the happiest time of my life because the hospitality of the nomadic people shown us and their games, entertainments are such events that will never be erased from memory».

Among the inheritors, the first who collected a large number of Kazakh folk games, highly valuing their

educational-developing value and expressed valuable pedagogical thoughts, was the ethnographer A. Divaev. He wrote about the stimulating role of the games arming children's feelings with bright impressions about the environmental reality, inspiring them on creative search inducing to independent activity – to the beginning of cognitive process.

T. Tazhibayev, considered games, in particular sports, as means of physical training. According to him, “horse and pedestrian sports had military and applied character and developed force, endurance, mobility, clearness of movements, promoted education of courage, dexterity”. Further it is noted that the correct evaluation of the meaning and character of traditional national games is possible on the basis of an analysis of the history of their origin, because each people, depending on their socially cultural and economic conditions, has developed the games inherent in it and physical exercises (Tanikeev, 1990).

We have already pointed out that competitions since ancient times were an indissoluble attribute

of the life of the Kazakh people. To this day, for example, historical data on the largest competitions on the occasion of the solemn exit of King Cyrus in Babylon, where the convincing victory in horse jumps was won by the saks rider, have reached our days. (Levshin A., 1996).

The competitions held in honor of the Persian tsar Cyrus took place in the territory of ancient Mesopotamia in 539 to our era (to the South-West from modern Baghdad). Cyrus, as we know, was killed during of hike to Middle Asia, when he decided to conquer the Saks and massagets – freedom-loving and warlike tribes of this era.

Herodotus told the legend, which the queen of the massagets Tomiris, after the victory over the Persians, ordered to fill the leather bag with blood, putting Cyrus's head in it, and said: "You was hungry for blood, drink it!" (Ish-Muhamed-Bunin., 1883).

Participation of the Saks rider in the games in Babylon is the first known in historical literature mention of international sports relations that have become traditional in subsequent epochs. In general, the forms of carrying out competitions in the Saks were very diverse. They were held, as between riders and pedestrian soldiers. One of such competitions were duels on horse with peaks. Images of duels on horse the saks of soldiers are found in Mountains Hantau in the Central Kazakhstan. The similar image was revealed also on the rocks Terektisay which are in south-west Balkhash region. A bit farther, there is a woman in pose of the free observer. This woman is, according to archeologists, is the main prize of competition – duel.

I. Anichkov, noting this ancient custom of Kazakhs, writes: "Before the arrival of the Russians, Kyrgyz people brought a man or woman from Bukhara and Khiva, put on beautiful clothes, good weapons, and put them on a camel and exhibited them as a sports prize" (Bronevsky S., 1830).

Kazakh folk games are an integral part of moral, intellectual, aesthetic and physical training. Traditional folk game is a social phenomenon that has great educational significance. Forms of manifestation of national game are extremely diverse. Together with the development of human society they are continuously improved and change. Game is the conscious activity directed to achievement of goal.

Various games, entertainments and physical exercises were applied constantly and almost daily. The eyewitness of life of Kazakhs of the beginning of XIX of century Philip Nazarov about it wrote that "in the evening the Kyrgyz gathered by crowd ashore, firing arrows at the target" (Alektarov A., 1891).

Universal application of games, physical exercises has led to the fact that some of them had already sports character. As independent sports were made out horse jumps on various distances, horse games, kok-par and to kyz-ku, archery, fight of two riders, fencing of two riders at peaks, free-style, zone wrestling and some other. They met all requirements imposed to sport in modern understanding of this word.

Competitions in such games as "kokpar", "arkan tartu", "aksuek", "ak serek and kok serek", "sibis", "sais", promoted to physical-sports development of men and women. The main place in the entire process of physical education was taken by horse riding. The main physical exercises, games and entertainments used for this purpose i.e. for physical development and physical perfectness of younger generation have been connected with it. The child was adapted at the birth to horse riding. A. Levshin pointed out that the Kazakhs swaddled and put between the knees and feet of the babies' small pads to have their feet then suitable for riding form (Haruzin A., 1889).

It is enough to tell that horse competitions were integral part of culture and life the saks of tribes. Severe military life, nomadic lifestyle demanded from them excellent horse preparation. Saks was beautiful riders, and cavalries of the saks of tribes enjoyed wide popularity. In the ancient world, at the ancient people their "heavenly" horses find reflection in ancient epic works, in particular in Avesta.

In terms of the popularity of equestrian species, equestrian racing, no state can compare with Kazakhstan. "Enlightened England is famous for its equestrian racing ... But England should in this case give way to an advantage not in the beauty and lightness of the horse – it is still a problem, but in their fortress and almost incredible transfer of labor. Also people are same in it... So are the people in it ... They do not pass not a single holiday, not a single feast, in which there would be no racing, and to which many hunters arriving often for sev-

eral hundred versts would not be prepared. Even ordinary women with great courage participate in them” (Bronevsky S., 1830).

It is considered that the athlete has won lawful victory if the kind of sport in which he has achieved success has old story in its country. Tradition – is one of factors of sports victory.

In Kazakhstan the equestrian sport develops for a long time. National competitions and national games – good way to skill and performances on world sports arenas. People aspired to ride usually, they learned to manage the horse perfectly. And it was quite natural to see equestrian games and competitions, which revealed the best riders, masters in the ability to sit on horseback, make a horse rush like the wind, obey every order of man. Popular national types of games remain and now. To take the same gallop. There is many of options of its carrying out in modern conditions. Kyz kuu-it is the game, and the gallop. In this folk game, girls on a par with men, competing with them, famously rush on feet. “Dzhigit, who overtook the girl,” A. Ivanovsky wrote, receives several kisses as reward, if he does not catch up, then the girl catching up turns horse back and pursues the dzhigit herself and, after catching, awards him by whip “

Thus, the games reflected the people’s memory of the high heroic qualities of Kazakh female warriors, who were able to drop dzhigits from horses by hitting the thigh with their horses. This game was part of the wedding rite in the past. The groom’s task was to show not only quickness and dexterity, but also to confirm his love, his right to her, after catching a bride on a horse ahead of him.

The most original and at the same time forgotten for some reason nowadays are games related to matchmaking and marriage, the value of which consists not only in that, the spiritual culture of the people is most fully manifested in them, but also through the games, The wedding ceremony turned into an amazing performance. Of course, that in all of these ceremonies with games the people wanted to see their dzhigits bold, strong and dexterous.

To develop these qualities in the steppe conditions could only be participating, for example:

- in alaman-bayga – racing on long distance,
- in zhorga-zharys – racing on amblers,

- in kokpar – competitions of two competing groups of riders for possession of flourish-es of the slaughtered buck,
- in the Dzhigit-dzharisu – this competition of two riders on speed of saddle and passing of certain distance,
- n zhaugashti game – in pursuit of the conditional enemy with the purpose to besiege him lash,
- in audarispak – where opponents drew each other from saddles,
- in kumis alu – in raising of coin on full to race.

Special importance was given to archery. This competition was already known with Usuns. The system of training the shooters allowed to educate outstanding masters in this kind of military art. There was also a custom to trim the riding horses, for the developing mane greatly hinders the rider at the archery.

As it was already emphasized, the games were not only fun, but also a means of developing vital skills, in the old days they tried with the help of games to educate young men physically healthy, in the spirit of respect for the elderly and duties to the community, relatives. In the future, the development of the adversarial and the game principle becomes more diverse at the form and deep in content. Physical exercises, games and entertainments with the use of special dice-bones are popular. Thus, during the excavation of ancient graves in the Pamirs, which characterize the culture and life of the Saks and Usuns tribes, numerous dice were found only in the burials of men. One of them found 72 copies. They were lying next to the bronze iron knives. This suggests that such games were distributed only among the male part of the population, as it was in particular, in subsequent times, including our modern era. The stragals were used not only in the games and entertainments of men, but also in the mobile games of children, with the help of which such physical qualities as agility, accuracy and speed were brought up.

A great creative achievement in connection with the development of gaming activities should be considered the emergence of table games. We are talking about togyz-kumalak (literally, nine balls).

The English traveler T. Atkinson, writes that folk games and entertainments primarily begin with

a contest of akyns. Aytys inspire the last participants of single combat to be completely adamant until they achieve victory.

Verbal contests were held on all kinds of holidays, sports, and events. The spirit of play, rivalry, competition was most fully manifested in the creativity of akyns. "As at the Olympic Games," recalled A. Yanushkevich later, "two poets fought each other. Hardly one shoots a strophe, the other immediately fires back; the first boldly attacked, the second masterfully defended himself; the passion of both grew and fomented this struggle. It was a whimsical picture."

In aytys with a representative of the opposite side akyn praised his family, his people, instantly composing his improvisations. Another, too, cited the dignity and valor of his relatives, their generosity and cordiality. The prize was given to the one who came out the winner from this competition in verse.

An important feature of aytys is its game form, which lies not only in the sophisticated play of words, but also in the game of unintelligible thoughts, associations, "Homogeneity" of rhyme ... A. Amrebaev, pointing to aytys as "a game form of self-knowledge of Kazakh nomads", says that in aytys as in the game "There is a mystery, a question, an exclamation and a certain goal is pursued."

It is known that akyns, singer-storytellers, who continued the traditions of kular-amateurs, wandered through steppe auls, kystau, arranging improvised performances-fun, dancing with singing, dancing games.

And nowadays the traditions of oral competition symbolically reflect the reality and practice of human activity, artfully reproduce a concrete historical essence characteristic of a given sociocultural situation, that's why aytys, as a tradition, is today an actualized culture of the past, because it has "mobilized" the experience of the past in interests of the present time. And in this sense, aytys as a cultural tradition, respectively, implies the originality of Kazakh culture, the presence in it of distinctive national traits. This manifests itself in the content of the improvisations of the aytyskers, which, as a rule, come from the very essence of folk life and folk psychology. In aytys, as in other forms of oral-poetic culture of Kazakhs (fairy tales, proverbs, sayings ...), free speech is inherent in Kazakhs, moreover,

freethinking.

Indeed, aytys akyns are a multifaceted phenomenon full of deep contemplation of competing akyns, in which sparkling humor interspersed with philosophical generalizations. Genre aytysa-improvised contests of folk akyns. Song competitions as one of the forms of development of spiritual culture have become the most popular characteristic phenomenon in the life of the Kazakh. It should be noted that different types of aytys exist among different peoples of the globe. The Sudanese "sananku", the Uighur "paw", verbal dueling of the Halk and Derbet occur in a prosaic form, in the form of ironic jokes, caustic remarks, comical teasing, provocative gestures, deft verbal attacks, or even simply abuse, allowed by custom. Ancient Greeks, medieval Arabs, Icelanders, Bengals competed, reading out previously composition (and often recorded) poems.

"In the conditions of the Kazakh reality ... the main poetic genre that allowed akyn to be called akyn was aytys. In order to become akyn, akyn must show his poetic power to the people: in order to display his poetic talent. A person who wants to become an akyn must submit it to the public, having entered into a competition in political craftsmanship with someone who has already received public recognition, then he gets the people's title of akyn, if he does not receive recognition, the people will not consider him akyn," S. Mukanov rightly noted.

Thus, without entering into a poetic contest, a person cannot become an akyn, and no one will consider him an akyn. The main feature that distinguishes akyns from other types of carriers of the Kazakh oral and poetic tradition is precisely in this.

The breadth of not only the voice, but also the speech range characterizes contests of akyns-improvisators. The defining feature of aytys as creativity is the ability of aytyskers "to instantly assimilate an extraneous idea, figuratively master and pretend the material offered from outside. This is the ability to focus at the right moment all the forces of the mind and soul, all the memory reserves and all imaginative fads on one, dictated by someone special task. And even so, to immediately turn this task into personal and vital"

To date, according to the above-mentioned types of Kazakh folk games, there are a number of classi-

fications. The first attempt to classify Kazakh folk games belongs to the ethnographer A. A. Divaev. He distinguishes 3 groups:

1. infantile games; 2. junior games; 3. games of Dz-higits;

Each group he divides into three subgroups. Firstly, he refers to the ancient Kazakh games that originated in the tribal union. Secondly-mobile, in the third-sports games. In our opinion, this classification is incomplete, it does not reflect the whole variety of games. It does not reflect the entire palette of games, their diversity, their ambiguity.

The classification of Kazakh national games was reflected in the collection of ethnographer M. Gunner. In it games were classified as follows:

1. General games; 2. games with elements of resistance and fight; 3. games on the open area; 4. games for rest; 5. horseback riding; 6. attractions

Of course, this classification also does not cover the entire palette of games, but it is interesting, at least in that it distributes games by character. For us it is important that such classifications took place, as there was a huge variety of Kazakh national games.

The development of a playful, competitive beginning in the culture of the Kazakh people includes an educational element, forms the physical development and training of the person as a whole. All sorts of games, competitions contribute to the development of thinking, ingenuity, strengthening the will, nurturing the habit of organized action. They are also regarded as a good attitude towards nature.

Conclusions. So, sport acts as an active social factor of the formation, development and upbringing

of patriotism, the desire for unity and cohesion of various nations and nationalities. This social function is based on the use of sports, which is a single international, interethnic cultural basis for communication and interaction. The combination of national and national international takes place during various competitions, from match games to the Olympic Games. Along with this, competitions on national sports are held, which contributes to the revival, consolidation and development of national folk forms of sport, as an integral part of the national folk culture.

References:

- Alekterov A. E. About the birth and education of children at Kyrgyz, about rules and the power of parents.– Orenburg, 1891.– Page 11.
- Atkinson T., Eastern and Western Siberia: a story about seven years of research and adventure in Siberia, Mongolia, the Kyrgyz steppes, Chinese Tatars and parts of Central Asia / (New York: Harper and the Brethren, 1858)
- Bronevsky S. Notes of Major-General Bronevsky. On the Kirghiz-Kaisaks of the Middle Horde // Otechestvennye zapiski. August, 1830.– St. Petersburg, 1830.– Part XLII.
- Ish-Muhamed-Bunin. Physical and intellectual education of the Kirghiz // Turkestanskije vedomosti, 1883, No. 17. S. 66–67.
- Gunner M., Rakhimgulovty M., “A Brief Collection of Kazakh Folk-National Sports”, 1949
- Divaev A. A. Ancient games of the Kirghiz youth // Turkestanskije vedomosti, 1907. № 54.-C. 3.
- Levshin A. Description of Kirghiz-Cossack or Kirghiz-Kaisak mountains and steppes. Almaty. Sanat. 1996.
- Tanikeev M. T. National games and physical exercises as important component healthy lifestyle//Materials of inter-republican scientific conference.– Bukhara, 1990.– Page 12, 64.
- Haruzin A., Kirghiz of the Bukeyev Horde. Anthropological and ethnographic essay. Issue 1. 1889
- Humboldt A., “Pictures of Nature”, 1 ed. 1808
- Yanushkevich A., Diaries and Letters from the Journey through the Kazakh Steppes / – 2nd ed., Ext.– Astana: Altyn kitap, 2007.– 384s.– (Library of Kazakh Ethnography, Vol. 29).

**SPORT MEDICINE, EXERCISE
PHYSIOLOGY, BIOMECHANICS,
NUTRITION**

STUDY ON THE FACTORS FOR MENSTRUAL DYSFUNCTION IN FEMALE ATHLETES

Galina Vanlyan, Diana Dimitrova

Abstract:

The aim of the present study was to determine the prevalence of menstrual dysfunction among sportswomen and to examine the importance of disordered eating behaviors and other selected factors for its occurrence. 281 women athletes (mean age 19.9 ± 2.4) participated in the study. Each participant provided information about her age, height, weight, use of contraceptive drugs, sports experience, and completed a screening questionnaire meant to identify the age of menarche, primary amenorrhea, secondary amenorrhea, oligomenorrhea and contraceptive use. The women athletes were divided into 2 groups according to their menstruation status – eumenorrheic (EM) and with menstrual dysfunction (MD) (amenorrhea/oligomenorrhea). All participants completed an anonymous EDE-Q. A mean cut-off of ≥ 4.0 for the subscales – WC, SC, DR or GS was used to classify the athletes as having disordered eating, as well as if they have been practiced pathogenic behavior on ≥ 2 days in the preceding 28 days. Comparison analyses between both groups of athletes were carried out by t-test, Mann-Whitney test and Chi-square test using SPSS-23. Menstrual dysfunction was found in 8.9% of the athletes, 16.6% of them were with high value of one of the subscales of EDE-Q and 36.3% of the respondents reported practicing pathogenic behavior. The results showed relatively low incidence of athletes with both eating disorder and menstrual dysfunction (4.98%). We have failed to detect any significant difference between the EM and MD group with respect to their mean weight, BMI, sports experience, contraceptive use and the values of the EDE-Q scales. **The average age of menarche of the MD group (14.5 ± 1.5) was significantly delayed as compared to EM group (13.3 ± 1.5). The proportion of athletes with elevated values of Weight Concern was higher in MD group (20%) vs. 7.8% in EM group ($\alpha < 0.05$).**

Key words: athletes, eating disorders, amenorrhea, oligomenorrhea, EDE-Q

Introduction:

Over the last three decades, the number of women engaged in sport competitions has been growing rapidly. There is undoubtedly the beneficial impact of sport on physical and mental health. However, a significant increase in the volume of physical exercises may adversely affect somatic growth, biological maturation and reproductive functions of female athletes (Roupas, Georgopoulos, 2011).

Studies conducted by a number of authors have indicated that there is an increased risk of Female athlete triad, a syndrome which includes three inter-related conditions – eating disorders, menstrual dysfunctions and decreased bone density (Nichols et al., 2006; 2007; Raymond-Barker et al., 2007; Forsberg, Lock, 2006).

According to modern conceptions, low energy availability or energy deficiency disrupts the reproductive system and that result in menstrual abnormalities (Nattiv et al., 2007; Loucks, 1990).

The reproductive function's abnormalities occur in 6–79% of women who practice sports (Warren, Perlroth, 2001). The most common menstrual disorders in female athletes include oligomenorrhea; primary and secondary amenorrhea (Carr, 1992).

The prevalence of secondary amenorrhea and oligomenorrhea varies widely (1–79%) in female athletes, while in the general population it is significantly lower 2–5% (American Academy of Pediatrics, 1989; Nattiv et al., 2007).

Energy balance, eating disorders, sports activity, body weight, and body mass index are basic factors associated with menstrual dysfunction in female athletes (FIMS Position Statement, 2000). According to Drinkwater (1984), the large variations in the prevalence of menstrual dysfunction in female athletes may be due not only to the factors mentioned above, but also to the studied population.

Aim of the study:

In Bulgaria, screening studies for eating disorders and menstrual dysfunctions in female athlete have not been conducted. The aim of the present study was to determine the prevalence of menstrual dysfunction among female athletes and to examine the importance of disordered eating behaviors and other selected factors for its occurrence.

Material and methods:

The present study was approved by the Ethics Committee of the National Sports Academy. All respondents, after informed consent and detailed

instructions, completed 2 paper-based questionnaires – 281 women aged 16–25 practicing different sports – aesthetic sports (n = 70), sports games (n = 56), athletics (n = 35), water sports (n = 30), combat sports (n = 35), fitness (n = 19), short track (n = 19) and other sports (n = 17) participated in the study.

Menstrual status questionnaire was meant to identify the following menstruation dysfunctions: oligomenorrhea – menstrual bleeding at intervals longer than 36 days; primary amenorrhea – lack of menstruation cycle up to 16 years of age; secondary amenorrhea – the absence of menstruation cycle for 3 consecutive months after the onset of menarche. Also the questionnaire included questions about the age of menarche and the use of contraceptives.

The women athletes were divided into 2 groups according to their menstruation status – eumenorrheic (EM) and with menstrual dysfunction (MD) (amenorrhea/oligomenorrhea). *Screening for eating disorders* was conducted using the Eating Disorder Examination Questionnaire (EDE-Q 6.0) (Fairburn et al., 2014), which is composed of 4 subscales: Dietary Restraint (DR), Eating Concern (EC), Shape Concern (SC), Weight Concern (WC) as well as Global Score (GS). The GS was calculated as an arithmetic mean of the 4 subscale scores. In addition to subscales, the questionnaire provides assess the presence of some pathogenic behaviors related to nutrition and maintenance of low weight: binge eating, self-induced vomiting, use of laxatives, or intentional intensive physical exercise aimed to control the weight (Fairburn et al., 2014).

A mean cut-off of ≥ 4.0 for the subscales WC, SC, DR or GS was used to classify the athletes as having clinical significant disordered eating (Nichols

et al., 2007). Pathogenic behavior was considered as of clinical severity if pathogenic eating behaviors was reported on ≥ 2 days in the preceding 28 days (Nichols et al., 2007) or if excessive exercise for controlling the weight was practiced ≥ 5 days in a week (Luce et al., 2008).

Statistical analyzes were performed using SPSS-23.0. Descriptive statistics was used to determine the mean and standard deviation (SD) for socio-demographic characteristics and EDE-Q subscales. An independent-samples t-test was conducted to compare all quantitative variables. The comparison of the mean values of EDC-Q subscales was performed by U-criterion of Man Whitney. The Pearson criterion χ^2 was used to compare prevalence rates for menstruation and nutrition disorders.

Results:

The whole group of studied female athletes consisted of 281 female athletes from different sports. The results showed that the majority of them – 91.10% (n = 256) are eumenorrheic and 8.9% (n = 25) had menstrual abnormalities (Table 1).

The cases of clinically significant eating disorders, determined on the basis of estimates of subscales SC, WC, DR, or $GS \geq 4.0$, were 16.63% of the whole group of athletes. The frequency of use of pathogenic weight control behaviors among sportswomen was 36.3% (n = 102), with some of the female athletes having more than one pathogenic behavior. The higher was the incidents of binge eating – 34.8% and excessive exercise training in order of maintenance of low weight – 22.4%. Both menstrual dysfunction and disordered eating were observed in 4.98% (n = 14) of the studied women.

Table 1. Percentage of athletes with disordered eating and/or menstrual dysfunction

	Whole sample (n=281)
Eumenorrhea	91.10%(n=256)
Menstrual dysfunction	8.9% (n=25)
– Primary amenorrhea	3.20% (n=9)
– Secondary amenorrhea	2.85% (n=8)
– Oligomenorrhea	2.85% (n=8)
EDE-Q Subscale score $\geq 4,0$	16.63% (n=47)
– Dietary restraint	6.05% (n=17)
– Shape Concern	13.88% (n=39)
– Weight Concern	8.90% (n=25)
– Global Score	4.27% (n=12)
Pathogenic behavior	36.3% (n=102)
– Binge eating	34.88% (n=98)
– Self-induced vomiting	1.78% (n=5)
– Use of laxatives	7.47% (n=21)
– Excessive exercise	22.42% (n=63)
Both menstrual dysfunction and disordered eating	4.98% (n=14)

We divided the subjects into two subgroups according to menstrual status (with normal menstrual cycle and with menstrual dysfunction) and compared their socio-demographic characteristics (Table 2).

The average age of the group of female athletes with normal menstrual cycle (20.0 ± 2.36 y) was higher ($p < 0.05$) than that of the group with menstru-

al dysfunction (18.84 ± 2.70 y). In terms of height, weight, BMI, sports experience and oral contraceptives intake there weren't statistically significant differences between both studied groups. More than one year, however, is the difference in the mean age at menarche between both groups and for female athletes with menstrual dysfunction menarche appears later.

Table 2. Socio-demographic characteristics of female athletes (mean \pm SD)

Characteristics	Eumenorrheic group (n=256)	Menstrual dysfunction group(n=25)
Age (years)	20.00 \pm 2.36	18.84 \pm 2.70*
Height(cm)	168.21 \pm 86.23	166.76 \pm 8.77
Weight (kg)	58.13 \pm 8.32	56.96 \pm 8.47
BMI (kg/m ²)	20.51 \pm 2.11	20.53 \pm 3.06
Age at menarche (y)	13.39 \pm 1.55	14.50 \pm 1.51**
Sports experience (y)	8.42 \pm 4.42	8.62 \pm 4.65
Oral contraceptive use (%)	11.3% (n=29)	24% (n=6)

* $p < 0.05$, ** $p < 0.01$

As can be seen from Table 3 there was not a significant difference between the mean values of the subscales of EDE-Q between tested groups.

Table 3. Results from EDE-Q for athletes (mean \pm SD)

EDE-Q Subscale	Whole sample of athletes(n=281)	Eumenorrheic group (n=256)	Menstrual dysfunction group (n=25)
Dietary restraint	1.42 \pm 1.44	1.42 \pm 1.46	1.35 \pm 1.28
Eating Concern	0.79 \pm 0.94	0.79 \pm 0.93	0.75 \pm 1.04
Shape Concern	1.93 \pm 1.53	1.91 \pm 1.51	2.10 \pm 1.73
Weight Concern	1.67 \pm 1.47	1.66 \pm 1.44	1.76 \pm 1.76
Global Score	1.45 \pm 1.17	1.45 \pm 1.17	1.49 \pm 1.25

* $\alpha < 0.05$, ** $\alpha < 0.01$

In order to determine whether the occurrence of menstruation disorders has been related to the nutritional pathology, we compared the prevalence of cases with a clinically significant eating disorder (score ≥ 4.0 for the corresponding EDE-Q subscales) or of pathogenic behavior in both studied groups. (Table 4).

Table 4. Incidents of EDE-Q subscale score ≥ 4.0 in both menstrual status groups

EDE-Q Subscale score ≥ 4.0	Eumenorrheic group(n=256)	Menstrual dysfunction group(n=25)
Dietary restraint	6.25% (n= 16)	4% (n= 1)
Shape Concern	13.28% (n= 34)	20% (n= 5)
Weight Concern	7.81% (n= 20)	20% (n= 5)*
Global Score	4.30% (n= 11)	4% (n= 1)
Binge eating	35.55% (n= 91)	28% (n= 7)
Self-induced vomiting	1.95% (n= 5)	0% (n= 0)
Use of laxatives	6.64% (n= 17)	16% (n= 4)
Excessive exercise	23.44% (n= 60)	12% (n= 3)

* $\alpha < 0.05$, ** $\alpha < 0.01$

The incidence of cases with clinically significant eating disorders in the group of female athletes with normal menstruation cycle did not differ significantly from the group of athletes with menstrual dysfunction for DR and SC subscales, as well as for

GS. Only the results of WC subscale of EDE-Q for the oligomenorrhea/amenorrhea group 20% (n=5) were significantly higher than that for eumenorrheic group - 7.81% (n = 20).

The results for use of pathological weight-making behaviors were similar. For female athletes with eumenorrhea they were as follows: binge eating 35.55% (n = 91); self-induced vomiting 1.95% (n = 5); use of laxatives 6.64% (n = 17); excessive exercise 23.44% (n = 60). The corresponding frequencies for the group of women athletes with menstruation disorders were: binge eating 28% (n = 7); self-induced vomiting 0% (n = 0); use of laxatives 16% (n = 4); excessive exercise 12% (n = 3). The comparisons between both groups failed to detect any significant differences in the practice of pathological nutritional behaviors.

Discussion:

This study has shown relatively low rates (8.9%) of menstruation dysfunction in female athlete. The later appearance of menarche in female athletes with menstruation dysfunction could not be explained by such factors as lower fat deposition due to the lack of differences in body weight and BMI in both groups. Similar results were obtained from Nichols et al (2006), who reported first menstruation 6 months later in female athletes with menstrual abnormalities as compared to eumenorrheic athletes. No differences were also observed with regard to sporting experience or the use of contraceptives. We found out a relatively high prevalence (36.3%) of pathogenic behaviors (binge eating; self-induced vomiting; use of laxatives or excessive exercise) among the studied female athletes. Close proportions of pathogenic behaviors (32%) were reported for African-American sportswomen (Rosen et al., 1986). However, studies in Norway have found lower frequencies of pathological weight loss methods – 25% (Borgen, Larsen, 1993).

The prevalence of clinically significant eating disorders was 16.63% and was similar to data reported by Nichols et al. (2006) (18%) and Beals & Manore (2002) (15.2%). Intergroup differences were found only in terms of WC subscale results, which was significant higher in female athletes with menstrual dysfunction (20%), as compared to eumenorrheic athletes (7.81%) ($\alpha < 0.05$).

The cases of both menstrual dysfunction and disordered eating were relatively low – 4.98% of the tested female athletes.

Conclusion:

The results of our study showed that the prevalence

of menstrual disturbances among Bulgarian female athletes is not high. However, the percentage of sportswomen with pathogenic eating behaviors is significant, which increases the risk to their long term health.

The results suggest that none of the factors studied – weight, BMI, sports experience, age at menarche, the presence of eating disorders could explain the occurrence of menstrual dysfunction in female athletes.

Reference:

- American Academy of Pediatrics: Committee on Sports Medicine: Amenorrhea in adolescent athletes. (1989) *Pediatrics*, 84(2):394–395.
- Beals, KA., Manore, MM. (2002) Disorders of the female athlete triad among collegiate athletes. *Int J Sport NutrExercMetab.*12(3): 281–293.
- Borgen, JS., Larsen, S. (1993) Pathogenic weight-control methods and self-reported eating disorders in female elite athletes and controls. *Scand J Med Sci Sports.* 3(3): 150–155.
- Fairburn, G., Cooper Z., O'Connor, M. (2014) Eating Disorder Examination (Edition 17.0D; April 2014) http://www.credo-oxford.com/pdfs/EDE_17.0D.pdf
- FIMS Position Statement: June 2000. The Female Athlete Triad. A statement for health professionals from the Scientific Commission of the International Federation of Sports Medicine (FIMS): <http://www.fims.org/files/8214/2056/2594/PS14-The-Female-Athlete-Triad.pdf>.
- Forsberg, S. and Lock, J. (2006) The relationship between perfectionism, eating disorders and athletes: a review. *Minerva Pediatr.*58(6):525–536.
- Loucks, AB. (2003) Energy availability, not body fatness, regulates reproductive function in women. *Exerc Sport Sci Rev.* 31(3):144–148.
- Luce, KH., Crowther, JH., Pole, M. (2008) Eating disorder examination questionnaire (EDE-Q): Norms for undergraduate women. *Int J Eat Disord.* 41(3):273–276.
- Nattiv, A., Loucks, AB., Manore, MM., Sanborn, CF., Sundgot-Borgen, J., Warren, MP. (2007) American College of Sports Medicine position stand. The Female Athlete Triad. *Med Sci Sports Exerc.*39(10): 1867–1882.
- Nichols, JF., Rauh, MJ., Barrack, MT., Barkai, HS., Pernick, Y. (2007) Disordered eating and menstrual irregularity in high school athletes in lean-build and non-lean-build sports. *Int J Sport NutrExercMetabol.* 17(4), 364–377.
- Nichols, JF., Rauh, MJ., Lawson, M., Ji, M., Barkai, HS. (2006) Prevalence of the Female Athlete Triad syndrome among high school athletes. *Arch Pediatr Adolesc Med.*160(2):137–142.
- Raymond-Barker, P., Petroczi, A., Quested, E. (2007) Assessment of nutritional knowledge in female athletes susceptible to the female athlete triad syndrome. *J Occup Med Toxicol.* 2:10.
- Rosen, LW., McKeaG, DB., Hough, DO., Curley, V.

(1986) Pathogenic weight-control behaviors in female athletes. *Phys Sports med.* 14(1): 79–86.

Roupas, ND. and Georgopoulos, NA. (2011) Menstrual function in sports. *Hormones* 10(2): 104–116.

Acknowledgments:

This research was supported from National Sports Academy by grant No83/2015. The funding organization did not participate in the design or conduct of the study; in the collection, analysis, or interpretation of the data; or in the preparation of the manuscript.

Authors greatly appreciate all athletes and students at National Sports Academy “V. Levski” who participated in this study.

Address for corresponds:

Galina Vanlyan, MD

National Sports Academy, Department of Sports Medicine

Phone/ Fax: (+359) 899846949

1700 Sofia, Bulgaria

E –mail: galina_vanlyan@abv.bg

Prof. Diana Dimitrova, MD, PhD

National Sports Academy, Department of Sports Medicine

Phone/ Fax: (+359) 898776281

1700 Sofia, Bulgaria

E –mail: dianansa@yahoo.com

AGE SUPPLEMENTATION MODULATES IL-6, IL-10 AND HSP27 RESPONSE IN HEALTHY MEN: EFFECT ON THE MUSCLE STRENGTH

¹Zekine Punduk, ²Adnan Adil Hismiogullari, ³Khalid Rahman

¹Physical Education and Sport, University of Balikesir, Balikesir, Turkey

²Department of Medical Biochemistry, Faculty of Medicine, University of Balikesir, Balikesir, Turkey

³Faculty of Science, School of Pharmacy and Biomolecular Sciences, Liverpool John Moores University, Liverpool, UK

SUMMARY

Aged garlic extract (AGE) is a dietary supplement and is reported have numerous health benefits including protection against oxidative stress, inflammatory, and dyslipidemia. The purpose of this investigation was to test the effects of AGE on the serum levels of interleukin-6 (IL-6), interleukin-10 (IL-10), heat shock protein 27 (HSP27), testosterone, cortisol, total antioxidant status (TAS), total oxidant status (TOS) as well as exercise performance parameters. Sedentary healthy men (n=6) participated in this study. After baseline cycling performance and isokinetic muscle contraction testing, the subjects ingested AGE (5 ml) for 10 days. At the end of this period, venous blood samples were obtained in the morning prior to and 10 days after AGE supplementation, followed by another sample 10 days after the supplementation (wash out) period. The serum was analysed for IL-6, IL-10, HSP27, cortisol, testosterone, total antioxidant status (TAS), and total oxidant status (TOS). The serum samples were analysed and physical performance evaluated at the beginning of the study, end of AGE supplementation and at the end of the washout period. Cycling performance parameters were not affected by AGE supplementation, whereas isokinetic muscle strength properties improved in the post-supplementation period. AGE upregulated serum level of the IL-6, IL-10 and HSP27 response in the post-supplementation period. However, serum level of the cortisol, testosterone, total antioxidant status (TAS), total oxidant status (TOS) were not affected by AGE supplementation. Therefore, AGE supplementation enhanced isokinetic knee muscle work parameters and it may play a protective role against the oxidative stress and apoptosis by upregulating the levels of HSP27, IL-10 and IL-6.

Key words: Aged garlic extract, Oxidative stress, Antioxidants, Muscle strength

Introduction

Aged garlic extract (AGE) is manufactured from organically grown garlic cloves (*Allium sativum*L.) that are sliced and soaked in an aqueous ethanol solution and extracted and aged up to 20 mo. Numerous compounds have been detected in AGE that have the potential to affect immunity, including the lectin family, which is known to interact with pathogen recognition receptors on immune cell surfaces (Huysamen, Brown 2009; Kingeter, Lin 2012). Previous studies have demonstrated that AGE reduces lipid cholesterol, oxidative stress, blood pressure, and improves endothelial function (Morihara et al. 2011, Ried et al.2010, Lee et al. 2009)

IL-6 is a key cytokine featuring redundancy and pleiotropic activity (Kishimoto, 1989). It plays a central role in host defence against environmental

stress such as infection and injury. Also, IL-6 acts as a major proinflammatory mediator for the induction of the acute phase response (Fattori et al., 1994), leading to a wide range of local and systemic changes including fever, leucocytes recruitment and activation, hepatic regeneration and hemodynamic effects. Considering the key role of IL-6 in mediating the acute phase response, its value as a prognostic biomarker in sepsis and various acute organ injuries has been extensively investigated in clinical and experimental studies. IL-10 is known to be a pleiotropic and potent anti-inflammatory and immunosuppressive cytokine, The expression of IL-10 is controlled on the transcriptional and post-transcriptional levels. Both direct (e.g., inflammation of the CNS through trauma, neurosurgery, or increased intra-brain pressure) and indirect (e.g., bacteremia) activation of the stress axis promotes IL-10 secretion. Oxidative stress in kid-

neys was associated with decreased IL-10 concentration. IL-10 has an important role in the prevention of infection-related tissue damage (Arimoto et al. 2007). Increased IL-10 concentrations have been shown to protect against damage to tissues, including diabetic wounds, ischemic stroke, and myocardial remodeling (Kanazawa et al., 2015; Kant et al., 2014;). Hsp27 is ubiquitously expressed and involved in the regulation of main cellular physiologic functions (Mymrikov et al., 2011) as inhibition of apoptosis, protection against oxidative stress, binding erroneously folded proteins for transfer to ATP-dependent chaperones and to the proteasome for further degradation and the regulation of the cytoskeleton (Mymrikov et al., 2011).

Many studies have already been shown the association of cardiovascular functions of aged garlic have cardiovascular protective effects on many types of cardiovascular disorders (Ried et al., 2016; Pérez-Torres et al., 2016; Avula et al., 2014; Takashima et al., 2017). However, the effects of AGE on pro-inflammatory cytokine (IL -6, IL-10) and HSP response as well as physical performance parameters have not been clearly defined in humans

Methods

Participants and procedure

Six sedentary healthy male volunteers (Mean age 30.2 ± 2.9 year, height 175.6 ± 2.8 cm) participated in this study. The study complied with the principles of the Declaration of Helsinki and was approved by the School of Medicine Balikesir University Ethics committee and informed written consent was obtained from each participant (Ethic prot. number 2014/61). The participants who informed that they were taking any medicine, had any medical history of disease, taking any antioxidant or other dietary supplementation, had a history of allergy to supplementation, or any injuries were excluded from the study. Body composition parameters namely BMI, percentage of fat percent, fat mass and fat free mass measured by using the Tanita BC418 MA (Tanita Corporation, Japan).

Physical performance test

Isokinetic knee extensor and flexor muscles performance assessments were assessed using

by isokinetic dynamometer (Isomed 2000 Basic). Participants performed a maximal incremental test on acycle Simulator (Tacx Vortex T1960, Tacx,

Wassenaar, Netherlands) that included a 5-min warm-up at a PO corresponding to 100 W, followed by increments of 30 W every 3 min until voluntary exhaustion as judged by the participants not being able to maintain the pedal frequency between 80–90 revolutions (rpm) was reached. Then, they were performed to cycle a distance of 10 km with free RPM, and were instructed to complete this distance in the shortest possible time.

Biochemical Analysis

Plasma levels of IL-6, IL10 and HSP27 level (eBioscience, Austria) were determined

by enzyme-linked immuno-sorbent assay (ELISA) using on a diagnostic instrument (BioTek, ELx 800, U.S.A). The levels of testosterone and cortisol hormone were measured on diagnostic instrument. Total antioxidant (TAS) and oxidative (TOS) activity was measured by spectrophotometry.

AGE supplementation

The supplementation with AGE was carried out essentially as described previously by Dillon et al. (Dillon et al.,2002). The AGE is prepared by soaking sliced raw garlic (*A. Sativum*) in 15–20% aqueous ethanol for up to 20 min at room temperature. The extract is then filtered and concentrated under reduced pressure at low temperature. The content of water-soluble compounds is relatively high, whereas that of oil soluble compounds is low. After the baseline test, subjects consumed 5 mL of AGE (taken in a small volume of fruit juice) daily for 10 d between 0700 and 0900 h; otherwise, subjects followed their usual diet and lifestyle, excluding alcohol intake. This dose of AGE is that recommended as a dietary supplement by the manufacturers and was used in previous study, which showed inhibition of ADP-induced platelet aggregation (Vang et al.22011).

Results

AGE upregulated serum level of the IL-6, IL-10 and HSP27 response in the post-supplementation period ($p=0.05$, $p=0.04$, $p=0.001$, respectively, Table 3). However, these levels of the interleukins were declined in the washout period of the experiment. The serum level of the cortisol, testosterone, total antioxidant status (TAS), total oxidant status (TOS) were not affected by AGE supplementation ($p >0.05$). Isokinetic knee extensor and flexor muscle function of the peak work, peak work/

body weight, average work, total work parameters were increased in the post-supplementation at 60 and 180°/sec velocity ($p \leq 0.001$, table 2). Whereas, cycling performance parameters were not affected by AGE supplementation. Interestingly, ten day garlic administration significantly elevated the body weight ($p=0.011$), BMI ($p=0.012$), fat percent ($p=0.013$), fat mass ($p=0.003$) in the washout with compared the post supplementation period, however AGE supplementation had no effect on fat free mass (Table 1).

Discussion

Our primary findings indicate that 10 days of dietary garlic supplementation significantly upregulated plasma level of IL-6, IL-10 and HSP27 response in the post-supplementation, also affected on isokinetic knee concentric extensor and flexor muscle work properties in both velocity at 60 and 180°/sec in sedentary human subject. This is the first study investigating the effects of AGE supplementation on IL levels, HSP response and isokinetic muscle contractile properties in healthy human subjects. Therefore, these results are novel and to the best of our knowledge, no data exists concerning the acute effect of AGE administration on these parameters. In literature, limited studies have been reported on anti-fatigue effect using garlic supplementation in animal or patients (Ushijima et al., 1997). According to this study results have shown that AGE significantly improved the running time in rat (Ushijima et al., 1997). Also, one study has been reported that six week AGE oil supplementation reduced the heart rate at peak exercise and the work load of the heart in cardiac patients (Verma et al., 2005).

We also found that AGE upregulated IL-6-10 and HSP response in the post-supplementation period in this study. As far as we are aware this finding has not been reported before and IL-6 and IL-10 is a cytokine and acts on a variety of tissues, and exhibits both pro-and anti-inflammatory prop-

erties (Starkie et al., 2003) In our study, the plasma level of the IL-6, IL-10 indicates a physiological level, although these levels were upregulated in the post-supplementation period. It has been well documented that the exercise induces plasma IL-6 levels which exerts inflammatory properties (Ostrowski et al., 1999) and also plays an anti-inflammatory roles within the body (Villarino et al., 2004). Additionally, IL-10 has an important role in the prevention of infection-related tissue damage (Arimoto et al. 2007). Increased IL-10 concentration has been shown to protect against damage to tissues, including diabetic wounds, ischemic stroke, and myocardial remodeling (Kanazawa et al., 2015; Kant et al., 2014). Furthermore, Hsp27 is also ubiquitously expressed and involved in the regulation of main cellular physiologic functions (Mymrikov et al., 2011) as inhibition of apoptosis, protection against oxidative stress, binding erroneously folded proteins for transfer to ATP-dependent chaperones and to the proteasome for further degradation and the regulation of the cytoskeleton (Mymrikov et al., 2011).

Conclusion

AGE enhanced muscle work properties in both flexor and extensor muscle group than the torque values in untrained healthy human knee. Furthermore, AGE was increased the, IL-6, IL-10 and HSP27 level in the post-supplementation period. Therefore, AGE supplementation, it may be played a protective role against the oxidative stress and apoptosis with up regulated the level of some of the interleukins and HSP27 in this study. Limitations to the present study include: 1) daily nutrition level and metabolism was not followed and may have had a significant effect on the muscle strength values. 2) This was a pilot study in which six participated in the study and it will need to be investigated in future studies.

TABLES

Table 1. Effect of garlic supplementation on physical characteristics of the subjects.

	<i>Pre-Supp Test 1</i>	<i>Post-Supp Test 2</i>	<i>Washout Test 3</i>	<i>F</i>	<i>P</i>	<i>Significant difference</i>
Weight (kg)	73.86 (5.52)	73.76 (5.68)	75.10 (5.85)	8.48	0.011	Test 2-3
Body Mass Index (kg/m ²)	24 (1.92)	23.98 (1.94)	24.52 (1.95)	8.08	0.012	Test 2-3
Fat Percent (%)	11.18 (3.95)	12.10 (3.70)	14.02 (3.17)	7.80	0.013	Test1-3
Fat Mass (kg)	9.02 (3.71)	9.70 (3.58)	11.22 (3.41)	13.80	0.003	Test 1-3
Fat Free Mass	64.8 (5.51)	64.1 (5.69)	63.8 (6.12)	1.44	0.290	

Values are expressed as mean (SE), (n=6). A significant difference was found by repeated measures by ANOVA. Significant differences were observed between post-supplementation and washout peri-

od in experimental sessions.*P<0.05, **P<0.001. Pre-Supp: Pre-supplementation, Post-Supp: Post supplementation.

Table 2. Effect of garlic supplementation on knee extensor and flexor muscle function of the subjects at 60 and 180° /sec velocity

<i>Extensor muscle function</i>						
	<i>Pre-Supp Test 1</i>	<i>Post-Supp Test 2</i>	<i>Washout Test 3</i>	<i>F</i>	<i>P</i>	<i>Significant difference</i>
Peak work (J)	132.8 (8.32)	110.4 (6.02)	108 (5.82)	7.74	0.01	1-2, 1-3
Peak work/weight (J/kg)	1.81 (0.30)	1.52 (0.27)	1.47 (0.31)	9.91	0.007	1-2,1-3
Average work (J)	124.4 (7.90)	100 (6.67)	97.5 (6.57)	10.55	0.006	1-2
Total work (J)	746.8(47.55)	599.2(40.18)	584.8 (39.5)	10.50	0.006	1-2
<i>Flexor muscle function</i>						
Peak work (J)	90 (5.85)	119.6 (17.25)	119.6 (6.32)	63.94	0.000	1-2, 1-3
Peak work/weight (J/kg)	1.30 (0.25)	1.66 (0.40)	1.62 (0.35)	11.75	0.004	2-3
Average work (J)	124.4 (7.90)	100 (6.67)	97.58 (6.57)	29.92	0.002	1-2, 1-3
Total work (J)	463.8 (33.23)	639 .8 (39.4)	646 (29.68)	28.74	0.000	1-2, 1-3
<i>Extensor muscle function</i>						
	<i>Pre-Sup Test 1</i>	<i>Post-Sup Test 2</i>	<i>Washout Test 3</i>	<i>F</i>	<i>P</i>	<i>Significant difference</i>
Peak work (J)	182.2 (8.06)	160.6 (4.68)	157.2 (6.31)	18.92	0.001	1-2, 1-3
Peak work/weight (J/kg)	2.50 (0.38)	2.21(0.36)	2.13 (0.40)	26.42	0.000	1-2,1-3, 2-3
Average work (J)	170.5 (7.4)	149.5 (3.4)	146.7 (5.9)	13.36	0.003	1-2, 1-3
Total work (J)	1022 (45)	897 (20)	880 (34)	13.16	0.003	1-2
<i>Flexor muscle function</i>						
Peak work (J)	125.8 (7.2)	157.8 (8.5)	153.6 (10.4)	50.5	0.000	1-2, 1-3
Peak work/weight (J/kg)	1.74 (0.40)	2.17 (0.42)	2.08 (0.44)	22.97	0.009	1-2,1-3
Average work (J)	116.4 (6.4)	147.9 (15.8)	142.7 (9.7)	23.13	0.009	1-2, 2-3,3-1
Total work (J)	698 (38.2)	886 (42.5)	856 (58.5)	23.94	0.008	1-2, 1-3 2-1, 3-1

Values are expressed as mean (SE) (n=6). A significant increase in the post-supplementation period according to Pre-Supp P<0.05, P<0.001, anal-

ysed by repeated measures by ANOVA. Pre-Supp: Pre-supplementation, Post-Supp: Post supplementation.

Table 3. Effect of AGE supplementation on biochemical parameters

	Pre-Supp (Test 1)	Post-Supp (Test 2)	Washout (Test 3)	F	P	Significant difference
IL10 (pg/ml)	3.1 (0)	60.2 (37.69)	44.1 (16.66)	2.49	0.04	Test 1-2
IL6 (pg/ml)	5.66 (0.15)	6.14 (0.35)	5.51 (0.64)	11.11	0.05	Test 2-3
HSP27 (pg/ml)	1549.7 (472.2)	5263.1 (800)	724.3 (120.15)	11.11	0.001	Test 1-2 Test 2-3
Testosteron (pg/ml)	751 (115.7)	614.6 (115.2)	616.4 (88.6)	0.55	0.58	
Kortizol (pg/ml)	10426 (174)	10127 (455)	9560 (784)	0.77	0.47	
Total Antioksidan seviye (mmol/L)	1.7 (0.76)	1.82 (0.08)	1.75 (0.11)	0.43	0.65	
Total Oksidatif seviye (mmol/L)	6.36 (0.41)	7.27 (0.43)	6.51 (0.38)	1.26	0.31	

Values are expressed as mean (SE) (n=6). A significant increase in the post-supplementation period according to Pre-Supp $P < 0.05$, $P < 0.001$, analysed by repeated measures by ANOVA. Pre-Supp: Pre-supplementation, Post-Supp: Post supplementation.

References

- Arimoto, T., Choi, D.Y., Lu, X., Liu, M., Nguyen, X.V. et al. (2007) Interleukin-10 protects against inflammation-mediated degeneration of dopaminergic neurons in substantia nigra, *Neurobiol. Aging* 28: 894–906
- Avula, P.R., Asdaq, S.M., Asad, M. (2014) Effect of aged garlic extract and s-allyl cysteine and their interaction with atenolol during isoproterenol induced myocardial toxicity in rats. *Indian J. Pharmacol*, 46: 94.
- Dillon, S.A., Lowe, G.M., Billington, D., et al. (2002) Dietary supplementation with aged garlic extract reduces plasma and urine concentrations of 8-Isoprostaglandin F_{2α} in smoking and nonsmoking men and women. *J Nutr*, 132, 168–171.
- Fattori, E., Cappelletti, M., Costa, P., Sellitto, C., Cantoni, L., Carelli, M., Faggioni, R., Fantuzzi, G., Ghezzi, P., Poli, V. (1994) Defective inflammatory response in interleukin 6-deficient mice. *J Exp Med*, 180(4):1243–50.
- Huysamen, C., Brown, G.D. (2009), The fungal pattern recognition receptor, Dectin-1, and the associated cluster of C-type lectin-like receptors. *FEMS Microbiol Lett*, 290:121–8.
- Kanazawa, M., Kawamura, K., Takahashi, T., Miura, M., Tanaka, Y. et al. (2015) Multiple therapeutic effects of progranulin on experimental acute ischaemic stroke. *Brain*, 138: 1932–48.
- Kant, V., Gopal, A., Pathak, N.N., Kumar, P., Tandan, S.K., Kumar, D. (2014) Antioxidant and anti-inflammatory potential of curcumin accelerated the cutaneous wound healing in streptozotocin-induced diabetic rats. *Int. Immunopharmacol*, 20: 322–330
- Kingeter, L.M., Lin, X. (2012) C-type lectin receptor-induced NF-kappaB activation in innate immune and inflammatory responses. *Cell Mol Immunol*, 9:105–12.
- Kishimoto, T. (1989) The biology of interleukin-6. *Blood*, 74:1–10.
- Lee, Y.M., Gweon, O.C., Seo, Y.J., Im, J., Kang, M.J., Kim, M.J., Kim JI. (2009) Antioxidant effect of garlic and aged black garlic in animal model of type 2 diabetes mellitus. *Nutr Res Pract*, 3:156–61.
- Morihara, N., Hayama, M., Fujii H. (2011). Aged garlic extract scavenges superoxide radicals. *Plant Foods Hum Nutr*, 66:17–21.
- Mymrikov, E.V., Seit-Nebi, A.S., & Gusev, N.B. (2011) Large potentials of small heat shock proteins. *Physiol. Rev.* 91, 1123–59.
- on physiological and psychological stress in mice. *Phytother Res.* 11, 226–230.
- Ostrowski, K., Rohde, T., Asp, S., Schjerling, P., Pedersen, B.K. (1999) Pro and anti-inflammatory cytokine balance in strenuous exercise in humans. *J Physiol.* 1999;515:287–291.
- Pérez-Torres, I., Torres-Narváez, J.C., Pedraza-Chaverri, J., Rubio-Ruiz, M.E., Díaz-Díaz, E., del Valle-Mondragón, L., Martínez-Memije, R., Varela López, E., Guarnier-Lans, V. (2016) Effect of the aged garlic extract on cardiovascular function in metabolic syndrome rats. *Molecules*, 21, 1425.
- Ried, K., Frank, O.R., Stocks, N.P. (2010). Aged garlic extract lowers blood pressure in patients with treated but uncontrolled hypertension: a randomised controlled trial. *Maturitas*, 67:144–50.
- Ried, K., Travica, N., Sali, A. (2016) The effect of aged garlic extract on blood pressure and other cardiovascular risk factors in uncontrolled hypertensives: The age at heart trial. *Integr. Blood Press. Control*, 9: 9. [CrossRef] [PubMed]
- Starkie R, Ostrowski SR, Jauffred S, Febbraio M, Pedersen BK. Exercise and IL-6 infusion inhibit endotoxin-induced TNF α production in humans. *FASEB J.* 2003;

17: 884–886.

Takashima, M., Kanamori, Y., Kodera, Y., Morihara, N., Tamura, K. (2017) Aged garlic extract exerts endothelium-dependent vasorelaxant effect on rat aorta by increasing nitric oxide production. *Phytomedicine*, 24, 56–61.

Ushijima M, Sumioka I, Kakimoto M, et al. (1997). Effect of garlic and garlic preparations

Vang, O., Ahmad, N., Baile, C.A., et al. (2011) What is new for an old molecule? Systematic review and recommendations on the use of resveratrol. *Plos one*, 6: e19881.

Verma SK, Rajeevan V, Jain P, et al. (2005). Effect of garlic (*Allium sativum*) oil on exercise tolerance in patients with coronary artery disease. *Indian J Physiol Pharmacol*. 49, 115–118.

Villarino, A., Huang, E., Hunter, C.A. (2004) Understanding the pro-and anti inflammatory properties of IL-27. *J Immunol*.2004, 173:715–720.

Ziamajidia, N., Nasiria, A., Abbasalipourkabira, R., Moheba, S.M. (2016) Effects of garlic extract on TNF- α expression and oxidative stress status in the kidneys of rats with STZ β nicotinamide-induced diabetes, *Pharmaceutical Biology*, 55, 1, 526–531.

Corresponding Author

Assoc.Prof.Zekine Punduk,

University of Balikesir

Physical Education and Sport

Balikesir/Turkey

e-mail: zkn1938@gmail.com

IMPLEMENTING A CUSTOMISED SOFTWARE FOR WEIGHT MANAGEMENT OF OVERWEIGHT AND OBESE PEOPLE

V. Panayotov, K. Petkov, N. Iankova, J. Karabiberov

SUMMARY

Introduction: *The rate of obesity escalated in many countries in recent years. A lot of different methodologies have been implemented to address this problem. A relatively new approach is using weight management computer software.*

Methods: *Our aim was to evaluate the impact of software driven process of calorie counting and exercise tracking on weight changes in overweight and obese people. We compared the results to those of applying a conventional approach for losing weight – following the instructions of a dietitian and a fitness instructor. 60 participants were randomly assigned to 3 groups – two experimental and one control. The experimental groups underwent an energy deficient diet plan and exercised for about 90 min. a week. No dietary restrictions were imposed on the subjects in the control group. The study was 24 weeks long.*

Results. *We compared the differences in body mass and fat tissue percentage within and between the groups. We found significant differences between the initial and the final values of these variables in both experimental groups (bigger ones in the first group).*

No significant differences were found for the subjects in the control group.

Discussion: *All experimental participants, who successfully finished the experiment, reduced their weight and body fat.*

Conclusions: *There is preliminary evidence for a superiority of the implemented software in the process of weight reduction for overweight and obese people. Further studies are necessary for reaching more convincing results.*

Key words: *overweight, obese, weight management, software, exercise*

Introduction

According to a study of the National Centre of Social Health in 2010–2011 30% of Bulgarian students aged between 6 and 19 were overweight and 12% were obese. The data for the countries in the Eurozone were even more alarming: between 36.9% and 56.7% of women and between 51% and 69.3% of men were overweight and obese (http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Overweight_and_obesity_-_BMI_statistics, 2015). Obese young people are at extremely high risk of morbidity with high social impact such as type 2 diabetes and cardiovascular disease (Maelhlm S, et al., 1986, Rexrode KM, et al., 1997). At the same time there is no complex methodology available, which to combine the two most effective approaches for treating obesity – healthy diet and physical activity.

There are a number of studies on similar topics (Brill JB, et al., 2002, Borsheim E, Bahr R., 2003, Brzycki, M., 1998, De Feo P, et al., 2003, Demling RH, DeSanti L. 2000, Doi T, et al., 2001, Earle RW, Wathen D, 2000, Meckling KA, et al., 2002, Meckling KA, et al., 2002, Poehlman ET, Horton ES, 1989, Pisunyer FX., 1993, Racette SB, et al., 1995, Sykes K, Choo LL, Cotterrell M., 2004, Tsai AC, et al., 2003, Walberg JL., 1989, Wilmore JH, et al., 1999). Despite the fact

that there are studies focused on researching daily regimens, which combine resistance exercises and negative energy balances, we did not find one in the literature to test the effectiveness of a methodology similar to ours. In our opinion, combining a daily schedule consisting of anaerobic training and a low-caloric diet under software supervision is an entirely new approach for treating obesity.

Aim and objectives of the study

the aim of the study was to evaluate the impact of software driven process of calorie counting and exercise tracking of the weight and body composition changes in overweight and obese people.

Objectives:

1. To recruit a group of sedentary subjects with BMI values of more than 27;
2. To split the subjects randomly into 3 groups– two experimental to follow low-caloric diets and one control with no energy consumption restrictions;
3. To estimate the theoretical daily energy expenditure of every participant every 2 weeks;
4. To upload the data of every participant of first experimental group into the diet software;

5. To design a diet regimen for every subject in the experimental group No.2;
6. To put the experimental subjects to a regimen of physical activity for 24 weeks;
7. To measure and evaluate statistically the differences between the initial and the final values of the variables we studied within and between the groups.

Methods

We studied 60 sedentary subjects of both genders, aged between 25 and 45 with BMI>27. We did not control for gender differences in the studied variables. We estimated the theoretical daily energy expenditure for every participant: we used the Mifflin et al. (Mifflin, MD, et al., 1990) methodology to estimate the theoretical energy expenditure at rest and after that we applied the Levine and Kotz (Levine, J. A. and Kotz, C. M., 2005) methodology to calculate the theoretical overall daily energy expenditure.

49 out of 60 subjects completed the experiment successfully.

We split the participants randomly into 3 groups. The first two groups were put on a 30% calorie deficient diet (comparing to the theoretically estimated daily energy expenditure) with the following proportions of food ingredients: 55–60% of carbohydrates, 15–20% of protein and 25–30% of fats. We controlled for the pursuance of the regimen via a feedback mechanism – the participants of experimental group No. 1 uploaded their daily consumptions in the software; every participant in the experimental group No.2 had to complete protocols for the food consumed on a daily basis. The third group we used as a control one – no restrictions upon food intake and physical activity were imposed on the subjects.

Every two weeks we measured the body mass and the quantity of adipose tissue (as a percentage of body mass) of every subject using the bioimpedance methodology (Kyle UG, et al., 2004) and updated the theoretical energy expenditure accordingly.

The energy deficiency was achieved via reduction of the calorie intake using conventional food sources. No food supplements were allowed.

The physical activity program consisted of training sessions with different parameters depending on each subject’s preferences. The only mandatory demands were for it to be of a predominantly anaerobic type and of metabolic equivalent of task (MET) (Jette, M. et al., 1990, Zatsiorski, V., 1990) between 600 and 1680 units weekly. The unification of the energetic costs of the exercise allowed us to compare statistically correctly the impacts of physical activities of different types (not cited here).

Results

The variation analysis is presented on table 1. To check for differences between the groups for each variable we conducted a standard test for differences in mean values – ANOVA (table 2) (Rutherford, A., 2011). This procedure was necessary for the verification of a successful initial randomization of the participants. Our data was consistent with the assumptions of the test (data not presented). Based on the results we concluded that there are no differences between the initial mean values of the studied variables between the groups ($p \leq 0.05$). ANOVA on final values was aimed at checking for differences in studied variables both between and within the groups. To account for the possibility of type I error during the post-hoc analysis, we applied a Bonferroni corrected procedure of ANOVA (<http://www.winsteps.com/winman/bonferroni.htm>). Results are represented on table 2.

To evaluate quantitatively the impact of the program we applied t-tests for paired samples for the participants of each group (James, G. et al, 2013). The results are presented on tables 3 and 4.

Table 1 Variation analysis

	N	Range	Min	Max	Mean	Std. Deviation	Var
BMb1	16	40.10	75.80	116.00	93.83	11.24	126.32
BMe1	16	59.70	54.60	114.30	83.16	14.21	201.94
FTb1	16	13.20	30.80	44.00	38.61	3.23	10.46
FTe1	16	15.00	24.50	39.50	32.64	3.65	13.38
BMb2	15	51.30	77.60	128.90	101.23	12.98	168.65
BMe2	15	50.30	62.50	112.80	88.79	14.14	200.13
FTb2	15	14.80	29.00	43.80	36.21	4.58	21.01
FTe2	15	16.00	25.00	41.00	32.47	4.58	21.06
BMbC	18	44.80	81.20	126.00	99.44	11.62	135.07
BMeC	18	43.00	82.00	125.00	99.64	11.34	128.74
FTbC	18	17.20	27.20	44.40	36.71	4.02	16.21
FTeC	18	17.00	27.50	44.50	36.63	4.10	16.89

Legend: BMb1 –initial body mass of experimental group 1; BMe1 – final body mass of experimental group 1; BMb2 – initial body mass of experimental group 2; BMe2 –

final body mass of experimental group 2; BMbC – initial body mass of the control group; BMeC – final body mass of the control group; FTb1- initial percentage of adipose tissue of experimental group 1; FTe1 – final percentage of adipose tissue of experimental group 1; FTb2 – initial percentage of adipose tissue of experimental group 1; FTe2 – final percentage of adipose tissue of experimental group 2; FTbC – initial percentage of adipose tissue of the control group; FTeC – final percentage of adipose tissue of the control group.

Discussion

No significant differences were found between the initial and the final values of the variables for the control group. The differences of both experimental groups were significant for the studied variables. The mean difference in BM was smaller in the first experimental group (10.66 kg vs. 12.61 kg), which could be considered an evidence for superiority of human intervention compared to machine guidance.

Table 2 Bonferroni adjusted ANOVA

Dependent Variable	(I) group	(J) group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
BMb	1.0	2.0	-7.37	4.28	.277	-18.03	3.28
		3.0	-5.61	4.10	.533	-15.80	4.57
	2.0	1.0	7.37	4.28	.277	-3.28	18.03
		3.0	1.76	4.17	1.000	-8.60	12.13
BMe	1.0	2.0	-5.62	4.74	.725	-17.42	6.16
		3.0	-16.47*	4.53	.002	-27.75	-5.20
	2.0	1.0	5.62	4.74	.725	-6.16	17.42
		3.0	-10.85	4.61	.069	-22.32	.61
FTb	1.0	2.0	2.39	1.42	.300	-1.15	5.94
		3.0	1.90	1.36	.512	-1.49	5.29
	2.0	1.0	-2.39	1.42	.300	-5.94	1.15
		3.0	-.49	1.38	1.000	-3.95	2.95
FTe	1.0	2.0	.16	1.48	1.000	-3.51	3.85
		3.0	-3.98*	1.41	.021	-7.51	-.46
	2.0	1.0	-.16	1.48	1.000	-3.85	3.51
		3.0	-4.15*	1.44	.018	-7.74	-.57

Table 3 Paired-samples t-tests

Mean	Paired Differences	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	
				Lower	Upper			
Pair 1	BMb1 – BMe1	10.66	5.27	1.31	7.85	13.48	8.083	15
Pair 2	FTb1 – FTe1	5.97	3.03	.75	4.35	7.58	7.880	15
Pair 3	BMb2 – BMe2	12.41	4.63	1.19	9.84	14.98	10.376	14
Pair 4	FTb2 – FTe2	3.74	1.96	.50	2.65	4.83	7.389	14
Pair 5	BMbC – BMeC	-.19	1.66	.39	-1.02	.62	-.509	17
Pair 6	FTbC – FTeC	.08	.34	.08	-.08	.25	1.011	17

Table 4 Linear correlation coefficients

		N	Correlation	Sig.
Pair 1	BMb1 & BMe1	16	.940	.000
Pair 2	FTb1 & FTe1	16	.619	.011
Pair 3	BMb2 & BMe2	15	.945	.000
Pair 4	FTb2 & FTe2	15	.909	.000

The mean difference in %FT shows the opposite pattern (5.97 vs. 3.94 kg lost) – the software achieved a weight loss consisting predominantly of fats and spared the lean body mass. The post-hoc analysis of the data, on the other hand, does not confirm a hypothesis of a statistically significant superiority of the software over the conventional weight loss approach. This may be the result of the relatively small number of studied cases. In addition, the correlation coefficient between the initial and the final values of %FT for the second experimental group is greater than that for the first one – 0.619 vs. 0.909. The correlation coefficient could be considered to some extent a measure of conservation of the distribution – the bigger the coefficient, the more similar the distributions. Using a very rough estimation, in this case, a participant with a high value of %FT (compared to the mean) at the beginning of the study would most probably end up with a high % – we would not witness a reshuffling of the distribution. This means that the bigger the correlation, the more consistent/targeted the methodology. We consider this finding as preliminary evidence for the superiority of conventional dieting approach over the software driven process. The body weight reduction under software assistance was achieved largely due to fat tissue loss and the same quantity of muscle tissue was spared, accordingly. The relative quantity of lean body mass increased and as it is well known, lean body mass consumes a lot more energy than fat tissue. More energy could be consumed without breaking the energy balance of the body (compared to the same body weight and the initial body composition). This is of great importance for obese people who, in most cases, have to maintain very restrictive diets (at least initially) to achieve a negative energy balance. It is very difficult to adhere to these types of diets for long periods of time. A preliminary interruption of the regimen is followed in most cases by switching to vastly positive energy balance and leads to a yo-yo effect, which swiftly increases the quantity of fat tissue of the body. This process is at the core of a vicious cir-

cle – every consecutive round of such dieting failures brings in more fat tissue than at the beginning and lessens the relative quantity of muscle tissue.

Conclusions

Both approaches – software or dietitian assistance – were successful in the process of long term weight loss;

A software guided weight loss process has the potential to successfully replace the conventional humanly led approach;

There are preliminary data for the superiority of a software-guided fat-loss process over the conventional methodology of human assistance;

Further studies are necessary for reaching to more definitive results concerning the effects of the studied software on body composition parameters.

References

- Borsheim E, Bahr R. (2003) Effect of exercise intensity, duration and mode on post-exercise oxygen consumption. *Sports Med*; 33 (14): 1037–60
- Brill JB, Perry AC, Parker L, et al. (2002) Dose-response effect of walking exercise on weight loss: how much is enough? *Int J Obes*; 26 (11): 1484–93
- Brzycki, Matt (1998). A Practical Approach to Strength Training. McGraw-Hill Baechle TR
- Cullinen K, Caldwell M. (1998) Weight training increases fat free mass and strength in untrained young women. *J Am Diet Assoc*; 98 (4): 414–8
- De Feo P, Di Loreto C, Lucidi P, et al. (2003) Metabolic response to exercise. *J Endocrinol Invest*; 26 (9): 851–4
- Demling RH, DeSanti L. (2000) Effect of a hypocaloric diet, increased protein intake and resistance training on lean mass gains and fat mass loss in overweight police officers. *Ann Nutr Metab*; 44 (1): 21–9
- Doi T, Matsuo T, Sugawara M, et al. (2001) New approach for weight reduction by a combination of diet, light resistance exercise and the timing of ingesting a protein supplement. *Asia Pac J Clin Nutr*; 10 (3): 226–32
- James, G. et al, (2013), An Introduction to Statistical Learning: with Applications in R (Springer Texts in Statistics), Springer, ISBN-13: 978–1461471370
- Jette, M. et al. (1990), Metabolic Equivalents (METS) in Exercise Testing, Exercise Prescription, and Evaluation of Functional Capacity, *Clin. Cardiol.* 13, 555–565
- Kyle UG, et al., (2004), Bioelectrical impedance analysis – part I: review of principles and methods, *Clin Nutr*; Oct;23(5):1226–43.
- Levine, J. A. and Kotz, C. M. (2005). NEAT – non-exercise activity thermogenesis – egocentric and geocentric environmental factors vs. biological regulation. *Acta Physiol. Scand.* 184, 309–318.
- Meckling KA, Gauthier M, Grubb R, et al. (2002) Effects of a hypo caloric, low-carbohydrate diet on weight loss, blood lipids blood pressure, glucose tolerance, and body composition, in free-living overweight women. *Can J Physiol Pharmacol*; 17 (5): 119–27
- Mifflin, MD, et al. (1990), A new predictive equation for resting energy expenditure in healthy individuals., *Am J Clin Nutr* 51(2):241–7
- Pisunyer FX. (1993) Medical hazards of obesity. *Ann Intern Med*; 119 (7): 655–60
- Racette SB, Schoeller DA, Kushner RF, et al. (1995) Effects of aerobic exercise and dietary carbohydrate on energy-expenditure and body-composition during weight-reduction in obese rate. *Am J Clin Nutr*; 61 (3): 486–94
- Rutherford, A., (2011), ANOVA and ANCOVA: A GLM Approach, 2nd Edition. Willey Inc., ISBN: 978–0–470–38555–5
- Sykes K, Choo LL, Cotterrell M. (2004) Accumulating aerobic exercise for effective weight control. *J R Soc Health*; 24–8
- van Aggel-Leijssen DP, Saris WH, Wagenmakers AJ, et al. (2001) The effect of low-intensity exercise training on fat metabolism of obese women. *Obes Res*; 9 (2): 86–96
- Walberg JL. (1989) Aerobic exercise and resistance weight-training during weight-reduction: implications for obese and athletes. *Sports Med*; 7 (6): 343–56
- Wilmore JH, Despres JP, Stanforth PR, et al. (1999) Alterations in body weight and composition consequent to 20 wk of endurance training: the HERITAGE Family Study. *Am J Clin Nutr*; 70 (3): 346–5
- Zatsiorski, V. (1995), Science and practice of strength training. New York, Human kinetics.
- http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Overweight_and_obesity_-_BMI_statistics (accessed Jan 2015)
- <http://science.jrank.org/pages/321/Anaerobic-Anaerobic-respiration.html> (accessed May 2014)
- http://www.psykiatri-regionh.dk/NR/rdonlyres/B35B097D-5BF9-483B-B039-DA6953132177/0/WHO5_Bulgarian.pdf (accessed June 2017)
- <http://www.winsteps.com/winman/bonferroni.htm> (accessed Sep 2017)

HEALTHY LIFESTYLE – A SURVEY AMONG YOUNG BULGARIANS

Evelina Miloshova
NSA “V. Levski”, Sofia, Bulgaria

Key words: youth, healthy lifestyle, GSHS, chronic non-communicable diseases

Introduction: Extending life expectancy and improving its quality is of particular importance to the individual as well as to the society as a whole. The main cause of poor health is the development of one or more diseases that occur in different periods of a person's life. These diseases are provoked by the effects of a number of factors, some related to the individual's behavior and attitude to his own health.

Developing basic health habits occur at childhood and youth, but some harmful and dangerous to health behavior is also developed at the same age, behavior that leads to future chronic diseases.

Nutritional habits that affect health can be divided into *positive* (fruit and vegetable intake) and *negative* (nonalcoholic, carbonated beverages and fast foods intake).

The fruits and vegetables are rich in vitamins, minerals, and vegetable fiber. Fruit and vegetable intake leads to good health, and it is an important attribute of a healthy diet. According to *some studies* only 30% of children consumed fresh fruits three to five times a week. On the other hand, high intake of sugar and sugar-containing products and beverages is common to the young Bulgarians, but affects negatively on health and leads to several chronic diseases later in life (National Dietary Intake and Status Study in Bulgarian Schoolchildren, 2003; National behavioral risk factor survey among population aged 25–64, 2009). Sachdeva S. et al. (2013), Xia Wang et al. (2014) and Aune et al. (2017) report similar data for fruit and vegetable intake in different countries.

Paganini-Hill A. (2007) and Rosenheck R. (2008) establish a significantly positive relationship between fast food consumption and energy and fat intake which lead to high risk of overweight, obesity in terms of BMI.

According to WHO (2015, 2017) alcohol use causes death and disability at a relatively early stage in life. At the age of 20–39, approximately 25% of the total number of deaths is due to alcohol. Smoking is the most important cause of premature death from a number of chronic non-communicable diseases. It's proved that 80–90% of chronic respiratory diseases; 80–85% of lung cancer; 30% of all malignancies and 25–43% of ischemic heart disease are directly related to smoking.

Low physical activity is one of the major risk factors for the occurrence of chronic diseases. Janssen I. and Leblanc AG. (2010) indicate that regular physical activity can help young people improve cardio-respiratory fitness, control weight, reduce symptoms of anxiety and depression, and reduce the risk of developing health conditions such as high blood pressure, heart disease, type 2 diabetes, obesity.

According to data of *National behavioral risk factor survey among population aged 25–64* (2009) above 80% of the working-age population has insufficient physical activity during leisure and 75% of them do not exercise at all; 45% of Bulgarians spend 2 to 3,5 hours sitting daily. At half of the young people, in general, many hours of sitting are combined with low motor activity. Laura K, et al. (2016) present a data of 27.1% of high school students participate in at least 60 minutes per day of physical activity on all 7 days of the week. Long M. et al. (2013) and Loprinzi PD, et al. (2015) show similar low physical activity in youth both in frequency and intensity.

In the current study we will focus on some parts of healthy lifestyles which concern the prevention of non-communicable, socially significant diseases such as cardiovascular diseases, diabetes, obesity, etc.

The aim of this survey is to explore some aspects (nutritional habits, tobacco and alcohol use, phys-

ical activity) related to the healthy lifestyle among young Bulgarians.

Material and Methods: The survey was conducted among high-school and university students from Sofia, Bulgaria. A WHO GSHS core questionnaire module (2013) was used as the basis for the survey. 218 people were interviewed, 138 women and 80 men, mean age – $24 \pm 6,3$ years. The participants were asked to provide information about their age, height and weight. BMI was calculated based on participant's data for height and weight.

The results were commented by gender and age (three age groups were identified – up to 19, 20–29 and 30 and above years old). The statistical analysis was performed using SPSS23.0. Descriptive statistics (mean \pm SD, frequencies) were computed for all variables. Pearson Chi-Square test and ANOVA was used for comparative analyses.

Results

The basic morphological characteristics of the respondents (height, weight and BMI) are presented in table 1.

Table 1. Basic morphological characteristics of the sample (mean \pm SD)

		n	Age (y)	Height (cm)	Weight (kg)	BMI (kg/m ²)
Gender	Male	80	23,9 \pm 5,9	180,9 \pm 6,9	79,5 \pm 11,5	24,2 \pm 2,8
	Female	138	24,04 \pm 6,5	166,4 \pm 6,5	58,9 \pm 8,9	21,3 \pm 2,9
Age group	Up to 19 (y)	33	17,4 \pm 1,4	170,1 \pm 8,9	64,5 \pm 11,2	22,2 \pm 3,4*
	20–29 (y)	165	23,4 \pm 2,3	172,3 \pm 9,6	65,8 \pm 13,9*	21,9 \pm 2,9*
	30+ (y)	20	39,3 \pm 9,02	169,7 \pm 11,1	75,2 \pm 16,7*	25,7 \pm 3,1*
	Total	218	23,97 \pm 6,3	171,7 \pm 9,7	66,5 \pm 14,03	22,4 \pm 3,2

* $p < 0,01$

Based on the height and weight data of the respondents, a BMI was calculated. It should be noted that teenagers have a higher BMI, compared to people in their twenties, but it's still within normal range, while people over 30 have a pre-obese BMI.

Nutritional habits

Eating fruit and vegetables daily is a key element of rational feeding. Consuming those helps the body supplies the required vitamins, minerals and fibers, which support a healthy metabolism, and also prevents several diseases. The recommended consumption of these foods is about 2–5 times a day.

The survey shows that 10% of the respondents do not eat fruit at all during the day, teenagers getting to 13%. 40–50% of the respondents eat fruit and vegetables once per day and only a third of those do it twice a day (fig.1). Overall women eat fruit and vegetables more than men, but they all average at twice daily.

Consuming carbonated, nonalcoholic drinks and fast food has a bad influence on health, due to the increased carbohydrates and fat stored in the body,

which can lead to obesity, diabetes and heart disease. The survey shows that 1/3 of the respondents consume nonalcoholic drinks daily, and with age (especially over 30) that goes up 2–3 times daily.

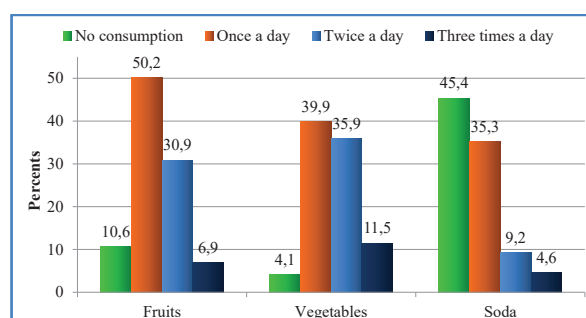


Figure 1. Fruits, vegetables and nonalcoholic beverage intake per day

In regards to fast food, every other respondent eats those foods, most commonly once a week, 5% of men in ages up to 30 eat fast food 5 times a week, which is 4 times more, compared to women of the same age (fig.2).

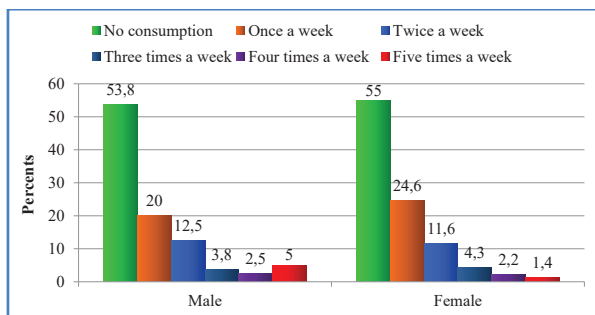


Figure 2. Fast food intake per week

Alcohol and tobacco use

Alcohol and tobacco use are a few of the proven risk factors in developing heart or lung disease. The earlier the age those bad habits develop, the bigger the risk of development of those diseases.

Early age of tobacco use is quite low. At age of 13, 13% of adolescents smoke, this percentage increase to 30% at the age of 15 (fig.3). Other than cigarettes, a third of the respondents smoke other tobacco products such as cigars or hookah, at least twice a month, each fifth of them is a teenager.

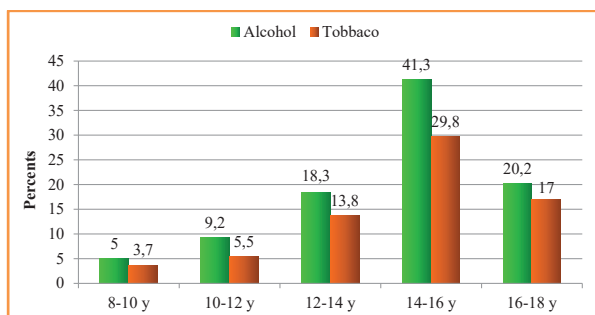


Figure 3. Age of first alcohol and tobacco use

Regardless of the ban on smoking in public areas, 45% of respondents are in a smoking habitat. The most vulnerable in that aspect are students; almost half of them are in contact with tobacco smoke, as passive smokers.

The data about alcohol consumption is even more alarming. 10% of male respondents have consumed alcohol for the first time between ages 8 to 10, females doing it 5 times less (2%). Regardless of gender, young adults (ages 20–29) drink alcohol at least twice monthly, with alcohol consumption increasing with age. Over a third of men have gotten drunk at least 10 times in their lives, making them skip class or work in 25% of the cases.

Physical activity

Physical activity has an important role preventing socially significant diseases. Teenage and youth have the highest physical activity and that is confirmed by the survey results. Most respondents are physically active 3 times a week (16.5%) or daily (18.3%). Males who do sports daily are 3 times more compared to Females. Unfortunately, 21% of people of age up to 19, have no weekly physical activity whatsoever, and women who don't engage sports are twice as much as men (fig.4).

Sitting for a considerable amount of time daily also contributes to low physical activity. A third of respondents are sitting down for at least 3–4 hours a day. 10% of female respondents remain seated for at least 8 hours a day, and with males it's about 4%.

An active way of moving about contributes to physical activity. A quarter of respondents walk or bike daily, but just as much doesn't. Teenagers appear to move actively the most (39.4%).

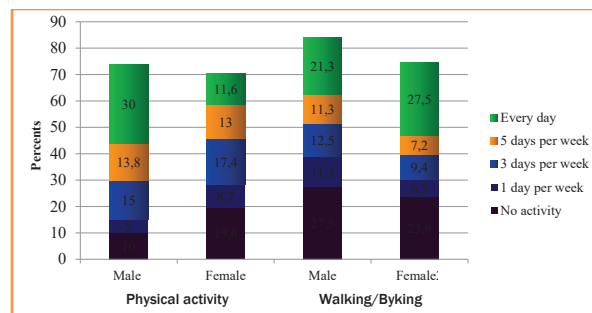


Figure 4. Physical activity (days per week)

Conclusion

Nutritional habits of young Bulgarians are not good enough. Fruits and vegetables intake is insufficient in contrast to the frequent use of fast food and nonalcoholic beverages. The use of tobacco and alcohol products begins too early in childhood. An increase in physical activity among young people is recommended. There is necessity of more adequate health promotion.

References

Aune D. et al. (2017) Fruit and vegetable intake and the risk of cardiovascular disease, total cancer and all-cause mortality – a systematic review and dose-response meta-analysis of prospective studies. *International Journal of Epidemiology*, 1029–1056
http://www.who.int/substance_abuse/publications/global_alcohol_report/en/ (access 09/17/2017)
http://www.who.int/tobacco/global_report/2015/en/

(access 09/17/2017)

- Janssen I, Leblanc AG. (2010) Systematic review of the health benefits of physical activity and fitness in school-aged children and youth. *IJBNPA*, 7:40.
- Laura K, et al. (2016) Youth Risk Behavior Surveillance – United States, 2015. *MMWR*. 65(6):1–174.
- Long M. et al. (2013) School-day and overall physical activity among youth. *Am J Prev Med*. Aug; 45(2):150–7.
- Loprinzi PD, et al. (2015) Association of concurrent healthy eating and regular physical activity with cardiovascular disease risk factors in US youth. *A JHP*, 30 (1): 2–8.
- National behavioral risk factor survey among population aged 25–64 (2009), *Bulgarian Journal of Public health*, vol. I, № 3(1)
- National Dietary Intake and Status Study in Bulgarian Schoolchildren (2003). Edited by S. Petrova, NCPHP
- Paganini-Hill A. (2007) Non-alcoholic beverage and caffeine consumption and mortality: the Leisure World Cohort Study. *Prev Med*. April; 44(4): 305–310.
- Rosenheck R. (2008) Fast food consumption and increased caloric intake: a systematic review of a trajectory towards weight gain and obesity risk. *Obesity reviews*, 9: 535–547
- Sachdeva S. et al. (2013) Increasing Fruit and Vegetable Consumption: Challenges and Opportunities. *Indian J Community Med*, Oct-Dec; 38(4): 192–197.
- Xia Wang et al. (2014) Fruit and vegetable consumption and mortality from all causes, cardiovascular disease, and cancer: systematic review and dose-response meta-analysis of prospective cohort studies. *BMJ*. 349: g4490 doi:10.1136/bmj.g4490 (Published 29 July 2014)

Corresponding address:

Evelina Miloshova MD, PhD

NSA “V. Levski”

Studentski grad 1700

Sofia, Bulgaria

Phone: 0240 14 344

E-mail: emiloshova@yahoo.com

ANTHROPOMETRIC NUTRITIONAL STATUS OF 11-14 YEAR OLD PUPILS OF SOFIA MUNICIPALITY

Nikolay Zaekov, Georgi Bogdanov,
Magdalena Baymakova, Mariya Zaharinova

Summary

The aim of this study was to assess the nutritional status and extracurricular physical activity of Sofia Municipality pupils depending on school conditions.

Methodology: the height and weight were measured of 123 respondents (boys and girls, with mean age 12.4 ± 0.9 years) from three schools, each of whom was later asked to complete questionnaires that contain questions about age, gender, extracurricular physical activity and dietary intake over the last 24 hours. Based on this information, the following factors were assessed: daily nutritional intake, BMI, nutritional status and physical activity. School conditions: School 1 is in a village type district – there is a mess room, however no Fast food places and Physical education lessons are not held on schedule; School 2 is in a central district – there is a Fast food place, no mess room and Physical education lessons are carried out as planned; School 3 is in a central district – there are four Fast food places, no mess room and Physical education lessons are not held on schedule.

Results: In School 1 was observed the highest percent of pupils with below normal BMI – 15.6%. In School 2 pupils with normal BMI were 70.7%, extracurricular physical activities were performed 2.5 ± 1.9 h/week and it is statistically at a lower rank than the other schools. In School 3 there were 32.4% of pupils with above normal BMI. Discussion: The high percentage of pupils with low BMI in school 1 is in accordance with an earlier national survey.

Conclusions: At School 3 which is with various types of Fast food and not realized Physical education lessons was reported the highest percent of pupils with above normal BMI.

Key words: Nutritional intake, Physical activity

Introduction

Essential physiological, cognitive and social changes take place during adolescence. In this important period the adequate nutritional intake is necessary for normal growth and development of adolescents. During this stage imbalanced diet, malnutrition, nutritional deficiencies, overweight and obesity have impact on the health in both adolescents and mature age. This part of the population is one of the groups at greatest risk related to nutrition (National survey, 2003; National survey, 2011). Nutrition of schoolchildren largely depends on their diet at home, on understanding of nutrition and the financial capabilities of their parents (Golden, 2000). Puberty is a period in which the individual's character independence reflects to the pattern of eating, which often leads to significant differences of pupils' nutrition from that of their parents (McElligott-Tangney, 2001). The type of food places at and around schools has a great impact on the

eating habits of a large number of pupils.

Other essential element for normal growth and development of adolescents is Physical activity. According to international recommendations, children aged 5 to 18 should daily have 1 hour moderate to intense physical activity to maintain good health, normal weight (USDA, 2000; Smithers G. et al., 2000; Vuori, 2001; Corbin et al. 1994) and prevent chronic non-infectious diseases related to nutrition as adults (Bar-or, 2002). A school program of Bulgarian schools for children up to 14 years include 3 lessons of physical education and sport for 45 minutes or a total astronomical time of 2 hours and 25 minutes. This means that for pupils' health and the maintenance of normal body weight it is of great importance the additional extracurricular moderate to intense physical activity (Popivanova, 2001).

Aim and Objectives of the study

The aim of this study was to assess the nutritional status and extracurricular physical activity of Sofia Municipality pupils depending on school conditions.

Methods

Subjects

The study involved 193 students (52 boys and 71 girls) from 5th to 7th class, between 11 to 14 years old. The study was conducted at school time at the end of the school year.

Study design

Randomly were selected three schools from different regions of Sofia Municipality. Schools were conditionally named School 1, School 2 and School 3.

School conditions: School 1 is in a village type district – there is a mess room, however no Fast food places and Physical education lessons are not held on schedule; School 2 is in a central district – there is a Fast food place, no mess room and Physical ed-

ucation lessons are carried out as planned; School 3 is in a central district – there are four Fast food places, no mess room and Physical education lessons are not held on schedule.

The interviewer conducted the survey separately in each class, starting with a detailed explanation of how the pupils would fill in the questionnaire as much as possible.

Anthropometric indicators

Body mass was recorded to the nearest 0,05kg using a portable digital scale with each subject wearing light clothing and no footwear. Height was measured to the nearest 0,5cm.

Nutritional status

Nutritional status was assessed through anthropometric indicators based of measured height and weight. Body Mass Index (BMI = kg/m²) was used.

Table 1. BMI scale for children (WHO 2007).

Age (years)	Boys			Girls		
	Under-weight if BMI is below	Over-weight if BMI is above	Obese if BMI is above	Under-weight if BMI is below	Over-weight if BMI is above	Obese if BMI is above
11	14.8	19.6	22.2	14.7	20.1	23.0
12	15.3	20.3	23.2	15.2	21.0	24.1
13	15.8	21.1	24.1	15.7	21.7	25.0
14	16.3	21.9	24.8	16.2	22.4	26.0

Daily energy intake

The data for Daily energy intake (DEI) were collected using the 24-hour recall method.

Extracurricular physical activity

Information for extracurricular physical activity (ECPA) was collected by a questionnaire (hours/week and times/week of moderate to intensive physical activity)

Statistical analysis

The data are presented as a mean and standard deviation. Criterion for significance was set at p < 0.05.

Results

Table 2 presents the nutritional status of the surveyed subjects in terms of Body Mass Index separately for boys and girls in individual schools.

School 1 has the highest percentage of underweight pupils – 15.6, while at School 2 it is only 2.4%. More than 2/3 of schoolchildren at School 2 are with normal body weight. In schools 2 and 3, nearly 1/4 of the persons are overweight. At School 3, the highest percentage of obese people was reported.

Table 2. Nutritional status in terms of BMI.

BMI	School 1 (n=45)	School 2 (n=41)	School 3 (n=37)
Under-weight	15.6%	2.4%	8.1%
Normal weight	55.6%	70.7%	59.5%
Over-weight	24.4%	19.5%	24.3%
Obese	4.4%	7.3%	8.1%

Table 3. Extracurricular physical activity.

Number of times a week	School 1 (n=45)	School 2 (n=41)	School 3 (n=37)
0	20%	24%	11%
1	4%	7%	8%
2	18%	17%	14%
3	7%	15%	19%
4	13%	17%	14%
5	11%	17%	19%
6	7%	2%	3%
7	13%	0%	3%
> 7	7%	0%	11%

The frequency of extracurricular physical activity in the three schools is presented in Table 3. School 2 has the highest percentage of schoolchildren who do not exercise extracurricular physical activity. On this indicator then rank School 1 with 20% and School 3 with 11%, this has the most children trained more than 7 times a week. The majority of pupils are trained on average between 2 and 5 times

a week (49% in School 1 and 66% in Schools 2 and 3). In School 2 there are no individuals reporting that they practice 7 or more times a week.

In terms of extracurricular physical activity, boys are more active than girls and also schoolchildren at School 1 and 3 are more active than this at school 2 (Table 4).

Table 4. Average extracurricular physical activity.

	Boys (n=71)	Girls (n=52)	Total (n=123)	School 1 (n=45)	School 2 (n=41)	School 3 (n=37)
Number of times a week	2.8 ± 2.0 *	3.9 ± 2.7 *	3.2 ± 2.4	3.6 ± 2.6 **	2.5 ± 1.9 **,***	3.6 ± 2.3 ***

*, **, *** – $p < 0.05$

Table 5 shows the average daily energy intake (DEI) compared with recommended daily energy needs (DEN) (National survey, 2003; WHO, 2000) for pupils in the three schools.

DEN of girls from School 3 is closest to the recommended values, and the highest deviation from the norms in the positive direction is in School 1 (nearly 500 kcal/24h). The boys in all three schools have DEN in the recommended values.

Table 5. DEI compared with recommended DEN.

	School 1 (n=45)		School 2 (n=41)		School 3 (n=37)	
	Girls	Boys	Girls	Boys	Girls	Boys
DEI (kcal/24h)	2690 ±1073	2543 ±1384	2436 ±843	2516 ±817	2267 ±971	2423 ±686
DEN (kcal/24h) WHO (2000)	2200	2500	2200	2500	2200	2500

Discussion

For the assessment of BMI-based nutritional status and the risk of overweight in adolescents, the WHO criteria used for the determination of overweight and obesity, age and gender differentiation based on a reference population (Cole et al., 2000) were applied. Analysis of BMI data by schools (Table 8) reported the highest percentage of pupils with BMI under the norm in School 1 (15.6%). This school is located on the territory of village district,

while School 2 and School 3 are located in residential complexes on the urban part Sofia Municipality. In National survey 2003, also reported a higher percentage of BMI individuals below the norm amongst rural residents than those in the city boys and girls aged 10–14 years.

In School 2, where the physical education lessons are carried out as planned, we report the highest percentage of children with normal BMI (70.7%).

In School 3, where the choice of food is restricted to fast food restaurants offering mainly fried foods, dinners, sandwiches and burgers, was reported the highest percentage of overweight and obese individuals, respectively 24.3% and 8, 1% – a total of 32.4% (almost 1/3 of the surveyed persons).

In School 1, where the food offered in the school area is a mess room, was accounted the smallest percentage of obese children – 4.4%.

The proportionality of the results of our study coincides with that in National Survey 2003, where the percentage of non-training girls and boys aged 10–14 is 11.2% and 4.5% respectively, but the values are twice lower. For those who train 7 or more times a week – girls are less than boys, respectively 8.7% and 17.0%.

Comparing the frequency of weekly extracurricular physical activity (Table 4), in individual schools (School 1, 2 and 3) with BMI was found that:

- in School 3, which has the lowest percentage of untrained (11%), a high percentage of people with frequency of ECPA between 2 and 5 times a week (66%) and 14% of people with 7 or more times we report the highest percentage of people with overweight and obese (a total of 32.4%). But this is the school where, at school time, the choice of children's food is limited to fast food;

– In School 2, where physical education lessons are held with the planned physical activity, there are no pupils who have marked that they practice 7 or more times ECPA. Here is also the highest percentage of those who do not train or train only once a week (31%) although this is the school with the highest percentage of normal BMI.

Perhaps this is due to the actual physical activity lasting 2 hours and 25 minutes weekly (3 lessons of physical education x 45 minutes).

Acknowledgements

We thank our colleagues, and investigated children for their assistance.

References

- Bar-Or, O. (2002), Health benefits of physical activity during childhood and adolescence, PCPFS Research Digest, No 4, pp. 17–21.
- Cole, T.J., Bellizzi, M.C., Flegal, K.M. and Dietz, W.H. (2000), Establishing a standard definition for child overweight and obesity worldwide: international survey. *Br. Med. J.*, 320, pp. 1–6.
- Corbin, C.B., Pangrazi, R.P. and Welk, G.J. (1994), Toward an understanding of appropriate physical activity levels for youth. *Sports Physical Activity and Fitness Research Digest*. 1(8), pp. 1–8.
- Golden, B. (2000), Infancy, childhood and adolescence. In: *Human Nutrition and Dietetics*, 10th ed., Churchill Livingstone.
- McElligott-Tangney, P. and Morrissey P.A. (2001), Nutrition and lifestyle survey of 15–17-year-old second level school pupils in the Cork city area. *Ir Med J.* Feb, 94(2), pp. 43–4.
- National survey on nutrition and nutritional status of schoolchildren in Bulgaria, (2003).
- National survey on nutritional status of school-children in Bulgaria, (2011).
- Popivanova, Ts., Uzunova, A., Antonova, Ts., Damyanova, R., Ruskova, R. R., Duleva, V., Todorova, G., Baikova, D., Yotova, E., Danev, S.G. and Datsov, E., (2001), Some health hygiene and psycho-social problems of physical activity in school age, *Sports and Science* 2, pp. 86–94.
- Smithers G., Gregory J.R., Bates C.J., Prentice A., Jackson L. V. and Wenlock R. (2000), *The National Diet and Nutrition Survey: young people aged 4–18 years*, British Nutrition Foundation, London
- USDA, (2000) US Department of Health and Human Services Nutrition and your health: dietary guidelines for Americans, 5th ed. Home and Garden Bulletin No 232, Washington, DC.
- Vuori, I.M. (2001), Health benefits of physical activity with special reference to interaction with diet, *Public Health Nutrition*, Vol 4, N2(B), pp. 517–528.
- WHO (2000) CINDI dietary guide, WHO Regional Office for Europe, Copenhagen
- WHO (2007) Reference for 5–19 years to monitor the growth of school-age children and adolescents.

Corresponding address: Nikolay Zaekov, PhD

Chief assistant on Biochemistry in Department of Physiology and Biochemistry, National Sports Academy, Sofia 1700, Bulgaria,

Phone: +359893396573

E-mail: nzaekov@abv.bg

ANTHROPOMETRIC AND SOMATOTYPE CHARACTERISTICS OF RACERS IN DIFFERENT SKI EVENTS

Bogdana Ilinova, Maria Toteva.

Key words: Body structure, somatotype, ski-racers

Body structure, form and dimensions are closely related to human motor functions. They are a morphological predisposition for the achievement of high performances in different sports. The successful presentation in the certain sport depends on wide variety of factors and part of them are a proper morphological structure, body composition and somatotype of the athletes from the corresponding sport. The interconnection between the structure of the body and its functional abilities plays a significant role in the training process for obtaining the best sports results.

Anthropometry has been widely used by different researchers to clarify variations in body profiles between numerous sports. (Reilly et al. 1990; Wilber & Pitsiladis, 2012). Physical characteristics and body structure of young athletes are also important criteria for coaches (Mildner et al. 2010). The somatotype, being a quantitative description of the present shape and composition of the human body may be used as a tool for sport selection among young athletes (Carter & Heath, 1990; Groshev & Toteva, 2002) and even within the same sport individual anthropometric characteristics are related to athlete's performance level. This makes the evaluation of the anthropometry in the athletic population very interesting in order to describe the best body profiles for the certain sport.

Material and methods

An anthropometric investigation of male ski racers, participating in different ski events was done. The athletes included in the present study were divided in the following three groups. 35 down-hill racers at mean age 22,3 years, 30 cross-country racers at mean age 21,5 years, and 25 ski jumpers at mean age 21,2 years.

Several anthropometric variables, needed for calculating of somatotype components (Carter, 2002)

were collected. Body height was measured to the nearest 0,1cm with Martin anthropometer. Body weight was determined with electronic body weight scale with accuracy up to 200 grams. Body Mass Index was calculated. Upper arm, thigh and calf circumferences were measured, using plastic measuring type to the nearest 0,1cm. The skinfolds were measured using Lange skinfold caliper with an accuracy up to 0,1cm. Bi-epicondilar humerus and femur breadths were measured with bone caliper, accurate up to 0,1cm. Over the measured parameters somatotype components (endomorph, mesomorph and ectomorph) were calculated. (Carter & Heath, 1990; Carter 2002)

The data were submitted to a statistical processing by means of the variation analysis

Results and discussion

Ski racers are of middle stature. The greatest high value being found in cross-country skiers (176,8cm), followed by the values obtained from down-hill (173,4cm) and ski jumping racers (172,8cm). The difference in the height between the last two groups is not statistically significant. Racers in ski jumping indicate the heaviest body weight (72,8kg). Similar values are found in down-hill racers (71,8kg). Cross-country skiers are with lowest mean values of body weight (70kg).

The circumferences of the lower extremities, and especially the thigh, show the lowest measures in cross-country skiers, due to the biomechanics of the event. The arm circumferences of the same group also indicate the lowest values. This fact can be explained by the cyclic movement of the upper extremities and the prevailing participation of the extensor muscles, which does not permit a considerable muscle hypertrophy to be developed. The bone diameters of the extremities attest to a good skeleton development in all ski racers. Some par-

ticular morphological specificities however were found in skiers, practicing the respective event – the down-hill racers have the largest elbow diameters, the ski jumpers – the greatest knee diameters, and the cross-country racers have the lowest values for the observed bone diameters. The sum of the skinfolds proves to be the lowest in cross-country skiers and the respective values obtained from ski jumping and down-hill racers were almost equal. The character of the physical loading in the par-

ticular ski event leads to a specific localization of the fat tissue. The lowest values for fat tissue were obtained from the lower extremities of the competitors in ski jumping and from the upper extremities of the down-hill racers

The observed parameters allow to draw up a somatotype characteristics of the racers in the respective events. (Table1)

Table 1: Body Height, Body Weight, BMI and Somatotype of Skiers, Participating in Different Ski Events.

		Body Height (cm)	Body Weight (kg)	BMI	Endomorphy	Mesomorphy	Ectomorphy
Down – hill racers	–	173,4	71,8	23,88	2,56	6,16	1,9
	X	4,8	5,09	1,9	1,09	1,12	0,98
	S						
Cross – country skiers	–	176,8	70,0	21,78	2,05	5,36	2,7
	X	3,9	5,0	0,9	0,83	0,71	0,69
	S						
Ski – jumpers	–	172,8	72,9	24,46	2,50	6,50	1,7
	X	5,7	5,3	1,2	0,98	0,91	0,81
	S						

Endomorphy, characterizing the relative part of the fat tissue, is moderately expressed in ski racers. The endomorphy component in cross-country racers indicates considerably lower ratios (2,05), while in down-hill racers and in ski jumpers are as follows – 2,56, and 2,50, which are almost equal.

Mesomorphy is the leading component in skiers, which exhibits a good muscle-skeleton development. It is most expressed in ski jumpers (6,50), not very much different in down-hill racers (6,16) and considerably lower in cross-country racers (5,36). The best qualified racers indicate the highest mesomorphy components, which gives us enough reason to assume that it is the main morphological predisposition for a good physical working capacity.

Ectomorphy is most clearly expressed in cross-country skiers due to the longer body proportions and the high values of the relation height/weight.

An endo-mesomorphic somatotype was established in down-hill racers with values 2,56–6,16–1,9. Similar are the ratings obtained from ski jumpers 2,50–6,50–1,7. The most homogenous with regard to body structure is the group of cross-country skiers which exhibit an ecto-mesomorphyc somatotype 2,05–5,36–2,7. The mean somatotype evaluations

for each event are presented on fig.1.

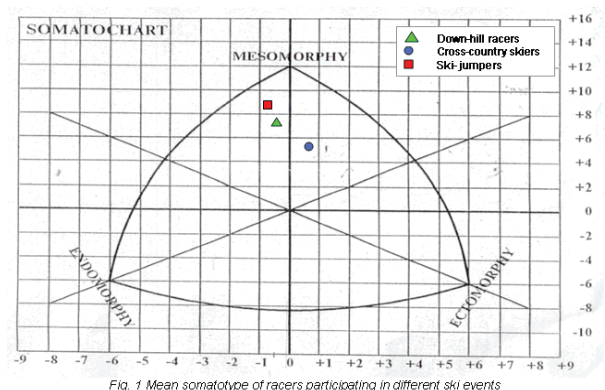


Fig. 1 Mean somatotype of racers participating in different ski events

The estimated parameter SDD (critical value 2,0) indicates statistically significant differences between the somatotypes of cross-country skiers and of the racers in the other two events.

Our findings correspond to these of Chovanova (1979) and Orvanova (1987), and White & Johnson (1991)

In an interesting study Vermeulen et al. (2017), investigating body characteristics of elite alpine skiers, divided in TECH (Slalom and Giant Slalom) and SPEED (Super Giant Slalom and Downhill) events found an edno-mesomorphic somatotype with mean values 2,8–5,6–1,8 for TECH racers and 3,1–6,4–1,4 for SPEED racers. This data concurs to

our findings in concern to samotypic characteristics of down-hill skiers. But the investigated from Vermeulen et al. (2017) elite alpine skiers are taller and heavier than our down-hill skiers. A heavy body profile is beneficial in alpine skiing, because it helps overcome frictional forces through a higher amount of potential energy (Gilgien et al. 2013). Body mass, preferably in the form of high muscularity is an important factor of success in elite alpine skiers, while a certain degree of body fatness can be functional as it may support the effect of gravity.

Taeymans et al. (2011) also found an endo-mesomorphic somatotype of alpine skiers 2,93–6,03–1,58

Conclusions

The following conclusions can be drawn from our investigation:

The racers in the observed ski events show specific structural features.

Down-hill and ski jumping racers exhibit a similar endo-mesomorphic somatotype.

Cross-country skiers have ecto-mesomorphic somatotype, differing significantly from the somotypic characteristics of the other two events.

Mesomorphy in ski racers is very well expressed and it can be considered as a morphobiological predisposition for a good physical working capacity.

References

Carter & Heath B (1990). *Somatotyping – Development and Applications* Press syndicate of the University of Cambridge (vol.5) New York.

Carter L (Ed) (2002) *The Heath – Carter Anthropometric Somatotype* (2nd ed.) San Diego, Ca.

Choranova E (1979) *Phisique of Top Ice Hockey Players and skiers and its Relation to Their Specialisation*. *Collegium Anthropologicum*, 3, 189–193.

Gilgien M, Sporry I, Kroll I, Chardonnens I, & Erich M (2013) *Determination of External Forces in Alpine Skiing Using a Differential Global Navigation Satellite System, Sensors*, 13, 9821–9835.

Groshev O, Toteva M (2002), *Age Reculiarities in the Somatotype Characteristics of Adolescent Skiers*, *Sport Science* 3, 78–82.

Mildner E, Barth M, Erin G, Kribernegg R, Standacher A & Raschner C. (2010) *Relationship between physical fitness, ski – technique and racing results of young alpine ski racers*, 5th Int. Congr. on Science and skiing, p 23, Austria.

Orvanova E (1987) *Physical Structure of Winter Sports Athletes*, *Journal of Sports Sciences*, 5, 197–248.

Relly T, Secher N, Snell P & Williams C. (1990), *Physiology of sports*. E & FN Sport.

Taeymans J, Aerenhonts D, Clijsten R, Fassler R, Clancy P & Baeyens J. (2010) *Somatotype and Kinanthropic Characteristics of Male and Female Junior and Elite Senior Alpine Skiers*, 5th Int. Congr. on Science and skiing (Austria) p. 452–460

Vermeulen B, Clijsten R, Fassler R, Taeymans J, D'Hondt E & Aerenhonts D (2017) *Event Specific Body Characteristics of Elite Alpine Skiers in Relation to International Rankings*, *Advances in Anthropology*, 7, 94–106.

White A & Johnson S (1991) *Physiological Comparison of International and Regional Alpine skiers*. *International Journal of Sports Medicine*, 12, 374–378.

Wilber R & Pitsiladis Y (2012) *Kenyan and Ethiopian Distance Runners What Makes them so Good?* *International Journal of Sports Physiology and Performance*, 7, 92–102.

Bogdana Ilinova MD PhD

Assoc. Professor Dep. of Sports Medicine

National Sports Academy „Vassil Levski”, Sofia, Bulgaria.

e-mail: bogyilinova@abv.bg

Maria Toteva MD DSc Professor

National Sports Academy „Vassil Levski”, Sofia, Bulgaria.

PILATES EFFECTS ON SPINAL COLUMN POSTURAL STATUS: A SYSTEMATIC REVIEW

Bojan Jorgic, Katarina Petrović,

Saša Milenković, Dobrica Živković
University of Nis, Serbia

Abstract:

Pilates exercise programs focus on increasing the strength and flexibility of muscles which make up core stability. Since the same muscles take part in maintaining proper posture, the aim of this study was to provide an overview of the existing research in order to determine the effects of a pilates exercise program on the improvement of postural status. When searching electronic databases, the following key words were used: spine, posture, effect, pilates, kyphosis, scoliosis, lordosis. Based on the set criteria, that the research was published after 2010 and that the applied pilates exercise programs focused on correcting postural status, the final analysis included 10 studies. An analysis of the characteristics of the sample of participants indicates that the problem of postural disorders is equally present among individuals of various ages. In terms of gender, in the analyzed studies the female population was almost four times the size of the male population. In most of the studies the exercise program lasted for 8 and 12 weeks, with 2 to 3 training sessions per week, with a duration of 60 min. Eight of the analyzed studies show that pilates exercise programs led to an improvement in the postural status. Based on the extensive analysis, it can be concluded that pilates has positive effects on the correction of postural disorders of the spinal column, such as kyphosis, lordosis and scoliosis among people of different ages.

Key words: corrective exercise, scoliosis, lordosis, kyphosis

Introduction

Proper posture represents the correct positioning of segments of the body (muscles, ligaments and bone tissue) whose role it is to, with the lowest possible expenditure of energy, enable its maintenance (Jovović, 2008). Deviation from proper posture or any disturbances of the postural status require a greater expenditure of energy and lead to the limited movement of the particular segment where the problem is located (Sabo, 2006; Milenković, 2007). The side-effects which emerge as a result of external and internal factors can cause a disturbance of the postural status of the spinal column (Jovović, 2008). The postural disorders of the spinal column occur in the frontal and sagittal plane, and can be noted based on convexity which can be directed towards the inside (lordotic posture) or outwards (kyphotic posture) or can be external that is directed either toward one or the other side of the frontal plane (scoliotic posture) (Živković, 2000; Milenković, 2007). Corrective exercise programs are meant to, with the help of proper dosing of physical exercise, correct any disorders of the postural status of the spinal column (Živković, 2009; Jovović, 2008). One of these programs which could be used is pilates, which was designed by Joseph Pilates in the first half of the twentieth centu-

ry, and which represents a combination of various physical exercise programs with the sole goal of establishing muscle balance based on strength of mind (Šiler, 2005; Krejg, 2005; Wells et al., 2012; Cvetković et al., 2008). With the proper selection of exercises with controlled dosing, pilates programs can influence the correction of postural disorders of the spinal column (Nikolov, 2014). Their goal is to establish a balance between the muscle strength of the entire body and to maintain their harmonious synchronicity. Pilates exercise programs focus on increasing the strength and flexibility of muscles which make up core stability. Since the same muscles take part in maintaining proper posture, the *aim* of this study was to provide an overview of the existing research to determine the effects of a pilates exercise programs on the improvement of postural status.

Methodology

In order to analyze the existing studies, we used the following electronic databases: Google Scholar, SCIndeks, MEDLINE, SPORTDiscus, PubMed and Web of Science. When searching the databases we used the following key words: Correct posture of spine, posture of spine, effect pilates exercises, kyphosis, scoliosis, lordosis. The identified titles of the

studies, abstracts and entire texts were analyzed and selected based on the following criteria: whether the studies were published during the period between 2010 and 2016, whether the participants were diagnosed with postural status disorders of the spinal column, and whether the participants were subjected to a pilates exercise program focused on the correction of the postural status of the spinal column.

The studies which met the set criteria were then analyzed and presented based on the following parameters: references (the first letter of the author's name and the year of publication), the sample of

participants (the number of participants, age of the participants, gender of the participants and the number of groups of participants), the experimental treatment, monitored parameters, measuring instruments and the research results

Results

Compiling the research, the analysis of the individual papers and their selection is shown in figure 1. After various levels of selection, it was determined that 11 papers met the set criteria and what ensued was their detailed analysis.

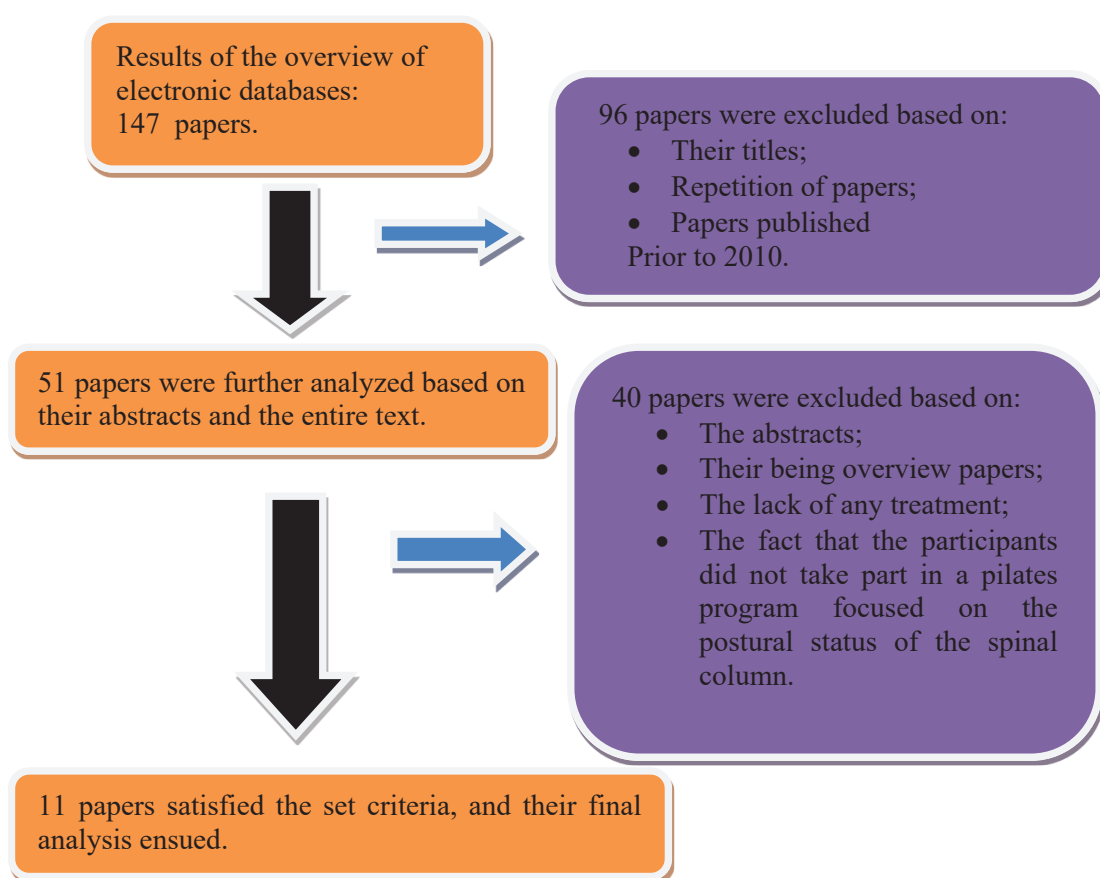


Figure 1. The analysis procedure of the selected papers

The results of the analyzed studies are shown in table 1. Starting from 2010, most of the papers on the topic of the effects of pilates exercise programs on postural status was published in 2016, while from 2011 to 2015 no papers of this type were published. In terms of the number of participants, the smallest number of participants were found in the work of Emery et al. (2010) while the largest number of

participants (n=50) were included in the work of Kloubec et al. (2010). In eight papers the samples of participants were divided into an experimental group and a control group, while in one paper the participants were divided into two experimental groups (Kim et al., 2016), and in yet another there was only one experimental group (Krawczyk et al., 2016).

Table 1. An overview of the compiled and analyzed studies

F I R S T A U T H O R A N D Y E A R	S A M P L E O F P A R T I C I P A N T S			E X P E R I M E N T A L T R E A T M E N T			R E S U L T S	
	Number	G e n - d e r	Year	Program	Duration	Measuring instru- ment		Outcomes
Emery, 2010.	n=19; 1E(n=10), 1K (n=9)	M/F	E (± 33.1 8.6), K (± 28.6 3.7)	Pilates (exercises for strengthening abdominal muscula- ture)	UT'=12 weeks; NU=2; TT=60 minutes.	Vicon 512 Motion Analysis System,	The angle of kyphosis measured in a seated position	1E: sig. decrease in kyphosis measures at rest in a seated position
Kloubec 2010.	n=50; 1E(n=25), 1K (n=25)	M/F	E (58-26); K (30-59)	Pilates (exercises for muscle endurance and flexibility of the abdomen)	UT=12 weeks; NU=2; TT=60 minutes	A coordinate network for the postural analysis.	Postural status	No significant differences were determined between groups in terms of postural status.
De Araújo, 2012.	n=31; 1E(n=20), 1K (n=11)	F	18-25	Pilates (exercises for muscle endurance and flexibility with the help of props)	UT=36 weeks; NU=2; TT=60 minutes.	Adam's test, a radio- graphic method and Cobb's angle	Angle of the dorsal lumbar scoliosis.	1E: sig. angle of scoliosis
Junges, 2012.	n=41; 1E(n=22), 1K(n=19)	F	Mean 59± 9	Pilates (basic deep breathing exercises and strength and stretching exercises)	UT= 30 weeks; NU= 2; TT= 60 minutes.	Cobb's angle, Fisimet- rix program	The angle of ky- phosis, postural status	1E: sig. angle of kyphosis; sig.* postural status
Rezaei, 2014.	n=30; 1E(n=15), 1K(n=15)	F	E (± 28.86 4.75); K (± 28.2 4.68)	Pilates (strength and flexibility exercises)	UT= 8 weeks; NU= 3; TT= 60 minutes	A flexible ruler	Lumbar lor- dosis	1E: sig. angle of lordosis
Sinzato, 2013.	n=33; 1E(n=14), 1K(n=19)	F	18-30	Pilates (strength and flexibility exercises)	UT=10 weeks, NU=2; TT= 60 minutes	Postural Assessment software	Postural status	No significant differences were determined between groups in terms of postural status.
Schroeder, 2014.	n=24; 1E (n=10), 1K(n=14)	F	33-53	Pilates (strength and muscle flexibil- ity exercises)	UT= 12 weeks; NU= 1; TT= 60 minutes	An analysis of the spinal shapes (stereg- ographic algorithm)	The angle of ky- phosis, angle of lordosis, pelvic incline, length of the spinal column	1E: sig. angle of kyphosis, sig. length of the spinal column; no other differences.
Kim, 2016.	n=24; 1E(n=12), 2E (n=12)	F	1E (Mean±SD = 15.6 ± 1.1); 2E (Mean= 15.3 ± 0.8)	1E - Schroth exercises 2E - pilates (cor- rective exercises, exercises of strength and bal	UT= 12 weeks; NU= 3; TT= 60 minutes	Radiography (Cobb's angle)	The angle of scoliosis	For both groups a sig. decrease in the angle of scoliosis was noted, where the improvement was greater for the 1E.
Krawczyk, 2016.	1E(n=13)	M/F	18-59	Pilates (exercises of flexibility and strength)	UT= 8 weeks; NU=2; TT= 60 minutes	SAPO software	The angle of ky- phosis, lordosis, the horizontal position of the head, pelvis)	1E: sig. a decrease in the angle of ky- phosis and lordosis
Navega, 2016.	n=31; 1E(n=14), 1K(n=17)	F	60-75	Pilates (exercises for stretching muscles and hips, and torso stabilization)	UT= 8 weeks; NU= 2. TT= 60 minutes	biophotogrammetry	The angle of kyphosis	1E: sig. decrease in the angle of kyphosis

M - male participant; F - female participant; 1E - first experimental group; 2E - second experimental group; 1K - control group; sig. ↑ - statistically significant increase in the results; sig. ↓ - statistically significant reduction in the results; UT - overall duration of the program; NU - weekly frequency; TT - duration of each individual training session.

In three of the ten studies, the sample of participants consisted of individuals of both genders (Emery et al., 2010; Kloubec et al., 2010; Krawczyk et al., 2016) while in the remaining papers the samples of participants were made up of women. The youngest population (average age = 15) included in a study was found in the work done by (Kim et al., 2016), while the oldest (60-75) was found in the work of Navega et al. (2016). In nine of the ten papers the experimental treatment that was used was only a pilates program, while in the work of Kim et al. (2016), in addition to a pilates program, the Schroth method was also used. The pilates exercise programs consisted of exercises performed without props and apparatuses, except in the work of De Araújo et al. (2012) which relied on theraband resistance bands, pilates balls and steppers. The exercises which were implemented had as a goal to increase flexibility and strength of the muscles. The duration of the exercise program lasted from at least 8 weeks in the studies (Rezei et al., 2014; Krawczyk et al., 2016, Navega et al., 2016) up to 36 weeks in the work of De Araújo et al. (2012). In most of the studies the exercise programs lasted from 8 to 12 weeks. The weekly frequency was twice a week in seven studies, in two of the studies it was three times a week, while a frequency of only once a week was noted in the study of Schroeder et al. (2014). In all the studies the duration of an individual training session was 60 minutes. The studies monitored various parameters which refer to the postural status, as well as parameters which refer to postural disorders on the spinal column. That was why the angles of kyphosis, lordosis and scoliosis were measured, along with the horizontal positions of the head, the horizontal position of the pelvis, the angle of the hips, and the vertical position of the body. In eight of the ten studies the implemented programs of pilates exercises led to an improvement in the results, in the sense that there was a decrease in the angles of lordosis, kyphosis, scoliosis as well as positive changes in other measured parameters. Only in the works of Kloubec et al., (2010) and Sinzato et al. (2013) were no improvements noted in the measured parameters of postural status.

Discussion

Based on the year of publication of the analyzed papers, we can note that the research into the effects of the implementation of pilates programs on postural status is very current, since it is precisely in 2016 that most of the papers were published. In

the case of the gender of the participants involved in the pilates programs for the correction of postural disorders, there were almost four times as many women as men. This gives us room to study the effects of the pilates program on the correction of postural disorders among male participants, considering the gender differences in the motor skills. When it comes to the age of the participants, we can note that the problem of postural disorders is equally present among participants, irrespective of age, from adolescence to old age, where most of the analyzed cases involved a population with an average age of 20 to 65. Compared to postural disorders, we can say that most of the participants showed signs of the changes in postural status located on the frontal plane (scoliosis) and on the sagittal plane (kyphosis and lordosis). Based on the analysis of the overall program duration, and the weekly frequency of duration of individual training sessions, we can conclude that the pilates programs which lasted from 8 to 12 weeks with a weekly frequency of two or three times a week, and sixty-minute training sessions, have positive effects on the correction of postural disorders of the spinal column. This kind of information is significant because it indicates that postural disorders can be corrected by implementing pilates exercise programs over a relatively short period of time of 2 to 3 months, which can certainly have a positive effect on people with this condition, influencing them to opt for this corrective exercise program.

Conclusion

Based on the extensive analysis, it can be concluded that pilates programs which last from 8 to 12 weeks, with a weekly frequency of 2 to 3 times a week, with a minimum duration of individual training sessions of 60 min have positive effects on the correction of postural disorders of the spinal column, such as kyphosis, lordosis and scoliosis among people of different ages.

References

- Cvetković, M., Obradović, J. and Kalajdžić, J. (2008), Efekti pilatesa na morfološke karakteristike studentkinja fakulteta fizičke culture [The effects of pilates on the morphological characteristics of female physical education students] *Glasnik Antropološkog društva Srbije*, 43, 605-613.
- De Araújo, M. E. A., da Silva, E. B., Mello, D. B., Cader, S. A., Salgado, A. S. I. and Dantas, E. H. M. (2012). *The effectiveness of the Pilates method: reducing the degree of non-structural scoliosis, and improving flexibility and*

- pain in female college students*, Journal of bodywork and movement therapies, 16(2), 191-198.
- Emery, K., De Serres, S. J., McMillan, A. and Côté, J. N. (2010), *The effects of a Pilates training program on arm-trunk posture and movement*, Clinical Biomechanics, 25(2), 124-130.
- Jovović, V. (2008), *Korektivna gimnastika sa kineziterapijom*. [Corrective gymnastics with kinesitherapy] Filozofski fakultet, Nikšić.
- Junges, S., Gottlieb, M. G., Baptista, R. R., Quadros, C. B. D., Resende, T. D. L. and Gomes, I. (2012), *Effectiveness of pilates method for the posture and flexibility of women with hyperkyphosis*. Rev Bras Cienc Mov, 20(1), 21-33.
- Kim, G. and HwangBo, P. N. (2016), *Effects of Schroth and Pilates exercises on the Cobb angle and weight distribution of patients with scoliosis*, Journal of physical therapy science, 28(3), 1012-1015.
- Kloubec, J. A. (2010), *Pilates for improvement of muscle endurance, flexibility, balance, and posture*, The Journal of Strength & Conditioning Research, 24(3), 661-667.
- Krawczyk, B., Mainenti, M. R. M. and Pacheco, A. G. F. (2016), *The impact of pilates exercises on the postural alignment of healthy adults*, Revista Brasileira de Medicina do Esporte, 22(6), 485-490.
- Krejk, K. (2005), *Pilates na lopti*. [Pilates on a ball] Luka Štampa, Beograd.
- Milenković, S. (2007), *Korektivna gimnastika, teorija i vezbe* [Corrective gymnastics, theory and practice]. SIA, Niš
- Navega, M. T., Furlanetto, M. G., Lorenzo, D. M., Morcelli, M. H. and Tozim, B. M. (2016). *Effect of the Mat Pilates method on postural balance and thoracic hyperkyphosis among elderly women: a randomized controlled trial*, Revista Brasileira de Geriatria e Gerontologia, 19(3), 465-472.
- Nikolov, M. (2014), *Uloga pilates vežbi u kondicijskoj pripremi sportista* [The role of pilates in the fitness training of athletes], Bachelor's thesis, Fakultet sporta i fizičkog vaspitanja, Beograd.
- Sabo, E. (2006), *Posturalni status dece predškolskog uzrasta na teritoriji AP Vojvodine* [Postural status of preschool children on the territory of the AP Vojvodina], Fizička kultura, 60(2), 157-164.
- Rezaei, A., Mahdavinejad, R. and Rezaei, S.S. (2014), *Pilates's selected exercises effects on women's lumbar hyperlordosis in immediate post-partum period*, Asian Journal of Multidisciplinary Studies, 2(2), 48-53.
- Schroeder, J., Grenz, K., Schaar, H., Liebig, M. and Braumann, K. M. (2014), *Pilates Can Affect Sagittal Spinal Alignment: An Observational Study*, J Spine, 3(180), 2.
- Sinzato, C. R., Taciro, C., Pio, C. D. A., Toledo, A. M. D., Cardoso, J. R. and Carregaro, R. L. (2013), *Effects of 20 sessions of Pilates method on postural alignment and flexibility of young women: pilot study*. Fisioterapia e Pesquisa, 20(2), 143-150.
- Šiler, B. (2005), *Pilates telo* [Pilates body], Akademska štampa, Beograd.
- Wells, C., Kolt, S.G. and Bialocerkowski, A. (2012), *Defining Pilates exercise: A systematic review*, Complementary Therapies in Medicine, 20, 253-262.
- Živković, D. (2000), *Teorija i metodika korektivne gimnastike* [Theory and methodology of corrective gymnastics], SIA, Niš.
- Živković, D. (2009), *Osnove kineziologije sa elementima kliničke kineziologije* [An introduction to kinesiology with elements of clinical kinesiology]. Fakultet sporta i fizičkog vaspitanja, Niš.

Corresponding author:

Jorgic Bojan, PhD, Assistant Professor,
Boulevard Z. Djindjica 73/7, 18000 Niš, Serbia
Telephone number: +381 60 5537118
Email: bojanjorgic@yahoo.com

WHOLE BLOOD VISCOSITY CHANGES AT COAGULATION UNDER COUETTE FLOW

Ivan Ivanov

National Sports Academy "Vassil Levski", Sofia, Bulgaria

Summary

The aim of the study is to observe how blood viscosity was changed in time in Couette blood flow at coagulation and under steady flow at two low shear rates $0,0237\text{ s}^{-1}$ and $0,0596\text{ s}^{-1}$. Blood samples from one donor with different hematocrits were used and 2% aqueous solution of CaCl_2 was added to initiate coagulation. The whole blood viscosity increases with the progress of coagulation at Couette flow at both shear rates. For detailed estimation of blood clot structure changing in time, three time parameters were introduced: i) whole time duration; ii) initial clot formation time; iii) clot formation time. All these time characteristics of coagulation reveal shear rate and hematocrit dependence. A higher shear rate determines shorter values for them. Higher hematocrit has a tendency for accelerated coagulation.

Key words: blood coagulation, whole blood viscosity, shear rate, Couette flow

Introduction

Blood coagulation is a phenomenon consisting of a number of conversions of plasma constituents which form blood clot. This complex biochemical process consisting of numerous enzymatic chain reactions is influenced by plasma compounds, endothelial and blood cells and by flow conditions. The key role is plasma fibrinogen transformation into structural fibrin. The result is a complicated net formation in which the blood cells are joined (Ivanov, 2006; Antonova, 2001).

The significance of blood flow in thrombosis and hemostasis was recognized as early as the 19th century, as flow being one of the components of the famous Virchow's triad (Lowe, 2003/2004). Two basic hemostatic mechanisms – platelet plug formation and blood coagulation, are known to depend differently on the flow conditions. Platelet adhesion and aggregation require high blood flow velocities, while fibrin deposition occurs better in slowly flowing blood (Shibeko et al., 2010; Baumgartner, 1973; Okorie et al., 2008). Moreover, recent data suggest that fibrin clot formation is inhibited by flow in a threshold-like manner (Shen et al., 2008). This can be observed *in vivo* by the formation of fibrin-rich red thrombi containing erythrocytes in the veins (where shear rate is low) and of platelet-rich white thrombi in the arteries (Brogan, 2002). The above mentioned results emphasize the blood flow importance for hemostasis and fibrin deposition.

The initial microstructure of the fibrin clone con-

sists of a mixed network of entangled and branched fibrin threads. Fibrin thread thickness is a marker for the presence of a certain type of pathology. Fiber mesh of thinner threads with more branching forms a denser thrombus with less permeability. Such a microstructure is known to be directly associated with a thromboembolic disease (Undas et al., 2009; Mills, 2002; Jörneskog et al., 1996).

The time development of the thrombus microstructure is associated with a significant change in the viscoelastic properties of the blood (a measure of the viscous and elastic blood properties). Clot viscoelastic properties are among the most sensitive measures for fibrin polymerization and thrombus structure (Weisel, 2004).

The coagulation process changes the physical properties of blood from a viscoelastic fluid to a viscoelastic solid. The important point between these two conditions has been previously defined as the gel point (GP) (Blomback, Bark, 2004; Evans et al., 2010). Before getting the GP, blood behaves as a non-Newtonian fluid. After the GP, the blood clot under flow exhibits both fluid (viscosity) and solid (elasticity) properties (Ranucci, 2014).

Aim and Objectives of the study

The aim of the study is to observe blood viscosity changes in time in Couette blood flow at coagulation and under steady flow at two low shear rates $0,0237\text{ s}^{-1}$ and $0,0596\text{ s}^{-1}$. To determine the relation between the time characteristics of coagulation,

shear rate and hematocrit.

Methods

Normal blood from a healthy female subject, Rh+, group 0, conserved with CPD-A₁ conserving agent (in ratio 63 ml/450 ml blood from National Centre of Transfusion Hematology, Sofia) was used in this investigation. The whole blood quantity was divided into 10 ml volumes with different hematocrits, which were kept at temperature 4 °C. To initiate coagulation 0,1 ml aqueous solution of 2% CaCl₂ was added to the measured blood samples of 0,8 ml.

The experiments were carried out using rotational viscometer LS30 Contraves, which uses Couette flow geometry, between two coaxial cylinders. The whole blood viscosity (WBV) changes with the evolution of the coagulation process under shear flow were measured. The coagulating samples are subjected at a steady shear flow at two shear rates 0.0237 s⁻¹ and 0.0596 s⁻¹.

Results

The time course of coagulation process (after CaCl₂ addition) was evaluated by blood viscosity recording. At the beginning of this course WBV keeps almost constant values. In case of low hematocrit values (Hct=28%, T=25 °C, shear rate 0.0596 s⁻¹) the WBV rises from 35,04 mPa.s in the 60-th second to 41,61 mPa.s in 510-th seconds (fig. 1). After this period of time WBV increases intensively, reaching a maximum value and slowly decreasing with time.

For detailed estimation of blood clot structure changing, three time parameters were introduced:

- whole time duration (WTD), describes the time interval between CaCl₂ addition and the maximum WBV value;
- initial clot formation time (ICFT), marks the initial time period of almost constant WBV;
- clot formation time (CFT), describes time interval of intensive WBV increase, starting at the moment when in 30 seconds WBV increases at least two-fold (fig. 1).

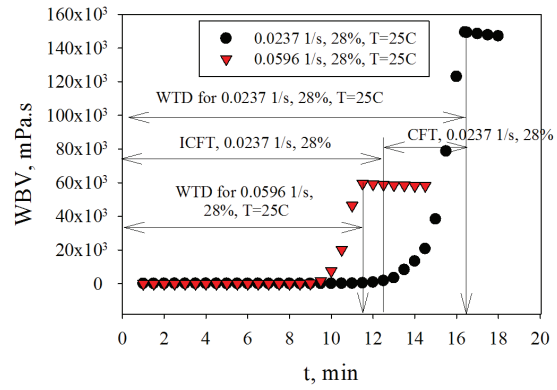


Fig. 1 Whole blood viscosity changes at coagulation at different shear rates.

These three time parameters are in the following relation:

$$WTD=ICFT+CFT \quad (1)$$

Significant shear rate dependence of WTD was obtained. The higher shear rate 0,0596 s⁻¹ led

to a shorter WTD parameter in comparison with 0,0237 s⁻¹ (fig. 2).

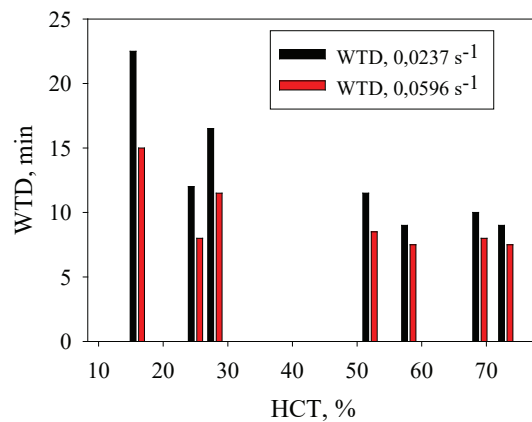


Fig. 2 Whole time duration (WTD) changes with hematocrit.

The other two measured time parameters (ICFT, CFT) also show a shear rate and hematocrit subordination (Fig. 3). Higher shear rate determines shorter CFT and ICFT intervals. As the hematocrit increases, there is a tendency for an accelerated process of thrombus formation (Fig. 3).

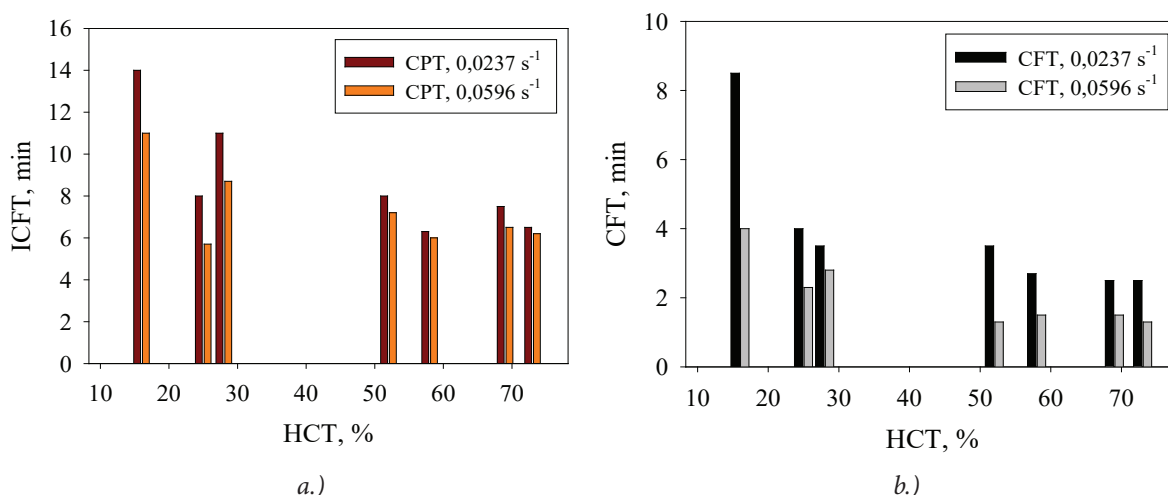


Fig. 3 a). Initial clot formation time (ICFT) at different hematocrits and shear rates; b). Clot formation time (CFT) at different hematocrits and shear rates.

Discussion

The obtained results show that the WBV increases with the progress of coagulation at Couette flow at both shear rates. These results confirm the data of Marco Ranucci et al. 2014, with specification that estimated WBV in their paper was measured by cone-on-plate viscosimeter geometry at higher shear rates (20 s^{-1} , 40 s^{-1} , 80 s^{-1}).

The introduced time parameters of coagulation WTD, ICFT and CFT reveal shear rate and hematocrit dependence. A higher shear rate determines shorter values for defined characteristics. These results correspond with those of Chen et al., 2013 and Sherif et al., 2013, who demonstrate the shear rate importance for platelet adhesion and activation in coagulation process.

Higher hematocrit has a tendency for accelerated coagulation. The results confirm these of Turitto and Weiss (1980), who receive rising levels of platelet adhesion and thrombus formation as hematocrit values increase from 10 to 70% (Turitto, Weiss, 1980). These authors explain the findings as both erythrocytes and platelets contain internal stores of ADP that on release serve to enhance the activation state of platelets, and this release may partially explain the enhanced thrombus formation observed at high shear rates and high hematocrits (Turitto, Weiss, 1980; Hathcock, 2006).

This investigation raised the interest for further examinations on the relations between the factors shear rate, hematocrit, temperature and clot inner

structure at Couette flow. Future studies should be oriented towards estimation of the viscoelastic properties of blood clot in oscillation regime.

References

- Antonova, N. (2001), Rheological aspects of the kinetics of blood coagulation, in *Proceedings of the Balkan Seminar on Rheology & 9th National Rheology Workshop*, Sofia, Bulgaria, April 22–25, pp. 172–179.
- Baumgartner, H. R. (1973), The role of blood flow in platelet adhesion, fibrin deposition, and formation of mural thrombi, in *Microvasc Res*, 5, pp. 167–179.
- Chen, H., Angerer, J. I., Napoleone, M., Reininger, A. J., Schneider, S. W., Wixforth, A. et al. (2013), Hematocrit and flow rate regulate the adhesion of platelets to von Willebrand factor, in *Biomicrofluidics* 7: 64113.
- Blomback, B. and Bark, N. (2004), Fibrinopeptides and fibrin gel structure, in *Biophys. Chem.* 112, pp. 147–151.
- Brogan, G. X. Jr. (2002), Bench to bedside: pathophysiology of acute coronary syndromes and implications for therapy, in *Acad Emerg Med*, 9, pp. 1029–1044.
- Evans, P. A., Hawkins, K., Morris, R. H., Thirumalai, N., Munro, R., Wakeman, L., et al. (2010), Gel point and fractal microstructure of incipient blood clots are significant new markers of hemostasis for healthy and anticoagulated blood, in *Blood* 116, pp. 3341–3346.
- Hathcock, J. (2006), Flow Effects on Coagulation and Thrombosis, in *Arterioscler Thromb Vasc Biol.* 26, pp. 1729–1737.
- Ivanov, I. (2006), Observations on the blood electrical conductivity changes at coagulation and under flow, in *Proceedings of 2nd Eurosummer School on Biorheology & Symposium on Micro Mechanobiology of Cells, Tissues and Systems*, Varna, Bulgaria, September 17–20, pp. 77–80.
- Jörneskog, G., Egberg, N., Fagrell, B., Fatah, K., Hessel, B., Johnsson, H. and Blombäck, M. (1996), Altered properties of the fibrin gel structure in patients with IDDM,

- in *Diabetologia*, 39(12), pp. 1519–1523.
- Lowe, G. D. O. (2003/2004), Virchow's Triad Revisited: Abnormal Flow, in *Pathophysiol Haemost Thromb* 33, pp. 455–457.
- Mills, J. D., Ariens, R., Mansfield, M. W. and Grant, P. (2002), Altered fibrin clot structure in the healthy relatives of patients with premature coronary artery disease, in *Circulation* 106(15), pp. 1938–1942.
- Okorie, U. M., Denney, W. S., Chatterjee, M. S., Neeves, K. B. and Diamond, S. L. (2008), Determination of surface tissue factor thresholds that trigger coagulation at venous and arterial shear rates: amplification of 100 fM circulating tissue factor requires flow, in *Blood* 111, pp. 3507–3513.
- Ranucci, M., Laddomada, T., Ranucci M. and Baryshnikova, E. (2014), Blood viscosity during coagulation at different shear rates, in *Physiol Rep*, 2 (7), pp. 1–7.
- Shen, F., Kastrup, C. J., Liu Y. and Ismagilov R. F. (2008), Threshold Response of Initiation of Blood Coagulation by Tissue Factor in Patterned Microfluidic Capillaries Is Controlled by Shear Rate, in *Arterioscler Thromb Vasc Biol* 28(11), pp. 2035–2041.
- Sheriff, J., Soares, J. S., Xenos, M., Jesty, J., Slepian, M. J. and Bluestein, D. (2013), Evaluation of shear-induced platelet activation models under constant and dynamic shear stress loading conditions relevant to devices, in *Ann. Biomed. Eng.* 41, pp. 1279–1296.
- Shibeko, A., Lobanova, E., Panteleev, M. and Ataulakhov, F. (2010), Blood flow controls coagulation onset via the positive feedback of factor VII activation by factor Xa, in *BMC Systems Biology*, 4:5. doi:10.1186/1752-0509-4-5
- Turitto, V. T. and Weiss, H. J. (1980), Red blood cells: their dual role in thrombus formation, in *Science* 207, pp. 541–543.
- Undas, A., Zawilska, K., Ciesla-Dul, M., Lehmann-Kopydłowska, A., Skubiszak, A., Ciepluch, K. and Tracz, W. (2009), Altered fibrin clot structure/function in patients with idiopathic venous thromboembolism and in their relatives, in *Blood*, 114(19), pp. 4272–4278.
- Weisel, J. W. (2004), The mechanical properties of fibrin for basic scientists and clinicians, in *Biophys Chem.* 112 (2–3), pp. 267–276.

Corresponding author:

Assis. Prof. Ivan Ivanov, PhD, Department of Anatomy and Biomechanics,
National Sports Academy "Vassil Levski",
1700 Sofia, Bulgaria

CHRONOTYPE IDENTIFICATION OF BULGARIAN SPORTS STUDENTS

Maria Zaharinova, Nikolay Zaekov,

Krassimir Rankov, Milena Nikolova

The aims of this study were to identify sports students' chronotype in Sofia, Bulgaria and to determine the subjective feeling for right training time. The experimental sample consisted of 104 male and female students attending various study programs at faculties of the National Sports Academy "Vassil Levski" in Sofia during the academic year 2016/2017. The participants' chronotype was identified by standardized questionnaire (Horn & Ostberg Morningness and Eveningness questionnaire, 1976). The results showed that 61 students tended to be the intermediate chronotype, moderate morning chronotype was identified in 26 students, and moderate evening chronotype was identified in 17 students. Definitely morning and definitely evening types were not identified.

Most of the subjects defined themselves, according question 19, as definitely morning (n= 22) or definitely evening type (n= 21), but the questionnaire assigns them as intermediate or moderate morning and evening types. More than half of the students who subjectively considered themselves to be an evening type suppose that the training is not done in a suitable time for them. Due to the significant differences between subjective self-identification by the persons surveyed and the determination of the chronotype through a questionnaire, the following conclusions can be drawn: 1) If possible, always make a determination of the athlete's chronotype through a questionnaire; 2) Coaches should always take into account the chronotype of athletes when they arrange the training schedules.

Keywords: Chronotype, athletes, training schedules.

Introduction

The study of biological rhythms mechanisms (with different period length), the possible disruptions of these rhythms and the consequences is called Chronobiology. The scientific interest in human circadian rhythms (CRs) began in 1938 when Nathaniel Kleitman spent a month in a cave. He demonstrated that under constant dim light conditions sleep did not retain its 24 – hour pattern (Wirz – Justice'07). In the last twenty years the interest in the study of individual typology has increased, as a way to understand the body's biochemical, physiological, psychological functions and performance (mental and sports). Chronotype is a behavioral phenotype that reflects human beings individual CRs (Levandovski et al.'13; Roenneberg et al.'07). These rhythms are internally driven biological fluctuations that oscillate with a period near 24 hours (Kunorozva'11). They are capable to synchronize to environmental photic and non-photoc cues (for example physical exercise). Typically, there are large inter-individual variations in the phases of the rhythms due to the fact that rhythms are not exactly 24-hours; which classifies humans as morning types, intermediate types and evening types. Morning types (MT or "larks") wake up easily early in the morning and are more active in the early hours of the day. They prefer to go to bed early in the evening and cannot stay awake after midnight. Evening types (ET or "owls"), in contrast, are more active in the afternoon or in

the evening and find it difficult to wake up early in the morning. In the middle of the spectrum between MT and ET there is one more chronotype – intermediate (IT) (Adan et al.'12) or neutral chronotype (NT). This chronotype has balanced performance and other characteristics during the day and there is no preference in any part of the day (Vancova & Pivovarnicek'16). The same classification is used by Horne & Ostberg (1976), Reilly et al. (2007), Rae et al. (2015), Lastella et al. (2016), Vankova & Pivovarnicek (2016). Studies in the field of chronotype distribution among the general adult population (19–31 years) showed that most individuals are ITs (Adan & Natal'02; Roenneberg et al.'07; Vancova & Pivovarnicek'16). Study of association between physical exercise and CRs is a recent and emerging area of research in the field of sports biochemistry, physiology and medicine. Many laboratories around the world are working in this area (Research Unit for Exercise Science and Sports Medicine, University of Cape Town, *South Africa*; Central Queensland University, Appleton Institute for Behavioral Science, *Australia*; Department of Physical Education and Sports, Matej Bel University, *Slovakia*; Department of Kinesiology, University of North Texas, *USA*). Chronotypes of sports people have been assessed mainly for their effects on aerobic and anaerobic performance. There is evidence that diurnal variations exist with best performance in the evening (reviewed in Drust et al.'05;

Kline et al.'07; Chtourou et al.'12). Recent studies showed that professional athletes tend to be more morning oriented (Lastella et al.'10; Rae et al.'15) and also that the time of the entrained awakening reflects the internal biological clock (Facer-Childs & Brandstaetter, 2015). Our observations showed that in Bulgaria there are studies on human CRs in the literature but in connection with different medical conditions, professions like professional soldiers, pilots and in the field of CR and sports it deals with jet lag (reviewed in Alexandrov'98; Kareva'12; Slanchev'14). For that reason, we considered that it would be beneficial to take up basic research in the area of CRs. Our aims were to identify sports students chronotype and to determine the subjective feeling for right training time. As the CRs of many physiological factors have been shown to differ in MTs and ETs (Baehr et al.'00; Hill et al.'88) it would appear logical to believe that chronotype might affect diurnal variation in sport performance and a person's preferred time-of-day for exercise and sport participation.

Methodology

A total of 104 physically active students between 20 and 31 years of age (69 male and 35 female students) from different faculties volunteered to participate in our study. Chronotype was assessed by the standardized Horne and Ostberg Morningness – Eveningness Questionnaire (MEQ). The MEQ is a self-assessment questionnaire which contains 19 closed questions and classifies humans according to their preference toward performing certain ac-

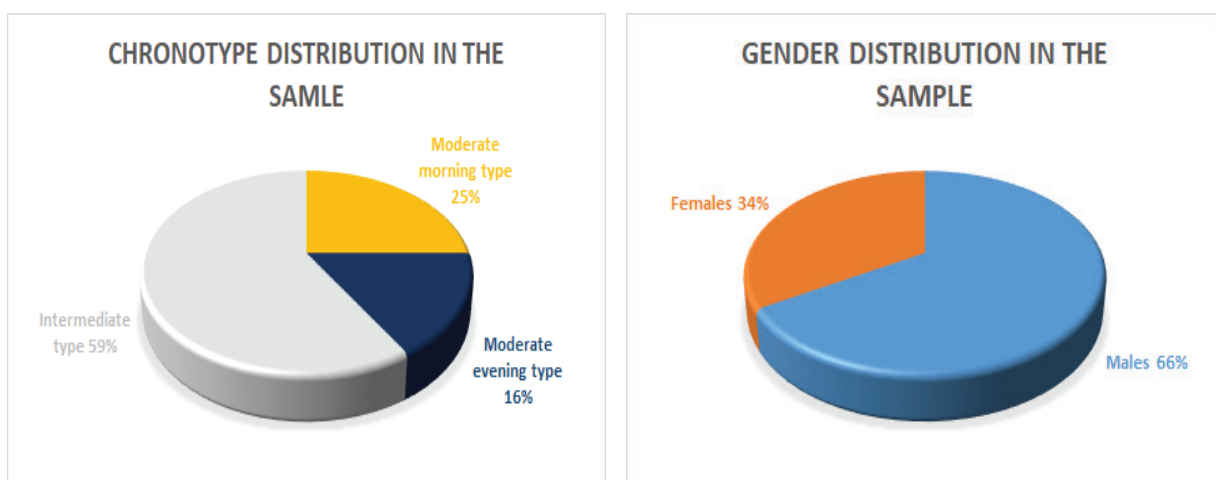
tivities in particular time of day. Each answer (a, b, c, d and sometimes e) has given number of points (from 16 to 86). Higher number of points determines morning oriented person and lower numbers of points indicates an evening chronotype. Initially we counted points according to answers after that we assess concrete chronotype according to MEQs rating scale with five options:

- Definitely morning chronotype – DMT (70–86 points)
- Moderate morning chronotype – MMT (59–69 points)
- Intermediate chronotype – IT (42–58 points)
- Moderate evening chronotype – MET (31–41 points)
- Definitely evening chronotype – DET (16–30 points)

We also compare the assessed chronotype with self-assessment made in question 19.

Results

We identified 61 students to be IT according to MEQ scores (59%). 26 students were identified as Moderate morning chronotype (25%) and Moderate evening type was assessed in 17 students (16%) as shown in figure 1A. The mean score for all students was 50.76. Our sample consisted of males (65%) and females (34%) as displayed in figure 1B. Figures 2 and 3 represent the distribution of different chronotypes by age. Females showed tendency to be more morning oriented than males.



A B
Fig.1 Chronotype (A) and gender (B) distribution in the sample

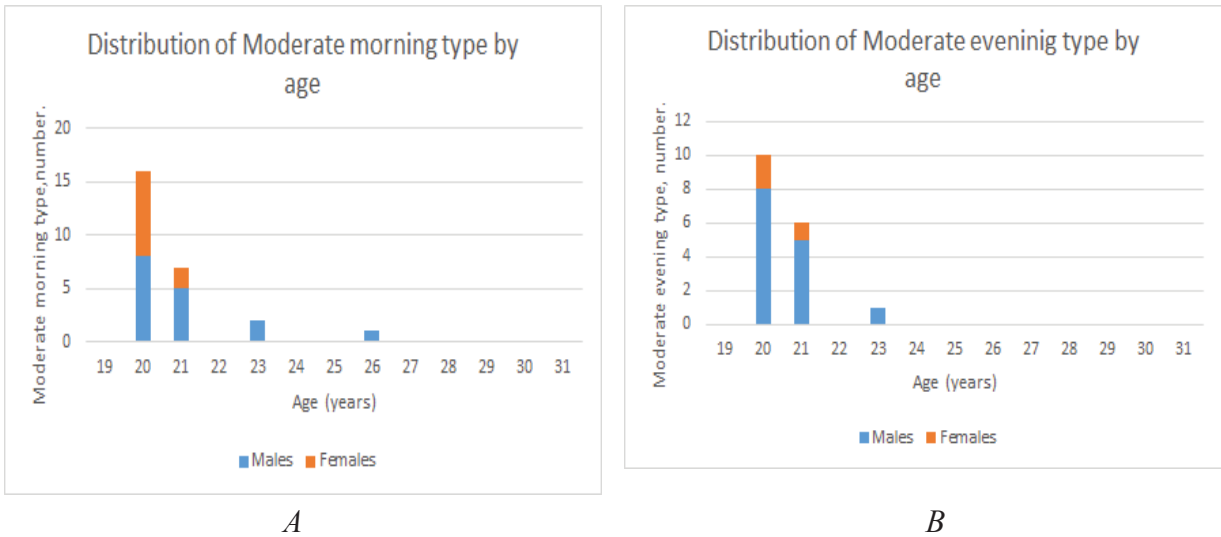


Fig. 2 Distribution of MMT (A) and MET (B) (according to MEQ scores) by age

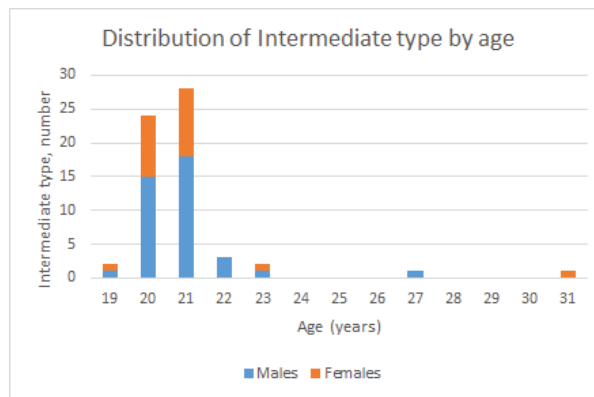


Fig.3 Chronotype distribution by age (intermediate type – according to MEQ scores)

Then we compared the chronotype distribution (according to MEQ scores) with the answers to question 19 (which required self-assessment). Interestingly, it was found that most of MMT identify themselves as definitely morning type (n= 22), MET stated that

they are definitely evening type (n= 21) and IT stated that they are more evening types than morning types but the questionnaire assigns them as intermediate, moderate morning or moderate evening types. That is shown on figures 4A, 4B and figure 5.

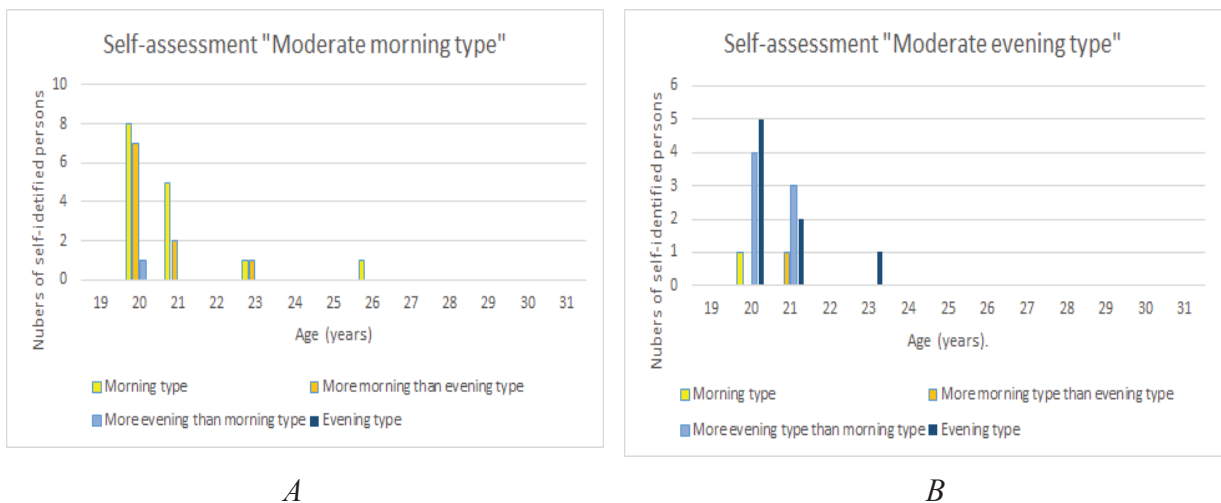


Fig.4 Self-assessment of moderate morning and evening types (according question 19)

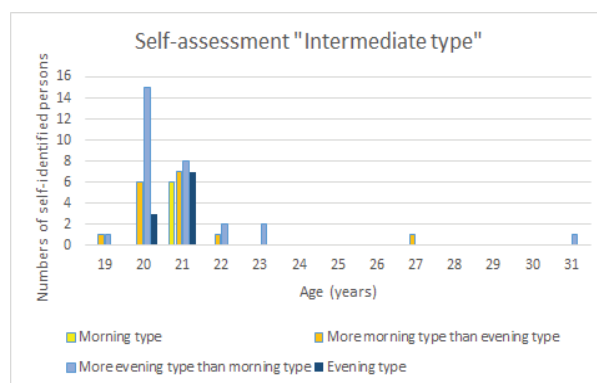


Fig.5 Self-assessment of intermediate type (according question 19)

Discussion:

The first aim of this study was the identification of chronotype in our sample. The results from the determination through MEQ showed that our sample of sport university students tended to be intermediate type and there were small number of students classified as moderate morning or moderate evening chronotype (these findings are in agreement with Vancova & Pivovarnicek'16; Lastella et al.'16). In our sample definitely morning and definitely evening chronotype were not identified. It is possible students' lifestyle (work shifts and night life) and the fact that they have not got declared exact schedule of activities to have influenced the results. The sport activities, lectures and seminars are scheduled variously during the day (from early in the morning until evening hours). Based on that we cannot determine the exact time when students get up or go to bed (it is modified during the week according to different requirements). Age also has influence on chronotype which vary between pubescence and adolescence (Biss & Hasher'12). The second aim was to compare self-assessment (question 19) to chronotype identified with MEQ. The result showed that there was misalignment between answers to the question and MEQ scores. That may influence the subjective feeling for right training time and may be due to age and lifestyle. As limitations to this study may be denoted that there were no chronotype assessment with more objective factor, no performance assessment and mixed gender group of participants. The objective determination of the chronotype is preferable but in most cases it is laborious, expensive, sometimes invasive, and must be performed by a specialist in chronobiology. Therefore, a questionnaire, although a subjective method, is always useful, inexpensive and sufficiently informative for a general assessment of a group's chronotype. In conclusion, we recommend

determination of athlete's chronotype through a questionnaire to be done in any case, if possible. Also we propose coaches should always take into account the chronotype of athletes when they arrange the training schedules.

Acknowledgments: We are grateful to the sports students from National Sports Academy "Vassil Levski" for their participation in this study.

References:

- Adan, A., Archer, S. N., Hidalgo, M. P., Di Milia, L., Natale V., Randler C. Circadian typology: A comprehensive review. *Chronobiology International*, 29(9): 1153–1175, (2012).
- Adan, A. and Natale, V. Gender differences in Morningness-Eveningness preference. *Chronobiology International*. 19, 39–51, 2002.
- Alexandrov A. S. Chronobiological Aspects in Endocrinology. *Journal Endocrinologia*, Vol. 3, no. 2, 4–15, 1998.
- Baehr, E. K., Revelle, W. & Eastman, C. I. 2000. Individual differences in the phase and amplitude of the human circadian temperature rhythm: with an emphasis on morningness-eveningness. *J Sleep Res*, 9, 117–27.
- Biss, R. K., Hasher, L., 2012. Happy as a lark: morning-type younger and older adults are higher in positive affect. *Emotion*. Vol. 12, no. 3, s. 437–441.
- Chtourou, H., Driss, T., Souissi, S., Gam, A., Chaouachi, A. and Souissi, S. The effect of strength training at the same time of the day on the diurnal fluctuations of muscular anaerobic performances. *Journal of Strength and Conditioning Research*. 26, 217–225, 2012.
- Drust, B., Waterhouse, J., Atkinson, G., Edwards, B. and Reilly, T. Circadian Rhythms in Sports Performance – an Update. *Chronobiology International*. 22, 21–44, 2005.
- Facer-Childs, E., & Brandstaetter, R. 2015. The impact of circadian phenotype and time since awakening on diurnal performance in athletes. *Current biology*, 25(4), pp. 518–22.
- Hill, D.W., Cureton, K.J., Collins, M.A. and Grisham, S.C. Diurnal variations in responses to exercise of morning types and evening types. *The Journal of Sports Medicine and Physical Fitness*. 28, 1988.

- Horne JA, Ostberg O. A self-assessment questionnaire to determine morningness- eveningness in human circadian rhythms. *Int J Chronobiol.* 1976;4(2):97-110.
- Kareva R.I. (2012), *Aviation psychology.*, Georgi Rakovski Military Academy, Sofia.
- Kline, C.E., Durstine, J.L., Davis, J.M., Moore, J.A., Devlin, T.M., Zielinski, M.R. and Youngstedt, S.D. Circadian variation in swim performance. *Journal of Applied Physiology.* 102, 641-9, 2007.
- Kunorozva, L. Diurnal preferences and sport performance: a subjective and genetic view. 2011. <https://open.uct.ac.za/handle/11427/11263> (18.12.2016).
- Lastella M., Roach G.D., Hurem D.C., Sargent C. Does chronotype affect elite athletes' capacity to cope with the training demands of triathlon? Living in a 24/7 world: The impact of circadian disruption on sleep, work and health Australasian Chronobiology Society, Adelaide, Australia, 2010; 24(7): 25-28.
- Lastella M., Roach G.D., Halson S.L., Sargent C. The Chronotype of Elite Athletes. *Journal of Human Kinetics*, Vol. 54/2016, 219-225.
- Levandovski R., Sasso E., Hidalgo M.P. Chronotype: a review of the advances, limits and applicability of the main instruments used in the literature to assess human phenotype. *Trends Psychiatry Psychother.* 2013;35(1) - 3-11.
- Rae DE, Stephenson KJ, Roden LC. Factors to consider when assessing diurnal variation in sports performance: the influence of chronotype and habitual training time-of-day. *Eur J Appl Physiol*, 2015; 115(6): 1339-1349.
- Roenneberg T, Kuehnle T, Juda M et al (2007) Epidemiology of the human circadian clock. *Sleep Med Rev* 11:429-438.
- Slanchev P. (2014), *Sports Medicine.* Novi znaniya, Sofia.
- Vankova D. & Pivovarnicek P. Identification of Chronotype and diurnal performance. *Slovak Journal of Sport Science* 1 (2016): 78-83.
- Wirz - Justice A. How to measure circadian rhythms in humans. *MEDICOGRAPHIA.* 2007, VOL 29, No. 1, 84-90.

HEALTHY AGING – THE ROLE OF SPORT SCIENCE

Nenad Stojiljković, Milovan Bratić, Saša Pantelić
University of Nis, SERBIA

Summary

Introduction: *Rapid technical and technological development make our lives easier and more comfortable but significantly decrease the level of physical activity which is extremely important in preserving health related skills and keeping ability to move even during the old age. The purpose of this paper is to present the health benefits of sports science research on the process of aging and to summarize what is done and what should be done in the field of sports science related to healthy aging.*

Methodology: *For the purpose of this review article literature search was conducted using the following bases: MEDLINE, Google Scholar, Kobson and DOAJ. The selection was based on criteria related to age which participants belong (60–80 years), then that study was related to the influence of sports science on the components of physical fitness, health, body composition and anthropometric parameters in elderly.*

Results: *Aging is a complex process which include many variables such as genetics, lifestyle, chronic disease, environment, etc. Research within the sports science continuously prove the health benefits of exercise (both aerobic and anaerobic) with older population and improving their strength, power, flexibility, body composition, independence in daily activities.*

Conclusion: *One of the main factors in the process of healthy aging is exercise. Different exercise programs based on the evidence from sport science could improve physical fitness of elderly.*

Key words: exercise, older, aging, science, physical activity

Introduction

Rapid technical and technological development make our lives easier and more comfortable but significantly decrease the level of physical activity which is extremely important in preserving health related skills and keeping ability to move even during the old age. Recent researches prove the importance of physical activity for older and statement that some physical activity is better than none and that any amount of physical activity can gain some health benefits (Chodzko-Zajko, 2009). Aging is inevitable process which is not fully discovered and explained, especially biological nature of aging and underpinning physiological processes. According to United Nations the older age starts over 60, but the newest definitions of older ages do not use ages as criteria but some kind of limitations in performing daily activities and the loss of previous roles. Therefore, it is possible to move the limit of the old ages. This is especially important if we know that in the developed world people are living longer than ever before. Life expectancy is increasing by two years every decade which means that most of western countries will have predominantly older population. Aging is traditionally linked with disease and frailty, but the recent studies gave the evidences that it is not necessary and that we

can save a lot of our health related fitness, as well as skill related fitness by the well planned exercise program. Planning physical activity of older adults is very challenging because we usually have the presence of different chronic disease and physical limitations. More than 80% of older people have at least one chronic health problem such as cardiovascular disease, cancer, diabetes, osteoporosis, sarcopenia, arthritis. The issue of aging is very complex and in the focus of different scientific disciplines (medicine, physiology, gerontology, biology, andragogy). In some cases, researches in the field of aging resulted by the new specific disciplines of science such as biogerontology. In last few decades' problem of aging became very important issue for the research within the sport science (human movement science).

The purpose of this paper is to present the health benefits of sports science research on the process of aging and to summarize what is done and what should be done in the field of sports science related to healthy aging. Understanding the role of exercising in slowing down the aging related changes in health and functions is important aspect of public health.

Methodology

For the purpose of this review article literature search was conducted using the following bases: MEDLINE, Google Scholar, Kobson and DOAJ. The selection was based on criteria related to age which participants belong (60–80 years), then that study was related to the influence of sports science on the components of physical fitness, health, body composition and anthropometric parameters in elderly.

Results and discussion

Aging is a complex process which include many variables such as genetics, lifestyle, chronic disease, environment, etc. Research within the sports science continuously prove the health benefits of exercise (both aerobic and anaerobic) with older population and improving their strength, power, flexibility, body composition, independence in daily activities.

There is an extensive volume of researches in sports science dedicated to the search for the fundamental physiological, genetic and biomechanical processes which are in the basis of the detrimental of functional integrity.

According to the researches in the sports science physical abilities in later life are compliant to improvement. Positive relationship between physical activity and improvements in physical fitness in older people is the crucial in slowing down the process of aging. Based on the published articles we divide the influence of sport science on different aspects of human life.

Physical activity, aging and musculoskeletal system

Decreasing of muscle function in the older ages is caused by numerous factors which has to be identified to reduce such loss. Muscle weakness is an independent risk factor for high mortality in older adults (Metter, Talbot, Schrager, and Conwit, 2002). Older adults with low muscle strength have a 2.6-fold greater risk of severe mobility limitation, 4.3-fold greater risk for slow gait speed, and 2.1-fold greater risk of mortality compared to older adults with high muscle strength (Manini et al, 2007). One of the main factors of losing muscle strength in older is sarcopenia. This is the age associated loss of skeletal muscle mass which causes reduction of physical strength and ability to perform activities of daily living (Thompson, 2007, Pantelic et al., 2014). In that manner older loose the independence and

their quality of life is seriously diminished. The loss of independence is related to high economic healthcare burden (Thompson, 2007) and it became one of the main problem for the state financial system. Today, there is no effective and safe therapy of sarcopenia and related loss of physical fitness. Current standard in care of sarcopenia is appropriate nutrition and physical activity (Phu, Boersma, and Duque, 2015). Exercise improves muscle mass through the activation of the satellite cell differentiation and activity. The role of satellite cells is crucial because it has been hypothesized that the only way to increase the synthesis of myofibrillar protein is through the incorporation of new nuclei from satellite cells into the parent cell (Thornel, 2011). During exercise active muscles release inflammatory and hormonal substances (cytokines and growth factor) that are satellite cell stimulants. These factors determine the activation of the satellite cells (Kang & Kraus, 2010).

Researches related to exercise and sarcopenia show that not any kind of exercise is good prevention against sarcopenia. Endurance exercise program increase maximal oxygen consumption by improving the central and peripheral circular capacities (increased muscular capillarity, increased stroke volume, expanded number of mitochondria, greater activity of mitochondrial enzymes) (Bassett & Howley, 2000), but in the fight against sarcopenia the most effective program is resistance exercise. This kind of exercise impact fiber-cross sectional area due to an increase in the number of myofibrils with the fast-twitching fiber types being responsible for the most increase in muscle size (Landi et al., 2014; Kang & Kraus, 2010).

One study shows that although the loss of muscle mass is associated with the decline in strength in older adults, this strength decline is much more rapid than the concomitant loss of muscle mass, suggesting a decline in muscle quality. Moreover, maintaining or gaining muscle mass does not prevent aging-associated declines in muscle strength (Goodpaster et al., 2006). The authors concluded that in addition to muscle quantity, muscle quality may be an important determinant of loss of strength with aging.

Physical activity, aging and cardiovascular system

Age related changes cause structural degeneration of the cardiovascular system which lead to the func-

tional decline. The causes of changes are very complex and diversified (Ferrari, Radaelli, & Centola, 2003). These changes are not necessarily related to disease and might be developed even in the absence of any disease. Moreover, it is very difficult to make a difference between age-dependent alterations and changes caused from disease conditions (atherosclerosis, heart failure, and diabetes mellitus) (Ferrari, 2002). Aging does not cause only decline in cardiovascular function. Some evidence proves that in elderly some features of cardiovascular system paradoxically increase (mild increase in heart weight, left ventricular hypertrophy, increased dimensions of cardiomyocytes). Such changes cause alterations in functions of cardiovascular system. The heart becomes slightly hypertrophic and hyporesponsive to sympathetic stimuli which is especially important for exercise because the heart and myocardial contractility do not respond with adequate intensity like in young age. Exercise-induced increases in heart rate and myocardial contractility are less intensive in elderly. During the maximal effort peak cardiac output of elderly is lower by 20 to 30% than in young healthy subjects. This decrease is caused more by the inability of heart to increase heart rate than by the changes in stroke volume. During exercise myocardial contraction mainly engages the Frank-Starling mechanism which increases end-diastolic and end-systolic volume. Physiologists and cardiologists explain the alterations in cardiac function of elderly during exercise by the example of the younger heart subjected to beta blocker treatment (Julius et al., 1967).

Recent studies prove that regular vigorous exercise is probably the most powerful treatment for cardiovascular health even in older adults. Study of 416,000 adults followed for a mean of 8 years, 40 to 50 minutes per day of vigorous exercise reduced risk of death by about 40% (O'Keefe & Lavie, 2012). Light to moderate physical activity reduced death rates too, albeit not as strongly, but in this case more physical activity appeared to be better, with no plateau out to 110 min daily (O'Keefe & Lavie, 2012). Studies performed on elite athletes proved benefits of vigorous exercise on healthy aging and longevity. Cross-country ski racers lower cardiovascular disease risk by 57% and overall mortality by 58% (Farahmand et al., 2003). Also, study with veteran athletes with arrhythmias shows that participants have higher heart rate variability which is considered as cardioprotective effect (Jensen-Urstad, 1998).

Aging causes different alterations in vascular system too. With age large arteries become elongated and their lumen becomes enlarged and wall thickened. The greater age-related change in vascular function, particularly in arterial function, is impairment of distensibility and cushioning function of the aorta and its major branches (Roach, & Burton, 1959). Changes are not solely dependent on structural changes in vascular system, but also are affected by humoral and endothelial regulation of vascular smooth muscle tone (aged vessels show an increased endothelial permeability and a reduced nitric oxide-dependent vasodilator response to acetylcholine (Taddei et al., 1995).

Physical activity has a significant impact on the structure of various blood vessels. These morphological changes are followed by functional changes and improving of blood flow. Physical activity induces angiogenesis which is an expansion of the capillary network by the formation of new blood vessels at the level of capillaries and resistance arterioles, and arteriogenesis which is an enlargement of existing vessels (Leung et al., 2008). Exercise can cause also an anti-inflammatory effect in vascular tissue. This kind of exercise influence can be especially important in preventing atherosclerosis as an inflammatory disease that is mediated by monocyte-derived macrophages which accumulate in arterial plaques and become activated to release cytokines that cause tissue damage (Leung et al., 2008). Exercise can produce a short-term inflammatory response that is accompanied by leukocytosis, increase in oxidative stress, and plasma levels of CRP. This pro-inflammatory response is followed by a long-term anti-inflammatory response. Exercise decreases levels of CRP, IL-6 and TNF- α and increases levels of anti-inflammatory substances such as IL-4 and IL-10 (Kasapis, & Thompson, 2005; Plaisance, & Grandjean, 2006)

Physical activity, aging and brain health

One of the causes of aging is declining of the cortical volume of prefrontal brain regions and detrimented executive functioning. The question that sports scientists consider is "Can we protect the anatomical structures and functions of our brain by the physical activity?" Recent studies (Marks et al., 2007) proved positive relationship between higher aerobic fitness (VO₂max) and improved executive functioning in older adults and their functional anatomy of the brain. With the ages the integrity of white matter

decline, but the aerobic exercise may be related to differing levels of white matter integrity which may in turn cause preserving of cognitive function.

Several studies suggest that higher physical activity levels, maximal aerobic capacity and aerobic activities are in high correlation with preservation of cognitive function and decrease of Alzheimer disease (Beydoun et al., 2014; Barnes et al., 2003).

Resistance training also can preserve cognitive functions and prevent development of cognitive impairment. Study from 2017 (Mavros et al., 2017) about the influence of different strength training programs on cognitive functions prove some new benefits of resistance training. They revealed evidence that progressive resistance training significantly improve strength in healthy elderly adults and also increase maximal oxygen consumption. Also, they revealed strong relationship between the magnitude of strength gain and cognitive benefits which explain the influence of resistance training on cognition. The explanation of this very new findings could be in the relationship between deficiency of insuline-like growth factor 1 (IGF-1) and cognitive dysfunction and incident dementia in older adults. Resistance training program increase IGF-1 which can lead to the improvements of cognitive functions. The second explanation of this relationship could be increases in brain-derived neurotrophic factor (BDNF) after 12 months walking program and improved function of brain. Exercise has influence on the level of cortisol. High cortisol levels are associated with worse cognitive function, small brain volume in older adult's memory impairment and atrophy of hippocampi. Resistance training can decrease basal cortisol level and make benefits in cognitive functions.

Conclusion

One of the main factors in the process of healthy aging is exercise. Numerous researches demonstrate a strong relationship between exercise and protection of the most important body systems such as musculoskeletal, cardiovascular and nervous system. Different exercise programs based on the evidence from sport science could improve physical fitness of elderly. This evidences could encourage sports scientists to work on development of wide range of exercise programs from calisthenics and resistance training to pure endurance training program. Influence of exercise (resistance or endurance training) on brain and nervous system

is still not fully discovered. Therefore, one of the following and very important tasks of sport science is the researches of the protection of brain and nervous system by different types of exercise.

References:

- Barnes, D. E., Yaffe, K., Satariano, W. A., & Tager, I. B. 2003. A longitudinal study of cardiorespiratory fitness and cognitive function in healthy older adults. *Journal of the American Geriatrics Society*, 51(4), pp.459–465.
- Bassett Jr, D.R. and Howley, E.T., 2000. Limiting factors for maximum oxygen uptake and determinants of endurance performance. *Medicine & Science in Sports & Exercise*, 32(1), p.70.
- Beydoun, M. A., Beydoun, H. A., Gamaldo, A. A., Teel, A., Zonderman, A. B., & Wang, Y. 2014. Epidemiologic studies of modifiable factors associated with cognition and dementia: systematic review and meta-analysis. *BMC public health*, 14(1), pp.643.
- Chodzko-Zajko, W.J., Proctor, D.N., Singh, M.A.F., Minson, C.T., Nigg, C.R., Salem, G.J. and Skinner, J.S., 2009. Exercise and physical activity for older adults. *Medicine & science in sports & exercise*, 41(7), pp.1510–1530.
- Farahmand, B. Y., Ahlbom, A., Ekblom, Ö., Ekblom, B., Hällmarker, U., Aronson, D., & Brobert, G. P. 2003. Mortality amongst participants in Vasaloppet: a classical long-distance ski race in Sweden. *Journal of internal medicine*, 253(3), pp.276–283.
- Ferrari, A.U., 2002. Modifications of the cardiovascular system with aging. *The American journal of geriatric cardiology*, 11(1), pp.30–34.
- Ferrari, A.U., Radaelli, A. and Centola, M., 2003. Invited review: aging and the cardiovascular system. *Journal of Applied Physiology*, 95(6), pp.2591–2597.
- Goodpaster, B.H., Park, S.W., Harris, T.B., Kritchevsky, S.B., Nevitt, M., Schwartz, A.V., Simonsick, E.M., Tylavsky, F.A., Visser, M. and Newman, A.B., 2006. The loss of skeletal muscle strength, mass, and quality in older adults: the health, aging and body composition study. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, 61(10), pp.1059–1064.
- Jensen-Urstad, K., Bouvier, F., Saltin, B., & Jensen-Urstad, M. 1998. High prevalence of arrhythmias in elderly male athletes with a lifelong history of regular strenuous exercise. *Heart*, 79(2), pp.161–164.
- Julius, S., Amery, A., Whitlock, L. S., & Conway, J. 1967. Influence of age on the hemodynamic response to exercise. *Circulation*, 36(2), pp.222–230.
- Kang, J.S. and Krauss, R.S., 2010. Muscle stem cells in developmental and regenerative myogenesis. *Current opinion in clinical nutrition and metabolic care*, 13(3), p.243.
- Kasapis, C., & Thompson, P. D. 2005. The effects of physical activity on serum C-reactive protein and inflammatory markers: a systematic review. *Journal of the American College of Cardiology*, 45(10), pp.1563–1569.
- Landi, F., Marzetti, E., Martone, A.M., Bernabei, R. and Onder, G., 2014. Exercise as a remedy for sarcopenia. *Current Opinion in Clinical Nutrition & Metabolic Care*,

- 17(1), pp.25–31.
- Leung, F. P., Yung, L. M., Laher, I., Yao, X., Chen, Z. Y., & Huang, Y. U. 2008. Exercise, vascular wall and cardiovascular diseases. *Sports Medicine*, 38(12), pp.1009–1024.
- Manini, T.M., Visser, M., Won-Park, S., Patel, K.V., Stromeyer, E.S., Chen, H., Goodpaster, B., De Rekeneire, N., Newman, A.B., Simonsick, E.M. and Kritchevsky, S.B., 2007. Knee extension strength cutpoints for maintaining mobility. *Journal of the American Geriatrics Society*, 55(3), pp.451–457.
- Marks, B.L., Madden, D.J., Bucur, B., Provenzale, J.M., White, L.E., Cabeza, R. and Huettel, S.A., 2007. Role of aerobic fitness and aging on cerebral white matter integrity. *Annals of the New York Academy of Sciences*, 1097(1), pp.171–174.
- Mavros, Y., Gates, N., Wilson, G. C., Jain, N., Meiklejohn, J., Brodaty, H., ... & Baker, M. K. (2017). Mediation of cognitive function improvements by strength gains after resistance training in older adults with mild cognitive impairment: outcomes of the study of mental and resistance training. *Journal of the American Geriatrics Society*, 65(3), pp.550–559.
- Metter, E.J., Talbot, L.A., Schrager, M. and Conwit, R., 2002. Skeletal muscle strength as a predictor of all-cause mortality in healthy men. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, 57(10), pp.B359-B365.
- O'keefe, J. H., & Lavie, C. J. 2012. Run for your life... at a comfortable speed and not too far. *Heart*, 99(8), pp.516–519
- Pantelic, S., Kostic, R., Popovic, R. Aleksandrovic, M., Uyunovic, S., Milanovic, Z., Jorgic, B., & Stojiljkovic, N. 2014. *Physical activity and fitness components in elderly* (in Serbian). The Ministry of Education, Science and Technological Development of the Republic of Serbia; Nis: Faculty of sport and physical education
- Phu, S., Boersma, D. and Duque, G., 2015. Exercise and sarcopenia. *Journal of Clinical Densitometry*, 18(4), pp.488–492.
- Plaisance, E. P., & Grandjean, P. W. 2006. Physical activity and high-sensitivity C-reactive protein. *Sports Medicine*, 36(5), pp.443–458.
- Roach, M. R., & Burton, A. C. 1959. The effect of age on the elasticity of human iliac arteries. *Canadian journal of biochemistry and physiology*, 37(4), pp.557–570.
- Taddei, S., Virdis, A., Mattei, P., Ghiadoni, L., Gennari, A., Fasolo, C. B., ... & Salvetti, A. 1995. Aging and endothelial function in normotensive subjects and patients with essential hypertension. *Circulation*, 91(7), pp.1981–1987.
- Thompson, D.D., 2007. Aging and sarcopenia. *Journal of Musculoskeletal and Neuronal Interactions*, 7(4), p.344.
- Thornell, L.E., 2011. Sarcopenic obesity: satellite cells in the aging muscle. *Current Opinion in Clinical Nutrition & Metabolic Care*, 14(1), pp.22–27.

Name and address of the corresponding author

Dr Nenad Stojiljkovic, assistance professor

Address: Faculty of Sport and Physical Education, Carnojevica 10a, 18000 Nis, Serbia

E mail: snesadif@yahoo.com

Mobile: +381638084961

MOTOR ABILITY PROFILE OF JUNIOR AND SENIOR MALE SOUTH AFRICAN TAEKWONDO ATHLETES

Musa Lewis Mathunjwa^{a*}, Sam Mugandani^a, Abidemi Kappo^b,

Svetoslav Ivanov^c, Trayana Djarova-Daniels^b

^{a*}Department of Biokinetics and Sports Science, University of Zululand, KwaDlangezwa, South Africa; ^bDepartment of Biochemistry and Microbiology, University of Zululand, KwaDlangezwa, South Africa. ^cBulgarian Union of Physical Culture and Sport; Bulgarian Taekwondo and Judo federation, Bulgaria.

Introduction: The purpose of this study was to assess and compare motor abilities in young and adult male South African taekwondo athletes. To date, knowledge of the motor ability demands of this combat sport is in its infancy. **Methodology:** Participants were junior ($n = 25$, 15.5 ± 2.6 years, 163.0 ± 13.4 cm, 53.3 ± 1 a 3.4 kg) and senior ($n = 20$, 15.9 ± 1.20 years, 166.8 ± 7.98 cm, 73.4 ± 10.7) males from a local taekwondo (WTF) club in South Africa. Flexibility (sit-and reach), abdominal strength and endurance (60-second sit-ups and 2minutes push ups), explosive leg power (vertical jump), agility (t-test), aerobic power (20 m bleep test) converted to maximum oxygen uptake (VO_{2max}) were measured. Data were analysed using t-test for independent samples and Z-score individual radar plots statistics for each athlete. **Results:** There was no significant difference in agility between juniors ($10.9 \pm 0.4s$) and seniors ($12.6 \pm 1.2s$) ($p > 0.05$). The seniors showed significant of ($p < 0.05$) higher values in sit ups (53.1 ± 6.1 vs 48.9 ± 13.8), push-ups (76.6 ± 17.1 vs 25.6 ± 10.6), sit & reach (54.6 ± 5.8 vs 40.1 ± 7.5 repetitions), horizontal jump (2.6 ± 1.1 vs 1.9 ± 0.3), and VO_{2max} (52.5 ± 2.8 vs 42.2 ± 6.6) than juniors. The results showed that the performance of senior male Taekwondo athletes are higher than the juniors as expected. **Conclusions:** More extensive research is required to extend the existing knowledge to permit specialized conditioning in juniors to improve their motor ability at the early stage of Taekwondo training, leading to better combat performance.

Keywords: Taekwondo athletes, motor ability

Introduction

Taekwondo (TKD) was officially accepted as an Olympic combat sport since the Sydney Olympics in 2000 (Lin et al., 2006). Successively, TKD has technically advanced into one of the frequently practiced martial arts sport worldwide with about 70 million participants in 180 countries (Fong & Ng, 2011). TKD is a dynamic form of unarmed self-defence that incorporates a variety of techniques for the purpose of attack, and can be distinguished from the other martial arts by its focus on kicking techniques that are performed at a high speed (Bridge et al., 2014; Hammami et al., 2013).

TKD is characterized by three main areas in competition: sparring (free fighting), poomsae (forms), destructions (breaking of wood and tiles) which require complex motor and functional skills, tactical excellence and high levels of fitness to excel (Cular et al., 2013; Melhim, 2001). International TKD athletes are categorised in different weight divisions for both male and female athletes to participate in poomsae and sparring. Poomsae is a structural form of group competition in which the participant simultaneously used both hands and feet displaying various techniques (Haddad et al., 2014). In Kyo-

rugi, combat matches are typically performed in three rounds of 2 minutes with 1-min rest period (World Taekwondo Federation, 2015). Points are awarded when kicks and punches make contact on the allowed body area. A winner is determined by scoring more points or by knockout.

There is an insufficient amount of scientific information on anthropometric and energy demand (Kazemi et al., 2009; Ball 2011), physiological profile (Kazemi et al., 2009), mental development (Chiodo et al., 2011 & Pieter W., Heijmans, 2000) with high technical and tactical proficiency (Bridge et al., 2011; Kazemi et al., 2009) of TKD sport. Additionally, there is few information regarding gender differences in Taekwondo to determine the impact of physical profile between junior male and females (Mathunjwa et al., 2015). Research on South African senior taekwondo athletes in both International Takwondo Federation (ITF) and World Taekwondo Federation (WTF) is scarce. The purpose of this study was to assess and compare motor abilities in senior and junior male taekwondo athletes.

Methodology:

Participants were junior ($n = 25$) and senior ($n = 20$)

males from a local taekwondo (WTF) club in South Africa volunteered to participate in this study. Following an explanation of all procedures, risks and benefits, each subject gave his informed consent to participate in the study. The participants were involved in taekwondo training and were members of the South African Taekwondo Federation. Ethical clearance was obtained from the University of Zululand. Data were analysed using *t*-test for independent samples and Z-score individual radar plots statistics for each athlete.

Procedure

The following tests were administered: anthropometric measurements: flexibility (sit-and- reach test), abdominal strength and endurance (60-second sit-ups and 2minutes push ups test), explosive leg power (vertical jump test), agility (t-test), aerobic power (20 m bleep test) converted to maximum oxygen uptake (VO_{2max}) were measured.

Anthropometric measurements

Body mass of the individuals was measured in kilogram (kg) using a digital scale (Kubota KA – 10–150V, Japan). Stature was measured using a stadiometer (La Fayette Instrument Co. USA) and body mass index was calculated as weight divided by height squared (kg/m^2) (Ross and Marfell-Jones, 1991).

Physical tests and physiological performance measurements

The details of these measurements were presented in a previous paper (Mathunjwa et al., 2015). Flexibility (cm) was measured in centimetres by the modified sit-and-reach test using the Lafayette sit and reach box (Model 01285A, La Fayette, USA). The T-test (sec) was used to determine the agility of body trunk without loss of balance including forward, lateral and backward running (Raven, Gett-

man, Pollock, and Cooper 1976; Getchell 1985). Leg power was measured by standing broad jump (cm) (Johnson and Nelson 1986). A tape measure was used (Stanley Power Locks, Tokyo, Japan) to measure the distance after jumping forward on a linoleum floor surface. The 20 min multi stage fitness test (MSFT) was used to measure endurance capacity. This test measured continuous running between two lines 20 meters apart in time to recorded beeps (Gabbett et al., 2009). Muscular strength and endurance were assessed by the one minute sit-ups and two minutes push-up test (repetitions) respectively (Sparling, 1997).

Statistical analysis

Data were analysed using mean and standard deviations. An ANOVA was computed to determine if differences exist senior and junior athletes. Significance was set at $p<0.05$. Due to the relatively small sample size, the statistical power of the study was calculated using two statistical power calculators: Alpha error level criterion set at 0.05 or 5% confidence level and Beta criterion set at 0.80 or 80% confidence level (Zodplay, 2004). The Z-criterion statistics (Marronna, Martony, & Yohar, 2006) was applied for preparing computerized individual performance Z-score radar plots (Mathunjwa et al., 2015) and used for comparison.

Results

The descriptive statistics of the performance variables in senior and junior South African taekwondo athletes are displayed in Table 1. Senior taekwondo athletes tend to have higher body mass and stature than juniors. No significant difference noted in BMI and sit ups. Statistically, significantly higher ($p<0.001$) push-ups, Horizontal Jump, sit and reach and VO_{2max} ($p<0.05$) were found in senior athletes compared to junior athletes.

Table 1. Physical characteristics of the South African Taekwondo Senior vs Junior athletes (mean±SD).

Parameters	Senior (n=20)	Junior (n=25)	Δ	%Δ
Age (years)	23.5±2.5	15.5±2.6	0.3	34.0
Weight (kg)	68.6±9.0	53.8±10.7	0.2	21.6
Height (cm)	166.8 ± 7.9*	163.0 ± 13.4	0.2	2.3
BMI (kg/m^2)	22.9±2.3	20.9±1.3	0.1	8.7
Sit & Reach (cm)	54.2±5.8*	40.1±7.9	0.3	26.0
Sit ups 60 s	53.1±6.1	48.9±13.8	0.1	7.9
Push-ups 2mins	76.8±17.4**	25.6±10.5	0.6	66.7
Horizontal Jump (m)	2.3±0.3*	1.2±0.1	0.5	47.8
VO_{2max} (ml/kg/min)	52.5±2.8*	42.2±6.8	0.2	19.6

** $p<0.001$, * $p<0.05$, Δ: change, % percentage, cm: centimeters, kg: kilograms

Z-criterion statistics was used to design Z-score radar plots based on the following physical characteristics (Sit-and- reach, sit-ups, push-ups, horizontal jump, T-test, aerobic power) that are key to the performance in Taekwondo.

The results of the Z-score individual radar plots (in %) of TKD of one senior athletes of more less the same weight category are presented in Table 2 and figure 1 and 2.

Table: 2. Individual Z score (in %) of senior and junior TKD athletes

Z-score	Sit & Reach (cm)	Sit ups 60 s	Push-ups 2mins	Horizontal Jump (m)	VO _{2max} (ml/kg/min)
NM Senior	51	49	68	2.2	52.1
MZ Junior	42	47	28	1.1	42

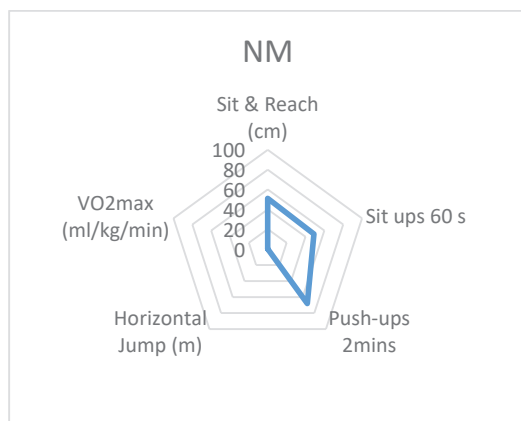


Figure 1: Z-score individual radar plots (in %) of senior athlete NM

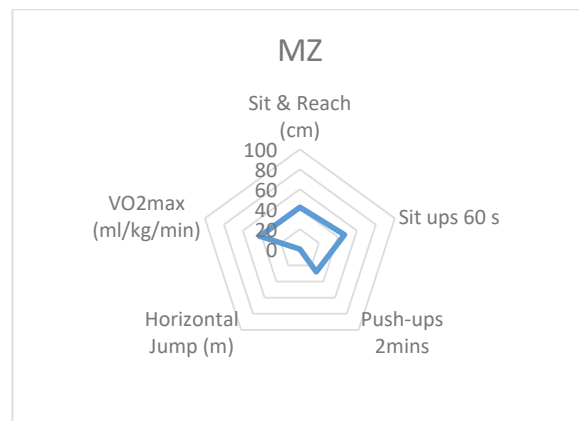


Figure 2: Z-score individual radar plots (in %) of junior athlete MZ

Analysis of Z-score

Athlete N.M. (Figure 1) displayed a higher level of Push ups and good flexibility. His execution will be strong when attacking an opponent. Due to high flexibility, the player will be able to reach the targeted area during his fight. Athlete M.Z. being a junior, has an advantage of his better VO_{2max}. He needs to avoid effective kicks from an opponent by always count attacking so that he can be last for longer fights since his muscular endurance is poor.

Discussion

This study has been able to establish the fact that motor ability plays an important role in promoting optimal short and long term health. This is in consonance with (Ortega et al., 2008) while accounting for improved performance. The five main components of motor ability (flexibility, endurance, strength, power and cardiorespiratory fitness) (Ruiz et al., 2006) were assessed in senior and junior athletes. Stature, weight and body mass index (BMI) were also measured at these time points.

TKD athletes regularly reduce their body mass to compete in selected weight categories and to optimize their power during combat (Tsai et al., 2011). The body mass recorded in this study correlates with data values reported in previous studies and recommended to facilitate performance and maintain good health (Bridge et al., 2014; Rodriguez et al., 2009).

The study also confirms that flexibility plays an important role in TKD and gives athletes an advantage in performing high kicks. As claimed by Chan and colleagues (2001), the authors explained that TKD training enhances flexibility due to the multiple bouts of static and ballistic stretching that increases during physical fitness. It was noted that junior TKD athletes produced lower sit and reach than seniors (see Table 1). Kim et al. (2011) established that training adaptation and the technical demands of sport produce higher flexibility. Therefore, this explains the reason why the senior athletes display higher flexibility scores than the junior (Bridge et al., 2014).

A study reported that VO₂max scores of junior male TKD athletes ranges between 41–49ml/kg/min (Bridge et al., 2011). This shows that the cardiorespiratory fitness of the athletes in our study is comparable with other international athletes (see table 1). Although the value of the senior athletes was higher than the junior nonetheless, the present results met the international standard.

TKD athletes require submaximal muscular endurance and strength to sustain repeated combat movement in competitions (Moir, 2012). The data of sit-ups and push ups in both senior and junior athletes gave an insight of muscular endurance and strength (see Table 1). There are limited studies that examined push ups and sit-ups of international TKD athletes which was in line with our study. (Toskovic et al., 2004; Markovic et al., 2005)

The Z-score radar plots based on the five most relevant motor fitness (flexibility, endurance, strength, power and VO_{2max}) was measured to assess the individual performance of the TKD athletes. The individual Z-score was implemented in the current study to analyse and interpret the result of the performance in order to provide coaches with information relevant for designing specific training for each athlete.

Reference

- Ball N., Nolan, E. and Wheelere K. (2011). Anthropometrical, physiological, and tracked power profiles of elite taekwondo athletes 9 weeks before the Olympic competition phase. *Journal of Strength Conditioning and Resistance* 25: 2752–2763.
- Bridge, C.A., D.A Silva Santos, J.F., Chaabene, H., Pieter, W. and Franchini, E. (2014). Physical and physiological profiles of taekwondo athletes. *Sports Medicine*, 44(6): 713–733.
- Bridge, C.A., Jones., M.A. and Drust, B. (2011). The activity profile in international taekwondo competition is modulated by weight category. *International Journal of Sports Physiology and Performance*, 6(3): 344–357.
- Chan, S. P., Hong, Y., & Robinson, P. D. (2001). Flexibility and passive resistance of the hamstrings of young adults using two different static stretching protocols. *Scandinavian Journal of Medicine and Science in Sports*, 11, 81–86.
- Chiodo S., Tessitore A., Cortis C., Cibelli G., Lupo C., Ammendolia A., De Rosas M. And Capranica, L. (2011). Stress-related hormonal and psychological changes to official youth taekwondo competitions. *Scandinavian Journal Medical Science Sports*. 21:111–119.
- Chiodo, S., Tessitore, A., Lupo, C., Ammendolia, A., Cortis, C. & Capranica, L. (2012). Effects of official youth taekwondo competitions on jump and strength performance. *European Journal of Sport Science*, 12(2), 113–120.
- Cular, D., Munivrana, G. and Katić, R. (2013). Anthropological analysis of taekwondo new methodological approach. *Collegium Anthropologicum*, 37(3): 901–906.
- Fong, S.S.M. and Ng, G.Y.F. (2011). Does taekwondo training improve physical fitness? *Physical Therapy in Sport*, 12(2): 100–106.
- Gabbett, T., Kelly, J., Ralph, S. and Driscoll, D. (2009). Physiological and anthropometric characteristics of junior elite and sub-elite rugby league players, with special reference to starters and non-starters. *Journal of Science Medicine and Sport*, 12(1):215–222.
- Haddad, M., Chaouachi, A., Wong Del, P., Castagna, C., Hue, O., Impellizzeri, F.M. & Chamari, K. (2014). Influence of exercise intensity and during on perceived exertion in adolescent. Taekwondo athletes. *European Journal of Sport Science*, 14(1): 275–281.
- Hammami, N., Zinoubi, B., Hamdi, F., Nouri, A., Zouita, A. and Dziri C. (2013). Isokinetic profile of knee muscles in olympic elite taekwondo practitioners. *Science Sports*, 28: 188–195.
- Johnson, B.I. and Nelson, J.K. (1986). Practical measurements for evaluation in physical education. New York: Macmillan publishing company.
- Kazemi, M., Casella, C. and Perri, G. (2009). 2004. Olympic taekwondo athlete profile. *Journal of the Canadian Chiropractic Association*, 53(2): 144–152.
- Kim, H., Stebbins, C.L., Chai, J. & Song, J. (2011). Taekwondo training and fitness in female adolescents. *Journal of Sports Sciences*, 29 (2), 133–138.
- Leger, L.A., Mercier, D., Gadoury, C. and Lambert, J. (1988). The Multistage 20M shuttle run test for aerobic fitness. *Journal of Sports Sciences*, 6(2): 93–101.
- Lin, W.L., Yen K. T., Lu, C.Y.D., Huang, Y.H. and Chang, C.K. (2006). Anaerobic capacity of elite taiwanese taekwondo athletes. *Science and Sports*, 21 (5): 291–293.
- Markovic, G., Misigo-Durakovic, M. & Trninic S. (2005). Fitness profile of elite Croatian female taekwondo athletes. *Collegium Anthropologicum*, 29(1), 93–99.
- Marronna, R. A., Martony, R.D. & Yohar, V.J. (2006). *Robust Statistics: Theory and Methods*: Wiley, New York.
- Mathunjwa, M.L., Mugandani, S.C., Ngcobo, M., Djarova-Daniels, T. and Ivanov, S. (2015). Physical, anthropometrical, and physiological profiles of experienced junior male and female South African Taekwondo athletes. *African Journal for Physical, Health Education, Recreation and Dance*, 21(4:2): 1402–1416.
- Moir, G. (2012). Muscular endurance. In T. Miller (Ed.), *National Strength and Conditioning Association: NSCA's Guide to Tests and Assessments* (pp. 193–217). Champaign, IL: Human Kinetics.
- Ortega, F. B., Ruiz, J. B., Castillo, M. J., & Sjöström, M. (2008). Physical fitness in childhood and adolescence: A powerful marker of health. *International Journal of Obesity*, 32, 1–11.
- Pieter W. and Heijmans J. (2000). *Scientific Coaching for Olympic Taekwondo*. 2nd ed. Oxford, UK: Meyer & Meyer Sport.

- Raven, B.P., Gettman, L.R., Pollock, M.L. and Cooper, K.H. (1976). A physiological evaluation of professional soccer players. *British Journal of Sports Medicine*, 10(4): 209–216.
- Rodriguez, N.R., DiMarco, N.M. & Langley, S. (2009). Position of the American Dietetic Association, Dietitians of Canada, and the American College of Sports Medicine: Nutrition and athletic performance. *Journal of American Diet Association*, 109(3), 509–527.
- Ruiz, J. R., Ortega, F. B., Gutierrez, A., Meusel, D., Sjostrom, M., & Castillo, M. J. (2006). Health-related fitness assessment in childhood and adolescence: A European approach based on the AVEN, EYHA and HELENA studies. *Journal of Public Health*, 14, 269–277.
- Sparling, P.B. (1997). Field testing for abdominal muscular fitness. *ACSM's Health Fitness Journal*, 1(4): 30–33.
- Toskovic, N.N., Blessing, D. & Williford, H.N. (2004). Physiologic profile of recreational male and female novice and experienced Tae Kwon Do practitioners. *Journal of Sports Medicine and Physical Fitness*, 44(2), 164–172.
- Tsai, M.L., Chou, K.M., Chang, C.K. & Fang, S.H. (2011). Changes of mucosal immunity and antioxidation activity in elite male Taiwanese taekwondo athletes associated with intensive training and rapid weight loss. *British Journal of Sports Medicine*, 45(9), 729–734.
- World Taekwondo Federation [Internet]. World Taekwondo Federation Competition Rules & Interpretation. [updated 2015] Sep; cited 2015 Dec 3]. Available from http://www.worldtaekwondofederation.net/images/Final_CompetitionRules_Amendments_E_Voting_2015_copy_copy.pdf, 17.
- Zodpala, S.P. (2004). Sample size and power analysis in medical research. *Indian journal of dermatology, venereology and leprology*, 70 (2), 123–128, at <http://www.dssresearch.com/knowledgecenter/toolkitcalculators/statisticpowercalculator.aspx>.

***Corresponding author:**

Musa L Mathunjwa,
Department of Biokinetics and Sports Science, University of Zululand, Private Bag X1001, KwaDlangezwa, 3886 South Africa. Tel: +27 35 902 6884, Fax: + 27 35 902 6386. Email: mlmathunjwa@gmail.com

DIFFERENCE IN THE DISTRIBUTION OF SELECTED BLOOD VARIABLES AMONG ATHLETES DURING A COMPETITION PERIOD

Sam Mugandani, Trayana Djarova-Daniels

Summary

Exercise is known to cause considerable changes in leucocyte counts and functions. The aim of the present study was to investigate the effect of exercise on leukocyte counts in athletes of different sporting codes during the competition time of the season.

Forty two (n=42) active university athletes voluntarily participated in the study, rugby players (n=9), male soccer players (n=17), female soccer players (n=9) and female netball players (n=7). Blood samples were collected and blood analysis for whole blood count was done in Lancet laboratory, Richards Bay, RSA. Data were analyzed using unpaired t-test for treatment independent samples.

It is noteworthy to point out the higher levels of leucocytes in the netball players than female soccer players ($6.8 \pm 1.24 \times 10^9/L$ and $6.11 \pm 1.28 \times 10^9/L$ respectively). The lymphocyte levels were also higher in the netball players than female soccer players ($2.60 \pm 0.58 \times 10^9/L$ and $2.16 \pm 0.49 \times 10^9/L$ respectively). There were also higher levels of leucocytes in the male soccer players compared to male rugby players ($6.26 \pm 1.97 \times 10^9/L$ and $5.46 \pm 0.99 \times 10^9/L$ respectively). The lymphocyte levels were higher in the soccer players than the rugby players ($2.17 \pm 0.36 \times 10^9/L$ and $1.85 \pm 0.32 \times 10^9/L$ respectively), but the differences were however not significant at $p < 0.05$.

The changes in leucocytes could be a result of among other things the removal of dead cells related to exercise stress and trauma. It was expected, considering the levels of physical contact that the leucocyte counts and the lymphocytes in particular were going to be higher among female soccer players and male rugby players compared to netball players and soccer male players respectively. The athletes' results for the measured blood parameters were within the health norms. These findings could be related to the less intensive training protocols and lower levels of physical contact and stress in players of students teams compared to professional players.

Key words: leucocytes, lymphocytes, exercise stress, athletes.

Introduction Training of athletes is intended to ensure that athletes reach their peak condition and produce performance which ensures that they succeed during competition. There is a complex relationship between training and competition. There is need therefore to have processes which can be used to monitor how athletes respond to training. There are a number of procedures which are used by coaches and sports scientists to monitor how athletes respond to both training during preparation for competition and during the competition period itself. A number of biochemical markers are being used to monitor fitness and fatigue of athletes (Coutts & Cormack, 2014). Muscle damage has been detected through blood markers and enzymes such as creatine kinase (CK) (Clarkson et al., 2005; Yamin et al., 2007). Myoglobin, troponin, urea, uric acid and ammonia have also been used as biomarkers of muscle damage (Kirwan et al., 1990). The hormones cortisol from saliva has been used as a marker and has been shown to be elevated soon after competition (Elloumi et al., 2003; Haneish et al., 2007). Elloumi et al., 2003 have also reported the use of the hormone testosterone as an exercise

marker. White blood cells and platelets increase following exercise hence are biomarkers of oxidative stress (Djarova et al., 2010), and may be useful to a clinician to better assess and evaluate the benefits of training and/ or supplementation programmes (Banfi et al., 2006). It is established that exercise of elevated intensity compromises the immune system leaving athletes susceptible to illness (Allgrove et al., 2012). Leucocytes and cytokines have been used as possible markers of compromised immune system due to exercise (Mackinnon 1997; Gleeson & Walsh 2012).

Exercise is known to cause considerable changes in leucocyte counts and functions. The aim of the present study was to investigate the effect of exercise on leukocyte counts in athletes of different sporting codes during the competition time of the season.

Methodology Forty two (n=42) active university athletes voluntarily participated in the study, the participants' ages were 21.76 ± 3.24 . They were all students recruited from the University of Zululand

as follows: rugby players (n=9), male soccer players (n=17), female soccer players (n=9) and female netball players (n=7). They had regular training sessions of two hours or more with a frequency of five to six times a week. They were also involved in club competitions of the UThungulu District in the Kwa-Zulu Natal province as well as inter- university games. As part of their obligation in the clubs and university games, they played competitive matches during the weekends. All participants participated in the study on a voluntary basis. The objectives of the study were explained to them and the possible risks of participating in the study were clearly elucidated, after which written consent was obtained from each one of the participants. A medical professional sought information on any diseases they might have had before, their present health status and any medication which they could have been taking. The following constituted the exclusion criteria; current infection, history of chronic disease use of antibiotics, herbal, antioxidant and steroids containing supplements. The study protocols were conducted in accordance with the Helsinki Declaration for the Ethical Treatment of Human Subjects and were evaluated and approved by the ethics committee of the Faculty of Science and Agriculture at the University of Zululand.

Blood samples were collected and blood analysis for whole blood count was done in Lancet laboratory, Richards Bay, RSA. Data were analyzed using unpaired t-test for treatment of independent samples.

Results It is noteworthy to point out the higher levels of leucocytes in the netball players than female soccer players ($6.8 \pm 1.24 \times 10^9/L$ and $6.11 \pm 1.28 \times 10^9/L$ respectively). The lymphocyte levels were also higher in the netball players than female soccer players ($2.60 \pm 0.58 \times 10^9/L$ and $2.16 \pm 0.49 \times 10^9/L$ respectively). There were also higher levels of leucocytes in the male soccer players compared to male rugby players ($6.26 \pm 1.97 \times 10^9/L$ and $5.46 \pm 0.99 \times 10^9/L$ respectively). The lymphocyte levels were higher in the soccer players than the rugby players ($2.17 \pm 0.36 \times 10^9/L$ and $1.85 \pm 0.32 \times 10^9/L$ respectively), but the differences were however not significant at $p < 0.05$.

Discussion The changes in leucocytes could be a result of among other things the removal of dead cells related to exercise stress and trauma. It was expected, considering the levels of physical contact that the

leucocyte counts and the lymphocytes in particular were going to be higher among female soccer players and male rugby players compared to netball players and soccer male players respectively. The relatively higher levels of leucocytes and lymphocytes in rugby and female soccer players reflect what has been obtained in other studies which show an increase of constituents of leucocytes such as the insulin-like growth factor 1 (IGF-1) which have a regulatory role in the immune response for muscle repair (Fragala et al., 2014). High competition physical exercise stress was seen to induce oxidative stress and activation of leucocytes in adolescents in fairly the same way as seen in individuals in our study who were also adolescents (Santos-Silva et al., 2001). Lymphocytes and their subsets have also been known to increase with exercise (Hong et al., 2004).

Conclusions The athletes' results for the measured blood parameters were within the health norms. These findings could be related to the less intensive training protocols and lower levels of physical contact and stress in players of students teams compared to professional players.

Acknowledgements

The authors would like to thank the University of Zululand for funding of the project.

Reference

- Allgrove, J.E., Chapman, M., Christides, T. & Smith, P.M. (2012). Immunoendocrine responses of male spinal cord injured athletes to 1-hour self-paced exercise: Pilot study. *Journal of Rehabilitation Research Development*. 49(6): pp. 925–34.
- Banfi, G. Malavazos, A., Iorio, E., Dolci, A., Doneda, L. Verna, R. & Corsi, M. M. (2006). Plasma oxidative stress biomarkers, nitric oxide and heat shock protein 70 in trained soccer players. *European Journal of Applied Physiology*, 96, pp. 483–486.
- Clarkson PM, Hoffman EP, Zambraski E, Gordish-Dressman H, Kearns A, Hubal M, Harmon B, Devaney J.M. (2005). ACTN3 and MLCK genotype associations with exertional muscle damage. *Journal of Applied Physiology*: 99: pp. 564–56.
- Coutts, A.J. & Cormack, S. (2014). Monitoring the training response in Joyce, D & Lewindon, D, (Eds.) *High-performance training for sports*, Human Kinetics, Champaign.
- Djarova, T., Andreeva, L., Stefanova, D., Mateev, G., Tzvetkov, S., & Bonov, P. (2010). Dark chocolate supplementation impact on blood oxidative biomarkers in track athletes submitted to maximal exercise tests. *Proceedings of the 5th International Congress "Sport, Stress Adaptation-Olympic Sport and Sport for All"*, *Journal of Sport*

Science Special issue, 1, pp. 330–336.

Elloumi, M., Maso, F., Michaux, O., Robert, A. & Lac, G. (2003), Behavior of saliva cortisol [C] testosterone [T] and T/C ratio during a rugby match and during the post-competition recovery days. *European Journal of Applied Physiology*, 90(1–2): pp. 23–28.

Fragala, M.S., Jajtner, A.R., Townsend, J.R., Gonzalez, A.M., Wells, A.J., Oliveira, L.P., Hoffman, J.R., Stout, J.R. & Fukuda, D.H.(2014), Leukocyte IGF-1 Receptor Expression during Muscle Recovery. *Medicine and Science in Sport and Exercise*, 47(1): pp. 92–99.

Gleeson, M. & Walsh, N.P. (2012), The BASES Expert Statement on Exercise, Immunity and Infection, *Journal of Sports Sciences*, 30(3): pp. 321–324.

Haneish, Fry, Moore, Schilling, Li & Fry, (2007), Cortisol and stress responses during a game and practice in female collegiate soccer players, *Journal of Strength and Conditioning*, 21(2): pp. 583–588.

Hong, H., Farag, N., Nelesen, R., Ziegler, M. & Mills, P.J.(2004), Effects of regular exercise on lymphocyte subsets and CD62L after psychological vs. physical stress, *Journal of Psychosomatic Research*, 56 (3): pp. 363–368.

Kirwan, J.P., Costill, D.L., Houmard, J.B., Mitchel, J.B., Flynn, M.G. & Fink, W.J.(1990), Changes in selected blood measures during repeated days of intense training and carbohydrate control, *International Journal of Sports Medicine*, 11: pp. 362–366.

Santos-Silvaa, A., Rebelo, M.I., Castro, E., M., B., Belo, L., Guerra, A., Rego, C. Quintanilha, A. (2001) Leukocyte activation, erythrocyte damage, lipid profile and oxidative stress imposed by high competition physical exercise in adolescents *Clinica Chimica Acta* 306: pp. 119–126.

Yamin, C., Amir, O., Sagiv, M., Attias, E., Meckel, Y., Eynon, N., Amir, R.E., (2007), ACE ID genotype affects blood creatine kinase response to eccentric exercise. *Journal of Applied Physiology*, 103: pp. 2057–2061

Corresponding author: Sam C Mugandani, (MSc, MEd, BEd), Centre for Biokinetics, Recreation and Sport Science, University of Venda, Private Bag X5050, Thohoyandou, 0950, South Africa; Mobile phone: [+27726819044](tel:+27726819044); Office: [+27159628651](tel:+27159628651); Fax: [+27159624749](tel:+27159624749); E-mail: sam.mugandani@univen.ac.za

USE OF NUTRITIONAL SUPPLEMENTS BY MALE GRECO-ROMAN WRESTLERS

Dilyana Zaykova, Lubomir Petrov, Albena Alexandrova
National Sports Academy "Vassil Levski"

Introduction: Wrestling is a strength sport which requires specialized training exercises successfully combined with an adequate nutritional regime and periods of recovery.

Methodology: We surveyed 24 male Greco-Roman-style wrestlers of various weight categories with an average age of 23.2 years and an average sports experience of 10.5 years, performing an average of 9.6 workouts per week. The wrestlers have won prizes at European, World and National Championships.

The subjects completed a diet-assessment questionnaire developed by us, which included 28 questions about their weekly consumption of basic food products and questions about age, training experience, the number of training sessions per week, height and weight. They had also completed a questionnaire on their use of nutritional supplements, including 18 questions about the sources of information, resources, the type and amount of vitamins, proteins, amino acids and other supplements.

Results: The wrestlers' primary source of information regarding nutritional supplements were their coaches as well as Internet. 67% of subjects used whey protein, which provides an average of 0.42 g of extra protein per kilogram of body weight. Twenty-two of the participants in the survey used amino acids. Fourteen people have indicated the additional use of BCAAs, the rest combined BCAAs with glutamine, other essential or complex amino acids. Certain individual athletes achieved the recommended protein intake only through a balanced diet, even without the use of supplements. For some, however, the intake of BCAAs and creatine was above the recommended. A total of nine of the wrestlers were taking creatine. Multivitamins were taken by 64% of the competitors, and B-complex and vitamin C – by 22% and 7%, respectively.

Conclusions: Athletes with a lower than the optimal protein intake for their sport must increase the consumption of foods with high protein content.

Key words: wrestling, nutrition, nutritional supplements, BCAAs, creatine

Introduction

Fighting is a strength sport with weight categories characterized by high intensity and short duration of combats (Erkal, 2015). Fighting develops different functional qualities: muscle strength, flexibility, and neuromuscular coordination, static and dynamic equilibrium (Basar et al, 2014). Good sporting form could be achieved through special training exercises, combined with adequate nutritional regime and recovery periods.

Of great importance is the optimal combination of the three groups of nutrients (proteins, carbohydrates and fats) that effectively provide the basic needs of the organism (Mcardle et al, 2001).

With the progress of the training experience, there is a need for a faster and more efficient recovery process for achievement of higher muscle hypertrophy and strength indicators (Aoi et al, 2006). Along with the application of an adequate diet depending on the sports type, there is also a need for additional intake of dietary supplements. Their use is indispensable for enhancing athletic performance and, at the same time, for injury prevention (Campbell, Kreider, 2007).

The purpose of this study was to assess the role of dietary supplements for the quality of the male Greco-Roman-style wrestlers' diet as an important factor in their sports training.

The tasks of the study were:

1. To conduct a nutrition survey with male Greco-Roman-style wrestlers.
2. To conduct a survey on the admission of nutritional supplements with the same group of male Greco-Roman-style wrestlers.
3. To evaluate the quantity and quality of the supplements as a factor in the nutrition and recovery regime of the competitors.

Hypothesis: The optimal intake of dietary supplements is an important factor for the quality of the nutritional diet of wrestlers.

Methodology: Twenty-four male Greco-Roman-style wrestlers of various categories were investigated. Their average age was 23.2 years. They had an average sporting experience of 10.5 years and during the study they performed an average of 9.6 workouts per week. The contestants have won prizes at the European, World and Republic Championships.

The surveyed men completed a nutrition assessment questionnaire developed by our research group and applied in a number of previous studies with various contingents (Kolimechkov et al, 2016). This questionnaire included 28 questions about the weekly use of basic food products and questions about age, sporting experience, the number of training sessions per week, weight and height.

The wrestlers completed also a second questionnaire on the use of nutritional supplements, which included 18 questions about the sources of information, the type and amount of vitamin, protein and amino acid supplements. This questionnaire has been developed by the authors especially for the purposes of this study.

Results and analysis

According to the results, the surveyed wrestlers received information on nutritional supplements mainly from their coaches (37%) and internet (23%). The other relied on friends (17%), other competitors (13%) or "other sources" (10%) (Figure 1). These data showed the leading role of coaches in formation of the supplements' regimen of contestants.

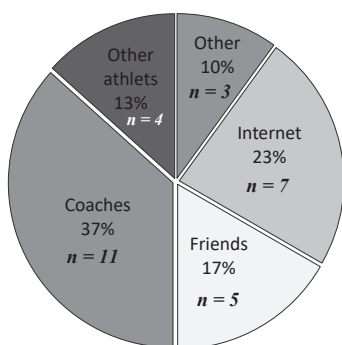


Fig. 1. Sources of information on nutritional supplements. The number of answers exceeded the number of people surveyed because in some cases more than one answer was given.

Of the athletes surveyed, 67% said that they were using whey protein. This protein gave them an average of 0.42 g of protein per kilogram of body weight. Eight of the people surveyed took protein only during the preparatory period. One contestant responded that he takes protein in the pre-competition period and one contestant – in the competition period. The other six wrestlers included whey protein in the course of its year-round sports training.

Figure 2 shows the individual relative protein in-

take for each competitor obtained both from the food and from the supplements. Considering the extremely intense workload, it could be assumed that the optimum protein intake in combat wrestlers was close to the upper recommended limit of 2 g/kg (Campbell, Kreider, 2007), (Kreider, 2004]. Moreover, the calculated average protein intake of the whole group was 2.1 g/kg.

With regard to protein intake, three groups of athletes were outlined: 1) 8 athletes with much higher than the optimal intake (over 2.5 g/kg), as it should be taken into account the opinion of some authors that in some strength sports even an intake of 2.5–3.0 g/kg could be considered as normal (Tripton, Wolfe, 2004); 2) 9 athletes with an intake of around 2 g/kg (1.5–2.5 g/kg), as the athlete № 15 achieved an optimal intake of 2.2 g/kg without any supplements; 3) 7 contestants with an intake far below this accepted for optimal. In this group, only two fighters reported an intake of supplement in very low doses.

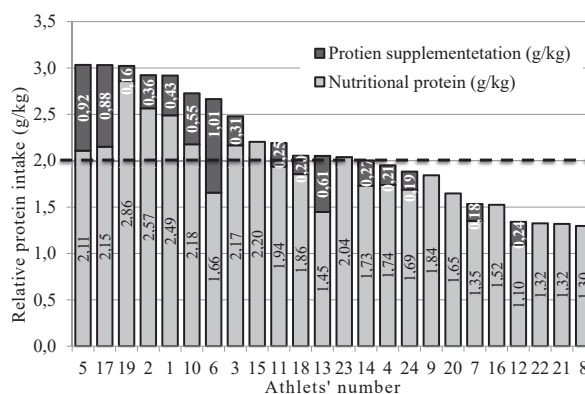


Fig. 2 Relative daily intake of proteins with both food and nutritional supplements in the investigated wrestlers. The dashed line shows the upper limit of the recommended relative intake of protein – 2.0 g/kg.

Twenty-two of the persons surveyed reported amino acids supplementation. Fourteen of them indicated the additional intake of branches chain amino acids (BCAA) mainly during the preparatory period and six of them have taken BCAA throughout the year. Two wrestlers have taken complex amino acids. Intake of a combination of BCAA and Glutamine has been shown by three people, BCAA and essential amino acids (EAA) – by one person, BCAA, Glutamine and complex amino acids – by one and BCAA, Glutamine, EAA – again by one person (Figure 3). Half of the subjects' athletes took amino acids throughout the year (n = 11) and the others – only in either the preparatory (n = 7) and

competitive (n = 4) periods. It has been shown positive effects of 5 g BCAA supplementation before and after the exercise load (Shimomura, 2004).

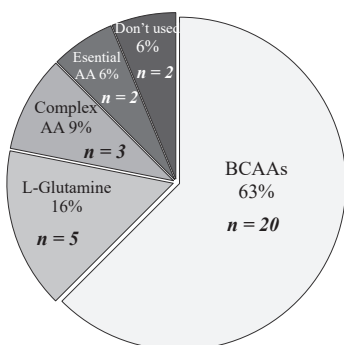


Fig. 3. The Amino Acid supplementation by the survived wrestlers. The number of answers exceeds the number of people surveyed because in some cases more than one answer was given.

A total of 9 people of the tested athletes have taken creatine supplementation: two of them have intake 5 g only before the workout, three wrestlers – 10 g only after completion, two wrestlers – an average of 7.5 g before and after training and two others indicated that they have consumed, on average 5 grams not only in the training days but also in the days without training. Five wrestlers noted that they have taken creatine during the preparatory period, two – during a pre-competitive period and two – throughout the year (Figure 4). In the specialized literature the creatine intake includes the following scheme: an initial saturation dose of 20 g per day or 0.3 g/kg divided into 4 intakes per day for a period of one week and a subsequent sustained maintenance intake of 3–5 g or 0.03 g/kg (Cooper et al, 2012).

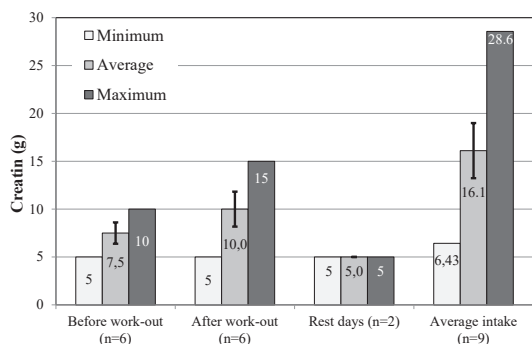


Fig. 4. Creatine supplementation of the tested wrestlers. The number of answers exceeds the number of people surveyed, because in some cases there was more than one answer.

In regard to vitamins, the multivitamin supplements were the most often mentioned (64%) by the

surveyed wrestlers, and a large number of the contestants have taken them throughout the year. The B-complex vitamins were taken by 22% of the survived persons. These vitamins were also taken year-round by the most athletes, and only some of them included B-complex vitamins periodically during the preparatory or competition period. Only 7% of the persons surveyed included Vitamin C in their year-round preparation (Figure 5).

Studies have found that athletes involved in heavy workloads may need larger amounts of vitamins such as thiamine, riboflavin and B6, which are actively involved in the catabolism of carbohydrates and fat in energy production. Also, vitamin B12 is essential for the hemoglobin synthesis, which is the major factor in the delivery of oxygen to muscles during aerobic workloads (Manore, 2001). Many authors recommend these needs to be covered by increased intake of nutrients, although other studies have found vitamin deficiency despite these recommendations. These are mainly reported in weight category sports, where the periodic reduction in body weight is required. The use of vitamin supplements in athletes favors the removal of harmful effects resulting from exercise stress and inadequate intake of essential nutrients (Manore, 2001). The antioxidants vitamins C and E prevent cellular and subcellular structures from oxidative damage and thus can optimize the training process. However, it should be noted that pro-oxidants generated during exercise serve as a “signal” for the activation of several cell signaling mechanisms important for optimal physiological function (Droge, 2002).

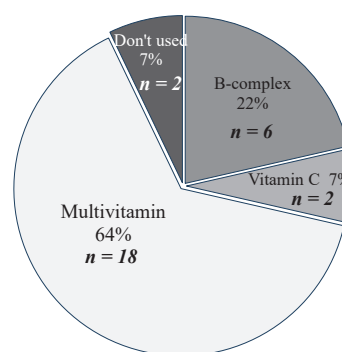


Fig. 5. Vitamin supplementation of the tested wrestlers. The number of answers exceeds the number of people surveyed, because in some cases there was more than one answer.

Conclusion:

The responses to the survey showed the leading role of coaches in developing a strategy for the nutri-

tional supplements intake in wrestlers. A low protein intake (below the lower limit of the optimal 1.5 g/kg) was observed even in highly qualified class competitors (in about one-quarter of such cases). A balanced diet could achieve the recommended protein intake even without the use of supplements. The intake of BCAA in some of the contestants significantly exceeded the recommendations in the literature. None of the creatine administration mode, applied by the investigated athletes was consistent with the literature described methodologies.

References:

- Almada et al., ISSN Exercise and Sport Nutrition Review: Research and Recommendations, Journal of the International Society of Sports Nutrition, 1(1),1-44, 2004.
- Aoi, W., Naito, Y., Yoshikawa, T., Exercise and functional foods, Nutrition Journal, 5 (15), 2006
- Basar, S., Duzgun, I., Guzel, NA., Cicioğlu, I., Celik, B., Differences in strength, flexibility and stability in free-style and Greco-Roman wrestlers., 27(3):321-30, 2014
- Campbell, B., Kreider, R., International Society of sports nutrition position stand: protein and exercise, Journal of the International Society of Sports Nutrition 2007, 4:8doi:10.1186/1550-2783-4-8
- Cooper, R., Naclerio, F., Allgrove, J. and Jimenez, A., Creatine supplementation with specific view to exercise/sports performance: an update, J Int Soc Sports Nutr, 9, 33, 2012
- Droge W: Free radicals in the physiological control of cell function. *Physiol Rev* 2002, 82(1):47-95] and therefore for achieving high sports results.
- Erkal Arslanoglu, Physical profiles of Turkish young Greco-Roman wrestlers, Academic Journals, Vol.10(8), pp. 1034-1038, April 2015
- Kolimechkov, S., Petrov, L., Alexandrova, A., and Atanasov, P., Nutrition and physical development assessment of pre-school and primary school children practicing artistic gymnastics, African Journal for Physical Activity and Health Sciences (AJPHEs), 22 (2:2), 565-577, 2016
- Manore M. Vitamins and minerals: Part I. How much do I need? ACSM's Health & Fitness Journal, 5, 33-35, 2001
- McArdle, W., Katch, F., and Katch, V., Exercise physiology-energy, nutrition and human performance, Williams & Wilkins, 1996
- Shimomura, Y., Murakami, T., et al., Exercise Promotes BCAA Catabolism: Effects of BCAA Supplementation on Skeletal Muscle during Exercise, The American Society for Nutritional Sciences J. Nutr., 134, 1583-1587, 2004
- Tripton, K., Wolfe, R., Protein and amino acids for athletes, Journal of Sports Sciences, 22, 65-79, 2004
- Dilyana Zaykova
NSA "Vassil Levski"
Sofia, 1700
Bul. Academician Stefan Mladenov № 21
Department "Heavy athletics, boxing, fencing and sport for all"
+359899729963; e-mail: dilianaizaikova@gmail.com
Lubomir Petrov
National Sports Academy "Vassil Levski"
Department of "Physiology and biochemistry"
Albena Alexandrova
National Sports Academy "Vassil Levski"
Department of "Physiology and biochemistry"

HEALTH AND FITNESS

EXTRACURRICULAR SPORT ACTIVITIES AND INSTITUTIONALIZED CHILDREN. SOCIALIZATION EFFECTS

Mariana Angelcheva

Summary

The research paper aims to estimate the impact of extracurricular sport activities at the level of socialization in respect to children deprived of parental care. 152 institutionalized children have been included in the respondent group, age from 8 to 14, in three age subgroups and two categories – sport involved and sport non-involved. The data obtained tell us that involvement in such activities significantly increases the child's socialization in respect to factors as social activity, personal autonomy and social adaptation. On the other hand, however, their effects on the children's ethic value system and behavior are very low.

Key words: *extracurricular sport activities, socialization, children deprived of parental care.*

Introduction

After the enforcement of the Child Protection Law (2000), the Bulgarian politics was directed to *de-institutionalization* of the children deprived of parental care and so, giving them a chance to live and to be educated in out-institution environment. This concentrates the state efforts and public attention on children social adaptation, carefully considering the values they have adopted in the special social institutions, on the one hand, and on the other, the requirements of the out-institution environment. The adaptation effects depend on the level of sufficiency between the individual perception of the personal Self and his/her social communications. A successful adaptation presupposes child adaptation to the bigger social community and, at the same time, creation of a capacity to establish stable own grounds while managing positively to survive everyday clashes.

The adoption of social roles gives each individual the chance to develop the personal Self and to become a real holistic personality. The difficulties, connected with the socialization process in the group of the children deprived of parental care, are usually associated with the barriers which they should surmount mastering some social roles. The lack of normal communication, typical for the other children (with a family, friends, relatives, etc.), creates a perception that the notion about such roles is developed on the ground of conflicting information coming from various socializing sources. It causes various troubles during the moral and emotional-determined development of the child as a person; the situation is typical for the age under

discussion.

Both, the motive activity and the sport, establish a complex mechanism, a combination of biological, psychological and social effects on the physical organism and the personality, simultaneously. The sport as an extracurricular activity assists the child to form skills and habits, improves the health status and the physical Self-acceptation (Weiss & Duncan, 1992), helps to set up higher Self-esteem, Self-respect, Self-confidence and Self-perfection (Iannotti R. et al., Group HPAF, 2005), to aspire to a better own psychological state (Kirkcaldy et al., 2002; Marsh, 1998), more positive peer relations (Smith, 1999) and less emotions linked to loneliness (Page et al., 1992), as well as socialization improvement and facilitation (Vilhjaimsson & Kristjansdottir, 2003; Moore et al., 1991; Sallis et al., 1998).

In this country we do not have any specialized studies concerning socialization sport activity effects on the social growth of the institutionalized children.

Aim and Objectives of the study

The research goal was to estimate the impact of the extracurricular sport activities the socialization of children deprived of parental care. 152 children took part in the fieldwork as respondents; their age was from 8 to 14 years; they were of both genders (90 boys and 62 girls), and were divided in 3 age subgroups: a) 8–10; b) 11–12; and c) 13–14. As for the sports being extracurricular sport activities factor, the children were divided in two groups: a) sport-involved and b) sport non-involved.

Methods

To make clear how the extracurricular sport activities effects surmount the institutional reactive behavioral model and what is the kind of connectivity between them and the socialization effects in children deprived of parental care-group, we have used the *M. Rozhkov Scale*. It enabled us to record the effects of social adaptation, social activity, autonomy and morals. The questionnaire included 20 statements evaluated on a 5-degrees scale: 4 – always; 3 – almost always; 2 – occasionally; 1 – very rare; 0 – never. Due to the values obtained for the *coefficient factor*, we could define the personal socialization level in each area, respectively: a) > 3 – high level; b) between 2 и 3 – mean level; c) < 2 – low level. These levels were set after an analysis of the fieldwork data. In order to calculate the medial values and standard deviations we used *standard statistic methods*.

Results

The adopted skills reflect the *social adaptation* level and include: a) *acceptance* of the rules and conformity to requirements imposed by the elders (teachers, educators, supervisors and parents while visiting the child in the institution); b) *efforts* to behave so that to get some credit; c) *efforts* to build up friendly and amicable peer relations; d) *efforts* to behave as all others. Such a *behavior* expresses a good-will to be accepted by those around you and readiness to obey the norm-frame set by the community. This means *ambition* for Self-control, respect for the elders' authority, conscientious and friendly mood to peers.

Such skills assimilation helps the child to develop adequate behavioral models; it guarantees emotional comfort for the grow-ups and enjoyment and satisfaction from the intercommunication with the environment as well as easy and graceful adaptation to it. The results for the social adaptation of sport-involved and non-involved institutionalized boys and girls are presented bellow in Figure 1.

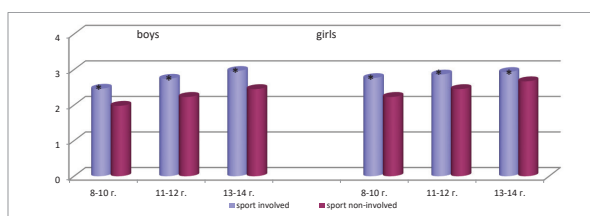


Figure 1. Data for social adaptation of sport involved and non-involved boys and girls from institutions (M. Rozhkov)

* Availability of statistically considerable distinction between the groups at $\alpha < 0,05$.

The results of the sport-involved boys from all age groups are higher in comparison to sport-non-involved. However, the data obtained in the group of the sport-non-involved boys from the first subgroup are low. In the next two subgroups the social adaptation level, expectedly, grows but still remains lower than the sport active grow-ups, as the data obtained demonstrate.

This trend is preserved in the girls' group. However, the social adaptation in this group also does not go beyond above the mean level, irrespectively of the higher results. At the same time the data for the sport non-active young register levels closer to middle and downward to low levels.

Sport is a stimulation factor for the development of social qualities such as respect to elders, self-control and tolerance to others, Self-discipline and respect for sport rules. It is a guarantee for the greater social adaptation. On the other hand, the group activities create environment to build friendly peer relationships and they occur to be an important component in the social adaptation process.

Typical for the transition years of adolescence is the drive to *autonomy*, Self-esteem, Self-reliance and Self-confidence in the bigger community. According to T. Savova (2006), the institutionalized children rank autonomy at the lowest level in comparison to their peers from a natural family environment where the motivation to be independent is among the leading factors for personal development. Life in institutions supposes a low level of empathy. This deficit, namely, is the ground of the need for care and protection they are searching from the others. At the same time, the atmosphere in such institutions does not stimulate the otherness, does not tolerate being different, neither give a chance to be such; it does not create surroundings where individuality may develop.

Sports, especially the so-called individual ones, grant a new social environment; they create conditions to develop skills such as competitive spirit, leadership, Self-reliance and positive esteem that stimulate autonomy in the grow-ups group (Figure 2).

Again the sport-involved grow-ups from all age subgroups express higher opinion than sport non-involved. In the boys age-group, as a whole, the distinctions are higher than in the girls age-

group. Therefore, the sport as a development factor influencing the formation of an independent autonomous personality is of higher value for the boys. Growing up, the non-involved from both gender groups begin perceiving autonomy as a more important factor; however, it still remains in the frame-limits between low and mean. One reason for such results may come from the specificity of the exercised sports; they are mostly individual ones – horse riding, swimming, tracks-and-fields-athletics, and gymnastics.

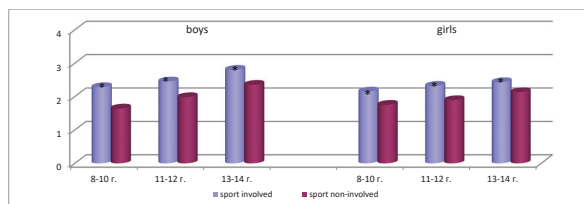


Figure 2. Data for autonomy of the sport involved and non-involved boys and girls from institutions (M. Rozhkov)

* Availability of statistically considerable distance between the groups at $\alpha < 0,05$

Social activity is evaluated by studying: a) the *ability* to be successful in various initiatives; b) to have *enough* confidence while defending your own justice; c) the *capacity* to realize practically any ideas; d) the *drive* to be victorious; e) the *know-how* to carry through a particular initiative. Analysis shows (Figure 3) that the sportive boys from all age-groups evaluate social activity higher.

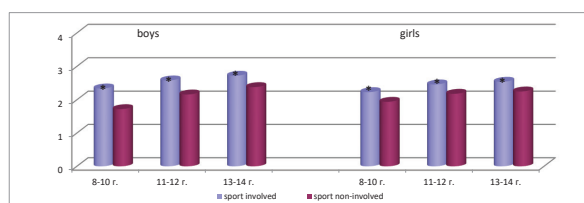


Figure 3. Data for social activity of sport involved and non-involved boys and girls from institutions (M. Rozhkov)

* Availability of statistically considerable distance between the groups at $\alpha < 0,05$

With age, social activity goes up in the group of sport non-involved children deprived of parental care; however, in this category it remains in the diapason of low to mean levels. In the group of the sport active children it is at medial level and drifts up. Similar results are got in the total girls' age-group: the distinction here between sport active and non-active is smaller but considerable. The development dynamics in the various age subgroups

of sport non-involved boys is similar to the dynamics of the boys non-involved in any sport; and with age its values again are going up from low to mean level but not beyond. Even though the results of the sport involved girls are a little bit higher, they still remain in the norms of the middle phase.

Good socialization presupposes higher *morals*, i.e. building up capability to be amicable, willing to help the other, empathic to their problems, endeavorable to protect the offended (Figure 4).

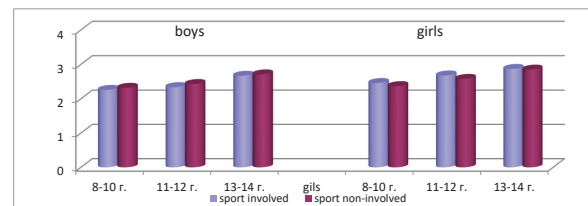


Figure 4. Data for morals of the sport involved and non-involved boys and girls from institutions (M. Rozhkov)

Absence of family or any important person in child's life is a serious reason for the institutionalized children deprived of parental care not to be able to build up simple social behavior models. The lack of empathy in their emotional relations with the stuff taking formal care for them, which, by the way, is frequently changed by the management, makes emotional and moral troubles in their individual development.

This explains, to some extent, why the effect of 'participation in extracurricular sport activities' is weaker evaluating the morals. Both genders do not endure any essential changes with age and the distinctions between sport non-involved and sport-involved is insignificant but in favor of the latter. Notwithstanding the small distance in all age/gender subgroups the expressed opinions remain in the frame of the mean phase. Therefore, the extracurricular sport activities have a real effect on the moral aspect of socialization.

Discussion:

The data obtained for the socialization evaluation opinion of the children deprived of parental care demonstrate that participation in extracurricular sport activities has a significant socializing effect in regard to social activity, autonomy and social adaptation. In all age/gender groups sport involving demonstrates mean socialization effect in comparison to sport non-engaged (in this group it is

closer to the mean-low). In respect to morals, the evaluation opinion distinctions for both groups are insignificant and remain in the frame of the mean scores.

Participation in extracurricular sport activities stimulates the institutionalized boys and girls to develop social skills to respect elders (trainers), Self-control and behavioral tolerance, Self-discipline and respect to the established rules and norms, amicable peer relationships. So, they ensure higher socialization effect among sport active teenagers. Still these activities are not enough to overpass the sequences of the institutionalization and to achieve real high socialization effects.

References:

- Iannotti R., Janssen I., Haug E., Kololo H., Annaheim B., Borraccino A., (2005), Group HPAF: Interrelationships of adolescent physical activity, screen-based sedentary behaviour, and social and psychological health. *International Journal of Public Health.*; 54(Suppl 2): pp.191–198.
- Kirkcaldy B., Shephard R., Siefen R., (2002), The relationship between physical activity and self-image and problem behaviour among adolescents. *Social Psychiatry and Psychiatric Epidemiology.*; 37: pp.544–550.
- Marsh H., (1998), Age and gender effects in physical self-concepts for adolescent elite athletes and non-athletes: A multicohort-multioccasion design. *Journal of Sport and Exercise Psychology.*; 20: pp.237–259.
- Moore L., Lombardi D., White M., Campbell J., Oliveria S., Ellison R., (1991), Influence of parents' physical activity levels on activity levels of young children., *Journal of Pediatrics.*; 118: pp.215–219.
- Page R., Frey J., Talbert R., Falk C., (1992), Children's feelings of loneliness and social dissatisfaction: Relationship to measures of physical fitness and activity. *Journal of Physics Teacher Education.*; 11: pp.211–219.
- Sallis J., Patterson T., Buono M., Atkins C., Nader P., (1998), Aggregation of physical activity habits in Mexican-American and Anglo families. *Journal of Behavioral Medicine.*; 11: pp.31–41.
- Savova, T., (2006), State and Development of the Need-Motivation Sphere of the Institutionalized Children Deprived of Parental Care, Author's essay, Shoumen, Bulgaria
- Smith A., (1999), Perceptions of peer relationships and physical activity participation in early adolescence. *Journal of Sport and Exercise Psychology.*; 21: pp.329–350.
- Vilhjalmsson R., Kristjansdottir G., (2003), Gender differences in physical activity in older children and adolescents: the central role of organized sport. *Social Science & Medicine.*; 56: pp.363–374.
- Weiss M., Duncan S., (1992), The relationship between physical competence and peer acceptance in the context of children's sports participation. *Journal of Sport and Exercise Psychology.*; 14: pp.177–191.
- Research Methodology in Socialization of Pupils' Personality, as to M. Rozhkov <http://www.vashpsixolog.ru/psychodiagnostic-school-psychologist/69-diagnosis-emotional-and-the-personal-sphere/1351-metodika-dlya-izucheniya-soczializirovannosti-lichnosti-uchashhegoy>(accessed December 2012).

* Mariana Angelcheva MD, PhD, National Sport Academy "Vassil Levski", Ass. Prof. at Department of Kinesitherapy and Rehabilitation; address: 1, Gurguljat Street, 1117 Sofia; Bulgaria; +359 889008269; e-mail: angelcheva_dr@abv.bg

THE EFFECTS OF EATING HABITS, PHYSICAL ACTIVITY, NUTRITION KNOWLEDGE AND SELF-EFFICACY LEVELS ON OBESITY

Pervin TOPTAŞ DEMİRCİ¹, Nevzat DEMİRCİ¹, Erdal DEMİRCİ³

¹Mersin University Department of Tourism Animation, Mersin/Turkey

²Mersin University, Physical Education and Sport Sciences, Mersin/Turkey

³Kafkas University, Physical Education and Sport Sciences, Kars/Turkey

Objective: *The purpose of this study is investigate the effects of eating habits, physical activity, nutrition knowledge and self-efficacy levels on obesity*

Methods: *The participants of the research were Kafkas University Physical Education and Sports College and Sarıkamış Vocational School students. Research includes eating habits, physical activity (PA), nutrition knowledge and self-efficacy questionnaire. The cases were divided into normal weight (NW) and overweight – obese (OW) groups based on age, sex, body mass index percentages. The obtained data were analyzed using SPSS.*

Results: *Approximately 35.5% of participants were identified as overweight or obese. Significant differences were observed between the OW and NW groups in terms of gender, weight control interest ($P < 0.01$). OW group women were found to exhibit less desirable behaviors when compared to NW. Compared to OW group NW group, it was determined that women participated in less physical activity than men. There was no significant difference in nutritional information between OW and NW groups. In particular, the self-efficacy level of the PA was significantly lower in the OW group than in the NW group ($P < 0.01$).*

Conclusion: *This study reveals eating habits, PA and self-efficacy differences among university students. It should focus on improving the self-efficacy of university students, changing eating habits and increasing PA levels by organizing programs to combat obesity.*

Key Words: Student, obesity, weight control, physical activity, nutrition knowledge

Introduction

According to the World Health Organization (WHO) report, the prevalence of obesity doubled worldwide between 1980 and 2014 (Seong et al., 2016). Many countries have embraced and implemented various national policies to prevent obesity and to reduce obesity and socio-economic burden, since obesity has been shown to be a risk factor for chronic diseases such as cardiovascular disease, type II diabetes and some cancers (Brown et al., 1998). Throughout the period corresponding to early adulthood in college, social and emotional development is complemented by physical maturity and one's eating habits are determined (Yu et al., 2014).

However, the increasing risk of chronic illness due to changes in nutrition habits by university students is not adequately considered. Obesity in college students is seen as the first indication of the risk of future chronic diseases of obesity (Keihner et al., 2011). For this reason, it is very important to actively control obesity from the first years of university. Although the cause of obesity is complicated,

nutrition habits or lifestyle play an important role in the development of obese conditions (Hatfield et al., 2015; Lee et al., 2014). The aim of this study is to examine the eating habits, physical activities, nutrition knowledge and self-sufficiency of university students and to investigate whether these characteristics differ according to obesity status.

Material and method

Subject and Participants

Participants of this study were students from the faculty and college of Kafkas University. The criteria for inclusion in the study are university students over the age of 18, no chronic illness, no chronic drug use, no musculoskeletal problems that could affect physical activity. The study includes nutrition habits, physical activity (PA), nutrition knowledge and self-efficacy levels in university students. All students participated in volunteer work, and each student was informed about the study prior to the application and taken to participate in the "Informed Consent Form" in accordance with Helsinki (WMADH, 2000). 220 male and female healthy university students participated in the study. Par-

ticipants were divided into two groups, normal weight (NW) and overweight-obese (OW), based on age, sex, and body mass index percentages.

Procedures

The study questionnaire was based on university students' eating habits, physical activity and nutrition knowledge, and literature review to determine self-efficacy levels (Ha et al., 2016; Cho et al., 2009; Kang 2009). General features include age, gender, height, weight, body mass index (BMI) items. The body mass index was calculated based on the weight and the dye reported. Participants' height measurements were measured by the millimetric height scale and body weight measurements by electronic scales. Body weight and height measurements are formulated by adding them to personal information forms. $BMI = \text{Body Weight (kg)} / \text{Boy}^2$ (m). BMI values were obtained by dividing the body length by body weight after taking the length of the body length. Overweight-obese (OW) with $BMI \geq 25$ and $BMI 18.5 < BKI < 25$ were determined as those with normal weight (NW).

Data Collection Tools

Eating Habits

Eating habits included diverse foods, regular meals, size of food, frequency of breakfast meals, eating and snacks, behavior during meals, unbalanced diet and unfavorable food (Na et al., 2010; Choi & Seo., 2003). These variables were measured using 5-point scales or by asking them to record the frequency of their behavior or to check the categories.

Physical Activity

Physical activity is measured based on seven factors: the frequency of physical activity for at least 30 minutes per day, the frequency of walking or cycling, the frequency of exercise, weekday or weekend walking times, weekday or weekly moving time, by the number of activities it has performed (Guthold et al., 2010; Centers for Disease Control and Prevention, 2007). The time spent walking was measured using four categories: "less than 30 minutes a day" or "more than 2 hours a day." The inactive time spent was measured using the categories "from less than one hour a day" to "no more than 4 hours a day"

Nutrition Knowledge

Nutrition information was measured on 10 items, including general nutrition (six items) and infor-

mation about obesity (four items) (Na et al., 2010; Choi & Seo, 2003). Information about obesity, definition of obesity, adequate weight control, fruit and energy and the effects of regular exercise. For each nutritional information item, the number and percentage of correct answers of the subjects were examined. The total score of the nutrition knowledge was the total score of the correct answers for the 10 nutrition information items.

Self-Efficacy

Self-efficacy obesity status in eating or physical activity was assessed using 10 items (Na et al., 2010; Ko & Kim, 2010; Kang 2009). Self-efficacy in physical activity was measured using four items. They regularly participate in spore exercises, perceived efficacy on tired or bad weather conditions, driving at short distances, exercising at lunch or in the malls. Each item was measured on a 4-item scale between 'very difficult' (1) and 'very easy' (4). The total score for self-efficacy was calculated as a total of 10 item points.

Statistical analyzes

SPSS (PASW Statistics 18.0; SPSS Inc., Chicago, IL, USA). Descriptive statistics including frequency, percentages, mean and standard deviation were calculated. Body weight and height measurements are formulated by adding them to personal information forms. $BMI = \text{Body Weight (kg)} / \text{Boy}^2$ (m). BMI values were obtained by dividing the body length by body length after taking the body length. The T-test was used to examine the differences between the eating habits, physical activity, nutrition knowledge and self-efficacy according to obesity status. Statistical significance was examined at $P < 0.05$.

Results

Participants were found to have an average age of 21.97 and approximately 64.5% (142) for the normal weight (NA) group and 35.5% (78) for overweight – obesity (OW). Gender is significantly different according to obesity status; In the OW group, the rate of female (64.1%) was higher than that of the NW group (56.3%, $P < 0.01$) (Table 1).

Table 1: General Descriptive Characteristics of University Students

Variables	Obesity status ¹		Total (n=220)
	Normal (n = 142)	Overweight & Obesity (n = 78)	
Age	22.0±1.7	21.95±2.2 ²⁾	21.97±1.95
Weight (kg)	66.4 ± 14.8	78.5 ± 11.8	72.45±13.3
Height (cm)	175.0 ± 10.3	169.0 ± 10.1 28.2 ± 3.4	172±10.2 25.4±3.7
BMI	22.6 ± 4.1	28 (35.9)	90 (39.8)
Male	62 (43.7)		
Famale	80 (56.3)	50 (64.1) ^{3)**}	130 (60.2)

** P < 0.01, ¹⁾ BKİ ≥25 olan aşırı kilolu- Obez (OW) ve BKİ 18.5 < BKİ < 25 arası normal ağırlıkta (NW)
²⁾ Mean ± SD, ³⁾ n (%)

The average frequency of breakfast was 5.0 ± 1.6 and the frequency of breakfast in both sexes was lower than in the NW group (P <0.05). While the frequency of eating outside did not differ from that of obesity in men, OW women eat less than women (P <0.01). Approximately 34% of participants were fed with irregular food, while the rate of regular eating was about 35%. The proportion of 'small' or 'very small' respondents according to the size of the meal ratio was significantly higher in the OW group (P <0.001) compared to the NW group in both boys and girls. The proportion of women fed an unbalanced diet was 41.2% lower in the OW group (36.0%) than in the NW group (P <0.001). There was no significant difference between the participants regarding the unfavorable foods (Table 2).

Table 2: Eating habits according to obesity status in university students

Variables	Male (n=90)		Famale (n=130)		Total (n=220)
	Normal (n= 62)	Overweight & Obesity (n =28)	Normal (n= 80)	Overweight & Obesity (n =50)	
Breakfast frequency (times/week)	5.6 ± 1.4	4.5 ± 1.6 ^{3)*}	5.7 ± 1.6	4.4 ± 1.7*	5.0 ± 1.6
Frequency of eating out (times/week)	1.3 ± 1.1	1.1 ± 0.8	1.4 ± 0.7	1.1 ± 0.8**	1.2 ± 0.8
Frequency of eating snacks (times/day)	1.6 ± 1.3	1.2 ± 0.8**	1.6 ± 1.2	1.2 ± 0.8**	1.4 ± 1.0
Variety of foods					
Do not eat a variety of foods at all	7 (11.3)	3 (10.7) ^{4)*}	11 (13.7)	4 (8.0)*	25(11.4)
Do not eat a variety of foods	8 (12.9)	5 (17.9)	13 (16.3)	9 (18.0)	35(15.9)
Average	17 (27.4)	7 (25.0)	26 (32.5)	14 (28.0)	64(29.0)
Eat a variety of foods	16 (25.8)	8 (28.5)	18 (22.5)	13 (26.0)	55(25.0)
Eat a variety of foods very often	14 (22.6)	5 (17.9)	12 (15.0)	10 (20.0)	41(18.7)
Regular meals					
Very irregular	6 (9.7)	4 (14.3)	9 (11.2)	8 (16.0)**	27(12.3)
Irregular	12 (19.3)	6 (21.5)	18 (22.5)	12 (24.0)	48(21.8)
Neither irregular nor regular	17 (27.4)	8 (28.5)	25 (31.3)	16 (32.0)	64(29.0)
Regular	18 (29.0)	7 (25.0)	20 (25.0)	9 (18.0)	54(24.5)
Very regular	9 (14.6)	3 (10.7)	8 (10.0)	5 (10.0)	25(11.4)
Size of meals					
Very small/ small	18 (29.0)	5 (17.9)**	15 (18.7)	17 (34.0)**	55(25.0)
Adequate	24 (38.7)	16 (57.1)	43 (53.8)	23 (46.0)	106(48.1)
Large/very large	20 (32.3)	7 (25.0)	22 (27.5)	10 (20.0)	59(26.9)
Behavior during meals					
Just eating	15 (24.1)	7 (25.0)	12 (15.0)	7 (14.0)	41(18.6)
Conversation with family members	25 (40.3)	13 (46.4)	48 (60.0)	25 (50.0)	111(50.5)
Playing games or watching TV	13 (20.9)	5 (17.9)	13 (16.3)	10 (20.0)	41(18.6)
Reading a book or others	9 (14.7)	3 (10.7)	7 (8.7)	8 (16.0)	27(12.3)
Unbalanced diet					
Yes	25 (40.3)	10 (35.7)	33 (41.2)	18 (36.0)**	86(39.1)
No	37 (59.7)	18 (64.3)	47 (58.8)	32 (64.0)	134(60.9)
Foods that they dislike¹⁾					
Grains and starches	11(17.7) ⁵⁾	8 (28.4)	16 (20.0)	12 (24.0)	47(21.4)
Meat	7 (11.3)	3 (10.7)	11 (13.7)	8 (16.0)	29(13.2)
Fish	3 (4.8)	2 (7.2)	5 (6.3)	4 (8.0)	14(6.3)
Eggs	6 (9.7)	2 (7.2)	8 (10.0)	5 (10.0)	21(9.5)
Beans	11 (17.7)	3 (10.7)	13 (16.3)	7(14.0)	34(15.5)
Vegetables	8 (12.9)	2 (7.2)	7 (8.7)	5 (10.0)	22(10.0)
Fruits	6 (9.7)	3 (10.7)	6 (7.5)	4 (8.0)	19(8.6)
Dairy products	4 (6.5)	3 (10.7)	5 (6.3)	3 (6.0)	15(6.9)
Seaweeds	0	0	0	0	0
Others ²⁾	6 (9.7)	2 (7.2)	9 (11.2)	2 (4.0)	19(8.6)

* P < 0.05, ** P < 0.01, 1) Multiple answers, 2) Shellfish, soy bean paste, greasy foods, spicy foods, etc. 3) Mean ± SD4) n (%), 5) The number in parentheses is the percentage of total subjects in each group.

Physical activity variables in women and men were significantly different between OW and NW groups. The percentage of those who stated that they did not walk or bike on weekends were higher in male OW and female OW groups ($P < 0.05$). OW 71.5% of males and 76% of females were less than 3 hours per day during the weekend, 28.7% of NW females performed more than 3 hours at the week-

end ($P < 0.01$). Approximately 30% of OW women participated in physical activity for at least 30 minutes a day. The proportion of OW women exercising three or more times per week was lower than NW women ($P < 0.01$). Approximately 90% of OW women walked less than an hour during weekdays or weekends, which was significantly higher than NW men (weekday and weekend $p < 0.01$) (Table 3).

Table 3: The level of physical activity according to obesity status of university students

Variables	Male (n=90)		Female (n=130)		Total (n=220)
	Normal (n= 62)	Overweight & Obesity (n =28)	Normal (n= 80)	Overweight & Obesity (n =50)	
At least 30 minutes of physical activity per day (days/week)					
No	13(20.9)	6 (21.5)	15(18.7)	13 (26.0)**	47(21.4)
1-2	18(29.0)	8 (28.5)	25(31.3)	11 (22.0)	62(28.2)
3-4	17(27.4)	6 (21.5)	18(22.5)	16 (32.0)	57(25.9)
5-6	8(12.9)	5 (17.9)	14(17.5)	6 (12.0)	33(15.0)
7	6(9.7)	3 (10.7)	8(10.0)	4 (8.0)	21(9.5)
Walking or riding a bicycle (days/week)					
No	9(14.6)	11 (39.2)*	24(30.0)	14 (28.0)*	58(26.4)
1-2	10(16.2)	4 (14.3)	10(12.5)	7 (14.0)	31(14.1)
3-4	15(24.1)	3 (10.7)	9(11.2)	8 (16.0)	35(16.0)
5-6	17(27.4)	5 (17.9)	20(25.0)	11 (22.0)	53(24.0)
7	11(17.7)	5 (17.9)	17(21.3)	10 (20.0)	43(19.5)
Time spent walking during weekdays (hours/day)					
< 30 min	12(19.3)	6 (21.5)	19(23.7)	15 (30.0)**	52(23.6)
30 min ≤ < 1 hour	27(43.6)	14 (50.0)	24(30.0)	20 (40.0)	85(38.6)
1 hour ≤ < 2 hours	10(16.2)	6 (21.5)	20(25.0)	8 (16.0)	44(20.0)
2 hours ≤	13(20.9)	2 (7.0)	17(21.3)	7 (14.0)	39(17.8)
Time spent walking during the weekend (hours/day)					
< 30 min	11(17.7)	7 (25.1)	18(22.5)	16 (32.0)**	52(23.7)
30 min ≤ < 1 hour	28(45.2)	15 (53.5)	25(31.3)	19 (38.0)	87(39.5)
1 hour ≤ < 2 hours	10(16.2)	5 (17.9)	21(26.2)	9 (18.0)	44(20.0)
2 hours ≤	13(20.9)	1 (3.5)	17(21.3)	6 (12.0)	37(16.8)
Sedentary activity during weekdays (hours/day)					
< 3	42(67.7)	22 (78.5)**	55(68.7)	36(72.0)**	155(70.5)
3 ≤	20(32.3)	6 (21.5)	25(31.3)	14(28.0)	65(29.5)
Sedentary activity during the weekend (hours/day)					
< 3	46(74.1)	20 (71.5)**	53(66.2)	38 (76.0)**	157(71.3)
3 ≤	16(25.9)	8 (28.5)	27(33.8)	12 (24.0)	63 (28.7)
Number of days for exercise (times/week)					
No	8(12.9)	3 (10.7)	12(15.0)	8 (16.0)**	31(14.1)
1	14(22.6)	6 (21.5)	18(22.5)	11 (22.0)	49(22.3)
2	18(29.0)	9 (32.1)	24(30.0)	15 (30.0)	66(30.0)
3 ≤	22(35.5)	10 (35.7)	26(32.5)	16 (32.0)	74(33.6)

* $P < 0.05$, ** $P < 0.01$, 1) n (%)

There was no significant difference between the OW and NW groups in both genders regarding nutrition knowledge. OW was found to have a total self-efficacy score ($P < 0.01$) and a physical activity self-efficacy score ($P < 0.01$) in women. The

OW women had significantly lower physical activity self-efficacy scores than NW women ($P < 0.01$). However, there was no significant difference in eating habit between self-efficacy score between OW and NW groups in both genders (Table 4).

Table 4: Nutritional knowledge and self-efficacy levels according to obesity status in university students

Variables	Male (n=90)		Female (n=130)		Total (n=220)
	Normal (n= 62)	Overweight & Obesity (n =28)	Normal (n= 80)	Overweight & Obesity (n =50)	
Nutrition Knowledge					
General nutrition knowledge score ¹⁾	4.2 ± 0.7	3.8 ± 0.6	4.2 ± 0.7	3.8 ± 0.6	4.0 ± 0.7
Obesity knowledge score	3.2 ± 0.7	3.1 ± 0.6	3.4 ± 0.8	3.3 ± 0.7	3.3 ± 0.7
Nutrition knowledge total score	7.8 ± 1.4	7,9 ± 1.2	7.8 ± 1.4	7.9 ± 1.2	7.9 ± 1.3
Self-efficacy					
Eating self-efficacy score	17.2 ± 2.8	18.2 ± 2.9	18.4 ± 3.0	19.1 ± 3.1	18.2 ± 2.9
Physical activity self-efficacy score	12.8 ± 2.1	11.2 ± 2.7**	12.7 ± 2.2	11.1 ± 2.7**	11.9 ± 2.4
Self-efficacy total score	31.7 ± 4.1	31.7 ± 4.2	31.8 ± 4.1	30.7 ± 3.7**	31.4 ± 4.0

Mean ± SD, ** P < 0.01

Discussion

The aim of this study is to examine the eating habits, physical activities, nutrition knowledge and self-sufficiency of university students and to investigate whether these characteristics differ according to obesity status. Gender is significantly different according to obesity status; In the OW group, the rate of female (64.1%) was higher than that of the NW group (56.3%). In a study conducted (Yahia et al., 2008), the majority of university students show normal weight. Normal weight women (76.8%) and men (49%) are overweight and obese than males. In the United States, 35% of the college students are reported to be overweight or obese (BMI ≥ 25) (Lowry et al., 2000).

According to our research results, eating habits according to obesity status of university students were lower than the NW group of both sexes. While eating out does not differ from obesity in men, OW consumes less women than women. The eating rate was significantly higher in the OW group than in the NW group in both boys and girls. In a study (Sakata et al., 2001), it was found that the proportion of individuals with regular eating patterns in young Japanese was low. Skipping breakfast is associated with low nutritional status and the risk of cardiovascular disease. It has been reported that adequate breakfast habits may contribute to the development and further development of obesity (Ortega et al., 1996). These findings support our findings.

This study shows that; physical activity variables in women and men were significantly different between OW and NW groups. The percentage of those who said that they did not use hiking or cycling on weekends was higher in male OW and female OW groups. On weekends, men and women participated in physical activity less than 3 hours a day, and on weekends NW group participated in

physical activity for at least 30 minutes a day. In a study conducted, the nutrition and physical activity habits and obesity cases of the university students were investigated, Only 8.5% of girl students and only 28.1% of male students had sufficient physical activity level (Arslan et al., 2016). Similarly, in the previous study (Song, 2011) obese children were reported to have negative attitudes and are less likely to participate in physical activity than normal weight children.

This study revealed that there was no significant difference between the OW and NW groups in both genders regarding nutrition knowledge. The OW women had significantly lower physical activity self-efficacy scores than NW women. However, there was no significant difference in eating habit between self-efficacy score between OW and NW groups in both genders. This finding suggests the importance of self-sufficiency that explains obesity or healthy behavior. Studies of self-efficacy in obese children (Ahn et al., 2011; Franklin et al., 2006) have found that children have difficulties with psychosocial adaptation and that they are able to perform or perceive their physical activity more negatively with increasing obesity.

As a result, it was determined that OW group students participated less in physical activity than NW students in this study. Healthy eating habits such as breakfast eating and the size of an adequate meal seemed to be less preferred in OW group students and especially in women. Nutritional information does not show any significant difference between OW and NW groups, while physical activity self-efficacy is lower in OW group than NW group. For this reason, physical education programs for the prevention of obesity in children should attach importance to increasing the confidence in performing exercise or physical activity. Physical education programs should focus on providing practical tips

for increasing physical activity and changing eating behavior. In addition, they should include adequate methods of body image, body satisfaction and weight control. In addition, university students are at risk because of lack of nutrition knowledge, psycho-social and economic reasons, TV and peer interaction and similar reasons. In this context it is important to give information to young people, families and trainers about this issue and raise awareness.

References

- Ahn HS, Chung KM, Jeon J (2011). The effect of BMI and physical ability on self-efficacy, quality of life, and self-esteem in overweight and obese children. *Korean J Health Psychol*; 16:537–55.
- Arslan SA, Daşkapan A, Çakır B (2016). Specification of nutritional and physical activity habits of university students. *TAF Prev Med Bull*; 15:(3), 171–180.
- Brown JE, Isaacs JS, Krinke UB, Lechtenberg E, Murtaugh MA, Sharbaugh C, Splett PL, Stang J, Wooldridge NH (2011). *Nutrition through the Life Cycle*. 4th ed. Belmont (CA): Wadsworth.
- Caspersen, C.J., Pereira, M.A., Curran, K.M (2000). Changes in Physical Activity Patterns in the United States, By Sex and Cross-Sectional Age. *Medicine and Science in Sports and Exercise*. 32. pp.1601–1609.
- Centers for Disease Control and Prevention (US) (2007). *State and Local Youth Risk Behavior Survey*. Clifton road Atlanta (GA): Centers for Disease Control and Prevention.
- Cho YG, Song HR, Kim KA, Kang JH, Song YH, Yun HJ, Kim HS (2009). Effect of a school-based intervention for overweight children “fitness class” performed on elementary schools located in Seoul. *Korean J Obes*;18: 146–57.
- Choi HJ, Seo JS (2003). Nutrient intakes and obesity-related factors of obese children and the effect of nutrition education program. *Korean J Community Nutr*; 8:477–84.
- Franklin J, Denyer G, Steinbeck KS, Caterson ID, Hill AJ (2006). Obesity and risk of low self-esteem: a statewide survey of Australian children. *Pediatrics*; 118:2481–7.
- Guthold R, Cowan MJ, Autenrieth CS, Kann L, Riley LM (2010). Physical activity and sedentary behavior among schoolchildren: a 34-country comparison. *J Pediatr*; 157:43–49.
- Hatfield DP, Chomitz VR, Chui KK, Sackeck JM, Economos CD (2015). Demographic, physiologic, and psychosocial correlates of physical activity in structured exercise and sports among low-income, overweight children. *J Nutr Educ Behav*; 47:452–458.
- Kang JH (2009). Relationship between physical activity and psychological factors in obese children [doctor’s thesis]. Seoul: Korea National Sport University
- Keihner AJ, Meigs R, Sugerman S, Backman D, Garbolino T, Mitchell P (2011). The power play! Campaign’s school idea & resource kits improve determinants of fruit and vegetable intake and physical activity among fourth- and fifth-grade children. *J Nutr Educ Behav*;43: S122–9.
- Ko SY, Kim KW (2010). Nutrition label use, self-efficacy, snacking and eating behavior of middle school students in Kyunggi area. *Korean J Community Nutr*; 15:513–24.
- Lee SY, Ha SA, Seo JS, Sohn CM, Park HR, Kim KW (2014). Eating habits and eating behaviors by family dinner frequency in the lower-grade elementary school students. *Nutr Res Pract*; 8:679–87.
- Lowry R, Galuska DA, Fulton JE, Wechsler H, Kann L, Collins JL Jan (2000). Physical activity, food choice, and weight management goals and practices among US college students. *Am J Prev Med*; 18:18–27.
- Na SY, Ko SY, Eom SH, Kim KW (2010). Intakes and beliefs of vegetables and fruits, self-efficacy, nutrition knowledge, eating behavior of elementary school students in Kyunggi area. *Korean J Community Nutr*; 15:329–41.
- Seong AH, Lee SY, Kim KA, Seo JS, Sohn CM, Park HR and Kim KW (2016). Eating habits, physical activity, nutrition knowledge, and self-efficacy by obesity status in upper-grade elementary school students. *Nutrition Research and Practice*;10(6):597–605
- Song JH (2011). The relationships between physical education attitudes and levels of physical activity in overweight and normal weight elementary school students. *Korean J Elem Phys Educ*;17: 99–109.
- WHO: Growth reference data for 5–19 years: WHO Reference; 2007. <http://www.who.int/growthref/en>.
- WMADH (2000). World Medical Association Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects. *Journal of the American Medical Association*. 284. pp. 3043–3045.
- Yahia N, Achkar A, Abdallah A, Rizk S (2008). Eating habits and obesity among Lebanese university students. *Nutrition Journal*, 7(32) 1–6.
- Yu SH, Song Y, Park M, Kim SH, Shin S, Joung H (2014). Relationship between adhering to dietary guidelines and the risk of obesity in Korean children. *Nutr Res Pract*;8:705–12.

Corresponding author: Okt. Pervin TOPTAŞ DEMİRCİ¹
¹Mersin University Department of Tourism Animation, Mersin/Turkey

Email: *pervindemirci36@hotmail.com

Work Phone: +90 (0324) 361 01 26

Fax: +90 (0324) 361 01 27

DYNAMICS THE RR FOR EVALUATION OF INTENSITY OF PHYSICAL ACTIVITY UNTO PREGNANT WOMEN

Irina Nesheva

National Sports Academy „V. Levski „

Keywords: Gymnastics, pregnancy, changes, arterial blood pressure

Introduction

Pregnancy is normal but extremely complex biological process, that has a profound influence over the regulatory functions of a woman (Melzer, K., Schutz, Y., Boulvain, M. & Kayser, B. 2010a; Генчева, Н., Д. Попова & М. Ангелчева 2007).

The physiological and hormonal changes throughout the pregnancy are unique for one woman's life. The hormones of pregnancy sometimes suddenly affect upon the tonus of the blood vessels by reduction of the arterial pressure (McMurray, R. G., Katz, V. L., Berry, M. J. & Cefalo, R. C. 1988; Tortora, J. G. 1987; Гаврийски, В., Д. Стефанова, Е. Киселкова & Бичев, К. 2005). Putting into practice a systematic physical exercises stabilizes the body of the future mother, also it has a favorable affect to the adaptation for this unique statement, it supports the pregnant woman functional reserve (Baciuk, E. P., Pereira, R. I., Cecatti, J. G., Braga, A. F. & Cavalcante, S. R. 2008; Borodulin, K. M., Evenson, K. R., Wen, F., Herring, A. H. & Benson, A. M. 2008; Broso, P. & Buffetti, G. 1993; Hegaard, H. K., Damm, P., Nielsen, B. B. & Pedersen, B. K. 2006; Jarski, R. W. & Trippett, D. L. 1990; Гаврийски В., Д. Стефанова, Е. Киселкова & Бичев, К. 2005; Георгиев, М. 1999). A main component of our methodology (in field conditions) is the implementation of functional control for the assessment of the intensity of applied gymnastic exercises by the Nesheva Program for pregnant women and the objective method used is the monitoring of arterial blood pressure. Gymnastics with its diverse variations and attractive disciplines has its considerably important role for the preparation of a pregnant woman. The gymnastic tools, precisely selected, have a general/ holistic as well as one good, broad impact for the future delivery (Нешева, И. 2010).

Good alternative would be Recreative practices during the pregnancy. They can be regarded, as

defined by (Димитрова, Б. 2009) in her research "... developing a polyvalent SPA culture...". It is important by (Димитрова Б. 2012) to "...discuss issues with remedial influence like the physical activity in aquatic environment and the immediate connection with the improvement of quality of life and health status for the participants ...". Great growth rates operation of services with qualified personnel certified through educational programs (Димитрова Б. and I. Donev 2006; Dimitrova, B. 2014), the quality services for pregnant women, required staff with fellowships, training seminars or received certified competencies (Димитрова Б. 2011; Dimitrova, B. 2014).

Arterial blood pressure decreases in early pregnancy, then slightly increases to pre-natal. In the second trimester, the heart rate of the pregnant woman at rest is faster, the effect of which is increased systolic volume of the heart. Hormones of pregnancy sometimes suddenly affect the blood vessel tone with lower blood pressure. The heart volume is increased by 30–40% (Tortora, 1987), due to increased metabolism and increased maternal blood flow to the placenta. **The aim** of our report is to study the influence of gymnastics on pregnant women on the functional reserve. And the **tasks** to accomplish the goal are:

1. Investigate the dynamics of arterial blood pressure in training pregnant women to assess the intensity of gymnastic activities.
2. Reporting and control of the functional indicator (RR):
 - arterial blood pressure (Systolic pressure – RRs, diastolic pressure – RRd) at baseline (RRs_I, RRd_I) and final study (RRs_F, RRd_F);
 - arterial blood pressure before and after a separate gymnastic (RRspre, RRdpre, RRspost, RRdpost).

Methodology

A main component of our methodology is the implementation of functional control for the assessment of the intensity of applied gymnastic exercises by the Nesheva Program for pregnant women and the objective method used is the monitoring of arterial blood pressure. To evaluate the effect of the Program on the cardiorespiratory parameters, a one-factor dispersion analysis was applied to the associated samples (ANOVA with repeated measures).

The Tester System Temeo (manufactured by SST, Bulgaria certified as a telemedicine device, TIV model 2A under TIV with the number 4422111384068-001) has registered a total of 47 pregnant women records during six gymnastic classes. The device includes a belt with a chip (figure 1 and 2) that is placed under the chest and the Doppler device is placed on one hand. The average duration of the recording is 50-60 minutes with direct visualization on the internet (Petrov et al., 2012; Нешева, И. 2014).



Figure 1-2 RR study at motor complex and relaxation at the end of the training

RESULTS

Table 1 presents the results of descriptive statistics (Mean ± SD) of circulatory performance of one hundred pregnant women during periodic inclusion

in the Gymnastics Program.

Table 1. Values (Mean ± SD) of the arterial blood pressure (RRs, RRd) functionalities upon inclusion in the Program.

INDICATORS	N	Mean ± SD
RRs [mm Hg] Systolic blood pressure	100	109.5±13.68
RRd [mm Hg] Diastolic blood pressure	100	69.1±8.36

The results obtained in relative resting conditions for RRs and RRd indicate that systolic pressure is around the lower limit and diastolic pressure is the mean value for the normal.

In the experiment, an example was a study of 6 women (3rd trimester) with normal pregnancy (age 29 ± 1.84 years, height 165 ± 10.01 cm) with an average of 10-12 exercises from the gymnastic program.

The cardiac responses RRs, RRd measured before (pre) and immediately after (post) specific gymnastic activity (table 2).

Table 2. Variation analysis (Mean ± SD) of cardiac responses

INDICATORS	MEAN	SD
RRs pre [mm Hg] – Systolic blood pressure before exercise	101,67	9,31
RRs post [mm Hg] – Systolic blood pressure after exercise	98,17	7,49
RRd pre [mm Hg] – Diastolic blood pressure before exercise	61,00	4,69
RRd post [mm Hg] – Diastolic blood pressure after exercise	59,33	5,12

The comparison between the measures measured before and after the gymnastic occupation showed that only diastolic pressure values (p <0.05) were significantly different. Before working diastolic pressure correlates only with diastolic pressure after gymnastics. The systolic pressure is slightly lower compared to the reference values for women, most likely related to pregnancy. Diastolic pressure is found to be within the limit of normal.

Conclusions

1. The indicators of the circulation in the relative rest of the pregnant women when entering the gymnastics program are within the limits of the norm.
2. Upon completion of the Program, improved control of arterial blood pressure is established.

3. The impact of the individual activities of the Neshева Program on Pregnant Women is characterized by a good recovery of circulatory performance.

References

- Baciuk, E. P., Pereira, R. I., Cecatti, J. G., Braga, A. F. & Cavalcante, S. R. (2008), Water aerobics in pregnancy: Cardiovascular response, labor and neonatal outcomes. *Reprod Health*, 5, 10
- Borodulin, K. M., Evenson, K. R., Wen, F., Herring, A. H. & Benson, A. M. (2008), Physical activity patterns during pregnancy. *Med Sci Sports Exerc*, 40, 1901–8
- Broso, P. & Buffetti, G. (1993), Sports and pregnancy. *Minerva Ginecol*, 45, 191–7
- Dimitrova, B. (2014), The enotherapy as an effective financial instrument for the wine tourism. International Scientific Conference for Tourism “SPA and wine”- part of the Culture corridor – cultural routes. Blagoevgrad. Faculty of Economy, Tourism department. SW University. Proceedings, 55–61.
- Hegaard, H. K., Damm, P., Nielsen, B. B. & Pedersen, B. K. (2006), Pregnancy and recreational physical activity. *Ugeskr Laeger*, 168, 564–6
- Jarski, R. W. & Trippett, D. L. (1990), The risks and benefits of exercise during pregnancy. *J Fam Pract*, 30, 185–9
- Mcmurray, R. G., Katz, V. L., Berry, M. J. & Cefalo, R. C. (1988), Cardiovascular responses of pregnant women during aerobic exercise in water: a longitudinal study. *Int J Sports Med*, 9, 443–7
- Melzer, K., Schutz, Y., Boulvain, M. & Kayser, B. (2010a), Physical activity and pregnancy: cardiovascular adaptations, recommendations and pregnancy outcomes. *Sports Med*, 40, 493–507
- Petrov L., P., Atanasov, N., Zaekov, A., Alexandrova, Z., Zsheliaskova-Koynova & Achkakanov (2012), Physiological and non-invasive biochemical indexes in a model of emotional stress in shooters. *Medical University*, 44 (1), 55–58
- Tortora, J. G. (1987), Principles of Anatomy and Physiology, New York, Harper & Row
- Гаврийски, В., Д. Стефанова, Е. Киселкова & Бичев, К. (2005), Физиология на човека с физиология на спорта I част, [Physiology of human with physiology of sport I part] С., Изд. Нови знания
- Гаврийски В., Д. Стефанова, Е. Киселкова & Бичев, К. (2005), Физиология на човека с физиология на спорта II част, [Physiology of human with physiology of sport II part] С., Изд. Нови знания
- Генчева, Н., Д. Попова & М. Ангелчева (2007), Методика на фит-бол гимнастика по време на бременността, [Methodology of fit-ball gymnastics in during pregnancy], Спорт & Наука, С., бр.2, 77–83
- Георгиев, М. (1999), кн. Функционални състояния [Functional states] С.
- Димитрова, Б., И. Донеv (2006), Плуvни спортове в училище. Монография. [Swimming sports in school. In Bulgarian] София: Издателство Авангард Прима
- Димитрова, Б. (2009), SPA култура и аква практики. Учебник за ОКС „Магистър“. [SPA culture and aqua practices. In Bulgarian.] София: Издателство Авангард Прима
- Димитрова, Б., Н. Деде (2011), Акваспининг като антистресова превенция на здравето. Трета международна научна конференция: Оптимизация и иновации в учебно-тренировъчния процес. [Aqua spinning as anti-stressing health prevention. 3th International Scientific conference: Optimization and innovation in educational training process.] Department of Physical education and sport, Sofia University “St. Kl. Ohridski. Сборник доклади, 2011, 146–153
- Димитрова, Б. (2012), Аква практики [Aqua practices. In Bulgarian] София: Издателство Авангард Прима
- Нешева, И. (2010), Примерен модел на двигателна активност за жени с нормална бременност [An exemplary model of locomotor activity for women with normal pregnancy], НСА, С., I част, сб. „V международен научен конгрес ССА”
- Нешева, И. (2014), Дисертация. [Dissertation] www.nesheva.eu

PHYSICAL ACTIVITY ASSESSMENT USING A MODIFIED PAQ-C QUESTIONNAIRE

Stefan Kolimechkov, Lubomir Petrov, Albena Alexandrova
National Sports Academy 'Vassil Levski', Bulgaria

Summary

Physical activity plays an important role in a child's development and is a powerful indicator of their health and well-being, and its assessment is an essential part of monitoring and surveillance in schools. The aim of this study was to measure and assess general levels of physical activity amongst Bulgarian and English children by applying a self-reported questionnaire. In total, 94 participants between the ages of 7 and 10, divided into four groups depending on their nationality and gender, took part in this study. Physical activity was measured by using the PAQ-C questionnaire, which was modified and adjusted for the purposes of our study. Weight, height and waist circumference were measured, and BMI and Waist-to-Height ratio were calculated. The Z-scores and percentile scores for weight, height and BMI were calculated and assessed using WHO software. The data was analysed by using one-way ANOVA with Bonferroni post hoc test. The final scores of the modified PAQ-C questionnaire for all four groups were recorded and shown to be within the range of medium physical activity for children (PAQ-C score >2.50 and <3.50), but there were significant differences between the Bulgarian (2.66 ± 0.3 for girls and 2.90 ± 0.3 for boys) and English children (3.17 ± 0.7 and 3.41 ± 0.6 , respectively), ($p < 0.05$). There was no significant difference between overweight and obese children (BMI Z-score $> +1SD$) and children with BMI within the norm (BMI Z-score $< +1SD$ and $> -1SD$) in terms of the PAQ-C score, which has also been observed by other authors. Further research needs to be carried out on the Bulgarian population in order to obtain normative PAQ scores for children and adolescents.

Key Words: children, obese, overweight, waist-to-height ratio

Introduction

Physical activity (PA) includes any body movement produced by the contractions of skeletal muscles that increase energy expenditure (American College of Sports Medicine, 2014), plays an important role in children's development, and it is a powerful indicator of their health and well-being. The benefits of PA are well-documented and include: improved health of muscles, bones, and joints, positive social and mental health, and a decreased chance of developing diseases (U.S. Department of Health and Human Services, 1996, Elliot et al., 2013). Based on these benefits, the World Health Organisation and the American Society of Health and Physical Educators recommend that children and adolescents should spend a minimum of one hour per day in moderate to vigorously intense PA (WHO, 2010, Ganley et al., 2011, Elliot et al., 2013).

The assessment of PA is an essential part of profiling and monitoring in schools. Subjective methods for assessing physical activity, such as questionnaires, interviews and diaries, are often preferred to the objective ones (heart rate monitors, pedometer, and accelerometer) because of the simplicity with which they are conducted on children, without the need for special equipment (Bervoets et al., 2014). However, self-reporting questionnaires have their own difficulties due to the nature of the children's

activity patterns and their lack of cognitive ability to accurately recall the amount and intensity of activity (Hagstromer and Sjostrom, 2010).

A systematic review, which was carried out on many available self-report questionnaires for assessing PA in children and adolescents, identified three such questionnaires as potentially most suitable: Youth Risk Behaviour Surveillance Survey (YRBS), Teen Health Survey, and The Physical Activity Questionnaire (PAQ-C/PAQ-A) (Biddle et al., 2011).

The Youth Risk Behaviour Surveillance Survey (YRBS) was developed in 1989 by the Center for Disease Control and Prevention (CDC) to monitor health risk behaviours that contribute to the leading causes of mortality, morbidity, and social problems amongst adolescents and adults in the United States (Brener et al., 1995). The Teen Health Survey was developed for adolescents only, and includes just two items (Biddle et al., 2011).

The Physical Activity Questionnaire (PAQ-C/PAQ-A) has two slightly different versions, one for elementary school children (8–14 years of age) and one for high school students (14–20 years of age). The questionnaires use a common scoring system and were applied successfully in many studies (Kowalski et al., 2004). Results indicated that PAQ-C pro-

vides a reliable and valid measure of general physical activity levels in children during the school year (Crocker et al., 1997, Kowalski et al., 1997, Wang et al., 2016). PAQ-C is based on questions for the last seven days and requires participants to check a list of activities, as far as frequency is concerned, by using the following scale: 'None', '1–2 times per week', '3–4 times', '5–6 times', '7 times or more'. The other questions cover 'physical activity in PE lessons', 'recess', 'lunch time', 'right after school', and 'evenings', as well as 'the last weekend'. A five-scale measure of frequency of participation is given for each question. The Physical Activity Questionnaire for Older Children (PAQ-C) has been used to classify children and adolescents into different activity levels and to investigate the relationship between physical activity and health outcomes (Kowalski et al., 2004).

Aim and Objectives of the study

The aim of this study was to measure and assess the general level of physical activity amongst Bulgarian and English school children by applying a modified PAQ-C questionnaire.

Methods

In total, 94 participants (30 females and 31 males from Bulgaria, and 15 females and 18 males from England) between the ages of 7 and 10 took part in this study. Informed consent was obtained from the parent/guardian of each child.

The anthropometric parameters, weight, height and waist circumference, were measured, and the BMI was calculated as: weight in kilograms / height in metres squared. Body weight was measured to within an accuracy of 0.1 kg by using an electronic scale, and height was measured to the nearest 0.1 cm with a stadiometer. The Z-scores and percentile scores for weight, height and BMI of each individual were calculated and assessed by using specialised software of the World Health Organisation, called 'WHO Anthro Plus' (WHO, 2007). Waist circumference was measured to the nearest 0.1 cm with the Lufkin W606PM anthropometric tape measure, and Waist-to-Height ratio was calculated as: waist circumference (cm) / height (cm).

In order to measure and assess levels of physical activity, we applied a widely used questionnaire for children, called PAQ-C (Kowalski et al., 2004), after adjusting it for our purposes (STK-SPORT, 2017a). Firstly, questions were reformulated to obtain in-

formation about a "usual week" (instead of the last seven days). Secondly, Question 9 (Q9 – physical activity frequencies for each day from the last week), and Q10 (Were you sick last week?) were excluded from the original PAQ-C test, as these questions did not fit into the modified test, which is concerned with a "usual week". Instead of Q9 and Q10, we added two new questions for verification of Q2 (activity during physical education classes) and Q3 (break-time activity), in which we asked the same thing in a different way in order to exclude children who answer such questions without paying attention. The scoring system of the test remained the same as in the original PAQ-C, where a value of 1 indicates low physical activity and a value of 5 indicates high physical activity for each question. The final PAQ-C activity score of the test is calculated as the mean value of the answers to the first eight questions. In addition, a Bulgarian language version of the test was provided (STK-SPORT, 2017b).

One-way ANOVA with Bonferroni *post hoc* test was applied to analyse the data from all participants, divided into four groups depending on their nationality and gender. In addition, eta-squared measure of effect size for use in ANOVA (η^2) (Lakens, 2013) was also calculated in order to present the magnitude of the effects. Statistically significant differences between the average values were evaluated at $p < 0.05$, and all data in the text are presented as average \pm SD.

Results

After calculating the differences between Q2, Q3 and their verification questions, we discovered that thirteen children (three Bulgarian females, seven English females, and three English males) did not provide reliable enough answers according to the criteria which we set (the sum of the differences was greater than a value of 2), and therefore they were excluded from the study. Following this test verification, the groups were reduced to 27 females and 31 males from Bulgaria, and 8 females and 15 males from England.

The anthropometric data of the participants is presented in Table 1. Their age, weight, height and their Z-scores and percentile scores, as well as BMI, BMI Z-score, waist circumference and waist-to-height ratio did not show any significant statistical differences between the groups. Only in the BMI percentile score was there a significant difference between English girls and boys ($p < 0.05$).

Table 1. Anthropometric data of all 81 participants who passed the test verification criteria (Mean \pm SD)

	Bulgarian Females (n=27)	Bulgarian Males (n=31)	English Females (n=8)	English Males (n=15)
Age (y)	9.0 \pm 0.6	8.8 \pm 0.5	8.7 \pm 0.4	8.6 \pm 0.4
Weight (kg)	34.1 \pm 8.0	33.0 \pm 6.7	35.8 \pm 13.1	34.6 \pm 5.8
Weight Z-score	0.9 \pm 1.1	0.9 \pm 1.3	1.2 \pm 1.5	1.4 \pm 0.9
Weight Perc. Score	71.3 \pm 24.5	72.1 \pm 27.5	69.6 \pm 25.8	86.1 \pm 13.7
Height (cm)	137.0 \pm 7.2	136.0 \pm 7.7	136.8 \pm 8.3	134.4 \pm 4.6
Height Z-score	0.7 \pm 0.94	0.7 \pm 1.2	0.9 \pm 1.3	0.7 \pm 0.7
Height Perc. Score	68.9 \pm 25.8	68.0 \pm 29.9	66.4 \pm 25.9	71.4 \pm 20.0
BMI (kg/m ²)	18.0 \pm 3.1	17.7 \pm 2.3	19.0 \pm 5.4	19.1 \pm 2.6
BMI Z-score	0.7 \pm 1.1	0.8 \pm 1.1	0.8 \pm 1.8	1.4 \pm 1.0
BMI Perc. Score	65.2 \pm 26.7	69.0 \pm 27.9	50.2 \pm 30.1*	84.7 \pm 15.6*
Waist circ. (cm)	64.8 \pm 6.2	64.3 \pm 6.6	63.6 \pm 10.6	64.8 \pm 6.3
WHtR	0.47 \pm 0.1	0.47 \pm 0.1	0.46 \pm 0.1	0.48 \pm 0.1

* - p < 0.05

The calculated average Z-scores and Percentile scores of weight, height and BMI in Bulgarian girls and boys were within the norm, according to the international standards of the World Health Organisation (WHO, 2007). The average Z-scores and Percentile scores of weight and BMI in English boys, as well as the Z-scores of weight in English girls, were shown to be slightly above the norm for their gender and age. The other scores for English children were within the WHO norms. The average waist-to-height ratio (WHtR) in all groups was below the global cut-off value of 0.5 (health risk of obesity). The individual results revealed that 17 children had a BMI Z-score greater than +1SD (overweight) and 16 had a BMI Z-score greater than +2SD (obese) according to the WHO norms. These children included individuals from each group, and none of the four groups was shown to have a significantly higher level of overweight or obese pupils, because the

number of cases was insufficient in order to be able to draw this conclusion. The WHtR of 27 children (20 of whom were assessed as overweight or obese according to their BMI Z-score) was above the global cut-off point where obesity is deemed to pose a health risk. Only four individuals had a BMI Z-score less than -1SD (1st grade thinness), and there were no cases of very low BMI Z-score (2nd grade thinness < -2SD and 3rd grade thinness < -3SD).

The results of the modified PAQ-C test of the Bulgarian and English children are presented in Table 2. Significant differences between the groups were recorded in four out of the eight questions which comprise the modified PAQ-C. Bulgarian boys and girls showed significantly higher levels of physical activity during physical education classes (Q2), and lower physical activity during break-time, lunch-time and after-school activities (Q3, Q4 and Q5) in comparison with English children.

Table 2. Descriptive characteristics of the modified PAQ-C of all the 81 participants who met the verification criteria (Mean \pm SD)

	Bulgarian Females (n=27)	Bulgarian Males (n=31)	English Females (n=8)	English Males (n=15)
Q1. Spare-time activity: sports	2.0 \pm 0.6	2.1 \pm 0.2	1.9 \pm 0.7	2.2 \pm 0.5
Q2. Activity during physical education classes	4.8 \pm 0.5 c, D	5.0 \pm 0.0 C, D	4.0 \pm 0.8	4.1 \pm 0.9
Q3. Break-time activity	2.2 \pm 0.7 C, D	2.8 \pm 0.9 C, D	4.3 \pm 1.0	4.7 \pm 0.6
Q4. Lunch-time activity	2.6 \pm 0.7 C, D	2.7 \pm 0.9 C, D	4.3 \pm 1.0	4.3 \pm 1.2
Q5. After-school activity	1.0 \pm 0.0 C, D	1.0 \pm 0.0 C, D	3.1 \pm 1.4	3.0 \pm 1.4
Q6. Evening activity	3.1 \pm 0.7	3.3 \pm 0.7	2.6 \pm 1.3	2.6 \pm 1.1
Q7. Weekend-activity	2.9 \pm 0.6	3.1 \pm 0.6	3.1 \pm 1.4	3.4 \pm 0.9
Q8. Activity frequency	2.6 \pm 0.8	3.2 \pm 0.9	2.1 \pm 1.0	3.0 \pm 1.4
Total PAQ-C activity	2.66 \pm 0.26 ^c , D	2.90 \pm 0.28 d	3.17 \pm 0.67	3.41 \pm 0.62

p < 0.001 vs. Bulgarian Females (A); vs. Bulgarian Males (B); vs. English Females (C); vs. English Males (D)

p < 0.01 vs. English Females (c); vs. English Males (d)

p < 0.05 vs. English Females (c)

The average total PAQ-C score for all four groups was shown to be within the range of medium physical activity for children (PAQ-C score > 2.50 and < 3.50). Statistically significant differences in the total PAQ-C scores were observed between the Bulgarian and English girls (2.66 ± 0.26 vs. 3.17 ± 0.67 , respectively, $p < 0.05$), the Bulgarian and English boys (2.90 ± 0.28 vs. 3.41 ± 0.62 , respectively, $p < 0.01$), and between the Bulgarian girls and the English boys (2.66 ± 0.26 vs. 3.41 ± 0.62 , respectively, $p < 0.001$). In addition, eta-squared (η^2) measure of effect size employed in ANOVA was also calculated and shown to be 0.319, which indicated large effects, according to the benchmarks provided by Cohen (Cohen, 1988).

There was no significant difference between children with a BMI Z-score greater than +1SD (overweight and obese, $n=33$) and children with a BMI Z-score within the norm in terms of the total PAQ-C score.

Discussion

The average total PAQ-C scores for English boys and girls were above the cut-off level (2.9 and 2.7, respectively), which categorises them into either “sufficiently active” or “low-active”, according to normative PAQ scores for English children and adolescents (Voss et al., 2013). Further research need to be carried out in order to obtain normative PAQ scores for Bulgarian children and adolescents.

Bulgarian children showed significantly lower scores in Q3, Q4 and Q5 (break-time, lunch-time and after-school activities) in comparison with English children. These differences probably occurred due to the variety of before-school and after-school activities added to the English curriculum.

In this study, we recorded 17 overweight (BMI Z-score > +1SD) and 16 obese children (BMI Z-score > +2SD), which made a total of 33 pupils (41% of all participants) at risk as far as health is concerned. The waist-to-height ratio (WHtR) assessment showed that 27 out of 81 children (33% of all participants) were at risk according to the global cut-off value of 0.5 (Ashwell and Hsieh, 2005). The findings of our study are in accordance with other authors who observed overweight/obesity frequency in children to range from 30% to 45% (Guinhouya et al., 2009, Sanchez-Vaznaugh et al., 2015). WHtR provided a good alternative assessment to the BMI, which was also found in other studies (McCarthy and Ashwell, 2006, Brown et al., 2017) Moreover, WHtR is seen to be an effective and simple screening index of body

composition during growth, both because it predicts cardiovascular disease risk factors better than BMI (Savva et al., 2000, Hara et al., 2002, Kahn et al., 2005), and because it is only loosely correlated to age, so there is no need for age- and gender-specific values in its assessment (Taylor et al., 2011).

The overweight and obese children (BMI Z-score > +1SD, $n=33$) and those within the norm (BMI Z-score < +1SD and > -1SD) had almost identical physical activity levels, as assessed by the total PAQ-C score (2.98 ± 0.48 and 2.92 ± 0.50 , respectively), which was also observed in obese and normal weight girls (Rourke et al., 2003). Similar findings of the total PAQ-C score were recorded in a study of 83 obese children, who were divided into groups of high health risk and low health risk (3.00 ± 0.66 and 3.01 ± 0.65 , respectively) (Ball et al., 2003).

In addition, we compared the physical activity levels of children at risk due to obesity according to the WHtR classification ($n=27$) and those within the norms (WHtR < 0.5, $n=54$). In the same way, there was no significant difference in the total PAQ-C score between children experiencing a health risk owing to obesity and the rest (2.83 ± 0.37 vs 2.99 ± 0.52 , respectively).

Physical inactivity has been defined by the WHO as one of the leading risk factors in terms of global mortality (6% of deaths worldwide), along with blood pressure (13%), tobacco use (9%), high blood glucose (6%), and overweight and obesity (5%) (WHO, 2009). Children and young people should be physically active on a daily basis, with play, games, sports, transportation, recreation, physical education, or planned exercises being part of their everyday activities (WHO, 2010), and we believe it to be of particular importance to improve the methods for assessing PA and to implement them as part of regular monitoring in schools.

References

- AMERICAN_COLLEGE_OF_SPORTS_MEDI-CINE2014. *ACSM's Health-Related Physical Fitness Assessment Manual, Fourth Edition*, USA, Lippincott Williams and Wilkins.
- ASHWELL, M. & HSIEH, S. D. 2005. Six reasons why the waist-to-height ratio is a rapid and effective global indicator for health risks of obesity and how its use could simplify the international public health message on obesity. *Int J Food Sci Nutr*, 56, 303–7.
- BALL, G., MARSHALL, D. & MCCARGAR, L. 2003. Fatness and Fitness in Obese Children at Low and High Health Risk. *Pediatric Exercise Science*, 15, 392–405.

- BERVOETS, L., VAN NOTEN, C., VAN ROOSBROECK, S., HANSEN, D., VAN HOORENBEECK, K., VERHEYEN, E., VAN HAL, G. & VANKERCKHOVEN, V. 2014. Reliability and Validity of the Dutch Physical Activity Questionnaires for Children (PAQ-C) and Adolescents (PAQ-A). *Arch Public Health*, 72, 47.
- BIDDLE, S. J., GORELY, T., PEARSON, N. & BULL, F. C. 2011. An assessment of self-reported physical activity instruments in young people for population surveillance: Project ALPHA. *Int J Behav Nutr Phys Act*, 8, 1.
- BRENER, N. D., COLLINS, J. L., KANN, L., WARREN, C. W. & WILLIAMS, B. I. 1995. Reliability of the Youth Risk Behavior Survey Questionnaire. *Am J Epidemiol*, 141, 575–80.
- BROWN, E. C., KILGORE, J. L., BUCHAN, D. S. & BAKER, J. S. 2017. A criterion-referenced assessment is needed for measuring child obesity. *Res Sports Med*, 25, 108–110.
- COHEN, J. 1988. *Statistical Power Analysis for the Behavioral Sciences*, USA, Lawrence Erlbaum Associates.
- CROCKER, P. R., BAILEY, D. A., FAULKNER, R. A., KOWALSKI, K. C. & MCGRATH, R. 1997. Measuring general levels of physical activity: preliminary evidence for the Physical Activity Questionnaire for Older Children. *Med Sci Sports Exerc*, 29, 1344–9.
- ELLIOT, E., ERWIN, H., HALL, T. & HEIDORN, B. 2013. Comprehensive School Physical Activity Programs: Helping All Students Achieve 60 Minutes of Physical Activity Each Day [Position statement]. *American Alliance for Health, Physical Education, Recreation and Dance*.
- GANLEY, K. J., PATERNO, M. V., MILES, C., STOUT, J., BRAWNER, L., GIROLAMI, G. & WARREN, M. 2011. Health-related fitness in children and adolescents. *Pediatr Phys Ther*, 23, 208–20.
- GUINHOYA, C. B., APETE, G. K. & HUBERT, H. 2009. Diagnostic quality of Actigraph-based physical activity cut-offs for children: what overweight/obesity references can tell? *Pediatr Int*, 51, 568–73.
- HAGSTROMER, M. & SJOSTROM, M. 2010. Standard operating procedure for the use of accelerometry in monitoring of physical activity at population level. *ALPHA Assessing Levels of Physical Activity*.
- HARA, M., SAITOU, E., IWATA, F., OKADA, T. & HARADA, K. 2002. Waist-to-height ratio is the best predictor of cardiovascular disease risk factors in Japanese schoolchildren. *J Atheroscler Thromb*, 9, 127–32.
- KAHN, H. S., IMPERATORE, G. & CHENG, Y. J. 2005. A population-based comparison of BMI percentiles and waist-to-height ratio for identifying cardiovascular risk in youth. *J Pediatr*, 146, 482–8.
- KOWALSKI, K., CROCKER, P. & DONEN, R. 2004. The Physical Activity Questionnaire for Older Children (PAQ-C) and Adolescents (PAQ-A) Manual. Canada: College of Kinesiology, University of Saskatchewan.
- KOWALSKI, K. C., CROCKER, P. R. E. & FAULKNER, R. A. 1997. Validation of the Physical Activity Questionnaire for Older Children. *Pediatric Exercise Science*, 9, 174–186.
- LAKENS, D. 2013. Calculating and reporting effect sizes to facilitate cumulative science: a practical primer for t-tests and ANOVAs. *Front Psychol*, 4, 863.
- MCCARTHY, H. D. & ASHWELL, M. 2006. A study of central fatness using waist-to-height ratios in UK children and adolescents over two decades supports the simple message—'keep your waist circumference to less than half your height'. *Int J Obes (Lond)*, 30, 988–92.
- ROURKE, K. M., BREHM, B. J., CASSELL, C. & SETHURAMAN, G. 2003. Effect of weight change on bone mass in female adolescents. *J Am Diet Assoc*, 103, 369–72.
- SANCHEZ-VAZNAUGH, E. V., SANCHEZ, B. N., CRAWFORD, P. B. & EGERTER, S. 2015. Association between competitive food and beverage policies in elementary schools and childhood overweight/obesity trends: differences by neighborhood socioeconomic resources. *JAMA Pediatr*, 169, e150781.
- SAVVA, S. C., TORNARITIS, M., SAVVA, M. E., KOURIDES, Y., PANAGI, A., SILIKIOTOU, N., GEORGIU, C. & KAFATOS, A. 2000. Waist circumference and waist-to-height ratio are better predictors of cardiovascular disease risk factors in children than body mass index. *Int J Obes Relat Metab Disord*, 24, 1453–8.
- STK-SPORT. 2017a. *Modified Physical Activity Questionnaire (PAQ-C)* [Online]. Available: <https://www.stk-sport.co.uk/images/sports-science-research-icass-2017-modified-paq-c.pdf>.
- STK-SPORT. 2017b. *Modified Physical Activity Questionnaire (PAQ-C) in Bulgarian language* [Online]. Available: <https://www.stk-sport.co.uk/images/sports-science-research-icass-2017-modified-paq-c-bg.pdf>.
- TAYLOR, R. W., WILLIAMS, S. M., GRANT, A. M., TAYLOR, B. J. & GOULDING, A. 2011. Predictive ability of waist-to-height in relation to adiposity in children is not improved with age and sex-specific values. *Obesity (Silver Spring)*, 19, 1062–8.
- U.S._DEPARTMENT_OF_HEALTH_AND_HUMAN_SERVICES1996. Physical Activity and Health: A Report of the Surgeon General. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion. USA.
- VOSS, C., OGUNLEYE, A. A. & SANDERCOCK, G. R. 2013. Physical Activity Questionnaire for children and adolescents: English norms and cut-off points. *Pediatr Int*, 55, 498–507.
- WANG, J. J., BARANOWSKI, T., LAU, W. P., CHEN, T. A. & PITKETHLY, A. J. 2016. Validation of the Physical Activity Questionnaire for Older Children (PAQ-C) among Chinese Children. *Biomed Environ Sci*, 29, 177–86.
- WHO. 2007. *BMI-for-age (5–19 years)* [Online]. World Health Organization. Available: http://www.who.int/growthref/who2007_bmi_for_age/en/ [Accessed accessed on 20 September 2017].
- WHO 2009. Global health risks: mortality and burden of disease attributable to selected major risks. Geneva: World Health Organization.
- WHO 2010. World Health Organization – Global recommendations on physical activity for health. Geneva: WHO Publications.

Contact information with the corresponding author:
Stefan Kolimechkov, PhD student at the NSA 'Vassil Levski', Sofia, Bulgaria, mobile:+44799957870034, Chalfont Road N99LW, London, UK, kolimechkov@gmail.com

CHANGES OF PARAMETERS OF METABOLIC SYNDROME UNDER THE INFLUENCE OF TRAINING PROGRAM

Danijela Zivkovic¹, Nebojsa Randjelovic¹,

Marija Djordjevic², Danica Pirsl¹

¹ University of Nis, Faculty of Sport and Physical Education,

² Preschool Teacher Training College Krusevac, Serbia

Introduction: *The prevalence of the metabolic syndrome has been increasing in the last years. There are tendencies to reduce it by applying the medical treatment, but also by means of a series of other measures, primarily by diet and physical activity. Many previous studies have confirmed the positive effect of physical activity on the metabolic syndrome, but the optimal intensity and volume of training have not clearly been defined yet.* **Methodology:** *Descriptive methods and theoretical analysis were used for the collection, classification, and analysis of targeted research. PUB MED and KOBBSOON databases were analyzed. Total of 65 studies met all the criteria set in advance.* **Results and discussion:** *The largest number of papers was related to the effects of programmed physical exercise on blood sugar regulation. The risk of developing type 2 diabetes can be reduced by 58% and even up to 65% with the help of physical exercise. It was found that the best effect on insulin is a combination of resistance training and aerobic exercise. However, in the long run, the greater intensity aerobic training ensures long-term benefit related to the activity of the insulin compared to weight training or low intensity exercise. As regards the change in the lipid status, it has been found that the controlled, long-term, moderate to moderately strong physical activity, improves the lipid profile by raising high-density lipoprotein cholesterol and by lowering the levels of triglycerides in obese adults with the features of the metabolic syndrome.*

Key words: metabolic syndrome, physical activity, diet, aerobic exercise, resistance training.

Introduction

Metabolic syndrome (MetS) is defined as a „cluster of anthropometric, metabolic and cardiovascular abnormalities that occur in concurrence at a higher rate than what would be expected by chance alone“ (Morales-Palomo et al., 2017). It was originally defined as a set of the following symptoms: insulin resistance, hyperglycemia, hypertension, low HDL cholesterol, and high levels of LDL cholesterol and triglycerides, and obesity was later added to the list. Three or more of symptoms which are numbered below make metabolic syndrome: waist circumference greater than 102 cm in men and 88 cm in women; serum triglycerides level of at least 150 mg/dL (1.69 mmol/L); high-density lipoprotein cholesterol level of less than 40 mg/dL (1.04 mmol/L) in men and 50 mg/dL (1.29 mmol/L) in women; blood pressure of at least 130/85 mm Hg; or serum glucose level of at least 110 mg/dL (6.1 mmol/L) (Ford, Giles, & Dietz, 2002). The International Diabetes Federation estimates that about 25% of the world's population has metabolic syndrome (O'Neill & O'Driscoll, 2015; Nolan, et al., 2017). The prevalence varies due to gender, age, and ethnicity (Kaur, 2014). Many previous studies have confirmed the positive effect of physical activity on the metabolic syndrome, but the optimal intensity

and volume of training have not clearly been defined yet. Although younger women are affected as well, the population of women aged 40 to 60 years belong to a group which is at risk for metabolic syndrome as hormonal changes that lead to the overall slowdown of the endocrine system occur in that period. In addition, with aging and an increase in blood pressure, central obesity also occurs. Additionally, the lack of physical activity, unbalanced and excessive nutrition, as well as other factors (such as alcohol, smoking), create the preconditions for the development of metabolic syndrome.

Aim and Objectives of the study

The aim of this review is to determine the models of training (aerobic exercise, resistance training; volume and intensity), applied individually or combined with medications or diet, that gave the best results in improvement of some of the elements of metabolic syndrome in women aged from 40–60.

Methodology

Analyzed scientific studies were published in scientific journals relevant to this field. In order to collect existing research, Google scholar internet browser was used, as well as the Pub Med database. Databases were searched using the terms “Meta-

bolic Syndrome”, “Physical Activity”, and “Elderly Women”. We collected a total of 65 studies, but 35 of them were eliminated because it was determined that the papers are repeated or that the age of the respondents did not correspond to the set criteria. The criteria that were followed during the collect-

ing operation were: the existence of the metabolic syndrome in the initial measurement in adult women (at least three symptoms) and the application of physical activity treatment (individually or combined with medications or diet).

Results

Table 1. Collected data

Researcher and year of publication	Number of subjects	Age (years)	Number of groups	Health status	Treatment	Intensity and frequency	Duration
O’Leary (2006)	16	63 ± 1		MetS and healthy	Treadmill	85% HRmax 5 times a week, 60min	12weeks
Brien et al. (2006)	6.475	18–64	1E/1C	MetS	PA	1 * 30 min	Long-term
Ring-Dimitrou et al. (2006)	14	50–65	1E	MetS	PA	50–65 VO2peak 3*45 min	24 months
Brien et al. (2007)	608	18–49	1E	MetS	PA	Low to moderate act.	Long-term
Balducci et al. (2007)	606	40–75	1E/1C	MetS	PA	150 min/week	12 months
Ekelund (2007)	217	elderly	1E/1C	MetS and healthy	PA	Low to moderate act.	5–6 years follow-up
Johnson et al. (2007)	80♀, 91	elderly	3E/1C	MetS and healthy	PA.	Running simulations	6 months
Lakka et al. (2007)	/	elderly		MetS	Low to moderate act.	30min a day	Long-term
Meckling (2007)	44	elderly	3E/1C	MetS	Two levels of intensity	3 times a week or less	12 weeks
Okura et al. (2007)	459	49±9	3E	MetS and healthy	Aerobic PA + diet	Low to moderate activity	14 weeks
Rector et al. (2007)	25		1E	MetS	PA + diet	5 * 45 min, 60%HRmax	4–7 months
Tjonna et al. (2008)	32	52,3 ±3,7	2E/1C	MetS	PA	3 times a week	16 weeks
Esteghamati et al.(2009)	3296	elderly	3E	MetS and healthy	Vigorous to moderate act.	30min a day, 7 times a week	Long-term
Helmerhorst et al. (2009)	210	elderly	1E	MetS and healthy	PA/no act.	Moderate to vigorous	5 years follow-up
Solomon (2010)	22	66 ± 1	2E	MetS and healthy	PA+high/low glycemic diet	1 hour/day 5 days/week ≈ 85% HRmax	12 weeks
Flack (2011)	/	elderly		MetS and healthy	8–10 repetitions per session	150 min a week	Long-term
Friedendrich et al. (2011).	320	elderly	1E/1C	MetS and healthy	PA	220 min/week	1 year
Lin (2014)	326	60.9	Cross-sec.	MetS	PA	30 min, 5 times a week	12 weeks
Trand (2016)	417	57,49,8±	1E/1C	MetS	PA+healthy diet	WHO recommendations	6 months
Beatge (2016)	133	48±11	3E/1C	MetS	WWPP, JCH, NSAS		90 days
South (2016)	19♂+10♀	elderly	1E/1C	MetS	RT	6 times a week	8 weeks
Kang (2016)	23	49±10,1	1E/1C	MetS	PA	40min, 5 times a week	12 weeks
Normandin (2016)	126	69,5±3,75	2E	MetS	Moderate Intensity RT	3 times a week	5 months
Enseny et al. (2017)	105	30–55	2E/1C.	MetS	AIT, TCT		16weeks 24follow-up
Bakker (2017)	7418	46±9,5	Cross-sec.	MetS	Aerobic+resistance tr.	Self reported freq.	4 years follow-up
Morales-Paloma (2017)	49	54±8	1E/1C	MetS	High Intensity AIT		16 weeks
Guadalupe-Grau (2017)	11	54,5±0,7	1E	MetS	AIT	3 times a week	6 months
Jahangiry (2017)	160	elderly	1E/1C	MetS	Web-based exp. program	Moderate PA	6 months
Ramos (2017)	66	56,8,7±	3E	MetS	MICT/4HIIT/1HIIT		16 weeks
Chung (2017)	36	elderly	2E/1C.	MetS	PA	3 times a week 1*30min or 3* 10min treadmill	12 weeks

Legend: MetS-Metabolic Syndrome; E – experimental group; C – control group; PA-Physical Activity; HIIT-High-Intensity Interval Training; RT-Resistance Training; AIT-Aerobic Interval Training; TCT-Traditional Continuous Training; WWPP-Weight Watchers Point Plus; JCH-Jenny Craig at Home; NSAS-Nutrisystem Advance Select.

Collected papers were published between 2006 and 2017. The number of subjects included in studies varied from 11 to 6475. Duration of experimental treatment ranged from 12 weeks to six months, with the longest follow-up period of six years. The most common experimental treatments were AIT-Aerobic Interval Training, HIIT- High-Intensity Interval Training, RT-Resistance Training and TCT-Traditional Continuous Training.

Discussion

The greatest number of papers were related to the effects of programmed physical exercise on blood glucose regulation. A sugar metabolism disorder is one of the most significant symptoms of this disease, and physical activity has a beneficial effect on this symptom, as indicated by the analyzed papers. The risk of type 2 diabetes can be reduced by physical exercise by 58% (Colberg et al. 2010), to 65% (Laaksonen et al., 2002). It has been found that the best effect on insulin is a joint action of exercises with resistance and aerobic exercises (Colberg, 2010) and there is evidence that the best results are achieved if the exercise has a greater total duration during the week, regardless of the intensity (Houmard, 2003). However, in the long-term, the higher intensity of training provides more lasting benefits in terms of insulin activity in comparison with moderate exercise or low-intensity exercise (DiPietro et al., 2005).

Regarding changes in the lipid status, it has been established that controlled, long-term, moderate to moderately strong physical activity, in the absence of therapeutic weight loss, improves the lipid profile by lifting high-density lipoprotein cholesterol and lowering triglyceride values in obese adults with metabolic syndrome characteristics (Carroll & Dudfield, 2004). It is interesting that here the emphasis is also placed on the importance of frequencies of weekly training rather on the intensity of the training regarding to positive results on lipid status. Tjønnå et al. (2008) compared moderate to high-intensity exercises related to the variables of cardiovascular function and prognosis in patients

with metabolic syndrome. Thirty-two patients with metabolic syndrome (52.3 ± 3.7 years old, $[V O_2 \text{ peak}] 34 \text{ ml/min/kg}$) were randomly divided into two groups. The first group performed moderate continuous training (CT; 70%HRmax), second performed aerobic interval training (AIT, 90%HRmax) three times a week, for 16 weeks, and third was a control group. Both programs were equally effective in lowering the mean arterial blood pressure and in weight loss (-2.3 and -3.6 kg in AIT and CT, respectively). Apart from the intensity and frequency of training, it is unclear whether the effects of physical activity on the metabolic syndrome are the same in the sedentary and in the fit population. One study shows a strong inverse relationship between physical activity and metabolic syndrome, and this relationship is significantly stronger in untreated individuals (Franks, 2004). Thus, the prevention of metabolic diseases may be the most effective in the population of untreated inactive people.

Research carried out by Halldin et al. (2006) showed a high inverse relationship between levels of physical activity during free time and metabolic syndrome. Physical inactivity, combined with several other factors, affects even more adversely the metabolic syndrome. Other factors include the level of education, as a component of social factors for the onset of illness, smoking, alcohol consumption and family history of this disease. Family history and level of education have the highest degree of correlation. The link between the change in fatty deposits with metabolic risk factors is two to three times stronger than the linkages of risk factors with energy consumption by physical activity (Ekelund, 2007). Friedenreich et al. (2011) have found that previously inactive women in postmenopausal who are involved in physical activity of moderate to severe intensity have changes in insulin values but also other metabolic changes that can reduce the risk of breast cancer in women in menopause.

Conclusion

The results show that the best form of exercise is combining exercise resistance training and aerobic exercises. There is also evidence that the best results are achieved if the exercise has increased in total, during the week, regardless of the intensity. The largest numbers of papers were related to the effects of programmed physical exercise on blood sugar regulation. Disorder in sugar metabolism

represents one of the major symptoms of the disease and a physical activity has a beneficial effect on this symptom. The risk of developing type 2 diabetes can be reduced by 58% and even up to 65% with the help of physical exercise. It was found that the best effect on insulin is the combination of exercise with resistance and aerobic exercise and there is evidence that the best results are achieved if the exercise has increased in total duration during the week, regardless of the intensity. However, in the long run, the greater intensity of training ensures long-term benefit related to the activity of the insulin compared to weight training or low-intensity exercise. As regards the change in the lipid status, it has been found that the controlled, long-term, moderate to moderately strong physical activity, in the absence of a therapeutic weight loss, improves the lipid profile by raising high-density lipoprotein cholesterol and by lowering the levels of triglycerides in obese adults with the features of the metabolic syndrome. Interestingly, the growing importance of weekly training volume compared to the intensity of training, even with minimal changes in body weight is also emphasized here.

Changes in lifestyle habits, including exercises and weight loss diet, can improve insulin resistance and glucose tolerance in obese people and are very effective in preventing or delaying the onset of type 2 diabetes in people with impaired glucose regulation. The results of experimental studies also show that exercise reduces blood pressure in obesity and obese people with hypertension. There is agreement that in terms of training intensity, the best results are achieved by exercising a stronger intensity. Regarding the frequency of training, there are some assumptions that the weekly number of 3–5 times training is sufficient to achieve positive effects on the parameters of the metabolic syndrome. Other authors believe that it is necessary to exercise every day for these effects to emerge. This evidence continues to support the recommendations given by the competent authorities. The exercise should be considered as an essential part of the “therapeutic change in lifestyle” which would result in improvement in blood sugar regulation and in the entire set of symptoms of metabolic syndrome.

References

- Baetge, C., Earnest, C.P., Lockard, B., Coletta, A.M., Galvan, E., Rasmussen, C., Levers, K., Simbo, S.Y., Jung, P., Koozehchian, M., Oliver, J., Dalton, R., Sanchez, B., Byrd, M.J., Khanna, D., Jagim, A., Kresta, J., Greenwood, M, and Kreider, RB (in press), Efficacy of a randomized trial examining commercial weight loss programs and exercise on metabolic syndrome in overweight and obese women, *Appl. Physiol. Nutr. Metab.* Doi: 79.110.17.154 on 01/05/17.
- Bakker, E.A., Lee, D.C., Sui, X., Artero, E.G., Ruiz, J.R., Eijsvogels, T.M.H., Lavie, C.J. and Blair, S.N. (2017), Association of Resistance Exercise, Independent of and Combined with Aerobic Exercise, With the Incidence of Metabolic Syndrome. *Mayo Clin Proc.* 92(8), pp. 1214–1222. doi: 10.1016/j.mayocp.2017.02.018. Epub 2017 Jun 13.
- Balducci, S., Zanuso, S., Nicolucci, A., Fernando, F., Cavallo, S., Cardelli, P., Falluca, S., Alessi, E., Letizia C., Jimenez, A., Falluca, F., and Pugliese, G. (2007), Anti-inflammatory effect of exercise training in subjects with type 2 diabetes and the metabolic syndrome is dependent on exercise modalities and independent of weight loss. *Obesity*, 15, pp. 2478–2484.
- Brien, S.E., Janssen, I., and Katzmarzyk, P.T. (2007). Cardiorespiratory fitness and metabolic syndrome: US National Health and Nutrition Examination Survey 1999–2002. *Applied Physiology, Nutrition, and Metabolism*, 32, pp.143–147.
- Brien, S.E. & Katzmarzyk, P.T. (2006). Physical activity and the metabolic syndrome in Canada. *Applied Physiology, Nutrition, and Metabolism*, 31(1), pp. 40–47.
- Carroll, S. and Dudfield, M. (2004), What is the Relationship Between Exercise and Metabolic Abnormalities? A Review of the Metabolic Syndrome. *Sports Medicine*, 34, pp. 371–418.
- Chung J, Kim K, Hong J, & Kong HJ. (2017). Effects of prolonged exercise versus multiple short exercise sessions on risk for metabolic syndrome and the atherogenic index in middle-aged obese women: a randomised controlled trial. *BMC Womens Health*. 2017 Aug 22;17(1):65.
- Colberg, S.R. Sigal, R.J., Fernhall, B., Regensteiner JG, Blissmer BJ, Rubin RR, Chasan-Taber L, Albright AL, & Braun B. (2010). Exercise and Type 2 Diabetes, The American College of Sports Medicine and the American Diabetes Association: joint position statement. *Diabetes Care*, 33, pp.147–167.
- DiPietro, L., Dziura, J., Yeckel, C.W., & Neuffer, P.D. (2005). Exercise and improved insulin sensitivity in older women: evidence of the enduring benefits of higher intensity training. *J ApplPhysiol*, 100,142–149.
- Ekelund, U. (2007). Increase in Physical Activity Energy Expenditure Is Associated with Reduced Metabolic Risk Independent of Change in Fatness and Fitness. *Diabetes Care*, 30, pp. 2101–2106.
- Ensenyat, A, Espigares-Tribo, G, Machado, L, Verdejo, FJ, Rodriguez-Arregui, R, Serrano, J, Miret, M, Galindo, G, Blanco, A, Marsal, JR, Sarriegui, S, Sinfreu-Bergues, X, and Noemi Serra-Paya. (2017) Metabolic risk management, physical exercise and lifestyle counselling in low-active adults: controlled randomized trial (BELLUGAT), *BMC Public Health* 17:257.
- Esteghamati, A., Meysamie, A., Khalilzadeh, O., Rashidi, A., Haghazali, M., Asgari, F., Kamgar, M., Mehdi Gouya,

- M., and Abbasi, M. (2009), Third national surveillance of risk factors of non-communicable diseases (SuRF-NCD-2007) Methods and results on prevalence of diabetes, hypertension, obesity, central obesity, and dyslipidemia, *BMC Public Health*, 9: 167.
- Flack, K.D., Davy, K.P., Hulver, M.W., Winett, R.A., Frisard, M.I., and Davy, B.M. (2011), Aging, resistance training, and diabetes prevention, *Journal of Aging Research*, 2011:12, pp. 127315
- Franks, P.W. (2004), Does the Association of Habitual Physical Activity with the Metabolic Syndrome Differ by Level of Cardiorespiratory Fitness? *Diabetes Care*, 27, pp. 1187–1193.
- Friedenreich, C.M., Neilson, H.K., Woolcott, C.G., McTiernan, A., Wang, Q., Ballard-Barbash, R., Jones, C.A., Stanczyk, F.Z., Brant, R.F., Yasui, Y., Irwin, M.L., Campbell, K.L., McNeely, M.L., Karvinen, K.H., and Courneya K.S. (2011), Changes in insulin resistance indicators, IGFs, and adipokines in a year-long trial of aerobic exercise in postmenopausal women. *EndocrRelat Cancer*, 18(3), pp. 357–69.
- Guadalupe-Grau, A., Fernández-Elías V.E., Ortega J.F., Dela F, Helge J.W, and Mora-Rodriguez R. (2017), Effects of 6-month aerobic interval training on skeletal muscle metabolism in middle-aged metabolic syndrome patients. *Scand J Med Sci Sports*. 2017 Mar 21.
- Hallidin, M., Rosell, M., De Faire, U., and Hellénius, M.L. (2007), The metabolic syndrome: Prevalence and association to leisure-time and work-related physical activity in 60-year-old men and women. *Nutrition, Metabolism & Cardiovascular Diseases*, 17, pp. 349–357.
- Helmerhorst H.J.F, Wijndaele, K., Brage, S., Wareham, N.J., and Ekelund1, U. (2009), Objectively Measured Sedentary Time May Predict Insulin Resistance Independent of Moderate- and Vigorous-Intensity Physical Activity. *Diabetes*, 5, pp. 1776–1779.
- Houmard, J.A., Tanner, C.J., Slentz, C.A., Duscha, B.D., McCartney, J.S., and Kraus W.E. (2003), Effect of the volume and intensity of exercise training on insulin sensitivity. *Journal of Applied Physiology*, 96, pp. 101–106.
- Jahangiry, L., Montazeri, A., Najafi, M., Yaseri M, and Farhangi, M.A. (2017), An interactive web-based intervention on nutritional status, physical activity and health-related quality of life in patient with metabolic syndrome: a randomized-controlled trial (The Red Ruby Study), *Nutrition & Diabetes* (2017) 7, e240; doi:10.1038/nutd.2016.35
- Johnson, J.L., Slentz, C.A., Houmard, J.A., Samsa, G.P., Duscha, B.D., Aiken, L.B., McCartney, J.S. Tanner, C.J., and Kraus, W.E. (2007), Exercise Training Amount and Intensity Effects on Metabolic Syndrome (from Studies of a Targeted Risk Reduction Intervention through Defined Exercise). *American Journal of Cardiology*, 100, pp. 1759–1766.
- Kang, S.J., Kim, E., and Ko, K.J. (2016), Effects of aerobic exercise on the resting heart rate, physical fitness, and arterial stiffness of female patients with metabolic syndrome. *J. Phys. Ther. Sci.*, 28(6), pp. 1764–8.
- Kaur, J., 2014. A comprehensive review on metabolic syndrome. *Cardiology Research and Practice*. (2014), pp. 1–21.
- Laaksonen, D.E., Lakka, H. M., Salonen, J.T., Niskanen, N.K., Rauramaa, R., and Lakka, T.A. (2002), Low Levels of Leisure-Time Physical Activity and Cardiorespiratory Fitness Predict Development of the Metabolic Syndrome. *Diabetes Care*, 25(9), pp. 1612–1608.
- Lakka, A.T., and Laaksonen, D.E. (2007), Physical activity in prevention and treatment of the metabolic syndrome. *Applied Physiology, Nutrition, and Metabolism*, 32(1), pp. 76–88.
- Lin, C.H., Chiang, S.L., Yates, P., Lee, M.S., Hung, Y.J., Tzeng, W.C, and Chiang, L.C. (2015), Moderate physical activity level as a protective factor against metabolic syndrome in middle-aged and older women. *Journal of clinical nursing*, 24 (9–10), pp. 1234–45.
- Meckling, K.A., and Sherfey R. (2007), A randomized trial of a hypocaloric high-protein diet, with and without exercise, on weight loss, fitness, and markers of the Met Syndrome in overweight and obese women. *Applied Physiology, Nutrition, and Metabolism*, 32(4), pp. 743–52.
- Morales-Palomo F, Ramirez-Jimenez M, Ortega JF, Lopez-Galindo PL, Fernandez-Martin J, and Mora Rodriguez R. (2017), Effects of repeated yearly exposure to exercise-training on blood pressure and metabolic syndrome evolution, *J Hypertens*, 35(10), pp. 1992–1999.
- Nolan, P.B., Carrick-Ranson, G., Stinear, J.W., Reading, S. A., and Dalleck, L.C. (In press). Prevalence of metabolic syndrome and metabolic syndrome components in young adults: A pooled analysis. *Prev Med Rep*. 2017 Jul 19;7:211–215.
- Normandin, E, Chmelo, E., Lyles, M.F, Marsh, A.P, and Nicklas B.J. (2017), Effect of Resistance Training and Caloric Restriction on the Metabolic Syndrome, *Med Sci Sports Exerc*. 49(3), pp. 413–419.
- O’Leary.V.B, Marchetti, C.M., Krishnan, R.K., Stetzer, B.P, Gonzalez, F and Kirwan, J.P. (2006), Exercise-induced reversal of insulin resistance in obese elderly is associated with reduced visceral fat, *Journal of Applied Physiology*, 100(5), pp. 1584–1589.
- Okura, T., Nakata, Y., Ohkawara, K., Numao, S., Katayama, Y., Matsuo, T., and Tanaka, K. (2007), Effects of Aerobic Exercise on Metabolic Syndrome Improvement in Response to Weight Reduction. *Obesity*, 15(10), pp. 2478–84.
- O’Neill, S., and O’Driscoll, L., 2015. Metabolic syndrome: a closer look at the growing epidemic and its associated pathologies. *Obes. Rev*. 16 (1), pp. 1–12.
- Praet, S.F, and Van Loon, L.J. (2007), Optimizing the therapeutic benefits of exercise in Type 2 diabetes. *Journal of Applied Physiology*, 103(4), pp. 1113–1120.
- Ramos J.S., Dalleck, L.C., Borrani, F., Beetham, K.S., Mielke, G.I, Dias, K.A., ..., Coombes JS. (In press). High-intensity interval training and cardiac autonomic control in individuals with metabolic syndrome: A randomised trial, *International Journal of Cardiology*.
- Rector, R.S., Warner, S.O., Liu, Y., Hinton, P.S., and Sun, G. Y. (2007), Exercise and diet-induced weight loss improve measures of oxidative stress and insulin sensitivity in adults with characteristics of the metabolic syndrome. *Am J Physiol Endocrinol Metab.*, 293(2), pp. 500–506.

- Ring-Dimitriou, S. Paulweber, B., von Duvillard, S.P., Stadlmann, M., LeMura, L. M., Lang, J. and Müller, E. (2006), The effect of Physical activity and plasma adiponectin in adults with predisposition to metabolic syndrome, *Europ Jour of Appl Physiol* 98(5), pp. 472–81.
- Solomon, T.P., Haus, J.M., Kelly, K.R., Cook, M.D., Filion, J., Rocco, M., Kashyap, S.R., Watanabe, R. M., Barkoukis, H., and Kirwan, J.P. (2010), A low-glycemic index diet combined with exercise reduces insulin resistance, postprandial hyperinsulinemia, and glucose-dependent insulinotropic polypeptide responses in obese, prediabetic humans, *Am J Clin Nutr*, 92(6), pp. 1359–68.
- South, M.A., Layne, A.S., Stuart, C.A., Triplett, N.T., Ramsey, M.W., Howell, M.E., Sands, W.A., Mizuguchi, S., Hornsby, W.G., Kavanaugh, A.A., and Stone, M.H. (2016), Effects of short-term free-weight and semiblock periodization resistance training on metabolic syndrome, *J Strength Cond Res*, 30(10), pp. 2682–2696.
- Tjønnå, A.E., Lee, S.J., Rognmo, Ø., Stølen, T.O., Bye, A., Haram, P.M., Loennechen, J.P., Al-Share, Q.Y., Skogvoll, E., Slørdahl, S.A., Kemi, O.J., Najjar, S.M., and Wisløff, U. (2008), Aerobic Interval Training Versus Continuous Moderate Exercise as a Treatment for the Metabolic Syndrome. *Circulation*, 118(4), pp.346–54.
- Tran, V.D., James, A.P., Lee, A.H., Jancey, J., Howat, P.A., and Thi Phuong Mai, L. (2016), Effectiveness of a Community-Based Physical Activity and Nutrition Behavior Intervention on Features of the Metabolic Syndrome: A Cluster-Randomized Controlled Trial. *Metab Syndr Relat Disord*. 15(2), pp. 63–71.

Correspondant author: DanijelaZivkovic, PhD student, Faculty of Sport and Physical Education, University of Nis, Carnojevica 10a, 18000 Nis, Serbia danijela21581@yahoo.com

**PHYSICAL EDUCATION, QUALITY IN
PHYSICAL EDUCATION, TEACHING AND
LEARNING**

TENDENCIES IN THE DEVELOPMENT OF SCHOOL PHYSICAL EDUCATION IN BULGARIA, MACEDONIA AND SLOVENIA

Eleonora Mileva, Ilija Klincarov, Biljana Popeska,
Marjeta Kovac, Gregor Starc

ABSTRACT

Physical education is an integral part of the educational system. In the EU Work Plan for Sport 2014–17 it is emphasized that physical education teachers are key agents for putting physical and sport policies into practice. The aim of the research is to study main elements of the physical education systems in three Balkan countries – Bulgaria, Macedonia and Slovenia. The following criteria are outlined: status of physical education in the educational system; learning programs; professional qualification of teachers; buildings and facilities for physical education classes. The research methods that have been used include a study of educational documentation, analysis of specialized literature sources, and comparative analysis. In the three countries of the research, physical education is an obligatory school subject in all levels of their education systems. In Bulgaria, official programs in physical education with concrete educational content and clear instructions have been adopted. In the secondary schools in Bulgaria, Macedonia and Slovenia there are qualified specialists in physical education. Generalist teachers providing physical education classes in the primary school do not have the necessary preparation and the adequate skills for teaching physical education. There is lack of appropriate buildings and facilities for realization of the curriculum in some regions of the countries. Future activities are intended for the professional qualification in physical education and sport for generalist school teachers, and for the continuing professional development of all sports pedagogues.

Key words: school sport, learning programs, teachers, preparation, primary school

Introduction

Physical education (PE) is an integral part of the educational system. It is a compulsory subject in primary and secondary schools in the European countries. The best possibility for a positive influence on children's physical development is the well-structured and organized physical education process at schools (European Commission, Expert Group on Health-Enhancing Physical Activity, 2015). Physical development is closely linked to the promotion of health and healthy lifestyle, including lifelong physical activity and exercise (European Commission/EACEA/Eurydice, 2013). Pupils who participate in regular physical education classes have better concentration and memory, increased problem-solving abilities and positive attitude toward self and others. This improves their personal and social behavior, school climate and reduces violence and vandalism (European Commission/EACEA/Eurydice, 2013). Physical education can "contribute crucially to the personal growth of young people in helping them to develop physical awareness and belief in their own physical abilities,

along with a general feeling of bodily well-being and thus greater self-confidence and self-esteem" (<http://ec.europa.eu/transparency/regexpert/>).

According to the World-wide Survey of School Physical Education (UNESCO, 2014) physical education is an obligatory school subject for boys and girls in 98% of the European countries. Formally accepted national curricula are evident in 94% of countries in Europe (a proportion similarly identified in the 2010–2011 EUPEA Physical Education Survey). In the European physical education curriculum, time allocations during the primary school phase amount to an average 109 minutes weekly (range of 30–290 minutes). In the secondary school phase there is an average of 105 minutes weekly (range of 30–240 minutes) (UNESCO, 2014).

In the EU Work Plan for Sport 2014–2017 (European Commission, Expert Group on Health-Enhancing Physical Activity, 2015) it is emphasized that physical education teachers are key agents for putting physical and sport policies into practice. They

have the most important role for the realization of different sports activities and forming of healthy life style of children. Physical education teachers should be role models and should be physically active as well. The Recommendation 13 of this document clearly states that qualified PE teachers should be preferred at all educational levels.

In secondary education a Master's degree is usually required for the positions of physical education teachers. It is pointed out that in the European Union, both generalist teachers and specialized (with a Bachelors or Masters Degrees) teachers give physical education classes. At pre-school and at primary education level, schools usually pursue a single-teacher model, where non-specialist teachers are allowed to teach physical education. In such cases, it is considered beneficial, that at least a qualified physical education teacher is provided as mentor and support to the generalist teachers.

The importance of continuous professional development (CPD) is also highlighted in this document. It is pointed that CPD should be normally available to physical education teachers, thereby facilitating interaction with other disciplines. High quality training opportunities should always be ensured to allow physical education teachers to expand their knowledge in relevant themes, such as new motor skills and sports, and health-enhancing physical activity, in order to improve the quality of their provision. Initial physical education teacher qualification should be constantly adapted to include such relevant topics, and also results from recent research and new learning approaches.

Aim and objectives of the study

the aim of the study is to compare *the state and development* of the school physical education in three Balkan countries – Bulgaria, Macedonia and Slovenia. *The main elements of the physical education system* are of special interest for the research. The following criteria are outlined: the status of PE in the educational system; PE learning programs; the professional qualification of teachers in PE; buildings and facilities for teaching PE at school.

It is important to compare the similarities and differences in the physical education systems of the three countries, and observe to what extend the elements of their systems of PE are aligned with the European requirements. Recommendations for a

future development in the research are also to be given. The present study is a continuation of other comparative reports on the development of physical education in Bulgaria, Macedonia and Slovenia (Klincarov et al., 2017).

Methodology

The research methods that have been used are a *study of educational documentation, an analysis of specialized literature sources, and a comparative analysis*. The main documents on the current state and on the development of school physical education in Europe and world-wide have also been studied. The national strategies and documents for the system of physical education in the countries have been analyzed. The learning programs in physical education for different education levels have been discussed.

Results

In Bulgaria, a National strategy for the development of physical education and sport 2012–2022 has been adopted (http://mpes.government.bg/Documents/Documents/Strategii/Strategia_2012-2022.pdf). This strategy is a basic document of the government about the role and the social functions of physical education and sports in the Republic of Bulgaria. It reflects the need for a qualitative reorganization of the system of physical education and sport as a compulsory component of the political, economic and social changes in society.

In Slovenia the revised expert doctrine of PE is described in the Guidelines of Physical Education (Kristan et al., 1992). In addition to the well-established PE in schools, the development of school sport is based also on the National Program of Sport (Jurak et al., 2011). This strategic document defines the key features of Slovenian sport development for the coming decade and emphasizes the intertwining of qualitative regular compulsory PE, school sport and out-of-school sports activities directed to as many school children as possible (Jurak et al., 2011).

The physical and health education in Macedonia is regulated by the Conception for the nine-year compulsory education (Bureau for development of education, 2007) and Law for primary education (Ministry of education and sciences of Republic of Macedonia, 2007). These two institutions, The Bureau for Development of Education and Ministry of

Development of education are the two main state bodies responsible for all educational policies, including the strategy for physical and health education (PHE) and PHE curricula.

In the three studied countries physical education is an obligatory school subject in all levels of the educational system. In Bulgaria, it is practiced three times per week from 1st to 12th grade and in Macedonia, it is done three times per week from 1st to 9th grade. In Bulgaria the third PE lesson is provided usually as module education out of PE classes. In some schools in the country, the third PE lesson is not provided (Peneva, Buyuklieva, 2016).

In Slovenia in the first six years of schooling, children have three PE lessons per week. In grades 6th – 9th (end of primary school) they have two obligatory PE lessons per week, but pupils can also choose one lesson per week as an optional sport subject, out of three one-year programs (sport for health, sport for enjoyment, optional sport), and one lesson per week of an optional subject in dancing activities (Starc, Strel, 2012).

In Bulgaria, official programs in PE have been adopted, with concrete educational content and clear instructions (www.mon.bg). In 2015 and 2016 new learning programs in PE for 1st, 2nd, 5th and 6th grade was introduced (according to the new Law for School and Pre-school Education). The PE programs for 3rd and 4th grade and for the other educational levels are being reorganized at present. There is obligatory and elective sports content in the PE programs for school education in Bulgaria (www.mon.bg). With reference to the elective sports content, teachers can choose between different sports disciplines. It is agreed with the school principals and it depends on the facilities and the equipment of the school, and the characteristics of the region.

In Macedonia, the PE curriculum has not been changed since 2007. It is characterized with the lack of clearly defined learning objectives, no comprehensible instructions for learning across the curriculum, as well as, lack of supporting documents (Klincarov et al., 2017).

PE in Slovenian schools is based on open curriculums (Jurak et al., 2011). They include goals with recommended activities, standards of knowledge (skills and theoretical knowledge) and didactic

recommendations. They evidence the connection between PE and school sport programs. In their annual working plan each school defines the course of lessons for all subjects and all additional activities, including sport activities. Schools themselves are responsible for the realization of their working plan and the programs are funded by the state and local budgets. Heterogeneous sport programs for children and youth are also offered by private enterprises.

In the secondary schools in Bulgaria, Macedonia and Slovenia there are qualified specialists in physical education. In all schools in Bulgaria from 5th to 12th grade, PE teachers are specialists, who have graduated the National Sports Academy (Peneva, Mileva, 2005), or specialized in Physical Education at the Pedagogical Faculties of the Universities in Veliko Tarnovo, Blagoevgrad, Shumen, Plovdiv and Sofia.

In most schools in Bulgaria from 1st to 4th grade, physical education and sports lessons are taught by generalist teachers who do not have the necessary professional qualifications and training in PE. In a small part of the big schools in the large towns in Bulgaria, all classes from 1st to 4th grade are conducted by certified PE specialist teachers.

The Faculty of Sport of the University of Ljubljana, is currently the only higher education institution in Slovenia for PE teachers. The course of study is five years. The three Faculties of Education (in Ljubljana, Maribor and Koper/Capodistria) educate only generalist teachers who teach PE in the primary-school classes (1 to 5). Their study program lasts four years.

The Faculty of Physical Education, Sport and Health in Skopje is the leading institution in Republic of Macedonia in education of specialized PE teachers that deliver physical and health education from 6th to 9th grade. The generalist teachers that teach PHE in the first stage of primary education (1st to 5th grade) are educated at the Teaching Faculties at the Universities in Skopje, Stip and Bitola, as well as at the Institute of Pedagogy at the Faculty of Philosophy in Skopje and Tetovo. The study programs at all named institutions lasts four years.

Discussion

the national strategic documents for the develop-

ment of physical education and sport in Bulgaria, Slovenia and Macedonia outline the main approaches and the theoretical formulations, defining the strategic objectives and directions of the national systems for physical education and sport and the basic principles on which they are built. The gap between the theoretical formulations in certain parts of the documents and their practical implementation can be considered as a major drawback. From the analysis of the literature sources, it is clear that the number of PE lessons per week and the time allocation for the subject of physical education in Bulgaria, Slovenia and Macedonia meet the requirements for quality physical education. Additional optional sport and health programs or elective sports contents in primary and secondary education are available in all three countries.

Regarding the PE curriculum, recent changes are made in the PE curriculum in Bulgaria. New state educational standards for physical education at all levels of the education system are adopted. They are introduced with the new School and Pre-school Education Law (2016). In Macedonia there are no clearly defined standards for evaluation, there are only expected goals. The lack of standards is one of the major problems. The recent and current changes in the legislation of sport and PE in Bulgaria and Slovenia, are good examples which could be implemented in Macedonia, where an inappropriate construction of the national PE curriculum is observed.

One of the important observations of the research analysis is that the specialist physical education teachers in the three countries have the necessary preparation and the adequate knowledge and skills for teaching physical education. The main education level requirements for PE teachers are a Bachelor's or a Master's degree of training. At the same time, the generalist teachers providing PE classes in the primary school do not have sufficient special skills and qualification to conduct physical education lessons. The competencies of generalist teachers are much lower.

It has been observed that the schools in some regions of Bulgaria and Macedonia lack appropriate buildings and facilities for the realization of the PE curriculum (Peneva, Buyuklieva, 2016). As a result, quite often two classes in PE have to be conducted simultaneously in one and the same school gym

(Popeska, 2016). This is one of the reasons for the lack of quality physical education at primary and secondary school levels in both countries.

Future activities are aimed at higher professional qualification in physical education and sport of generalist teachers and continuing professional development of all PE teachers. Receiving a higher educational degree (a Master's Degree) is necessary. Teachers feel the greatest need for improvement of competencies which are directly applicable within PE classes. For older teachers it is important to meet some new requirements in PE teaching, such as the integration of students with special educational needs within regular classes, the concept of cross curricular teaching, multicultural education, etc. (Tul et al., 2015). For that purpose, some universities in Bulgaria have opened departments for professional development and training of PE teachers (Kl. Ohridsky Sofia University, Trakia University, Stara Zagora, and University of Shumen). In 2016 a department for continuing professional development of PE teachers was also created at the National Sports Academy in Sofia. It was aligned with the new Law for School and Pre-school Education and the new regulations for the professional qualification of teachers, adopted in January 2017. Since January 2017 many qualification courses have been organized at the National Sports Academy. They are directed at the new tendencies, methods and content of physical education in Europe and on national level.

We recommend common educational programs to be organized in the future between Bulgaria, Slovenia and Macedonia for the professional development of specialized PE teachers, for international discussions, seminars and joint projects focused on sharing positive experience between authorities, experts and pedagogues. We hope that similar initiatives will improve the quality of PE in all three countries.

References

- Bureau for development of education. (2007), *Physical and health education curriculum for first-ninth grade in nine-year primary education*, Skopje: Macedonian ministry of education.
- EU Work Plan for Sport 2014–2017. (2015), *Expert Group on Health- enhancing physical activity*, European Commission.
- European Commission/EACEA/Eurydice. (2013), *Physical Education and Sport at School in Europe*. Eurydice

Report. Luxembourg: Publications Office of the European Union.

Jurak, G., Kovač, M., and Strel, J. (2011c), *Influence of the Enhanced Physical Education Curriculum on the Physical Fitness of Children*. Croatian Journal of Education, 13(4), pp. 41–59, pp. 60–70.

Klincarov I., Popeska, B., Kovac, M., Mileva, E. and Starc, G. (2017), Comparative study on the state and the status of primary physical education in Macedonia, Slovenia and Bulgaria, in *Changes in Childhood and Adolescence: Current Challenges for Physical Education, Proceedings of the 12th FIEP European Congress, 2017*, Logos Verlag, Berlin, pp. 89–90.

Kristan, S., Cankar, A., Kovač, M. and Praček, T. (1992), *Orientations of Physical Education at Schools*. Ljubljana: Board of Education and Sport.

Ministry of education and sciences of Republic of Macedonia. (2007), *Conception for nine years' compulsory primary education*.

Natsionalna strategiya za razvitie na fizicheskoto vaspitanie i sporta v Republika Bulgaria 2012–2022, (Национална стратегия за развитие на физическото възпитание и спорта в Република България 2012–2022) available at: http://mpes.government.bg/Documents/Documents/Strategii/Strategia_2012–2022.pdf (accessed at 10 April 2017).

Peneva, B., Buyuklieva, A. (2016), *Challenges in front of the profession teacher of physical education*, Physical Education, Sport, Kinesitherapy Research Journal, 1(2), Art.12, pp. 58–61.

Peneva, B., Mileva, E. (2005), *Social problems of Bulgarian School Physical Education (historical view)*, FIEP Bulletin, Vol. 75, 1, pp. 69–72.

Popeska, B. (2016), Possibilities of the classroom for re-

alization of physical and health education, in *Proceeding book of scientific professional summit "The teacher and the environment for learning and development"*, 02.10.2015, Stip: Faculty of Educational Sciences, Goce Delcev University, pp. 83–91.

Quality Physical Education (QPE). Guidelines for Policy-Makers. (2015), United Nations Educational, Scientific and Cultural Organization, available at: <http://unesdoc.unesco.org/images/0023/002311/231101E.pdf> (accessed 15 March 2017).

Starc, G., Strel, J. (2012), *Influence of the quality implementation of a physical education curriculum on the physical development and physical fitness of children*. BMC public health, Vol. 12.

Tul, M., Leskosek, B., Jurak, G. and Kovac, M. (2015), *Perceived importance of Slovenian physical education teachers' professional competencies*. Hacettepe Egitim Dergisi, Vol. 30, Issue 1, pp. 268–281.

Uчебни програми po fizicheskoto vaspitanie i sport (Учебни програми po физическо възпитание и спорт), available at: www.mon.bg (accessed 10 April 2017).

World-wide Survey on School Physical Education, Final report 2013, UNESCO, 2014.

Contact information:

Prof. Eleonora Mileva, D. Sc., Ph.D.

Lecturer at Department of Psychology, Pedagogy and Sociology

National Sports Academy "V. Levski"
Studentski Grad, 1710 Sofia, Bulgaria

Tel.: + 359 898 776676

E-mail: emileva2002@yahoo.com;

ANALYZING TEST RESULTS IN BILATERAL DEVELOPMENT AT 5–7 YEAR OLDS

Ana Buyuklieva
NSA „Vassil Levski“ Sofia Bulgaria

Introduction: The meaning of every physical educational activity consists in achieving optimal functional and morphological equilibrium of the organism in its interaction with the middle of development. From here we derive the result of the bilateral development in the children of preschool age. Our methodology is the following: The subject of study is the sign of physical bilateral development. The study is the dynamics of the physical performance of the Development in 5–7-year-olds. A contingent of research is a total of 180 children aged 5–7 years. The study took place through the school year 2016/2017, from October to May, at the Kindergarten Dolphin, city of Burgas(Bulgaria). Our tasks will be to make testing of every child and to determine the difference in development between the left and right sides.

Keywords: physical development, bilateral development, testing.

Results: The results obtained were processed by the application of variation and comparative analysis.

Test juggling	Girls			Boys			Growth <i>d</i>
	<i>x</i>	<i>s</i>	V%	<i>x</i>	<i>s</i>	V%	
Missed left hand	90	13,8	13,1	88	8,1	7	2
Missed right hand	70	9,4	8,7	72	9,6	8,3	2

Our **discussions** were on how and indeed mini games affect physical development and in regular motor activities are achieved good results for the physical development of the children. Why the left side of the upper limbs in some children prevails and why in most, in both sexes, the right side has been developed.

Conclusion: the data from our research confirms the accepted working hypothesis. Whatever our difference is the bilateral physical development, the movement must exist. In this sense I emphasize on the health significance of the movement in all periods of early childhood to adulthood.

Introduction

The leading pedagogical theories in the most general terms define childhood as a particularly important and sensitive period in which substantial biological, mental and social changes are carried out with the child, with an impact on the specificity and dynamics of developing children's personality. (Dzhorova, B., 2010)

The pre-school period is characterised by an intensive morphological growth and functional improvement of the main organs and systems. The

growth of the child is one of the main signs, characterising the quantitative changes in the body in the age-sexual aspect. It is assessed on the changes of anthropometric indicators growth, weight, chest circumference, etc., as the dynamics of these pre-school signs is ascending (Kadiyski, Kostov, Glushkova y col, 1992).

For its part, the physical development, as a natural biological process, influence two types of factors:

- Internal (endogenous), which determines the natural course of this development. The most important here is heredity.
- External (exogenous), among which an important role is the environment, nutrition, organised and unorganized motor activity, etc. (Kostov, Dokova, Kinov, 2017; Marinov,2005).

Most children have active behavior. Climbing to the top of the slide and hanging like monkeys on the levers, however, has a much more significant meaning than physical activity. Children's activity has been vitally important since the age of school. There the revolutions and the pace of everyday life with which the child will face require his endurance and ambition. It is good when children are young, parents to love the sport and the activity in this respect and the active attitude towards life.

Children in pre-school age cannot understand the complex rules and are often careless and distracted, which can lead to adverse incidents and injuries. At this age most children should not learn sports rules,

but simply develop their body and mind through various movements and games.

The general purpose of the education and the peculiarities of the physical activity determine the purpose of physical education in preschool-age – putting the foundations of the child's physical perfection, understood as:

1. Improvement of the health condition, hardening and physical development of the child's organism.
2. Development of dexterity and capacity through mastery of motor knowledge, skills and habits and development of physical qualities.
3. Personal formation of the child through the use of all potential possibilities of physical culture for mental, moral, labor and aesthetic formation of children's personality.

The systematic implementation of a diverse motor activity supports the optimal development of the adolescent children's body. Qualitative and quantitative changes occur in the physical development of the child, ensuring its normal and harmonious growth.

The conscious mastery of physical exercise, their repeated repetition becomes the basis for formation of aggregated propulsion skills, trains the children for planning and regulation of their propulsion and behaviour, builds on attitudes towards physical activity.

Designed in synchrony and drawn into a general plan, physical development gives the adolescent organism:

- Increased further growth
- Increased active weight
- Increases the strength of the bones and their mass
- Improves immunity
- Improves the concentration and productivity of mental labour

In addition to all these developing functions, it also performs remedial functions.

Educational tasks

Physical education as a pedagogical process gives the opportunity and knowledge for the most rational use of physical exercises to acquire the motor skills and habits necessary for the daily physical activity of the adolescents.

Remedial tasks

This task group takes place mainly in school-age. Here, physical education transcends the school because, apart from the reinforcement and improvement of the objectives that the period poses, it can be achieved and confirmed goals far beyond the norms. Important for the period is the tasks to lead to the reinforcement of the musculoskeletal system, the sealing of bones, proper formation of a posture (a curve of the spine and position of the shoulders/pelvis), vaulting of the feet, even development of the musculature on the sections of the body (proportions), etc. The healing tasks are tasks of the family, including family sports on weekends and sports tourism. A sought-after element of hardening against physiological stress and adverse environmental conditions.

Educational tasks

In one with the growth of motor intelligence, physical education also improves analytical, emotional and logical intelligence. This includes improved memory, developing imagination, improving capabilities for monitoring, comparison, synthesis, analysis, summary, and more. It is necessary for children to be educated in practice to use their skills and information in their possession, making them a lasting habit. Sport, conducted as part of physical education, is the basis for the formation of physical and health culture, which in turn is an important unit in the cultural richness of the adult individual.

The tasks of physical education in pre-school age are specified and specified in each age group. They are realized through the content, organization and conditions of the educational process of physical education and in unity with the other activities in the kindergarten, by creating the necessary real prerequisites and opportunities for purposeful activity and personal development of the child and preparation for school.

From the contradiction between the strong desire of the child to participate in the life of the elderly and the inability to create children's play.

The game is an activity of children in which they take the social roles of adults and in game conditions reproduce their relationships. Namely, the role and the related actions are the main unit of the game.

From a pedagogical point of view, it is possible the autonomy of children in the game and good development of physical qualities.

The specifics of the children's game from the preparatory group consists in the fact that it is related not only to the objectives and tasks of the program, but also to the peculiarities of the children. The overall organisation of the material environment and the life of the children in the group is intended to show them that they are in a preparatory group/class, but are on the verge of getting into school. The requirements for them are bigger and serious, but they can also play.

The hypothesis of our research is that the purposeful application of testing in the form of a game in their diversity when working with 5–7-year-olds will lead to an increase in their physical capacity and good physical development.

In this direction is our goal – to determine the extent to which the difference between the left and right side games in 5–7-year olds from kindergarten. Based on the stated objective and hypothesis of the study, the following tasks are defined:

1. Selection of appropriate games.
2. Selection of appropriate tests.
3. Raising the overall capacity of children by complying with the psycho-physical and anatomic-physiological their peculiarities, respect for children's interests and knowledge.
4. Inclusion in games and love for physical education.

5. Establishing the difference in development in children.

Methodology of the study

The subjects of the study are the signs of physical bilateral development and their change due to physical education training.

The study is the dynamics of the physical development indicators in 5–7-year-olds.

A contingent of study were a total of 180 children aged 5–7 years. The study took place through the school year 2016/2017, from October to May, at the Kindergarten Dolphin, city of Burgas(Bulgaria). Our tasks will be to make testing of each child and determine the difference in development between the left and right sides.

To analyze the results for determining the level of physical performance we used the tests juggling included in the game „Get out with me without knocking me out“, passing a soccer ball with left and right foot in pairs, throwing a small dense ball.

Results

Начало на формуляра

Analysis of results

The results obtained were processed by the application of variation and comparative analysis. The data from the measurements are set out in table 1, 2, 3, 4, 5, 6.

Table 1

Data from the variance analysis of the results of girls and boys from the control group.

	Girls			Boys			Growth
	<i>x</i>	<i>s</i>	V%	<i>x</i>	<i>s</i>	V%	
Test juggling							<i>d</i>
Missed left hand	90	13,8	13,1	88	8,1	7	2
Missed right hand	70	9,4	8,7	72	9,6	8,3	2

Table 2

Data from the variance analysis of the results of the girls and boys from the experimental.

	Girls			Boys			Growth
	<i>x</i>	<i>s</i>	V%	<i>x</i>	<i>s</i>	V%	
Test juggling							<i>d</i>
Missed left hand	85	7,6	6,9	67	6,9	5,4	18
Missed right hand	75	9,9	8,7	93	14,2	13,9	18

Table 3
Data from the variance analysis of the results of girls and boys from the control group.

	Girls			Boys			Growth
	<i>x</i>	<i>s</i>	V%	<i>x</i>	<i>s</i>	V%	<i>d</i>
Submitting a soccer ball							
With a left foot	14,08	1,25	8,9	11,9	1,47	11,7	2,19
With a right foot	88,78	8,12	7,7	106	11	8,9	16,82

Table 4
Data from the variance analysis of the results of the girls and boys from the experimental group

	Girls			Boys			Growth
	<i>x</i>	<i>s</i>	V%	<i>x</i>	<i>s</i>	V%	<i>d</i>
Submitting a soccer ball							
With a left foot	13,14	1,31	9,9	11,9	1,49	12,5	1,27
With a right foot	92,78	8,07	8,7	102	10,1	9,8	9,62

Table 5
Data from the variance analysis of the results of girls and boys from the control group

	Girls			Boys			Growth
	<i>x</i>	<i>s</i>	V%	<i>x</i>	<i>s</i>	V%	<i>d</i>
Throw a small dense ball into a target							
With a left hand	2,45	0,25	2,2	2,60	0,40	1,2	0,15
With a right hand	3,50	1,12	2,1	3,80	1,13	1,4	0,30

Table 6
Data from the variance analysis of the results of the girls and boys from the experimental group.

	Girls			Boys			Growth
	<i>x</i>	<i>s</i>	V%	<i>x</i>	<i>s</i>	V%	<i>d</i>
Throw a small dense ball into a target							
With a left hand	2,65	0,32	2,3	2,85	0,50	1,3	0,20
With a right hand	3,70	1,14	2,2	3,75	1,15	1,6	0,05

Figures 1, 2 and 3 graphically represent the dynamics of the studied physical development indicators for 5-7 year old children.

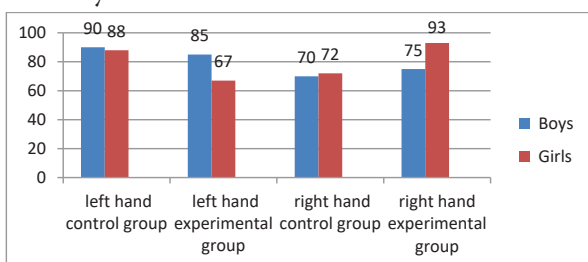


Fig. 1. Development dynamics of the left and right hand in the juggling test.

From the analysis of the results giving information on the condition of the upper limbs, and in both sexes, greater growth was found in the experimental group.

In all the boys and girls the left hand, and the right hand, can see a significant difference. It is interesting the fact that in this group, the left hand of the girls is stronger than the right one. While the boys notice the opposite – the right is stronger than the left.

And the control group is almost equally developed in girls and boys.

We will only note that there is a difference in the development of the right hand, which is weak compared to the left. The difference of the left hand with the right is 20, which is a lot. The right result is 90, and the left side is 70. Also, the results on the right and left hand of the experimental group in the boys dropped dramatically. The right hand score is 93, and the left hand is 67. These indicators are sufficient to show that the physical development of each person is different. It also matters their motor culture, but also to remember that this is actually their natural development.

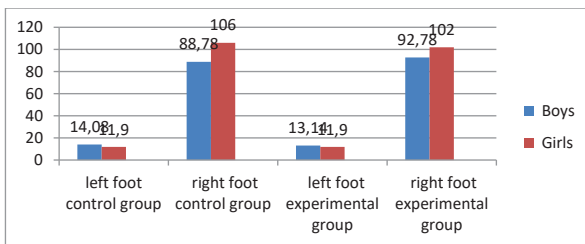


Fig. 2. Developmental dynamics of the left and right side of the lower limbs in the test „Feeding the soccer ball“.

In comparing the performance of the test, which measured the development of the lower extremities of children, there are approximately analogous results in boys and girls.

Interestingly, in both of these groups, there is a big difference between the left and the right leg.

In the girls in the control group the score on the right leg is 88.78, and in the experimental group is 92.78. The difference here is minimal. It's the same way it gets in the boys. The difference between the two groups for the right leg is very small. The control group has a 106 result and the experimental is 102.

From here you can generalize that girls and boys are better developed on the left side of the upper limbs on the left side of the lower limbs.

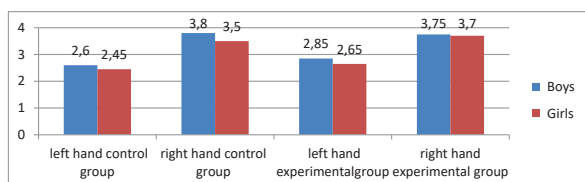


Fig. 3. Developmental dynamics of the left and right sides of the upper limbs in the test „Throwing a small dense ball in a goal“.

In analyzing the test results „Throwing a small solid ball into the goal“ we find that in both sexes the achievements with the right hand are better and with a higher result. With the left hand in both of these groups, the results are weaker. The girls and boys in the control group have small differences in the left hand compared to the right. The latter is also reported in the left hand of both sexes in the experimental group. We notice a very small difference only on the right hand in the experimental group. And from here we will add that the girls have a lot of developed upper limbs and they do not retreat to the boys, even an achievement of the development between boys and girls is gained.

Conclusions and recommendations

As a result of the conducted pedagogical experiment and analyzing the results came to the following conclusions:

- The Games and regular motor activity achieve a good result for the physical development of children.
- Girls show better development than boys on the upper limbs in juggling, but when throwing in the target boys take prevention.
- While the boys show better developed lower right limbs.
- The left side of the upper limbs in some children prevails.
- Generally, in most cases, in both sexes, the right side has been heavily developed.
- But in modern society and most of all, in the physical development of children, we often observe a more highly developed left side.

The data from our research confirms the accepted working hypothesis. Our recommendation is for educators to study and offer children more games related to the development of limbs in pre-school age children.

Driving mode should be a daily routine for all children at any age!

In conclusion, I emphasize the health significance of the movement in all periods from early childhood to adulthood as a basis for life after that. Modern studies, the personal and professional experience of the majority of specialists shows that active childhood generates health in advance and

keeps already grown children away from the pharmaceutical network.

References

- Dzhorova, B. (2010). Pedagogical conditions for legal education of 6-7 year old children. Autoreferate. Sofia;
- Kadiyski, Iv., Kostov, K., Glushkova, M., i kol (1992). Theory and methodology of physical education. Blagoevgrad;
- Kostov, K., Dokova, N., Kinov, S. (2017). Physical education at elementary school. Blagoevgrad;
- Bozhilov, M.,(1996) , , Morph-functional characteristic and peculiarities in the motor function of the children , „ Wee „Konstantin Preslav“, Y, D.;
- Rachev, K.,(1998) „Theory and Methodology of Physical Education“ Part 2, NSA Press, Sofia.
- Dare, TZ, (2007) „Motor activity and health of children“, s., teacher case, PCs. 7.

ATTITUDES OF THE STUDENTS AT THE NATIONAL SPORTS ACADEMY “VASSIL LEVSKI” TOWARDS WORK IN MULTICULTURAL ENVIRONMENT

Ina Georgieva Vladova

Summary

Introduction: Racially, ethnically and religiously the World is diverse. This gives ground to acts of discrimination, social exclusion and inequality. Diversity implies an intercultural communication between the members of the different social groups and communities, that takes place in a multicultural environment. People of different ethnicity, religious background and mother tongue live in Bulgaria and the same diversity can be observed in the educational system on all levels. The most heterogeneous is the Roma minority. Methodology: The study of the opinions and the attitudes in respect of the work in multicultural environment (in the context of working with Roma students at school) has been realised by interviewing 185 students of the Teacher's Faculty of the National Sports Academy. For the achievement of the aim of the survey the methodology of collection of empirical information by pedagogical observation has been used – for preliminary formulation of the problem and by using a specially developed for the survey questionnaire. Results and Discussion: Most of the interviewed students state that they are tolerant of people of different ethnicity and religion – 57,8% of the respondents, while one fifth declared that they are not tolerant. Asked whether they would leave work if they have to work with Roma students the results of the variation analysis show that very few would be inclined do so ($M=1,64$, $Min=1$, $Max=5$, $SD=1,133$). Conclusions: The results of the survey are important should some timely measures on university level be needed for the proper training of the future pedagogical experts.

Keywords: multicultural environment; intercultural communication; ethnic minorities

Introduction

There is a racial, ethnic and religious diversity all over the world. This is a premise for discrimination, social exclusion and inequality. The diversity, on the other hand, leads to intercultural communication among the members of different social groups in a multicultural environment. And each multicultural environment is characterised with its specifics depending on the groups which comprise it.

There are multicultural schools in the multicultural societies. Pupils of different ethnos, different religion and mother tongue can be gathered and can socialize within the same school and the same “classroom”¹. In most cases, the teachers who work with these pupils do not belong to these minority groups. This trend is common for the schools in our country, too.

People of different ethnicity, religious background and mother tongue live in Bulgaria. This diversity is also observed in the education system on all levels:

- Orthodox Christians, Catholics, disciples of different Protestant churches, Muslims, Jews, etc.;
- Roma people (the most heterogeneous minority); Bulgarian Turks; Bulgarian Mohammedans; Jews; Armenians; Wallachians, etc.

This demographic picture calls for not allowing “the

¹ Classroom in a sense of pupils gathered in one class

language of hatred” towards the different people, because the consequences according to Weis (1995) are alienation, marginalization, decreased opportunities, anxiety, oppression, exclusion. It is important that people should not be divided on the base of their ethnos, religion or mother tongue. Marginalization and social exclusion of groups from the Bulgarian population should not be tolerated.

On a macro level (the government of the country) there are a number of policies, laws and programs aimed at encouraging the equality and rights of the people from the different minority groups living on the territory of the country, as well as the struggle against discrimination. Policies for desegregation and inclusion of minority groups (mainly Roma community) in the education system and community life are present in the official government and non-government documents. However, despite these policies:

- Roma people are “at the bottom of the social-economical ladder”, and they face discrimination and exclusion from different social spheres in the country which leaves them totally isolated and in risk of poverty;
- The religious minorities have religious freedom but nevertheless, there are cases of violence, threats, vandalism, hatred, tension rousing (United Nations, 2011). These registered trends are rather alarming. The Roma community itself is explicitly differentiated

ethnically. The overcoming of this fact, as well as overcoming the problems connected with it, is a task of the whole community. To resolve these problems, we need to create a good intercultural communication and to join and integrate these people in the education system. It is important to point out that the Roma community in Bulgaria is not homogeneous, but heterogeneous (it consists of 4 main groups and a number of sub-groups with various multicultural differences) (Tomova, 1998; United Nations, 2011).

The issue of intercultural communication and socializing in multicultural environment is discussed not only in summary standards and strategies from political point of view but also from business point of view. Due to globalization and the emergence of multinational companies and corporations' business is interested in these relations and interpersonal interactions (Lillis, Tian, 2010; Gut et al., 2017). Besides in business, this problem is very actual in psychological and pedagogical research and practice.

Aim and Objectives of the study

The aim of the research is to examine the attitudes of the students of the Teachers Faculty at NSA "Vassil Levski" toward working in a multicultural environment (in the context of the university and their work with Roma pupils). The attitudes explain the formation and development of one's Self as they constitute the relation between inner processes and social behavior (Erikson, 2013). Currently most of the problems in our education system are due to the negative social attitudes to the Roma community. For this reason, sometimes the integration of these children in school is problematic (but we do not exclude the negative attitudes of some of the Roma groups to education).

The examination of attitudes will help us, to a certain extent, to determine the level of tolerance among the future pedagogical experts to those who are "different" from them. The divergence is in the context of multicultural differences between learners and teachers. According to Michael P. Lillis and Robert Guang Tian cultural differences suppose divergent models of behavior, different living standards and way of life. Culture itself comprises attitudes, values, beliefs, opinions and behavior (Lillis, Tian, 2010). Tolerance, on the other hand, includes elements of rejecting and accepting: first, the unacceptable thing is noticed or rejected, and at a later moment it is accepted (Scanlon, 2003; Lundberg, 2017). The Living History Forum defines tolerance as: "*an explicit stance to accept, respect or affirm individuals and groups based on skin colour, ethnicity, sexual orientation, beliefs, opinion, and several other categorizations*" (Lundberg, 2017).

Due to the presence of multicultural environment in Bulgarian schools, the attitudes towards working with pupils from the minority groups should be considered because the presence of "*pedagogical racism*" is reported even worldwide (Lovern, 2012).

It is important that pedagogical specialists at schools, especially in the regions with mixed population, should increase their professional competences and quality of teaching under multicultural conditions. Thus, timely measures regarding their preparation could be taken.

Methods

The study of the opinions and the attitudes in respect of the work in multicultural environment (in the context of working with Roma students at school) was done among 185 full-time students of the Teacher's Faculty of the National Sports Academy at the beginning of 2016/2017 academic year (table 1).

Table 1 Researched individuals

Variable	Sample (n)	Percentage (%)	Percentage of all*
Gender	185		
Female	68	36,2%	
Male	118	63,8%	
Year	185		
II	93	50,3%	87%
III	54	29,2%	55%
IV	31	16,8%	26%**
Master	7	3,8%	

*percentage proportion from the total number of students in the respective academic year according to the Ministry of Education and Science

**the researched students study "Pedagogy of physical education" as their first and second major

The average age of the researched individuals is M=21.3 years (Min=19, Max=42, SD=2.22).

In order to fulfill the aim of the research a complex set of methods was applied to collect empirical information: pedagogical observation – for prior orientation and development of methods and instruments: an inquiry and a questionnaire specially designed for the research. The inquiry consists of

questions regarding the students’ gender; age; year of study; place of residence where the students finished high school; whether there were pupils of different ethnoses, religion and mother tongue at their high school; whether they had any problems with such pupils. The questionnaire aims at surveying their attitudes to working with students of Roma origin (table 2).

Table 2 Instrument for measuring the students’ attitudes to working with students of Roma origin

Instrument	Scale description (Items)	Rating
Students’ attitudes to working with Roma students	Unidimensional scale measuring attitudes. The answers were given in Cronbach’s Alpha: $\alpha=0,71$ (n of Items=8). The factor analysis outlines two factors with 4 items each: attitudes to working with Roma students (Cronbach’s Alpha: $\alpha=0,70$) and attitudes to working with their parents, including their motivation for regular class attendance ($\alpha=0,743$).	5-point Likert type scale: 1- least true of me; 5 – most true of me; 2, 3, and 4 are marginal.

The methods used for quantitative assessment and analysis are: frequency, variation, comparative analyses (Mann-Whitney Test) and factor analysis. The results were statistically processed with “SPSS21 for Windows”.

Results and Discussion

The results from the inquiry show that 73.5% of the researched individuals studied in multicultural environment (based on ethnoses, religion and mother tongue) before enrolling at the NSA “Vassil Levski”. It turns out that at school², as well as outside its premises, most of the students did not have any problems with their peers of different ethnic group, (69% on the school premises and 65% outside the school premises). They did not have any problems with pupils with different religion, either (81,1% on the school premises and 73,5% outside the school premises). As few as 2% of the students report they had frequent problems on the school premises. Only 7.6% of the students had problems with representatives of different ethnic group outside the school premises. Dimitrova-Denkova and Lefterov (2014) also discuss similar results from their research among students practicing combat martial arts: according to all researched individuals reli-

gion is not a reason for conflicts and violence in the relations among athletes. As regards ethnic affiliation as a reason for conflicts, the researched sports students mark the answers “not really” and “sometimes”. These results justify the conclusion that the students have intercultural experience because in their school years they had to socialize with representatives of other ethnic groups with different religion (at school and during their sports activities – in trainings and competitions). The results from the inquiry also confirm that 57.8% of them state firmly that they are tolerant to the “different” in the context of ethnoses, race and religion against 20% of them who do not share this opinion. The other 22.2% have not thought about this issue yet and do not have strong opinion on the subject.

The results from the test for evaluation of students’ attitudes to working in multicultural environment are also hopeful. They are presented in Table 3.

Table 3 Students’ opinion²

Factor	Test	n	M	SD
I.	Students’ attitudes to working with Roma students	167	4,31	0,80
II.	Attitudes to indirect, additional work (incl. motivation, coordination with parents, taking into consideration their holidays, skills improvement)	182	3,72	0,96

² Distribution of schools where the students studied on the base of their location: 20,7% are in Sofia; 31% in cities; 47,8% are in small towns, one school in Canada (0,5%)

In order to receive more details about the students' attitudes to working in multicultural environment we applied variation analysis (table 4). It must be noted that there is almost no difference in the mean values with both men and women. The results from the comparative analysis (Mann-Whitney Test) also show that along the factor *gender* there is no statistically significant difference.

The research of students' attitudes, which are in the base of the development of their professional philosophy and behavior, serves as a kind of attempt to predict their future working models. They currently

believe that pupils are equal regardless their ethnoses and religion and everybody should face the same requirements. They also think that in case there is lack of skills among some of the Roma pupils, they should do everything possible to improve this situation. Most of the researched students consider they are a factor for integrating Roma children in the education system and will work in this direction both with the pupils and with their parents.

The fact that there are low mean values as regards the holidays of different ethnic and religious communities is not alarming ($M=2,87$; $SD= 1,52$).

Table 4 Attitudes to working with Roma pupils

Items	Female sample (n=67)	Male Sample (n=118)	Total Sample (n=185)
	M SD	M SD	M SD
1. When I become a PE teacher all students will be equal for me regardless their ethnoses and religion.	4,48 0,83	4,33 1,06	4,39 1,00
2. When I become a PE teacher my requirements to all pupils will be the same regardless their ethnoses and religion.	4,60 0,76	4,45 1,03	4,50 0,94
3. When I become a PE teacher, if I have to work with Roma pupils, I will treat them as if they don't belong to this ethnic group.	3,85 1,41	3,74 1,33	3,78 1,35
4. When I become a PE teacher, if I have to work with Roma pupils who don't have good skills and good motor abilities, I will try to improve them.	4,27 1,10	4,08 1,13	4,15 1,12
5. When I become a PE teacher, if I have to work with Roma pupils, I will try to influence them and to motivate them to attend school classes regularly.	4,27 1,10	4,15 1,17	4,20 1,14
6. When I become a PE teacher, if I have to work with Roma pupils, I will try to influence their parents' support as regard the regular attendance of their children in PE classes and other school classes.	3,93 1,18	3,55 1,32	3,68 1,28
7. When I become a PE teacher, if I have to work with pupils of different ethnoses and religion, I will take their holidays into consideration.	2,91 1,45	2,85 1,56	2,87 1,52
8. When I become a PE teacher, if I have to work with Roma pupils, I will quit my job.	1,50 1,05	1,73 1,17	1,64 1,13

In our country there is a centralized management of our school education system with unified government education standards, curriculum, as well as preliminarily set holiday dates and days-off.

Having in mind the size of the Roma population in our country, which is the biggest in EU as a proportion of the total number of the population (according to the unofficial data it is considerably more than the official statistics – approximately 10%) (United Nations, 2011), as well as the students' personal observations, it turns out that they have formed a positive attitude to working with pupils from this group. When asked whether they would quit their job if they had to work with Roma pupils, few of them gave a positive answer ($M=1,64$, $Min=1$, $Max=5$, $SD=1,133$).

Conclusions

The results from the research of the students' attitudes are hopeful because the problems with the Roma pupils are numerous. There should not be only administrative and legislative measures aimed at solving these problems. A lot of work should be done on a micro level and not in the form of a single act. This work is done mainly by pedagogical specialists – by teachers.

The results from the research are important. They enable universities to take timely measures as regards the preparation of the future pedagogical experts and the development of positive attitudes to working in multicultural environment (mostly with Roma pupils).

References

- Dimitrova-Denkova, A., Lefterov, E. (2014). The violence in the sports. In: 9th FIEP European congress, 7th International scientific congress "Sport, stress, adaptation". Sofia, Bulgaria
- Tomova, I. (1998). "Ethnic Dimensions of Poverty in Bulgaria," Report commissioned by the World Bank, p. 14, available at <http://siteresources.worldbank.org/EXTGL-DEVLEARN/Resources/IlonaTomova.pdf> (5/05/2017)
- United Nations (2011). General Assembly, Human Rights Council, Nineteenth session, Report of the independent expert on minority issues, available at: <https://documents-dds-ny.un.org/doc/UNDOC/GEN/G12/100/19/PDF/G1210019.pdf?OpenElement> (5/05/2017)
- Gut, A., M. Wilczewski and Gorbaniuk, O. (2017). Cultural Differences, Stereotypes and Communication Needs in Intercultural Communication in a Global Multicultural Environment. The Employees' Perspective. Journal of Intercultural Communication, ISSN1404-1634, issue 43, available at: <http://www.immi.se/intercultural/nr43/gorbaniuk.html> (1/5/2017)
- Eriksson, M. (2013). Attitude stability in a changing carnivore context: The foundations of attitudes towards the Swedish wolf policy. In: Linda Lundmark, Camilla Sandström (ed.), Natural resources and regional development theory (pp. 98-123). Umeå: Institutionen för geografi och ekonomisk historia, Umeå universitet GERUM Kulturgeografisk arbetsrapport
- Scanlon, T. (2003). The Difficulty of Tolerance: Essays in Political Philosophy. Cambridge University Press.
- Lillis, M. and R. Tian (2010). Cultural Issues in the Business World: An Anthropological Perspective. Journal of Social Sciences, 6 (1): 99-112; ISSN1549-3652
- Lundberg, E. (2017). Mechanisms of tolerance: an anthology, The Living History Forum, Stockholm
- Lovern, L. (2012). Trampling the sacred: multicultural education as pedagogical racism. International Journal of Qualitative Studies in Education, Vol. 25, Issue 7, 867-883
- Weis, L. (1995). Identity formation and the processes of "othering": unraveling sexual threads. Educational Foundations, 9(1):17-33
- Contact information:* Vladova Ina, PhD; National Sports Academy "Vassil Levski", Department "Psychology, Pedagogy and Sociology", Studentski grad, Sofia 1700, Bulgaria; Contacts: +359 2 4014 (274); e-mail: vladova_ina@abv.bg

EDUCATION OF PHYSICAL EDUCATION TEACHERS IN PRIMARY SCHOOL LEVEL IN MACEDONIA AND BULGARIA

Biljana Popeska, Ilija Klincarov,

Eleonora Mileva, Nikovski Goran

ABSTRACT

Effectiveness and quality of physical education teaching process is determined by many factors. The key factor in this process is the teacher, particularly his/hers abilities to plan, organize and realize the PE teaching process according to students abilities and interests, following the prescribed curriculum and using all available resources and equipment. Educating future physical education teachers is not a simple process of transmission of knowledge, but it is also a process of training for practical work of students – future teachers. The aim of this research is to analyze and compare the initial education of future PE subject teachers and general classroom teachers that will teach PE in primary schools, studying at the Universities in Macedonia and Bulgaria. The analyses of documentation and comparative analyses are used as a research method. Similarity in some components of the programs are established. Similar study programs and exam requirements could be note at Teaching faculties in Macedonia and Bulgaria that prepare generalist teachers as well as certain similarities between requirements for PE specialists educated at Faculty of sport and PE and National Sport Academy. Different requirements and approaches in realization of teaching practice and practical work of students' future generalist's teachers and PE specialist in Macedonia and Bulgaria can be outlined. Recommendations are given for improving the current situation in both countries.

Key words: teacher education, curriculum, physical education, teaching practice

Introduction

Effectiveness and quality of physical education teaching process is determined by many factors. The key factor in this process is the teacher, particularly his/hers abilities to plan, organize and realize the PE teaching process according to students abilities and interests following the prescribed curriculum and using all available resources and equipment. Organizations such as EU Commission and UNESCO recognize physical education teachers as key agents for putting physical and sport policies into practice (European Commission, Expert Group on Health-Enhancing Physical Activity, 2015).

The status of PE as school subject and the status of PE teachers are determined by many factors. One of the leading one is the quality of professional education of PE teachers or generalist teachers that deliver physical education. The Recommendation 13 of the EU Work Plan for Sport (2014–2017) clearly states that qualified PE teachers should be preferred at all educational levels. In this regard, the subject of our study is directed on education of teachers delivering PE in primary schools in Macedonia and Bulgaria.

Aim and objectives of the study

the aim of this study is to analyze and compare the initial education of future generalist teachers that deliver PE in the basic primary education and future PE specialists, studying at the Universities in Macedonia and Bulgaria. The analyses and comparison were based on several key aspects including the following elements: learning programs at the universities – contents, structure, time allocation, exam requirements, ECTS credits; realization of teaching practice; general requirements for teacher's competences; requirements for employment, etc. Similarities and differences between countries related to PETE are used as a foundation for future improvement and for recommendations for future development of PETE. The analyses of documentation and comparative analyses are used as a *research method*. Several documents from both countries related with teachers education, law regulations and regulations for teachers competences. For the state in Macedonia, the following documents were analyzed: Law for Primary education (2015); Conception for nine-year compulsory primary education (2007); Regulation for teacher's development; PHE curricula from 1st to 9th grade; study programs of

the faculties that educate generalist teachers that deliver PHE and PE specialists. From Bulgaria, following documents were analyzed: National strategy for the development of physical education and sport 2012–2022 in Bulgaria, Regulation № 12 (from 01.09.2016) for status and professional education development of teachers, principals and other pedagogical specialists. Special emphasis was given at analyses of the study programs from the both countries, differences regarded contents, maintains of the subject, exam requirements and practical teaching.

Results

The analyses of teachers education can't be made or at least can't be done completely if we don't know the general educational perspective and structure in each of analyzed countries and in these frames, the position and state of physical education. In this regard, based on the information from official documents and some national studies realized in Bulgaria (Mileva, 2012) and Macedonia (Malcev & Popeska, 2017; Popeska, Klincarov, Mitveski & Nikovski, 2017) and comparative studies including this countries (Klincarov, Popeska, Kovac, Starc & Mileva 2017) some similarities but also differences regarded the state and structure of educational system and position of PE in both analyzed countries could be noted. One of the main differences closely related with the object of this study is the general structure of the educational systems in both countries (Klincarov et al., 2017). In Macedonia, the compulsory education starts at the age of six, named as compulsory nine years primary education, realized in three cycles of studies, (1st – 3th grade, 4th – 6th grade and 7th – 9th grade). The first stage of primary education (1st – 5th grade) is known as classroom teaching delivered by generalist teachers. The second stage of primary education is subject teaching (6th–9th grade) realized by subject teachers. In Bulgaria, the general structure of education system is following: primary education from 1st to 4th grade, pro-gymnasium (Junior High School) from 5th to 7th grade, followed by secondary education from 8th to 12th grade, realized in two stages (high school from 8th to 10th grade and secondary school from 11th to 12th grade). This structure of the educational system within two countries indicates the different education and preparation of the teachers. Comparative studies among two countries (Klincarov et al, 2017), suggest on certain similarities regarded physical education. In both studied countries, physical education is an obligatory school subject in all levels of

the educational system, practiced three times per week. In Macedonia, the subject is named “physical and health education”, while in Bulgaria is named “physical education and sport”. Regarded the number of classes, in Bulgaria the third PE lesson is provided usually as module education out of PE classes.

Education of generalist teachers and preparation for PE in Macedonia and Bulgaria

The education of the teachers for PE is related with the low requirement for delivery of PE classes in different stages of education. In Macedonia, the subject physical and health education is delivered by generalist teachers in the stage of classroom teaching (1st to 5th grade) and by PE specialist in the stage of subject teaching (6th to 9th grade). Similar situation is noted in Bulgaria, where in primary education (1st – 4th grade), PE is delivered by generalist teachers, while in the next stages of education (5th to 12th grade), PE specialists realize PE classes.

Regarded teachers education, in Macedonia, generalist teachers are educated at Teaching Faculties in Skopje, Stip and Bitola or at the Faculty of Philosophy – Institute of Pedagogy in Skopje and Tetovo. The professional qualifications at the Teaching faculties are Bachelor in primary education or “graduated primary school generalist teacher” and at the Institutes of Pedagogy is Bachelor in pedagogy or “graduated pedagogic”. For both diplomas, 240 ECTS are required. Regarded the preparation for physical and health education there are differences in study programs between Teaching Faculties and Institutes of Pedagogy. Courses for methodic of physical education are included in the study programs at all Teaching Faculties in Macedonia At the Faculty of educational sciences at Goce Delcev University in Stip, during the 5th and 6th semester of study, students learn Basics of Physical and Health education with methodic 1 (6 ECTS) and Physical and health education with methodic 2 (8 ECTS) (<http://arhiva.ugd.edu.mk/mk/fon/studiski-programi/oddelenska-nastava.html>). Both courses included theoretic lectures, practical exercises, independent work on projects and presentations, observation classes and obligatory practical realization of PHE classes in schools. Special attention is given to practical work and practical realization of PHE classes in schools. These classes are instructed and supervised by teacher – mentor and professor – mentor and obligatory for all students during all 6th semester. Individual realization of PHE classes

in each grade, positively estimated by the university professor are one of the requirements for final exam from this subject. In the 8th semester, in period of 4 weeks, students have obligatory internship training or “pedagogic work”. During this period, students are fully involved in the teaching process in schools, teaching all school subjects including PHE. All students’ activities are noted in their “diary for practical work”. The whole process is monitored by university teachers and guided by mentor – teacher. This practical work is precondition for getting the final diploma. Related with PHE, beside mentioned courses, students can also learn “Sport and recreation”, “Theory and practice of movement games”. Similar situation, with different names of the subjects and different maintains by semesters is noted at other Teaching faculties in Macedonia.

Compared with this, at the Faculty of Philosophy, Institute of Pedagogy, beside fundamentals of pedagogy, didactics, methodic of educational work, there is no subject related with PHE and methodic and didactical aspects of realization of PHE (http://www.fzf.ukim.edu.mk/ddtest21/public/uploads/files/00programinovi/Predmetni_programi_-_Pedagogija_finalna.pdf). Similar situation is noted for art and music education as well.

Similar situation as one presented for education of generalist teachers at the Teaching faculties in Macedonia is also noted in Bulgaria. Namely, the generalists teachers in Bulgaria who teach PE in primary school study the specialties Pre-school and Primary school pedagogy or Primary school pedagogy with Foreign language in the Universities in Bulgaria to Faculties of Pedagogy. The professional qualifications are: Bachelor in pedagogy – pre-school and primary school teacher or primary school teacher with foreign language. All regular students study the module Theory of Physical education for one semester in the second study year between 3 and 5 ECTS. In the third study year the generalist students learn Methodic of Physical education (5 ECTS – lectures, seminars and ongoing pedagogical practice) (<http://uni-sz.bg/>). During the practice each student observes and when it is possible he/she provides part or whole PE lesson under the supervision of teacher mentor and after consultations with the university assistant. In the 8th semester (last) is organized the pre-graduate internship/training, which takes place in two cycles: in elementary school – 4 weeks and in kindergarten

– 4 weeks. During the internship, future primary school teachers teach lessons on all subjects, including PE. According to the new Regulation № 12, each mentor teacher has 2 students allocated. The internship (16.5 credits) runs under the guidance of an assistant who keeps in touch with mentor teachers. Each cycle ends with a state practical examination before a state exam committee. An oral exam is also held by the State Examination Commission on private methodic, with questions in the field of PE (being equal to those in mathematics, etc.). There are four state examinations: written theoretical exam (general in pedagogy and psychology), oral exam on Methodology of pre-school and primary school education and two practical – in kindergarten and elementary school. Other disciplines offered to the bachelors as optional are: “Motor training and APA”, “Motor training and Kinesitherapy” “Sports animation”, “Bulgarian folks dances” with 2 to 3 credits.

Education of PE specialists in Macedonia and Bulgaria

In Macedonia and Bulgaria, PE specialist are delivering PE classes in the second stage of primary education (6th – 9th grade in Macedonia) or in the secondary schools (5th to 12th grade) in Bulgaria. In Macedonia, the oldest and leading institution in preparation of PE specialist is the Faculty of physical education, sport and health at the “St. Cyril and Methodius” University in Skopje. In the last few years, such studies are also realized at the Faculty of Sport at the University in Tetovo. Related with preparation for practical realization of PHE classes, students are prepared during 4 years studies at the study program “Physical and health education”, earning totally 240 ECTS. The professional qualification that students achieve is Bachelor in Kinesiology. Study program contains obligatory and optional courses from different areas of kinesiology. Students learn subjects related to different sports: gymnastics, sport games, martial arts, recreation; subjects with bio – medicine background; background in humanities – pedagogy, psychology, sociology; practical teaching in summer and winter sports etc. The subject dedicated to learning of methodic and didactic aspects of PE teaching process is named “Didactics of physical and health education”. This course is realized in the final year of studies, evaluated with 8 ECTS. Students are included in theoretic lectures, practical exercises in schools (observation and practical realization of PHE classes) and project activities The pre – exam requirement for final exam

are very similar with the practical work of students at the Teaching faculties. It includes observation classes, written preparations for the class, tandem realization of PHE classes in schools, independent realization, pedagogical work etc.

Similar, in Bulgaria in the secondary schools there are qualified specialists in physical education. In all schools in Bulgaria from 5th to 12th grade, PE teachers are specialists, who have graduated the National Sports Academy (Peneva & Mileva, 2005), or specialized in Physical Education at the Pedagogical Faculties of the Universities in Veliko Tarnovo, Blagoevgrad, Shumen, Plovdiv and Sofia. The Faculty of Physical Education at the National Sports Academy in Sofia has been the core of the National Sports Academy in Bulgaria since its establishing in 1942 (then as Higher Institute for Physical Culture) (Mileva, 2011). The professional area is currently defined as Pedagogy of Physical Education with Physical Education Major. Bachelor's Degree programs last for eight semesters in regular mode of study and ten semesters in part-time education. Both modes lead to obtaining 240 ECTS credit points. Graduation from the Faculty of Physical Education provides professional qualification "Teacher in physical education". Using modules of general preparation, students have the opportunity to obtain an additional qualification along with their major – Coach in sport or Sport manager, Sports animator, Coach in APA. During their studies the graduates of the Faculty can also specialize their initial qualification in post-graduate programmes (www.nsa.bg).

Regarded the structure of the study program, it contains Compulsory general theoretic subjects; compulsory specialized subjects, elective subjects – theoretical and practical, optional subjects; training courses in skiing, water sports, tourism, orientation and camping; Teaching practice at school and finaly state examination or defending a diploma thesis. Teaching methods at the Faculty include lectures and individual work as well as participation in projects development and implementation. Practical training is a key component of all qualification programmes. Training structures and programmes for obtaining a degree in physical education and teacher qualification are entirely in compliance with the European standards and requirements. The Faculty participates actively in all European activities intended to align the European higher education structure in sport science.

Studying at the Faculty of Physical Education at NSA in Sofia and at Faculty of PE sport and health in Skopje, encompasses the three educational and qualification degrees – Bachelor, Master and Doctor. The formal university education is only one of the segments of education of future teachers. Related with the professional competences of the teachers, in Macedonia they are defined in the Regulations for basic professional competences of primary and secondary school teachers (2015), defined in the Low for primary and secondary schools (2015). In Bulgaria, the State Educational Standards for Status and Professional Education development of teachers, principals and other pedagogical specialists are defined in Regulation № 12 (from 01.09.2016).

Discussion

based on the analyses of the national strategic documents for development of PE and of the study programs of the faculties that prepare generalist teachers and PE specialist from the both countries, similarities in some components of the programmes are established. Similarities are noted between study programs of the Teaching faculties in Macedonia and Bulgaria regarded the preparation of generalist teachers for delivering physical education. Similarities are noted in the contents, practical teaching and work, exam requirements. Exception is the profile of generalist teachers in Macedonia educated at Faculty of Philosophy, Institute of Pedagogy that can be also employed as generalist teachers but have no subject for methodic and didactic aspects of physical education. Existence of such profile of teachers with no specific education for PE, music and art in their university education have a great negative effect in their future work with children in primary school. From the aspect of the quality of delivery of PE classes by generalist teachers, lot of problems are noted in both countries (Klincarov et al, 2017). Possible reasons should be analyzed in wider context including conditions in schools, material facilities, structures of PE curricula, and possibilities for continuous professional development, improved cooperation with faculties for Sport and Physical education / National Sport Academy etc.

Different requirements and approaches in realization of teaching practice, the exam criteria and evaluation of PE specialists in Macedonia and Bulgaria can be outlined. In this regard, what can be done as a future step is international agreements and learning practices connect the Faculty of Phys-

ical Education with similar higher education institutions and faculties all over Europe. Great opportunities for student and teacher exchange exist especially within the framework of mobility under European educational programmes.

Conclusions

Based on the obtained results, we highlighted the positive teaching experiences and teaching practices, but also determined the gaps that should be corrected and improved. The analyses suggested on existing correlation between the current curriculum for professional training of PE teachers in the universities in Bulgaria and Macedonia with the proposed European model curriculum for training of these professionals.

The given recommendations are pointed toward certain changes that could be made in order to improve the initial education of teachers for physical education. The future steps can be pointed toward increase of hours for practical teaching and work, clearly defined standards and requirements for teacher professional development, greater cooperation between the Teaching faculties and the Faculties for Sport and PE/the National Sports Academy in the process of initial preparation of generalist teachers for PE, improved cooperation between these institutions and governmental bodies responsible for education on state level, creating a network of teachers involved in delivery of PE for sharing experiences and good practices etc.

References

Bureau for the development of education (2007). Physical education curriculum for first – ninth grade in nine year primary education, Skopje: Macedonian ministry of education.

Conception for nine years compulsory education in Republic of Macedonia (2007). Bureau for the development of education. Skopje: Ministry of education

EU Work Plan for Sport 2014–2017 (2015). *Expert Group on Health- enhancing physical activity*, European Commission.

Klincarov I., Popeska, B., Kovac, M., Mileva, E. and Starc, G. (2017), Comparative study on the state and the status of primary physical education in Macedonia, Slovenia and Bulgaria, in *Changes in Childhood and Adolescence: Current Challenges for Physical Education, Proceedings of the 12th FIEP European Congress, 2017*, Logos Verlag, Berlin, pp. 89–90.

Наредба № 12 от 01.09.2016 г. за статута и професионалното развитие на учителите, директорите и другите педагогически специалисти available at: [\[naredba_12_01.09.2016_prof_razvitie_uchiteli.pdf\]\(http://zareformata.mon.bg/documents/naredba_12_01.09.2016_prof_razvitie_uchiteli.pdf\) \(accessed 20 September 2017\).](http://zareformata.mon.bg/documents/</p>
</div>
<div data-bbox=)

Национална стратегия за развитие на физическото възпитание и спорта в Република България 2012–2022 http://mpes.government.bg/Documents/Documents/Strategii/Strategia_2012–2022.pdf (accessed at 10 September 2017).

Учебни програми по физическо възпитание и спорт (Uchebni programi po fizichesko waspitanie i sport), available at: www.mon.bg (accessed 10 September 2017).

Учебен план на специалност Физическо възпитание ОКС „Бакалавър” при Национална спортна академия (Ucheben plan na spezialnost Fizichesko vaspitanie OKS Bakalavar pri Natzionalna sportna akademiya), available at: www.nsa.bg (accessed 20 September 2017).

Предучилищна и начална училищна педагогика, Тракийски университет, Педагогически факултет (Preduchilishtna i nachalna uchilishtna pedagogika, Trakiyski universitet), available at: <http://uni-sz.bg/> (accessed 21 September 2017).

Malcev, M., Popeska, B. (2017). Primary School Physical Education in Republic of Macedonia -Condition and Challenges, in *“Physical Education in Primary School: Researches – Best Practices – Situation”*, (Editors: D. Colella, B. Antala, S. Epifany); Publisher: Pensa Multimedia in cooperation with University of Foggia.

Mileva, E. (2011), Vocational qualification and training of physical education teachers at the National Sports Academy in Bulgaria, in *Proceedings book Physical Education in the 21st century – pupils’ competencies, 6th FIEP European Congress, Porec, June 18–21, 2011*, pp. 320–325.

Милева, Е. (2012), *Европейски измерения на спортнопедагогическото образование*, Авангард Прима, София (Mileva, E. (2012), *Evropeyski izmerenija na sportnopedagogicheskoto obrazovanie*, Avangard Prima, Sofia).

Peneva, B., Mileva, E. (2005), *Social problems of Bulgarian School Physical Education (historical view)*, FIEP Bulletin, Vol. 75, 1, pp. 69–72.

Peneva, B., Buyuklieva, A. (2016), *Challenges in front of the profession teacher of physical education*, Physical Education, Sport, Kinesitherapy Research Journal, 1(2), Art.12, pp. 58–61.

Popeska, B., Klincarov, I., Mitevski, O. and Nikovski, G. (2017). Common problems in realization of physical education teaching process in Republic of Macedonia. In *Proceeding book Changes in Childhood and Adolescence: Current Challenges for Physical Education, Proceedings of the 12th FIEP European Congress, 2017*, Logos Verlag, Berlin.

Закон за наставници во основно образование (2015). Министерство за образование и наука. Available at <http://mon.gov.mk/images/documents/zakoni/zakon-za-nastavnici-osnovno-sredno-2015.pdf> (accessed 15 September 2017).

<http://arhiva.ugd.edu.mk/mk/fon/studiski-programi/oddelenska-nastava.html> (accessed 10 September 2017)

http://www.fzf.ukim.edu.mk/ddtest21/public/uploads/files/00programinovi/Predmetni_programi_-_Pedagogija_finalna.pdf (accessed 10 September 2017)

http://ffosz.ukim.edu.mk/Nastavni_programi/Nastaven_Plan_FSZO_2017_18.pdf (accessed 10 September 2017)

SCIENTIFIC SUBSTANTIATION OF EFFICIENCY OF CONTROL OF PHYSICAL PREPATIVITY OF HANDBALL

¹ Zhunisbek D. N.; ² Mavrudieva N.; ² Kudashova L.R.; ²

Kefer N. E.; ² Andrewishkin I.L., ² Kudashov E.S.

¹ National Sports Academy. Vassil Levski, country Bulgaria city Sofia

² National Sports Academy. Vassil Levski, country Bulgaria City of Sofia

² Kazakh Academy of Sport of Tourism, the country Kazakhstan, Almaty

Summary

The urgency of the problem is connected with the increase in the role of universalization of players in the modern handball and their functional specialization, which requires the development of models for their control, evaluation and management of the level of athletic preparedness at each age, training and competitive stage of the training process. The purpose of our research is to increase the effectiveness and reliability of the tests used to comprehensively assess the level of preparedness and selection of more promising female students for employment in handball.

The study was conducted on 80 handball players of various qualifications for creating model characteristics of tests, assessing their significance for controlling physical fitness and influencing competitive activity.

The results of the study made it possible to draw conclusions that the leading motor abilities of handball players, mainly influencing the effectiveness of gaming activity, are: the level of manifestation of speed-power abilities when performing exercises approximate in structure to the specifics of the performance of game techniques; coordination abilities, expressed in the effective performance of game tasks in the variation conflict situations of the game; the ability of athletes to accurately differentiate patio-temporal parameters of motion; the ability to carry out a specific activity for a long time without reducing its effectiveness.

The most significant indicators reflecting the level of performance of the leading motor qualities are: speed of running on short stretches; running speed with the ball; length and height of the jump; power and maximum rate of ballistic movements; accuracy of differentiation of effort; level of general physical working capacity.

Key words: student handball, leading physical qualities, selection of effective tests.

Introduction. The rapid growth of sports achievements and the related intensification of the training process, the reduction in the age of champions and record-holders, as well as the early specialization in the opinion of (Bril, 1980), (Guzhalovsky, 1986), (Zatsiorsky, 1979), (Ignatieva et al, 2005) put before the trainers and specialists working with young athletes the problem of selecting able students for various sports activities. The preparation of a perspective reserve in handball is largely hampered by the lack of reasonably well-founded and methodologically developed approach to the process of selecting informative control tests for the level of physical preparedness.

In modern handball at every stage of the training and competitive training processes, the role of functional specialization and universalization of players is increasing, which requires the development of models for managing selection and the level of athletic preparedness by monitoring and evaluating the states of the organism's preparedness in each period of preparation.

Relevance of the research topic. Especially actual is the problem of selecting informative and meaningful tests for control of physical readiness when

training players in handball at the university, which is difficult in many respects because of insufficiently substantiated and methodologically developed approaches for the selection process of students who have not previously engaged in this sport. The practice of selection in higher educational institutions is based in the basic on the intuition of trainers-teachers and the application of tests for selection, which do not allow to comprehensively evaluate the perspectives of those engaged. All of the above stated was the subject of this study for the qualitative selection of handball players in the university.

The purpose of these studies is to assess the significance of the indicators being studied for compiling a comprehensive assessment of physical abilities in the formation of teams of handball players of different sports qualifications.

Development and refinement of the most significant indicators for a comprehensive assessment of the level of physical fitness and abilities of female students for playing handball, selecting them for the team of the university, the handball club based on the selection of more informative and reliable control tests.

To achieve this goal, the following research objectives were identified:

1. Identify the group of the most significant indicators influencing the level of special physical, technical and tactical preparedness in order to select students of sports qualifications in teams.
2. Compare the indices of variation of the tested parameters of physical readiness for handballs – students of different qualifications, for assessing the homogeneity of the selection by physical qualities.
3. Conduct selection of female students in the handball team according to the most informative tests of physical fitness.

To solve the set goals and objectives, we used scientific methods:

1. Analysis of scientific and methodological literature
2. Teaching observations
3. Pedagogical experiment using the following methods: chronometry, chronodinamometry, pedagogical testing, pedagogical observation
4. Method of expert evaluation
5. The method of mathematical statistics.

The study was conducted with the participation of 80 high-qualified athletes, among them MS-12, CCM-24, sportsmen of the 1st category – 24 and 2 categories – 20 people. In total, 80 people took part in the study, who did not have any abnormalities in their health status. In order to obtain informational material about the gambling activities of the handball players, the analysis of which helps to more clearly and specifically correct the training of players, numerous pedagogical observations of the gaming activities of members of the leading Kazakhstan handball players and the strongest women's clubs of Kazakhstan were conducted in the present work.

To obtain quantitative indicators, the level of development of the qualities of speed, strength, dexterity, endurance, flexibility, as well as coordination abilities and functions of the state of the organism of sportswomen in handball players in dig research, special pedagogical tests were applied that best reflect the level of development of motor cachets' and show the level of mastery of specific techniques, characteristic for the game of handball.

Long-term research on the preparation of Russian teams in handball shows that the indicators of the integrated test correlate with the effectiveness of the gaming activity of women's handball players. The results of the analysis of scientific work A. Blokhin. (Blokhin, 2003) confirmed the prognostic significance of the "Complex Exercise" test, according to which one can judge the players' preparedness for the forthcoming competitive struggle. The results of this test show a significant decrease in the performance of players by the end of the competition period. The remaining tests at the level of higher sportsmanship can give only a general idea of the level of development of physical qualities in handball.

In our studies, we used a complex test, as a generalized universal indicator of the sports skills of the handball players.

In the first series of tests, control tests were tested on high-qualified handball players with the goal of revealing the average level of physical fitness and homogeneity of indicators for high-skilled handball players. The results of testing the physical fitness of handball players of high qualification are presented in Table 1.

Table 1 – Results of average indicators of testing physical fitness of handball players of high qualification

No	Name of the methodology, test or indicator	\bar{O}	S	S% variation of standard deviation
1.	Complex test, with	34,6	5,79	16,7
2.	Running 30 m, with	4,9	0,41	8,4
3.	Keeping the ball 30 m, with	5,3	0,54	10,2
4.	Throws of the ball (1kg.) For range, m	19,5	3,14	16,1
5.	Transfer of the ball in 30 seconds, the number of times	20,3	2,34	14
6.	The magnitude of the maximum force of the brush, kg	37,8	8,61	22,8
7.	An error occurred while playing back 50% of the max. force, kg	2,9	0,98	33,7
8.	Long jump from the place, cm	206,5	8,79	4,2
9.	Harvard Spree Test Index, average	88,5	6,54	7,4
10.	Height of jumping up, cm	49,3	5,67	11,5
11.	The burden of a simple motor reaction, with	0,31	0,05	16,1
12.	The test «Boomerang», with	14,2	0,67	4,7
	X			13,8

The data given indicate that the coefficient of variation in motor qualities was on the average within 13.8%, which indicates the homogeneity of the group.

In the second series of studies, the correlation between the indicators of the complex test and the level of sports qualification of female students – handballers was determined (Table 2).

Table 2 – Correlation dependence of the complex test indicators on the level of sports skills of handball students

№	Comparative indicators Coefficient of correlation	Coefficient correlation		
		Groups of sports qualification		
		1	2	3
1.	Rating	-	0,861	0,817
2.	The level of sporting achievements	-	-	0,724
3.	Comprehensive test	-	-	-

Note: 1-members of the RK team; 2) members of the youth team of the Republic of Kazakhstan; 3-club teams.

From these 12 indicators, by comparison with the use of the method of rank correlation between the data of the complex test, the leading parameters reflecting the level of manifestation of the basic abilities of the subjects were identified.

To determine whether a complex test is associated with the level of sports handball skill and with the effectiveness of their gaming activities in the second series of studies, a correlation analysis was conducted. To solve this problem, the subjects were ranked according to three indicators: rating (according to the method of expert assessments), the result of the complex test and the level of sports achievements. So, the members of the RK team got 1 place, members of the youth team, RK – 2, club teams – 3.

Sufficiently high correlation values allow us to state that the levels of complex test indicators were higher for masters of sports and lower for handball play-

ers of club teams, which gives the right to say that a complex test really reflects the level of game skill of the subjects.

Further, in the third series of studies, calculations of the correlation dependence of each of the tested indicators and the complex pedagogical test were carried out to identify the leading factors that were determined by comparing the test scores with the complex test.

The results of the correlation analysis are presented in Table 3. Thus, the coefficient of correlation of the 30 meters and 30 meters of running with the ball in relation to the complex test of highly skilled handballers is 0.865, respectively; 0.773; jump in length from the place – 0,743 throw 1 kg. the ball with three steps 0.547; error with force differentiation 50% of maximum 0.497; Number of transfers in 30 seconds. 0.652; IGST – 0,627.

Table 3 – Correlation dependence of each of the tested indicators and the complex pedagogical test in handball players of the 2nd category

The name of the methodology, test or indicator	r
The «Boomerang» test, with	0,387
Height of jumping up, cm	0,418
The burden of a simple motor reaction, with	0,426
The maximum force of the brush, kg	0,443
An error occurred while playing back 50% of the max. force, kg	0,497
Ball throw (1kg.) For range, m	0,547
Harvard Special Test Index, units	0,627
Transfer of the ball to 30 «, the number of times	0,652
Long jump from the place, cm	0,743
Keeping the ball 30 m, with	0,773
Running 30m., With	0,865

Thus, as the most significant tests evaluated by the correlation coefficient, we selected the following seven tests: run 30 m, keeping the ball 30 m, throw 1 kg. ball on the range, the number of gears for 30s, the accuracy of 50% of the maximum effort, IGST, long jump from the place.

In the 4 series of studies, tests were conducted on 8 leading tests, including a complex test, on the part of the tested female students having the II sports discharge. The obtained data of average quantities of physical readiness and indices of variation, tested parameters for handballers – students of different qualifications are presented in Table 4, which

were compared by calculating t criterion of reliability of difference using the Student's table.

We can assume that those indicators that show a significant increase in physical fitness with an increase in the sports qualification of handball players are the most suitable as indicators of selection of students who have not previously engaged in handball. If any qualities significantly affect the effectiveness of gaming activity and in the process of sporting ontogenesis, the player does not change much, they are related to the division of important qualities in a significant extent genetically determined.

Table 4 – Average values of physical readiness and indices of variation, tested parameters for handballers – students of various qualifications

Name of the test	Indicators by groups							
	MCMC, MS (n - 15)		CCM, I category (n - 48)			II bit, without bit (n - 20)		
	1		2			3		
	\bar{O}	σ	\bar{O}	σ	% differences between 1 and 2 group	\bar{O}	σ	% difference between 1 and 3 group
Running 30 m, with	4,7	0,24	5,1	0,38	-8,5	5,2	0,56	-10,6
Keeping the ball 30 m, s	5,1	0,22	4,4	0,23	13,7	5,8	0,31	-13,7
Comprehensive testing, with	32,7	1,74	35,3	2,11	-7,95	36,9	1,91	-12,8
Throw I kg. ball, m	20,5	2,16	18,7	1,26	-9,8	16,3	2,24	-20,05
Number of ball transfers in 30 s	21,4	1,07	11,2	1,26	-52,3	18,7	1,17	-12,7
An error occurred while playing back 50% of the max. force, kg	2,2	1,84	3,8	2,93	-72,7	4,7	2,62	-113,6
IGST, standard units.	90,5	9,01	86,9	11,77	-13,16	80,9	10,17	-10,7
The result of the long jump from the place, cm	214,2	10,05	206,4	9,69	-4,0	200,8	8,87	-6,3

If the effectiveness of gaming activity also reveals a positive dynamics accompanying the growth of skill, it means that it refers to the section of necessary and in a large measure of the qualities being formed.

It is to the latter form that we include the indicators obtained using tests with a high differentiated ability. Consequently, these tests are more suitable for selection of students to engage in handball.

An analysis of the percentage of differences between the qualification groups showed a decrease in the test results depending on the level of sports qualification by 4.0–113.6%. Moreover, the lowest

result was revealed by the indicator of management by force.

Conclusions:

1. Leading motor abilities of handballers, mainly influencing the effectiveness of gaming activity are: the level of manifestation of speed-strength abilities when performing exercises approximate in structure to the specifics of the performance of game techniques; ability of athletes to precise differentiation of space-time parameters of motion; the ability to carry out a specific activity for a long time without reducing its effectiveness.

2. The most informative tests for the diagnosis of

the motor abilities of handball players who have not previously engaged in handball, according to the degree of correlation with the complex test are:

- running 30m. (0.865)
- running 30m. with the control of the ball (0.773)
- the number of gears in 30 s (0.743)
- long jump from the seat (0,650)
- Harvard step test (0.627)
- throwing a ball weighing 1 kg. to the range (0.547)
- the accuracy of reproduction from the maximum force (0.497)

The most significant indicators reflecting the level of performance of the leading motor abilities are the following control tests, which should be used for selection of handball players in the team:

- running speed for short distances;
- speed of running with the ball;
- length and height of the jump;
- power and maximum rate of ballistic movements;
- working capacity;
- accuracy of differentiation of effort.

Comprehensive pedagogical test, including sequential execution of game techniques in combination with rapid movements closely correlate with the indicators of technical and tactical mastery of handball players: player rating (0.817) and level of controversial achievements (0.724)

References:

- Blokhin, A.V., (2003) Special preparedness of handball players of high qualification in a long competitive period. Candidate of pedagogy – Sciences Moscow -C16
- Bril M.S. (1980) Selection in sports games.– Moscow: Physical training and sports.– 127 p.
- Guzhalovsky A.A. (1986) Textbook for institutes of physical culture / Ed. A.A. Guzhalovsky.– Moscow: Physical training and sports.– 352 p.
- Ignatiev V. Ya., Portnov Yu.M. (1996) Handball: A textbook for sports universities.– M: BACKGROUND.
- Ignatieva V. Ya., Tkhorev VI, Petracheva I.V.(2005) Preparation of handball players at the stage of higher sportsmanship. training. allowance. M .: Physical Culture.
- Zatsiorsky V.M. (1979) Basics of sports metrology Text. / V.M. Zatsiorsky. Moscow: Physical training and sports.– 149 p.

FORMATION OF JUDO TECHNIQUE, USING OF THE BASE OF TECHNICAL PREPARATION OF WRESTLERS OF NATIONAL WRESTLING “KAZAKH KURES”.

Y. Nasiyev¹, M. Shepetyuk², B. Konakbayev², B. Dzhamberbayev²

¹National sports academy of Vassil Levski, Bulgaria, Sofia,

²Kazakh academy of sport and tourism. Republic of Kazakhstan

Annotation. *The exit of the wrestlers of Kazakh kures (the most popular kind of wrestling in Kazakhstan) on the international tournaments on others kinds of wrestling, first of all judo, to participate in the Olympic Games, required the careful analysis of their technical preparation that to correspond to the rules of other kinds of wrestling during the competitions.*

During the researches of technical preparation of participants of the Championships of the Republic of Kazakhstan on wrestling of Kazakh kures and judo, by authors were defined the technical methods used at official competitions in these kinds of wrestling.

Relying on the received results of research, the most effective technical activities applied by the leading wrestlers in the competitions on Kazakh kures and judo revealed. The practical recommendations of improvement of basic technique of wrestling of Kazakh kures for its effective application in judo competitions were developed.

Keywords: Kazakh kures, judo, technical preparation, effectiveness of receptions.

Introduction. In recent years Kazakhstan gives much attention to development of national sports, the most popular of which is a wrestling of Kazakh kures. On the wrestling of Kazakh kures hold the World Cup, the championship of Asia and Europe, the command tournament “Eurasia Barysi” and series of the international competitions. The most popular tournament on the wrestling of Kazakh kures is an Absolute Championship of the Republic of Kazakhstan, which is held annually, where to the winner, give the most prestigious title “Kazakhstan Barysi”.

Participation of wrestlers of Kazakh kures on the international tournaments on the others kinds of wrestling, first of all on judo, with the purpose to participate in the Olympic Games, required the necessity to conduct the researches of the analysis of technical preparation of wrestlers of Kazakh kures and judo, to define the technical methods used at official competitions in these two kinds of wrestling. It requires new approaches to organization of the formation of arsenal of technical activities of the wrestlers Kazakh kures for their effective application in Judo on competitions of various levels.

Methodology. For the solution of the put problem the following research tasks have been defined:

to objectively estimate variety and quality of the technical activities applied in competitions on the Kazakh kures and judo; to carry out the comparative analysis of technical preparation of participants of competitions in judo and the Kazakh kures; to develop the recommendations of planning and improvement of technical preparation of wrestlers Kazakh kures, for successful performance in judo competitions.

Methods are used: analysis of scientific and methodical publications; pedagogical observations, videos of competitive meetings; registration of technical activities, methods of mathematical statistics.

Results. For determination of technical preparedness of participants of competitions on the Kazakh kures, were made the observations in the World Cup (Almaty, 2006), in the Championship of the Republic of Kazakhstan (RK) – Karaganda, 2016, in Rural games (Kyzylorda, 2015) with the help of video and shorthand registration of fights. Results are presented in table 1.

Table 1 – The technical-tactical activities, estimated by judges on official tournaments on Kazakh kures

Techniques, throws	Estimates of technical activities in competitions												In total estimates
	World Cup, 2006				Championship 2016				RK, Rural games, 2015				
	T	Zh zh	Zh	B	T	Zh zh	Zh	B	T	Zh zh	Zh	B	
floating hip (koshiwaza)	11	4	4	9	9	14	2	18	3	4	2	11	91
forward leg trip (tai-otoshi)	4	4	3	2	4	5	6	19	3	10	6	24	90
outside leg trip (o-soto-otoshi)	4	5	1	4	15	12	10	13	13	11	11	11	110
corner throw (sumigaeshi)	2	5	1	1	1	9	12	6	6	8	5	12	68
ankle trip	1	4	7	14	2	8	10	25	2	6	11	29	119
by reaping foot		1			1	2	2	3	2			4	15
by reaping hip	5	2	7	4	6	5	12	10	5	8	10	6	80
buttock, hip-roll (se oi-nage)		3		1	1	13	7	6	4	12	2	6	55
by pick-up (harai-goshi)	14	9	3	6	12	20	8	12	10	13	5	13	125
drop back	4	1	2	4	7	10	12	6	9	10	5	7	77
breaking of balance (tsukuri)	13	6	9	49	15	24	12	80	5	9	9	46	277
by encirclement	1	1	1	2		3	2	1	2	10	4	3	30
Total	59	45	38	96	73	125	95	199	64	1011	70	172	1137

Note: T-assessment «taza zhenis», Zhzh – assessment «zharty-zhenis», Zh- assessment «zhambas», B- assessment «bouck».

The analysis of the obtained data shows that at these competitions of the referees most often assessed the throws: leg trips (249 times), ankle trips (136 times), reaping's (111 times), pick-ups (145 times) and breaking of balance (273 times). The wrestlers have gained the greatest number of clean victories by performing throws: leg trips (43 times), reaping's (19), breaking of balance (33), pick-ups (36), floating hip (23), drop back (16). Were revealed differences between the estimated receptions in young men and adults.

In the first World Cup on the Kazakh kures have taken part the athletes from 45 states of various continents. Registration of technical-tactical activities was carried out on the E.M. Chumakov's method. 234 receptions at 91 registered meeting have been estimated.

Throws were the most popular technical activities of participants: breaking of balance which were productively applied 77 times, pick-ups – 32 times, throws floating hip – 28 times, throws by ankle trips – 26 times, outside leg trip – 14 times, forward leg trip – 13.

On the quality, the estimated technical-tactical activities distributed as follows:

Taza (clear victory) it is awarded by referee of 59 times. Of them for throws: pick-ups – 14 times; breaking of balance – 13 times; floating hip – 11 times; reaping hip – 5 times; outside and forward leg trip and drop back on 4 times; by corner throw – 2 times; for ankle trips and encirclement on 1 time. Such throws as reaping foot, buttock have not been estimated on “taza” during all tournament.

Zharty-zhenis (half victory) was awarded by referee of 45 times, of them for throws: pick-ups – 9 times; breaking of balance – 6 times; outside leg trip and corner throw on 5 times; floating hip, forward leg trip and ankle trip on 4 times; buttock – 3 times; reaping hip – 2 times; by reaping foot, drop back and encirclement on 1 time.

The mark “zhambas” was awarded by referee of 38 times for throws: breaking of balance – 9 times, ankle trip and reaping hip on 7 times, floating hip – 4 times, forward leg trip and pick-ups on 3 times, drop back 2 times, outside leg trip, corner throw and encirclement – 1 time.

Bouck (the minimum assessment) was awarded by referee of 96 times, from them for throws: breaking of balance – 49 times; ankle trip – 14 times; floating hip – 9 times; pick-ups of 6 times; outside leg trip,

drop back and reaping hip on 4 times; encirclement and forward leg trip 2 times; corner throw and buttock on 1 time.

Evaluating the quality of the receptions, it can be noted that the composition of the participants in the World Cup was not equivalent. From 91 registered meetings, 59 have ended *taza* (clear victories).

Teams from 14 regions and cities of Astana and Almaty took part in the championship of Kazakhstan and Rural Games. Technical-tactical activities at 269 meetings took down in shorthand, where referees (Table 1) assessed 897 activities. At these meetings of the referees estimated throws: breaking of balance – 200 times; outside leg trip – 96 times; ankle trip – 93 times; pick-ups – 93 times; floating hip – 63 times; drop back – 66 times; forward leg trip – 77 times; reaping hip – 62 times; corner throw – 59 times; buttock – 51 times; reaping foot – 14 times.

On the quality, the estimated technical-tactical activities distributed as follows:

Taza – 137 estimates, of them for throws: breaking of balance – 20; outside leg trip – 28; pick-ups – 22; floating hip – 12; drop back – 16; reaping hip – 11; forward leg trip – 7; ankle trip – 4; corner throw – 7; buttock – 5.

Zharty-zhenis – 226 estimates, of them for throws: breaking of balance – 20, pick-ups – 22, outside leg trip – 28, floating hip – 12, buttock – 5, drop back – 16, ankle trip – 4, corner throw – 7, forward leg trip – 7, reaping hip – 11, reaping foot – 3, encirclement – 2.

Zhambas – 165 estimates, of them for throws: breaking of balance – 21; drop back – 17; corner throw – 17; reaping hip – 22 times; outside leg trip – 21; ankle trip – 21; buttock – 9; pick-ups – 13; forward leg trip – 12; floating hip – 4; reaping foot – 2; encirclement – 5.

Bouck – 371 estimates, of them for throws: breaking of balance – 126; ankle trip – 54; forward leg trip – 43; floating hip – 29; pick-ups – 25; outside leg trip – 24; reaping hip – 16; corner throw – 18; drop back

– 13; reaping foot – 7; buttock – 12; encirclement – 4.

The most popular throw is a breaking of balance, which was estimated 200 times, cannot be attributed to qualitative, 126 times it was estimated by the minimum estimate of “*bouck*”, which is 63% of the total number of evaluations.

Estimating technical preparation of participants of the three above listed competitions, it should be noted that were most often estimated by referees such throws as breaking of balance, pick-ups, floating hip and outside leg trip. Throws by a reaping foot, by encirclement and buttock were rarely estimated. The most effective estimates were put by referee for throws by pickup, outside leg trip and buttock. 260 men took part in the competitions, including all the strongest judokas of Kazakhstan. In total, the referees evaluated 364 technical activities at the men throw from a standing position and throw from a ground position. The distribution of the number of receptions estimated by the referees throw from a standing position on weight categories is reflected in table 2.

The greatest number of times the referees estimated the throws buttock from knees of 65 times, 17 times this reception has been estimated in weight category up to 66 kg, on 11 times in weight categories up to 60 kg and 81 kg and 9 times in weight category up to 90 kg. On the second place on the quantity of estimates the throw breaking of balance of 39 times, but it was more often used as counters in weight categories up to 73 kg (9 times), 60 kg and 66 kg (on 7 times). On 31 times by referees have estimated throws by ankle trip and by pick-ups under one leg. Throws by ankle trip more often were applied in weight categories up to 73 kg (10 times), up to 90 kg (6 times) up to 66 kg (5 times). Throws by pick-ups under one leg more often were estimated in weight categories up to 60 kg (7 times), over 100 kg (6 times), up to 66 kg, 73 kg and 81 kg on (5 times). On 28 times throws outside leg trip and by corner throw were effective. The outside leg trip was estimated in weight categories up to 81 kg (8 times), up to 60 kg and 90 kg (on 5 times). Throws by corner were most effective at athletes of weight categories to 66 kg and over 100 kg (on 6 times), up to 100 kg (5 times).

Table 2 – Number of the estimated technical activities on weight categories at the men

№	Technical action (throw)	Weight category							Total
		60	66	73	81	90	100	+100	
1	floating hip	4	6	4	1	4	1	1	21
2	buttock	-	-	-	1	1	-	-	2
3	buttock from knees	11	17	4	11	9	7	6	65
4	forward leg trip	2	2	1	2	-	-	-	7
5	outside leg trip	-	5	4	8	5	3	3	28
6	ankle trip	3	5	10	4	6	2	1	31
7	reaping foot	-	-	1	1	-	-	-	2
8	reaping hip	8	6	4	2	2	2	-	24
9	pick-up under one leg	7	5	5	5	1	2	6	31
10	pick-up under two legs	-	2	1	1	-	4	2	10
11	drop back	1	-	-	1	1	-	1	4
12	flying near with emphasis foot	2	1	-	1	-	-	-	4
13	flying near with emphasis hip	5	1	3	-	1	2	1	13
14	breaking of balance	7	7	9	5	5	3	3	39
15	corner throw	3	6	2	3	3	5	6	28
Total		53	63	48	46	38	31	36	309

24 times estimated throws by reaping hip, the most often in weight categories to 60 kg (8 times), up to 66 kg (6 times), up to 73 kg (4 times). 21 times by referees were estimated the throws floating hip: in weight category up to 66 kg (6 times), in weight categories up to 60 kg, 73 kg and 90 kg (on 4 times). From a standing position seldom were applied such effective throws as: buttock throw from a standing position (2 times); forward leg trip (7 times); by reaping foot (2 times); drop back and stomach throw (on 4 times). The throw of flying near with emphasis hip estimated 13 times, that allows us to speak about return of this technical action.

Analyzing the technical actions estimated by the referees from a standing position, it is possible to say that participants began to hold more receptions, protection against which is less effective: throws buttock from knees, ankle trips and pick-ups. To such less dangerous receptions, it is necessary to carry and breaking of balance, which was often used as counters from the attacks of opponent. Athletes are fighting more circumspectly, eliminating from their arsenal any activities, in the reliability of which they doubt. In 42 meetings out of 265, referees did not assess not a one technical action that is almost 16% of the fights. Such tactics of conducting competitive struggle is less dangerous, but its

frequent use reduces the spectacle of judo, reduces the number of attacking actions and attraction for spectators. But most importantly, at the athletes lose confidence in the effectiveness of their activities, that often manifests itself at the participation in international starts with more prepared fighters.

In the wrestling ground-work athletes conducted 55 evaluated actions, from which: 40 were received for hold-down (osaekomiwaza), 10 for painful receptions and 5 for necklocks (shimewaza). To obtain comprehensive and objective information, we analyzed the quality of the evaluated technical activities (Table 3). The number of estimates ippon – 73, waza-ari – 125, yuko – 111.

Carrying out the comparative analysis of technical preparedness of participants of the Championship of the Republic of Kazakhstan with the competitions of 2014 and 2015 it should be noted that the number of qualitative estimates has increased: the waza-ari is 40%, and ippon 29%, the estimates of the yuko are 31%. Practically 69% of the estimates were waza-ari and ippon, although earlier their number was slightly more than 50%. It can be said that in the course of improving the technique of judo, coaches paid more attention to the quality of the performance of technical activities.

Table 3 – Indicators of technical preparedness of wrestlers of Kazakh kures and judo

Throw	Kazakh kures					Judo			
	number of re-ceptions and%	quantity of estimates				number of recep-tions and%	quantity of estimates		
		T	Zhzh	Zh	B		ippon	waza-ari	yuko
1. floating hip	93–7,9%	23	22	10	38	21–2%	6	6	9
2. forward leg trip	90–7,7%	11	19	15	45	7–2,4%	1	3	3
3. outside leg trip	110–9,5%	32	28	22	28	28–9,6%	12	12	4
4. ankle trip	119–10,2%	5	18	28	68	31–10,6%	6	12	13
5. reaping foot	115–1,3%	3	3	2	7	2–0,7%	-	2	-
6. reaping hip	80–6,9%	16	15	29	20	24–8,2%	5	11	8
7. buttock	55–4,7%	5	28	9	13	2–0,7%	1	-	1
8. pick-up	125–10,7%	36	42	16	31	41–14%	9	23	9
9. drop back	77–6,6%	20	21	19	17	4–1,4%	-	1	3
10. encirclement	53–4,6%	3	14	30	6	-	-	-	-
11. breaking of balance (tsukuri)	278–23,9%	33	39	30	176	39–13,4%	7	14	18
12. corner throw (sumigaeshi)	68–5,8%	9	22	18	19	28–9,6%	11	6	11
13. buttock from knees	-	-	-	-	-	65–22,3%	11	27	27
Total	1163	196	271	228	468	292	69	117	106

The greatest number of estimates ippon judokas have received for throws in a standing position: corner throws and throws buttock from knees (11), outside leg trip (12), inner thigh (uchimata) (9). The mark of waza-ari awarded for throws: 16 times by pickup; 14 times by breaking of balance; 12 times for throws outside leg trip and by ankle trip; 11 times for throws reaping hip. The yuko referees awarded 27 times for throw buttock from knees, 18 times for breaking of balance, 13 times for throws by ankle trip, 9 times for throws floating hip and 8 times for reaping hip, 11 times for corner throw.

Summarizing the results of technical preparedness of the participants of the competitions on Kazakh kures and judo, we conducted a competitive analysis of the evaluated activities (Figure 1).

In wrestling the Kazakh kures of the referees have put down 1163 marks, more often were assessed the following techniques: breaking of balance of 278 times (23,9%), throws by pick-up of 125 times (10,7%), throws by ankle trip of 119 times (10,2%), throws by outside leg trip of 110 times (9,5%), throws by forward leg trip of 90 times (7,7%), throws by floating hip 93 times (7,9%), throws by reaping hip of 80 times (6,9%), throws by drop back of 77 times (6,6%), corner throw of 68 times (5,8%), buttock of 55 times (4,7%), by encirclement 53 times (4,6%), throws by reaping foot of 15 times (1,3%).

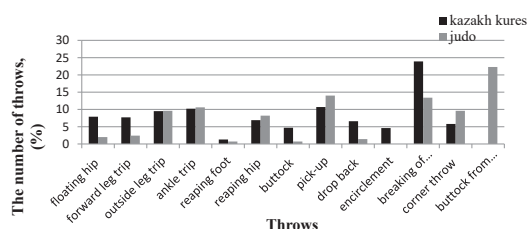


Figure 1 – Indicators of technical preparedness of wrestlers of Kazakh kures and judo

In wrestling of judo of the referees have estimated 292 activities from them: for throw buttock from knees 65 times (22,3%), throw by pick-up have estimated 41 times (14%), breaking of balance 39 times (13,4%), throws by ankle trip of 31 times (10,6%), throws by outside leg trip and corner throw on 28 times (9,6%), throws by reaping hip 24 times (8,2%), throws by floating hip of 21 times (7,2%), throws by forward leg trip of 7 times (2,4%), throws by drop back 4 times (1,4%), buttock and reaping foot on 21 times (0,7%).

Conclusions and practical recommendations.

The most effective in both kind of wrestling were: breaking of balance of 23.9% – Kazakh kures and 13,4% – judo; throws by pick-up 10,7% and 14%; throws by ankle trip 10,2% and 10,6%; throws by outside leg trip 9,5% and 9,6%; throws by floating hip 7,9% and 7,2%.

On the quality of the evaluated activities in Kazakh kures on the leading positions: throw by pick-up of 36 clear victories; 42 zharty-zhenis (half victory); breaking of balance 33 and 39; throws by outside leg trip 32 and 28; throws by floating hip 23 and 22; throws by drop back 20 and 21; throws by reaping hip 16 and 15.

In wrestling of judo, the most quality estimates are received from referees for throws: outside leg trip 12 ippon, 12 waza-ari (half victory); throws buttock from knees 11 and 27; corner throw 11 and 6; throws by ankle trip 6 and 12; throws by floating hip 6 and 6; breaking of balance 7 and 14; throws by reaping hip 5 and 11.

It is revealed, that in wrestling of Kazakh kures and wrestling of judo, effective receptions coincide overall. To such receptions, it is necessary to carry the throws by pick-up, breaking of balance, throws by ankle trip, throws by outside leg trip and throws by reaping foot. Only two effective receptions as encirclement in Kazakh kures (4.6%) and throws buttock from knees in judo (22.8%) can be applied only in their kinds.

It is determined that on the quality of technical activities, the leading receptions also practically coincide. These include throws: breaking of balance, throws by pick-up, throws by outside leg trip, throws by ankle trip, throws by reaping hip, and throws by floating hip.

For the successful performance of the wrestlers of Kazakh kures in judo, it is recommended:

In training process are to pay more attention, on the improvement of technical activities, which are successfully applied in Kazakh kures and judo.

These include throws: breaking of balance, throws by pick-up, throws by outside leg trip, throws by ankle trip and throws by floating hip;

Improvement of receptions effective in judo should be carried out only after getting of the base techniques of Kazakh kures; when choosing of the individual technique of athletes, it is necessary, to take into account the morpho-functional features of their organism; the application of technical activities of Kazakh kures in judo competitions will be effective, if the structure of the reception is kept in accordance with the rules of the competition.

Literature

- Shepetyuk M. N., Almukhanbetova G. N., Ten A. V., Nasiyev Y. K., Dzhamberbayev B. A. Control to the technical preparedness of the participants of the championship of the Republic of Kazakhstan on judo // *Theory and Methods of Physical Culture*. – 2017. – No. 1. – P. 86–92.
- Shepetyuk M. N., Andruchshin, Y. P., Shepetyuk N. M. Analysis of technical-tactical preparation of judokas // *Theory and methodology of physical culture*. – 2016. – No. 1. – P. 188–193.
- Shepetyuk M. N., Baishulakov Zh. S., Nauryzbekova S. M. Technical-tactical preparation of the participants in the Spartakiad of students of the youth of the Republic of Kazakhstan on Kazakh kures // *Theory and Methods of Physical Culture*. – 2006. – № 2. – P. 126–131.
- Shepetyuk M. N., Baishulakov Zh. S., Improvement of the training process on Kazakh kures // *Tashkent, 2006, International scientific-practical conference "Problems of improving the preparation system" of highly qualified athletes to the Olympic Games*. – P. 84–87.
- Shepetyuk M. N., Krushbekov E. B., Ten A. V., Almukhanbetova G. N. Evaluation of the technical preparedness of judokas in the conditions of competitions // *Theory and Methods of Physical Culture*, № 2, 2016. – P. 63–67.
- Svishchev I. D. Analysis of the technical-tactical activities of the world's strongest judokas in competitive activity // *Sports Wrestling: Yearbook*. – M.: F&S, 1981. – P. 11–13.

FEATURES OF CHANGES IN INDICATORS OF PHYSICAL PREPAREDNESS OF 6–9 GRADE STUDENTS

Sabit Abildabekov, Iosif Andruchshin,
The Kazakh Academy of Sport and Tourism

Summary.

In the article, important aspects of improving the process of physical education of students of the secondary schools are examined: the scientific substantiation of an effective system of managing the educational process and the introduction of innovative forms, means and methods of physical culture in pedagogical practice on the basis of objective data on the dynamics of physical development and physical preparedness of students.

The effectiveness of the organization of the physical education system requires the regular information about the level of physical qualification of students, during the period of education in the secondary schools. Now it is well known that an objective assessment of the physical development and physical preparedness of students is conducted on the basis of comparing the results of measurements obtained during the survey with the assessment standards developed taking into account the age and gender characteristics of middle and senior school age. Lyakh V. I. 2005.

In this way, for an objective analysis of monitoring data and making informed decisions on the correction of program material for the physical education of schoolchildren, information is needed on the structure and significance of the main factors determining the structure of the motor skills of students of different ages and sex. The actual direction of optimization of pedagogical control in the physical education of schoolchildren is the development of an integral formalized assessment of the physical readiness of students in general education institutions, taking into account the individual structure of the motor skills of schoolchildren. Levushkin S. P. 2006, Matveev AP, Nazarkina N. I. 2005.

The results of our research were mixed, especially in changing of individual indicators of physical fitness. There was confirmation of the fact that physical education lessons for boys are ineffective in the 8th-9th grades on the development of hand strength, flexibility and strength of the abdominal press; in girls, a decrease in the effectiveness of lessons is noted to the 9th grade. This is due to the deterioration of speed and power capabilities, the development of hand strength and abdominal pressure.

Keywords: Physical education, new programs and technologies, school students, physical qualities.

Introduction. The problem of improving the quality of instruction in physical education is socially determined and dictated by the demands of the time. In many respects it is connected with aspects of practical statement of the school subject “Physical Culture”. First of all, it is about fulfilling the requirements of the normative parts of the curricula. In accordance with the contents of these programs, the school should ensure the full-fledged mastering of the teaching materials by the students in all five Olympic sports disciplines. Only in this case it is possible to successfully solve the problems of comprehensive physical preparation of children in different periods of studying.

The aim. Study of the impact of teaching and upbringing on the physical preparedness of students in 6–9 grades for physical education.

The task. To study the features of changing the indicators of physical readiness of students of 6–9 grades in the subject “Physical Culture” in connection with the implementation of the content of new curricula.

The object of the study. Students of 6–9 grades of

the secondary school № 34, 128, 141 in Almaty.

Physical fitness was determined on the basis of testing such physical qualities as: high-speed strength (jump in length from the location shown in Figure 1A); dexterity (shuttle run for a time, depicted in Figure 1B); force of the abdominal press (the exercise is shown in Figure 1B); the relative strength of the arms (flexion and extension of the arms in the support lying); Flexibility (inclination of the trunk to the legs from the saddle on the floor, depicted in Figure 2).

Results of the research. Testing boys 6–9 grades showed the following (Table 1).

1. A long jump from the place

In the 6th grade this indicator is higher than in the 7th by 12.2% and lower than in the 8th and 9th grades by 3.6 and 10.5%, respectively.

The indicators of the 7th grade were lower than those of the 8th and 9th grades by 17.9 and 25.8%, respectively; the results in grade 8 were worse than in the 9th by 6.7%.

2. Exercise “push-up” in the supine position.

The results of the boys of the 6th grade ranged from 20.6 ± 0.72 push-ups per minute. At the 7th grade level, this indicator increased by 18.9

at the 8th grade level – at 85.4 and at the 9th level – at 59.7%. In the 7th class, the number of “push-ups” was less than in the 8th by 55.9 and less than in the 9th – by 34.3%.

When comparing the data of the 8th and 9th grades, it was revealed: this power factor in 8-graders is higher than in 9-graders by almost 14%.

1. Exercise “flexibility” sitting on the floor. Flexibility indicators for boys of the 6th grade reached the limits of 6.5 ± 0.11 cm. This index improved significantly in the 7th grade, and in 8 and 9th grades differed little from the achievements of 6-graders. The boys of the 7th grade were more flexible than the boys of the 8th, because Reliable differences in the results were almost 33.3%. But in the same 7-graders the results were higher than in the 9-graders by almost 53%; in the 9th grade, compared to with the 8th, flexibility deteriorated, although this deteriorated

ration in the digital value is not significant.

2. Shuttle running. The result of the shuttle race in the 6th grade was 8.8 ± 0.07 seconds. This index slightly fluctuated in the 7th and 8th grades, but significantly improved only in the 9th grade, reaching a level of 6.7 ± 0.12 seconds, i.e. almost by 24%. The results of the 7th and 8th grades differed little, and the 7th and 9th had a difference of more than 20% in favor of the 9th grade; in addition, the speed of the shuttle run in the 9th grade was higher than in the 8th by 23%.

5. Exercise “abdominal press” lying on his back, bending his knees. In the performance of this test, the results of grades 6 and 7 differed little from each other and averaged 31–32.7 trunk elevations per minute. But at the level of 8th grade, this indicator naturally improved by 42.3, and at the 9th level – by 39%.

Comparative data of 7th, 8th and 9th grades showed: the results of boys of the 7th grade are lower than the 8th and 9th grades by 33.9 and 31.8%, respectively. The differences in the results of the 8th and 9th grades turned out to be unreliable and ranged from 43.1 to 43.8 rises per minute.

Table 1 – Results of testing the physical fitness of boys (6–9grades)

Index	6 grade		7 grade		t	P
	\bar{x}	S	\bar{x}	S		
long jump from the place, cm	181,0	11,9	159,0	16,52	7,3	< 0,001
exercise «push-up» in the support lying for 1 min	20,6	4,19	38,2	7,46	2,62	< 0,05
exercise «flexibility», cm	6,5	0,64	11,9	6,52	6,48	< 0,001
shuttle run, sec	8,8	0,40	8,44	11,1	0,24	>0,05
exercise on the «abdominal press» for 1 min	31,0	11,9	32,7	7,6	5,1	< 0,001
Index	6 grade		8 grade		t	P
	\bar{x}	S	\bar{x}	S		
long jump from the place, cm	181,0	11,9	187,5	1,78	7,3	< 0,001
exercise «push-up» in the support lying for 1 min	20,6	4,19	24,5	9,78	3,1	< 0,05
exercise «flexibility», cm	6,5	0,64	8,0	3,24	1,36	>0,05
shuttle run, sec	8,8	0,40	8,7	0,64	0,42	>0,05
exercise on the «abdominal press» for 1 min	31,0	11,9	43,8	7,46	5,1	< 0,001
Index	6 grade		9 grade		t	P
	\bar{x}	S	\bar{x}	S		
long jump from the place, cm	181,0	11,9	200,2	17,5	4,82	< 0,001
exercise «push-up» in the support lying for 1 min	20,6	4,19	32,9	8,75	6,69	< 0,001
exercise «flexibility», cm	6,5	0,64	5,37	6,25	0,93	>0,05
shuttle run, sec	8,8	0,40	6,7	0,63	15,4	< 0,001
exercise on the «abdominal press» for 1 min	31,0	11,9	43,11	5,75	10,1	< 0,001
Index	7 grade		8 grade		t	P
	\bar{x}	S	\bar{x}	S		
long jump from the place, cm	159,0	16,52	187,5	1,78	12,46	< 0,001
exercise «push-up» in the support lying for 1 min	38,2	7,46	24,5	9,78	4,62	< 0,001
exercise «flexibility», cm	11,9	6,52	8,0	3,24	2,81	< 0,05
shuttle run, sec	8,44	11,1	8,7	0,64	0,17	>0,05
exercise on the «abdominal press» for 1 min	32,7	7,6	43,8	7,46	4,14	< 0,01

Index	7 grade		9 grade		t	P
	\bar{x}	S	\bar{x}	S		
long jump from the place, cm	159,0	16,52	200,2	17,5	10,17	< 0,001
exercise «push-up» in the support lying for 1 min	38,2	7,46	32,9	8,75	3,93	< 0,05
exercise «flexibility», cm	11,9	6,52	5,37	6,25	4,41	< 0,01
shuttle run, sec	8,44	11,1	6,7	0,63	1,2	> 0,05
exercise on the «abdominal press» for 1 min	32,7	7,6	43,11	5,75	6,97	< 0,001

Index	8 grade		9 grade		t	P
	\bar{x}	S	\bar{x}	S		
long jump from the place, cm	187,5	1,78	200,2	17,5	3,62	< 0,05
exercise «push-up» in the support lying for 1 min	24,5	9,78	32,9	8,75	2,62	< 0,05
exercise «flexibility», cm	8,0	3,24	5,37	6,25	1,63	> 0,05
shuttle run, sec	8,7	0,64	6,7	0,63	8,1	< 0,001
exercise on the «abdominal press» for 1 min	43,8	7,46	43,11	5,75	0,25	> 0,05

The results of testing girls more clearly reflected the age features in the change in physical fitness indicators (Table 2).

1. Jump long from the place. The length of this jump was 161.0 ± 2.04 cm. of girls of the 6th grade, in the 7th grade, this index significantly decreased by 8.3, in the 8th – by 13.9, and in the 9th class – by 4.8%.

The results of the 7th and 8th grades differed little. The differences between the indices of the 8th and 9th grades turned out to be significant; the jump in the 9th grade was 153.25 ± 3.14 cm, which is 10.6% more than in the 8th.

2. Exercise “push-up” in the supine position. According to the data of the 6th grade, the number of “push-ups” here fluctuated in the range of 13.2 ± 1.9 times. Further, at the 7th, 8th and 9th grade levels, this result improved, respectively: by 84.6%; by 55.3 and 19.8%.

When comparing the results of classes 7 and 8, the differences were insignificant; at the same time, the results of the 9th grade were lower than in the 7th – by more than 35%, and lower than in the 8th – by almost 23%.

3. Exercise “flexibility”. Flexibility in the torso was more than satisfactory of girls of the 6th and 7th grades, flexibility in the torso was more than satisfactory and was expressed in figures of 12.5–12.02 cm.

In the 8th grade, these indicators worsened by 42.9%, and in the 9th – improved by 43.2%; on a par with that the results of the 7th grade were high-

er than in the 8th (40.6%) and lower than the 9th (43%) grades. In the 9th grade, compared with the 8th grade, the state of flexibility improved more than 2.4 times.

4. Shuttle run. According to the results of the shuttle race, the indicators of the 6th and 7th grades were almost equal and varied within 9.4–9.23 seconds. In the 8th grade, these indicators worsened by 9.5%, and in the 9th – they improved by 11.4%.

When comparing the data of the 7th and 8th grades, the deterioration of the result in the 8th class was revealed by 11.5%, and when comparing the data of the 7th and 9th grades, an insignificant improvement was observed in the 9th grade. Differences in running speed in the 8th and 9th grades proved to be reliable in favor of the 9th class, where the result was higher than in the 8th more than 19%.

5. Exercise “abdominal press”, laying on his back, bending his knees, this figure was an average of 19.0 ± 0.49 rises in 1 minute for girls in the 6th grade. In the 7th, 8th and 9th grades, this indicator naturally improved accordingly: by 60, 57 and 30.6%; between the results of the 7th and 8th classes there was no reliable difference.

Indicators of the 9th grade were higher than in the 7th by 18.6% and differed little from the indicators of the 8th grade.

Thus, based on the results of a study of boys, speed-strength training consistently improves from 6th to 9th grade, taking into account a significant deterioration in the 7th grade; strength endurance of

the muscles of the hands (“push-up”) is consistently worsening at the levels of 8 and 9th grades, reaching 38.2–32.9 “push-ups” per minute; The index of flexibility deteriorates at the 9th grade level, reaching 5.37 cm, the value of the 6th grade;

Table 2 – Results of testing the physical fitness of girls of 6–9 grades

Index	6 grade		7 grade		t	P
	\bar{x}	S	\bar{x}	S		
long jump from the place, cm	161,0	11,8	147,7	16,35	3,94	<0,05
exercise «push-up» in the support lying for 1 min	13,2	11,1	24,37	9,34	4,78	<0,01
exercise «flexibility», cm	12,5	5,24	12,02	5,84	0,48	>0,05
shuttle run, sec	9,4	0,57	9,4	0,57	0,63	>0,05
exercise on the «abdominal press»for 1 min	19,0	2,85	30,47	10,0	6,63	<0,001

Index	6 grade		8 grade		t	P
	\bar{x}	S	\bar{x}	S		
long jump from the place, cm	161,0	11,8	138,6	12,96	8,5	<0,001
exercise «push-up» in the support lying for 1 min	13,2	11,1	20,5	5,55	2,96	<0,05
exercise «flexibility», cm	12,5	5,24	7,14	1,85	4,55	<0,01
shuttle run, sec	9,4	0,57	10,2	0,37	4,94	<0,01
exercise on the «abdominal press»for 1 min	19,0	2,85	29,86	5,56	4,68	<0,01

Index	6 grade		9 grade		t	P
	\bar{x}	S	\bar{x}	S		
long jump from the place, cm	161,0	11,8	153,2	11,33	2,07	<0,05
exercise «push-up» in the support lying for 1 min	13,2	11,1	15,81	4,53	1,15	>0,05
exercise «flexibility», cm	12,5	5,24	17,19	5,67	2,97	<0,05
shuttle run, sec	9,4	0,57	8,33	1,39	2,72	<0,05
exercise on the «abdominal press»for 1 min	19,0	2,85	24,81	7,08	2,86	<0,05

Index	7 grade		8 grade		t	P
	\bar{x}	S	\bar{x}	S		
long jump from the place, cm	147,7	16,35	138,6	12,96	1,53	>0,05
exercise «push-up» in the support lying for 1 min	24,37	9,34	20,5	5,55	1,35	>0,05
exercise «flexibility», cm	12,06	5,84	7,14	1,85	3,98	<0,05
shuttle run, sec	9,4	0,57	10,29	0,37	3,64	<0,05
exercise on the «abdominal press»for 1 min	30,47	10,0	29,86	5,56	0,61	>0,05

Index	7 grade		9 grade		t	P
	\bar{x}	S	\bar{x}	S		
long jump from the place, cm	147,7	16,35	153,2	11,33	1,35	>0,05
exercise «push-up» in the support lying for 1 min	24,37	9,34	15,81	4,53	4,3	<0,01
exercise «flexibility», cm	12,02	5,84	17,19	5,67	2,8	<0,05
shuttle run, sec	9,4	0,57	8,33	1,39	1,98	>0,05
exercise on the «abdominal press»for 1 min	30,4	10,0	24,81	7,08	2,20	<0,05

Index	8 grade		9 grade		t	P
	\bar{x}	S	\bar{x}	S		
long jump from the place, cm	138,6	12,96	153,2	11,33	2,38	<0,05
exercise «push-up» in the support lying for 1 min	20,5	5,55	15,81	4,53	1,81	>0,05
exercise «flexibility», cm	7,14	1,85	17,19	5,67	5,7	<0,001
shuttle run, sec	10,29	0,37	8,33	1,39	4,8	<0,01
exercise on the «abdominal press»for 1 min	29,86	5,56	24,81	7,08	1,68	>0,05

The speed of the shuttle run only in the 9th class reaches 6.7 ± 0.12 seconds, and in the 6th, 7th and 8th grades it fluctuates within 8.4–8.8 seconds; endurance of abdominal muscles is very high at the 8th and 9th grade levels and reaches an average of

43–43.8 rise in minutes, which is 39 and 42% more than in the 6th and 7th grades.

According to the results of the study of girls, the speed-strength training index varies from 6th to

9th grade unevenly and within the limits of a reliable level gradually decreases from 161 cm to 153 cm; strength endurance of the muscles of the hands was the highest at the levels of 7–8 classes; to the 9th class, this endurance is reduced to the level of the 6th grade; the indicator of girls' flexibility varies little from class to class and remains at the level of the middle-aged up to the 9th grade, complying with objective measures of 12–17 cm; The speed of the shuttle run increases most noticeably in the 9th grade, making 8.3 seconds; endurance of the muscles of the abdominal press is best manifested in the 7th and 8th grades, reaching 29–30 rises in 1 min; in the 9th grade the results are closer to the results of the 6th grade.

The conclusion. It is known from literary sources: during the whole school period, the distinct development of physical qualities and the intensification of sensitive manifestations are noted on average by 20.5% in relation to the perception of exercises aimed at the education of certain motor qualities. Mustayev V.L. 2003, Polyakov M.I.2002., Rudnitsky V.F, 2002, Teleugaliev U. G. 2001.

The results of our research in this sense have been mixed, especially in changing individual indicators

of physical fitness. It is confirmed that the physical culture lessons of boys are not very effective in the 8th-9th grades on the development of hand strength, flexibility and strength of the abdominal press; in girls, a decrease in the effectiveness of lessons is observed towards the 9th grade, which is associated with a deterioration in the speed-strength indicators, the development of hand strength and the abdominal pressure.

Literature:

- Lyakh V.I. Teaching and learning of motor actions // Physical culture in school.– 2005.– No. 1 – C. 18–24.
- Levushkin S.P. Sensitive periods in the development of the physical qualities of schoolchildren of 7–17 years old with different types of physique // Physical culture: education, education, and training.– 2006.– № 6 – C. 2–4.
- Matveev AP, Nazarkina N.I. What should be the textbook on physical culture // Physical culture in school.– 2005.– No. 4.– P. 4–6.
- Mustayev V.L. By increment. Assessment of physical preparedness of schoolchildren // Physical culture in school.– 2003.– № 2.– P. 26–28.
- Polyakov M. I. On the development of physical qualities // Physical culture in school.– 2002.– No. 1.– P. 18–20.
- Rudnitsky V.F. Criteria of academic achievement // Physical culture in school.– 2002.– № 5.– P. 56–58.
- Teleugaliev U. G. Training in physical exercises and optimizing the content of motor activity (monograph).– Almaty: “Print”, 2001.– 260 p.

**SPORTS PEDAGOGY, CREATIVITY AND
INNOVATION IN THE EDUCATIONAL
SYSTEM AND MOTOR DEVELOPMENT
AND MOTOR LEARNING**

SURVEY OF CHESS "PROFILE" OF SECONDARY SCHOOL PUPILS

Leyla Dimitrova

National Sports Academy "Vassil Levski", Sofia, Bulgaria

Abstract: *The main purpose of the survey was to obtain basic information about school students' attitude towards in-school and after-school chess activities. The second purpose of this study was to identify the key motivation factors for pupils' wish for chess tuition in school. The third objective was to estimate the importance of chess-playing families as a background for the introduction of chess to the school environment. Research sampled a group of 62 children aged between 11 and 14 (boys: 35; girls: 27) from 10 Bulgarian cities. The most important questions we focused on were: "Who are you playing with?"; "Does anybody from your family play chess?"; "Would you attend chess lessons in your school?"; "How often would you like to attend chess lessons in your school?" The first key theme that emerged from the data: the students' attitudes towards in-school and after-school chess activities were significantly positive. In the second instance it was instructive to view the influence of chess-playing families on pupils' motivation to learn chess in school. Both the classroom and family are bonding environment with mutual influence on each other.*

Key words: chess in school, chess-playing families

Introduction

As teachers and parents battle with the distractions of electronic games, social media and attention deficit disorder among younger generations, the supporters of chess education argue that it is a great way for children to learn about fair competition, mental discipline, planning and perseverance. Clubs and federations focus on developing chess as a sport. But we believe that chess has more to offer mainly as a tool for educational benefits, such as concentration, critical thinking, abstract reasoning, problem solving, pattern recognition, strategic planning, creativity, analysis, synthesis, and evaluation, to name a few. A series of evaluation studies have been made on the effects of chess teaching on performance in the academic, cognitive and behavioral domains. Most studies (Redman Tim (2006); McDonald, P.S. (2005, 2006)) concluded playing chess could raise IQ scores, strengthen problem solving skills, enhance memory and foster creative thinking. Chess is part of the curricula in nearly 30 countries. In Venezuela, Iceland, Russia, Armenia and other countries, chess is a subject in all public schools. From September, 1st, 2017 chess will be implemented in primary schools in Poland as a tool for learning mathematics. In countries where chess is offered widely in schools, students exhibit excellence in the ability to recognize complex patterns and consequently excel in math and science (Milat, 1997).

The acceptance of the Initiative of the EU Parliament in March 2012 to bring chess into the school system in EU-members was seen as an important milestone in Bulgaria. There school chess is considered as one of most important topics for Bulgarian

chess federation.

The main purpose of the survey was to obtain basic information about school students' attitude towards in-school and after-school chess activities and to investigate their opinion on chess tuition in school. The second purpose of this study was to identify the key motivation factors for pupils' wish for chess tuition in school. The third objective was to estimate the importance of chess-playing families as a background for the introduction of chess to the school environment.

Our hypothesis: The survey of school students' opinion about in-school and after-school chess activities will show their attitude towards introduction of chess lessons to the secondary school curriculum.

Methods

For the analysis of the qualitative data we used chi-square test. The χ^2 statistic is based on the difference between the expected and the observed number of cases and it permits to test our hypothesis. Research sampled a group of 62 children aged between 11 and 14 (boys: 35; girls: 27) from 10 Bulgarian cities. They were asked to complete a brief questionnaire. Majority of the questions concerned in- and after-school informal chess activities. Most questions included several answer suggestions. The most important items we focused on were: "Who are you playing with?"; "Does anybody from your family play chess?"; "Would you attend chess lessons in your school?"; "How often would you like to attend chess lessons in your school?" In-depth

interviews and focus group discussion were also used.

Data was analyzed with software SPSS16

Results

Who do you play with more often?

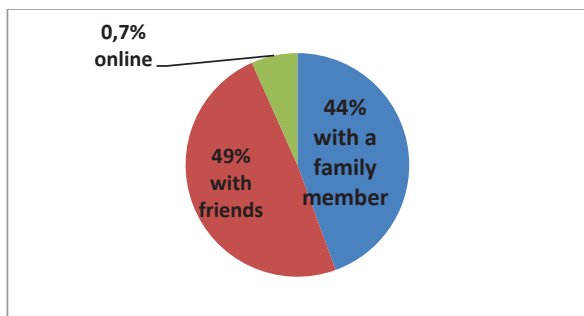


Fig.1 Distribution of answers of the question: Who do you play with more often?

49% of students enjoy playing chess with friends while 44% usually play with a family member. Despite of great electronic chess game development only 7% of students play chess online. And none of them mentioned actual chess site. None of them attends a chess club or uses chess software either. Respondents indicated they easily find a partner to play with and most common opponents are friends and family members.

Does anybody from your family play chess?

More than a half of pupils stated that at least one family member plays chess. Most common this is father – 51,5% of answers, followed by grandfather – 24,2%, brother – 15,2, mother – 6,1% and sister – 3%. Observations have shown that children learn to play chess more quickly if their teacher is older brother or sister or elder relative. Ideally, a parent or someone else at home knows the game and can play at least a basic game with the child.

For studying family impact on students’ motivation we used the following table:

Table1. Impact of family factor

family * can play chess Crosstabulation				
Count		Can play chess		
		Y	N	Total
Family member	can play	27	6	33
	can't play	12	17	29
	Total	39	23	62

Table2. Results of χ^2 -analysis

Chi-Square Tests					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	10,817 ^a	1	,001		
Continuity Correction ^b	9,154	1	,002		
Likelihood Ratio	11,145	1	,001		
Fisher's Exact Test				,001	,001
Linear-by-Linear Association	10,643	1	,001		
N of Valid Cases	62				

a. 0 cells (,0%) have expected count less than 5. The minimum expected count is 10,76.
 b. Computed only for a 2x2 table

The role of the educator is very important in our new age of modern technologies that requires a different skill set. Parents see the need for students to develop healthy habits of mind and value the critical thinking and creative problem solving skills inherent in studying and playing chess. The development of intergenerational chess play between parent and child and grandparent and child generate a new period of quality time at home for adult-child relations.

Would you attend chess lessons in your school?

In school we can't avoid "classroom-style" of chess teaching, which conflicts with pupils' aspiration for more physical activities. Nevertheless a huge majority of respondents – 62,9% answers they would like to attend chess lessons in their school. A quarter wouldn't attend such lessons, while 11,3% have no opinion.

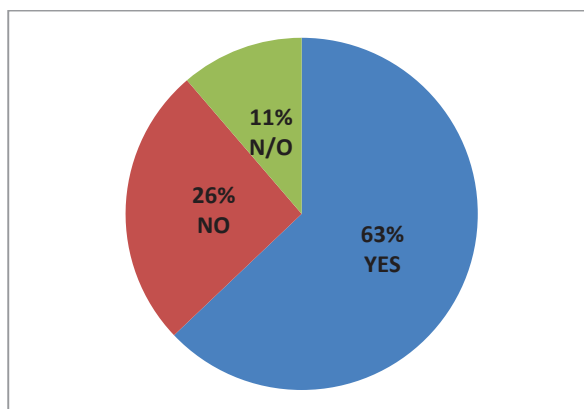


Fig.2 Would you attend chess lessons in your school?

How often would you like to attend chess lessons in your school?

Overall 66 per cent of the children said they would like to try chess once a week. These results correspond with the idea that scholastic chess movement has to be focused on bringing the students educational benefits and not to be used mainly to attract junior club members. According to us chess being taught within normal class time for one hour a week by accredited chess coaches will be a good start. Many students are engaged in other activities. However, two hours per week are usually enough for a busy person to make sensible progress in chess if he follows a structured program of study and training.

About one fifth of pupils want to learn chess twice a week, while the most enthusiastic 11,3% would like to have chess lessons three times per week.

Conclusions

This paper is targeted to stimulate debate on chess in schools. It is not possible to draw general conclusions from the survey, but it discloses school students' attitude towards in-school and after-school chess activities.

The research showed that the children, living in the

cities and those living in the smaller towns have the same attitude towards playing chess. A significant factor for children's attitude to chess is the presence of a family member who is good at playing the game.

Chess has become a part of modern education and is pro-family, pro-education and pro-social.

Reports from students noticed they have significant positive attitude to learning chess in school.

Incorporation of chess into the curriculum of schools must be promoted and encouraged.

References

- Horgan, R. W., & Morgan, D. (1990). Chess expertise in young children. *Applied Cognitive Psychology*, 4, 109–128.
- McDonald, P.S. (2005, 2006) The Benefits of Chess in Education, a collection of studies and papers on chess in education.
- Milat, M. (1997). The role of chess in modern education. [Online]. Available: https://www.kidchess.com/milat_roleofchess.htm
- Redman Tim (2006). Chess and education: Selected essays from the Koltanowski conference. Dallas, TX: Chess Program at the University of Texas at Dallas.

STUDY OF THE APPLICATIONS OF PUNISHMENT AS AN EDUCATIONAL METHOD

V. Slavova, N. Iankova, V. Panayotov

SUMMARY

Introduction: Intense training activity and competing in contests are the basic blocks that build the competitor's character. We should always use some elements of systemic and targeted educational work in order to give the process a more comprehensive and active shape during all stages of sports training. Punishment is one of the most controversial methods, especially concerning its application in the process of educational training and contest participation.

Methodology: The aim of this study was to survey students' attitude towards punishment as an educational method applied by their coaches in cases of systematic violations of discipline and norms. We used the inquiry method and conducted an alternative analysis of the data. Students of both sexes at "Coaches" Faculty at the National Sports Academy of Bulgaria were Subjects of the study.

Results: We found that punishments are commonly applied in many sports. In our opinion, the misuse of this method could lead athletes to a psychic block.

Discussion: Using punishment as an educational method affects positively athletes' behavior and motivation. As a result the performance could be improved both during training and during competition.

Conclusions: A successful coach should be a master at combining systematically different complex educational methods. Adopting such an approach is the most important determinant of the rate of progress of the training process.

Key words: method of education, punishment, students, sport

Introduction

Achieving a great performance is only a small part of the training process in sport. Growing up an athlete with a strong character and willpower along with high morality is the most important achievement of the multiyear coach-athlete interaction. Sport bears the mission to cultivate such character so as to prepare the athletes to become most valuable members of the society. Training hard and participating in contests hardens the athlete's willpower. A well-balanced and comprehensive educational process must include an element of systematic and purposeful educational work done by the coach.

Ergo, the efficiency of the educational process is a function of the proficiency of the coach in implementing the objective potential of different sports disciplines, which the athlete has been practicing during the whole process of maturation from beginner to elite.

In our opinion there are several interdependent objectives, which affect the multifaceted educational process of professional athletes:

- Cultivating high morality;
- Cultivating the character – growing up willpower qualities such as persistence, bravery, proactivity, etc.;

- Developing and imprinting steady and conscious motives for overcoming great physical and emotional hardships – the most important personal trait for all athletes.

The educational work of young athletes is very important and of exceptional complexity as well. To succeed in this process the coach has to have the skill to coordinate his efforts with the influences of the environments of the family, the team and the school. Of great importance is the form of the educational training – it has to be interesting, proactive and creative, but at the same time, not formal. Coaches' failure to amalgamate the educational and the training processes brings alone a lot of difficulties in their work. It is absolutely necessary a more complex approach towards the training-educational process to be adopted in order for the formality and one-sidedness to be avoided. In order to transmit the notion that the success in sport depends on many personal traits and a lot of hard work, the coach needs to base his theses on objective research, on success and failure in sports performance and vivid examples.

The methods and means the coach uses in the educational process have to be based on personal ex-

ample, persuasion, increasing the difficulty of the tasks, encouragement, and punishment.

Punishment is one of the most controversial educational methods and its applications in the training and competition processes raise debates among sport scientists. Its application requires an attentive and deliberative attitude. Above all, it has to be just and timely. Its magnitude has to match that of athlete's misdemeanor and the more experienced the competitor, the more severe the punishment should be for one and the same misdemeanor.

Aim and objectives

the aim of the present is studying the application of punishment as an educational method in different sports disciplines.

1. The objectives of the study are as follows:
2. Developing an interview card, consisting of 11 questions, nine of them of closed type and 2 of them of open type.
3. Analyzing the results.
4. Gauging the opinion of athletes in different sports disciplines about the application of punishment as an educational method.

Methods

We used the method of inquiry and also, alternative analysis as a statistical method for estimating the final results. We recruited 52 athletes, female and male, aged 22 years on average for subjects of the study.

Results

According to scientific data, the most effective types of punishment among athletes are eviction from training session, banning from training and suspending the competitor from participating in contests. The ever-diminishing number of weightlifters in Bulgaria in recent years made punishment an unpopular and unfeasible method of education in Olympic weightlifting. That is the reason for different educational methods to be used in sport training process nowadays.

After analyzing data we reached the following results:

According to the answers on the question "Which types of punishment have been applied upon you personally during your sport career?" the most popular types of punishment were notice and repetition-punishment (fig. 1).

tition-punishment (fig. 1).

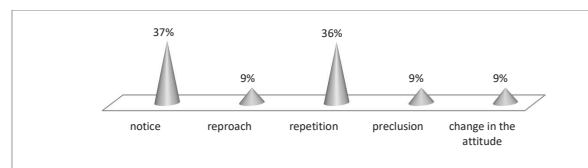


Fig. 1 Types of punishment in sport

37% of the subjects suffered most often from "notice" as a punishment. 36% ranked "repetition – punishment" as the most often used punishments. The other 3 types of punishment – "reproach and rebuke", "preclusion" and "punishment with a change in the attitude" – are last in frequency. In corroboration with the abovementioned situation of decreasing number of trainees in many sports in recent years, which made coaches unwilling to apply punishments in general, nobody answered "suspension of participating in contests" has been exercised upon him or her.

Answering the question "Which were the reasons for you to be punished?" the interviewed competitors in individual sports stated that appearing late to workout was the most common reason for instilling punishments in the training process (fig. 2). Next after that reason, "Violation of the rules" and "not complying with the instructions" were ranked (with equal weight of 18%). On the other side of the spectrum, with 4% of the answers, as the least widely spread reason for implying a punishment was ranked "other reasons – distractions, conversations during working out etc."

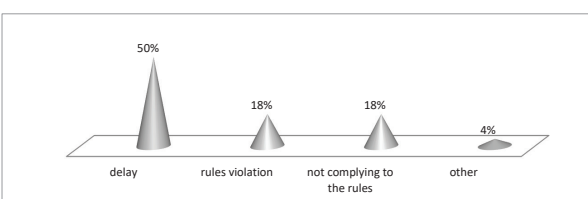


Fig. 2 Reasons for imposing punishments

According to the answers of all the respondents, the most widely used form of punishment was making the athlete run around the training facilities for a number of rounds. Depending on the specific sport the types of punishments varied:

- Track and field – dashes, jumps;
- Swimming –training with appliances on the ground, swimming additional distances;

- Rowing – additional training and cleaning the facility;
- Tennis – “dips”, eviction from the training session;
- Figure skating – exercising till failure;
- Judo – additional repetitions in technics exercises;
- Football – “push ups”, sprints.

Fig. 3 represents the distribution of the answers on the question regarding the application of the punishment as an educational method. 55% of the respondents have been punished “from time to time”, 27% of them – “often” and 18% of them – “seldom”.

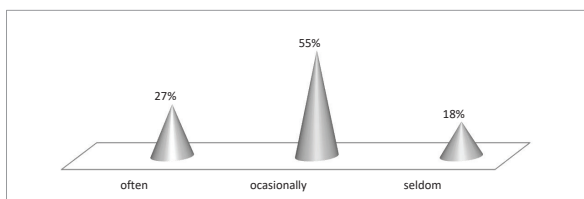


Fig. 3 Punishments in sports training process

54% of the subjects consider the punishments imposed upon them to be “to a great extent just”, 32% of them – “to a very great extent just” and 14% of them – “to some extent just” (fig. 4).

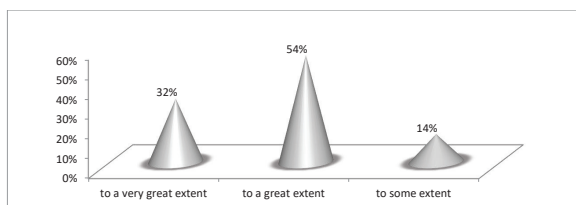


Fig. 4 Attitude of trainees towards punishments

59% of the competitors answered that punishments helped them improve their behavior to “a great extent”, 27% of them – “to a very great extent” and 14% of them – “to some extent”.

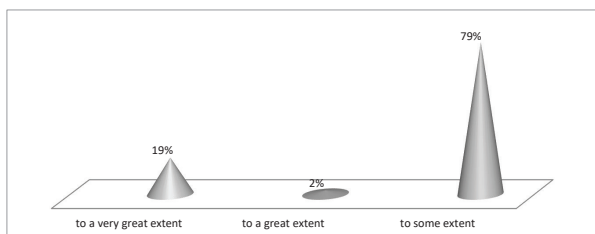


Fig. 5 Effect of imposed punishments on motivation

79% of the respondents thought that punishments

improved their motivation for achieving better results in training process and in competitions “to some extent”, 19% of them – “to a very great extent” and 2% of them – “to a great extent” (fig. 5).

As a whole, the imposed punishments did not lead to negative behavioral effects during the training process and the competitions (fig. 6).

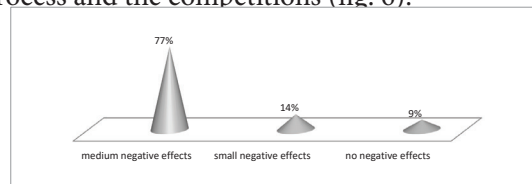


Fig. 6 Negative behavioral effects of punishments

After being punished, 50% of the respondents felt “unwilling to train”. Due to fatigue and overtraining, they have been unable to perform power movements and exercises with a big range of motion and intensity. Verhoshanskii reports that heavy physical efforts, which exhaust the central nervous system, impair the coordination abilities (Верхошанский, Ю., 1970). Another 25% of the respondents consider “stress reactions” and “anxiety and aggression” the basic negative effects of applying punishments during the training process and competitions.

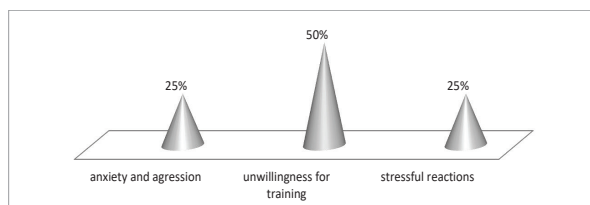


Fig. 7 Negative effects from punishments

Discussion

We found that it is not advisable for the coaches to overuse the most common punishment in sports practice, punishment-repetition, because it could lead to physical exhaustion and psychological blockage. Generally, there are some positive effects of imposing punishments for improving the behavior and motivation for achieving a better performance. Choosing the right punishment methods and applying them timely are two factors of great importance for achieving positive results in the educational process of the athletes.

References

Верхошанский, Ю. В. (1970), Основы специальной

силовой подготовке в спорте. Москва, ФиС
Гюрова, В. (2011), Андрагогията в шест въпроса,
Екс-Прес, Габрово,
Милева, Ел. (2012), Европейски измерения на
спортнопедагогическото образование, С., Авангард
Прима
Славова, В. (2014), Информационни и
комуникационни технологии в обучението по
чужд език при студенти от Националната спортна
академия «Васил Левски». Дисертация, С., НСА
Тодоров, Ат., Й. Калайков (1986), Възпитание в
учебно-тренировъчния процес и състезанието. В:
Медицина и физкултура, С.

Ass. Prof. Vesela Slavova, PhD
Department of “Foreign language teaching and
information and communication technologies”
National Sports Academy of Bulgaria
1700, Studentski grad
Sofia
Bulgaria
++359892299749
vessela_slavova@abv.bg
Assoc. Prof. Neli Yankova, PhD
Department of “Weightlifting, Boxing, Fencing and
Sport for All”
National Sports Academy of Bulgaria
1700, Studentski Grad
Sofia
Bulgaria
++359893396422
yankova_nsa@abv.bg
Assoc. Prof. Valentin Panayotov, PhD
Head of “Weightlifting” Sector
Department of “Weightlifting, Boxing, Fencing and
Sport for All”
National Sports Academy of Bulgaria
1700, Studentski Grad
Sofia
Bulgaria
v_panajotov@abv.bg

RECREATIVE INDUSTRY, INNOVATIONS AND THE BULGARIAN EDUCATIONAL MODEL FOR SPECIALISED STAFF

Bistra Dimitrova
National Sports Academy "V. Levski"

Key words: *Recreative industry, innovations, Bulgarian educational model, specialised staff, Wellness culture & new EU profession.*

Introduction: Over the last five years, people actively talk about Wellness tourism and Recreative programs (Ignatov, 2012), but it is still developing spontaneous, without a clear concept, unable to compete with even the countries of Central Europe due to lack of specialized personnel. Service standards in the industry have not been introduced, worldwide not given a specific definition, and global tourism defined as the strongest niche – "SPA and Wellness sector" (Dimitrova, 2011). Significantly increased the proportion of active healthy holidays, as in 2016 Wellness tourism practiced more than 4 million People worldwide. Wellness methodologies and practices can be seen as "... creating polyvalent Wellness & Spa culture ..." (Dimitrova, 2009), it is important to "... discuss problems recuperation significance of physical activity in the aquatic environment and the direct link to improving the quality of life and health status of the practitioners ..." (Dimitrova, 2012). *According the Summary Report, of the Global Wellness institute* (Ellis, S., 2013), globally find highly qualified staff for Wellness centres is a major problem. The U.S. economic analysts call this fact a "War for talents". According the research team of the Global Wellness Institute, in the study of the industry, which results are presented in the Economy Report (2014): "... 95% of the leaders of the SPA & Wellness industry said they are facing serious problems in recruiting Wellness & SPA managers / directors with right mix of skills and experience. Over 52% of the owners of the centres stated that the issue of qualification of the staff remains the same or even worse ..." (Dimitrova, 2014). The needs of the practice grow, and definitely not enough staff (Polimenov, 2014). Therefore, a person's particular situation in which the dynamics of the SPA & Wellness tourism on the demand for specialized packages outstrips with great growth rates operation of services with

qualified personnel certified through educational programs (Dimitrova, Donev, 2006), fellowships, training seminars or received certified competencies. On international level, according the research team of the Global Wellness Institute, in the study of the industry, which results are presented in the Economy Report (2014) – highlighted the fact that wellness tourism is expanding rapidly, demanding for more staff than existing. The global wellness tourism market is currently worth 425 billion euro and 36% of that spending is generated by Europe (Polimenov, 2014). Six of the top 10 world wellness tourism destinations are in Europe (Treneva, 2013). Growth forecasts suggest opening up the potential of Eastern Europe (Polimenov, 2014). The European wellness industry is aware that in order to maintain its leading positions and quality, ensuring relevant training is a critical success factor (Trendafilov, Dimitrova, 2013), both for current and future employees involved in the provision of services to ensure the satisfactory delivery of the tasks assigned to them (Nesheva, 2015) and "...the wellness practices as a cultural phenomenon has a positive impact on health..." (Staneva, 2014).

Methodology: The **aim** of the publication is to establish the actual quality of the educational programs in the Balkan countries (Bulgaria, Romania, Serbia, Montenegro, Greece, Albania and Macedonia) and setting out the requirements for specialized staff in Bulgarian Recreative Industry and Niche tourism. **Object** of the study were 243 costumes (from a study of the Wellness Institute Bulgaria) senior professionals from various SPA & Wellness & Thalasso centres (employees, executives, investors, entrepreneurs, managers, company managers, representatives of professional organizations and the executive power, master and PhD students in NSA), which conducted the Bal-

kan survey in support of the experts mapping of the Wellness industry and educational programs on regional level. NGOs supporting this survey was: the Balkan Cluster for Health, Wellness & SPA tourism, the Federation of sport pedagogues of Republic of Macedonia, the vocational training centre "Progress and knowledge" from Sofia, the Medical SPA association of Montenegro, the Wellness academy of Serbia, the Romanian foundation "Amphytheatru", Wellness institute of Greece and the Bulgarian Association for Geomedicine and Geotherapy). **The survey is executed during the period:** 2016, December to 2017 March, **as a part of the Wellness Instructor VET Course (WELVET)**, Erasmus + action key 2, Cooperation for innovation and the exchange of good practices, strategic partnerships: 2016-1-BG01-KA202. Our **work hypothesis** is built on the assumption that joint action is needed, in collaboration with the professional associations and NGOs for the development and adoption of state regulatory tools for the education of specialized staff for the Recreative and Wellness industry and the Niche tourism. The applied method is a psychometric registration of the costumers (different structural levels) opinions, analysis by weight and the ranking of significance and systematization of the governmental statistical data for the educational programs in different cognitive levels, by countries. The expert's analysis, of the WELVET survey in Bulgaria, was identified, by finding 6 **indicators** for ranking the Wellness facilities and 6 indicators for the customer expectations for the Wellness staff that they ranked by importance. We calculate the weight of each indicator – in points and in percentages of the entire unity.

Results: On the basis of the survey we believe that joint action will produce: Setting standards for categorization of Wellness & SPAs and quality assessment procedures and services; provide specialized training of personnel with specialized secondary and higher educational content (in Bulgaria, NSA "V. Levski" are accredited "Bachelor", "Master" and "Doctoral" degree programs in the professional fields: 7.6. Sport and 7.5. Health Care). The WELVET project's core intellectual output, a VET course for the emerging "wellness instructor" occupation, is addressing a pressing need of the European wellness tourism industry, namely the lack of trained staff to deliver high quality specialized customer service. Our ambition is to also ensure and propose a unique delivery method by design-

ing, testing and producing a WELVET mobile app., in order to ensure free and open access innovative training embedded in the digital era. The WELVET project further resonates the main new features and meta priority lines of Erasmus+ such as dissemination and exploitation of results: the project consortium covers 4 main regions of EU – South-Eastern, Central, North and Western Europe, open access to education products and multilingualism (products in 5 languages: EN, BG, EE, MK, DE). Important it is to create "... educational Wellness modules and levels of education in the teaching and training process ..." in the secondary and the higher education (Dimitrova, (Димитрова), 2012).

Discussion: For the first time is presented the statistical data 2017, for the Balkan region and the educational models from secondary school to "Doctoral degree" programs.

Table 1 summarized the existing education and training programs worldwide by continents in 2014. This information is considered to be as accurate as possible, from the Global Wellness Institute / by his research team / but the figures are permissible standard error. Perhaps there are other providers of special education who are not identified and were noted in the study – as is the Bulgarian case. Providers listed in the table are based on data of the research team of SRI, according to information compiled: online, by email, site survey or filed by telephone. The survey of the WELVET project show for the first time, the existing type of programs for specialised staff on the Balkan Region and some other European countries. Providers of continuing education are also new, fragmented and no "proven" model for effective delivery of training for employees already working in the Wellness sector. At present special problems in management of Wellness business concern (Ellis, 2013):

1. The challenges associated with current / future SPA & Wellness managers;
2. The requirements for a high level of skills acquired in their careers / path of growth;
3. Challenges in taking a management position, which requires interdisciplinary knowledge and skills combined with an understanding of the Wellness Culture and people motivation for healthy life style. In our original psychometric experiment, the main factors for high quality and preferences for one Wellness Centre, according to the majority of customers (Table 2) / experts "The centre must

Table 1:

Types of educational programs and training for SPA & Wellness worldwide

Summary of Wellness & SPA Management - Education & Training programs on the sector

Destinations	Total number of University / College specific programs	Total number of University / College	Private companies	
			Bachelor / Master / Doctoral Degree	Short courses, seminars, Certification
Worldwide (2014)				
Caribbean region	3	1	1	7
Europe	9	3	8	15
Latin America	4	1	-	3
Middle East	1	1	-	-
North America	16	7	-	9
In the world	41	15	2	24
Balkan Region of Europe (2017)				
Bulgaria	7	3	6 + 1 PhD	2
Macedonia	2	-	-	2
Austria	4	2	1 BD +1 MD	4
Estonia	3	-	-	3
Romania	1	-	-	1
Greece	1	-	-	1
Montenegro	1	-	-	1
Serbia	2	-	-	2
Turkey	1	-	-	1
Albania	-	-	-	-
Total	22	6	9	17

Note: Worldwide data are the intellectual property of the Global Wellness Institute (Miami, FL, USA) and published with permission.

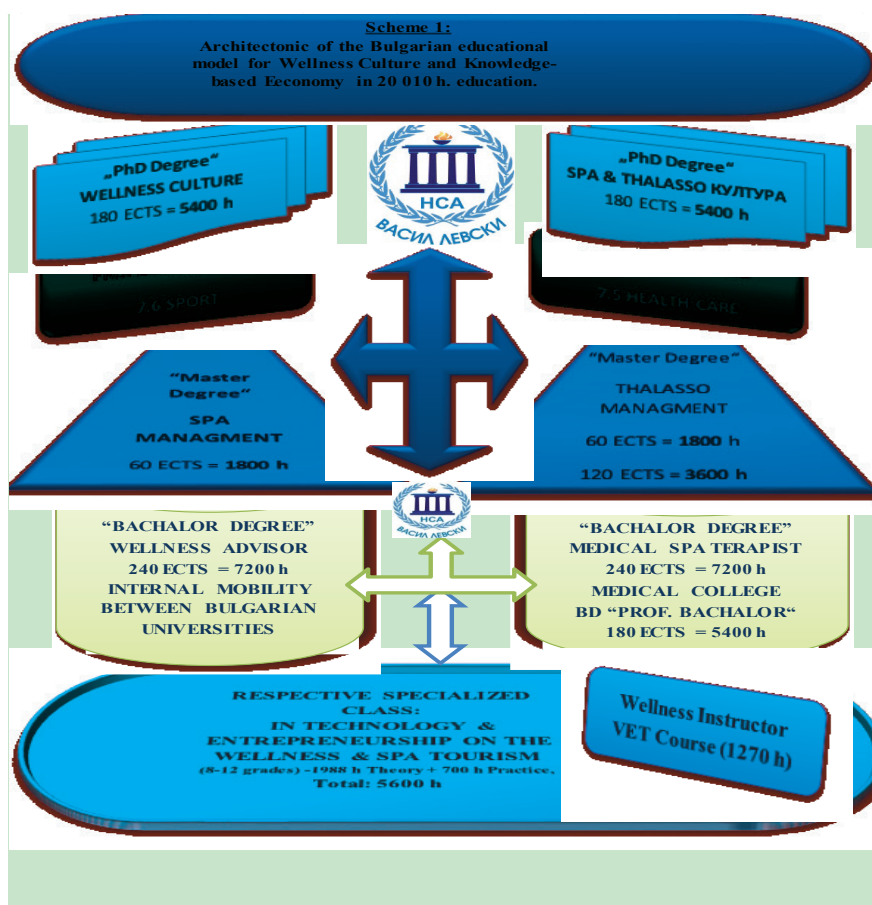
Table 2:

Matrix of the opinions of surveyed experts for evaluation of the quality of Wellness facilities

Indicators	1	2	3	4	5	6	Sum	Rang
	/6	/5	/4	/3	/2	/1		
	un.	un.	un.	un.	un.	un.		
1. The centre must employ highly qualified and trained personnel, selected according to specific criteria like education, skills and experience.	88 86% 486	12 12% 60	1 1% 4	1 1% 3	-	-	102 553 Units	I
2. The centre must meet standards in the quality of Wellness services and EU standards regarding wellness & spa products	9 8.50% 54	66 65.50% 330	15 14.50% 60	6 5.50% 18	5 5% 10	1 1% 1	102 100% 473	II
3. The centre must have state-of-the-art facilities and equipment	4 3.50% 24	3 2.50% 15	70 69% 280	6 5.50% 18	10 9% 20	9 8.50% 9	102 100% 366	III
4. The centre needs a detailed investment project plan concerning the areas of wellness & spa business development	1 1% 6	12 12% 60	6 5.50% 24	42 41.50% 126	4 3.50% 8	37 36.50% 37	102 100% 261	IV
5. The centre must have effective structure of governance and procedures for management	-	4 3.50% 20	6 5.50% 24	20 9% 60	72 71.50% 144	-	102 100% 248	V
6. The centre must have excellent image and competitiveness.	-	5 5% 25	4 3.5% 14	27 26.50% 81	11 10% 22	55 54.50% 55	102 100% 197	VI

employ highly qualified and trained personnel, selected according to specific criteria like education, skills and experience” (grades weight 553 units – 86%) and “The centre must meet standards in the quality of services and EU standards regarding wellness & spa centres” (Ranks weight 473 units – 65,5%). Third and fourth are classified “The centre must have state-of-the-art facilities and equipment” (Ranks weight 366 units – 69%) and “The centre needs a detailed investment project plan concerning the areas of wellness & spa business development” (rang. weight 261 units – 41,5%). Indicators: “The centre must have effective structure of governance and procedures for management” and “The centre must have excellent image and competitiveness”, received (rang. Weight 209 units – 71,5%) and (rang. Weight 197 units – 54,5%). The ranking of the other indicators / 7 to 10 place /, studied by the Wellness Institute Bulgaria, are as follows: a large assortment of Wellness services; optimal pricing strategy; flexible marketing policy; favourable conditions of work and promotion of employees, but for the WELVET study the Consortium makes his preference only for 6 statements. From the data analysis we find, that the first and second place are

based on the professional qualifications of the personnel and the effectiveness of the implementation of services. The experts determination of the priority indicators in the study, conducted to their ranking, should be considered when uniform standards will be introduced (in accordance with the EU criteria) by all public authorities responsible for the National categorization of Wellness&Spa facilities and the National certification of staff in the wellness sector. A crucial need of training programs is established, during the WELVET survey in the partner countries. Future professionals in the wellness industry needs a stable knowledge and competencies for effective organizational and methodical (Intellectual and practical knowledge and skills for different procedures and healthy influences, based on the natural resources and holistic approaches), with a high level of motivation to offer and perform quality services tailored to the needs of wellness customers and promote their interests. In this connection it is necessary to activate the professional contacts between academic units, VET course centres, Secondary schools, professional educational bodies, for build a Bridge between the theory and the wellness business and Industry sectors (with



real practice in real professional environment).

The elaborated, in our Erasmus + WELVET project – Curriculum, Syllabus and Job profile are intellectual outputs are with high added value to the EU educational and labour policies, which expect to ensure inclusive smart growth.

For the first time is presented the full architectural vertical of the Bulgarian educational model from secondary school to “Doctoral degree” programs (Table 3) – successful accredited with excellence by the external experts from the Bulgarian Agency for accreditation and evaluation for the Bulgarian University: National Sports Academy “V. Levski” – Educational Leader, with 5 accredited Wellness & SPA & Thalasso programs – from “bachelor degree” to “Doctoral” degree in 2 professional fields: 7.6. Sport and 7.5. Health Care.

Conclusions:

In conclusion, on the basis of our survey, we propose conclusions, as the following:

1. On European level, the Recreative industry has needs for well-educated Staff;
2. The Bulgarian model has 7 accredited programs for Wellness & SPA managers and the requirements for a high level of skills acquired in their education;
3. In Europe and the Balkans, to take a management position, requires interdisciplinary knowledge and skills combined with an understanding of the Wellness Culture and people motivation for healthy life style.
4. Bulgaria is the Balkan educational leader in the Wellness sector;
5. Europe is building her won quality standards and criteria on educational and professional competencies of specialized staff for Wellness services.

References

DIMITROVA, B., Y. DONEV.(2006). Плувни спортове в училище. Монография. [Swimming sports in school. In Bulgarian.] София: Издателство Авангард Прима.
 DIMITROVA, B. (2009). SPA култура и аква практики. Учебник за ОКС „Магистър“. [SPA culture and aqua practices. In Bulgarian.] София: Издателство Авангард Прима.
 DIMITROVA, B. N. DEDE (2011). Акваспининг

като антистресова превенция на здравето. Трета международна научна конференция: Оптимизация и иновации в учебно-тренировъчния процес. [Aqua spinning as anti-stressing health prevention. 3th International Scientific conference: Optimization and innovation in educational training process.] Сборник доклади, 2011, p.146–153, Department of Physical education and sport, Sofia University «St. Kl. Ohridski.

DIMITROVA, B. (2012). Аква практики [Aqua practices. In Bulgarian.] София: Издателство Авангард Прима.

DIMITROVA, B. (2014). The enotherapy as an effective financial instrument for the wine tourism. International Scientific Conference for Tourism “SPA and wine” - part of the Culture corridor – cultural routes. Proceedings (p. 55–61). Blagoevgrad. Faculty of Economy, Tourism department. SW University.

ELLIS, S. (2013). *The global wellness tourism economy 2013*. Report of the Global Wellness Tourism Congress (Delhi, India). Ed. Global wellness and Spa Association, Miami, USA.

GLOBAL WELLNESS INSTITUTE (2014). *Economic Report*. Miami, USA, 2014. (<https://www.globalwellnessinstitute.org/>).

IGNATOV, I. (2012). Water in the Human Body is Information Bearer about Longevity, World Scientific Conference “Chemistry, Physics and Biology of Water” (www.waterconf.org). Acts 2012, (p.57). Vermont Photonics, NY.

NESHEVA, I. (2015). Benefits of the physical activity and the elaborated program mental prevention gym for women with normal pregnancy. *Research in Kinesiology*, 43(2), 210–214.

STANEVA, K. 2016. An evaluation of the potential of Cross-border region Bulgaria-Serbia for development of Wellness, medical SPA and SPA tourism – possibilities and perspective. *ATLAS Tourism and Leisure Review*, ISSN2468–6719, *Health, Wellness and Spa Tourism in the Balkans*, Netherlands. 3(2016), 43–58.

TRENDAFILOV, D., & DIMITROVA, B. (2013). Aqua Spinning as anti-stress health prevention. Acts of Conference “Physical education and sport”. Montenegro, 2013, No 37–39 / XI, (p. 454–460. ISSN1451–7485 (9771–4517–48001).

TRENEVA, V. (2013). Селекция в спорта кану-кааяк [Selection in canoe-kayak sport. In Bulgarian.] Национална спортна академия „В. Левски“. НСА Прес.

POLYMENOV, M. (2014). Иновации в ресторантьорството [Innovations in restaurant management. In Bulgarian.] София: Авангард Прима.

Correspondence: Bistra Dimitrova, E-mail: dimitrova.bistra@yahoo.com

National Sports Academy “Vassil Levski” Sofia,

Depart. Aquatic sports, Studentski grad 1700 Sofia Bulgaria

MODERN DESIGN OF A CHILDREN 'S ZONE IN NATURAL PARK VITOSHA

Krastyo Zgurovski, Milena Zdravcheva

Summary: In the Bulgarian winter resorts, the need for modern sport-animation services, oriented to the smallest ones, is still underestimated. The present work demonstrates how a modern ski area for children, meeting current standards, can be built with creative design solutions tailored to the legal framework, the terrain conditions, the needs and potential of the potentially interested parties. Along with the theoretical contribution, the study offers a model that responds to real terrain and is feasible in practice.

Key words: sports-animation services, adapted training areas, attraction facilities

Snow sports are an essential tool for physical education and sports during the winter months of the year. The improvement of the methodology and the equipment and the improvement of the infrastructure in our winter resorts have created conditions for ski training from early childhood. The available snow and artificial equipment are for easy introduction of the beginner skiers in the winter mountainous conditions. However, when it comes to children, the skiing area must be richly decorated with fabulous characters, secured and adapted to appropriate terrain shapes and facilities (Zgurovski, Yankov, 2007). This adds to the learning experience, which directly affects the short-term motivation of the children and, in general, their desire to practice. That's why we set ourselves the goal to offer a modern project for a children's ski area in one of the places where most children are trained – Vitosha Mountain.

Purpose: Developing a modern project for a children's ski area, adapted to the conditions of the terrain.

Tasks: 1. Study of the normative basis regulating the construction of a children's ski zone.

2. Comparative analysis of the conditions in which this service is offered in Bulgaria, compared to the world experience.

3. Select location and terrain. Developing a modern project for a children's ski area, adapted to the conditions of the terrain.

The Bulgarian winter resorts have invested in different directions in recent years, increasing their popularity worldwide and placing their sports and cartoon services in a highly competitive environ-

ment. However, with regard to children's sports, development opportunities are still underestimated. The present work demonstrates how a modern ski area for children, meeting current standards, can be built with creative design solutions tailored to the legal framework, the terrain conditions, the needs and potential of the potentially interested parties. Along with the theoretical contribution, the study offers an eye-catching model that responds to real terrain and is feasible in practice.

Methodology and methods

for the elaboration of the present project, an interview and an interview with experts – three teachers from the National Sports Academy: Prof. Krastyo Zgurovski, Assoc. Prof. Petar Yankov, Deyan Todorov, directors and employees of „Machirski sport ski schools“, „Moten“, Marina Sport“, Yulen „Boro Sport School“, „Pamporovo AD Ski School“.

Four experts from the Bulgarian Demo team, who participated in workshops for children during the last congress of ski teachers, helped us with analysis. In this way we analyzed and compared World experience and that of the Bulgarian ski resorts offering the service.

We sought the services of design experts in the realization of the Ophelia children's ski area project – Petya Zdravcheva, engineer Stefan Dossev. Through Adobe Photoshop CC, Autodesk Sketch Book Pro 2015, the ski area was created.

Results and discussion

In the Law on Tourism, we did not find precise criteria governing the construction of a children's ski area, but in § 1, item 77 of the Additional Provisions thereto the following definition was given: "Chil-

dren's ski area is a separate area for practicing snow sports from children up to 6 age-old ... equipped with snow-tools and other materials to ensure a safe and safe practice of snow sports according to the age-specific characteristics of children..." (Ordinance for categorizing ski runs, 2007). By comparison: in Italy, Austria and Germany this type of service is clearly regulated. We believe that there should be criteria in our country to allow the standardization of children's ski areas, similar to the categorization of ski slopes.

In connection with our choice of location for our project, we have also reviewed the Vitosha NP Management Plan, which regulates the coordination of the efforts of the authorized state bodies as well as the rights and interests of the owners and users in order to regulate precisely all types of zones with their limits, suitability and limitations for tourist use. According to the Plan, the Ophelia ski center falls under the category "Tourist formations and settlements". In part 3.2. of the Plan, which regulates the regimes and norms for the management of activities in the nature park, three categories of their treatment are unified: promotion, admis-

sion and non-admission. At Golden Bridges-Ophelia-Konyarnika Center, repairs and reconstructions of existing sites and facilities are encouraged in order to increase the category and the level of service; Temporary bungalows or vans in the Ophelia area are allowed to serve visitors and skiers (Management Plan of Vitosha NP, 2005). Considering these norms and the nature of the facilities to be used in the design of the children's ski area, namely their mobility and ecology, we can say that its construction will not disturb the biological and landscape diversity.

A comparative analysis of the conditions in which it is offered child ski service in Bulgaria, to the world experience.

The survey has shown that some of the most visited winter resorts in Bulgaria have previously made attempts to build specialized children's ski areas. However, the equipment and supplies used in them do not correspond to the current trend, which is shown in comparative terms by the following indicators presented in Table 1.

Table 1. Condition of the Bulgarian standard versus the world on the indicators surveyed.

Indicators	World experience	Bulgarian	Borovets	Bansko	Pamporovo	Vitosha Mountai
1. The presence of an animator (animated character)	+	+	+	+	+	-
2. The presence of cartoon characters	+	-	-	-	-	-
3. Thematic area (magical path, speaker system)	+	-	-	-	-	-
4. Solid foam figures indicating different areas in the children's ski garden	+	+	+	+	+	-
5. Devices for different configurations of children's ski tracks	+	+	+	+	+	+
6. Rails and waves	+	-	-	-	-	-
7. Ramp	+	-	-	-	-	-
8. Step-up climbing facility	+	-	-	-	-	-
9. Rotondo carousel	+	+	+	+	-	-
10. "Magic carpet" - a climbing device	+	+	+	+	+	-
11. Plastic slopes.	+	+	-	+	-	-
12. Equipped children's rest rooms.	+	+	+	+	+	-
13. Safety	+	+	+	+	+	+
14. Legislative basis and regulation of children's ski areas	+	-	-	-	-	-
15. Attraction facilities typical of amusement parks.	+	-	-	-	-	-
in general	15	8	7	8	6	2
	0	7	8	7	9	13

used indicators	+
missing indicators	-

In order to form a detailed idea in its entirety, we made a comparative analysis of the categories considered as follows:

- a) Percentage of used and unused indicators in Bulgaria;
- b) Percentage ratio of the level of Bulgarian ski resorts to the world experience.

The results are presented in Figure 1 and Figure 2.

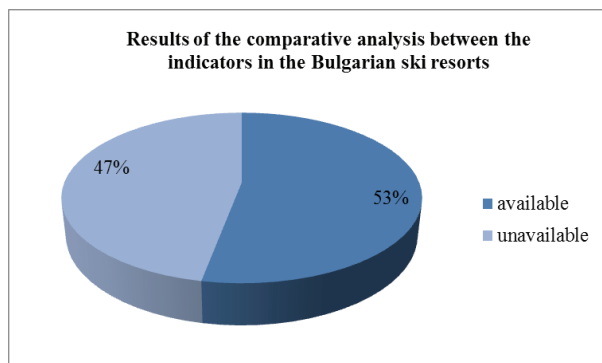


Figure 1. Percentage ratio between used and unused indicators in Bulgaria.

It is clear from the comparison that in the Bulgarian ski resorts the ratio of used and unused indicators is in favor of the available equipment, appliances and tools that correspond to the world trends (53%). The most favorable is the situation in Bansko (8 metrics), and the worst – in Vitosha (only 2 metrics).

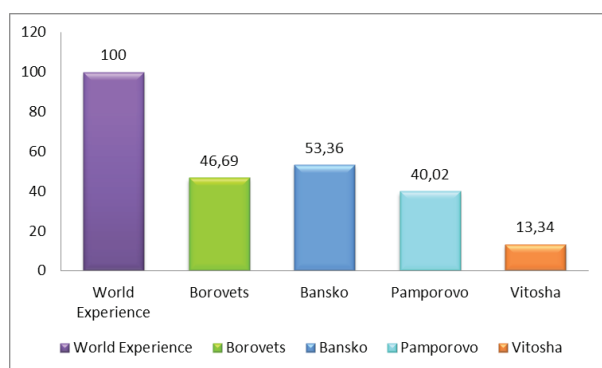


Figure 2. Percentage ratio of the level of Bulgarian ski resorts World experience.

At the same time, all the native ski resorts use equipment for different configurations of children's tracks, and also meet the requirements for securing these areas. The analysis showed that, despite

the attempts of our leading winter resorts to offer adapted ski training areas for the smallest ones, we still do not have key appliances and equipment that are widely used in the world. Bansko Ski Center is most close to metrics (53.36%), followed by Borovets (46.69%) and Pamporovo (40.02%). The ski areas of Vitosha with the two indicators covered are the last (13.34%). The average result of the studied Bulgarian ski resorts is 38.35% compared to the world experience.

Choosing a plot to develop a project for a children's ski area.

As a result of the analysis of the world experience and the main features of the modern children's ski areas we can say that for the construction of such a skiing zone it is necessary: a) appropriate location with favorable weather conditions (low mountain zone, forest belt, south exposure; 4-season gear); b) the concessionaire of the zone; (c) well-maintained infrastructure.

On the basis of these criteria, we decided to focus on a part of Golden Bridge-Ophelie-Konynarnika, namely the Ophelie ski center. The area is located in the Vitosha mountain, 12.5 km from Boyana district and 3.5 km above the Golden Bridges in the direction of the Boeritsa hut. The altitude is 1540 m. The Machirski sport ski school has a concession on the track and the sloping platform beside it. On the territory of the area there is a qualified mountain rescuer and 2 chalets – Ophelia and Malinka. School boards are 50 meters from the base. The school board has an area of 3 decares and ends with an incline. Its length is between 55 and 65 m. The slope ratio is equal to 1: 3 of the total area. The slope is 5–6%, the width of the plate 60–65 m, GPS coordinates 42o35' 56.1"N23o14' 07.6"E.

The Ophelie Circuit is one of the best for the initial training of skiers of all ages. Its length is 180 m at a width of 100 m, a displacement of 25 m and an average slope of 16–17%. Served by 2 climbing facilities. The two plates are connected with a wide flat meadow. The exposition of the big plate is north-west, and the small – southeast. They are located in the forest belt of the mountain and the weather is calm and soft even in the coldest winter days. The premises of Ophelia are owned by the Mountain Rescue Service and are conceded at the Machirski sport ski school. By means of reconstruction and

reorganization of the movable objects (two wagons – ski wardrobes) another warm room for the tourists was established.

Development of a project for a children's ski zone.

We divided the whole ski area into five learning areas (Figure 3). The entrance is on the south side of the plateau and is marked with a high arch, which we have placed an information plate with the 10 basic ski rules (Figure 4).

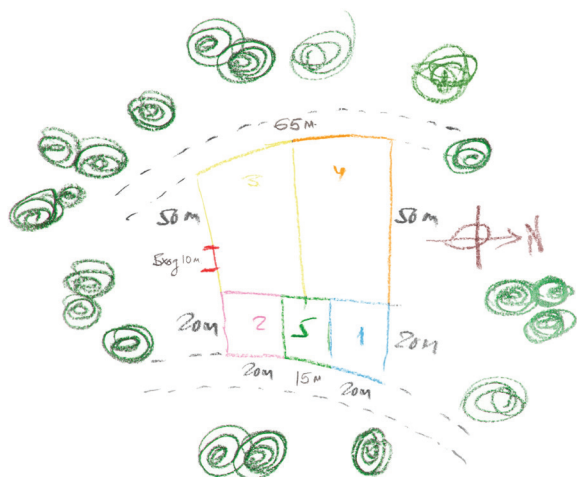


Figure 3. Children's project the Ophelia ski area



Figure 4. Entrance to children's ski area

On Polygon 1 (Figure 5) we placed the so-called magical path. We chose this place because it is equal and the children will not have difficulty walking along the route. On polygon 2 (Figure 6) a rotate carousel will be installed. The terrain is suitable because it is flat and allows the installation of special pavements during the summer to make full use of the 4-season facility.

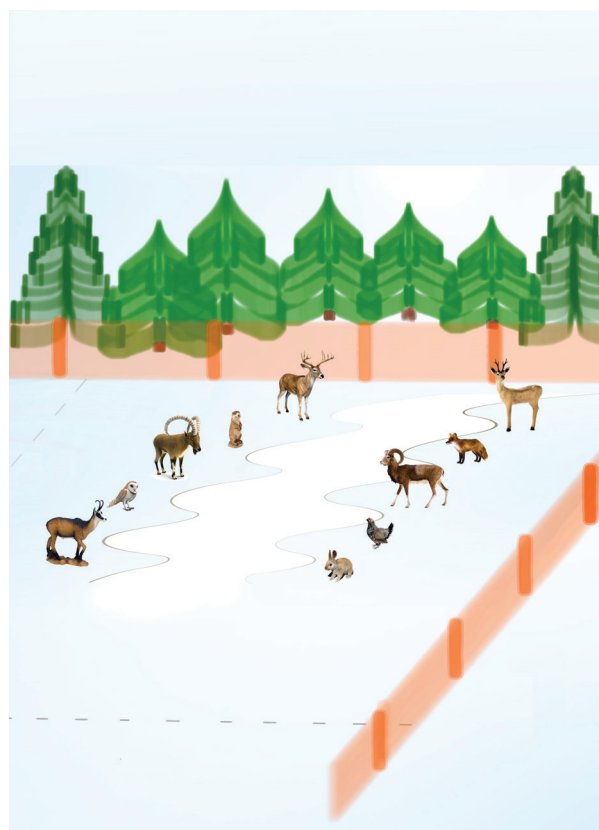


Figure 5. Polygon 1.

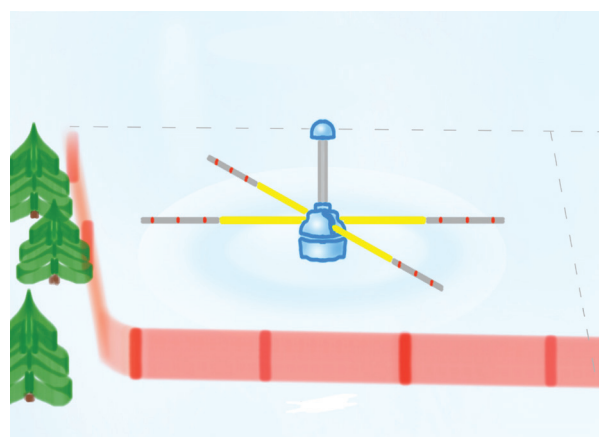


Figure 6. Polygon 2.

The third polygon (Figure 7) covers the southwestern part of the plate. There, the slope is 5–6%, making it suitable for the installation of an auxiliary mobile gear for stepping climbing. Routes for right-down and sliding and stopping plows will also be configured on both sides. An arch will be installed at the start of each route.

In the downhill submarine, we used the "Baba Yaga" arch – its design is such that at a stroke the figure rotates at 360 °. After that, we placed a

“mushroom” arch with a height of 110 cm below which the children will pass from high to low ski stand. There are two models of giants with a height of 240 cm, which, next to each other, form a tunnel. The children have to stretch out to hit the giants on their hands. The design of this configuration is the transition from low to high ski stand. The last challenge is at the end of the polygon: “ripples”, imitating bumps or bumps.

On the other side, we set up a track to study the sliding and stopping piste, again with a starting arch. Using two cones, we tagged the Baba Yaga hat – the place where the kids will be practicing in a sliding plow. At 4 meters behind it are placed two models of “fir trees”, where the children have to stop with a stopping plow.

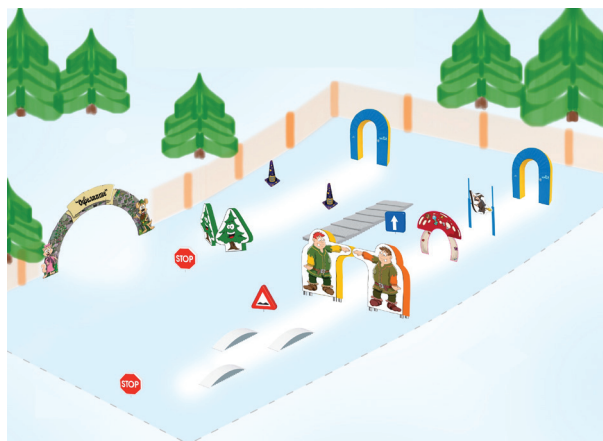


Figure 7. Polygon 3.



Figure 8. Polygon 4.

The fourth is in the northwest of the plaza. There will be installed a “Magic Carpet” – an escalator with a length of 30 m. The area is again divided into two sub-sections – left and right, – marked with

starting arches. The left-hand sub-area is for the use of arcs with a snow-plow, and the right – for their improvement. A so-called “snow snake” is configured at the top of the left sub-zone. It is composed of segments of 750 cm, allowing it to be modified in different lengths.



Figure 9. Snow Snake.



Figure 10. Polygon 5.

In the lower sub-area, we placed two models of “fir trees”, along which to make two more turns in both directions – alone, without the “snake”. On the left side there is arranged the track for improvement of the arc element with snow plow. Five mushroom markers are placed in order to perform associated plow arcs. After that there is a rail mounted – “jump” (Figure 8).

Polyline 5 covers the smallest area of the board. It is located in the flat area between Poligon 2 and Poligon 1 and is designed for active rest. Here we put two benches and mock-ups of foam animals.

Conclusion

The construction of modern children’s ski areas includes the use of specialized facilities, appliances and equipment, some of which are 4-seasonal. They

predispose children to skiing activities by helping them learn a basic, safe, accessible and entertaining way to learn the basic ski skills, to get used to the equipment, the winter conditions in the mountains and the basic rules of conduct on the track. The great variety of childcare facilities allows small skiers to quickly and easily integrate into this new situation.

The comparative analysis showed that in Bulgaria the quality of provision of such services is almost 2 times lower than in the world's leading ski centers. Despite this fact, every winter of Vitosha teaches thousands of children in the absence of a children's ski area. In recent years the management of our major winter resorts – Bansko, Borovets, Vitosha and Pamporovo – has demonstrated a longing for alignment with the world standards in this tourism

sector. The normative documents allow the construction of children's ski areas on the territory of Vitosha NP, there are suitable terrains and it is only a matter of time to do so.

References

Naredba za kategorizirane na ski pistite. (obn., DV, br. 98 ot 29.11.2007g.) // Наредба за категоризиране на ски пистите. (обн., ДВ, бр. 98 от 29.11.2007 г.)

Plan za upravljenie na PP Vitosha (2005–2014 g.) (s reshenie na MS № 305 ot 22.04.2005g.) // План за управление на ПП Витоша (2005–2014 г.) (с решение на МС № 305 от 22.04.2005 г.)

www.geaitalia.com

www.kuts.org/docs/sola_smucanja_2010.pdf

www.snowkidz.com

www.sunkid.at

Zgurovski Kr., P. Yankov. Alpiiska ski tekhnika. Sofiya, 2007.s.104 // Згуровски Кр., П. Янков. Алпийска ски техника. София, 2007.с.104.

FACTORIAL STRUCTURE OF PHYSICAL DEVELOPMENT AND PHYSICAL ABILITY OF STUDENTS

Nedyalka Mavrudieva, Dinara Zhunisbek,
Petko Mavrudiev, Milena Kuleva

Introduction

The specific of the sports teacher work requires a good academic background and a certain level of physical fitness, sports and technical skills and movement culture. These facts underlie and provoke our interest in the presented issues.

Methodology

The Methodology of the survey is complex and includes: desk research of literature, teacher observation, testing, anthropometry, mathematical and statistical data processing and analysis. This survey was conducted during the academic year 2015/16.

Objective of the study is detecting the factorial structure of physical development and physical ability of students, IV year in the NSA "Vassil Levski" – Sofia.

Subject of the study are the signs of physical development and physical ability of students.

Target group of the study: 48 students, IV year, Coaches' faculty and Teachers' faculty of the NSA.

For the purpose of the study, a 9 indicators testing of students was conducted, carrying information about main signs of physical development and physical ability.

The results from the study have been processed by variation and factor analysis.

Results

Three main factors that characterize the specifics of the surveyed targeted group, have been outlined, which are explaining the total percentage of the starting dispersion of the studied process (67, 08%).

Discussion and conclusions

The most important for the studied population students is the morphological factor, which shows high importance of: weight-lifting parameters and strength of upper limbs.

On second place about the importance of physical fitness by the studied population are: speeding and speed-power capabilities of the lower limbs.

On third place are: the speed-force abilities of abdominal and spinal muscles.

Key words: *students, factorial structure, physical development, physical ability*

Introduction

It is well known that the professional realization of the sports pedagogue is based on good academic training and the pursuit and motivation for continuous improvement. The specific of the sports teacher work requires a good academic background and a certain level of physical fitness, sports and technical skills and movement culture. These facts underlie and provoke our interest in the presented issues.

In a very interested publication by *Harvard Business Review* is presented the High-Performance Pyramid. (Loehr, Schwartz, 2001) According to the publication, the maximum productivity and high performance on the work place is possible, when four factors are combined together – physical

well-being (resistance to stress), emotional balance, mental capacity and motivation. However, the basis of the pyramid is not any, but the physical capacity, in our opinion, which is significant for sports pedagogues also.

This fact, and also similar publications in this area (Borukova, 2015; Borukova, 2014; Iskrov, 2015; Mavrudieva, 2008; Hristova, 2015) provoke our interest in the presented issue.

Methodology

The *Methodology of the survey* is complex and includes: desk research of literature, teacher observation, testing, anthropometry, mathematical and statistical data processing and analysis. This survey

was conducted during the academic year 2015/16.

Objective of the study is detecting the factorial structure of physical development and physical ability of students, IV year in the NSA "Vassil Levski" – Sofia.

Subject of the study are the signs of physical development and physical ability of students.

Target group of the study: 48 students, IV year, Coaches' faculty and Teachers' faculty of the NSA.

For the purpose of the study, a 9 indicators testing of students was conducted, carrying information about main signs of physical development and physical ability.

The results from the study have been processed by *variation and factor analysis*.

Results

The results of the variance analysis of the observed physical development and physical capacity indicators (*table 1 and fig. 1*) show that the values have a normal distribution for most of the indicators, only in the indicator related to the abdominal muscularity, the distribution is different from the normal. The observed population is homogeneous in terms of the height ($V1=3.36\%$), the degree of obesity ($V3=8.95\%$), the speed capability of the students ($V4=7.37\%$) and their speed-power capabilities ($V8=7.18\%$). The examined population is relatively homogeneous in terms of weight, blast strength of lower limbs ($V5=11,99\%$) and strength of upper limbs ($V6 = 18,90\%$) and ($V7 = 21,65\%$). Abdominal muscles ($V9= 0.97\%$). Three main factors that characterize the specifics of the surveyed targeted group, have been outlined, which are explaining the total percentage of the starting dispersion of the studied process (67, 08%), (*table. 2*).

Table 1
Average values and variability of the surveyed indicators

Nº	Indicators	N	Min.	Max.	X	S	As	Ex	V%
1.	Height	48	1,68	1,93	1,81	0,060	-0,223	-0,664	3,36
2.	Body mass	48	57,00	102,00	77,92	9,118	0,189	0,699	11,70
3.	BMI	48	18,11	29,48	23,86	2,130	-0,207	1,729	8,95
4.	Run 20 m	48	4,20	3,00	3,55	0,261	0,351	0,163	7,37
5.	Long jump from positon	48	1,80	3,35	2,31	0,277	0,773	2,939	11,99
6.	Throwing a solid ball of leg	48	4,13	10,00	6,90	1,305	0,461	0,1	18,90
7.	Throwing a solid ball from seating	48	2,5	13,00	9,39	2,032	-0,816	1,814	21,65
8.	Running 10x5 m	48	13,71	19,56	16,51	1,184	0,593	0,812	7,18
9.	Crunches	48	15	58	28,48	8,819	1,898	4,083	30,97

Table 2
Factor structure of the physical development and physical capacity of students of IV year – Coaching faculty and Teachers faculty at NSA

Nº	Indicators	I	II	III	h^2	$1-h^2$
1.	Height	0,753	-0,138	-0,350	0,786	0,214
2.	Body mass	0,909	0,055	0,278	0,708	0,292
3.	BMI	0,618	0,147	0,614	0,906	0,094
4.	Run 20 m	0,090	0,684	-0,387	0,625	0,375
5.	Long jump from positon	0,097	-0,813	0,060	0,675	0,325
6.	Throwing a solid ball of leg	0,760	0,036	-0,063	0,582	0,418
7.	Throwing a solid ball of seating	0,722	-0,266	0,186	0,627	0,373
8.	Running 10x5 m	-0,077	0,722	0,140	0,547	0,453
9.	Crunches	-0,004	-0,124	0,752	0,581	0,419
$\Sigma a^2 =$ 67,08%		33,87%	19,78%	13,49%		

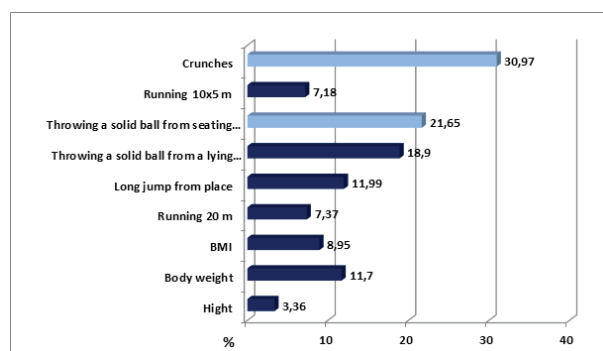


Fig. 1. Variance coefficient (V%)

In addition to the factor weights, the table also presents data on the magnitude of the explained (h^2) and the unexplained ($1-h^2$) source dispersion of each studied sign. The analysis of table 2 shows that the first deduced factor explains 33.87% of the initial dispersion of the study phenomenon. The following two have a lower contribution to the overall physical development and specific ability of students (19.78% and 13.49% respectively).

The first factor in the factor structure of the physical development and physical capacity of the 4th year students in the NSA is determined by five main indicators and, as already noted, explains the highest percentage of the initial dispersion of the phenomenon under investigation (33.87%). This factor can be defined as *morphological*, because it reveals the place in the factor structure of indicators related to the height-to-weight ratios. They are also a prerequisite for the higher achievements in throwing a solid ball, both from leg and seating. (fig. 2).

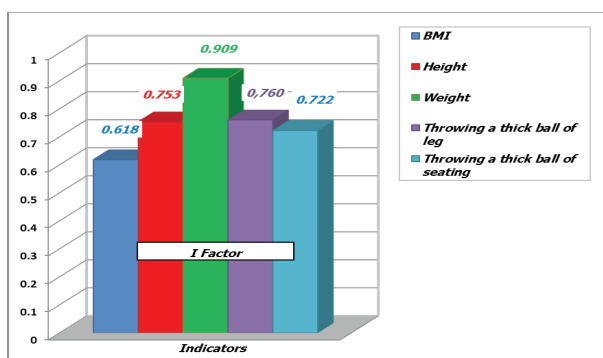


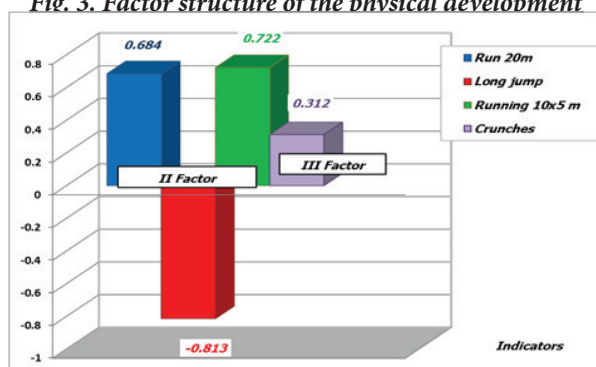
Fig. 2. Factor structure of the physical development and physical capacity of students of IV course at NSA

The second factor in the factor structure of physical development and physical capacity of students is determined by three main indicators, which explain a high percentage of the initial dispersion of the phenomenon under study (19.78%). The indi-

cators that determine this factor are related to the students' physical training. In the study, the excellent speed and speed-power capabilities are a prerequisite for higher achievements in 20m running, 10x5m running and 2-leg-length jump from position. (fig. 3).

The third factor in the factor structure of the physical development and physical capacity of the students is determined by one indicator which, however, explains a high percentage – 13,49% of the initial dispersion of the phenomenon studied. This is the indicator of the speed-power abilities of abdominal and spinal muscles.

Fig. 3. Factor structure of the physical development



and physical capacity of students of IV course at NSA

Conclusions

An analysis of the results regarding the factor structure of the physical development and the physical capacity of the IV course students at NSA gives us the reasons to formulate the following conclusions:

The most important for the studied population students is the morphological factor, which shows high importance of: height-weight parameters and strength of upper limbs.

On second place about the importance of physical fitness by the studied population are: speeding and speed-power capabilities of the lower limbs.

On third place are: the speed-force abilities of abdominal and spinal muscles.

References:

Borukova M. Ivanov. I, Izsledvane dugosrochnata motivacia na studentite ot NSA. Soia, *Sport & Science*, 5/2015, 63–68 // Борукова, М., Иванов, И., Изследване дългосрочната мотивация на студентите от НСА, София, *Sport & Science*, 5/2015, 63–68

- Borukova M. „Factor structure and basic factors of the physical development and the specific workability of growing up basketball players (12–19 years old) “.- 9th FIEP European Congress – Physical Education and Sport – Completeness for life 9–12 October 2014. Proceeding book, p.287–296.
- Gigova V. Statisticheska obrabotka i analiz na dannii. Sofia, NSA pres. 1999, 42–46. // Гигова, В., Статистическа обработка и анализ на данни, София, НСА прес, 1999, 42–46
- Iskrov V. Liderstvo povedenie na treniora i vrazkata mu sas sportnoto postijenie, Sofia. *Sport & Science*, 5/2015, 159–164 // Искров, В., Лидерското поведение на треньора и връзката му със спортното постижение, София, *Sport&Science*, 5/2015, 159–164
- Mavrudieva N. Faktorna struktura na fizicheskata godnost I sportno-tehnicheskite umenia na uchenici ot VI klas na SOU. *Sport I nauka, izvanreden broi 4/2008*, s. 173–183. // Маврудиева, Н., Факторна структура на физическата годност и спортно-техническите умения на ученици от VI клас на СОУ. В “Спорт и наука”. Извѣнр. Брой 4/2008, с. 173–183.
- Hristova V. Izsledvane na motivacionnata aktivnost na studentite ot NSA “V. Levski” specialnost “Kinesiterapia” kum uchebnata disciplina sitting volleyball. Sofia, Sport & Science, 5/2015, 164–169. // Христова, В., Изследване на мотивационната активност на студентите от НСА “В. Левски” специалност „Кинезитерапия“ към учебната дисциплина sitting volleyball, София, *Sport&science*, 5/2015, 164–169.
- Jim Loehr & Tony Schwartz, The Making of a Corporate Athlete, Harvard Business Review, <https://hbr.org/2001/01/the-making-of-a-corporate-athlete>

POSITIVE AND NEGATIVE CHARACTERISTICS OF THE WESTERN THEORIES FOR MOVEMENT LEARNING

Boyanka Peneva, Vladimir Chernev, Ljubomir Borisov

Summary

Human knowledge is in a process of a constant development. Nowadays in the scientific space two tendencies can be seen. Firstly, theory and practice are in a constant contradiction. The existing theories do not correspond to the new data from the practice and the experience. Secondly, in the age of the enormous information due to the new electronic technologies scientists can come in a touch with the concepts of their colleagues dealing with the same problems in the scientific space but living thousands kilometers away from them. New ideas emerge on the base of the exchanged information. Comparisons can be done and are done. In the sphere of movement learning worldwide three main tracks are outlined.

- *Western theories – written mainly in English.*
- *Eastern theories of Russia (the former Soviet Union countries) and the former socialist countries – written mainly in Russian.*
- *Eastern theories of Tibet, China, Japan, etc. whose knowledge in the sphere of movement learning as a whole is still not well overspread in the Western world.*

Our study is with address the Western theories for movement learning whose pick nowadays are supposed to be (1) The schema-theory of Richard A. Schmidt (1975) & (2) The movement notation principles of Rudolf Laban (1956).

Key Words: movement learning, schema theory, variability in motor skill education

Introduction

Movement learning is of interest to people from the dawn of humanity. In the times of globalization and high level of information spreading all over the world, scientists of different spheres fall in the situation (1) to pick out new data, standpoints, ideas, etc. (2) to compare the different views and to outline the knowledge on a higher level. With the spreading of Internet and the predominant use of the English language in its publications in front of the specialists in the field of physical education of children arise the opportunity to get acquainted with the work in movement learning of their colleagues in other countries, with the different theories that exist in this field as well.

Methods

In the study are used the following methods:

- Research on scientific literature – Internet information is used too.
- Comparative analyses
- Generalization

Results

Purpose of the study is to reveal the positive and the negative characteristics of the most known and

recognized Western theories for movement education. On this base a comparison to be done with the theories in this attitude that are in use in Bulgaria.

Still in 1956, Rudolf Laban formulated on the base of his experience in dance teaching the movement notation principles (R. Laban, 1956).

1. Awareness of body
2. Awareness of space – space harmony
3. Awareness of effort
4. Relationships

Unfortunately, these principles for a long time remained unknown for the physical education and sports specialists in Bulgaria.

The retrospective analysis of the Western theories for movement education shows that their aim is to reach highest accession to the functions of the motor control mechanisms. The assumption is that the clearness of this problem will lead to effectiveness in the rule of movements and higher results in the methods of education. Regardless of the schematic representation of the views in these theories, the Western authors reach to the idea for variability of practice in motor skill education.

Four main theories for movement education are more famous in the Western scientific space. With the advance of insight of matters, betterment of the comprehension on the problem is established.

- (A) The theory of E. C. Poulton – the year is 1957 (T. McMorris, 2004)
- (B) The memory-drum theory of Henry & Rogers from 1960 (J. G. Anson, 1982).
- (C) The closed-loop theory of motor learning of Jack A. Adams from 1971 (J. A. Adams, 1971, 1976, 1987).
- (D) The schema-theory of Richard A. Schmidt – the year is 1975 (R. A. Schmidt, 1975).

The theory of E. C. Poulton (1957) is characterized with the use for the first time of the terms *closed* and *opened* in the skill acquisition. In it it is spoken about opened skills and closed skills.

The memory-drum theory of Henry & Rogers (1960) presumes response of the memory to every movement. This theory is the first one that explains the mechanism for motor implementation with central stored inborn programmes. According to Henry & Rogers every movement demands its own motor programme. Here can be seen the imperfection of this theory. Own motor programme for every movement predicates enormous capacity for storage as the person can move his muscles in many ways. Such enormous capacity is not available and then comes the question “Maybe the mental notion of the movements is organized in more economic way” (J. G. Ansons, 1982).

The closed-loop theory of motor learning of Jack Adams (1971) is precondition for the nascency of the schema-theory of Richard Schmidt. This is the theory that nowadays dominates in the Western countries (Germany, USA, France, Canada, etc.). It is accepted that this theory most correctly explains the mechanism for motor skill acquisition.

Let us say some more words about the closed-loop theory of Jack Adams. Helfried Albrecht & Klaus Fischer (1988) in their article “The contribution of schema theory of motor learning to research in motor performance” (1988) connect the nascency of Jack Adams theory as a result of the influence of cybernetics. In the same time, they define thid theory as concurrent to the theories of Nikolai Aleksandrovich Bernstein (1896–1966) and Peter Kuzmich Anohin (1898–1974). The following remarks

may be done here:

1. The theory of Nikolai Aleksandrovich Bernstein is published in 1947.
2. Even in these early times though slighgtly slower than today good and correct knowledge is spread in the world for better realization in the practice.

According to the closed-loop theory for skill acquisition (1) memory trace selects and initiates given movement plan, (2) perceptual trace compares movement in progress with correct memory of the movement, (3) practice reduces the error.

The closed-loop theory has some deficiencies. The main disadvantages are that it (1) requires feedback, (2) more feedback does not always improve performance, (3) is difficult to be applied to complex movements. Jack Adams built his theory on the base of the slow movements and this reduces its validity. However, Jack Adams'closed-loop theory is an important leap forward in movement learning research.

The schema-theory of Richard A. Schmidt (1975) suggests in opposition to closed-loop theories that a motor programme contains general rules to be used to different environments or situational content via the involvement of open-loop control process and generalized motor programme (GMP). So, when learning novel movements an individual may generate a new GMP based on the selection of parameters or refine an existing GMP (reducing the storage problem that exists in the closed-loop theories), depending on prior experience with movement and task content. The GMP is thought to contain an abstract representation for a class of movements with invariant features pertaining to the order of events (R. A. Schmidt & T. D. Lee, 2005).

According to R. A. Schmidt, four things are stored in memory after an individual generates a GMP.

1. The initial conditions of the movement, such as the proprioceptive information of the body.
2. The response specifications for the motor programme (the parameters used in the GMP, such as speed and force).
3. The sensory consequences of the response, which contains information about the movement felt/looked.
4. The outcome of that movement, which contains information of the actual outcome of the movement with knowledge of results.

All this information is stored in components of the motor response schema, which includes the *recall schema* and *recognition schema*. Throughout a movement, the recognition schema is compared to the expected sensory information (proprioceptive and exteroceptive) from the ongoing movement to evaluate the efficiency of the response.

The Richard Schmidt's schema theory illustrates that movement learning consists of continuous processes that update the recall and recognition schemas with each movement that is done (R. A. Schmidt, 2003).

In his research work Richard Schmidt pays great attention to the variability of practice as hypothesis. "The hypothesis claims that variable practice is more effective for schema development than constant practice. The empirical foundation of the variability prediction is evaluated on the basis of 63 relevant studies (mainly journal articles and dissertations), reporting 73 different experiments and covering 12 years of empirical research (from 1975 through 1987) (J. H. Van Rossum, 1990).

The variability of practice is position affirmed by Nikolai A. Bernstein in 1947 (H. A. Бернштейн, 1947), later introduced in Bulgaria by M. Бъчваров/M. Bachvarov in 1982 as diversity of the specialized training (M. Бъчваров, 1982).

Conclusions

The Western and the Eastern specialists (Russia / the former Soviet Union countries and the former socialist countries) in physical education and sports since the 40-ies of XX century have done observations and conclusion in the sphere of movement education and the acquisitions of motor skills. As the truth is one the two streams in their independent way reached to the conception about the variability of practice in motor skill education.

In the Western theories prevails the schematic representation.

References

- БЕРНШТЕЙН, Н.А. О построении движения, М., 1947 Ново издание на руски език през 2012 г./New edition in Russian in 2012 – ISBN978-5-458-24996-6
- БЪЧВАРОВ, М. Разнообразие на специализираната тренировка", С., „Медицина и физкултура”, 1982. (in Bulgarian)
- ADAMS, J. A. (1971) A closed-loop theory of motor learning. *Journal of Motor Behaviour*, v.3, 111-149.
- ADAMS, J.A. (1976) Issues for a closed-loop theory of motor learning. In G.L. Stelmach (Ed.) *Motor control: Issues and trends*, New York, Academic Press.
- ADAMS, J.A. (1987) Historical Review and Appraisal of Research on the Learning, Retention, and Transfer of Human Motor Skills, *Psychological Bulletin*, Vol. 101, N1, 41-74.
- ALBRECHT, H., & FISHER, K. The Contribution of Schema Theory of Motor Learning to Research in Motor Performance, *International Journal of Physical Education*, 3, 1988.
- ANSON, J.G. (1982) Memory drum theory: alternative tests and explanations for the complexity effects on simple reaction time, *Journal of Motor Behaviour*, Sep. 14 (3):228-246.
- BERNSTEIN, N. (1967) *The Coordination and Regulation of Movements*, Oxford, Pergamon.
- LABAN, R. (1956) *Principles of Dance & Movement Notation*, London.
- McMORRIS, T. (2004) *Acquisition & Performance of Sports Skills*, John Wiley & Sons Ltd., Atrium, Southern Gate, Chichester, West Sussex PO 19, England.
- SCHMIDT, R.A. (1975) A schema theory of discrete motor-skill learning, *Psychological review* 1975, 82, 225-260.
- SCHMIDT, R.A. (2003) Motor schema theory after 27 years: Reflections and implications for a new theory. *Research Quarterly for Exercise and Sport*, 74, 366-375.
- SCHMIDT, R.A. & LEE, TIMOTHY DONALD (2005) *Motor control and learning: a behavioral emphasis*, Champaign, IL: Human Kinetics. ISBN978-0-7360-4258-1. OCLC265658315.
- VAN ROSSUM, J.H. Schmidt's schema theory: the empirical base of the variability of practice hypothesis: A critical analysis, *Human Movement Science*, Volume 9, Issue 3-5, September 1990, Pages 387-435.

DETERMINING CRITERIA FOR EVALUATING THE EFFICIENCY OF THE EDUCATION IN A DISTANCE LEARNING PLATFORM

Milena Kuleva

National Sports Academy "Vassil Levski", Sofia, Bulgaria

Summary: *In the modern conditions of continuous educational process, the nature, the role, the methods and the technologies of training at universities are changing. This study aims to offer objective criteria for evaluating the efficiency of the distance learning process of sports specialists through a distance learning platform.*

Key words: evaluation criteria, efficiency, distance education, e-learning platform

Introduction: In order to evaluate the efficiency of the eLearning, a number of models have been developed that cover a wide range of indicators such as: return of the investments, organization of the learning process, interests of the parties involved in the process and learning outcomes. (Scriven, 1991) (Holton, 1996) (Yonjoo Cho, 2009) (Khan, 2005) (Rosenberg, 2001) (Schreurs, 2008). In 1954, Kirpatrick created a model for assessing the efficiency of the education, which is one of the most widely used models today. Initially, the model was created to assess the efficiency of the staff training for the business, and today it is successfully used to evaluate non-traditional forms of training. The model has 4 levels of evaluation.

Another widely used model for evaluating the efficiency of eLearning is CIPP (Context input process product evaluation). Key areas in the evaluation of the training effectiveness are measurement and analysis of the indicators "effectiveness, efficiency and relevance of education. "The CIPP model uses "critical" indicators to measure the efficiency of eLearning. It contributes, on the one hand, to the continuous improvement of the educational process and, on the other hand, proves the value of the training of the interested parties.

Another model that is important to mention is that of Khan (Khan, 2005). He developed a model to assess the effectiveness of eLearning program, which is based on two dimensions. In the first dimension, he focuses on the elements of the process of e-learning – people, materials, processes and products of the training.

The second dimension is related to the e-learning process itself – its design, support for the educational process and the delivery of e-courses. (Eva García, 2012)

We believed, that none of the examined models was suitable for the evaluation of the effectiveness of the distance learning in the National Sport Academy "Vassil Levski" and therefore, we have set the aim to offer objective criteria for assessment the effectiveness of the distance learning process.

Methodology: Based on the analysis of the foreign experience, as well as the detailed analysis of the existing evaluation models and the main components of the education in the NSA online platform, we developed a questionnaire with indicators assessing the effectiveness of the eLearning platform of NSA. (Osika E., 2005) (Piccoli G., 2001). The research was done among 45 lecturers – involved as experts in the evaluation and ranking criteria for efficient learning. We used Variation analysis, Comparative t-criterion of Student ($Pt \geq 95\%$), and Frequency analysis. The calculated sum of the frequencies was multiplied by the corresponding weight factor (3, 2 or 1), depending on the ranking order of the proposed indicators. (Levy, 2006)

The results were processed with variance analysis, which allowed us to determine the average scores of the experts for each of the defining indicators, as well as the dispersion around them of the individual cases. It should be noted that Asymmetry (As) and Excision (Ex) calculations, in general, are within the normal range, which is evidence of a normal distribution. This allows us to make accurate analyzes and generalizations. (Гигова, 1999) (Гигова, 2002)

Results: The analysis of Table1 shows, that as a result of the observed differences of the experts' opinions, the dispersion of the individual estimates around the average for each indicator is relatively stable. The only exception occurred in the 10th indicator. This area of dispersion is the widest ($V10 = 34,67\%$).

Table 1.
Average values and variability of the estimates on the surveyed indicators

N ^o	Indicators	X	S	V	min	max
1.	<i>Students' satisfaction with the learning process in platform</i>	8,20	1,41	17,17	5	10
2.	<i>Usefulness of the acquired knowledge according to the students</i>	8,40	1,62	19,23	4	10
3.	<i>Practicality of the material</i>	7,67	2,23	29,03	3	10
4.	<i>Topicality of the study material</i>	9,20	1,31	14,21	4	10
5.	<i>Quality of teaching</i>	8,69	1,50	17,32	5	10
6.	<i>Presentation of educational materials in the platform</i>	8,84	1,40	15,80	5	10
7.	<i>Online communication between student and lecturer</i>	8,76	1,57	17,92	4	10
8.	<i>Accessibility of the learning materials and resources</i>	8,91	1,44	16,20	5	10
9.	<i>Activity of the students in the platform</i>	7,98	1,47	18,42	4	10
10.	<i>Attrition from the learning process</i>	5,98	2,07	34,67	2	9
11.	<i>Interest in learning</i>	8,16	1,54	18,84	4	10
12.	<i>Students' success (final mark)</i>	8,00	1,49	18,66	4	10
13.	<i>Flexibility of the learning</i>	8,53	1,50	17,60	4	10
14.	<i>Theoretical orientation of the material</i>	8,13	1,70	20,90	4	10
15.	<i>Convenient virtual environment (platform)</i>	8,89	1,48	16,66	5	10

It was also observed that there are serious differences in terms of 3rd indicator. However, the value of the coefficient of variation V ($V3 = 29,03\%$) enables us to assume that this indicator is relatively stable, the group of the investigated experts – relatively homogeneous, about the possibilities of the online learning to provide a high practical orientation of the study material. In the analysis of the Table 1, it is also noteworthy that the average scores on the determined indicators vary between 9.20 points (at the 4th indicator – “Topicality of the

study material”) and 5.98 points (for the 10th indicator – “Attrition from learning process”). It is also observed that the relative shares of the obtained maximal scores are of the highest value (10 points) for the 4th, 8th and 15th indicators, these are “Topicality of the study material”, “Accessibility of the learning materials and resources” and „Convenient virtual environment (platform)”.

This fact, in general, is also confirmed by the ranking of the indicators proposed by us (Table 2).

*Frequency analysis results multiplied by weight ratios
(according to surveyed experts)*

Indicator N ^o	Arrangement	Points	Frequency of indicators placed at I place	Frequency of indicators placed at II place	Frequency of indicators placed at III place
1.	12	8	1	2	1
2.	7	20	5	1	3
3.	9	17	2	4	3
4.	1	36	7	6	3
5.	2	26	7	1	3
6.	3	26	4	5	4
7.	8	20	1	6	7
8.	4	24	2	7	4
9.	11	13	1	3	4
10.	15	3	1	-	-
11.	10	16	2	2	6
12.	14	6	1	1	1
13.	5	23	4	3	3
14.	13	7	1	2	-
15.	6	22	5	2	3

The analysis of the table shows that the 10th indicator has received lowest number of points (3 points) which is related to the possibility of students' attrition from the learning process. Such low ratings on this indicator is something unexpected, because in

the literature that we study, it is proven that the attrition of the learners who study through electronic (online) form is most often due to the poor communication between the teacher and the learner and the inadequate communication between the

learners themselves, which directly affects their motivation to learn and the degree of satisfaction with the work done (Cobb, 2012). Moreover, the use of distance studies platforms and different web based courses offer an innovative teaching method which increases students' participation motivation and enhances their interest towards the particular subject (Doncheva, 2015).

The 12th and 14th indicators have also received lower ratings (respectively 6 and 7 p.). This gives us reason to believe that some experts do not attach great importance to indicators such as the theoretical orientation of the materials and the final grade on the module, regarding the possibilities of online learning.

The analysis of the results from the study of the opinion of the experts, involved in the study, makes it possible to propose a theoretical model for evaluating the effectiveness of the learning process (Кулева, 2016), through the web-based platform, which corresponds to the needs of the NSA "Vassil Levski" (Table 3).

Theoretical model to assess the effectiveness of the learning process according to the web-based platform of NSA "Vassil Levski"

Nº	Indicator Nº	Name of the indicator
1.	4	Topicality of the study material
2.	5	Quality of teaching
3.	6	Presentation of educational materials in the platform
4.	8	Accessibility of the learning materials and resources
5.	13	Flexibility of the learning
6.	15	Convenient virtual environment (platform)
7.	2	Usefulness of the acquired knowledge according to the students
8.	7	Online communication between student and lecturer

Discussion and conclusion: The efficiency indicators provide a basis for assessing the quantitative efficiency of the system. The experts most probably do not consider that students' dropping out of the educational process is related to the efficiency of the education itself, but rather to other personal reasons. We believe that students' dropping out of the learning process is most often due to both

poor communications between the lecturer and the learner and insufficient communication between the learners themselves that directly affects their motivation to learn and the level of satisfaction with the work done. The analyses made enable us to propose a theoretical model for evaluating the efficiency of the educational process, which would meet the needs of NSA "V. Levski".

The effectiveness of the learning process, according to experts, is mostly determined by the platform's capabilities to ensure the relevance of learning material, accessibility to learning materials and resources, and a user-friendly virtual environment (platform).

There are significant differences in expert judgment regarding the relevance of the learning material that can be provided through the web-based platform and the opportunities for attrition from the learning process of students which are taught through this platform.

We believe that it is necessary in the future to trace the question of attrition from the learning process by examining the possible reasons for this, both in attendance education and in distance (online) learning.

We are sure that the platform provides opportunity for highly efficient preparation for the theoretical subjects. The skillful combination between the different forms of education will undoubtedly raise the quality of the education process in all universities, including the National Sports Academy.

References

- Cobb, T. P., 2012. NETWORKED LEARNING: EVALUATING THE EFFECTIVENESS OF DISTANCE EDUCATION IN COMPARISON TO TRADITIONAL EDUCATION. Dissertation.. s.l.: Louisiana State University: Louisiana State University.
- Eva García, A. G.-C. M. K., 2012. Analysis of standards and specifications of quality and accessibility in e-learning. Loja (Ecuador), Actas del IV Congreso Internacional ATICA 2012.
- Holton, E. F., 1996. The flawed four level evaluation model.. 1 ed.s.l.: Human Resource Development.
- Khan, B., 2005. Managing E-learning: Design, delivery, implementation and evaluation.. 1 ed. Hershey, PA: Hershey PA: Information Science Publishing..
- Levy, Y., 2006. Assessing the Value of E-Learning Systems.. 1 ed.s.l.: Science Information Publishing..
- Osika E., D. C., 2005. Concentric Model for Evaluating

- Internet-Based Distance Learning Programs.. s.l., 18th Annual Conference on Distance Teaching and Learning.
- Piccoli G., R. A. B. I., 2001. „Web-based virtual learning environments: A research framework and a preliminary assessment of effectiveness in basic IT skills training.. MIS Quarterly, December, pp. 401–426.
- Rosenberg, M. J., 2001. E-learning: Strategies for delivering knowledge in the digital age.. 1 ed. New York: McGraw Hill.
- Schreurs, J., 2008. TQM in e-learning: A Self-Assessment Model and Questionnaire.. s.l.: Institute of Information Theories and Applications FOI ITHEA.
- Scriven, M., 1991. Beyond formative and summative evaluation.. 1 ed. Chicago: University of Chicago Press.
- Yonjoo Cho, S. P. C.-W. J. S. J. J. D. H. L., 2009. Developing an Integrated Evaluation Framework for E-Learning. Long Beach, USA: s.n.
- Гигова, В., 1999. Статистическа обработка и анализ на данните със SPSS. 6.1. Базова статистика.. София: НСА.
- Гигова, В., 2002. Статистическа обработка и анализ на данни – учебно помагало.. София: НСА.
- Кулева, М., 2016. Управление на интерактивна платформа за обучение на специализирани спортни кадри. DISSERTATION.. София: s.n.

**SPORTS MANAGEMENT, INTEGRITY OF
SPORT, GOOD GOVERNANCE, LEGAL
ISSUES AND VOLUNTEERING**

INTEGRITY OF SPORT, GOOD GOVERNANCE, LEGAL ISSUES

Vasil Iliev Dimitrov

Summary

Introduction: The aim of the present study is to review and analyze the normative framework of the sport that concerns the citizen as a natural person of law, as well as some aspects of counteracting discrimination in sport. The increasing specialization of the legal sports regulation at the national and international level leads to the constant development and improvement of sport law as a science and its increasing significance. All major governance sports issues ultimately seek their legal decision. Sport law covers an increasing range of public relations. From leisure time sport to professional sport. Sport law is implemented as a sub-sector of civil law with its specificity. This is because citizens are the main subject of sports law. The right to sport is one of the fundamental rights of modern civil society. The methodology used is an analysis of normative sources – internal and international, case-law dealing with the issues under consideration. The results analyzed are the state as a subject of sports law, legal entities in sport as subjects of civil law, as well as the requirements for legal certainty in sport and civil relations. Discussions – discussed issues such as the new law on physical education and sport and the measures taken against hooliganism in sport. **Conclusion:** A leading idea is the value of sport law as a regulator and its main and ultimate aim is to strive and bring sporting relationships to the same degree as between them but also to the other leading public relations under conditions of public regulation.

Key words: public regulation, sport law.

Introduction

The principles of the civil law include the main ideas and rules which effect either in civil law, or in sports law.

The sports activity is aimed to achieve the score corresponding to the established sports functions when its result is targeted to meet the needs of others subjects then we talk about the supply of product which is used by the subjects in society and not for personal needs.

For sport law as a branch of civil law the following principles are characteristic:

Autonomy of sports-civil legal entities and freedom for their participation in civil legal life. This principle is very widely used in sport.

Justice and fair-play in sports relations. The principle means protection and defense which are included in the rules of the sport and civil law interests, seeking a maximum matching the interests of individuals.

The research hypothesis suggests that by analyzing the international and local regulations will reveal opportunities for improving the functioning of the system of the sport.

The aim of the research is to analyze the sports law as a branch of civil law and to position the athlete in public legal relations.

Tasks: to develop the theoretical foundations of the problem. To analyse the systematical structure's conformity of the sport of modern management model.

Methodology

The methodology of the study includes analysis of normative sources relevant to the topics. Comparative analysis of the American model of professional sports and the European model of sport.

Results

First type are the sports services, independently which of the five functions educational, healthy, social and recreational have been completed by them. In their implementation and in accordance

with art. 6 of the Physical Education and Sport Law the people who offer the service must possess two qualities – competence and qualifications (eg. Law of Physical education and Sport, 1996).

Legal capacity is guaranteed legal opportunity to practice a particular profession. Without the presence of this legal competence no one may offer sports activities, such as training and rehabilitation activities. And all other forms of sports services.

Equality of subjects of civil law. This principle suggests that the norms of civil law must treat equally civil subjects, by providing them with equal opportunities to acquire the rights for their implementation and for their participation in civil legal life. This principle in relation to individuals is fixed in article 6 of the Constitution, which states for equal legal capacity for all persons and prohibits both the privileges and limitations. When there has been a selection procedure for a member of the Board of Directors in sports organization anyone can be nominated and, accordingly, if he/she satisfies the requirements to be elected (eg. Constitution of Republic of Bulgaria, 1991).

Requirement of legal certainty at sports and civil legal relations is of very great importance to the interests of all participants in the public interest. A great number of legal norms and civil law institutes are dominated by this requirement (eg. Gorder, 2005). Basic, primary subject of sports relations is the citizen as an individual. This is determined because the sport as an activity exists to educate the individual, and to provide opportunities for its implementation through various organizational forms. Personality's quality is made of three elements:

The individual legal capacity appears since the moment of birth. In individual cases, the public interest requires individuals to be restricted in their capacity. It is only allowed if it is pre-arranged in a normative act;

Liability as a subject's right cannot be restricted by a treaty, refusal or unilateral will. It is recognized and guaranteed by the State with the advent of adulthood. Efficiency means making legitimate actions, while in the act of wrongdoing, the ability to act is the responsibility of their actions. Depending on the age of the individuals and the degree of legal capacity there are the following groups: minors – up

to 14 years of age – completely incapacitated; Minors – from 14 to 18 years of age – limited ability; adults – over 18 years of age – full legal capacity;

Age eighteen is legally a fact that automatically provide the capacity of doing legal actions. As an example we can cite the contracts for transfer in sport. Sports relations and their legal regulations mostly occur in professional sports. Of interest are two main models governing profession and athletes and coaches involved in sports and other professions that are directly or indirectly dependent on sport.

Discussion

Many authors have examined sports activities selectively and have showed different sports: cycling (eg. Kolev, 2012), equestrian (eg. Vulev, 2016), boxing (eg. Lefterov, Ilinova, 2013), medicine (eg. Valtchev, et al., 2014), management (eg. Dimitrov, 2016; Slavchev, 2012; Slavova, 2016).

American model of professional sports – has been developed on the basis of norms inherent strained right. Leagues (associations or councils) are the main structural units in professional sport, which in turn participate in a very specific type of so-called sports entertainment business. The biggest difficulties are encountered in governing employment legal relationships between leagues, clubs and players. The system of legal regulations has been shown in a few key points – the team and the players in it, keeping the players in clubs, solutions to disputes between the owners of teams and players, transfers of players.

European model of sport – the main characteristic of professional sports is the presence of numerous national legislations and laws adopted for sport or departments governing professional sport in Austria, Spain, Italy, Portugal, Bulgaria, and France. After the creation of the Council of Europe all international sports organizations, including UEFA actively cooperate in the field of legal regulation in sport. Sports activities in many countries in Europe have been predetermined by the content of the European Sports Charter and „Code of Sports Ethics“ of 1992 and other acts of recommendatory nature (eg. European sports chart, Council of Europe, 1992).

Institutionalization of sports activities – based on cultural norm for fair play and definitely expected behavior of participants in sports competition as

well as sanctions for violations of the rules on the basis of mutual consent is the essence of institutionalization of sports activities (eg. Dimitrova, 2017). In the process of adjustment of various sports statutes and regulations to the current legislation often some contradictions between the statutes of international sports organizations and national laws appeared. Collision is sometimes a conflict with substantial parts or all of law norms, and to overcome these contradictions it must be applied interpretative process. When there is a contradiction between public law which is an enactment of the state – and act of the sports organization, it is governed by a public rule. Sports law implement regulations in the sphere of social, economic and trade relations. There are also sports rules regulating the activities of all major subjects:

1. Citizen as a physical entity law.
2. Organizations of citizens as legal entities law (NGOs TD).

Forms of internal association in Bulgaria. In Bulgaria there are all internationally recognized forms of internal association as club, federation, national sport organization and BOC.

Legal entities law in sports, as subjects of civil rights law creates the legal entity law and determine in which case there may be a legal entity law.

The main features that characterize legal entity law in general and in sport are:

- organizational structure;
- separate property;
- individual responsibility;
- legal entity law is a subject to civil law.

Types of legal entities law:

1.1. Legal entities public law – are those that are created by law or administrative act and implement state or local government functions and tasks;

1.2. Legal entities private law – are created voluntarily and perform tasks set by their founders. In turn they have to be divided into: entities commercial law and legal entities civil law. Depending on the type of ownership of legal entities law are – state, municipal, private. Legal entities civil law are non-profit organizations. Their main activity is scientific, sports, and other. Their business is limited.

Legal non-profit associations

A. arise in legally – control system, natural or legal entities law demonstrated commitment to creating specific association to approve the statutes and determine which individuals should be included in its bodies.

B. Foundations are non-profit organizations with common objectives that have membership composition. The Foundation is a legal entity law which is formed voluntarily by civil entities law that are not its members. They provide resources for its activities, define the objectives and the authorities who will carry out (eg. Law of non-profit legal entities law, 2001).

The state as a subject of civil law has equal rights as other civil entities law. The state has no legal personality and is a kind of entity with special legal status in civil law. As a subject of civil law the state is a property that is associated with it and state authorities, who on its behalf may carry out legal actions with consequences in civil law. The state, through its state institutions appears as a subject of civil law. The state institutions are non-profit organizations and carried out in the interests of a wide range of people according to national interest. Their maintenance is mainly at the expense of the state budget. They carry out their duties in different areas of social life – government (eg. Draker, 2001). The state is a particular subject of sports law who through its legislative, executive and judicial organs, regulates and supervises the activities of sports organizations. In this sense it is the most influential entity sports law (eg. Naidenov, 2011). Inspectorate of a Law on Physical Education and Sports is a specialized control body directly subordinate to the Minister (eg. Law of Physical education and Sport, 2016). The Inspectorate shall perform the following functions:

1. Provides current and subsequent control over the activities of sports organizations funded by the ministry, and for lawful and proper expenditure of funds;
2. supervise the activities of sports organizations and individuals offering sports services public.

PENALTY PROVISIONS Settled in accordance ZFVS Chapter Thirteen. Art. 65. (SJ. 53 of 2000) Art. 67. (New SJ issue, No. 53 of 2000, amended. SJ issue, No. 87 of 2012, effective 11.09.2012) (1). Violations of anti-doping rules constitute governed by (Art. 68 (new-SJ. 53 of 2000, SJ. 50 of 2010) Art. 69. (new-SJ. 53 of 2000, SJ. 50 of 2010) (1) (eg. Law of Physical education and Sport, 2016).

Conclusion

It is urgent to adopt new Law on Physical education and Sport, whose project law was debated repeatedly in order to include contemporary social relations and create conditions for a functioning sport system. However, it is necessary to create greater competitiveness in sport, which will lead to more public interest and will draw more money for sports.

There are significant gaps in the regulatory system for creation and realization of sports products, like sport services and especially the intellectual property that is implemented by three basic legal forms, such as social, business or commercial activity. These methods require three separate regulations concerning the financing of sport.

References

- Vulev, J. (2016), „Assessment of tests in dressage discipline in equestrian sport“, Sport and science, issue 3, p. 19.
- Vultchev, V., Nikolova, M., Rankov, K., Alexieva, D. (2014), „Study on frequency of inguinal epidermopathy and tinea pedis of athletes“, For some actual problems of physical education and sport, Coll. NSA „Vassil Levski“, Sofia., p. 98.
- Gorder, J. (2005), The world of Sophie, Ed. „Damjan Jakov“, Sofia.
- Dimitrov, D. (2016), „Actuality of students' sport system in Republic of Bulgaria after 1999“, volume 55, book 8.2, p.71.
- Dimitrova, A. (2017), Sport sociology, NSA PRESS, Sofia, p. 128.
- Draker, P. (2001), Management practice, Ed. „Classics and style“, Sofia.
- European sports chart, Council of Europe, (1992), available at: <http://www.coe.int/DefaultEN.asp> (accessed 16 May 2017).
- Law of Physical education and Sport. In SJ. issue 58/9 July 1996, № 61/11.08.2015, in force of 1.11.2015, № 79/13.10.2015, in force of 1.08.2016, № 101/22.12.2015, № 43/7.06.2016.
- Law of non-profit legal entities law. In force from 01.01.2001. SJ. № 81/6 October 2000 and SJ. № 103/27 December 2016.
- Code of sports ethics, Council of Europe (1992), available at: <http://www.consilium.europa.eu/bg/council-eu/> (accessed 3 April 2017).
- Constitution of Republic of Bulgaria (In: SJ, № 56/13.07.1991, in force from 13.07.1991, and № 85/26.09.2003, SJ. № 18/25.02.2005, № 27/31.03.2006, № 78/26.09.2006 – Decision № 7 of Constitutional Court 2006, № 12/6.02.2007, and SJ. № 100/18 December 2015)
- Kolev, I. (2012), System of sport selection of cyclers, NSA PRESS, Sofia.
- Lefterov, E., Ilinova, B. (2013), „Nutrition and weight control in boxing“, Scientific papers University of Rouse.
- Naidenov, G. (2011), Sport Law, Ed. „Europress“, Plovdiv, p.76.
- Slavova, V. (2016), „Blended Learning a foreign language through the eyes of students from NSA „Vassil Levski“ In: Scientific University of Rouse, ie. 55, series 8.2. Physical Education and Sport.
- Slavchev, I. (2012), Management of athletics races in the Republic of Bulgaria, Unpublished doctoral dissertation, National Sports Academy, Sofia.
- Vasil Dimitrov, Chief Assist. PhD, Sofia 1700, Bulgaria, Studentski grad, NSA „Vassil Levski“, Department of „Management and Sports History“, sector „Sports Management“, Studentski Grad, www.nsa.bg GSM: +3590892299705. e-mail: Vasil1331@abv.bg

UEFA CRITERIA AND CLUB MANAGEMENT

Serdar SAMUR

ABSTRACT

After the 1990's, the changes in the football world had helped to develop and to grow the economy of football rapidly. The development of digital broadcasting led to build a bigger commercial structure. With the effect of those changes, commercial incomes, sponsor revenues, stadium and facilities incomes, and betting incomes have increased over time. This rapid change also brings several problems.

UEFA has published UEFA criteria in order to protect football's sustainability and viability in a long term. Depending on license criteria that is published by UEFA, it has used a road map for football clubs, regarding of corporate structure of UEFA to work, that identified the general rules like in a company structure and management that should be all the necessary factors of production in a systematic and effective way in order to transform football clubs to a corporate organization and make them sustainable.

Football clubs are determinedly founded and play an important role in the improvement of football player. However, few resources are available for those responsible for organizing, developing, and managing club sports.

With this out of the common guide explains readers how to run a club in today's demanding, high competitive and high-tech environment and, establish its brand, and bring in the revenue required to ensure long-term success. Those who manage and lead clubs will find that they can improve a successful business plan of their club mission and have the instruments to develop and sustain organizations that are feasible and financially wealthy and that satisfy the needs of footballer and those who support them.

Key words: UEFA Criteria, Sports Management, Football, Success, Football Player

Introduction

As a global phenomenon, sport is spreading depending on the socio-economic conditions of societies, on the other hand, it is also beginning to show itself economically as much as in sport industry.

Some issues in sports due to paying astronomical transfer fees to athletes, appearing world clubs in global stage, following sport organizations by millions of people, advertising and sponsorship agreements, and a contribution to the country presentation help to become sport industry more important such as organization and facility investments, sport accommodations, sports fans, the broadcasting of sport organizations, food-drink industry, sport souvenirs, sports clothing, and so on. People and organizations in this industry have changed over time; clubs were converted into a business, fans and spectators were converted into a consumer. Since the beginning of the 1990's, the sport industry has seen as a profitable area and incorporation of the professional sport organizations or teams, public offering, higher ticket prices and broadcasting rights changed the Figure of the sport industry. Football is the biggest part of sport economics that has rapidly moved away from Olympics understanding and become one of commercial

branch like a tradable meta. The organizational structure of football teams, the size of incomes, the features of fans, the physical conditions of stadiums, physical and technical capacities of the players, the tactical and technical skills of coaches, written and visual media of the sport which are running to manage the dynamics of sport has been changed. The football which is the driving force of sport and being the most important part of sport industry. The football teams in the past were managed with an amateur understanding and continuously resulted in the failures. Therefore, today they need to restructure in terms of financial, legal, social, and organizational aspects.

Aim and objective of the study

UEFA criteria are determined by UEFA that these are mandatory to be applied for all professional sports club as the target audience that will be participated in the Europe Cups. UEFA criteria has been declared by UEFA as mandatory criteria since 2014. There are financial and sporting sanctions in case of failure to comply with these criteria. Although Criteria attributed so much importance they are not known exactly what kind of contributions to sports club management and sporting success.

The Primary goal of this research is conducted to identify How can be defined the effects of UEFA criteria on managing of the professional Football Clubs effectively and efficiently to provide the sporting success.

Methodology of the research

the model I present here has three components, each of which addresses a specific set of concerns: this research will be examined in accordance with *qualitative research methods*.

In qualitative research method, the *Descriptive Approach and Phenomenological* Qualitative research designs were used for the model of this research.

Discussion

Sport Management:

In sports, as in other businesses, managers determine organizational performance both on and off the playing field. Sport management programs train people for management positions in such areas as college athletics, professional teams, fitness centers, recreational centers, coaching, officiating, marketing, youth organizations, and sporting goods manufacturing and retailing. (Lussier & Kimball, 2004)

Sport management means, management of all activities that is required to fulfill all tasks within a business or organization as a performance process. (Steinmann and Schreyögg, 1997).

Human Resources Management:

Every team and organization is only as good as its players and workers. Thus, the key driver of business success is human resource (HR) management practices of hiring and developing great people. Human Resources management consist of planning, attracting, developing, and retaining employees. HR practice affect firm performance, and even more important in high-growth firms. (Karl, 2006)

Organization Management:

When applying the basic principles of corporate governance, planning an organization according to the organizational goals, converting these plans into actions, and tracking the reached point that will start on a systematic process of TQM within our sport system. Competitive power of the organization in service area will be evaluated on Organizational Learning, Brand and Corporate Communications, Financial Management, Organizational

Culture and Strategic Management. (Uluslararası Spor Araştırmaları Dergisi, 2010)

An effective organization management needs someone who has management skills which compromise; technical skills, people skills, communication skills, conceptual skills, and decision-making skills. (Katz.,1974)

Organizational Learning:

Today's managers are knowledge workers, which is a change in the realm of management. (Gupta, 2005). Knowledge is a dominant source of competitive advantage (Jansen et all, 2006), because knowledge leads to creativity and innovation action. Success often comes from recognizing new opportunities through knowledge of a market, industry, or customers. (Baron, 2006). The learning organization is based on knowledge. In a learning organization, everyone understands that the world is changing rapidly and, that they must not only be aware of these changes but also adapt to the changes and, more important, be forces for change. The learning organization has a capacity to learn, adapt, and change as its environment changes to continuously increase customer value.

Brand Value and Corporate Communications:

When a sport organization is able to achieve a strong image in the consumer's mind, it realizes brand equity. According to David Aaker, a leading expert on branding, brand equity is "a set of assets and liabilities linked to a brand, its name and symbol, that add to or subtract from the value provided by a product or service to a firm and/or that firm's customers" when a team such as Manchester United is able to generate a wealth of assets linked to its brand, the team is thought to have high brand equity. This is the ultimate goal for the sport franchise manager because there are a number of benefits to having high levels of brand equity. (Trecker, 2004)

Strategic Thinking:

The strategic management process is generally thought to consist of five sequential and continuing steps (Takagawa, 1995)

- Environmental analysis
- Establishment of an organizational direction,
- Strategy formulation,
- Strategy implementation,
- Strategic Control.

Sport Facilities Management:

The value of sport in each case depends on the ways that sport is managed, and without facilities there is no sport. There are many sport management jobs related to facilities management, including facility financing, construction, facility operations, user agreements, and insurance (MacMillen, 2007), and the job of sport-facility security has increased in importance since September 11, 2001 (Appelbaum et. all, 2005). Sport management professionals often find careers in managing various type of facilities. Such these work includes managing provide health clubs, fitness centers, managing anything from indoor sporting centers to entire stadiums. Facility managers are challenged daily basis while the facility management industry continues to grow. Club managers are involved with scheduling events, arranging for transportation, managing event security, and food concessions are ready before the game time.

Sports Marketing:

Sport marketing consists of all activities designed to meet the needs and wants of sport consumers through exchange process. Sport marketing has developed two major thrusts: the marketing of sport products and services directly to consumers of sport, and the marketing of other consumer and industrial products or services through the use of sport promotions. (Mullin et. all, 2007)

The sport product is both an integrated ensemble and a bunch of components with lives of their own. At the core is the “Event Experience, composed of four components” (Mullin et. all, 2007)

Game Form, Player, Equipment and Apparel, Venue. Everything else builds on these components.

The products produced by the clubs has been expanding three areas: fan products, rights and services.

Sponsorship:

Often a company will negotiate a sponsorship or licensing agreement that designates that company as the exclusive sponsor. The benefit of this type of sponsorship is a high level of exposure without the competition and clutter of traditional advertising. In other words, sponsorship can serve as a subtler alternative to advertising; sponsorship may communicate the company’s message in a different, “new” and “less commercial” form. (Littman, 1997)

Sport and Media:

The relationship between sport and the media is not a function of public service, nor does sport provide the media with access merely to increase public awareness. Rather, the sport media nexus is driven by commercial forces. The evolution of the sport media nexus, its strength, and the global power and influence of both of its component industries, has largely been driven by money. The media coverage of sport has become the central means by which sport organizations obtain revenue, while sport has become one of the most valuable ‘properties’ for media organizations. (Nichson,2007)

UEFA Criteria and Management:

UEFA has published UEFA criteria in order to protect football’s sustainability and viability in a long term. With the introduction of such philosophy mean that:

- Enhancing the financial and economic capacities of the clubs,
- Rising their transparency and reputation,
- Fostering the institutionalization,
- Improving the management structure,
- Proving to survive through the next season with control of the annual financial, structure of the clubs,
- Increasing the clubs’ competitive power of the national and international,
- Protecting the clubs’ receivables.

Thus, it is expressed that can be obtained continuity and success in management with strengthening the economic and financial structure of the clubs, raising their *transparency and reliability*, and protecting their outstanding receivables.

It is needed to improve the quality standards with the main factors that compose the football game and that can be fulfilled under the name of *club licensing system* by means of a control mechanism.

Sports clubs operate in sports industry as a business that should be managed in the light of UEFA criteria in accordance with business general principles.

UEFA criteria are generally designed to gather some elements, Labor-money-time-material-land, together belonging to a business and that elaborated to provide its continuity.

The most important point for club’s management

is to struggle to manage the club's resources (labor, money, time etc.) more effectively.

Business Management even in a non-profit organization should be in the implementation effort for planning-organizing-leading-coordinating and controlling activities. Management function, management-finance-marketing and production cannot be sufficient for this reason additionally HR, Accounting-Public Relation-Management Style and have a system, input-process-output-feedback must be considered as a support functions.

The clubs, participated in UEFA leagues in the last 5 years were managed business principles and strategic management model because the between Club management and UEFA criteria should have a good correlation in the base of system.

In general, as being an industrial part, the football clubs for their survival that need more well-educated players, supporters, financial resources, sportive facilities, and proper management structure and organizational chart.

It is needed to bring those elements similar to production factors together like in a business in a planned and systematic way that **labor** (skilled player), **capital** (economic resource), **land** (sports facilities), and **enterprise** (club management). Because of UEFA criteria, sporting criteria refers labor, infrastructure refers land, financial criteria refer capital, Personnel and administrative criteria refer enterprise and legal criteria refers legal border of all works and sporting organization should be based on legal. So If you obey UEFA criteria exactly, you can find the good road map to success and be sustainability in your organizations.

Results

The implementation of UEFA criteria with licensing system give the sports Clubs weight to professionalism, financial stability, and reliability in effort to provide efficiency in management.

There is a positive relationship between UEFA criteria objective and functions and in Sports Club' Management.

There is a positive relationship between an Integration of UEFA Criteria in Sports Clubs and their success in the UEFA European League.

Acknowledgments

With these study UEFA criteria give information about managing a sports organization but they do not give any suggestions on how and which management styles can be used. The responsibility of management styles are given to clubs.

This study has revealed that only applying the UEFA criteria was not enough for the stability of the organization for a long time and its sports success, so those criteria need to be supported with the business principles.

For an effective club management to attain and sustain a sporting achievement, it is needed to apply completely UEFA criteria, to divide the football clubs into two main functions in terms of administrative and technic, and to identify the job descriptions of those functions, and to provide a balance of power.

Depending on license criteria that is published by UEFA, it has used a road map for football clubs, regarding of corporate structure of UEFA to work, that identified the general rules like in a company structure and management that should be all the necessary factors of production in a systematic and effective way in order to transform football clubs to a corporate organization and make them sustainable.

Applications of UEFA criteria in the way of adjusting to their own organization implied by club authorities and written textbooks of those applications will contribute to the efforts of institutionalization.

Providing professional people who are experts in executive management will also create positive contributions during the period of adaptation of UEFA criteria and stability of those criteria.

Planning/Organizing/directing and controlling which are important actions in club management as well as in business management should be highly emphasized. However, not only finance/marketing/Human Resources/Human Relations but also crises and problem solving/risk management/total quality management and relations with fans which take place in the functions of managing the business should be taken into consideration.

The club management as administration and football management should be seen as a field requiring

expertise and the executive management department should include professionals who are trained as specialists and experienced in their own field.

References

- A. Gupta, (2005) "Leadership in a Fast-Paced World: An Interview with Ken Blanchard," *Mid-American Journal of Business* 20: 7–11p.
- Bernard J. Mullin & Stephen Hardy & William A. Sutton, (2007) *Sport Marketing*, ISSN: 147–149–322–323p.
- James Trecker, (2004) "The Freddy Factor", *SSSBJ*, 10–16 May, 10;
- J.J.P. Jansen, F. A. J. Van Den Bosh, and H. W. Volberda, (2006) "Managing Potential and Realized Absorptive Capacity: how do organizational antecedents matter?," *Academy of Management Journal* 49, 999–1015p.
- J.D. MacMillen, (2007) "Sport Law: A Managerial Approach", *Journal of Sport Management*, 21: 137–138p.
- K. A. Karl, (2006) "Book and Resource Review," *Academy of Management Learning & Education* 5, 245–252p.
- M.K. Takagawa, (1995), "Turn traditional work spaces into virtual offices", *Human Resources Professional*: 11–14p.
- M. Littman, (1997), "Sponsors Take to the Court with the New Women's NBA", *Marketing News* 31 (5), 1–6p.
- M. Nicholson, 2007, "Sport and Media", *Managing the Nexus*: 84
- R. Katz, (1974), "Skills of Effective Administrator, *Harvard Business Review*", 90–102p.
- R. N. Lussier & D. C. Kimball, (2008), "Applied Sport Management Skills", 4–15p.
- R. A. Baron, (2006) "Opportunity Recognition as Pattern Recognition", *Academy of Management Perspective*, 20, 104–111p.
- S. Warfield, (2004) "Adu Mania Spurs MLS Attendance", *SSSBJ*, 8–14 November, 1, 38–39
- H. Steinmann and G. Schreyögg, (1997), "Corporate Ethics and Management Theory", 4th ed., 132
- S. H. Appelbaum, E. Adeland, and J. Harris, (2005), "Management of Sports Facilities: Stress and Terrorism since 9/11", *Management Research News*. 28 (7) 69–83p.
- Uluslararası Spor Araştırmaları Dergisi*, (2010)

Contact information

SAMUR, Serdar, PhD (Corresponding author)
 Address: 39–72 65th Street, Woodside, New York-USA
 Phone: 929 471 9527
 E-mail: ssamur_2002@yahoo.com

THE ROLE OF SPORT IN THE MODEL OF EU YOUTH POLICY

Stefka Djobova

In the last three decades the youth are in the focus of the policy makers ranging from local through national, reaching European and international level. While respecting Member States' overall responsibility for youth policy, the EU is pacing efforts to provide more and equal opportunities for young people in education and the job market. It is also trying to encourage young people to actively participate in society. Sport is one of the main tools to approach young people. Despite all the measures significant number of young people are out of school and social life. The aim of this study is to provide a systematic review of youth policy and work, to define the role of sport and to explore the effectiveness of the respected policy. Qualitative methods of research were applied including content analysis, retrospective analysis and comparative studies. Sport is recognized as a key factor for youth development. We found a growing tendency for common governance of youth and sport, as well as overlapping in the related policy. In terms of structures we observed both subject specific and combined governmental and non-governmental organizations. The existing studies are showing greater association between youth policy and sport activities. Sport activities are considered the most attractive among young Europeans. More studies are necessary to explore the capacity of the cross-sectoral and multi-level cooperation between the sport and youth policy. It is also necessary to develop new governance tools in order to enhance the role of sport in the model of EU youth policy.

Key words: sport, youth policy, youth work

Introduction

Young people are the present and the future of Europe and a rich source of dynamism in our societies. Since 1990s European youth policy development is receiving increased attention and is subject of interest of all European governments and on common EU level. It doesn't come as a surprise. Young people's human and social capital is one of Europe's greatest assets for the future. The European Union and its Member States possess a treasure in the potential of 90 million young Europeans (17,7% of the EU28 member states). Youth work is a polyvalent and multi-faceted practice. It takes place in a wide range of settings, varies from unstructured activities to fairly structured programs, reaches a diverse array of young people, touches upon many different themes and cuts across several other disciplines and practices. This versatility is one of the strengths of youth work, but at the same time it may lead to fragmentation and product vagueness (Verschelden at al, 2009). Youth work has always played a role in broader social and pedagogical strategies but in times of change there is a risk of instrumentalisation and youth work becoming a weapon for all targets. Moreover the deep social problems that many young people are facing get deeper and more serious. Based on our experience and documents data availability we consider that sport plays a central role in youth policy and work and is the most

appreciated tool for achieving multidimensional results.

Youth work as defined by Verschelden at al, (2009) is a polyvalent and multifaceted practice. It takes place in a wide range of settings, it varies from unstructured activities to fairly structured programs, it reaches a large diversity of young people, touches a lot of different themes and is on the interface with many other disciplines and practices. This versatility is one of the strengths of youth work. Young people grow up in very different situations. Youth work has the power to respond in a flexible way to this diversity. As for the youth policy Ashing (2010) stays that there is no common, accepted, definition of what youth policy is or what it includes. Each country has its own national policy and decides what is to be considered youth policy. However, he made an attempt to define youth policy as the sum of all the initiatives aimed at young citizens, everything that affects young people in any way. This could be the result of youth policy today being spread across many different sectors and the large number of actors in the area. According to Denstad (2009) The concept of national youth policy has become well established in Europe. The European institutions of the Council of Europe and the European Union have become strong advocates for the development of national policies that aim at improving the situ-

ation of young people. They are pursuing different mechanisms for encouraging their member states to undertake measures to develop cross-sectoral holistic policies that perceive young people as a resource and which actively involve young people and non-governmental youth organisations in decision making on issues that affect them.

Methodology

For the purpose of this paper young people are considered aged 15–29 based on the Eurostat methodology.

Content analysis code models by Saldana (2011) and Grounded theory analysis by Sparkes & Smith (2014) were performed to explore the historical perspective that aims to identify the close links between youth work and policy developments and the place of sport in the broader social, cultural and political developments.

To collect data for this article we searched in the following databases: EUR-Lex; Eurostat; UNECE database and Eurobarometer surveys.

Results

Many young people struggle to find quality jobs which seriously hamper their path towards independence. In spite of a decrease in most Member States after its 2013 peak, youth unemployment remains a serious concern: According to Eurostat 8.7 million young Europeans cannot find work and the proportion facing long-term unemployment or involuntary part-time work remains high. As Europe continues to age, the historical triangular age pyramid associated with an expanding population has been reshaped, with a smaller proportion of children and young people and an increased share of elderly persons.

In Coyette et al. (2015) we find statistical data confirming our hypothesis. The most popular organized activities in which young people participated were those linked to sports clubs. Over one third (35%) of respondents across the EU reported having participated in sports club activities within the past year, while the next most frequent activity was being involved in a youth club, leisure-time club or any kind of youth organization (22%). Participation rates for young people involved in local organizations aiming to improve the local community were lower (at 15%), followed by those active in cultural

organizations (14%) and non-governmental organizations (12%). A 2014 Special Eurobarometer on 'Sport and physical activity' confirmed that sports clubs were the most popular type of organization that young people joined. According to this survey, only 21% of young people in the EU aged 15 to

24 were members of a sports club; although an additional 6% of this age group were members of cultural clubs that included physical activities. The proportion of people aged 25 to 39 who were members of a sports club fell to 12%. By contrast, a majority of young people were not members of any type of club: 58% of those aged 15–24 and 70% of those aged 25–39. From the above numbers appear that a higher proportion of young people practice sports and physical activities more informally. This fact should be considered when developing future strategies and work plans. Another important aspect from this survey is that 64% prefer outdoor activities. It allows us to predict stronger future emphasis on outdoor activities which must be taken into account from our university authority.

From the EU Council resolution from 19.12.2009 in the period 2013–2015 we found that the Commission and the Member States continued working together, to improve young people's employability, their integration in the labor market, their social inclusion and participation. In the face of a growing socio-economic divide, the policy continued to tackle the deep social problems that many young people are facing. In 2016–2018, the cooperation framework for youth is aiming to empower more and more diverse young people, especially those at risk of exclusion. The target is to help them find quality jobs and participate in social life. In this most recent policy model sport plays crucial role in both – as a training tool for new skills development and powerful tool for social inclusion and socialization. There are number of instruments existing for this. EU funding under the Erasmus+ program complement the policy cooperation on youth work, volunteering and participation in democratic life. Other instruments, the European Social Fund (ESF) and the Youth Employment Initiative (YEI), are providing funding targeted at the inclusion of young people in the labor market and at developing their human capital.

The Joint report for Education and training (2015) emphasize that the urgent challenge for education

and training across the EU is to invest and modernize quickly enough to realize youth potential. Experts recommend youth policy, operating outside the classroom, because it can also help young people acquire the right mix of skills to prepare them for life and work. Here again appears the central role of sport.

According to Youth statistical portrait (2009) excessive weight and obesity among young people have been shown to be significantly associated with long-term morbidity and mortality. Physical changes during adolescence may lead to weight problems (overweight or underweight). Furthermore in follow up of researching this issue Coyette et al (2015) presents that health is the main motivation for practicing sport. This shows that health motivation is well understood and gives another reason for including sport in the focus of youth policy.

Discussion

The share of young people in Europe is relatively low and they require special attention. Sport is essential part in EU youth policy. Participation in sport activities is among the favorites of young Europeans with clear preference for outdoor sport. This indicator should be taken into account when implementing the policy and designing of local activities. The outdoor sports might be the most effective way to attract young people in social activities.

References

Ashing, I., (2010) Youth and youth policy – a Swedish perspective. Introduction to Youth Policy– Swedish and Turkish Perspectives.

Coyette, C., Fiasse, I., Johansson, A., Montaigne, F. & Strandell, H. (2015) Being young in Europe today. Eurostat, Unit B4. Luxembourg: Publications Office of the European Union.

Denstad, F., (2009). Youth policy manual – How to develop a national youth strategy. Council of Europe Publishing.

Saldana, J., (2011) The coding manual for qualitative research. London: Sage

Siurala, L. (2007). Involving Young People in Policy and Implementation Department of Youth, Integrated Youth Policy Conference 17–19 January, Rotterdam, Netherlands.

Sparkes, A. & Smith, B., (2014). Qualitative research methods in sport, exercise and health. Routledge Taylor & Francis Group

Verschelden, G., Coussée, F., Van de Walle, T. & Williamson, H. (eds.) (2009). The history of youth work in Europe and its relevance for youth policy today. Council of Europe Publishing.

Documents

Council Resolution of 27 November 2009 on a renewed framework for European cooperation in the youth field (2010–2018), OJ C311, 19.12.2009, p. 1–11.

Special Eurobarometer 412 “Sport and physical activity” (2014) Project number 2014.3314.

Education and Training 2020 Joint Report, COM(2015) 408.

Eurostat 2014 <http://ec.europa.eu/eurostat/web/products-statistical-books> (accessed on 20.08.2017)

Youth in Europe – A statistical portrait. (2009). Managed and produced by Eurostat. Luxembourg: Publications Office of the European Union.

Contact information:

Ass. Prof. Stefka Djobova, PhD

Department water sports, Sector APA

National Sports Academy, Sofia, Bulgaria

e-mail: stefka.djobova@abv.bg

ETHICS, SOCIOLOGY, SPORT STATISTICS AND ANALYSES

SOCIAL INTEGRATION OF PEOPLE WITH DISABILITIES IN THE FIELD OF SPORT

Albena Dimitrova

Modern civilized societies are based on the principles of humanism and democracy. The center of public interest is the person – a unique person with his rights and responsibilities. People are born different but with equal rights. Public attitudes towards the disabled are part of the human and social norms that characterize the free, civil society. In the value system designed to improve this category of people, physical culture and sport occupy a definite and essential place. Activities with adapted physical activity contribute significantly to speeding up the recreational and integration process of children with disabilities in society.

The aim of the research is to reveal some problems related to the social integration of people with disabilities and the role of sport in improving their quality of life. The purpose of this paper is to enhance the theoretical and practical knowledge of real and potential users (specialists, students, people involved in sport).

Methodology: study of literary sources and content analysis.

Conclusion: The dispute is a social phenomenon that has a positive influence on the education of society in the ideas of humanism and fights against prejudices and stereotypes in this category of people.

Key words: social integration, sociology, people with disabilities, sport.

Introduction

Sport for people with disabilities is not a new concept, but its full potential as a powerful, low-cost means to foster inclusion and well-being of disabled people has begun to be realized.

The sociological indicators which have been used for defining disability and addressing the issue in question are as follows:

- “- possibilities to fulfill social roles,
- possibilities for interpersonal communication,
- possibilities for basic daily activities” (eg. Ikov, 2014).

Sociologists could also usefully apply the concepts of role and status to disability. The role of “people with disabilities” is similar to, and at the same time different from other roles which have not been fully delineated yet. Its influence on other roles such as wife and mother have not been fully explored yet. A paper which date back from the past did consider the question of disability and role (Thomas, 1966), but both its terminology and its conceptualization of disability have been outdated. Sociologists have not considered the question of whether or not disability is a main status, and, if so, how it compares to other main statuses such as race and gender, although Barnartt (2001) made a start at such analyses (eg. Barnartt, 2005).

In particular, they can be interpreted from the point of view of the main categories of life: “possibilities for: self-service; self-moving; education; work; orientation in time and space; communication (establishment of contacts between people, processing and transmission of information); control of their own behavior, etc. “(eg. Ikov, 2014).

If disability has been considered by the concept of the rights of disabled people, it could have been affirmed that these restrictions are based on the person’s difficulties in realizing and protecting his / her rights – civil, social, economic, etc.

Hypotheses:

- ✓ I assume that various issues related to the social integration of people with disabilities on national and global scale will be recorded at the end of the survey;
- ✓ I assume that adapted physical activity, including sport and its different elements, will contribute to adequate social integration of the people with disabilities and to the improvement of their quality of life.

The aim of the research is to reveal some problems related to the social integration of people with disabilities and the role of sport in improving their quality of life.

The aim of the present publication is to enhance the theoretical and practical knowledge of real and potential users (specialists, students, people with respect to sport).

For realization of the research the following objectives are outlined:

- to study literary sources related to the problem;
- to outline and analyze the people's needs for adapted physical activity and social integration of people with disabilities;
- to reveal and analyze the main interrelations between the social integration of people with disabilities and the role of sport in improving their quality of life.

Methodology of the research: study of literary sources and content analysis.

Organization of the conducted tests: 02.04.– 28.07. 2017.

Discussion

The social model of disability distinguishes between impairments and the disabling practices of society which prevent people with impairments from fully participating in social life. Shakespeare and Watson question the extent to which the social model can make invisible the experiences of impairment, which is to ignore a large part of people's lives. Research has shown that many people with 'impairments' prefer to be identified as 'ill' rather than 'disabled'. This is perhaps not surprising, as 'disabled' is a stigmatized identity. The example of Cherubism is presented as an example of the relationship between stigma and disability.

Whilst the impairment/disability distinction has been politically useful for disability rights campaigners, medical sociologists criticize the distinction, as both are social constructs (eg. Giddens, Sutton, 2013).

The use of social factors to explain community health status is not a new phenomenon. Since Durkheim's classic work on suicide, the importance of social integration and social capital has been recognised for people well-being (eg. Durkheim, 1951).

Today there are needs for concrete practical actions to ensure conditions to create equal chances for a

complete activity for people with disabilities (eg. Stoeva, Kostadinova, 2004; Mladenova, 2014). This means equal rights, equal opportunities, equal responsibilities for all members of society. The rules for equal participation cover all spheres of public life. One of the priorities for overall formation is education and physical activity. The dispute, as one of the major social institutes in society, has a unique nature and performs various functions such as: educational, health respectable, social, cultural and recreational (eg. Nikolova, 2009).

Integration could be realized in many ways and forms. One of them is the adapted physical activity, which is an important factor for beneficial impact. Good opportunities for physical strengthening, development of motor skills and habits, psychological, social and spiritual development have been created through the application of adapted physical activities according to V. Aleksandrova (eg. Aleksandrova, 2013).

Contemporary tendencies require the inclusion of adapted physical activity including sports and elements of various sports (skiing, rowing, swimming, horse riding, ice skating, car rallies with adapted cars and others) in complex rehabilitation as a curative, preventative and sporting tool (eg. Vultchev et al., 2014).

The CONNECT project in Australia has led to the inclusion of people with disabilities in a wide variety of national sports organizations covering the following sports: athletics, basketball, swimming, tennis, bowling, yachting, baseball, softball, surfing, table tennis, cricket, golf, bowling, and riding. It also attracts and retains people with disabilities in a variety of sports roles: volunteer, spectator, administrator, player, and coach.

The use of the sporting potential for SOCIAL INCLUSION, integration and equal opportunities has had an important contribution to economic and social cohesion. It is therefore necessary to take into account the specific needs and situation of the under-represented groups and to pay attention to the special role of sport for young people, people with disabilities and disadvantaged socio-economic backgrounds. Sports must be accessible to all categories of people.

"The principle of equal participation of all people,

independently from gender, ethnicity, religion, social status, physical and intellectual development, has been respected during one year's work in the clubs and during the Fairs. In the "Yunache" clubs are accepted all children – weak, fat, regardless of physical and intellectual development, children from ethnic groups. Promoting social inclusion and cohesion, enshrined in the Olympic principles and in European documents " (eg. Vladova, 2015).

Fotev believes that social integration is realized in multiple social interactions, the necessity of which is normative in terms of the whole. Basic solidarity between individual and collective agents, as well as the sharing of main values, and especially social values, is needed to maintain (eg. Fotev, 2004).

Social integration, according to T. Parsons, can be divided into normative and valuable, which is truly related to the sport as social institute (eg. Parsons, 1998). The values that are transmitted through sport help to develop the knowledge, motivation, skills and readiness to make personal efforts. The time spent in sports activities has a beneficial impact on health and education, and this impact needs to be increased. Sport enhances human capital through its role in formal and non-formal education.

The integration has been considered as the development of common activities and initiatives between different countries, the organization of multinational projects through cooperation, interaction, exchange of experience, information as well as positive examples and practices in different social spheres and joint activities, according to Ekholm (eg. Ekholm, 2006; Slavova, 2016).

Sport for people with disabilities "aims to improve the quality of life, rehabilitation and social integration, providing the necessary conditions for practicing various sports" (eg. Dimitrov, 2016; Fay, Wolff, 2009).

Integration and inclusion of people with disabilities into regular sports events has been a major focus in recent decades and creates new opportunities for participation and competition.

Three biggest international sport competitions for people with disabilities are the following:

- Special Olympics (for athletes with intellectual disabilities) – provides opportunities for

training and competitions throughout the year;

- Paralympic Games (for athletes with different degrees of physical disabilities) – six different groups of athletes with physical disabilities;
- Deaflympics (for hearing impaired athletes).

The number of international organizations and associations serving athletes with disabilities has increased dramatically. In some countries, there are more opportunities for people with disabilities to participate in school sports events, clubs and various kinds of sports activities in the community.

At local level, the program for the development of important organizations such as "Handicap International" has enabled thousands of people with disabilities in developing countries to become active in sport and physical activity.

Touring competitions in other cities and countries, receiving first prizes, sports victories have allowed active integration, acquisition of models and types of behavior, etc.

All competitions increased in quantity, new sports bases, the training process organized abroad, have created new values and orientations. A major role in the socialization stage has been played by the economic relationships that develop between athletes and coaches.

The National Assembly of Bulgaria has ratified the UN Convention on the Rights of People with Disabilities on 26 of January 2012. Our country has taken small steps towards integrating people with disabilities into and through sport. It sets out different strategies and principles that have safeguarded the rights of people with disabilities, as well as provided more opportunities for equality, full inclusion in society, accessibility, etc. (eg. United Nations Convention of Rights of people with disabilities, 2012).

Practicing sports facilitates social integration and fosters cultural dialogue. In view of this, it is important to provide sport facilities and support sports activities.

Sport enhances the shared sense of belonging and empathy and can therefore be an important tool for integration.

Conclusion:

The quality analysis of the data has revealed that the hypotheses have been confirmed.

Physical activity as a result of participation in sports events contribute to an improvement in the functional status and quality of life of people with disabilities, related to improving self-esteem and social sensitivity.

Sport works to improve the inclusion and well-being of people with disabilities in two ways – by changing the point of view of communities about people with disabilities and by changing the point of view of people with disabilities about themselves. The first is necessary to reduce the stigma and discrimination associated with disability. The second empowers people with disabilities so that they recognize their own potential and opt for changes in society. The community impact and individual impact of sport help reduce the isolation of people with disabilities and integrate them more successfully into community life.

Literature

Alexandrova, V. (2013), „Adapted physical activity and skating for children with autism“, *Journal of Sport and science*, 1, pp. 124.

Vladova, I. (2015), Olympic children's fair „Yunache“ – sport pedagogical model for education and training. Doctoral thesis, NSA, Sofia, pp. 110.

Vultchev, V., Nikolova, M., Rankov, K., Alexieva, D. (2014), „Research of frequency of inguinal epidermophytia and tinea pedis for athletes“, On some actual problems of physical education and sport, Collection. NSA „Vassil Levski“, Sofia, pp. 98.

Dimitrov, V. (2016), *Sport law*, NSA Press, Sofia.

Ivkov, B. (2014), *Sociology of handicap*, Omda, Sofia.

Karanechev, G. (1983), *Theory and methods of curative physical education, Medicine and Physical education*, Sofia.

United Nations Convention of Rights of people with disabilities, (2012), available at: <http://www.un.org/disabilities> (accessed on 12 April 2016).

Nikolova, M. (2009), Social and educational integration of people with disabilities through adapted physical activity and sport, NSA PRESS, Sofia, pp. 33–34.

Slavova, V. (2016), „Study of attitudes of children and youth towards implementation of new technologies in sport training“, scientific conference „Challenges and perspectives for sport science“, „Specifics of preparation in different sports disciplines“, NSA PRESS, Sofia, pp. 195.

Stoeva, B., Kostadinova, V. (2004), Group for European prognosis and researches (GEPR), People with disabilities and their rights in European Union, Bulgaria and its “invisible” citizens; Main problems of people with disabilities. Sofia, available at: http://www.osf.bg/cyeds/downloads/euro_gepi_7.pdf (accessed on 07 March 2016).

Fotev, G. (2004), *Dialogical sociology, East – West*, Sofia, pp. 463–479.

Parsons, T. (1998), *System of contemporary societies*. M. Barnartt, S. (2005), Report of the ASA Committee on the Status of Persons with Disabilities (PWD) January, By haron 1 PhD, Gallaudet University.

Ekhholm, L. (2006), The Bologna Process 1999–2006, and beyond, ERASMUS – contact seminar, March 8, 2006, Stockholm.

DePauw, K., Gavron, S. (1995), *Disability and Sport, Human Kinetics, Illinois*.

Durkheim, E: *Suicide: a study in sociology* Edited by: Simpson G, Spaulding JA, Simpson G 1951. New York: Free Press; 1897.

Fay, T., Wolff, E. (2009), „Disability in sport in the twenty-first century: creating a new sport opportunity spectrum“, *Boston University International, Law journal*, Vol. 27, pp. 230–248.

Giddens, A., Sutton, P. (2013), *Sociology, 7th Revised edition*, Polity Press, Chapter Health, Illness and Disability, pp. 93–101.

Mladenova, S. (2014), „Safety possibilities, socialization, and integration of people with disabilities“, *Journal of International Scientific Publications*, Vol. 12, available at: www.scientific-publications.net (accessed 12 May 2016).

Yakkaldevi, A. (2014), *The sociology of disability*, Volume 2, Issue 3. ISSN:-2347–2723.

ass.prof. Albena Dimitrova, Ph.D. Sofia 1700, Bulgaria, Studentski grad, NSA „Vassil Levski“, Department of Psychology, pedagogy and sociology tel.: (02) 4014 (373) www.nsa.bg GSM: +359 893 393 370 e-mail: albena234@abv.bg

ON THE FOOTBALL TERRACE IN THE CZECH REPUBLIC

PETR SCHOLZ

Summary

Introduction: Football is one of the most popular sports all over the world. Given the long history of spectator sports events consumption it is not a surprising fact that there have also been serious manifestations of spectator aggression. In this context, we realize that the rapid development of sport itself has brought problems and complicated relationships, especially at the professional level (corruption, homophobia, violence, and racism). Methodology: The goal of this paper is to analyze the relationship between fans' verbal and other expression and their violent behavior at selected football stadiums in the Czech Republic. Primary data were collected by a questionnaire survey (PAPI method) mainly at the Eden stadium in 2015 and 2016. A total of 462 respondents (aged 26.29 ± 10.19 years old) participated in this research and all of the respondents were attending in a stand of home team supporters. Results and discussion: In our research, we found that expressions of demolishing the stadium and other disturbances are considered the most serious expression of violent behavior by 79.22% of the fans. On the other hand, 77.06% of the fans stated that boo is the least serious problem. Conclusions: Based on the ascertained data of the research, we found that supporters under 23 years of age are more tolerant of negative social phenomena in the surroundings of the stadium.

Key words: aggression, fans, football club, Slavia Prague, violence.

Introduction

Sports spectatorship is a social phenomenon that can be analyzed from several different perspectives. Socio-psychological aspects of this phenomenon primarily take notes of the motivation for spectator attendance, spectator experience, links between spectators' relations to clubs. The reactions of spectators to the selected game situations and ways of preventing negative manifestations of spectator are not disregarded (Sekot, 2010). The behavior of sports fans has been the subject of interest for many years, not only in Britain but also in other European countries. Violent behavior of fans is, therefore, also known as football hooliganism and sometimes named English disease (Frosdick & Marsh, 2005). Precisely the issue of football hooliganism has become the subject of intense media, political and academic interest in recent years. The Czech Republic in this regard is no exception, although we can say that the hazards of football hooliganism are considerably smaller on our territory than in some other countries, but it certainly cannot be underestimated.

Unfortunately, oftentimes ignorance and lack of understanding of this phenomenon determine a view on it. It is important to distinguish hooligans from other people who watch football matches. In this context, it is possible to identify four major groups, namely: football spectators, football fans, supporters, and football hooligans (Smolík, 2008). In this paper, we will focus on the fans.

Classical fans ("normal"). These are the individuals who attend football games regularly, have a relationship with their clubs, often because the stadium is located relatively close to their residences. The fan has certain expectations for the course of the match and, by identifying with the team, experiences the highs and lows of the club. Football is usually the only favorite sport for the fan. Football fans present their identification mainly with clothing, e.g., replicas of jerseys, club scarves, baseball caps, T-shirts, flags, badges, etc. For the football fan, the division into "we" (supporters of the club) and "they" (fans of other clubs) is characteristic, (Slepička, 1990). These fans can be found mostly on the main terraces, in some cases they can even get carried away by loud cheering, sometimes with racist overtones. We note that this group of spectators usually does not get involved in other manifestations of spectator violence, except for random throwing of objects on the pitch.

Marsh, Rosser & Harré (1978), based on observations, classified seven types of social roles among active fans in the end. These are the so called (1) Chant leader, (2) Aggro leader, (3) Nutter, (4) Hooligan, (5) Organizer, (6) Fighter, and (7) Heavy drinker. Smith (1988) states that it is necessary to distinguish the so-called serious fans from regular fans. The main difference is found in the fact that the serious fan expects and utterly believes in their team winning. Hunt, Bristol & Bashaw (1999) define a football fan as an enthusiastic lover of foot-

ball. Real & Mechikoff (1992) have a similar view to the distribution, and besides the “classical” fans they distinguish the so-called devoted fan who identifies with the club. According to the motivation and differences in behavior, we can identify other five types of fans: (1) Temporary (provisional) fan, (2) Local fan, (3) Devoted fan, (4) Fanatical fan, and (5) Disturbed fan.

Material & methods

The goal of this paper is to analyze the relationship between fans’ verbal and other expression and their violent behavior at football stadiums in the Czech Republic. After having stipulated the aim, a research question was set. RQ: Which attitudes, expressions, and speeches are considered most serious by football fans of Slavia Prague?

Primary data were collected by a questionnaire survey mainly at the Eden stadium and other football stadiums in the Czech Republic in 2015 and 2016. The questionnaire consisted of twenty-nine questions; some of them were scalable, where respondents rated on Likert scale (1–5) individual verbal and other expression and also their violent behavior speeches. The least serious activity was rated 1, the most significant activity received the highest grade, i.e. 5. This paper uses quantitative research, methods of analysis, mathematical and statistical methods. For the evaluation of the results, Statistica program was used.

The research is focused on the oldest football club (est. 1892) in the Czech Republic. The next reason for choosing this football club was finding that stands of the stadium (end) are the most occupied by football fans. The stand of the stadium for the home supporters is called the end, with the capacity of 3.065 seats. It consists of 5 sectors with 25 seats in 28 rows each. The end is mostly filled up to 2/3, and sold out during matches with attractive away teams e.g. Sparta Prague, Plzeň, and Baník Ostrava.

The selection of respondents was based on carefully pre-defined factors; e.g. seats 1, 3, 5, 7 in the first row; seats 2, 4, 6, 8 in the second row etc. from all the rows. The respondents were informed about the research and anonymity of the questionnaire. Once they answered the questionnaires, each of them received a small Slavia club badge. They had also the opportunity to contact the interviewer on the email stated on the questionnaire list and get themselves

informed about the research results. Filled in questionnaires by 467 fans were selected of the total 720 questionnaires. Five questionnaires from fans were answered incorrectly and incompletely, therefore, they were not included in the research.

The sample consisted of 462 people aged 26.29 ± 10.19 years; of which 372 were males (26.67 ± 10.17 years), 88 females (25.05 ± 10.14 years), and 2 persons did not indicate gender.

Results

a) Fan attendance motivation and expressions.

More than half of fans (58.44%) started attending football matches in their childhood, the other 28.14% of fans in the rest of adolescence and adulthood (13.42%). The last option was ticked mainly by women who participated in football matches with their partners. Almost half of fans (49.78%) attended the first football match with their parents, further 41.13% mentioned friends and fans, and less than one-tenth (9.09%) attended their first football game on their own. Currently, more than two-thirds of fans (70.13%) attend a football match with friends, nearly 1/4 of fans (22.94%) in the company of family and only 6.93% of fans attend the match on their own.

Fans attend football matches for various reasons. More than half of fans (57.14%) said the main reason was cheering, then the atmosphere (42.42%) and entertainment (38.96%). More than 1/4 of fans (26.41%) stated that, during a football match, they get away from their private problems and job responsibilities. More than 1/10 of fans (12.12%) attend football matches because of the party. Through cheering, the fans mostly try to support the club (62.34%), create an atmosphere (51.08%), unwind (28.57%), weaken opponents (7.79%), and intimidate opponents (4.76%). Fans try to engage in cheering the other tribunes and make the atmosphere during the matches even stormier. They also help with the choreographies, some even assist with batting pyrotechnics. Regarding the reasons for attendance and cheering, there were multiple answers possible (max. 3), therefore totals reach more than 100%.

The ownership of the club symbols. Almost every fan club own symbols (93.51%).

The most common symbols include scarves and jerseys, as well as Slavia T-shirts, silicone wrist-

bands, wallets, and shorts. At home games, symbols of the club are always worn by more than 3/4 of fans (77.49%). More than half of fans (54.98%) always carry club symbols to away games, but more than 1/5 of fans (20.35%) does not have any club symbol for the matches that are played on the fields of opponents. The reason is that fans often travel to matches on their own and are afraid of conflicts with local fans. In any skirmish, they would be reluctant to surrender scarves, jerseys and even the flag to the opponent. Therefore, the mentioned fans would rather opt for watching the match from the main terrace as opposed to supporting from the end. Some football clubs in the Czech Republic (e.g. Vysočina Jihlava, Olomouc) deny access to the main terrace with the club symbols of the away opponent. Either the visitor must surrender them during the inspection before entering the stadium or must go into the sector for the away guests, where it is allowed to have a club symbols.

Nearly half of all fans (41.56%) were annoyed by the defeat of Slavia only immediately after the match, more than a third of fans (34.20%) were disappointed until the next match, almost a fifth of fans (19.91%) were annoyed by the loss until the next win, and only 4.33% of fans were not annoyed by the loss of Slavia. Although, in past seasons, Slavia did not participate in the Champions Football League in the Czech Republic and only 0.87% of fans opted for television coverage instead of supporting the club in the stands. By contrast, almost half of fans (48.92%) visited the terraces, even though the match was broadcast on TV, and 50.22% of fans said that sometimes they visit football and sometimes not. The main reason for the students was the lack of funds, the fans also mentioned the lack of time, work responsibilities, and the weather. For the fans outside Prague, the deciding factor was the date and time of kick-off, since not all fans were able to commute back home after the game on the weekend. Regarding the negative experiences, we note that as for the fans, poor level of the games, controversial decisions of the referees, and visitors' unsportsmanlike behavior are the main concerns.

b) Fans' expressions on mentioned activities.

Pyrotechnics. Half of fans do not mind pyrotechnics (53.24%), and sometimes they help with the actual firing, but it is rather an exception. They state that the pyrotechnics belong to football and make the atmosphere complete, although they know that

launching pyrotechnics is prohibited at the stadium. Personal checks by the organizer before entering the turnstiles at the stadium are not so thorough, so a significant part of pyrotechnics are smuggled into stadiums in clothing or by women, or alternatively, through the VIP entrance, where inspections do not take place. Almost a fifth of fans (19.48%) finds this activity a serious problem, particularly with regard to safety and due to the interruption of the match, and then a forfeit. They argue that while handling pyrotechnics, there is a danger of burns, but so far, was not registered any case of burns at Slavia. We agree that some matches (Sparta, Pilsen, Baník Ostrava) were interrupted due to the indiscipline of some people, but after a few minutes the matches continued. The match has never been terminated by forfeit against Slavia for pyrotechnics. Less than a tenth of surveyed fans had experience with the firing of pyrotechnics during a football game; of those 9.09% occasionally helped with pyrotechnics and 0.87% of fans helped whenever they were present at the match. More than 90% of fans (90.04%) never helped with the firing of pyrotechnics.

Booing. It was clearly identified as the least serious expression at the stadium. More than 3/4 of fans (77.06%) marked this behavior with the lowest mark. We note that the opponents are most booed at (sometimes 43.72% and often 34.43%), referees (occasionally 55.41% and often 21.65%), chairman of the FACR and other officials (36.36% occasionally and often 35.50%). We noticed even booing at Slavia (26.84% occasionally, and often 2.16%), especially when Slavia players are not interested in the game and do not fight for Slavia.

Vulgar expressions. As for vulgar chanting, the entire end or a vulgar individual, we can say that we have achieved approximately the same results. Vulgar expressions are addressed in particular at Dagmar Damková (former President of the Central Committee of Referees) and Miroslav Pelta (President of FACR), but also to the players of the opposing team (e.g. emotional celebration of a goal in front of Slavia supporters). More than two-thirds of fans (68.39%) sometimes used coarse language, and more than 1/5 of fans (20.35%) always use coarse language during a match. Some respondents even indicated that they attend football matches for vulgarisms. The rest of the fans (11.26%) always use polite language during the match and do not use coarse language.

Physical aggression. More than half of fans (59.31%) consider the physical aggression against rival fans in the stadium as the most serious behavior. Nearly identical results were recorded in the physical aggression against the Czech Republic Police or security. Fans attend football games primarily because they want to enjoy the game itself, or admire players.

Hooligan fight. Regarding the agreed hooligan fight outside the stadium, more than 1/3 of fans (33.77%) stated that this is a very serious issue and rated it highest mark, i.e. 5. One grade lower ratings were expressed by nearly a tenth of fans (9.52%). These very fans regret that the club is related to these skirmishes. Conversely, 28.57% of fans have no problem with an arranged conflict outside the stadium and sympathize with hooligans. Hooligan fights are part of their culture, and if this type of violence is not in the stadium, it is alright with the fans. On the other hand, if the opponent fan is dressed in the jersey and scarf and meets a hooligan, they need not worry. The true hooligans are much disciplined in this, they know what this culture is about and do not beat a fan.

Stadium demolishing. More than 3/4 of fans (79.22%) marked demolishing stadium and other riots the most serious behavior and absolutely unacceptable activity that should never be associated with Slavia Prague. Hooligans themselves participate most in this activity directly (demolished seats, urinals, etc.). This is done solely during the away matches, when they destroy the property of other clubs. We have to say that the respondents (97.40%) were almost never involved in demolishing a stadium and if they are witnesses of these activities, they prefer to flee to higher floors of the stadium or leave the stands. The rest of the fans (2.60%) are occasionally involved in demolishing a stadium (in particular plucking seats) so that they can protect themselves from batons of riot police.

Throwing objects on the pitch. Almost half of fans (45.45%) believe that throwing objects onto the playing surface is also the most serious activity, which is confirmed by other 19.05% of fans, who called it too serious. Most often it happens when the wrong verdict is made by a side referee or when celebrating a goal by opposing player in front of

their home audience and the football pitch is sprinkled with empty or filled cups of beer, small coins or even lighters. We can conclude that the conduct of referees, therefore, in some cases, can even become an igniter for violent clashes, even in such cases when they themselves are in contradiction to football rules, which is at best perceived by fans either as improper conduct, or even worse, directly as a provocation. For the fans surveyed, we noted that 12.99% had already thrown some subject onto the pitch, the rest of the fans had not (87.01%).

Pitch incursion. This activity does not reach such important values as we expected. It was ticked as the most serious behavior by 37.23% of fans. We must take into account that the recorded values are influenced by the fact a considerable part of the fans had already invaded the field (16.45%). At first it was the historical progress of Slavia Prague in the Champions League (2007), where the majority of supporters in the end celebrated this special moment in the field with the players directly after the end of the match. Later, in 2014, a friendly match was played with Hajduk Split but the match was interrupted at 73rd minute. Croatian fans invaded the pitch after a while were followed by Slavia supporters. At the centre circle the two camps greeted each other, chanted, and sang hymns together. When they all returned to the terraces the match was not finished because the playing area remained dotted with pyrotechnics, cups, etc. Both clubs share common history and friendly relations because in 1911 Slavia assisted in establishing Hajduk in Prague pub U Fleků.

Racism. Racism was regarded by more than half of fans (58.87%), who found expressions against dark-skinned players a very serious problem. More than 3/4 of fans (80.08%) does not use racist chants during the match, it is sometimes used by 17.32% of fans, and is often uttered by 2.60% of fans.

According to the findings of our field survey, we must conclude that football fans find the biggest problems with demolishing stadiums (79.22%) and racism (58.87%). Most respondents agree that physical aggression against rival fans in the stadium (59.31%) and the Police of the Czech Republic or security (56.28%) is a very serious activity (Table 1).

Table 1: Fans' expressions on mentioned activities in percentage

	1	2	3	4	5
<i>firing of pyrotechnics</i>	36.36	16.88	20.35	6.93	19.48
<i>vulgar chants in the stand</i>	36.36	28.57	15.15	10.39	9.52
<i>individual vulgar expression</i>	36.36	22.08	19.91	9.09	12.55
<i>physical aggression against rival fans at the stadium</i>	4.33	5.63	14.29	16.45	59.31
<i>physical aggression against police and riot police</i>	6.49	8.66	14.72	13.85	56.28
<i>arranged hooligan fight outside the stadium</i>	28.57	12.55	15.58	9.52	33.77
<i>throw in the object on the pitch</i>	6.93	9.09	19.48	19.05	45.45
<i>demolishing stadium and other riots</i>	0.43	3.03	4.76	12.55	79.22
<i>expressions of racism</i>	8.23	8.23	12.12	12.55	58.87
<i>boos</i>	77.06	9.09	9.09	1.30	3.46
<i>pitch incursion</i>	10.39	11.26	24.24	16.88	37.23

Note. 1 – the least serious expression, 5 – the most serious expression

Discussion

We can state that violence at the football stadiums is one of the most discussed topics in the Czech Republic. The media reported that just violent behavior is one of the major factors that discourage visitors and fans from enjoyable atmosphere of the football stadiums. We consider that this is not a true statement because football stadiums in the Czech Republic are safe for the 1st league matches.

The Football Association of the Czech Republic tries to make football attractive as a product. Football matches should become the social events such as in England and other western countries. But it is necessary to say that this mentioned product will not be as attractive in the Czech Republic as in England. The fact that the stadiums are often almost empty and there are not so many families with children is not caused by hooligan fights at the stadiums. There are a lot of different leisure activities (theatre, cinema, zoo, etc.) instead of football.

We found that expressions of racism are considered the most serious expression of violent behavior by 31.25% of the fans. The same result was mentioned about the demolishing of a stadium and other disturbances. Almost one fifth of the fans (18.75%) marked that a pitch incursion is the most serious activity. On the other hand, over 3/4 of the fans (81.25%) stated that firing of pyrotechnics is the least serious problem; other least serious activities were hooligan fights outside the stadium (87.50%), and boos (93.75%).

Conclusions

To meet increasingly socially less negative phenomena in the terraces around stadiums, it is more than desirable that all existing preventive measures are now sufficiently utilized. Currently, the stadiums sell only non-alcoholic beer, sectors or ends for supporters are separated, tickets to riskier games are sold only upon production of identity cards, personal inspections are more thorough etc. For the future, also addressable ticketing and CCTV are also considered. In our view, the football clubs and the media should be more involved in the educational process through television broadcasts, as well as promoting fair play and critical evaluating the violence. However, the most important type of football violence prevention, we consider raising of public awareness, with the help of which it is possible to capture new incoming fans and prospective hooligans. The intention is to direct these people to positive cheering, i.e. without violence, group and individual vulgarities, racist insults, etc. An important aspect is the financial cost of security measures with regard to risk behavior of some groups of visitors, which probably should not be paid from public finances.

References

- Frosdick, S. & Marsh, P. (2005). *Football Hooliganism*. Devon: Willan Publishing.
- Hunt, K. A.; Bristol, T. & Bashaw, R. E. (1999). A conceptual approach to classifying sports fans. *Journal of Services Marketing*, 13(6), pp 439–452.
- Jones, I. (1997). A further examination of the factors

- influencing current identification with a sports team, a response to Wann et al. (1996). *Perceptual and Motor Skills*. 85(5), pp 257–258.
- Marsh, P.; Rosser, E. & Harré, R. (1978a). Life on the Terraces. In Gelder, K. & Thornton, S. (eds.). *The sub-cultures reader*, pp 327–339. London and New York: Routledge.
- Real, M. R. & Mechikoff, R. A. (1992). Deep fan: mythic identification, technology, and advertising in spectator sports. *Sociology of Sport Journal*. 9(4), pp 323–339.
- Sekot, A. (2010). *Úvod do sociální patologie*. Brno: Masarykova univerzita.
- Slepička, P. (1990). *Sportovní diváctví*. Praha: Olympia.
- Smith, G. J. (1988). The noble sport fan. *Journal of Sport and Social Issues*. 12(1), pp 54–65.
- Smolík, J. (2008). *Fotbalové chuligánství – historie, teorie, a politizace fenoménu*. Karlovy Vary: Zdeněk Plachý.

Petr Scholz, Ing., Di S.
Assistant Professor
College of Polytechnics Jihlava
Department of Travel and Tourism
Tolstého 16, 586 01 Jihlava
Czech Republic
Tel: +420 567 141 136
E: petr.scholz@vspj.cz

HEALTH AND SOCIAL ASPECTS OF CONDUCTING SPORTS ACTIVITIES

Jelka Gošnik, Krešimir Žažar

Summary: *Engaging in sports activities certainly possesses multiple facets. Notwithstanding the apparent health dimension, doing sports is a pertinent social activity, and is of particular importance for the young population, including students. The main aim of this paper is to present the key contours of sports performance of the student population in Zagreb. The focus is on the examination of the following three aspects: self-estimation of (non)obtained sport skills and capabilities, attributes of health condition and attitudes towards sports as a social activity. The empirical analysis is based on survey data gathered in February 2016 on a non-probable occasional sample (N= 2400) that comprised attendants of mandatory physical education courses at the Faculty of Humanities and Social Sciences (of the University of Zagreb) and the Faculty of Science (of the University of Zagreb). The diversity of fields of study allows for interesting comparisons among students of different study groups. Despite certain slight differences, preliminary findings indicate quite a poor general engagement in sports activities and a relatively weak level of attained abilities. At the same time, sport is considered as a valuable activity in itself, which also contains the important social dimension of nurturing friendship and connecting with other people. In conclusion, the necessity for the systematic organization of sports activities and their more intensive incorporation in the academic environment, school system and at different societal levels, is emphasized. Besides, the need of sensitizing students, the young population and overall public about the importance of doing a sport, recreation and physical activity, also of pursuing a healthy life-style, is underlined. The urgency of multidisciplinary scientific inquiry of sport is highlighted, as well.*

Key words: physical exercise, students, questionnaire, social dimension of sports

Introduction: Sport represents an enormously important domain in contemporary societies. It is a highly complex, multifaceted phenomenon that requires a multidisciplinary scientific approach. Alongside other dimensions, sport comprises the *health and social dimension*, which is the focus of this paper. As a type of recreational, physical activity, sport plays a crucial role in preserving a person's health condition. The performance of sport activities prevents widespread obesity, heart and cardiovascular diseases, as well as conveys other positive impacts on health, development of motor skills and general well-being of a person (Delaney, Madigan, 2015:117–143). A drawback of doing sports is the risk of injuries that often occur and stress related to competitive situations, intertwined with huge expectations of superior results (Delaney, Madigan, 2015:133–139). Conceived as a social phenomenon, sport can be depicted in positive and negative terms. Regarding the latter, it has often been employed as a tool of imposing particular cultural patterns, as support of nationalism and racism and a form of gender discrimination (Centre for Leisure & Sport Research, 2002:3; Jarvie in Craig, Beedie, 2008:115; also Penney, 2002), it has been intertwined with political and hegemonic power (Houlihan, 2002; Craig, Beedie, 2008:125). On the other hand, sport reflects a dozen of positive attributes, such as: capability of overcoming social exclusion (Centre for Leisure & Sport Research, 2002:2), i.e.

it contributes to social inclusion and promotion of individuals from deprived and marginalized social groups (Levine, 2010; Delaney, Madigan, 2015:141), and consequently conduces to social cohesion (Craig, Beedie, 2008:118). Furthermore, some studies report that practising sport activities generates positive personal attributes (Delaney, Madigan, 2015:118–121), and that taking part in certain competitive sports (for instance rugby) has favourable effects in developing entrepreneurial ethos (Nikolašević, 2011). In sum, sports certainly possesses transformative capacities towards building an enhanced society.

Engaging in physical activity is of immense importance for children, adolescents and the youth, as the habit of exercising and the attitude towards physical activities tend to be continued throughout a lifetime. In the context of Croatian society, a more comprehensive insight into health and social aspects of pursuing sports activities is still missing. Over the years (during 1970s and 1980s), the examination of sport as a social phenomenon was firmly affined to kinesiology experts, while the more recent research interest of sociologists has been focused on topics like football fans behaviour (primarily violent), subculture of football fans and akin themes (Perasović, Bartoluci, 2007). Among quite rare studies on youth and sport-related topics, the research of Bjelajac (2006) ought to be men-

tioned, on the position of sports within the leisure time activities among secondary school pupils, and the study of Andrijašević and others (2005) which identified gender differences in a self-evaluation of health related to sport experiences among students of the University of Split. When focusing on the student population, there is a lack of detailed knowledge on diverse features of their sport performance.

Aim and Objectives of the Study: The crucial objective of this empirical contribution is to reveal the scope of attained sports and motoric skills, examine habits and attitudes towards healthy life-styles and inquire into the attitudes of students' population in Croatia towards certain social aspects of sport. This research is confined to a sample of the target population of the University of Zagreb, focusing on the self-estimation of (non)obtained sport skills and capabilities, attributes of health condition and attitudes towards sports as a social activity.

Methodology: The empirical analysis is based on survey data gathered in February 2016 on a non-probable occasional sample (N= 2400) that comprised attendants of mandatory physical education courses at the *Faculty of Humanities and Social Sciences* of the University of Zagreb (FHSS), and the *Faculty of Science* of the University of Zagreb

(FS). The overall sample includes 1483 respondents of FHSS and 917 of FS¹. The gathered responses are presented separately for both faculties, since the diversity of fields of study allows for interesting comparisons among students of different study groups. As this survey was not undertaken directly for the purpose of the analysis that follows, possible hypotheses have not been formulated. Still, certain items in the questionnaire are relevant to the issues under consideration. This study is mainly descriptive in nature and inevitably exhibits certain epistemological limits and constraints. However, the gathered data delineate general sketches of the examined phenomenon, providing valuable insights that can be further deepened.

Results and Discussion: The first set of items is related to students' *self-estimation of (non)obtained sport skills and capabilities*. A relatively considerable number of respondents of FHH report that, besides regular classes at the physical education course, they never (26,2%) exercise physical activity, alongside approx. one third that exercise several times per month, while others perform it more frequently. The students of FS are slightly more active: 17,4% of them are not involved in physical activities, one third is engaged in practising several times per month, whereas the rest of the subsample claim to be quite regularly engaged in such activities.

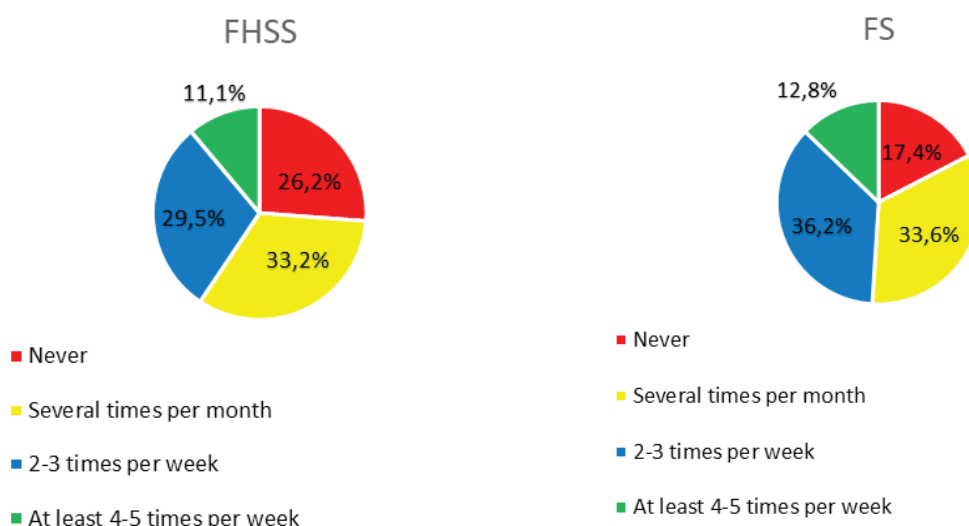


Figure 1. Frequencies of conducting physical activities alongside obligatory faculty courses

¹ Both subsamples consist of predominantly female respondents: 72,8% in the case of FHSS and 63,0% of FS.

There is no significant difference between the sub-groups regarding their swimming skills. Roughly 40,0% of all respondents estimate themselves as 'exceptionally good' swimmers and approx. 45,0% labelled their swimming capabilities as 'good'. However, more than 10,0% of those who estimate their swimming skills as 'average' and several students who have barely attempted to swim should raise concern. Even more concern raises the degree of alpine skiing skills. Namely, nearly two third of the respondents at both faculties assert that they have never experienced skiing, whilst less than 15,0% estimate their skills as 'good' or 'exceptionally good'. A distinctively favourable situation represents bicycle riding, since approx. 90,0% of the students claim that they perform this activity either 'good' or 'exceptionally good'.

The second section refers to particular aspects of the *health condition* of the target population. The students of FHSS declare themselves as cigarette smokers in considerably larger rates compared to their colleagues from FS. Whereas nearly 70,0% of the attendees of the latter institution claim that they have never smoked, the proportion of such answers of the FHSS subsample is close to 55,0%. Simultaneously, less than 20,0% of students enrolled in FS smoke at least half a box of cigarettes, and there is almost one third of such respondents within the FHSS sample. The majority of smokers started smoking during their teenage years, a smaller proportion even earlier. The provided numbers, especially in the case of FHSS students, are quite troublesome, and certainly there is an urgency to introduce programmes and campaigns directed to profoundly reduce smoking.

How many cigarettes do you smoke on a daily basis?	FHSS		FS	
	N	%	N	%
I have never smoked cigarettes	787	53,1	625	68,2
Up to half a box	285	19,2	116	12,6
Up to 1 box	148	10,0	57	6,2
More than 1, less than 2 boxes	37	2,5	11	1,2
More than 2 boxes	0	0,0	0	0,0
I do not smoke anymore	222	15,0	108	11,8
<i>Total</i>	1483	100,0	917	100,0

Table 1. *Smoking habits*

Table 2. contains data regarding drinking habits. It is discernible that a fair number of students gladly consume alcoholic drinks, most of them less than once a week, and a significant number 1 to 3 times a week. There is no huge difference between the two subsamples, albeit FHSS students are more

attached to the 'bottle'. Beer is the most popular beverage, followed by wine, while shots, and particularly cocktails, are less consumed. In sum, the usage of alcoholic drinks among students is quite widespread and surely requires mechanisms to mitigate that habit.

How frequently do you consume alcoholic drinks?	FHSS		FS	
	N	%	N	%
I do not consume them at all	281	18,9	203	22,1
Less than once a week	847	57,1	553	60,3
1 to 3 times per week	283	19,1	145	15,8
4 to 6 times per week	31	2,1	8	0,9
Every day	8	0,5	0	0,0
Uncontrolled	33	2,2	6	0,7
<i>Total</i>	1483	100,0	917	100,0

Table 2. *Habits/frequencies of drinking alcoholic drinks*

Another relevant medical aspect is related to the type of job² that students perform parallel to their academic obligations. The pattern recorded in the case of both subsamples is very akin: more than 40,0% perform a job that requires sitting, slightly above 20,0% jobs dominantly performed while standing, 6,0 to 8,0 percent of jobs are considered to be both physically intensely demanding and severely stressful. As the detected attributes surely can negatively affect students' health, there is the need to constantly improve their working environment.

It is interesting, and also rather surprising, to find that students of both faculties express certain ambivalence regarding the attitude that lessons in physical education should be a platform to discuss sexual health issues. Almost 30,0% within both groups believe that such topics are equally important and unimportant to examine. Considerably more of them share the opinion that physical education courses should examine topics like healthy food and prevention of obesity, or the role of regular physical activity in health care. The somehow bewildering finding of undermining the importance of sexual health topics requires further examination.

Under the header *attitudes towards sports as a social activity* several items comprised in the questionnaire are subsumed. Students of both groups consider sport to be an important leisure time activity. More than 70,0% of FHSS respondents and above 80,0% of FS students underlined exactly that aspect. Furthermore, sport is viewed as a valuable social activity since approx. two third of FHSS, and more than 70,0% of FS respondents appraised it like a modality of spending time with friends. To a considerably lower degree, yet still notably (in both groups approx. 44,0%), sports activities are seen as a means of obtaining new friendships. Whether the new companions share an equal worldview is less, but still (especially in the case of FS) important. The competitive aspect of sport is not particularly present, as less than 20,0% of respondents indicate this particular attribute as relevant. However, it should be noted that this motive is not central, because other factors connected to health care, maintaining fitness, good body shape and personal psychological benefits are valued as more important. The presented data imply that sport is conceived as a pertinent social activity. Obviously, sport has a vast

² Almost 40,0% of FHSS and nearly 30,0% of FS students reported to work paid jobs during the semester.

inclusive potential, the prospect of integrating an individual within a group, as well as linking diverse social groups. In the examined case of Croatian society, the urgent task is to contrive optimal ways through which this potential can be achieved.

The questionnaire also includes several claims that reflect general attitudes towards sport. The favourable comprehension of sport activities is evident. A slightly more positive estimation is registered by FS students, with only 3,5% of undecided respondents, whereas the dominant majority acclaimed the benefits of practicing sports. Among respondents from the FHSS sample 6,3% were ambiguous, and 1,5% did not agree with the assumption of advantages of doing sports. At the personal level, somewhat different figures appear. Namely, almost two third of FS attendees perceive physical activity as personally important in life, while 53,0% of respondents provided such an answer in the case of FHSS. Around 75,0% of the FS sample alleged that they prefer to conduct physical activities, while such feedback occurs in approx. 65,0% cases of the FHSS sample. On the other hand, around 10,0% of FHSS students declared that they do not like to exercise physical activities in comparison to approx. 5,0% in the other group. In short, it seems that engaging in physical activity is estimated as a positive cultural value. However, problems appear when it should be converted into concrete exercising practice. Despite certain very slight differences between the two subsamples (notably in terms of smoking and drinking alcohol behaviour, and the opinion about the relevance of physical activities), the overall preliminary findings indicate quite a poor engagement in sports activities and a relatively weak level of attained abilities and motoric skills (particularly alpine skiing, and to some extent also swimming). On the other hand, students give quite high importance to sport in general, while simultaneously not performing physical activities in practice. Hence, the pertinent task is to reconcile the detected discrepancy between the nominally accepted value of sports and the lack of its practising.

There are particular limits and constraints of this contribution. This study offers worthy, though only partial insights. Having in mind the type of the sample, the results surely cannot be generalized on the entire student population of the University of Zagreb, and the findings are especially not valid for the overall student population in Croatia. Furthermore, the list of possible important questions relat-

ed to all the examined aspects can be considerably expanded in order to acquire a more encompassing analysis. Besides, it is necessary to implement the bivariate analysis to uncover the effects of particular independent variables on the complex issue of overall students' sports engagement. Among others factors, it ought to be examined how class position, some sport's socialisation attributes³, family and overall social background influence an individual's physical activities behaviour, as well as the general social appreciation of sport. Nonetheless, future researches also require the inspection of existing sports and recreational facilities, spatial accessibility of recreational contents (especially to inhabitants of rural areas), economic affordability of practising certain sports, availability of organized activities, competencies of trainers etc⁴. There is a need to explore particular cultural variables like the general position attached to physical activity in a dominant value matrix. Finally, the issue needs to be scrutinized by quantitative and qualitative methodological approaches. Afterwards, adequate programmes aiming at increasing the level of physical activities of students and the overall population, as well as promoting a healthy life-style can be introduced.

Conclusion: Bearing in mind the scarce engagement of student population in physical activities and their relatively poor level of achieved motoric skills, the necessity for a systematic organization of sports and their more intensive incorporation in the academic environment, school system and at diverse societal levels is emphasized. It is equally exigent to considerably diminish the recorded rates of smoking and consuming alcoholic drinks. Moreover, there is a need of sensitizing students, the young population and the general public about the importance of doing a sport, recreational and physical activities, as well as pursuing a healthy life-style. In order to reach these objectives, adequate targeted programs ought to be initiated. Prior to their creation, detailed scientific inquiry by diverse disciplines of sport as a complex

phenomenon ought to be carried out.

References:

- Andrijašević, M., Paušić, J., Bavčević, T. and Ciliga, D. (2005), Participation in Leisure Activities and Self-Perception of Health in the Students of the University of Split, in *Kinesiology*, 37(1): 21–31.
- Bjelajac, S. (2006), Učenici i sport: komparativna analiza obalnog, zagorskog i otočkog područja županije Splitsko-dalmatinske, in *Zbornik radova Filozofskog fakulteta u Splitu, Filozofski fakultet, Split*. 1(1): 89–100.
- Centre for Leisure & Sport Research (2002), *Count Me In. The Dimensions of Social Inclusion Through Culture and Sport (Report)*, Leeds Metropolitan University, Leeds.
- Craig, P., and Beedie, P. (2008), Sport and Diversity: Issues of Race, Ethnicity and Disability, in Craig, P., and Beedie, P. (Eds.), *Sport Sociology*, Learning Matters, Exeter, pp. 110–125.
- Delaney, T., and Madigan, T. (2015), *The Sociology of Sports (Second Edition)*, McFarland & Company, Inc., Jefferson.
- Houlihan, B. (2002), Political Involvement in Sport, Physical Education and Recreation, in Laker, A. (Ed.), *The Sociology of Sport and Physical Education*, Routledge, London and New York, pp. 190–210.
- Levine, R. F. (2010), Race, School Attachment, and the Role of High School Sports, in Smith, E. (Ed.), *Sociology of Sport and Social Theory*, Human Kinetics, Champaign – Windsor – Stanningley – Lower Mitcham – Auckland, pp. 115–127.
- Nikolašević, M. (2011), Utjecaj sporta na razvoj poduzetništva mladih, in *Učenje za poduzetništvo*, 1(1): 197–201.
- Penney, D. (2002), Equality, Equity and Inclusion in Physical Education and School Sport, in Laker, A. (Ed.), *The Sociology of Sport and Physical Education*, Routledge, London and New York, pp. 110–128.
- Perasović, B., and Bartoluci, S. (2007), Sociologija sporta u hrvatskom kontekstu, in *Sociologija i prostor*, 45(1): 105–119.
- Stroot, S. (2002), Socialisation and Participation in Sport, in Laker, A. (Ed.), *The Sociology of Sport and Physical Education*, Routledge, London and New York, pp. 129–147.
- Corresponding author: M. Sci. Jelka Gošnik, Senior Lecturer; University of Zagreb, Faculty of Humanities and Social Sciences; Ivana Lučića 3, 10000 Zagreb, Croatia; ++385 1 6113 147; +385 1 6156 879; jgosnik@ffzg.hr

³ For instance, how the engagement in physical and sport activities has been shaped by role models and the expectations of parents. It is recommended to consult the excellent paper by Stroot (2002) concerning this topic.

⁴ Regarding these issues, it is advisable to see: Penney, 2002; Centre for Leisure & Sport Research, 2002.

PHYSIOTHERAPY IN ORTHOPEDICS AND TRAUMATOLOGY

CLOSED KINETIC CHAIN EXERCISES FOR TRAINING OF THE DYNAMIC STABILIZATION IN SHOULDER IMPINGEMENT SYNDROME

Lyubomira Sazdova

Abstract

Introduction. In modern literature impingement syndrome of the shoulder is defined as a group of symptoms, rather than a specific diagnosis. A number of underlying pathologies can lead to symptoms of impingement, including: muscle imbalance or dysfunction, rotator cuff pathologies, glenohumeral instability, or scapular dyskinesis. If left untreated or misdiagnosed, partial-thickness and full-thickness rotator cuff tears may result.

The aim of this report is to present closed kinetic chain exercises for training of the dynamic stabilization of the shoulder and to evaluate the effect of their application in patients with secondary impingement syndrome.

Material and Methods. The study was conducted on 14 subjects – 9 men and 5 women, mean age 28.7, all with shoulder impingement or compressive symptoms. The specialized physiotherapeutic program included closed kinetic chain exercises to address scapular dyskinesis and rotator cuff dysfunction. To evaluate the functional condition and response to the treatment were examined: pain intensity, painless active range of motion, and scapular stability and symmetry.

Results. The results of application of the specialized therapeutic exercises showed statistically significant decrease in pain level, increased pain-free range of motion and improved scapular stability.

Conclusion. Physiotherapy in shoulder impingement syndrome is a complex process that requires thorough analysis and detailed clinical examination to determine the causes of this problem. Once muscle strength and balance are restored, functional kinetic chain exercises and patterns of muscle activation should be incorporated throughout the physiotherapy process.

Key words: shoulder impingement, closed-chain exercises, physiotherapy.

Introduction. In modern literature impingement syndrome of the shoulder is defined as a group of symptoms, rather than a specific diagnosis. A wide range of different factors and underlying pathologies can lead to symptoms of impingement, including: muscle imbalance or dysfunction, rotator cuff pathologies, glenohumeral instability, or scapular dyskinesis. If left untreated or misdiagnosed, partial-thickness and full-thickness rotator cuff tears may result.

In secondary shoulder impingement syndrome (SIS) stability of the humeral head is often compromised. A major role for the stabilization of the head of the humerus plays the muscles of the rotator cuff (Supraspinatus, Infraspinatus, Teres minor, Subscapularis). In cases of impingement commonly humeral head translates superiorly, subacromial space decreases and soft tissues get pinched. This glenohumeral instability may be due to force couple dysfunction (deltoid – rotator cuff), delayed muscle activation, decreased muscle strength or

muscle imbalance.

On the other hand, scapular position and movement are also critical components of normal glenohumeral function. There are evidences, suggesting that in SIS kinematic of scapulothoracic motions is impaired (9,4,5), condition also known as scapular dyskinesis. Stability of the scapula depends on the surrounding musculature, which must dynamically position the glenoid, so that efficient glenohumeral movement can occur. The main scapula stabilizers are Levator Scapulae, Rhomboids, Serratus Anterior, and Trapezius. When weakness or dysfunction is present in these muscles, normal scapular positioning and mechanics may become altered, which result in abnormal stress to the capsular structures, rotator cuff compression and impaired performance (14). Changes in resting position of the scapula, often seen in patients with SIS, can be presented as increased anterior tilting and lack of posterior tilting, increased internal rotation of the scapula and decreased upward rotation, or scapu-

lar winging (7,9,10,11). Problems associated with changes in scapular kinematics during dynamic arm movements are: altered muscle activity patterns in the scapular muscles (9), decreased muscular activity or strength, or change in the timing properties of the Serratus Anterior, the Lower Trapezius and Middle Trapezius, and increased activity in the upper part of the Trapezius (2, 9).

In conservative approach in the treatment of SIS, exercise therapy has an important role. New insights emphasize that the dynamic stabilization of the shoulder and scapula is an essential part of the management (1). Unfortunately, the scapular musculature is often neglected in the treatment of SIS. This lack of attention may often lead into the incomplete treatment (14). Therefore, physiotherapy for overhead athletes with symptoms of impingement and scapular dyskinesis has to be addressed towards reestablishment of normal shoulder function by restoration of dynamic stability, muscular balance, endurance and proprioception and neuromuscular control.

The purpose of this study is to present closed kinetic chain exercises for training of the dynamic stabilization of scapula and shoulder, and to evaluate the effect of their application in patients with secondary shoulder impingement syndrome.

Material and Methods. Contingent of the study. The study was conducted on 14 subjects – 9 men and 5 women, mean age 28.7, with unilateral shoulder pain (the dominant upper limb was affected) (Table 1). All participants are active athletes (playing volleyball, tennis and beach tennis) with shoulder impingement or compressive symptoms, with no history for operative treatment.

Table 1. Contingent of the study.

Contingent of the study	Sex		Average age	Affected side	
	Male	Female		Left	Right
n=14	9	5	28.7	3	11

Methods for functional assessment. To evaluate the functional condition and response to the treatment were examined: (1) pain intensity by visual analogue scale (VAS); (2) pain-free active shoulder range of motion (ROM) by a standard goniometer; (3) scapular stability and symmetry – scapular tilt, rotation, winging, measurement of the distance between the inferior angle of the scapula and the adja-

cent spinous process (in resting position and in 90° shoulder abduction). All measurements were taken before and after 8-week treatment period.

The specialized physiotherapeutic program included closed kinetic chain exercises to restore muscle activation patterns and improve the dynamic stabilization of the shoulder and scapula. The level of difficulty of the exercises increased based on the quality of the performance and perceived intensity of pain.

For patients with SIS with presumed weakness of the Serratus Anterior, activation of this muscle is of particular importance. One of the best exercises for training of the Serratus Anterior is push-up plus, where the plus phase refers to the posterior translation of the thorax on a fixed scapula, resulting in scapular protraction. In this exercise Serratus Anterior shows increased activity with decreased activity of the Upper Trapezius (8). In our therapeutic program this exercise started from standing position (wall push-up plus), and later was performed from standard (Fig.1), and plank position – Plank push-up plus (Fig.2). Another exercise for activating the Serratus Anterior is wall slides. According some research, the amount of Serratus Anterior activation during this exercise is not significantly different than the amount of Serratus Anterior activation during the plus phase of the wall push-up plus exercise (3). The wall slide exercise, however, allows for this activation overhead (above 90° of shoulder elevation), where patients with shoulder impingement have been shown to have altered scapular mechanics and decreased Serratus Anterior activity. For our therapeutic program we choose wall slides to be performed with foam roller against the wall (Fig.3). The level of difficulty of this exercise was increased by the use of the Theraband loop (Fig.4). During the wall slides with Theraband loop additional tension of the external rotators of the shoulder was added, which elicits depression of the humeral head and decreases Pectoralis Major activity. The level of the resistance was adjusted accordingly for all subjects throughout the treatment process. To increase the difficulty of this exercise and resistance over the foam roller patients step back from the wall. The progression of wall slides was by using a stability ball. Another exercise for strengthening of the posterior chain of the shoulder and training of the rotator cuff and scapular stabilization is scapular-clock exercise – small ball circles against the

wall (clockwise and counter clockwise) (Fig. 5, 6). It develops proprioception, balance and coordination of the shoulder and scapular muscles. The exercise was performed in different starting positions of the shoulder elevation (90°, 120°), and with different patient's positions (facing the wall or sideways the wall).

Another exercise for strengthening of the posterior chain of the shoulder and training of the rotator cuff and scapular stabilization is scapular-clock exercise – small ball circles against the wall (clockwise and counter clockwise) (Fig. 5, 6). It develops proprioception, balance and coordination of the shoulder and scapular muscles. The exercise was performed in different starting positions of the shoulder elevation (90°, 120°), and with different patient's positions (facing the wall or sideways the wall).

When the quality of the performance improved progression in the therapeutic program was made by including exercises from quadruped and plank position. Exercises for training of the dynamic sta-

bilization from these positions are connected with heavy loading, so it is important patients to keep good scapular control – no winging or excessive protraction or rotation of the scapula. Because of the easier scapular control, at the beginning the following exercises were performed from quadruped position, then from plank position.

Exercises started with plank body saw – moving the body forward/ backward (Fig.7). For training of scapular stabilizers and rotator stability of the shoulder were included plank rotations (Fig. 8) and archer turns (Fig. 9) – rotation of the body from plank position and with extended elbow.

For multidirectional training of the dynamic stabilization patients performed quadruped 4-way reaching – reaching forward/ backward/ left/ right from quadruped position (Fig. 10), and quadruped lateral/ forward/ backward crawls. Progression in these exercises was made by using Theraband loop (Fig. 11).



Fig.1. Push-up plus.



Fig. 2. Plank Push-up plus.



Fig.3. Wall slides with foam roller.

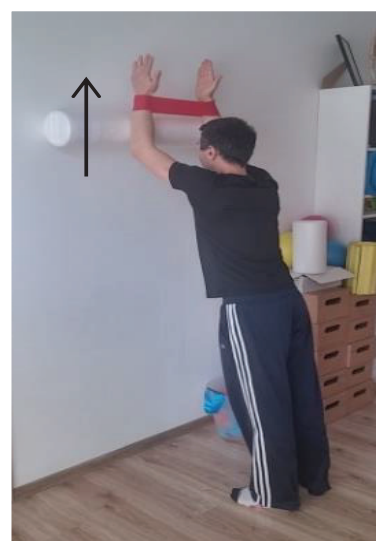


Fig.4 Wall slides with Theraband loop.



Fig. 5. Clock exercise with therapeutic ball.

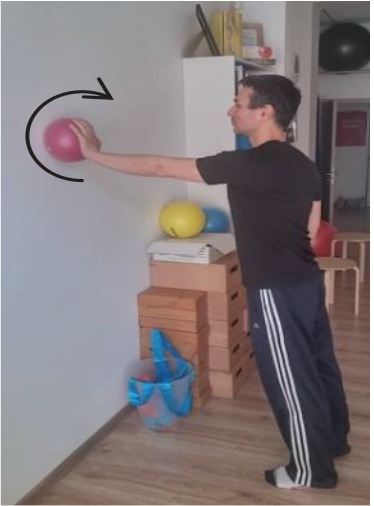


Fig. 6. Clock exercise with small ball.



Fig.7. Plank body saw.



Fig.8. Plank archer turns.



Fig. 9. Archer turns with extended elbow.



Fig. 10. Four-way reaching.



Fig. 11. Four-way reaching with Theraband loop.

Results. The results of this study indicated that closed kinetic chain exercises, applied to our patients with SIS, significantly decreased pain, improved active pain-free shoulder ROM and scapular stability and symmetry in motion.

Pain. The data of the examination of the pain intensity showed, that at the beginning of the treatment course pain level was average 4.7 (VAS) and at the end VAS score decreased to 1.3 ($P = 0,001$). The effect of the exercise therapy in reducing pain is mostly related with improved scapular and shoulder stability, which provides better stabilization of the humeral head and reduces compression of the subacromial soft tissues. For better results exercise therapy could be combined with other treatments, such as manual–mobilization techniques, stretching and modalities.

ROM. The findings of our study demonstrated statistically significant improvement in pain-free active shoulder ROM. At the end of the treatment course active shoulder elevation increased by 52.7° for flexion and 44.8° for abduction, and reached average 171.1° and 157.3° respectively. Improvement in shoulder ROM is mainly connected with decreasing patients' level of pain. Another reason may be improved scapular stabilization (position and motion), which is of great importance for all glenohumeral joint movements. Our findings agree with those of other researchers who have documented improvements in ROM following an exercise program in patients with SIS (1,6,12,13).

Scapular stability and motion. The results revealed considerable improvement in scapular symmetry in resting position and kinematics during arm movements after the exercise therapy. Greater improvement was detected for scapular position – at the end of the treatment course there were no signs of winging or asymmetry in position of the scapula in rest or in 90° shoulder abduction in most of the patients. Regardless of the significant changes in scapular stabilization full recovery of the scapular kinematics during shoulder functional movements might require a long term practice.

Conclusion. Physiotherapy for athletes with SIS is a complex process that requires detailed and comprehensive evaluation and identification of causes of impingement. In patients with impaired dynamic stabilization of the shoulder and with scapular

dyskinesia exercises for muscle strength and balance and timing properties of couple forces of muscles are of particular importance.

The study supports that closed kinetic chain exercises are effective in the treatment of patients with SIS. Training of the dynamic stabilization of the shoulder and scapula contributes for the reduction of pain, improved scapular stability and symmetry, and increased pain-free ROM. When the dynamic stabilization of the shoulder and scapula is restored functional kinetic chain exercises with functional muscle patterns should be included in the exercise treatment of SIS.

Bibliography

- Azar Moezy, Saeed Sepehrifar, Masoud Solaymani Dodaran. The effects of scapular stabilization based exercise therapy on pain, posture, flexibility and shoulder mobility in patients with shoulder impingement syndrome: a controlled randomized clinical trial. *Med J Islam Repub Iran.* 2014; 28: 87.
- Cools AM, Witvrouw EE, Declercq GA, et al. Scapular muscle recruitment patterns: trapezius muscle latency with and without impingement symptoms. *Am J Sports Med* 2003;31:542–9.
- Dustin H. Hardwick, Justin A. Beebe, Mary Kate McDonnell, Catherine E. Lang, A Comparison of Serratus Anterior Muscle Activation During a Wall Slide Exercise and Other Traditional Exercises *J Orthop Sports Phys Ther* 2006;36(12):903–910.
- Graichen H, Stammberger T, Bonel H, Englmeier K-H, Reiser M, Eckstein F. Glenohumeral translation during active and passive elevation of the shoulder – a 3D open-MRI study. *J Biomech.* 2000;33(5):609–13.
- Han KJ, Cho JH, Han SH, Hyun HS, Lee DH. Subacromial impingement syndrome secondary to scapulothoracic dyskinesia. *Knee Surg Sport Tr A.* 2012 Oct;20(10):1958–60.
- Kuhn JE. Exercise in the treatment of rotator cuff impingement: a systematic review and a synthesized evidence-based rehabilitation protocol. *J Shoulder Elb Surg.* 2009;18(1):138–60.
- Laudner KG, Myers JB, Pasquale MR, et al. Scapular dysfunction in throwers with pathologic internal impingement. *J Orthop Sports Phys Ther* 2006;36:485–94.
- Ludewig P, Hoff M, Osowski E, Meschke S, Rundquist P. Relative balance of serratus anterior and upper trapezius muscle activity during push-up exercises. *Am J Sports Med.* 2004;32:484–493.
- Ludewig PM, Cook TM. Alterations in shoulder kinematics and associated muscle activity in people with symptoms of shoulder impingement. *Phys Ther.* 2000;80(3):276–91.
- Ludewig PM, Reynolds JF. The association of scapular kinematics and glenohumeral joint pathologies. *J Orthop Sports Phys Ther* 2009;39:90–104.

Lukasiewicz A, McClure P, Michener L, Pratt N, Sennett B. Comparison of 3-dimensional scapular position and orientation between subjects with and without shoulder impingement. *J Orthop Sports Phys.* 1999;29(10):574.

McClure PW, Bialker J, Neff N, Williams G, Karduna A. Shoulder function and 3-dimensional kinematics in people with shoulder impingement syndrome before and after a 6-week exercise program. *Phys Ther.* 2004;84(9):832-48.

Michener LA, Walsworth MK, Burnet EN. Effectiveness of rehabilitation for patients with subacromial impingement syndrome: a systematic review. *J Hand Ther.*

2004;17(2):152-64.

Voight ML, Thomson BC. The role of the scapula in the rehabilitation of shoulder injuries. *J Athl Training.* 2000;35(3):364.

Correspondence address:

Assoc. Prof. Lyubomira Sazdova, PhD

NSA "Vassil Levski", 1700 Studentski grad

Mobile: +359892299772

e-mail: l_sazdova@abv.bg

PROGRESSION OF THE PHYSICAL ACTIVITY AFTER DELIVERY BY CAESAREAN SECTION

Nadezhda Popova, Georgi Petrov,

Daniela Mileshkina, Irina Nesheva

Key words: caesarean section, physiotherapeutic program, progression

Summary

A number of Bulgarian women deliver by caesarean section for different reasons. After their discharge from the hospital there is no practice for giving detailed guidelines for physical activity after this type of birth. Aim: to offer adequate physiotherapeutic program after a cesarean delivery. Material and Methods. Physiotherapeutic program starts at 3rd postoperative weeks (POW) in the absence of contraindications and continues to up to 12th POW by gradually upgrading the exercises. It includes active exercises in the upper limbs with a gradual increase in elastic resistance, various kinds of squats, aerobic workout with different types of physical activity. Exercises for abdominal muscles begin after 6th POW in absence of contraindications. The type and dosage of the abdominal exercises are selected individually. The duration of the procedure do not exceed 45 minutes, which makes it suitable for every-day performance in this difficult period for daily organization. Conclusion. Physiotherapeutic program after a cesarean delivery is essential to the recovery process of the affected soft tissues from the surgical intervention. The individual selection of the exercises for the abdominal muscles and their application on the right time provides a good tone and positive emotional affection of the woman and also helps adaptation to her new social role.

The tendency to increase the deliveries by caesarean section (CS) is expressed. Therefore, there is a strong tendency for rise in the number of CS performed in Bulgaria. For example, at the largest obstetric and gynecological hospital in Bulgaria – “Maichin dom” – Sofia, in 1977, 4.1% of all the deliveries were by caesarean section, in 1986.– 13,92%, in 2000.– 24.52% (Димитров, 2003) and by the end of 2014.– 50%. At national level, the trends are similar – in 2012 36% of the births were cesarean sections, 2013–38.4%, and towards the end of 2014–41% (Национален регистър на

ражданията, 2014). After this type of delivery Physiotherapy (PT) might get start in the first days after the surgery, in which case the primary goal is early verticalization of the patients (Попов и кол., Kinser et al., 2012). Then, from the fifth postoperative day, until the third postoperative week, it is desirable for the patients to maintain a moderate level of physical activity, also avoid severe physical efforts and especially those causing pain and / or excessive fatigue. A therapeutic exercise program may include some basic exercises from supine lying position but the dosage should be individualized, as the comfort level of effort is the most important criterion. Breathing exercises are also suitable. They should be performed with an emphasis on diaphragmatic breathing but without retaining air also without pushing or resistive inhalation and/or exhalation.

Currently, after discharging from the hospital there is no practice of giving detailed guidance on the progression of physical activity. In the reviews of the available scientific and scholarly literature, PT after delivery by CS has not been well considered, especially in the later postoperative period. Nevertheless, authors agree that the physical activity after such an intervention assists the overall recovery process (Gursen et al, 2006; Wyrzykiewicz T. et al, 1979; Tsunehiro, 1976; Kinser et al., 2012), and in particular – improves the posture (Gursen et al., 2006), the scar elasticity (Sancho et al., Karakava et al, 2015; Stillermann, 2009; Kinser et al., 2012) and overall fitness of the patient. That is why the aim of our study is to offer an exemplary physiotherapeutic program for patients in the late postoperative period, after delivery by CS.

Material and methodology. The studied literature and mostly our practical experience shows that the active PT could start at the 3rd postoperative week only in the absence of contraindications (postoper-

ative complications, low levels of the hemoglobin, large amount of lochia, diastasis recti, etc.) and after a consult with an obstetrician-gynecologist. The total duration of our program is 12 postoperative weeks (POW).

Physical activity after the 3rd to the end of the 4th POW. In this period the program consists active exercises with elastic resistance for the upper limbs also active exercises for the gluteal muscles, and closed kinetic chain exercises for the lower limbs. All exercises are performed in 2 sets of 10 repeti-

tions at moderate pace as a circular workout. It is recommended to start with a resistance band TheraBand blue (its load corresponds to 2.6 kg weight). The duration of a session is 20–25min. The following sample exercises are appropriate:

1. The patient is sitting on a chair or on a Fitball, the shoulders are 90 ° flexed, and she’s holding the Thera Band. The TheraBand should be extended side wards but without increasing in lumbar spine while performing the exercise (Fig. 1A).

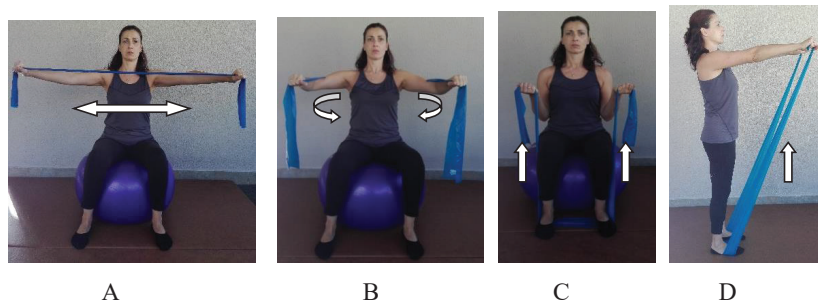


Fig. 1 (A-D). Upper limb exercises.

2. The patient is sitting on a chair or on a Fitball, the shoulders are 90 ° abducted, the elbows are slightly flexed and the TheraBand passes behind the back. Shoulder transversal flexion is performed (Fig. 1B)

3. The patient is sitting on a chair or on a Fitball, the upper limbs are next to the body and the TheraBand passes under the feet. The patient performs flexion in the elbows. The movement should be performed only in the elbow joint without flexion in the shoulder or any extension of the body (Fig. 1C)

4. The patient is in standing position. The TheraBand passes under the feet, and each end is held by the respective hand. A shoulder flexion with extended elbows is performed. There should not be an increase of the lumbar lordosis during exercising. This is prevented by a slight contraction of the abdominal and gluteal muscles.

5. Spiral-diagonal patterns of motion – “drawing the sword” (Fig.2A), “replacing the sword” (Fig.2B), “reaching for seatbelt” (Fig. 2C), “strapping the seatbelt” (Fig.2D). The starting position is standing next to a suitable place for the elastic band. In each variant, the patient should maintain a good posture. Special attention should be paid to

the correct scapulothoracic rhythm, the good spine position and the lack of rotation of the body.

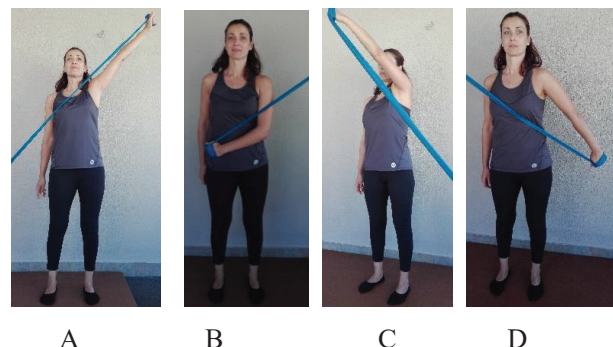


Fig. 2 (A-D). Diagonal spiral patterns of motion

6. The patient is in supine lying position with flexed knees and feet on the floor. Pelvic lift is performed. There should not be an increase of the lumbar lordosis during exercising (Fig.3)

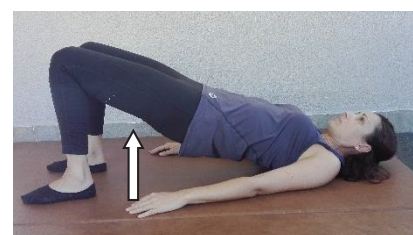


Fig. 3. Pelvic lift

7. The patient is in side-standing position, next to a suitable location for tightening the TheraBand. The other end of the elastic band is bounded to the contralateral ankle. A hip abduction is performed in the physiological range of motion (Fig. 4A).
 8. The patient is in side-straddle position, next to a suitable location for tightening the TheraBand. The other end of the strap is tied to the unilateral ankle. A hip adduction is performed until the exercised lower limb is brought next to the other (Fig.4B).

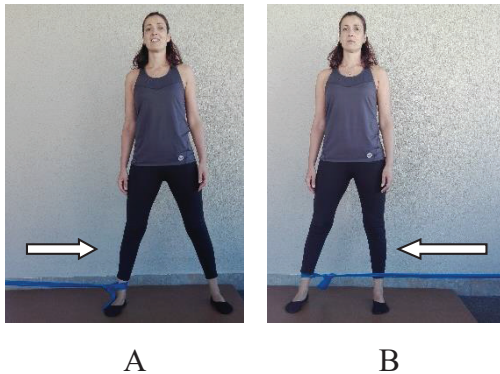


Fig. 4 (A-B). Hip abductors and adductors exercises.

9. The patient is in standing position with Fitball between her back and a wall. A squat is performed to a comfortable position, but no more than 90° of knee and hip flexion (Fig. 5).

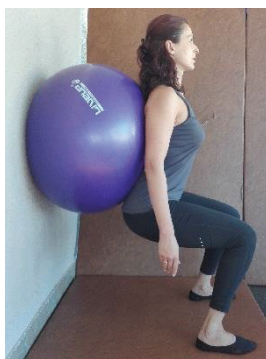


Fig. 5. Fitball squat

Another type of appropriate exercising for this period is walking. Our methodology offers daily walks of about 20–30 minutes. The pace of walking should be slow to moderate. If the walk is done with the baby stroller, the patient should pay attention on lifting the stroller to the curbs, stairs and other obstacles.

Physical activity after the 4th to the end of the 6th POW. Exercises for the upper limbs remain the same, but after the 5th POW the resistance may be

increased with a black TheraBand (corresponds to 3.3 kg of free weight). The repetitions are also increased to 12, the series remain two, on the principle of a circular workout. For lower limbs strengthening we add lunges with a dosage of 2 sets of 10 repetitions, for each leg (Fig.6).



Fig. 6. Lunge Fig. 7. Side-lunge

The total duration of the procedure is 25–30 minutes. Walking also increases its duration to 30–40 minutes, but the pace remains moderate.

Physical activity after the 6th to the end of the 7th POW. At the end of the 6th POW, in the absence of contraindication and good physical condition, exercises for activation of the abdominal muscles are included. A deep-diaphragmatic breathing with a tightening of the pelvic floor muscles is performed from the supine lying position with flexed knees and feet on the floor (Fig.8). There is a slow, full exhalation with the sound of “shush”, “sss”, “zzzz”. The dosage for these exercises should be two sets of 5 repetitions.

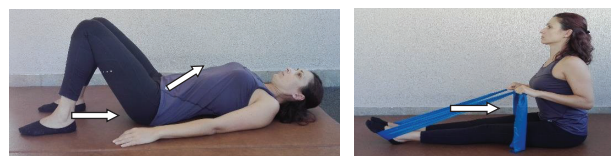


Fig. 8. Diaphragmatic breathing with Fig. 9. “Rowing exercise pelvic floor contractions.

For the upper limb strengthening “the rowing” exercise is added. The patient is sitting on the floor with extended knees and feet in dorsal flexion. The TheraBand passes under the feet, the upper limbs are extended in elbows with a slight flexion in the shoulder. A stretch of the elastic band is performed as an imitation of a rowing movement (Fig.9). The dosage is 2 sets of 10 repetitions.

In the lower limb exercises we add a side lunge – 2

sets of 10 repetitions, for each leg (Fig.7).

The total duration of the procedure is 30–35min.

The duration of the walks can be increased individually, depending on the patient's capacity, however it is good to take breaks every 30 to 40 minutes and without waiting for the accumulation of fatigue.

Physical activity after 7th until the end of 8th POW.

In this period the strengthening of abdominal muscles may happen with the following exercises:

1. Knee plank (Fig. 10A) – 3 sets for 10 sec holding the position.
2. Side knee-plank (Fig. 10B) – 3 sets for 10 sec holding the position for each side. In a good functional state, the upper limb may be extended in the knee (Fig.10C).

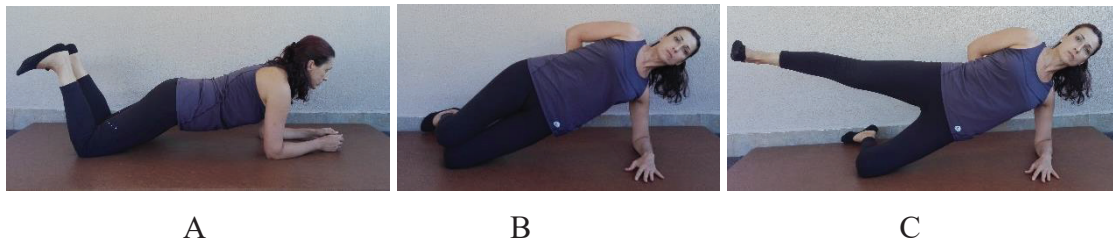


Fig. 10 (A-C). Different variations of a knee plank

3. Anti-rotational exercise for the body. The patient is in a side-standing position, next to a suitable location for tightening the TheraBand. The elastic band is attached to the wall at the level of the waist. The patient pulls the band ahead, with the shoulders in 80° flexion and very slightly flexed elbows in front of the body (Fig. 11). In this position, when the arms are tight, the lateral pull of the elastic band “tries” to twist the torso to which the patient counters with isometric contraction of the abdominal musculature. There should be no tension or compression feeling in the low back (it occurs with increased lordosis and low contraction of the abdominal muscles.) Dosage – 3 sets per 10 seconds on each side.

4. The starting position is as in Exercise 3. In this case the purpose of the exercise rotating the body on the outer leg, which plays the role of a pivot. For positive appliance, the heel of the inner leg is lifted in order to rotate the foot in the direction of the torso and pelvis Fig.12. The connection and position between the torso and the inner leg should not be disturbed. This is done by contraction of the oblique abdominal musculature. The dosage is 2 series of 10 replicates.

The different types of squats and lunges are made in 3 sets of 10 reps.

The total duration of the procedure is 35–45 minutes.



Fig. 11. Anti-rotational exercise for the body Fig.12. Pivoting over the outer leg

Walking is done with the patient's tolerance, but not less than 30–40 minutes a day.

Physical activity after the 8th to the end of the 12th POW. In the end of the 8th to the end of the 9th POW planks are upgraded to their “classic” performance (Fig. 13 A-B). The dosage is 3 sets held for 10 seconds for each plank.

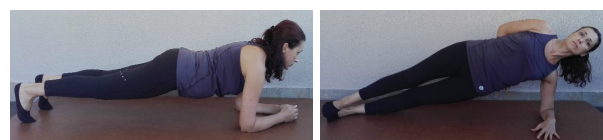


Fig. 13A. Plank Fig. 13B. Side-plank

The exercise “elastic deadlift” is added (Fig.14). The patient is standing with slightly flexed knees, the upper part of the body is tilted forwards, with flexion in the hips and spine in neutral. The TheraBand

passes under the feet. The hands hold the two ends of the elastic band. The patient then performs simultaneously extension of the knees and hips, which straightens-up the upper part of the body against the resistance of the elastic band. The drive comes from the hamstrings and quads, while the spine muscles and abdominals keep the torso in neutral position. The dosage is 2 sets of 10 repetitions.



Fig. 14. Elastic deadlift

From 9th to 10th POW all of the exercises are done in 3 sets of 10 repetitions. The plank and side-plank holding should be increased to 20 to 30 sec.

As an aerobic workout some activities as cycling/ stationary bike (about 15–20 min to 30 min at the end of the period) and/or mountain trekking with overcoming a small altitude may be added.

From the 10th to the 12th POW the improved condition of the abdominal and back muscles allows more opportunities for education of correct performance of the daily activities – weight lifting, lifting of the baby, leaving it in a cot, etc.

At the end of 12th POW, the total duration of the procedure is about 45–60 minutes. During the entire period, aerobic workout activities remain the same – walking, cycling, mountain trekking. The dosage varies according to duration, intensity, altitude. After 12th POW, swimming or water aerobics can be included at the discretion of the obstetrician-gynecologist. The distribution of the physical activity during the week is made in proportion to the physical shape and capacity of the patient. We recommend exercise sessions to be done 4 times a week, and the aerobic workouts two times a week. One day for full rest without the described activities is necessary.

The suggested progression of therapeutic exercises is appropriate for most women who had caesarian delivery.

Conclusions. The postpartum physiotherapeutic program is of utmost importance for the recovery process of the affected soft tissues from the surgical intervention. The individual selection of therapeutic exercises and the timely inclusion of abdominal muscles exercises provide good fitness and positive psycho-emotional effect on the woman. This also facilitates smoother adaptation in her new social role.

References:

- Димитров А. (2003). Съвременни проблеми на абдоминалното родоразрешение. Дисертация за получаване на научна степен: “Доктор на медицинските науки”
Информационна система за ражданията (2014), цитирана в <http://www.ag-specialist.com/index.php>
Попов Н. (2012). Въведение във физиотерапията – основни средства и методи. София, НСА-прес, с. 290–302
Çıtak Karakaya İ, Yüksel İ, Akbayrak T, Demirtürk F, Karakaya MG, Ozyüncü Ö, Beksaç S. (2012). Effects of physiotherapy on pain and functional activities after cesarean delivery. Arch Gynecol Obstet.; 285(3), p. 621–7. doi: 10.1007/s00404-011-2037-0. PubMed PMID: 21830007.
Gürşen C, İnanoğlu D, Kaya S, Akbayrak T, Baltacı G. (2016). Effects of exercise and Kinesio taping on abdominal recovery in women with cesarean section: a pilot randomized controlled trial. Arch Gynecol Obstet.; 293(3):557–65. doi: 10.1007/s00404-015-3862-3. PubMed PMID: 26329802.
Kinser, C., Colby, L. (2012). Therapeutic exercise. Foundations and techniques. Sixth edition. F.A. Davis Company, Philadelphia, p.952–954
Sancho MF, Pascoal AG, Mota P, Bø K. (2015). Abdominal exercises affect inter-rectus distance in postpartum women: a two-dimensional ultrasound study. Physiotherapy; 101(3):286–91. doi: 10.1016/j.physio.2015.04.004. PubMed PMID: 26094117.
Stillerman E. C-section scar massage. (2009). Midwifery Today Int Midwife; (92):29, 64–5. PubMed PMID: 20092144.
Tsunechiro MA. (1976). Influence of physical and breathing exercise on intestinal evacuation in surgical postpartum patients. Rev Esc Enferm USP; (1):149–62. PubMed PMID: 1050051.
Wyrzykiewicz T, Kowalczyk J. (1979). Early exercise therapy after cesarean section and gynecological abdominal surgery. Ginekol Pol. 50(11):981–4. Polish. PubMed PMID: 544359.

Contact information with the corresponding author

Assistant professor Nadezhda Popova, PhD
National Sports Academy “Vassil Levski”
Department „Theory and methodics of physiotherapy”
Studentski grad, 1700, Sofia, Bulgaria
Tel. +359 892 299 797
E-mail: popova_nadia@abv.bg

STABILOGRAPHY A RELIABLE METHOD FOR MEASUREMENT OF POSTURAL BALANCE IN PATIENT AFTER ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

Tanya Grueva, Katherina Stambolieva

Summary

The purpose of the present report was to observe the dynamics of postural balance during unilateral stance with the help of stabilography method in patients after anterior cruciate ligament reconstruction during their 6 months postoperative recovery period.

Methodology. Forty patients divided in 2 groups, experimental and control ones, have been investigated. The two groups were formed according to the starting day with physiotherapy and the type of exercises in the treatment. Computerized stabilography system ("CAT 2004" Plovdiv/Bulgaria) was used to detect the results at the 1st, 3rd and 6th month of the physiotherapy treatment. The measurement included quiet unilateral stance with eyes open and eyes closed. The tests were done both on the stable platform, as well as on a foam block with the operated and non-operated leg.

Results. The patients from the experimental group have shown better balance in unilateral stance on the operated leg on the stable platform as well as on the unstable one already at the 3rd month postoperatively. That significant difference was maintained till the 6th postoperative month. Apart of that the patients from the same group have demonstrated better performance with the non-operated leg, which shows better general conditioning with the lower limbs at all.

Conclusion. The results show that the stabilography method can be considered as a reliable one for measuring postural balance discrepancies in patients with lower extremity injuries.

Key words: stabilography, postural balance

Introduction. Computer based stabilography system is made to investigate the postural balance changes while maintaining upright position (Hoffman et al., 1999). It can be used to determine different postural strategies in healthy subjects as well as for patients with different pathologies of the musculo skeletal and vestibular systems (Ben Moussa et al., 2009). As we incorporated specific proprioceptive exercises, responsible for the postural balance, in early postoperative treatment in patients after anterior cruciate ligament (ACL) reconstruction (Mohamaddi et al., 2012), we decided to implement the measurement of the static postural balance with the stabilography platform and to check the reliability and validity of the test in patients with that pathology.

The purpose of the present report was to observe the dynamics of postural balance during unilateral stance with the help of stabilography method in patients after ACL reconstruction during their 6 months postoperative recovery period.

Methodology. Forty patients divided in 2 groups, experimental (EG) and control (CG) ones, have been investigated. The two groups were formed according to the starting day with physiotherapy and the type of exercises in the treatment. The phys-

iotherapy treatment for the patients from the EG included proprioceptive and close kinetic chain exercises, which were performed still in the early postoperative days (Harrison et al., 1994). While for the patients from the CG these specific exercises were done when they were allowed to do some weight bearing of the operated leg, approximately 30 days after the reconstruction. Computerized stabilography system ("CAT 2004" Plovdiv/Bulgaria) was used to measure the changes in the parameters of the postural balance of the patients while they were maintaining unilateral stance. The system includes stable platform and adapted software (Stambolieva, 2007). The displacements of foot pressure center in both medio-lateral (ML) and anterior-posterior (AP) directions were registered. The following parameters were detected: mean amplitude (MA) and mean velocity (MV). It is presented in the so called stabilograms, fig. 1. Two analogue signals were digitized with a sampling interval of 10 ms and filtered with a digital Hamming low-pass filter with cut-off frequency of 10 Hz in order to remove the high frequency noise and sampling error.

The dynamics of postural sways for both groups were statistically processed by monofactor dispersion analysis (ANOVA), where the factor is Time

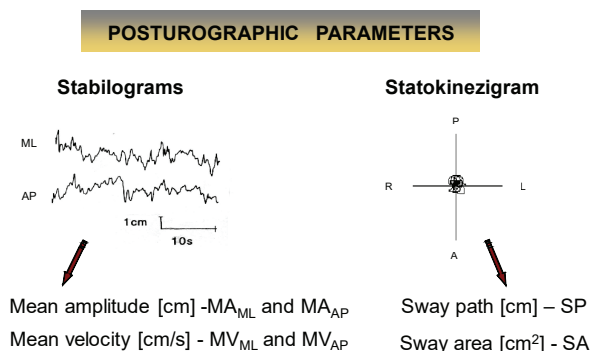


Figure 1

(T). While the internal group discrepancies were statistically processed by nonparametric Wilcoxon test. The measurement itself was done directly on the platform (stable surface) (figure 2), as well as on a foam block placed on the platform (unstable surface) (figure 3), both conditions performed with the operated and non-operated leg.



Figure 2
Stable surface



Figure 3
Unstable surface

All tests were done with eyes open (EO) and with eyes closed (EC). In that way, the measurement was done at 1st, 3rd and 6th postoperative month for the patients from the EG, while for the ones from the CG were done only at 3rd and 6th month. Some of the patients from the CG still could not put weight and stand on the operated leg, for others, performing these tests was too complicated task.

Results.

Unilateral stance on a stable surface.

There was not much differences between the groups in the oscillation of the *mean amplitude* of postural sway while standing on a stable surface with eyes open both for operated and non-operated leg. The results for both groups were close, only at the 3rd postoperative month there was a significant difference in AP direction, with lower oscillations for the EG (figure 4).

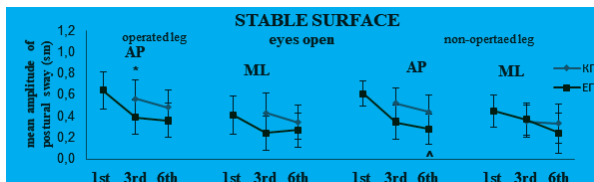


Figure 4

*St. Significance between groups ($p < 0,05$); ^St. Significance between 1st and other measurements within group ($p < 0,05$)

When the vision was eliminated the mean amplitude postural sways for the non-operated leg increased for both groups, but in lesser degree for the patients from the EG. In the time, it was observed a systematical decrease of the oscillation for both groups. While standing on the operated leg, the patients from the EG showed significant lesser oscillation of the mean amplitude, which was statistically confirmed at the 3rd and 6th month in both orthogonal axes. The starting values in AP and ML direction for the EG at the 1st monitoring month were even lower than the data collected for the CG at the 3rd monitoring month (figure 5).

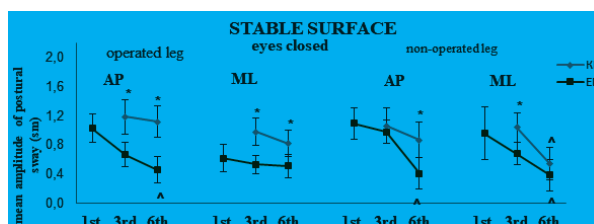


Figure 5

*St. Significance between groups ($p < 0,05$); ^St. Significance between 1st and other measurements within group ($p < 0,05$)

The *mean velocity* of postural sway while standing either on the non-operated or operated leg, on a stable surface, with eyes open, was very close between the groups throughout the monitoring periods, and that for both directions (Figure 6)

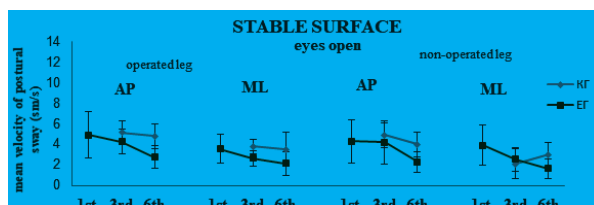


Figure 6

When reducing the visual input, the results was considerably different. The velocity sway in both

orthogonal axes, of the non-operated leg, for the EG was lower for the whole period, but it was statistically significant only at the 6th postoperative month. Also, it was significantly established a systematical drop of the values in the EG in every second control period. Furthermore, velocity sways in unilateral stance on the operated leg had a different point. For the EG the values of the 1st and 3rd month were very close, they lowered significantly still at the 6th monitoring month, where there was also statistical difference between the groups, for AP plane. For the CG, the velocity sway was lower in the final control period, but it was statistically supported only in ML axes (figure 7).

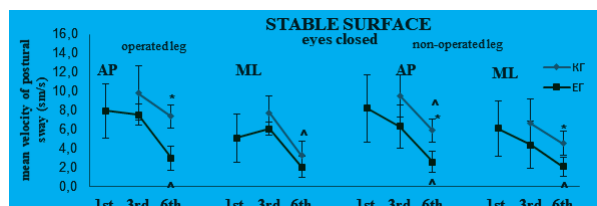


Figure 7

*St. Significance between groups ($p < 0,05$); ^St. Significance between 1st and other measurements within group ($p < 0,05$)

It was observed that the parameters of postural sway in unilateral stance on the operated leg, on a stable surface when eyes were open, did not differ much between the groups through the measured period. Even though they lower in every next control period, the changes are very little. With reducing the vision, patients from both groups showed different strategies to maintain quiet unilateral postural balance. The posturographic parameters increase for both groups, but that was observed significantly more for the CG in both orthogonal planes. The patients from the EG showed more stable unilateral stance on the operated leg still on the 3rd control month and that maintained till the 6th one, especially in AP plane.

Unilateral stance on an unstable surface.

The mean amplitude of postural sway in standing on the operated leg on a foam block, when eyes were open was much more expressed considering the value in standing on the non-operated leg, and that for both groups. A significant difference was seen between the groups in the time, while maintaining balance on the operated leg. The dynamics of oscillations is minimal and the values between the groups in non-operated leg were very close (fig-

ure 8). The condition of closed eyes did not affect the tendency between the groups while standing on the operated leg. But it has changed while standing on the non-operated one. The amplitude oscillations have

increased for both groups, as for the patients from the EG the values were significantly lower in ML plane at the 3rd monitoring month and in AP plane at the 6th month, comparing with the CG. Also, the final results for the EG, compared to the starting ones were much lower, statistically supported, in both orthogonal axes (figure 9).

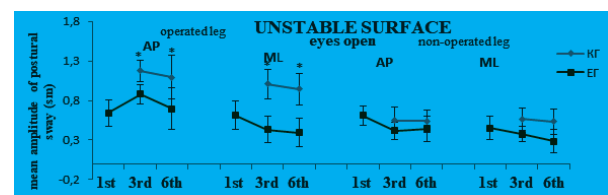


Figure 8

*St. Significance between groups ($p < 0,05$)

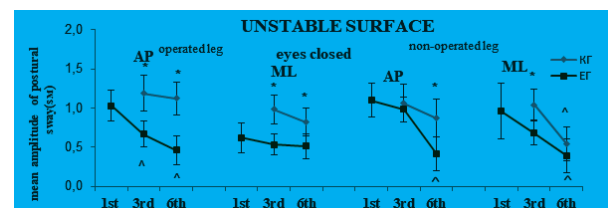


Figure 9

*St. Significance between groups ($p < 0,05$); ^St. Significance between 1st and other measurements within group ($p < 0,05$)

Under the same experimental circumstances, the mean velocity sway was comparatively equal for the operated and non-operated leg and that for both groups. Statistical significant differences between the groups were observed mainly at the 6th control month. The lower values were for the EG. Within the groups there was significant differences between the starting and final values in both planes for both legs, for the patients from the EG. For the CG, it was in ML plane for the operated leg and in AP plane for the non-operated leg (figure 10).

Like in the other experimental conditions here with closing eyes standing on one leg on a foam block the velocity postural sway increased for both groups, but with significant lower values for the patients in the EG. Standing either on the operated or on the non-operated leg statistical significance could be seen already at the 3rd control month in AP plane

and in both orthogonal axes at the 6th monitoring month. Both groups showed significant progressive decrease of velocity sway values in the time, especially in AP plane, and for the EG this is observed still at 3rd postoperative month (figure 11).

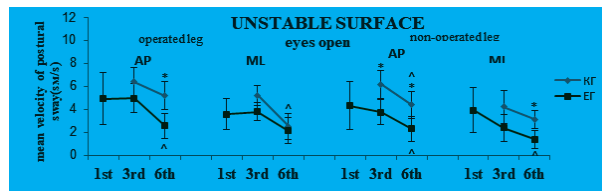


Figure 10

*St. Significance between groups ($p < 0,05$); ^St. Significance between 1st and other measurements within group ($p < 0,05$)

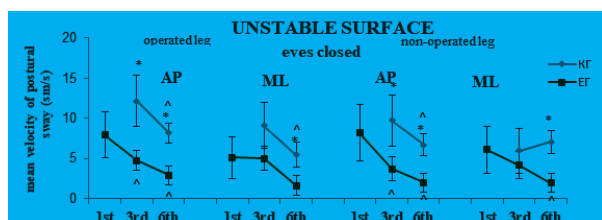


Figure 11

*St. Significance between groups ($p < 0,05$); ^St. Significance between 1st and other measurements within group ($p < 0,05$)

Overall the patients from the EG were dealing better with the given task of maintaining unilateral stance on unstable surface, meaning on a foam block. The patients from the CG showed significantly higher amplitude and velocity postural sway values during the measured period. Even though they showed positive dynamics of postural sway during the time, those discrepancies between the groups were well observed at the 6th control month in both orthogonal axes, as well as with eyes open, as with eyes closed.

In general, the patients from the EG have shown better balance in unilateral stance on the operated

leg on the stable platform as well as on the unstable one already at the 3rd month postoperatively. That significant difference was maintained till the 6th postoperative month. Apart of that the patients from the same group have demonstrated better performance with the non-operated leg, which shows better general conditioning with the lower limbs at all.

Conclusion. The results show that the stabilography method can be used effectively for scientific investigations, as well as for clinical practice, to determine and follow the dynamics of postural balance in patients with ACL disorders. Also, it can be considered as a reliable tool for measuring postural balance discrepancies in patients with lower extremity injuries.

References:

Ben Moussa AZ, Zouita S, Dziri C et al. Single-limb assessment of postural stability and knee functional outcome two years after ACL reconstruction. *Ann Phys Rehabil Med* (2009) 52:475–484

Harrison EL, Duenken N, Dunlop R et al. Evaluation of single-limb standing following ACL surgery and rehabilitation. *Phys Ther* (1994) 74:245–252

Hoffman M, Scharder J, Kocaja D. An investigation of postural control in postoperative ACL reconstruction patients. *J Athl train* (1999) 34:130–136

Mohammadi F, Salavati M, Akhbari B, Mazaheri M, Khorrami M, Negahban H. Static and dynamic postural control in competitive athletes after ACL reconstruction and controls. *Knee Surg Sports Traumatol Arthrosc* (2012) 20:1603–1610

Stambolieva K. Computerized stabilographic measurement of the functional status to the vestibular analyzer PhD dissertation/ Sofia 2007.

Corresponding author:

Chef assistant, Tanya Grueva-Pancheva, PhD
tgrueva2000@gmail.com
 Sofia 1000/str.Gurguliat 1
 NSA “Vassil Levski”
 Kinesitherapy faculty
 TM of the kinesitherapy

DISTRIBUTION OF LOWER LIMB EDEMA IN PREGNANT WOMEN

D. Mileshkina, D. Popova-Dobreva, N. Popova

Summary

Introduction: Lower limb edema is a common problem during pregnancy. The aim of the study: to determine the incidence of edema of the lower limbs in pregnant women during the second and third trimesters. Methodology: The studied group consisted of 230 pregnant women, aged between 15 and 43 years. The criteria for inclusion are: pregnant women in the second and third trimesters. The survey was conducted for the period January-March 2017 in 18th diagnostic and consultative center, Hospital "Sheynovo" and University Obstetrics and Gynecology Hospital "Maichin Dom". Results: 40% of the women reported lower limb edema during second and third trimester of pregnancy. The most often affected area is the ankle (52,4%), followed by the feet (36.3%), 9,1% change their foot size, 18,3% of the women have varicose veins, 50,9% reported muscle cramps. In this study, the results associated with the presence of edema, the degree of edema and its localization, the condition of the lower limbs and the presence of varicose veins, foot ache, lower limb muscularization, and concomitant diseases were analyzed. Characteristics of women in the study were made according to their age, parity, profession, pre-pregnancy, Body Mass Index (BMI), blood pressure values, motor activity, etc. Discussion: Even if the lower limb edema is not painful, it can be uncomfortable and swelling may make it difficult to put on socks or shoes. It can make also walking difficult and decrease the quality of life.

Key words: physiotherapy, pregnancy, lower limb edema

Introduction:

The presence of lower limb edema is a common complaint of pregnant women. (Muzzafar, M., 1998; Mohaupt, M., 2004; Popov, N., 2012). Physiological changes taking part during the pregnancy within the body, are the main reason for their appearance, and gravity is to be responsible for them to be mainly placed in the limbs. The most prone to edema are the feet and the ankles, compared to – the shanks, the knees, the palms and the fingers, which are affected to a lesser extent. Mostly, the pregnant women have those clearly formed edemas appearing during the third trimester. Usually, there is no danger of their appearance during the late stage of pregnancy, but in some cases, they could be an indication of serious, hidden pathological problems and caused by them complications.

Aim and Objectives of the study:

The aim of this research is to track the spread of the edema of the lower limbs among the pregnant women in second and third trimester.

Methods:

The research is carried out for the period January – April 2017 among pregnant patients, visiting the women's consultation – Second SAGBAL "Sheynovo", as well as 18 Diagnostic Consultative Centre and University Hospital "Maichin Dom". Only women in second and third trimester of the pregnancy with not complicated and normal pregnancy up to the moment are chosen for the research. The number of participants for the set period is 230. The age of the persons in the research varies from 15 up to 45 years old. The chosen method of research is through a poll. The questionnaire consists of 20 questions. The first a few questions give you basic information for the people in the research – age, profession, parity, trimester. The rest of the questions are concerned about the presence of edema, its localization, the change in the feet, the presence of cramping and varicose veins, blood pressure values, Body Mass Index (BMI), ongoing illnesses, practice and type of physical activity and etc.

Results:

The statistical method for one – dimensional frequency distribution is used to process the results. The results from the age distribution of the women have been presented on Fig. 1. Of the total surveyed, 230 pregnant women in second and third trimesters, with the lowest percentage being those over the age of 40–3%, followed by the women in the age group below the age of 20–5%. Most are

pregnant in the age range between 30 and 40 years – 51% and those between 20 and 30 years – 41%.

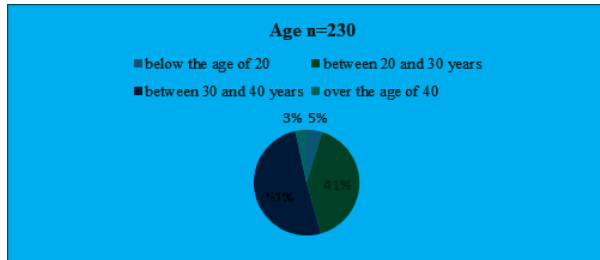


Fig. 1. Age distribution of the pregnant women

The distribution as per the trimester shows that from those being surveyed in third trimester are 67%, and those in second are – 33% (Figure 2).

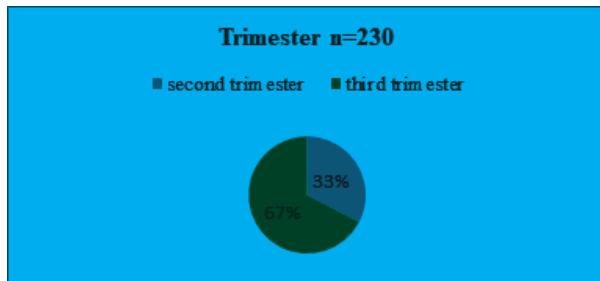


Fig. 2. The distribution of the women as per the trimester

Figure 3. presents the results as to whether the edema is only present on one of the lower limbs or is present in both. Nearly all of the people reported swelling of both lower limbs – 91%. A small percentage – 9% of them indicated edema of only one of the lower limbs.

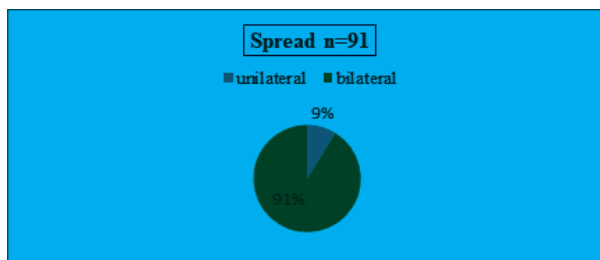


Fig. 3. Unilateral / bilateral spread of swelling.

On Figure 4 and 5 is presented in which part of the pregnant women in the second and third trimesters of pregnancy respectively there is a swelling. About a quarter (23%) of women in the first group have this complaint, whereas almost half of women in the third trimester have swollen swellings.

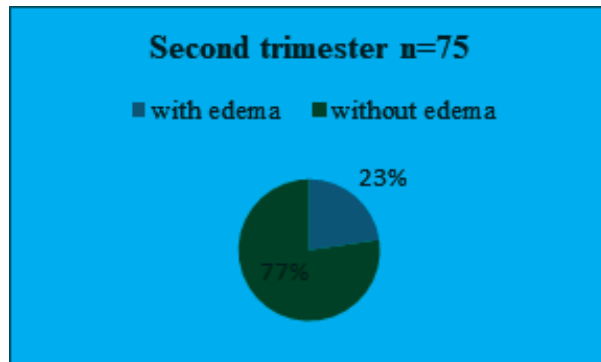


Fig.4 Presence of swelling – second trimester

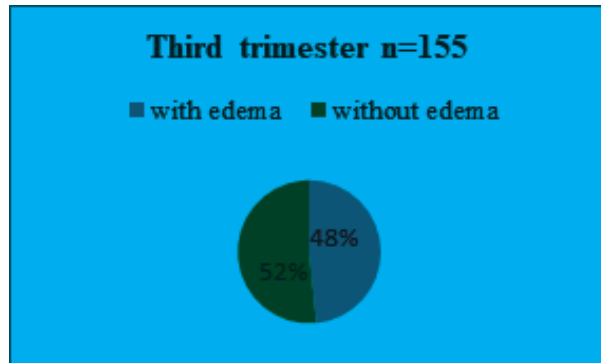


Fig.5 Presence of swelling – third trimester

Depending on their duration, we classify swellings as permanent (more lenient, difficult to respond) and temporary or variable (appear after a longer sitting / standing, etc.), soon after they disappear on their own and respond easily to the starting positions). 91 of the pregnant respondents (81%) characterized their swellings as temporary and varying. The remaining 19% complain of edema, which persists for a longer period of time (Fig. 6).

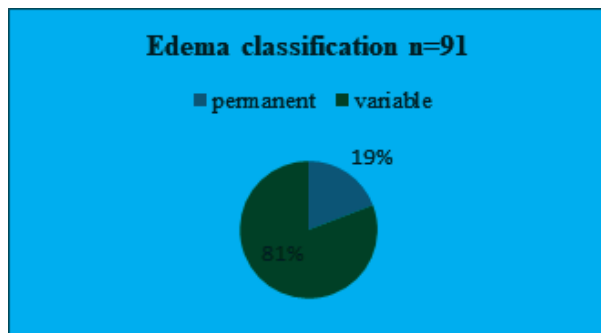


Fig. 6 Edema classification as per its longevity.

There may be more than one answer to the question of localization of swellings, so the percentages in the chart exceed 100%. The results shown in Fig. 7 show that the largest share is ankle response – 72.2%, followed by feet – 50%. Lower legs and

thighs are equal – 7.8%.

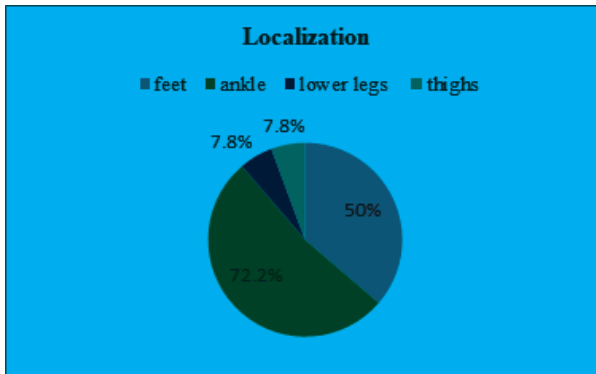


Fig. 7. Localization of edema

Localization of edema also varies according to the three months. Given the large incidence of swelling in the ankle, Figures 8 and 9 reflect the appearance of it during pregnancy. 11% of the respondents are in the second trimester and 37% in the third.

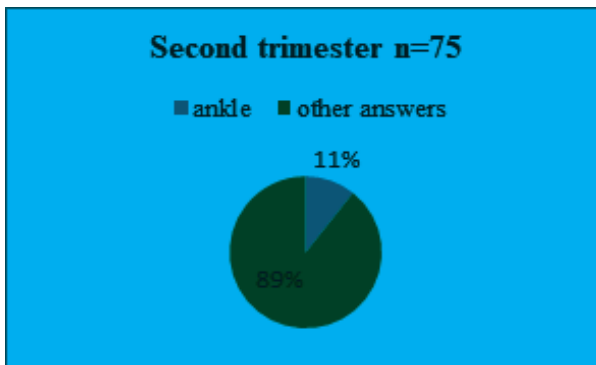


Fig.8 Localization of edema in the ankles – second trimester

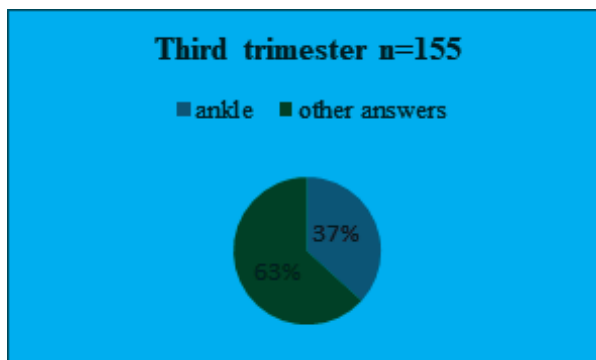


Fig.9 Localization of edema in the ankles – third trimester.

A subjective degree of discomfort in the lower limbs experienced by respondents in the trimester is shown in Fig.10 and Fig.11. A higher percentage of women in the second trimester of

pregnancy did not report discomfort in their lower limbs – 45%. With a slight degree of sensation of weight are 36% and moderate – 19%. There are not those who have experienced a lot of discomfort. In respondents from the third trimester, the percentage of lack of discomfort was the highest – 41%. The percentage ratio between the mild and moderate severity of the lower limbs is almost the same – 27% and 31%, respectively. Only two of the pregnant (1%) responded that they had a heavy burden during this period, which caused them a problem in their everyday lives.

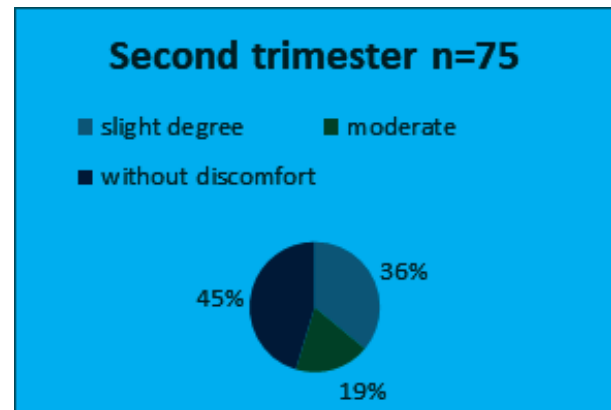


Fig.10 Subjective degree of discomfort – second trimester

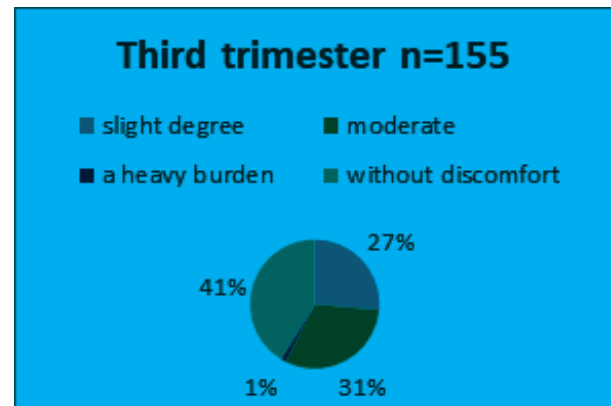


Fig.11 Subjective degree of discomfort – third trimester

Discussion:

The lower limb edema can make walking difficult and decrease the quality of life. Although the presence of swelling is a common problem during pregnancy, it often remains in the background. In the mass information sources (pregnancy sites, forums) it is mentioned that about 75% of pregnant women experience swelling. Typically, the issue is not considered on its own, but it is in addition to other types of research without having detailed characteristics. Similar to our survey was conducted by

M. Lebech et al. (1996). The authors track the presence of headache, fatigue and swelling of the lower limbs in pregnant women through a questionnaire filled out daily from the 30th week of gestation to birth. Although the presence of edema is a common problem during the pregnancy, it is often left on behind. In mass media (online sites for pregnant women, forums) it is mentioned that around 75% from the pregnant women have those swellings. Usually, the problematic issue is not considered on its own, but as an application to other kinds of research, without having been reached detailed characteristics. Similar to our poll research is done by M. Lebech et al. (1996). The authors track the presence of headache, fatigue and swelling of the lower limbs in pregnant women through a questionnaire filled out daily from the 30th week of gestation to birth. The weekly incidence of swelling increased significantly from 20% at week 31 and up to 60% in 42nd, 42% of women did not report edema during the third trimester. These results correspond to the data obtained from our study.

Interesting information is provided by a study conducted among Nigerian pregnant women belonging to the Igbo ethnic group (Nkwo P., 2009). The age of the subjects varies from 17 years to 45 years. The overall incidence of lower limb swelling during pregnancy is 8.5%. The earliest gestational age, when first appeared during pregnancy, was the 24th week. These results are compared with data on the incidence of edema among Caucasian pregnant women, where the values are about 75% – 80%.

Our results with regard to the incidence of edema of the lower limbs may have been influenced by its duration. Since the study covers the winter months – January and February, and two of the spring – March and April, we believe lower temperatures could be seen as the reason for the lesser spread of swellings among the respondents than the widespread data. The high percentage of those characterized as temporary / varying swellings (81%) also correlated with the study season as well as the sin-

gle cases reporting severe discomfort. Other possible causes for differences in the results obtained may be related to quality of life, nutrition, motor activity, etc.

Conclusion.

The data from the survey shown that about one-quarter of the pregnant women in the second trimester have swelling, and those in thirds are about half (1/2). Typically, swelling is present in both lower limbs, in only one case only one is affected. In a large percentage of cases swelling does not cause discomfort and, if so, it is basically mild or moderate. Future studies could cover hot months and prevalence according to the body weight and physical activity of the respondents.

References:

- Davey DA, Hypertensive Disorders in Pregnancy. In: Whitfield CR (Ed) Dewhursts Textbook of Obstetrics and Gynecology for Postgraduates. 4th edition. Osney Mead, Oxford. Blackwell Science 1990. p. 200–241
- Lebech M, Hansen M, Knudsen A. Headache, fatigue and edema of the lower limbs during the third trimester of normal pregnancy. 1996 Nov 18;158(47):6778–80, Ugeskr Laeger. 1996 Nov 18;158(47):6778–80.
- Lewis TLT, Chamberlain GVP. Obstetrics by Ten Teachers. 5th edition, London, Edward Arnold, 1990, p. 33–62.
- Moore TR. Maternal Adaptation to Pregnancy. In: Moore TR, Reiter RC, Rebar RW, Baker VV (Eds) Gynecology and Obstetrics: A Longitudinal Approach. New York, Churchill Livingstone, 1993. pp 48–61.
- Nkwo P. Leg Oedema During Pregnancy Among Nigerian Igbo Women: Perceptions, Prevalence, Prognosis and Treatment-Seeking Behaviours. The Internet Journal of Gynecology and Obstetrics. 2009 Volume 14 Number 2.
- Popov N. et al., Introduction to physiotherapy – main tools and methods, Sofia, NSA-press, 2012, p. 290–302
- Wynn RM. Obstetrics and Gynaecology: The Clinical Core: 5th edition. Philadelphia. Lea and Fabiger. 1992. p. 152–160
- Contact information with the corresponding author: Daniela Mileshkina candidat PhD; National Sports Academy “Vassil Levski” Department „Theory and methodics of physiotherapy” Studentski grad, 1700, Sofia, Bulgaria Tel.+359 888 048 192, E-mail: streetpsl_90@abv.bg

INJURY ASSESSMENT OF ANTERIOR TALOFIBULAR LIGAMENT IN KARATE ATHLETES

V. Taskova, Stoyan Rusev, Dimitar Ganchev

Abstract: This research is a systematic study of 30 Shotokan karate athletes in the period August 2016 – May 2017. The purpose of the research is to trace the dependency between the fighting stance and the dominant limb of the athlete compared to the percent of athletes with anterolateral instability of the ankle joint. The used research methods include: modified questionnaire containing 52 questions on the health status of the athletes, created by us questionnaire for determining the fighting stance and the dominant limb, imaging diagnostic through stress-radiography, provocative clinical “anterior drawer” tests and „talar tilt test”.

. Data analysis show high percent of affection of anterior talofibular ligament of right ankle joint with registered right dominant limb and the fighting stance.

Key words: anterolateral instability, ankle instability, Shotokan, provocative clinical tests, the fighting stance ankle instability, Shotokan, karate athletes, fighting stance, diagnostic imaging

Introduction

Ankle joint ligament injuries as a result of spraining are most frequently seen injuries of the musculo-skeletal system. Each year about half a million ankle sprains require visits to the emergency wards in the USA. Published data show that more of the half of all people with ankle sprain do not seek specialist care. That way the real frequency of injury can be much greater (McKeon, Wikstrom, 2015).

Jennifer M. et al. show five types of sports as most risky: basketball, volleyball, football, soccer, lacrosse (McKeon, Wikstrom, 2015). Although karate does not belong to the above listed types it is of the sports requiring quick changes of directions, jumping and kicking. After analyzing the mechanism of injury and the condition of the injured ankle joint in particularly injury of the anterior talofibular ligament referred to the fighting stance, we think that this gives possibility for grading the risk assessment and determining the specific preventive program, compliant with the specific nature of this sport.

About 80% of ankle ligament lesions are caused by forced supination (supination inversion type), during which the lateral ligaments are injured to a different degree: lig. talofibulare ant (ALTF), lig. calcaneofibulare (LCF) et lig. talofibulare post. (PLTF), as well as anterolateral joint capsule. Pronation injuries with abduction of the base or eversion of the tip of the same are much rarely seen and in them the deltoid ligament is injured. Bigger pronation load can lead to a rupture of tibiofibular

syndesmosis (Shoylev, 1983).

In great number of the cases the lateral ankle sprains have very high percent of recurrences (30% to 40%) and many of the patients develop chronic ankle instability (McKeon, Wikstrom, 2015).

Purpose

To trace the dependence between the fighting stance and the dominant leg of the athlete compared to the percent of the athletes with anterolateral instability of ankle joint.

Characteristic of the tested people

A population of 30 karate athletes was followed-up, 24 of them men and 6 women (fig.1). The average values of the indexes are: age – 25.86 years, height 176 cm and weight 73.43 kg.

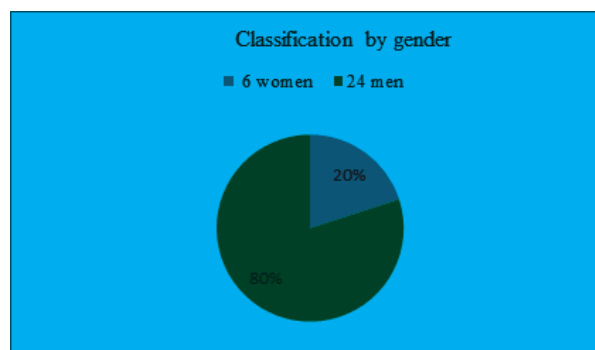


Figure 1. Classification by gender.

Organization of the study

For the period August 2016 – May 2017 in the University Multi-Profile Hospital for Active Medical Treatment and Emergency „N.I. Pirogov” clinical trials of 30 karate athletes with the medical history of ankle joint instability were carried out.

Methods

- Modified questionnaire for the health status of the athletes which included 52 questions (Brukner, Khan, 2007). It was drawn up by the Medical Committee of the Bulgarian Shotokan Karate Federation (BSKF). Some of the questions give information about the history of ankle joint injury.
- Created by us questionnaire for identifying the fighting stance and the dominant limb.
- Provocative anterior drawer test rect. Talus moves forward with fixed tibia. Above 10 mm or difference of 3 mm contralateral injury of ATFL was also observed (Penev and Others, 2012).
- Provocative talar tilt test. The tilt test was done with inversion and eversion of the ankle joint from neutral position. The normal limits are from 5° to 23°. With more than 23° or difference of 5° contralateral injury of ATFL was observed (Penev et al, 2012). The provocative tests were applied before stress-radiography of both ankle joints.
- Imaging diagnostic – Stress-radiography was administered by traumatologist and radiologist and the data were objectified with x-ray images with recorded tilt degrees of the talus and distance between the tibia and talus in millimeters for left and right ankle joint. According to data from other authors (Penev et al, 2012), when reading the tibiotalar angle bigger than 10° and difference bigger than 5° compared to contralateral ankle anterolateral ankle instability was found.

(http://www.su-varna.org/izdanij/Medicina-2-12/pages29_32.pdf) (available on 30 May 2017)

Results

1. Stress radiography results among tested people – 67% of the cases were identified as stable and 33% of the cases as instable (figure 2).

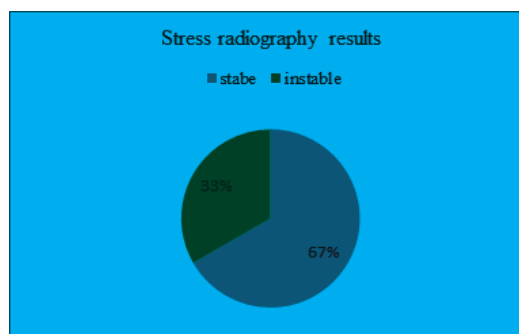


Figure 2. Stress radiography results.

2. The analysis of the stress radiography results show that 43% of all the tested people have injury of anterior talofibular ligament (figure 3). Of them 62% are on right ankle and 38% on left ankle (figure 4).

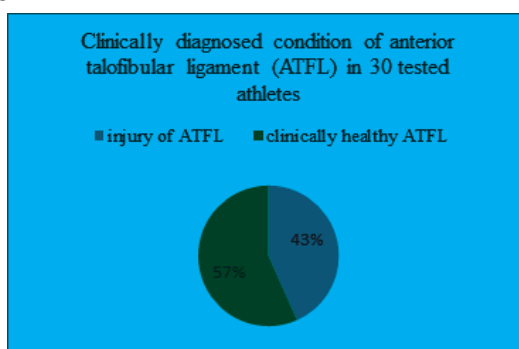


Figure 3. Clinically diagnosed condition of anterior talofibular ligament (ATFL) in 30 tested athletes.

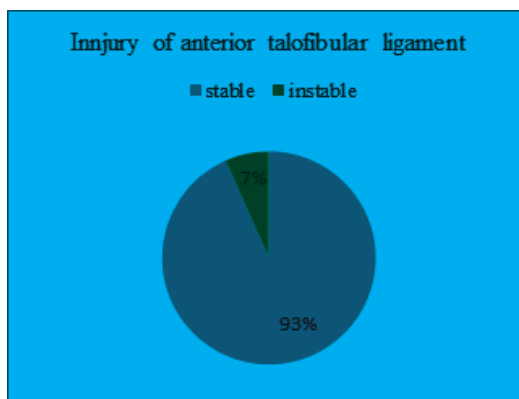


Figure 4. Injury of anterior talofibular ligament.

3. The anterior drawer and talar tilt functional tests were performed before stress radiography by a traumatologist. The preliminary testing of ankle joint instability through these tests gave a result which was proven by means of radiography in 93%.

4. The analysis of the results from the questionnaire for the dominant limb and the guard used in the game – 90% of the athletes determine as

dominant their right limb, 10% the left one (figure 5). In accordance with the fighting stance – 83% use left fighting stance and 17% right fighting stance (figure 6).

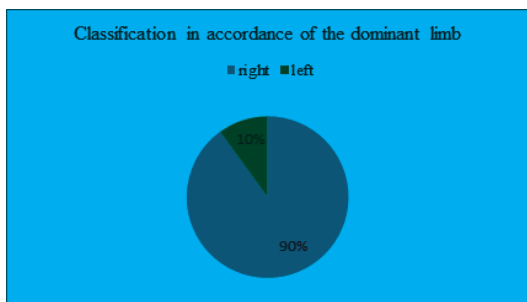


Figure 5. Classification in accordance of the dominant limb.

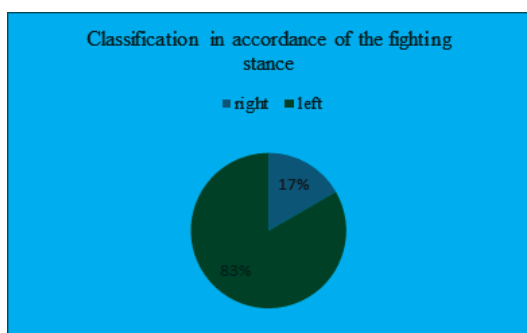


Figure 6. Classification in accordance of the guard used.

5. In 47% of all the tested people right ankle joint is the most often injured one (figure 7). This result compared with the guard used and the dominant limb shows that according to the fighting stance the right ankle joint is in position of biggest loading and is determining for the rapid movement, the abrupt change of direction when moving and for kicking because it is dominant according to the received tests.

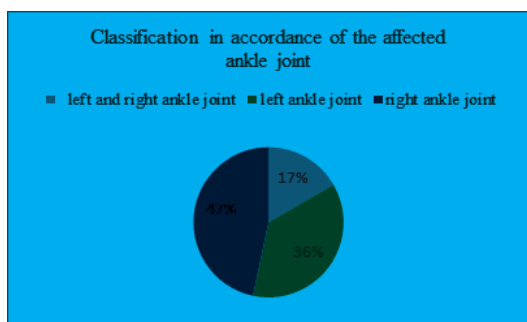


Figure 7. Classification in accordance of the affected ankle joint.

Discussion

The lack of data about traumatism of ankle joint in karate athletes is the main reason for the performed

study. Karate does not fall into the classification of the riskiest sports for ankle joint injuries, but the analysis of the received by us results shows that the main group of athletes undergo trauma of this joint. We were interested in using an algorithm for determining the stability of the joint and to register the affection of anterior talofibular ligament. The correlation with the fighting stance the dominant limb would give an idea for the most frequently affected ankle joint in accordance of the type of play and competitive sport technique. This would put a good foundation for risk assessment for future injuries and a possibility for establishing a preventive program. On the basis of this research, a number of analyses are to be made of the ability to balance, using a tensiometric platform and functional kinesi-therapeutic tests.

Acknowledgements

We would like to thank the athletes from the National team on Shotokan karate for their assistance and patience during the tests.

Thanks to the management of the NSA “Vassil Levski” for their support during this study.

Thanks to the team from Institute “N.I. Pirogov” for their assistance.

Literature

Brukner P., Khan K., Clinical sports medicine 3E, McGRAW-HILL Professional, 2007, p. 949–953
 McKeon, P. Wikstrom E. (2015), Quick questions in ankle sprains: expert advice in sports medicine, NJ: SLACK Incorporated, Thorofare
 Penev Pr., Raykov D., Simeonova V., Introducing ultrasound diagnostic for testing anterior talofibular ligament. Bulletin of the scientists union – Varna, 2012, volume XVII, 29–32., http://www.su-varna.org/izdanij/Medicina-2-12/pages29_32.pdf
 Shoylev D., Sports traumatology, Sofia, 1983, p.155
 Veselina Taskova, PhD
 Department of Theory and methodology of kinesitherapy “Vassil Levski” National Sports Academy
 Sofia 1000, № 1 Gurgulyat str
 Phone number: +359 898592031
 Email: veselina_taskova@abv.bg
 Dimitar Ganchev, Associate Professor
 Department of Theory and methodology of kinesitherapy Vassil Levski National Sports Academy
 Sofia 1000, № 1 Gurgulyat street
 Phone number: +359 892299790
 Email: dimigan@mail.bg
 Stoyan Rusev S, M.D., PhD
 UMHAMTE „N.I. Pirogov” EAD
 Sofia 1000, Blvd. Totleben № 1 21
 Phone number:+359 29154256
 Email: dl_100@abv.bg

DIAGNOSTIC OF THE FOOT IN CHILDREN VIA A TENSOMETRIC PLATFORM

Tasheva Rumiana, Kolev Krasimir, Belchev Vassil,
Dalev Valentin, Popova Desislava, Mitrev Georgi

ABSTRACT

Introduction

The foot disorders in children are a wide-spread problem and the studies in this aspect are very scant.

THE AIM of the research is to assess the symmetry in loading of the foot in children via a tensometric platform.

Methodology

The tensometric platform ISTEP 5000 was applied in 145 children (76 girls and 69 boys) with the average age 8, 66 (from 7 to 10 years) at the School "Jordan Iovkov" – Sofia during the period April – May 2017.

Results

The results were processed through IBMSPSS Statistics v.19 program and MS Excel, using: variation analysis, statistical hypothesis testing, which includes Student's *t*- distribution among the indicators with guarantee probability *P* (*t*). The differences between loading of the left and right foot are statistically significant: in girls $d = -3.974$ with $t_{emp} = 6.65$, *P* (*t*) 100.00; boys $d = -2.710$ with $t_{emp} = 3.98$, *P* (*t*) 99.99. The results demonstrated statistically significant asymmetry in loading of the foot.

Discussion

Methods for the functional diagnostic of the foot are very limited and innovation in this area is essential for the prevention of the disorders.

Conclusions

This study confirmed that the applying of the tensometric platform ISTEP 5000 contribute very important data and give an opportunity to precise the functional diagnostics of the foot in children at primary classes.

Key words: children, foot, tensometric platform

Introduction

The foot disorders in children are a wide-spread problem and the studies in this aspect are very scant. The anatomic architecture of the foot appears related to its primary function of weight bearing and shock absorption arising from ground reaction forces [4]. Tracking and exploration of underweight from the feet is essential for functional diagnosis and prevention of disorders. The use of equipment contributes to the objectivity of the results.

The aim of the research is to assess the symmetry in loading of the foot in children via a tensometric platform.

Methodology

The tensometric platform ISTEP Aetrex 5000 – iStep v 9.0 software was applied in 145 children (76 girls and 69 boys) with the average age 8, 66 (from 7 to 10 years) at the School "Jordan Iovkov" – Sofia during the period April – May 2017. Measurement of the foot load in the three support zones – in the area of: first metatarsal bone (MTB) – first zone; fifth MTB – the second zone and the third zone – the heel/calcaneus.

Results

The results were processed through IBM SPSS Statistics v.19 program and MS Excel, using: variation analysis, statistical hypothesis testing, which includes Student's *t*- distribution among the indicators with guarantee probability *P* (*t*) (Damyanova, Gigova, 2000).

Analysis on the Maximum foot pressure at one point – the results are presented in Tables 1 and 2.

Table 1 Values of the pressure left foot

		Left foot		
		Maximum pressure	Medium pressure	Minimal pressure
Maximum values analysis per area:	I (first MTB)	15	6.8	1
	II (V MTB)	15	5.5	0
	III (calcaneus)	16	15	9

In the analysis of the maximum values in the defined areas, it is noted that: the mean pressure at one point in area I (first MTB) is 6.84 kg / cm², with a maximum pressure of 15 kg / cm² and a minimum of 1 kg / cm².

In area II (fifth MTB) mean values in one point varying about 5.5 kg / cm², the maximum – 15 kg / cm², and the minimum 0 kg / cm².

In area III (calcaneus) there is a significant difference in the values where the compression is highest: 15kg / cm² is mean value of the maximum pressure at one point where maximum is 16 kg / cm² and a minimum is 9 kg / cm².

Table 2 Values of the right foot pressure

		Right foot		
		Maximum pressure	Medium pressure	Minimal pressure
Maximum values analysis per area:	I (first MTB)	16	6.09	0
	II (V MTB)	14	4.9	1
	III (calcaneus)	16	15.2	7

Analysis of the right foot results, the average pressure in the maximum values at one point in the first area is 6.09 kg / cm², at a maximum of 16 kg / cm² and a minimum of 0 kg / cm².

At area II, the mean value of the maximum right foot pressure is close to 5 kg / cm², with a maximum of 14 kg / cm² and a minimum of 1 kg / cm².

At area III the difference in the mean values of the maximum pressure on the left and right foot is 0.17 kg / cm², with a maximum of 16 kg / cm² and a minimum of 7 kg / cm².

From this analysis we can see asymmetry with a significant difference in the left and right foot zones: I area maximum pressure – difference 1 kg / cm², average pressure 0.74 kg / cm², minimum – 1 kg / cm²; area II maximum pressure of 1 kg / cm², average of 0.56 kg / cm² and minimum 1 kg / cm²; area III more significant difference is observed in the minimum values of maximum pressure at one point – 2 kg / cm².

Analysis of the Minimum pressure at one point of the foot – the results are presented in Tables 3 and 4.

Table 3 Minimal values of the left foot

		Left Foot		
		Maximum pressure	Medium pressure	Minimal pressure
Minimal values analysis per area:	I (first MTB)	5	1.83	1
	II (V MTB)	5	1.68	0
	III (calcaneus)	5	2.41	1

Analysis of the minimum values in the defined areas, it is noted that: the mean maximum load at one point in area I (first MTB) is 1.84 kg / cm², with a maximum load of 5 kg / cm² and a minimum of 1 kg / cm².

In area II (fifth MTB), means values of minimal pressure at one point varying about 1.7 kg / cm², the maximum is 5 kg / cm², and the minimum 0 kg / cm².

In area III, there was no significant difference in the values of 2.41 kg / cm² for the mean value of the minimum pressure at one point, at a maximum of 5 kg / cm² and a minimum of 1 kg / cm².

Table 4 Minimal values of the right foot

		Right Foot		
		Maximum pressure	Medium pressure	Minimal pressure
Minimal values analysis per area:	I (first MTB)	5	1.71	0
	II (V MTB)	4	1.5	1
	III (calcaneus)	5	2.36	1

Analysis of the right foot results, the average pressure in minimum values at one point in the first area is 1.71 kg / cm², at a maximum of 5 kg / cm² and a minimum of 0 kg / cm².

In area II, the average right foot pressure is close to 1.5 kg / cm², with a maximum of 4 kg / cm² and a minimum of 1 kg / cm².

In area III, the average right foot pressure is 2.36 kg / cm², with a maximum of 16 kg / cm² and a minimum of 7 kg / cm².

Significant asymmetry was no observed in the analysis of minimal values between two feet.

The differences in loading of the left and right forefoot and rearfoot between girls and boys are presented in Table 5 and Figures 1 and 2.

Table 5 Data of the forefoot and rearfoot

Index	Boys			Girls			Difference		Significance	
	n ₁	‘C ₁	S ₁	n ₂	‘C ₂	S ₂	d	Cohen d	t _{emp}	P (t)
Fore left foot	69	13.25	5.88	76	10.93	5.16	2.32	0.41	2.52	98.72
Rear left foot	69	14.55	1.70	76	14.91	0.70	-0.357	0.28	1.68	90.51
Fore right foot	69	11.99	5.57	76	11.13	5.54	0.854	0.15	0.92	64.35
Rear right foot	69	14.70	0.97	76	14.78	1.10	-0.081	0.08	0.46	35.72



Figure 1 Fore and rear left foot loading Figure 2 Fore and rear right foot

The difference between girls and boys loading of the left forefoot is statistically significant $d = 2.32$ with $t_{emp} = 2.52$, $P(t) = 98.72$.

Discussion

The three plantar arches of the foot (medial and lateral longitudinal arches, and transverse arch) are designed to act as shock absorbers and distribute body mass on the feet (Iunes Monte-Raso et al, 2008). There are several studies on changes in the arches in adults (Eke-Okoro, 1989), (Ledoux, Hillstrom, 2002). Some of them discuss changes in foot stability and posture when wearing high heel shoes (Gefen et al, 2002), (Iunes Monte-Raso et al, 2008). On the other hand, there are interesting results about distribution of the plantar vertical force in pes planus feet. (Ledoux, Hillstrom, 2002).

Obviously, the methods for the functional diagnostic of the foot are very limited and innovation in this area is essential for the prevention of the disorders, especially in children. In this aspect our study showed for the first time results from the tensometric platform in children. From the analysis of the maximum values in the defined three zones, it is noted the asymmetry with a significant difference between left and right foot. On the other hand there

is also statistically significant difference between girls and boys in loading of the left forefoot. The results indicate the presence of asymmetry in the loading of the feet in children, requiring more extensive examination and application of physiotherapy for correction of deviations.

Conclusion

This study confirmed that the applying of the tensometric platform ISTEP 5000 contribute very important data and give an opportunity to precise the functional diagnostics of the foot in children at primary classes.

Acknowledgements

Project "Functional diagnostic for prevention pes planus in children".

References

- Damyanova, R., Gigova, V. (2000), Statistical methods in sport. Student guide for bachelors. NSA Press, Sofia.
- Eke-Okoro, S. (1989), Velocity Field Diagram of Human Gait. Clin. Biomech., 4: 92-96.
- Gefen, A., Megido-Ravid, M., Itzchak Y., Arcan, M. (2002), Analysis of muscular fatigue and foot stability during high heeled gait. J. Gait and Posture, 15: 56-63.
- Iunes Monte-Raso, D., Santos C., Castro, F., Salgado H., (2008), Postural influence of high heels among adult women: analysis by computerized photogrammetry. Brazil. J. Physical Therapy, 12(6), 441-446.
- Ledoux, W., Hillstrom H. (2002), The distributed plantar vertical force of neutrally aligned and pes planus feet. J. Gait Posture, 15(1): 1-9.
- Assoc. Prof. Tasheva Rumiana, PhD
National Sports Academy "Vassil Levsky"
Physiotherapy Department
Student town, Sofia, Bulgaria
+359893396583
rumiana_tasheva@yahoo.com

POSITION AND STABILITY OF THE BODY IN CASE OF CHILDREN IN YOUNGER SCHOOL AGE

^{1,2}Hudáková Zuzana, ³Lysá Ludmila, ^{1,4} Lesňáková Anna,

⁵Kurzeja Piotr

¹Faculty of Health, Catholic University in Ruzomberok,

² Polytechnic University in Jihlava

³Faculty of Education, Catholic University in Ruzomberok

⁴Central Military Hospital SNU-FH Ružomberok

⁵Podhale State College of Applied Sciences in Nowy Targ

Abstract

Introduction: Nowadays the physical activity is very low. Frequent, long-lasting sitting and higher educational demands cause postural disorders especially in case of children. The main aim of this work was examination of relation between the balance and the position of the body among 10–11 years old pupils of an elementary school.

Material and methods: Surveyed group consisted of 71 pupils of an elementary school: 37 boys and 34 girls. As a method the superficial topography was used – the optical technology used for evaluation of asymmetry of contours of the back area connected with scoliosis. The Moiré's system moves the shape of the back and it got the greatest popularity in rehabilitation. Evaluation of the superficial topography has got a good potential of repeatability and reproductibility. Using of the superficial topography is potentially a valuable method of the early detection of scoliosis.

Results: Measured data were processed by the use of the statistic programe Excel. We were watching the mutual dependence expressed by the index of correlation of the ratio data expressed by the descriptive statistics. For expression of mutual dependences of qualitative data, the chi-quadrade test was used. All data were processed and verified on the level of significance 0,05.

Conclusions: In connection with the occurrence of scoliosis we supposed the dependence of the sex of respondents, of their weight and height. Not all assumptions were fully confirmed, we state dependences in the following article.

Keywords: posture defects, postural stability, surface topography, children, screening

Introduction: Position of the human body had a lot of definitions. Most of them find out that there is a free configuration of the body in the standing position -, how to keep an object "(Jopkiewicz A, Suliga E.1998). Carriage of the body is,, an individual shape of the body and placement of particular parts of the trunk and legs in the standing position (Kasperczyk T. 1994, Žuk T, Dziak A., Gusta A 1980). Configuration of the body is an expression of the physical and health state of the body influenced by genetic and environmental factors (Dourros et all, 2000).

After Kasperczyk, configuration of the body is an order of particular parts of the body on which lesions for the optimal stability of the body don't relate, which require minimal muscular effort and create conditions for the optimal internal organ, which are expressed by its contour (Kasperczyk,1994)

Changes in configuration of the body

Configuration of the human body changes during the evolution since the birth until the death

(Chowańska, J.2011). It is influenced not only by the age, but also by many other factors as the life-style, the kind of employment, daytime, tiredness or by the psycho-emotional state of the person (Chowańska, J.2011). Therefore various authors are concerned with evaluation of the configuration of the body for a longer time who use various testing methods and records of the configuration of the body (Chowańska, J.2011). Nowadays a number of public resources are invested into performing of diagnostic and therapeutic programes connected with disorders of configuration of the body especially in case of children. These programes with the aim of rewieving of their position seem to be substantial because incorrect configuration of the body has negative consequences for the next evolution and health which can be accompanied by the pain and functional disorders which can influence the quality of the next life in childhood and adulthood (Mrozkowiak, M. 2010). In this article, we are concerned with the possibility of using one of the methods of the superficial topography during screening providing at the detection of scoliosis. Majority of scoliosis cases remains stable, but in

some cases it comes to worsening during puberty. Superficial topography is an optic method for evaluation of the surface of the back including asymmetry connected with scoliosis.

Topography of the surface of the body. Moire technique

Topography of the surface of the body present photographic methods. They are photogrammetric methods, known also as the phototopography or the moiré method. Phototopography deals with the shape and position of the body and with measuring of space objects on the base of so called photograms. In case of children in the period of their growth, but also in case of adults, the reviewing of the space arrangement of particular structures, especially of the axial system is an important indicator of the state of the movement system. It is clear that especially the pathological state (after the injury, degenerative changes etc.) is usually manifested on the change of filling a certain function. Another principle is the technology of moiré stripes which uses for example the system Wicks @ Wilson's TriForm (2001). In case of this system, contour lines are depicted on the monitored surface in the outcome of the light and shadow interference shed by the fibres of the grid. By this way, it is possible to identify also the third space dimension of the monitored object from the plane photograph. The method is based on the moiré effect creating the shadow picture of the contour lines on the monitored surface which enables us to perform the space reconstruction of the shape (Otáhal 1989). From the acquired information, there are shadow pictures of the contour lines additionally detected besides the shape of the own object in the plane. Their shape and mutual arrangement on the monitored surface describe expressly the shape of the object in the space, it means the superelevation in the direction of the axis which is vertical on the plane of the photograph.

Methodology of the research: The group of children in the age from 10 to 11 years was the object of the research. Whole file was created by 70 children, 33 from them were girls and 37 were boys. In the file, we examined the spine deflection. We observed if these groups are comparable in the marks height and weight. Measurements were made by the photogrammetric method in two phases: with open and closed eyes. We were interested especially in the fact if these measurements are equally reliable. If determined differences are statistically notable or not.

If yes what they are dependent on. In the processing, we used the photogrammetric method known also as phototopography or the moiré method. For evaluation of results, statistic methods for hypothesis testing – indexes of correlation and regression were used, data were processed in the program Excel with the use of the packet of the data analysis.

Hypotheses

1. We suppose that the parameters for the evaluation of the spine are weight and height dependent regardless of the gender of the respondent.
2. We suppose that the measured values in the AP projection are equal in the case of open, but also closed eyes.
3. We suppose that measured values of the spine deflexion in the middle abnormality in the frontal plane (ML) with closed eyes are significantly higher than with open eyes.
4. We suppose that values of abnormalities of the angles α , β and γ are statistically confident and they have a character of system abnormalities.

Analysis of results:

Hypothesis 1: We suppose that the parameters for the evaluation of the spine are weight and height dependent regardless of the gender of the respondent.

Basic characteristics of the file:

Sex		Weight	Height
Boys	AVERAGE	142,784	38,378
	STDEVP	6,261	10,344
Girls	AVERAGE	145,061	40,667
	STDEVP	6,125	10,528

The t-test of two middle values with the dispersion unlevelness was used for verification. Values of the F-test for the dispersion:

	Boys	Girls
	Weight	Height
Mean	38,37838	40,66667
Variance	109,964	114,2917
Observations	37	33
df	36	32
F	0,962135	
P(F<=f) one-tail	0,452905	
F Critical one-tail	0,56688	

The F-test confirmed the dispersion unlevelness. The value t_{stat} lies in the interior of admissible intervals, therefore we recommend to accept the zero hypothesis on the level 0,05. The weight in both files is comparable. By the same way we verified also the height of elements in monitored files. The assumption of equality of average physical heights was also confirmed. Therefore we will watch the evaluation on the monitored files from the point of view of the sex of particular respondents.

During monitoring of the weight we found out that in case of girls correlation achieves their value 0,835. The dependence is more expressive between the weight and the alpha angle (lumbosacral tilt), the beta angle (the tilt in the thoracolumbal area) and the gama angle (the tilt in the upper breast part). In case of boys the correlation achieves the r value 0,548 – this means that this dependence is lower than in case of girls.

Hypothesis 2: We suppose that the measured values in the AP projection are equal in the case of open, but also closed eyes.

For verification of the presumption, we used the F-test for dispersion and on the base of its results the t-test of two middle values with the dispersion equality.

	AP (mm) anterior posterior/open eyes	AP (mm) anterior posterior/ eyes closed
t Stat	0,623863	
P(T<=t) one-tail	0,266866	
t Critical one-tail	1,655811	
P(T<=t) two-tail	0,533732	
t Critical two-tail	1,977054	

On the base of obtained data, we recommend to accept the zero hypothesis. In cases of open and closed eyes, the differences in measured values are statistically irrelevant.

Hypothesis 3: We suppose that measured values of the spine deflexion in the middle abnormality in the frontal plane (ML) with closed eyes are significantly higher than with open eyes. For verification was the F-test for the dispersion used again and

subsequently the t-test of two middle values with the dispersion equality. Results of both tests state following charts.

	ML (mm) Side length Right left open eyes	ML (mm) Side length Right left closed eyes
Mean	263,3944	281,2535
Variance	2392,357	3589,135
Observations	71	71
df	70	70
F	0,666555	
P(F<=f) one-tail	0,045984	
F Critical one-tail	0,673088	

On the base of these values, we recommend to accept an alternative hypothesis. In case of closed eyes are the values significantly higher than in case of open eyes. The object is able to correlate his/her position with open eyes and by this way to reduce values of the deflection. Values are at the border of confidence.

Hypothesis 4: We suppose that values of abnormalities of the angles α , β and γ are statistically confident and they have a character of system abnormalities.

We monitored values of the abnormalities KNT, the angle α , the angle β , the angle γ . For the norm, we consider the zero abnormality, the constant will be marked as $\mu=0$. For verification of the confidence of this abnormality, we used the t-test of the middle value and the known constant. The testing characteristics has a form and it was compared with the critical value t on the level 0,05 with the propriate number of freedom $\nu=70$.

	KNT (degrees)	angle alpha (degrees)	angle beta (degrees)	angle gamma (degrees)
AVERAGE	0,733803	8,65493	8,357746	10,98732
STDEV.S	0,724459	1,763826	1,135739	1,874333
t_{stat}	8,474508	41,05412	61,56865	49,04495
t_{krit}	1,666914			

In all monitored parameters was the statistically confident abnormality from the monitored plane confirmed. What are the dependences between monitored marks like, we expressed by the help of the correlation r. Values are stated in the following chart.

Together Boys and girls	Body height	Weight	angle alpha (degrees)	angle beta (degrees)	angle gamma (degrees)	height of arms (mm)	height of blades (mm)
Body height	0,687162	1					
Weight	0,138583	0,110005	1				
angle alpha (degrees)	-0,18382	-0,2362	-0,00631	1			
angle beta (degrees)	-0,24215	-0,11853	-0,2839	0,396557	1		
angle gamma (degrees)	0,094058	0,136759	-0,07256	-0,04973	-0,01913	1	
height of arms (mm)	0,103657	0,02634	0,083646	-0,13358	-0,19754	0,04226	1

The highest value was confirmed only in the marks weight. In other combinations are the values of correlation low, they move at the border of a weak dependence.

Discussion: After the Wilczyński's research of persons with eye disorders, the kyphosis occurs more frequent than in case of healthy persons. The position of the body is connected with the eye activity (Penha et al. 2005). Function of variability in case of children is relatively small and the visual impact on variability of the angle COP. After Wilczynski's research results support the opinion that in case that weight parameters with closed eyes which are not impaired, we can speak about the lack of ability to use visions in the process of the balance in case of children. There are no sensual integrations which are in case of children in this process of growth (Przewęda, R. 1973).

In our study it was found out that increasing of the chest angle of kyphosis doesn't change the value of stabilometric parameters in the sagittal level in case of open and closed eyes very much. The weight in both files is comparable. The assumption about equality of average physical heights was also confirmed. During monitoring of the weight we found out that in case of girls the dependence between the weight and the angles α , β and γ is more expressive. In case of boys, this dependence is lower than in case of girls.

Results of the tests show that in case of open and closed eyes, differences in measured values are statistically irrelevant. A lot of studies proved that people with idiopathic scoliosis are with the control of stability of the carriage of the body comparable with the control of healthy people (Roczniak et al, 2015; Sahlstrand T, Ortengren R, Nachemson A. 1988). Complex responses of the regulation system, equivalent of reflexes, positions and movement in case of people with idiopathic sclerosis can be disturbed (Silferi, Rougier, Labelle, Allard, 2004). Some decades ago, Swedish doctors Sahlstrand,

Ortengren and Nachemson Lidström pointed out to an important correlation between the unbalance and the curvature angle, between the progression speed and the skeletal ripeness grade. In their opinion, belated development of the balance can be an aetiologic factor for the rise of idiopathic scoliosis (Stoliński, Ł, Kotwicki, T. 2011; Świec, A. 2005). Mechanism of the balance managing in the calm can be changed in case of healthy population of the same sex because the results demonstrate us various strategies during the work, caused for example by the excessive relaxation or by intentional rustiness of muscles. Examples of the relation between the quality of the carriage of the body and some reactions equivalently confirm improved legitimacy of position reflexes reeducation (Zawieska, D. 2000) through corrective exercising or biofeedback and by this way the quality of carriage and balance of the body will be increased (Błaszczuk, 2004). In case of children in the age 6–7 years the development of processes of carriage and balance of the body is harmonic. There are no clear biological factors with the consequence of wrong carriage of the body. We can monitor negative changes only in new conditions for the child – at school. There are some factors as: dimensions of desks, distance of eyes from the desk, from the board, sitting in an incorrect position, the type of the chair, a heavy school bag, tiredness etc. With regard of using of the whole series of factors in evaluation of the body posture and the interaction between variables, sectional material and also a small number of publications which could be considered as the same ones in the results of comparison, conclusions can be difficult and not always clear.

Conclusion: A sufficient obstacle of evaluation of the body posture are often various research methodologies in which various indicators are used and they point to the borders between pathology and correct formation of carriage of the body. Studies evaluating the effect on the postural stability of carriage of the body are important in the practice of physiotherapy.

Bibliography:

- Błaszczak J. 2004. Biomechanika kliniczna. Podręcznik dla studentów medycyny i fizjoterapii. PZWL, Warszawa 2004: 192–232.
- Douros, I., Buxton, B., Treleaven, P. 2000. Developing Techniques for Building Active Shape Models from 3D Scanner Data for the Representation of Human Bodies, PhD Report, University College London.
- Chowańska, J. 2011. Wykorzystanie metody topografii powierzchni ciała oraz skoliometru do badań przesiewowych dzieci szkolnych w kierunku wykrywania skoliozy idiopatycznej, Rozprawa doktorska. Uniwersytet medyczny w Poznaniu. Poznań, 2011.
- Jopkiewicz, A., Suliga, E. 1998. Biologiczne podstawy rozwoju człowieka. ITE, Radom- Kielce, 1998: s. 221.
- Kasperczyk, T. 1994. Wady postawy ciała diagnostyka i leczenie. Kraków 1994: 9–10.
- Mrozkowiak, M. 2010. Uwarunkowania wybranych parametrów postawy ciała dzieci i młodzieży oraz ich zmienność w świetle metody projekcyjnej. Oficyna Uniwersytetu Zielonogórskiego, Zielona Góra, 2010.
- Otahál, S., Václavík, P. 1989. Moire tomografie. Lékař a technika, 20 (4), s. 89–93.
- Penha, P, Jaão, S, Casarotto, R, Amino, C, Penteado, D. 2005. Postural assessment of girls between 7 and 10 years of age. Clinics 2005; 60: 9–16.
- Przewęda, R. 1973. Rozwój somatyczny i motoryczny. PZWL, Warszawa 1973: 88–124.
- Roczninak, W, Babaška-Roczninak, M, Roczninak, A, Roczninak, RG. 2015. Kryteria oceny rozwoju motorycznego uczniów szkół podstawowych. Med Og Nauk Zdr 2015; 21: 138–141. 90
- Sahlstrand T, Ortengren R, Nachemson A. 1988. Postural equilibrium in adolescent idiopathic scoliosis. Acta Orthop Scand 1978;49(4):354–65. Lidström J, Friberg S, Lindström L, Sahlstrand T. Postural control in siblings to scoliosis patients and scoliosis patients. Spine (Phila Pa 1976) 1988;13(9):1070–4.
- Stoliński, Ł, Kotwicki, T. 2011. Wstępne wyniki analizy postawy ciała dzieci biorących udział w projekcie „Poznań stawia na zdrowie – profilaktyka wad postawy”. W: Profilaktyka wad postawy i kształtowanie zachowań prozdrowotnych wśród dzieci. Urząd Miasta Poznania 2011: 11–20.
- Świec, A. 2005. Komputerowa diagnostyka postawy ciała – instrukcja obsługi. Czernica Wrocławska 2005 [dostępne na: www.cq.com.pl].
- Wicks and Wilson Limited TriForm™ system. 2001. <http://www.wwl.co.uk/triform.htm>.
- Zawieska, D. 2000. Topography of surface and spinal deformity. International Archives of Photogrammetry and Remote Sensing, Amsterdam, 2000: 937–942.
- Żuk, T., Dziak, A., Gusta, A. 1980. Podstawy Ortopedii i Traumatologii. Podręcznik dla studentów. PZWL, Warszawa 1980: s. 53.

Contact address

Doc. PhDr. Zuzana Hudáková, Ph D.
Faculty of health, Catholic University in Ruzomberok,
Physiotherapy Department
Nám. A. Hlinku 48, 034 01 Ruzomberok; e-mail: zuzana.hudakova@ku.sk

INTERDISCIPLINARY COOPERATION IN DEALING WITH SPINAL DISEASES

Lesňáková, A.^{1,2}, Hudáková, Z.¹, Kolárová, M.¹, Rusnák, R.^{1,2}

¹Faculty of Health, CU Ružomberok,

²Central Military Hospital SNU-FH Ružomberok

Summary

Introduction: Spinal diseases include a large number of functional and degenerative spinal diseases whose common symptom is pain. They represent an interdisciplinary issue in which a wide range of medical disciplines are involved in diagnostics and therapy. Through a multidisciplinary approach, we will achieve the effect of therapy in a much shorter time, which will positively impact several aspects of a patient's everyday life.

Material and Methods: Many studies suggest that nearly 80% of all adults experience back pain during their lifetime. An important role in rehabilitation is played by intervention during one's childhood that focuses on body posture disorders and the disorders related to the musculoskeletal system, leading to the area of primary prevention (Gúth, 2003). We investigated how correct posture and suitable exercise affect spinal deformities. A survey sample consisted of 100 patients who underwent treatment during the period from October 2010 to February 2011. The survey was conducted in Bratislava with the consent of the patients' parents. We chose the following survey methods: a questionnaire and examination of a patient by inspection.

Results: We observed stagnation and improvement of spinal deformities in patients who were able to go through the exercise maintaining correct posture. In addition to the deformity improvement, stagnation of the condition is also considered a successful treatment.

Conclusions: Exercising while maintaining good posture positively affected spinal deformities in patients. We recommend its application in common practice.

Key words: Spine Disease, Body Posture, Correct Posture, Primary Prevention.

Introduction

Various medical fields, such as neurology, orthopedics, traumatology, rehabilitation, neurosurgery, rheumatology, osteology, oncology, infectious medicine, manual medicine, general medicine and, last but not least, psychology or even psychiatry are involved in the issue of spinal diseases. All of them are directed towards the same goal with their treatment methods, i.e. to remove pain and improve spine mobility.

There are several factors with a decisive influence on the condition of our spine, such as good body posture, walking and sitting stereotypes, physical activity, etc. (Hnízdil, 2005). Body posture is an active and constantly changing process which can be understood as the relationship between the muscular system and the bone structures, working in mutual continuity with respect to the external and internal conditions (Junior, 2011). An active posture of individual segments of the human body in relation to external forces is controlled by the central nervous system CNS (Kolář, 2009).

The change in the movement mode of a man into a predominantly prevailing static load while sitting is more and more common. In this area it is necessary to look for one of the primary causes of back pain, whose prevalence reaches up to 19% of the European adult population (Breivik, 2006). Nearly 80% of all adults experience back pain during their lifetime (Hnízdil, 2005).

Changes in lifestyle cause vertebroprogenic problems in younger and younger people when acute pain arises after a sudden movement – manipulation with loads or inappropriate exercises in the gym, based on the principle of statics and dynamics disorders of the spine (Adamová, 2007).

In the present, children and young people are more and more experiencing an increasing amount of time spent sitting at school, or at home in front of a computer without being interested in movement activity, which significantly influences body posture and supports the development of various spine deformities. Interventions during childhood, consisting in the prevention of body posture disorders

and worsening of musculoskeletal disorders, is important in terms of primary prevention of the axial organ disorders (Gúth, 2003).

Correction of pathological spine curvature can be achieved by body posture correction through exercise and normal daily activities. "Correct Posture" implies that we correct – improve the patient's poor posture of body parts and the spine that are inconsistent with the so-called physiological posture. Gúth states that a precisely set posture is important during exercise and must be strictly maintained throughout activation (Gúth, 2004).

Correct Posture

Correct posture is a term we use more often in treating patients with spine deformities. This is the position in which we try to achieve optimal body posture and economical muscle coordination (Čepíková, 2009)

In correct posture when lying on back, the following conditions must be met: the patient is lying flat, the head is aligned with an extension of the body axis and the chin is tucked in, the blades are in depression and mild adduction, the hands have palms facing up, the waist area is directed to the mat, we maintain physiological waist lordosis, the pelvis is in a neutral position at all three levels, the lower limbs are bent in knees, hip-width apart, the feet are fixed on the mat (Schorová, 2002).

Correct posture lying on stomach. The following conditions have to be met during exercise lying on stomach: the patient has the cervical spine and head aligned with an extension of the body axis, the hands have palms facing down, the blades are squeezed into a letter "V" shape, the patient maintains a neutral position of the pelvis, the lower limbs are hip-width apart and the feet are kept in a neutral position (Čepíková, 2009).

Correct standing posture. The patient maintains the cervical spine and head aligned with the extension of the body axis, the shoulders and blades are pulled back and down, the pelvic muscles are tucked in, the pelvis is in a neutral position and the feet are hip-width apart, the weight is evenly distributed between both lower limbs (Blažušová, 2002).

Correct sitting posture. We start this exercise on a

solid mat, later we can add dynamic sitting on a ball or on a coccyx pillow, the principle is the same as when standing, only lower limbs are fixed with feet on a mat and bent at a 90° angle in the hips, knees and ankles (90° – 90° – 90°), respectively the hips are slightly higher than the knees (Čepíková, 2009).

Survey Methodology

This survey was conducted to find out the effect of correct posture and proper exercise on spine deformities. We applied correct body posture in basic exercise positions, both horizontal and vertical. We monitored how it was maintained during exercise lying on back and stomach and how it was maintained in prototype activities (while sitting and standing).

The aim was to find out whether patients maintain correct posture during exercise, whether they need assistance (of a parent or physiotherapist) or they maintain it on their own, whether maintaining correct posture positively affects the treatment of spinal deformities, whether the failure to maintain correct posture leads to the treatment of spinal deformities.

We chose the following survey methods: a questionnaire and examination of a patient by inspection. A survey sample consisted of 100 patients who underwent treatment during the period from October 2010 to February 2011. The survey was conducted in Bratislava with the consent of the patients' parents.

Results

Maintaining correct posture while lying on back

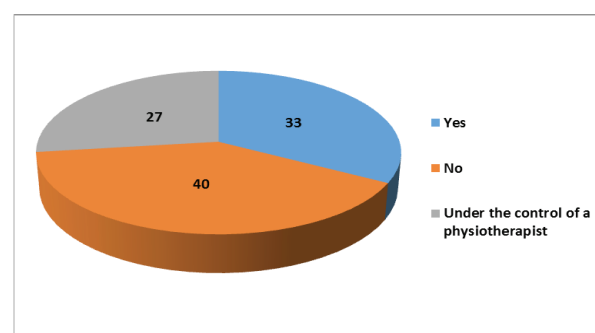


Figure 1 Distribution of respondents regarding whether they maintain correct posture while lying on back.

A total of 33% of the respondents maintained correct posture while lying on their back. Up to 40%

of the patients were not able to manage this posture and 27% of the patients needed assistance and control of the physiotherapist in having correct posture.

Most common mistakes: forward and backward head posture, shoulders anteversion, failure to maintain a neutral pelvis position, failure to maintain standing with the lower limbs hip-width apart, loading stress on the outside of the foot only.

Maintaining correct posture while lying on stomach

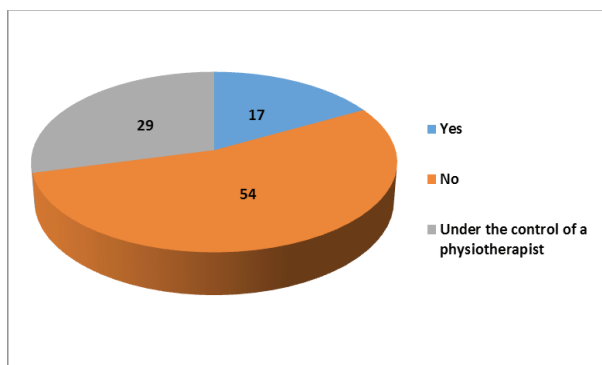


Figure 2 Distribution of respondents regarding whether they maintain correct posture while lying on stomach.

Up to 54% of the respondents were unable to maintain correct posture. A total of 29% of the patients managed to have correct posture with assistance of the physiotherapist, and only 17% of the patients had correct posture while lying on stomach.

Most common mistakes: excessive curvature of the cervical and lumbar spines, failure to maintain a neutral pelvis position, extra rotation of the lower limbs.

Maintaining correct posture while standing

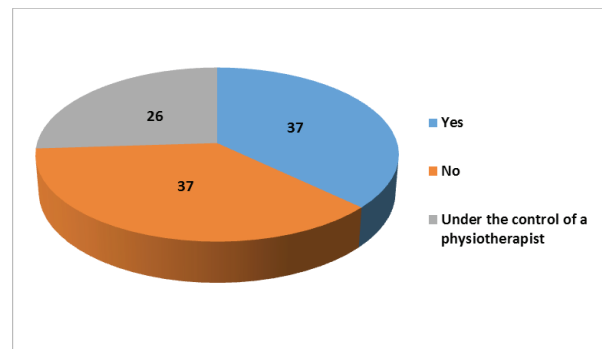


Figure 3 Distribution of respondents regarding whether they maintain correct posture while standing.

Figure 3 shows that 37% of the patients did not manage correct posture. A total of 37% of the patients maintained correct posture while standing and 26% of the patients needed the physiotherapist's assistance to have correct posture.

Most common mistakes: uneven lower limb load, skewed pelvis, pelvis anteversion, chest symmetry failure, shoulders anteversion, forward head posture.

Maintaining correct posture while sitting

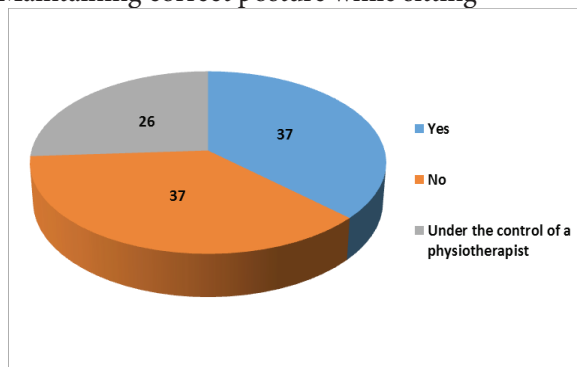


Figure 4 Distribution of respondents regarding whether they maintain correct posture while sitting.

The results of correct posture while sitting were identical with the results while standing. A total of 37% of the patients managed correct sitting, 37% of the patients did not manage correct sitting posture and 26% of the patients needed help to have correct posture.

Most common mistakes: loading stress on the outside of the foot only, wide sitting posture (failure to maintain the lower limbs hip-width apart), leaning against the ball with the calf, spine traction failure, choosing an inappropriate ball or chair height.

Effect of correct posture and proper exercise on spinal deformities treatment

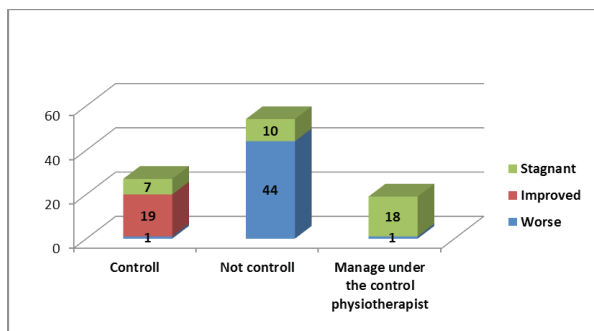


Figure 5 Effect of correct posture on spinal deformities treatment

The last figure presents the results of the effect of correct posture and proper exercise on spinal deformities treatment. All the patients were instructed about their correct posture which they should always maintain during exercise. During the follow-up examination, we grouped the patients into three groups. The first group consisted of the patients who were independent in maintaining correct posture during exercises and performed them correctly (27 patients). The second group consisted of those who did not manage the correct posture during exercises and were not able to have it even after being guided by the physiotherapist, so the exercise was not targeted to deformity and was not correct (54 patients). The third group included the patients who needed a verbal alert of the physiotherapist to maintain correct posture and to perform the exercises properly (19 patients).

Based on the above results, in the first group of patients we recorded an improvement of spine deformities in a total of 19 patients who maintained correct posture and the condition did not deteriorate in 7 patients. There was no improvement in 1 patient, despite the correct posture. This means that maintaining correct posture and proper exercise lead to the improvement of spine deformities in almost all cases.

As shown in Figure 5, in the second group of patients improvement was not recorded in a total of 44 patients who did not maintain correct posture. In 10 patients, despite the fact that they did not maintain correct posture, we recorded stagnation, so they did not get worse. This means that failure to maintain correct posture and improper performance of exercises, in most cases do not lead to an improvement of spine deformities. Analyzing the results of the third group, we found out that of the total number of patients, 19 patients needed exercise guidance and only under the control of the physiotherapist, they were able to have correct posture during exercise. In these patients, only 1 deteriorated and up to 18 patients did not get worse. Their condition stagnated, which confirmed the success of the treatment.

Discussion

The aim of the survey was to prove the necessity of maintaining correct posture by the patient during exercise, since the patient's posture itself ensures the influence of the muscle imbalance and correc-

tion of the pathological spine curvature. We must look at the spine as a whole, and when we influence pathological curvature in the lumbar spine, we must have correct posture of the pelvis and lower limbs. Otherwise, its poor posture will move up to the cervical spine. According to Palašćáková-Špringrová, a loss of the neutral pelvis position in the sense of lordosis (insufficiency of *m. trasverzus abdominis* and *mm. multifides* and at the same time hyperactivity of *m. iliopsoas*) stimulates the formation of cervical spine hyperlordosis and shoulders protraction (Palašćáková, 2010).

A necessary part of the treatment is the involvement of parents in the treatment process because as many as 19% of the patients managed to maintain correct posture with the help. Some techniques require daily cooperation with a trained person – most often parents (Kolář, 2009).

Conclusion

Spinal diseases represent an interdisciplinary issue where a wide range of medical disciplines are involved in diagnosis and therapy. A dominant role of rehabilitation lies in primary prevention, in childhood interventions, aimed at the prevention of body posture disorders and worsening of disorders related to the musculoskeletal system.

The fact that maintaining correct body posture has proven value in the treatment of spine deformities by the results of the survey. We recorded stagnation and correction of spine deformities in patients who managed exercise with maintaining correct posture. In addition to the improvement of deformities, we consider stagnation of the condition as a successful treatment. The disadvantage of this exercise is that we cannot apply it to preschool patients and patients with concentration disorders, as well as to patients with CNS damage (poliomyelitis, autistic patients and other brain damage patients) because they cannot sufficiently focus on maintaining correct posture, and thus not even on the accuracy in the exercise performance. We would recommend other forms of exercise to influence spinal deformities in these patients. Since the exercises with maintaining correct posture positively influenced spinal deformities in other patients, we recommend applying it in normal practice.

References

Adamová, B., Bednařík, J. Vertebrogenní algický syn-

- dróm, in Skála, B., Pavelka, K., Müller, I., Herle, P. Chronické choroby pohybového aparátu. Praha: Společnost všeobecného lékařství ČLS JEP, 2007. s. 4–14. ISBN:80–86998–17–7. Dostupné tiež na World Wide Web: www.svl.cz.
- Blahušová, E. 2002. Pilatesova metóda. 1. vyd. Praha: Olympia, 2002. 14, 15 s. ISBN80–7033–742–7.
- Breivik, H., Collett, B., Ventafridda, V., Cohen, R., & Gallacher, D. (2006). Survey of chronic pain in Europe: prevalence, impact on daily life, and treatment. *European Journal of Pain* (London, England), 10(4), 287–333. doi:10.1016/j.ejpain.2005.06.009
- Čepíková, M. a kol.: Komplexná liečba skoliózy: interný materiál z celústavného semináru, Bratislava, 29.1.2009
- Gúth, A. et al. 2003. Výchovná rehabilitácia alebo Ako učiť školu chrbtice. Bratislava: Liečreh Gúh, 2003, 96 s., ISBN80–88932–12–2.
- Gúth, A. a kol. 2004. Liečebné metodiky v rehabilitácii pre fyzioterapeutov. Bratislava: Liečreh, 2004. 95 s. ISBN80–88932–16–5.
- Hnízdil, J., Šavlík, J., Beránková, B. 2005. Bolesti zad: mýty a realita. Praha: Triton. 2005. 231 s. ISBN80–7254–659–7.
- Junior JVS, Sampaio RMM, Aguiar JB, Pinto FJM. Perfil dos desvios posturais da coluna vertebral em adolescentes de escolas públicas do município de Juazeiro do Norte – CE. *Fisioter Pesq.* 2011; 18(4):311–6.
- Kolař, P. 2009. Rehabilitace v klinické praxi. 1. vyd. Praha: Galen, 2009. 44s. ISBN978–80–7262–657–1.
- Sochová, V. 2002. Skoliózy detí a mladistvých. In *Rehabilitácia*. ISSN0375–0922, 2002, roč. 35, č. 4, s. 212–323.
- Palaščáková-Špringrová, I. 2010. Funkce. Diagnostika. Terapie hlubokého stabilizačního systému. 1. vyd. Praha: Rehaspíring, 2010. 33 s. ISBN: 978–80–254–7736–6

Contact

prof..MUDr. Anna Lesňáková, Ph D.

Faculty of Health, Catholic University of Ruzomberok

Namestie A. Hlinku 48, 034 01 Ruzomberok

anna.lesnakova@ku.sk

PHYSIOTHERAPY IN CARDIO AND RESPIRATORY DISEASE

PHYSICAL THERAPY PROGRAM IN PATIENTS WITH TRANSCATHETER AORTIC VALVE IMPLANTATION

**Antoaneta Dimitrova, Zhasmina Koleva, Ivan Maznev, Nikolay Izov,
Daniela Lubenova, Kristin Grigorova-Petrova, Milena Nikolova**

Summary

Aim: *To evaluate the effect of cardiac rehabilitation on functional status in patients with transcatheter aortic valve implantation (TAVI).*

Material and methods: *Ten patients referred for physiotherapy before and after TAVI underwent in-hospital and after discharge assessments to evaluate functional status and degree of autonomy.*

Results and discussion: *All patients had improvement in six minutes walking performance and were more independent in activities in daily living compared with baseline after three months regular therapeutic exercise sessions.*

Conclusion: *Complex therapeutic approach shows benefits in activities of daily living and walking abilities and is suitable for all patients with TAVI.*

Keywords: cardiac rehabilitation, transcatheter aortic valve implantation

Introduction

Transcatheter aortic valve implantation (TAVI) is a new procedure that delivers a replacement valve in a similar way that a cardiac stent is implanted. The valves are expanded in place over the existing valve and immediately begins functioning. TAVI is an alternative method for aortic valve replacement for old and polymorbid patients with contraindications to surgical aortic valve replacement (SAVR) and high surgical risk of opening the chest cavity. The choice of proceeding with SAVR versus TAVI is based on multiple factors, including the surgical risk, patient frailty, comorbid conditions, and patient preferences and values. Concomitant severe coronary artery disease may also affect the optimal intervention because severe multivessel coronary disease may best be served by SAVR and coronary artery bypass graft surgery (CABG). Longer-term follow-up and additional randomized controlled trials have demonstrated that TAVI is equivalent to SAVR for severe symptomatic aortic stenosis (AS) when surgical risk is high. Thus, in patients with severe symptomatic AS who are unable to undergo surgical AVR because of a prohibitive surgical risk and who have an expected survival of >1 year after intervention, TAVI is recommended to improve survival and reduce symptoms. This decision should be made only after discussion with the patient about the expected benefits and possible complications of TAVI. Patients with severe AS are considered to have a prohibitive surgical risk if they

have a predicted risk with surgery of death or major morbidity (all causes) >50% at 30 days; disease affecting ≥ 3 major organ systems that is not likely to improve postoperatively; or anatomic factors that preclude or increase the risk of cardiac surgery, such as a heavily calcified (eg, porcelain) aorta, prior radiation, or an arterial bypass graft adherent to the chest wall. TAVI is not recommended in patients in whom existing comorbidities would preclude the expected benefit from correction of AS (Nishimura, et al., 2014; Nishimura, et al., 2017).

It's important to lead a heart-healthy lifestyle in order to prevent complications after TAVI, which insists personal lifestyle changes as weight reduction, healthy eating, and regular physical activity. Cardiac rehabilitation is a customized in-hospital and outpatient program of exercise and education, designed to improve the recover the patients from a heart attack, other forms of heart disease or surgery or implantation. Patients after TAVI, are candidates for referral to exercise-based individually tailored physiotherapy (PT). Despite this, until 2013 no data have been available about the safety and the efficacy of a comprehensive rehabilitative period in these subjects. physiotherapy is a helpful tool to maintain independency for daily life activities and participation in socio-cultural life. A lot of patients a month after TAVI have limited activities of daily living. The goals of cardiac rehabilitation include establishing an individualized plan to help regain

strength, preventing from worsening, reducing the risk of future heart problems, and improving functional status and health-related quality of life (Cribrier, et al., 2002; Fauchere, et al., 2014; Lawrie, 2012).

The current study aims to determine if patients after TAVI do benefit from an in-patient and three months home-based rehabilitation program despite their frailty.

Material and methods

The patients (mean age 71.6 ± 5 ; NYHA 3.3 ± 0.5) referred for physiotherapy before and after TAVI in City Clinic, Sofia, underwent in-hospital and after discharge 3 months home-based physiotherapy.

Inclusion criteria were: all TAVI patients above the age of 65; male or female; signed informed consent. Exclusion criteria were: unstable clinical condition – according to treating physician; handicap before the procedure; recent stroke; decompensate diabetes mellitus type II; severe cognitive decline.

Outcome measures were six minutes walking test (6 MWT), five times sit to stand (FTSTS), Borg scale, inspiratory capacity (IC) and Cumulative Illness Rating Scale (CIRS) which evaluate polymorbidity in adults and elderly people related to conducting PT procedures. The scale is validated for rehabilitation in geriatrics and measures the clinical burden of multiple concomitant illnesses in patients (Parmalee, et al., 1995).

The assessments were performed four times: before TAVI procedure, on the day of hospital discharge, on the 1st and 3rd month to evaluate functional abilities and degree of autonomy.

Physiotherapy depends on the functional status of the patients according NYHA classification for chronic heart failure. The patients were class III and class IV of NYHA classification. The purpose of the PT is to maintain both the general condition of the patients, the ability to perform the daily activities and to prevent complications. In-hospital PT sessions were performed twice a day for 7–9 days. The exercises were performed in supine position with a raised upper part of the body, in sitting or standing position. The methodology of physiotherapy includes the following tasks:

1. To relieve cardiac activity by including extra-cardiac factors: mobilizing the muscle pump through

rhythmic exercises for the distal parts of the limbs and chest and diaphragm breathing. The biofeedback breathing device for inspiratory training (Coach2 Incentive Spirometer) is applied to all patients with the instruction to make 5 repetitions with 1 to 3 min rests between them, at least 4–5 times a day, every day of the week during hospital stay.

2. Maintaining the coronary circulation – via isometric exercises in circular mode.

3. Maintaining the cardiovascular activity to perform daily activities – gradual verticalization, exercises for strengthening the lower limbs, slow walking in the room or hospital corridor, stair climbing, enhancing independence in terms of performing functional and self-service activities.

Physiotherapeutical methodology aims to achieve improvement of collateral circulation and trophic of myocardium by exercises against resistance for large muscle groups and to increase functional abilities of the cardiovascular system (by chest and diaphragm breathing, active exercises for large muscle groups, isometric muscle exercises).

After discharge the patients were given a booklet with instructions for home-based exercise program and breathing training with feedback inspiratory training device Coach2 Incentive Spirometer.

An indication for discontinuation of the exercising is arrhythmia, tachycardia, precordial pain or chest discomfort, a change in the breathing pattern with inclusion of additional respiratory muscles, paradoxal breathing, etc.; severe fatigue or dyspnea; patient's desire to discontinue.

Results

All patients had progressive improvement in physical tolerance, decreased levels of fatigue and dyspnea increased respiratory function and were more independent in activities in daily living compared with baseline after three months' regular therapeutic exercise sessions (Table 1).

The patients increased the walking distance with 150 m on the 3rd month after hospital discharge (from 185 ± 77 to 335 ± 49 m) and simultaneously decreased the levels of fatigue and dyspnea from 6.3 ± 2.5 to 3 ± 2 points.

Improvement in the functional lower limb muscle strength was observed because the time for performing the FTSTS test decreased with 7sec on the 3rd month compared to the condition before TAVI in mean values.

Inspiratory capacity is important indicator for respiratory dysfunction. There is an improvement of 633 ml on the 3rd month compared to the baseline in mean values.

Table 1. Changes in functional status (mean value and standard deviation) in the patients before and after treatment

Test	X ₁ (mean value±SD)	X ₂ (mean value±SD)	X ₃ (mean value±SD)	X ₄ (mean value±SD)
6 MWT (m)	280±98	185±77	270±98	335±49
Borg Scale (points)	9.6±0.5	6.3±2.5	3.6±1.1	3±2
FTSTS (sec)	27±4	22±2	21±4	19.5±0.7
IC (ml)	1300±526	1516.6±625	1866.6±709	1933±802
CIRS (points)	15±5	14±5	14±5	13±5

X₁ - before TAVI; X₂- on hospital discharge; X₃-1st month; X₄-3rd month; SD - standard deviation; 6MWT - Six minutes walking test; FTSTS-Five times sit to stand; IC - Inspiratory capacity; CIRS - Cumulative Illness Rating Scale

The changes in the results of Cumulative Illness Rating Scale (range 0–56 points; 0 points – no problem affecting a body system; 56 points – extremely severe condition affecting all body systems) shows a slight tendency of improvement of overall physical status of 2 points.

Discussion

The main goals of physiotherapy in geriatric frail patients after TAVI treatment and many complications and comorbidities are to increase the physiological response to the body’s oxygen needs, to reduce the symptoms, to increase the patient’s functional capabilities, to educate the patient in the healthy lifestyle, to enhance prevention of secondary complication and to improve daily life activities for better reintegration of the patient. It has been shown that proper and regular PT in these patients can improve their physical tolerance, respiration and to reduce complaints. Physiotherapy usually starts with a hemodynamically stable patient’s condition, aiming at responding to complaints. PT sessions include exercises for respiratory muscles, exercises for muscles of the limbs, frequent change of body position with low intensity.

Russo, N., et al. (2014) compared the safety and efficacy of a structured, exercise-based program in octogenarians after a traditional SAVR vs. TAVI, and concluded that a short-term, supervised, ex-

ercise-based cardiac rehabilitation is feasible, safe and effective in octogenarian patients after TAVI as well as after traditional surgery. An early PT exercise program enhances independence, mobility and functional capacity and should be encouraged in all patients. Long-term effects and prognostic relevance should be evaluated in future studies.

Yue, Li. et al., (2015) compare the improvement in the quality of life in the long-term follow-up of 12 to 24 months after transcatheter aortic valve implantation therapy for old people with severe aortic stenosis using different questionnaires and conclude that there are significant improvements for this group in health-related quality of life in the follow-up. The authors assessed the hypothesis that patients after TAVI benefit from PT, compared to patients after SAVR. They concluded that patients after TAVI benefit from cardiac rehabilitation despite their older age and comorbidities. PT is a helpful tool to maintain independency for daily life activities and participation in socio-cultural life. The same conclusion was made by Fauchère, I., et al., (2012) – patients in the TAVI group were older and sicker than SAVR patients. Despite these differences, both patient groups did benefit in the same way from a post-acute in-patient rehabilitation program as assessed by 6-Minute Walking Tests and FIM scores.

Zanettini, R., Gatto, G., Mori, I., et al. (2014), con-

ducted a study with 60 patients after TAVI who underwent a long term rehabilitation in an outpatient center. The reported results underline the important role of early in-hospital and need to continue after discharge from hospital for increasing physical tolerance according 6 MWT. During in hospital rehabilitation the walking distance increased with 65 m from 210 ± 87 to 275 ± 97 m in mean values. The greater distance compared to our patients may be due to the longer in-hospital stay of 3 weeks and their better condition – NYHA class 1.8 ± 0.4 . Similar results of changes in physical tolerance according 6 MWT reported Fauchère, I., et al., (2012) in their study. In a large multicenter study called PARTNER trial with 699 enrolled patients after TAVI the authors concluded that if walking distance of 6 MWT not improve at 6-month follow-up results could predict long-term mortality in those unable to walk, in slow walkers and in fast walkers after two years. Walking ability is an indicator of overall physical fitness because it requires integration of circulatory, respiratory, nervous, and musculoskeletal systems. Walking speed is an established marker of frailty in the general population and in cohorts with cardiovascular disease and polymorbidity. Frailty is highly prevalent in the TAVI population. Their study does not suggest that TAVI is useless in those who are unable to walk (mortality rate 43.3% at 2 years). One of the limitations of the study is the lack of detailed information concerning the reasons for inability to perform the 6 MWT and whether differences in the reasons for not performing the test (i.e., overall immobility vs severe shortness of breath at rest) have different prognostic implications. The patients who survive 2 years after TAVI improved the walking distance (Green, Cohen, Genereux, et al., 2013).

The FTSTS test is very useful in assessing elderly and frail patients for lower limb muscle strength, to quantifying functional change of transitional movements and risk of falls. Normative values for community dwelling adults from 70 to 79 years are $10.0 + 3.1$ sec (Bohannon, 2006). The results of our patients decreased from 27 ± 4 to 19.5 ± 0.7 sec in mean values and their functional abilities have the tendency to get closer to the normative values.

Inspiratory training involves the training of the specific muscles including diaphragmatic and intercostal muscles. Feedback inspiratory training devices are used for improving pulmonary function

and providing feedback about respiratory training to the patients with different diseases. The inspiratory capacity data in-hospital patients with stroke showed improvement for 10 days, period with mean 300 ml (Grigorova-Petrova, et al., 2014). The inspiratory capacity data in our study showed improvement with mean 216 ml during the hospital stay. The greater inspiratory capacity mean values are a result of improved inspiration. The early application of an incentive breathing device for voluntary respiratory training is applicable in patients with TAVI in clinical setting and after discharge. The improvement of respiratory function is important for prevention of congestive pneumonia and to improve oxygen supply.

Conclusion

Complex physiotherapeutic approach benefits the functional status and is considered to be appropriate for patients with TAVI.

References

- Bohannon R. W. Reference values for the five-repetition SIT-TO-STAND TEST: A descriptive META-ANALYSIS of data from elders. *Perc.1 and Motor Skills*: 103; 215–222, 2006
- Cribier, A., Eltchaninoff, H., Bash, A., Borenstein, N., Tron, C., Bauer, F., et al. (2002), Percutaneous transcatheter implantation of an aortic valve prosthesis for calcific aortic stenosis, *Circulation*, Vol. 106, pp. 3006–8.
- Fauchere, I., Weber, D., Maier, W., et al. (2014), Rehabilitation after TAVI compared to surgical aortic valve replacement, *International Journal of Cardiology*, Vol. 173, № 3, pp. 564–566
- Green, P., Cohen, D., Genereux, P., et al. (2013), Relation between six-minute walk test performance and outcomes after transcatheter aortic valve implantation (from the PARTNER trial), *Am J Cardiol*, Vol. 112, pp. 700–706
- Grigorova-Petrova, K., Lubenova, D., Dimitrova, A., Bal-daranov, D., Lozeva J. (2014), Feasibility of early physical therapy program in-hospital patients with acute ischemic stroke, *Maced J Med Sci*, Vol. 2, № 3, pp. 452–455
- Lawrie, G. (2012), Role of Transcatheter Aortic Valve Implantation (TAVI) Versus Conventional Aortic Valve Replacement in the Treatment of Aortic Valve Disease, *Methodist Debaquey Cardiovasc J*, Vol. 8 № 2, pp. 4–8
- Nishimura, R., Otto, C., Bonow, R., et al. (2014), AHA/ACC Guideline for the Management of Patients with Valvular Heart Disease, *Circulation*, Vol. 129, pp. 1–235
- Nishimura, R., Otto, C., Bonow, R., et al. (2017), AHA/ACC Focused Update of the 2014 AHA/ACC Guideline for the Management of Patients with Valvular Heart Disease, *Circulation*, Vol. 135, pp. e1159–e1195
- Parmalee, P., Thuras, P., Katz, I, et al. (1995), Validation of the Cumulative Illness Rating Scale in a geriatric res-

ident population. *J Am Geriatr Soc*, Vol. 43, pp. 130–137

Russo, N., Compostella, L., Tarantini, G., et al. (2014), Cardiac rehabilitation after transcatheter versus surgical prosthetic valve implantation for aortic stenosis in the elderly. *European Journal of Preventive Cardiology*, Vol. 21 № 11, pp. 1324–1331

Yue, Li. (2015), Improvement in Quality of Life in Old People with Aortic Stenosis after Transcatheter Aortic Valve Implantation, *Current Signal Transduction Therapy*, Vol. 9 № 3, pp. 164–171

Zanettini, R., Gatto, G., Mori, I., et al. (2014), Cardiac re-

habilitation and mid-term follow-up after transcatheter aortic valve implantation, *Journal of Geriatric Cardiology*, Vol. 11, pp. 279–285

Address for correspondence:

Antoaneta Dimitrova
Department of Physiotherapy and Rehabilitation
National Sports Academy “Vassil Levski”, Sofia, Bulgaria
mobile: +359 892299763
Email: tonialllex@yahoo.com

PHYSIOTHERAPY IN PATIENTS WITH CHRONIC RESPIRATORY FAILURE IN CLINICAL STAGE

Milena Nikolova¹, Nikolay Izov¹, Ivan Maznev¹, Ivan Ivanov¹,
Danche Vasileva², Antoaneta Dimitrova¹, Kristin Grigorova-Petrova¹

¹National Sports Academy "Vassil Levski", Sofia, Bulgaria

²Faculty of Medical Sciences, Goce Delchev University,
Shtip, Republic of Macedonia

ABSTRACT

AIM: To evaluate the effect of physiotherapeutic (PT) methodology including inspiratory training device on functional status in patients with acute exacerbation of chronic obstructive pulmonary disease (COPD) and chronic respiratory failure (CRF) in clinical stage.

METHODS: 20 patients with exacerbation of COPD in clinical stage divided into experimental group (EG) and control (CG) were examined. One week in-hospital physical therapy sessions were conducted. All patients were applied the same PT methodology, but in the EG in addition was included individual inspiratory training device without resistance of inhaled air. For the purpose of the study are double-tracked and evaluated the following tests and measures: breathing rate at rest, saturation and two apneic tests.

RESULTS: After completion of the PT sessions there is an increase in saturation, in the strength of intercostal muscles and diaphragm according the tests for inspiratory and expiratory apnea and decrease in the respiratory rate at rest in both groups, but in the EG the results were better in mean values.

CONCLUSIONS: The use of inspiratory training device without resistance in patients with COPD and CRF in a period of exacerbation in clinical stage leads to significant positive effect on studied parameters.

Key words: COPD; inspiratory training device; physiotherapy

Introduction

Chronic obstructive pulmonary disease (COPD), is a group of respiratory diseases, including pulmonary emphysema and chronic obstructive bronchitis, which almost always present together in varying degrees of manifestation with progressive development of chronic respiratory failure (CRF).

COPD is considered to be a major global epidemic, as one in ten adults over 40 years most likely has COPD. Almost 3 million people worldwide have died from COPD annually. According to the World Health Organization, COPD is the sixth leading cause of death in the world. The prediction is that by 2020 COPD is going to be the third leading cause of death worldwide after the heart attack and stroke (Kostov, 2004).

Pulmonary rehabilitation is integrated into the over-

all approach of treating patients and it is individually aimed at reducing the burden of respiratory complaints, optimizing the functional status, keeping patients in a stable condition, preventing the complications of other organs and systems, and reducing the economic expenses and the need for health care. Moreover, it is the most effective therapeutic strategy for reducing breathlessness, improving the physical endurance, and improving the quality of life compared to the standard and self-medication treatment (Kostov, 2004; Karaneshev, 1991).

The physiotherapy is the most important part of a complex pulmonary rehabilitation. It positively affects patients with COPD and CRF at all stages of the disease (Berry et al., 1999), and the long-term effect of a PT course of treatment is undoubtedly proven (Foglio et al., 1999; Griffiths et al., 2000; Young et al., 1999). One of the most common causes of pro-

gressive worsening of pulmonary function and the progressive development of a chronic respiratory failure is Chronic Obstructive Pulmonary Disease.

Chronic respiratory failure is a disease state in which the exchange of oxygen and carbon dioxide between the atmosphere and the blood in the lungs is impaired, and the normal oxygen content (hypoxemia), and later the carbon dioxide in the arterial blood (hypercapnia), can not be supported. CRF occurs in a number of acute and chronic diseases of the cardiorespiratory system, blood diseases, some diseases of the central nervous system and others. The most progressive chronic bronchopulmonary diseases cause respiratory failure, which is often accompanied by a cardiovascular failure and neuropsychiatric syndrome. Depending on the nature of the underlying disease process, respiratory failure occurs acutely or chronically. Chronic pulmonary failure develops progressively over most chronic diffuse bronchopulmonary diseases, most commonly due to the chronic bronchitis, bronchial asthma, and pulmonary emphysema. All other diffuse diseases of the lungs and thorax could also cause respiratory failure (Dimitrova, 2009).

Targeted respiratory rehabilitation is recommended for all patients, especially if they have reduced physical tolerance, dyspnea on exertion, fatigue, and/or impaired daily motor activity. The early administration of PT in COPD patients has demonstrated clinically significant improvements in the quality of life and health status (Dimitrova, 2013).

Weakness of the respiratory muscles in the majority of COPD patients, even in the early stages of the diseases, is observed and it leads to the appearance of hypercapnia, dyspnea, night oxygen desaturation, and reduced functional walking options. It is proven that during physical exercises, diaphragm work increases in COPD patients as compared to healthy individuals, and causes quicker respiratory muscle fatigue and shortness of breath.

Inspiratory muscle training (IMT), in addition to the selected physiotherapeutic methodology, is suitable for use in a number of respiratory illnesses, but studies on its influence on the functional status of patients with COPD at the clinical stage are quite controversial. Some researchers conclude that IMT increases the muscle strength and endurance of the respiratory muscles and reduces the dyspnea. Other

authors believe that adding of IMT to the general training program does not significantly improve the physical capacity and quality of life of the patients. The exact characteristics of the patients with COPD, which require the inclusion of IMT with devices as part of the therapeutic exercises in PT sessions, have not yet been established (Gosselink, 2011).

This study aimed to research the effect of the use of an inspiratory training device without resistance on the functional status of patients with CRF due to exacerbation of COPD.

Material and methods

Twenty patients with exacerbation of COPD and CRF in the St. Anna University Hospital – Sofia, were examined. The study covers the period from the hospitalization of patients and administration of physiotherapy to their discharge from the pulmonary disease clinic (an average of 7 days). The contingent was divided into two groups – control (CG) and experimental (EG) (Table 1). The EG consisted of 10 patients selected according to their desire to perform an inspiratory training with an individual Coach2 Incentive Spirometer without resistance, in addition to the individual PT procedures. The CG included 10 patients who were treated with the same PT methodology as the EG but without an inspiratory training device. The patients were in the second stage of COPD according to GOLD (Global Initiative for Chronic Obstructive Pulmonary Disease, 2014) with a mean disease duration over 10 years.

For the purposes of the study, the following indicators were tracked and evaluated: respiratory rate at rest (number of inspirations/min.), oxygen saturation at rest (%), inspiratory and expiratory apnea tests (sec.).

The PT complex comprised the following administered to patients in both groups: nasal, thoracic and diaphragmatic breathing; rhythmic exercises for distal muscle groups; resistance exercises against upper limbs; specific breathing techniques; relaxing massage of the intercostal muscles; active exercises including slopes and curves; exercise to stimulate expectoration and coughing, and dosed walking.

The patients from the EG performed an inspirational muscle training with an individual Feedback Device Coach 2 Incentive Spirometer without inspi-

ratory resistance. All patients in the experimental group, after the initial tests, were given inspiratory exercise devices and precise and clear instructions, in order to allow them to practice 3–4 times a day for self-training. According to the norm, depending on the height, gender and age of the patients, the maximum amount of air was set to be inhaled slowly and gradually. The inspiration itself was through the mouthpiece which is linked to the section that shows how steady the breathing is, and in turn is related to the section indicating the amount of inhaled air. Each series consisted of 3–4 inspirations and after each inhalation a rest of 30 sec. was made. The inhalation time duration must be at least 3 sec. 3–4 series of inspirations were performed throughout the duration of the whole day. The use of this device, provided with a scale allowing visual control of the velocity and volume of the breathed air, stimulated a slow and deep inhalation. The aim was to improve the strength and endurance of the inspiratory muscles.

In the clinical stage of treatment, the load was determined by the patient's current status. The functional capabilities of patients and their clinical conditions were taken into consideration, and the load was optimal and distributed twice a day.

Student's t-criterion was used to determine the

change significance for each group in the course of treatment, and the significance of the changes between the two groups.

Results and discussion

The general characteristic of the surveyed contingent is presented on table 1.

Table 1. Common characteristic of the contingent

Parameter	Group		
	EG	CG	
Mean age	59,5 ± 8,9	67,8 ± 3,8	
41–50 years	0	1	
51–60 years	2	4	
61–70 years	6	5	
71–80 years	2	0	
Gender	male	4	5
	female	6	5
Smoking status	5	2	

EG – experimental group; CG – control group

The results of monitored saturation, respiratory frequency at rest, and functional breathing tests, objectively reflect the changes in the cardiorespiratory system in both groups of patients, and are presented on table 2.

Table 2. Changes of the respiratory parameters and the saturation (mean value and standard deviation) in the experimental and control groups before and after treatment

Parameter	Group	mean value ± SD	mean value ± SD	Difference ($X_2 - X_1$)
Respiratory rate at rest (number of breaths/min)	EG	23.5 ± 2.6	20.8 ± 1.8**	- 2.7
	CG	24.0 ± 0.8	21.4 ± 0.5***	- 2.6
	P	0.605	0.350	
Saturation at rest (%)	EG	91.6 ± 6.0	94.5 ± 5.8**	2.9
	CG	81.9 ± 7.1	77.39 ± 8.60**	5,1
	P	0.010	0.010	
Inspiratory apnea (sec)	EG	18.4 ± 6.2	21.5 ± 5.4***	3.1
	CG	19.0 ± 1.9	20.9 ± 1.8***	1.9
	P	0.788	0.761	
Expiratory apnea (sec)	EG	15.9 ± 4.7	18.9 ± 3.6***	3.0
	CG	16.0 ± 1.4	77.39±8.60***	2.1
	P	0.944	0.579	

EG-experimental group; CG-control group; X_1 - mean values before treatment; X_2 - mean values after treatment; SD - standard deviation; p-significant difference between the EG and CG (Student t-test) *** $p < 0.001$, ** $p < 0.01$

The two apneic tests reflect the condition of the cardiorespiratory system. There are no fixed norms for the parameters of inspiratory and expiratory apnea in elderly people.

As it is known, the expiratory apnea test provides indirect information about the left atrial and left ventricular functional conditions, and the inspiratory apnea test provides indirect information about

the right heart half. The inspiration increases intrathoracic pressure, which prevents blood movement from the right ventricle to the lungs. In healthy middle-aged individuals, the breathing retention time after inspiration usually is an average of 40–50 sec., and the breathing retention time after expiration is 30 sec. on average. An inspiratory test under 15 sec. and expiratory test under 10 sec. is considered to be a sign of impaired cardiac and pulmonary function (Slünchev, Toteva, 1975; Slünchev et al., 1986).

The results of the two apneic tests from the patients in the EG, before the applied PT, were on average 18.4 sec. for the inspiratory apnea and on average of 15.9 sec. for expiratory apnea. This indicates worsening cardiac function, specifically in the right ventricle and right atrium. The results for the CG at the beginning of the study were slightly higher than results in the EG. Regarding the inspiratory apnea, an average score of 19 sec. was recorded, and an average of 16 sec. was recorded in the expiratory apnea. (Table 2). At the end of the study an improvement in both groups was observed, and in the experimental group the two apneic samples were improved on average by 3 sec., and apneic samples in the CG were improved on average by 2 sec. The results at the end of the study showed a statistically significant increase in time for both inspiration and expiration ($p < 0.01$).

Oxygen blood saturation at rest is relatively constant, and it is difficult to influence. Changes at the end of the study were insignificant and unreliable. Against the background of stable oxygen saturation, an increase in breathing hold time was observed, which had a direct relationship to the haemodynamics and breathing. We take these small but unidirectional in dynamics results as a consequence of purposefully applied physiotherapy.

The respiratory rate at rest, measured at the beginning and the end of the study, showed significant reductions in both groups, and it was important to take into account that the mean values (20.8 ± 1.8) in the experimental group were close to the norm (16–20 inspirations/min).

The application of a respiratory training device is an appropriate addition to the PT complex to improve the functional condition of the patients, because it gives positive results, it is safe, easy, and convenient to use, and it does not require continuous control by

a physiotherapist.

Conclusion

In conclusion, the present study shows that the use of a non-resistance inducer device in COPD patients at the clinical stage is appropriate and has a positive effect on oxygen saturation, respiratory muscular strength, and respiratory rate at rest.

Reference

- Berry, M., Rejeski, W., Adair, N., et al. (1999), Exercise rehabilitation and chronic obstructive pulmonary disease stage, *Am J Respir Crit Care Med*, Vol.160, pp. 1248–53
- Dimitrova, A. (2013), Geriatrična dikhatelna rehabilitatsiya, Betaprint – Petrovi i Sie, Sofiya
- Dimitrova, A. (2009), Pulmonalna rehabilitatsiya pri khronichna dikhatelna nedostatichnost i khronichna obstruktivna belodrobna bolest, In Spiro, Vol. 2, pp. 24–29
- Foglio, K., Bianchi, L., Brulletti, G., et al. (1999), Long-term effectiveness of pulmonary rehabilitation in patients with chronic airway obstruction, *Eur Respir J*, Vol.13, pp. 125–132
- Global Initiative for Chronic Obstructive Pulmonary Disease (GOLD), (2014), Global strategy for the diagnosis, management and prevention of chronic obstructive pulmonary disease
- Gosselink, R. (2011), Controlled breathing and dyspnea in patients with chronic obstructive pulmonary disease, *J Rehabil Res Dev*, Vol.40, pp. 25–34
- Griffiths, T., Burr, M., Campbell, I., et al. (2000), Results at 1 year of outpatient multidisciplinary pulmonary rehabilitation: a randomised controlled trial, *Lancet*, Vol. 355, pp. 362–368
- Karaneshev, G. (1991), Obshta teoriya i metodika na lechebnata fizkultura, *Meditsina i fizkultura*, Sofiya
- Kostov, K. (2004), KHOB. Ima li takava bolest?, *Monografiya*, Ankos, Sofiya
10. Slünchev, P., Bonev, L., Bankov, S. (1986), Rükovodstvo po kineziterapiya., ÍÍ izdanie, *Meditsina i fizkultura*, Sofiya
- Slünchev, P., Toteva, M. (1975), Rükovodstvo za prakticheski uprazhneniya po meditsinski nadzor, *Meditsina i fizkultura*, Sofiya
- Young, P., Dewse, M., Fergusson, W., et al. (1999), Improvements in outcomes for chronic obstructive pulmonary disease (COPD) attributable to a hospital – based respiratory rehabilitation programme, *Aust N Z J Med*, Vol. 29, pp. 59–65
- Correspondence address:
Assistant Profesor Milena Nikolova, Ph. D.
Department of Physiotherapy and Rehabilitation
National Sports Academy “Vassil Levski”, Sofia, Bulgaria
Gurgulyat str. 1, 1000 Sofia, Bulgaria
Mobile: +359897883358
E-mail address: milenanikolova78@gmail.com

PHYSIOTHERAPY IN NEUROLOGY AND PSYCHIATRY

PRINCIPLES OF MODERN PHYSIOTHERAPY AFTER SURGICAL TREATMENT OF LUMBAR SPINE PAIN (REVIEW ARTICLE)

Daniela Lyubenova, Tsvetelina Bizheva, Nikolay Izov,

Ivan Maznev, Antoaneta Dimitrova
National Sports Academy "Vassil Levski", Sofia, Bulgaria

Summary

Low back pain is a common disorder and is an important and serious health and social problem. The prevalence and economic burden grow exponentially. Over 350 000 people per year seek consultation with a neurologist and neurosurgeon because of lower back pain in Bulgaria. The pain is provoked most often by improper posture or lifting weights. It is strong and sometimes leads to significantly impaired performance and an inability to get out of bed. Walking and moving are difficult to impossible. Treatment can be conservative or operative. Neurosurgical techniques are continuously evolving in order to facilitate and optimize healing processes. Physiotherapy is essential for functional recovery of the patients after operation, related to overcome the complications, the fatigue and the delayed functional recovery. Various specialized methods as postisometric relaxation, proprioceptive neuromuscular facilitation, neurocognitive methodology of Perfetti, neurodevelopment treatment and therapeutic exercises for motor recovery are recommended in order to improve the independence and health related quality of life of the patients.

Keywords: physical therapy, low back pain

Introduction

Degenerative spinal diseases (DSD) are a significant medical, social and economic problem worldwide, resulting in the demand for different therapeutic strategies for DSD prevention and optimal treatment options. Lumbar spine surgeries as a result of degenerative diseases are associated with a prolonged hospital stay. A second operation is often necessary, and there is a risk of developing post-operative complications (Mannion et al., 2007). The number of patients undergoing spinal surgery, in Bulgaria and abroad, has been increasing. In the United States between 1999 and 2001 the frequency has increased by more than 200%, and reached 61 operations per 100,000 population (Deyo et al., 2005). Data for Denmark is similar, where the number of operations between 1997 and 2003 has increased from 26 to 46 per 100 000. In recent years, early rehabilitation has been introduced in order to overcome complications and delayed recovery after surgical interventions (Langelotz et al., 2005). However, a pre-surgical program involving pre-rehabilitation, as well as early postoperative rehabilitation, has not been integrated yet (Nielsen et al., 2010). Data for Bulgaria is similar: Over 350,000 Bulgarians consult with a neurologist due to lower back, lumbar spine, and neck

pain, on average annually. Most often the pain is provoked by an incorrect posture, sudden movement, or lifting heavy objects. Moreover, the pain is often strong and sometimes lead to a significant disability, inability to get out of bed, and difficulty during movement (Gerasimov, 2016). DSD are the most common surgical diseases of the spine, spinal cord and its nerve roots (Todorov et al., 2014). The high DSD frequency and treatment costs require a better understanding of contemporary surgical interventions by physiotherapists in order to develop suitable rehabilitation programs based on modern therapeutic approaches (Krajdzhikova, 2011, Lyubenova, 2011, Matzuridis et al., 2013, Nielsen).

Etiology of degenerative spinal diseases

The most common cause for DSD are the intervertebral disc changes associated with formation of spinal disc herniations, protrusions, intervertebral joints' changes, osteophytes, spondylolisthesis and other changes in the spine structures. Risk factors include the followings: heavy physical work, bad posture when lifting heavy objects, weak connective tissue, gender, old age, and others (Gerasimov, 2016).

Pathogenesis and pathophysiology of degenerative spinal diseases

The vertebral column represents a perfectly balanced system of vertebrae. Intervertebral discs lay between adjacent vertebrae and act as shock absorbers. They take up the stresses to which the backbone is subjected, due to the fact that they are made of elastic tissue with high fluid content. The amount of liquid and elasticity of the discs, as well as their height, decrease with aging. This compromises the system balance and leads to increasing the pressure to the fibrous sheath that surrounds the gel-like core (nucleus pulposus) of the intervertebral disc, mainly to its rear end due to a physiological spine lordosis. In case of a sudden load on the vertebral column, it creates a possibility that a part of the disc core may tear or perforate the fibrous ring (annulus fibrosus) and herniate out by pressing a neighboring spinal cord nerve root. Strong pain then occurs due to nerve root irritation. The roots in the lumbar region of the spine are most commonly affected because the lumbar vertebrae carry the greatest weight of the body. If the muscles around a backbone are stronger, they can distribute some of the weight and prevent the disc prolapse. The formation of a disc herniation leads to a decrease of a disc height and plays an important role in the genesis of degenerative stenosis (Cholakov et al., 2008).

In spondylolisthesis, the body of the affected vertebra slips forward (along with the overlying vertebral column), and its arc remains in its place, back and curved upwards. A degenerative type of spondylolisthesis is a combination of degenerative changes in the intervertebral disc and remodeling of processus articulares at the level of the damage, which in turn progresses with age. At the stability in L5, spondylolisthesis occurs in level L4 due to degenerative changes in it (Gechev, 2002).

Clinical presentation of degenerative spinal diseases

The most common cause of surgical intervention in DSD is the disc herniation, which results in the following symptoms: low back pain, paresthesia, and sensory disorders in the distal parts of the lower extremities and last two toes of the foot. The increased paravertebral muscle tone leads to extending the rear disc space between the vertebrae, reducing the compression from the disc prolapse, expanding the intervertebral foramina, and relieving the pressure on the roots. The ventral and dorsal body flexions are limited. A similar reflector mechanism that leads to increasing a muscle tone, is the scoliosis of the spine. The patients occupy an antalgic

posture – standing slightly bent and distorted to one side, and lying down with a folded lower limb in order to avoid the painful tension of the sciatic nerve. When moving, they try to spare the affected lower extremity and lame. Muscle weakness, hypotension and muscle hypotrophy may occur in the corresponding myotome. A disc hernia at L5-S1 level affects S1 nervous root, and the tibial group of muscles is damaged. The foot is in an equinovarus position and the patients cannot occupy plantar flexion and walk on their tiptoes. In some cases, motor symptoms may be leading or only be manifested by a muscle hypotension (Shotekov, 2004).

Degenerative lumbar spinal stenosis is a leading cause of pain, impairment and loss of independence in older age. The clinical syndrome is known as a neurogenic claudication. It is characterized by bilateral or unilateral pain in the hip and the distal part of the lower extremities, weight, stiffness, tingling or weakness, which increases while walking and standing and decreases in sitting and bending forward positions (Suri et al., 2010; Ammendolia, 2014).

At first, the patients with spondylolisthesis complained of mild fatigue, especially while standing for a long period of time, sitting, or during physical effort, with consequent impossibility to stand in a vertical position for a long time. The pain occurs in the form of lumbar radiculalgia and can be caused by compression of a nervous root due to the presence of pathological mobility (in case of slightly expressed spondylolisthesis). A traumatic nerve root injury can be caused in the area of the facet vertebral joints that have been altered as a result of arthrosis (degenerative spondylolisthesis). It is typical that walking does not cause the pain to increase, whereas changing the body position, such as getting up, causes pain.

Development of a pain syndrome in women is often associated with pregnancy and childbirth. The lumbar lordosis is greatly increased. The disturbed statics require hard muscle work to maintain the trunk and the long lumbar musculature tension (mm. erectors trunci). As compensation, hypertrophy occurs in the back, thigh, and glutes muscles. The flexion movements are restricted, while the lateroflexions is free (Gechev, 2002).

Conservative and operative treatment in patients with degenerative spinal diseases

Surgical treatment for DSD is recommended (disc, hernia, spondylolisthesis, stenosis) in the case that conservative treatment through medications, preformed physical factors, manual therapy and others has failed, and if pain and sensory symptoms are unaffected by medication and physiotherapeutic treatment for at least 4 to 6 weeks, as well as definite data from X-ray, MRI, CAT Scan.

After the surgical treatment, in about 15–30% of the patients with disc herniation and spondylolisthesis, paraesthesias, residual pain predominantly as lumbalgia than ischialgia, persist to varying degrees. Neurological deficits are influenced to varying degrees, depending on the duration and severity of the root compression. (Busarski et al., 2009; Kalevski, 2010; Mannion et al., 2009).

Physiotherapy after neurosurgery in patients with degenerative spinal diseases

Influence of physiotherapy on motor skills

In elderly people, problems with functional disorders (poor coordination, balance, strength and movement performance), neurological changes (loss of sensory and motor neurons), muscle changes (atrophy of type-2 muscle fibers), arthrosis, and osteoporosis further complicate the treatment.

Pilates exercises are suitable for positive influence on muscle strength, equilibrium and functional recovery (Granacher et al., 2013).

Targeted exercises for relaxation of muscles with reflexively increased tone and strengthening the weak musculature are essential for the functional recovery of the patients (Lyubenova, 2012; Lyubenova, 2015).

Ball exercises allow purposeful training of certain muscle groups of the trunk and the limbs (Bizheva, 2015).

It is appropriate to be included postisometric relaxation in the presence of muscle imbalance and increased muscle tone of m. triceps surae, m. iliopsoas, m. quadratus lumborum, m. piriformis, hip joint adductors and others (Kraïdzhikova et al., 2005).

The reduced muscle strength of vertebral column extensors and abdominal musculature is associated with chronic and recurrent low back pain.

Motor control exercises, combined with resistance exercises, as well as mechanotherapy, achieve greater changes in the trunk muscle strength than if the resistance exercises are applied alone (Shahtahmassebi et al., 2014).

Stabilizing exercises from sitting to standing, combined with movements with increasing resistance, isometric exercises for spine extensors, motor control exercises, coordination and balance exercises, moving from stable to unstable support (ball), treadmill, and bicycle are recommended (Schubert et al., 2013).

Influence of physiotherapy on the sensory disorders

Stimulating proprioception during training activities by using unstable surfaces, leads to increased demands on the trunk muscles and improves the stability and balance. In search of a precise balance between stability and mobility, sensor-motor control plays much more important role than the strength or endurance of the trunk muscles. The central nervous system creates a stable basis for movement of the limbs through the cooperation of certain muscles (Borghuis et al., 2012).

The use of breathing exercises is appropriate, such as a combination of deep diaphragmatic breathing with slow counting, which leads to muscle relaxation. The postisometric relaxation has a marked pain reliever effect because it affects the segmental reflex arc through the nerve-reflection mechanisms (Bizheva, 2016).

Influence of physiotherapy on the global movements related to transfer and walking

Proprioceptive neuromuscular facilitation support the neuromuscular response by stimulating proprioceptors through postural stimuli, and improving the posture, equilibrium, coordination and functional activity of the patients. The methodology includes volitional, active and purposeful movements to restore the normal flexibility and mobility of the locomotor apparatus (Lyubenova, 2011; Bizheva, Lyubenova, 2016). Some authors recommend a physiotherapeutic program be performed for 6–8 weeks after surgery and to include the following: exercises in aerobic mode, treadmill, stretching, stabilizing exercises, exercises for improving the strength and endurance of the muscles of the back, abdomen and lower limbs, training in ergonomic performance of the movements, self

motivation, and advice regarding how to lift and place objects (Mc Gregor et al., 2012).

The optimal postoperative physiotherapy, applied to patients undergoing spinal surgery because of DSD, can make a significant contribution to improving the long-term outcome of this surgery. The restrictions on specific activities in the post-operative period, and in particular the recommended period during which the patients should comply with these restrictions, are still a subject of a study.

Conclusion

Physiotherapy is essential for functional recovery of the patients after neurosurgical treatment, and is related to overcoming the possible postoperative complications: pain and fatigue.

Reference

Ammendolia, C. (2014), Degenerative lumbar spinal stenosis and its imposters: three case studies, *J Can Chiropr Assoc*, Vol. 58 No. 3, pp. 312–319

Bizheva, Ts., Lyubenova, D. (2016), Prouchvane vürkhu vüzmozhnostite na kineziterapiyata za terapevtichno povliyavane pri bolni s degenerativni spinalni zabolyavaniya sled operativno lechenie, Sedmi natsionalen kongres na AFB, 5–7 Yuni 2015, Sofia, Bulgaria, *Sbornik nauchni dokladi v Sport i Nauka*, Vol. 1, pp. 39–43

Bizheva, Ts. (2015), FuntSIONal'noye vosstanovleniye pri degenerativnykh zabolovaniyakh pozvonochnika. *Sbornik konferentsii lechebnaya fizicheskaya kul'tura: dostizheniya i perspektivy razvitiya*, Materialy IV Vserossiyskoy nauchno-prakticheskoy konferentsii s mezhdunarodnym uchastiyem, Moskva, Rossiya, 27–28 maya, 2015, pp. 26–30

Bizheva, Ts. (2016), Issledovaniye vliyaniya kineziterapii na osushchestvleniye povsednevnoy deyatelnosti v rannem posleoperatsionnom periode posle laminektomii, *Sbornik konferentsii lechebnaya fizicheskaya kul'tura: dostizheniya i perspektivy razvitiya*, Materialy V Vserossiyskoy nauchno-prakticheskoy konferentsii s mezhdunarodnym uchastiyem, Moskva, Rossiya, 25–26 maya, 2016, pp. 44–48

Borghuis, J., Hof, A., Lemmink, K. (2008), The Importance of Sensory-Motor Control in Providing Core Stability, *Sports Medicine*, Vol. 38, No. 11, pp. 893–91

Busarski, V., Marinov, M., Gabrovski, St. (2009), Spinalna nevrokhirurgiya, Standarti i preporuki po nevrokhirurgiya, Bülgarsko druzhestvo po nevrogirurgiya i assotsiatsiya na nevrokhirurzite v bülgariya, Sofiya, pp. 89–104

Cholakov, D., Kumchev, Y., Karaslavova, E. (2008), Diskova kherniya i degenerativna stenoza v lumbalniya ot-del-vüzrastovo razpredelenie, *Medinfo*, Vol.6, pp.475–481

Deyo, R., Gray, D., Kreuter, W., Mirza, S., Martin, B. (2005), United States trends in lumbar fusion surgery for

degenerative conditions, *Spine*, Vol. 30, pp. 1441–1445

Gerasimov, B. (2016), Diskogenni lumbosakralni radi-kuliti, *Medical magazine*, Vol. 1, pp. 14–17

Gechev, İ. (2002), Osnovi na vertebrologiyata, *VION*, Sofiya, pp. 248–478

Granacher, U., Gollhofer, A., Hortobágyi, T., Reto, K., Muehlbauer, T. (2013), The Importance of Trunk Muscle Strength for Balance, Functional Performance, and Fall Prevention in Seniors: A Systematic Review, *Sports Medicine*, Vol. 43 No. 7, pp. 627–641

Kalevski, S. (2010), Persistirashti i retsidivirashti lumbosialgii sled lumbalna diskektomiya. *Etiologiya, lechenie, rezultati*, *Bulg Neurosurg*, Vol. 15 No. 1–2, pp. 15–23

Kraïdzhikova, L. (2011), Manualni metodi za mobilizatsiya pri muskulno-skeletni disfunktsii v oblastta na grübnachniya stülb, *Avangard prima*, Sofiya

Kraïdzhikova, L., Petkova, D., Andonova, T., Akhmedov Sh. (2005), Masazhna metodika za mekotükanna mobilizatsiya pri khronichen bolkov sindrom v lumbosakralnata oblast, *Kineziterapiya i rekhabilitatsiya*, Vol. 1–2, pp. 4–12

Langelotz, C., Spies, C., Muller, J., Schwenk, W. (2005), 'Fast-track'-rehabilitation in surgery, a multimodal concept, *Acta Chir Belg*, Vol. 105, pp. 555–59

Lyubenova, D. (2011), Kineziterapiya pri nervni i psikhichni bolesti, *BETAPRINT – EOOD*, Sofiya

Lyubenova, D., Tityanova, E. (2012), Printsipi na süvre-mennata nevrorekhabilitatsiyata, *Nevrosonologiya i mozüchna khemodinamika*, Vol.8 No.1, pp. 45–55

Lyubenova, D. (2015), *Nevrorekhabilitatsiya, V: Uchebnik po nervni bolesti. Obshta nevrologiya*. Tityanova, E., Sveti Kliment Okhridski, Sofiya, pp. 249–258

Mannion, A., Denzler, R., Dvorak, G., Grob, D. (2007), A randomised controlled trial of post-operative rehabilitation after surgical decompression of the lumbar spine, *European Spine Journal*, Vol. 16, No. 8, pp. 1101–1117

Mannion, A., Helbling, D., Pulkovski, N., Sprott, H. (2009), Spinal segmental stabilisation exercises for chronic low back pain: programme adherence and its influence on clinical outcome, *European Spine Journal*, Vol.18 No.12, pp. 985–998

Matzuridis, A., Kraydzhikova, L., Andonova T. (2013), Avtostreching dlya profilaktiki boley v spine u patsiyentov s osteoporozom, *Sbornik konferentsii lechebnaya fizicheskaya kul'tura: dostizheniya i perspektivy razvitiya*, Materialy II Vserossiyskoy nauchno-prakticheskoy konferentsii s mezhdunarodnym uchastiyem „Lechebnaya fizicheskaya kul'tura: Dostizheniya i perspektivy razvitiya“, Moskva, Rossiya 27–28 maya 2013, pp.162–165

Mc Gregor, H., Henley, A., Morris, T., Dore, C. (2012), Patients' views on an education booklet following spinal surgery, *Eur Spine J*, Vol. 2, pp. 1609–1615

Nielsen, P., Andreasen, J., Asmussen, M., Tønnesen, H. (2008), Costs and quality of life for prehabilitation and early rehabilitation after surgery of the lumbar spine. *MC Health Serv Res*, Vol. 8, pp. 209

Nielsen, P., Jorgensen, L., Dahl, B., Pedersen, T., Tønnesen, H. (2010), Prehabilitation and early rehabilitation

after spinal surgery: randomized clinical trial, *Clinical Rehabilitation*, Vol. 24, pp. 137–148.

Shahtahmassebi, B., Hebert, J., Stomski, N., Hecimovich, M. (2014), The Effect of Exercise Training on Lower Trunk Muscle Morphology, *Sports Medicine*, Vol. 44 No.10, pp. 1439–1458

Shotekov, P. (2004), *Nevrologiya, Arso, Sofiya*, pp. 55–57

Schubert, M., Helmbrencht, A., Schultz, Ch. (2013), Postoperative program after spine surgery, *International Spine Center, Apexspine*

Suri, P., Rainville, J., Kalichman, L., Katz, J. (2010), Does this older adult with lower extremity pain have the clinical syndrome of lumbar spinal stenosis? *JAMA*, Vol. 304 No.23, pp. 2628–36

Todorov, T., Todorov, I., Mikhaïlova, M., Vladeva, E. (2014), Suvremenna fizikalna terapiya i rekhabilitatsiya pri diskova bolest, *Varnenski meditsinski forum*, Vol.3, No.1, pp.62–65

Correspondence address:

Professor Daniela Lyubenova, Ph. D.

Department of Physiotherapy and Rehabilitation
National Sports Academy “Vassil Levski” Sofia, Bulgaria
Gurgulyat str. 1, 1000 Sofia, Bulgaria

Mobile: +359898776414

E-mail: lubenova@abv.bg

THE INFLUENCE OF PHYSIOTHERAPY ON GAIT AFTER SPINAL SURGERY

Tsvetelina Bizheva
National Sports Academy "V. Levski"

Summary:

Purpose. The purpose of the study is to determine the influence of specialized physiotherapy program on gait in patients after lumbar spinal surgery.

Methodology The contingent includes – 80 patients, of which 38 males and 42 females. The assessment was made on the first day after surgery, on the day of discharge and one month after surgery. The gait was examined with a Functional gait assessment (FGA) test and 6 meters walking test. All patients underwent daily exercises including proprioceptive neuromuscular facilitation (PNF) during hospital stay and performed a home exercise program for one month after discharge.

Results There were significant improvements in the first month in all functional aspects of the gait.

Discussion The specialized early physical therapy including PNF and home exercise program leads to improved gait and walking speed.

Conclusions The study showed that the use of physiotherapy during hospital stay and one month after surgery positively influenced the functionality and speed of walking in patients after spinal surgery.

Keywords: spinal surgery, gait, physiotherapy

Introduction:

Herniated lumbar disc is a displacement of disc material beyond the intervertebral disc space. The highest prevalence is among people aged 30 to 50 years, with a male to female ratio of 2:1 (Jordan et al, 2011). Surgical intervention is the most common method used to treat spinal disc herniation. When surgery is performed with adequate consideration for the resulting adaptation syndromes its success rates are from 80 to 90% (Ju et al., 2012). For better surgical outcomes and avoidance of unpleasant complications, the most important points are appropriate patient selection and effective neural decompression constitute (Omid-Kashani et al, 2016). Because the surgical removal of the disc and nerve decompression does not resolve the whole pathological process of the lumbar disorder, post-operative exercise treatment programs for rehabilitation are important (Ju et al, 2012).

There are numbers of rehabilitation programs for recovering after spinal surgery, but almost all of them are targeting the improvement of the movements, increasing the strength and the endurance of the muscles and improving the performance of everyday task (Yoo, 2015) and (Sokunbi, Kachalla 2015). There is very little information about what the actions must be in order to improve the gait in patients after lumbar spinal surgery.

The current study is researching the exercises that help to improve the gait. Walking exercises are a

good choice for such, because walking is well tolerated by most patients regardless of fitness level and back condition.

Aim and objectives of the study. The purpose of the study is to evaluate the effect of application of specialized physiotherapy program on gait in patients after lumbar spinal surgery. The contingent includes – 80 patients, of which 38 males and 42 females, voluntarily attended, treated in Department of neurosurgery of the University Hospital Sofiamed-Sofiq. The mean age of patients is 61 years.

Methods: The assessment was made on the first day after surgery, on the day of discharge and one month after surgery. The gait was examined with a Functional gait assessment (FGA) test and 6 meters walking test. All patients performed daily physiotherapy program for 30 minutes with mild to moderate intensity until the day of discharge. PNF for gait training was used during the hospital stay. After discharge all patients did a walking program at home for one month.

The main goal was to gradually extend activities of daily living from personal care to housekeeping tasks in the short term and return to work in the long term. At the beginning the treatment was focused on the ability and possibility to execute personal care activities and perform transfers in bed. Next step was gradually increasing the load of the exercises, using lumbar extension muscle-strengthening pro-

gram, exercise in walking, climbing stairs and stepping over obstacle. The functional gait assessment test was used as a part of the rehabilitation program.

Statistical analysis was performed using SPSS19.00 for Windows. Paired sample t-test was used to determine the effect of the intervention on Gait and speed.

Results: There were significant improvements in the first month in all functional aspects of the gait. The highest improvement was seen in indicators: step over obstacle with 0.97 points, gait end pivot turns with 0.91 point and change in gait speed with 0.90 points. The rest of the indicators improve with 0,72 to 0.88 points. (fig.1) The overall point for FGA at the beginning were 14.25. After one month there was a significant improvement to 21.65 (fig.2). The 6 meters walking test shows significant improvements on the day of discharge and one month after surgery (fig.3).

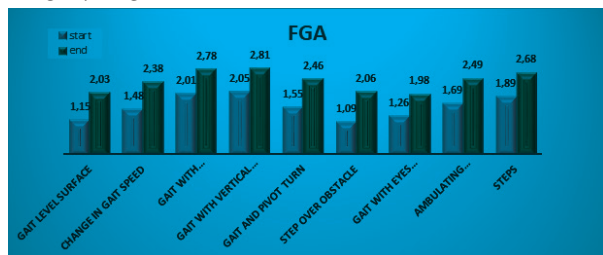


Fig.1 Changes in the subscales of FGA before and after applied physical therapy



Fig.2 Changes in the FGA overall points

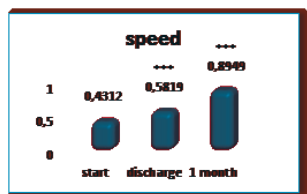


Fig.3 Changes in speed at the beginning, on before and after applied physical therapy the day of discharge and one month after surgery

Discussion:

According to Oosterhuis and Tulder, patients who undergo lumbar disc surgery for herniated discs, are

advocated two different postoperative management strategies: a watchful waiting policy, or referral for rehabilitation immediately after discharge from the hospital. (Oosterhuis et al, 2013). We started our physiotherapy program at the very first day after surgery. At the beginning the intensity was low and the goals were painless turning in bed, early verticalization and performing a few steps. We believe that the immediate engage with the program was reason for the observed significant increase in the walking speed in all of our patients at the day of discharge. The starting and ending values are shown in fig. 3. Our results are similar to those of Erdogmus, which proof that physiotherapy-based rehabilitation starting 1 week after lumbar disc surgery is more **effective in the short-term** (Erdogmus et al, 2007).

Hylton suggest that one of the primary objectives of the postural control system when walking is the head control, and that subjects adapt their stepping pattern on irregular surfaces to ensure that the head remains stable (Hylton et al, 2003). Based on that, we consider that the position and the movements of the head have special part during the rehabilitation. The FGA test itself include walking while looking left and right, up and down, walking over obstacle, walking with closed eyes also walking with reversal of direction and walking backwards. In our research we used the FGA test not only for assessment, but as a daily exercise. On that base we report considerable rising in all of its components, as shown in fig. 1. During the study we also noticed that all patients after back surgery are walking with a bowed head due to insecurity and fear of falling. Applying the FGA test as a daily exercise trains the patients to look at all directions, while building confidence and decreasing the fear of falling.

Studies on the effects of treadmill walking exercises for treating post-surgical lumbar disc herniation are not many, but in some of them is mentioned that the therapeutic benefit of treadmill exercises might be similar to the benefit of core-stability exercises. The study of Sokunbi showed that a combination of core-stability exercises, and treadmill walking exercises produced improvement in terms of pain reduction, increased spinal mobility, and improved general health of the patient following lumbar disc herniation surgery (Sokunbi, Kachalla,2015). In our study we combined lumbar extension muscle-strengthening program along with a

walking program with the FGA. An improvement of the mentioned above indicators, for a period of one month after spinal surgery, which is also supported from more studies, as those of Choi, who concluded that the early lumbar extension muscle-strengthening program has positive effects in patients after herniated lumbar disc surgery (Choi et al, 2005). The results of previous research together with this study's findings suggest that the performance of lumbar extension muscle-strengthening combined with gait training may significantly improve the walking speed and the possibilities for walking as general for patients after lumbar disc herniation surgery.

Conclusions

The study showed that the application of physiotherapy program during hospital stay and one month after surgery positively influenced the functionality and speed of walking in patients after spinal surgery.

The survey we made is only one aspect of broad field for research. There must be more surveys targeting the changes in the gait after spinal surgery. The possibilities of the impact of the physiotherapy has to be considered, too.

Therefore, this program must be introduced as a rehabilitation program after lumbar disc herniation surgery.

References:

- Choi G, Raiturker PP, Kim MJ, et al. (2005). The effect of early isolated lumbar extension exercise program for patients with herniated disc undergoing lumbar discectomy. *Neurosurgery*, 2005, 57: 764–772.
- Erdogmus C, Resch K, Sabitzer R, Müller H, Nuhr M, Schöggel A, et al. Physiotherapy-based rehabilitation following disc herniation operation: results of a randomized clinical trial. *Spine*. 2007; 32:2041–2049.
- Hylton B, Menz, Stephen R, Lord, Richard C, Fitzpatrick. (2003). Acceleration patterns of the head and pelvis when walking on level and irregular surfaces Gait end posture August 2003 Volume 18, Issue 1, Pages 35–46
- Jordan, J., Konstantinou, K., and O'Dowd, John. (2011). Herniated lumbar disc, Clinical Evidence Musculoskeletal disorders BMJ Publishing Group Ltd 2011.06:1118
- Ju S, Park G, Kim E. (2012). Effects of an exercise treatment program on lumbar extensor muscle strength and pain of rehabilitation patients recovering from lumbar disc herniation surgery. *J Phys Ther Sci*. 2012; 24:515–518.
- Omidi-Kashani, F., Hejrati, H., and Ariamanesh, S. (2016) Ten Important Tips in Treating a Patient with Lumbar Disc Herniation, *Asian Spine J*. 2016 Oct; 10(5): 955–963
- Oosterhuis T, van Tulder M, Peul W, Bosmans J, Vleggeert-Lankamp C, Smakman L, et al. (2013). Effectiveness and cost-effectiveness of rehabilitation after lumbar disc surgery (REALISE): design of a randomised controlled trial. *BMC Musculoskelet Disord*. 2013; 14:124
- Sokunbi, G., Kachalla, G., Effects of Acupuncture, Core-stability Exercises, and Treadmill Walking Exercises in Treating a Patient with Postsurgical Lumbar Disc Herniation: A Clinical Case Report, *J Acupunct Meridian Stud* 2015;8(1):48e52
- Sabitzer R, Müller H, Nuhr M, Schöggel A, et al. (2007). Physiotherapy-based rehabilitation following disc herniation operation: results of a randomized clinical trial. *Spine*. 2007; 32:2041–2049.
- Yoo, W., (2015). Comparison of the isolated contraction ratios of the hip extensors and erector spinae muscles of the lumbar region and thoracic muscles during different back extension exercises *J. Phys. T* 316 her. Sci. Vol. 27, No. 2, 2015,

Contact information with the corresponding author:

Bizheva Tsvetelina Stanimirova, assistant

National Sports Academy "V. Levski"

Department of Kinesitherapy and Rehabilitation

Bulgaria, Sofia

str. «Gurgulqt» № 1,

1000 Sofiq,

Telephone number: +359886743213

e-mail: tsvetelina_bijeva@abv.bg

MOTOR ACTIVITY IN PATIENTS WITH SUPRATENTORIAL UNILATERAL STROKE

Danche Vasileva, Nikolai Izov, Ivan Maznev, Daniela Lubenova,
Kristin Grigorova-Petrova

Abstract

The aim of the study is to evaluate the effect of the specialized kinesitherapy methodology (SKTM) on motor activity in patients with supratentorial unilateral stroke in the chronic period (SUSChP).

Material and Methods

The study was conducted with 67 patients with SUSChP (56 patients are included in the experimental group – 32 men and 24 women, with the duration of the disease 7.8 ± 2.0 months, and 11 patients in the control group – 9 men and 2 women, with the duration of the disease 7.3 ± 1.5 months).

To evaluate the changes, the motor capabilities are tracked with a modified Chedoke-McMaster test, and muscle tone with a modified Ashworth scale for upper and lower extremities that are relevant metric to evaluate the motor activity of the patients. The experimental group was conducted with a specialized 10-day KT treatment, which later continued to perform as an adapted exercise program at home for a period of 1 month. Control patients are following a conventional 10-day KT.

Results

After applying SKTM, the highest tendency towards improvement of motor activity is established in the 1st month for upper and lower extremities, with a level of significance during treatment $p < 0.001$.

Conclusion

The applied SKTM to the experimental group, later continued as adapted exercise program at home, which significantly improves the motor activity of patients with supratentorial unilateral stroke in the chronic period compared with the usual kinesitherapeutic methodology applied in the control group.

Keywords: Kinesitherapy, Motor activity, Motor capabilities, Stroke, Chronic period

Introduction

Motor activity is an essential part of complex therapy in patients suffering from stroke. It has been shown that physically active people have a lower risk of stroke and fatal outcome than those with low physical activity. This dependence is due to the positive effect of physical activity on body weight, blood pressure, serum cholesterol, and glucose tolerance. Physical activity performed during leisure time (3–4 times/week, on average 40 min) (Eckel et al., 2013; Kernan et al., 2013) have a favorable short-term effect in patients with mild stroke (Katsiki et al., 2011; Willey et al., 2011; Li, Siegrist, 2012). Modern neurorehabilitation and kinesitherapy (KT) have principal differences in acute, suboptimal (up to the 6th month of the accident) and chronic (after 6 months) restoration phase. While its application during the first 6 weeks after the stroke stimulates and supports the spontaneous recovery of motor disorders, its role in the chronic period is not the actual recovery of the

motor deficit, but the use of compensatory behavioral strategies to overcome it, which is associated with a bishhemic reorganization. Unintentional brain cells are trained to perform certain functions (Titianova et al., 2008; Peppen et al., 2004). The recovery potential is increased by combining KT and pharmacotherapy (Krakauer, 2006; Dobkin, 2010; Bersano et al., 2010). Newer concepts offer intensive therapy with motor-related tasks that involve more functional skills. As a prognostic mark, the degree of damage to the corticospinal pathway is considered. Patient's relatives are trained to assist and support the day-to-day activities of the patient (Titianova, 2007; Lubenova, Titianova, 2012). It is known that after the KT, the patients are more independent, their mood improved and their activity level increased. There is a number of evidence that KT could be effective in motor control, but systemic comparisons of effectiveness across different types of treatment programs are limited (Duncan, 1997; Gordon et al., 2004; O'Sullivan, 2001). It has

been shown that nearly 14% of stroke survivors achieve almost complete recovery of motor skills, between 25% –50% need support for daily activities, and other patients have permanent disability. Abnormal mobility is common in stroke survivors, especially in the elderly (Roth, Harvey, 2000).

Purpose

To investigate the early (10th) and the late (1st month) effect of the application of the specialized KT method in patients with chronic hemiparesis, in comparison with the control group, which is the usual KT, on the motor activity.

Material and methods

The study was conducted in 67 patients with supratentorial unilateral stroke in the chronic period (56 patients in the experimental group (EG) – 32 males and 24 women with a disease duration of 7.8 ± 2.0 months and 11 patients in the control group (CG) – 9 men and 2 women with disease duration 7.3 ± 1.5 months). The clinical characteristics of the contingent are presented in Table 1. A modified Chedoke-McMaster scale was used to determine the gravity of the phase that the 4th and 5th stage patients had a moderate degree of involvement, and the 6th and 7th stages had a slight degree of involvement (Cowland et al., 1993; Wade, 1992). On this basis, the patients were divided into two subgroups (moderate and mild).

Table 1. Clinical characteristics of the contingent at the start of the study

Parameters	Patients	Moderate degree	Mild degree
Experimental group	n=56	n=33	n=23
Age	63.2±8.8	63.9±7.1	62.3±10.9
Sex(men / women)	32/24	22/11	10/13
Limitation periods (months)	7.8±2.0	8.3±2.2	7.2±1.5
Localization (left / right)	26/30	16/17	10/13
Control group	n=11	n=5	n=6
Age	63.3±6.0	63.6±5.3	63.1±7.1
Sex (men / women)	9/2	5/0	4/2
Limitation periods (months)	7.3±1.5	7.6±1.8	7.0±1.2
Localization (left / right)	5/6	2/3	3/3

$\bar{X} \pm SD$ – mean and standard deviation EG – the experimental group, KG – control group. The significance of the intra-group changes is defined by the binominal test. Intergroup significance of sex and localization is determined by U-criteria of Mann Whitney for independent samples, while for age and limitation period, a Student t-test for independent samples is attached.

To evaluate the changes, the motion capabilities were tracked through a modified Chedoke-McMaster test and muscle tone through Ashworth's modified upper and lower limb scales, which are current informative indicators for motor performance assessment. Patients from the EG were treated with a specialized 10-day KT, which was later performed as an adapted home exercise program for a period of 1 month. It is based on the basic principles of modern neurorehabilitation: to be individual, intensive and specifically oriented – tailored and focused on the individual needs of the patient; To realize the active involvement of the patient and his / her family during prolonged administration so as to ensure care that is tailored for the patient's needs throughout his life to achieve recovery and influence of late complications of the disease (Vasileva, Lubenova, 2014). A 10-day standard KT method with a 30 min duration was applied to CG patients

using traditional approaches to central motor neuron damage as outlined in the „Medical Standard on Physical and Rehabilitative Medicine“ (Lubenova, Titianova, 2015). The two KT methods used are different in their duration of treatment, structure and included postural movements, walking, active upper limb movements and transfers).

Statistics

A set of statistical programs were used to quantify the received data. The Wilcoxon test was used to compare non-parametric parameters during treatment, and the Mann-Whitney U-criterion was used to determine the significance of differences between the groups. The Paired Samples Test is applied to compare parametric parameters.

Results

Comparison of patients in two groups did not show

significant differences in age, gender, localization and disease duration. The evaluation was performed before KT, on the 10th day and 1st month after the start of treatment. The results of the traceability indicators of the changes in motor activity in patients with chronic ischemic stroke from the

EG and CG as well as the significance of changes in the course of treatment are presented in Table 2. The differences between the obtained and the baseline values as well as the significance of the changes between the two groups are presented in Fig. 1 and Fig. 2.

Table 2. Prospective comparative assessment of motor activity in the EG and CG

Parameters	Groups	At the beginning	10 th day	1 st month
	EG (n=56) CG (n=11)	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$
Chedoke-McMaster - Upper limb (stage)	EG	4.2±0.7	5.2±0.7 ***	5.7±0.4 ***
	CG	4.4±0.7	5.20.7± *	4.70.9±
	P	0.390	0.884	0.000
Chedoke-McMaster – Lower limb (stage)	EG	4.8±0.6	5.7±0.5 ***	6.0±0.3 ***
	CG	4.90.7±	5.80.6± *	5.40.9±
	P	0.693	0.600	0.001
Ashworth – Upper limb (points)	EG	1.6±0.6	0.8±0.7 ***	0.4±0.5 ***
	CG	1.4±0.5	0.9±0.6 *	1.20.5±
	P	0.419	0.972	0.000
Ashworth – Lower limb (points)	EG	1.1±0.6	0.5±0.6 ***	0.1±0.3***
	CG	1.2±0.3	0.60.6± *	0.9±0.5
	P	0.912	0.925	0.000

$\bar{X} \pm SD$ – mean and standard deviation, *** $p < 0.001$, * $p < 0.05$ – significant change compared to baseline in the course of treatment assessed by Wilcoxon Test; $P < 0.001$ – significance of the change between the two groups measured by U-criteria of Mann-Whitney Test.

It was found that at the beginning of the treatment both groups had decreased motor activity. There are no significant differences in the baseline data between two groups. Compared with the baseline data in the experimental group, there is a significant improvement in the upper limb capabilities, as evidenced by the Chedoke-McMaster test. Similar are the changes in the lower limb. In absolute terms, the positive change was most pronounced on the 1st month, with a level of significance $p < 0.001$. The effect on motor restoration of the limbs is sustained and is maintained until the first month of follow-up in the EG. It means that patients are restored to the possibility of coordinated movements near normal. Unusual patterns of movement can occur only in fast and complex action. Control patients have significant improvement in motor activity that was observed on day 10, then the values decreased. Compared to the baseline, no change was observed in the 1st month.

Similar are the results of tracking the muscle tone in the upper and lower limbs, according to the Ashworth scale before and after the KT in the EG. An improvement is noted between mild and missing spasticity. The effect of reducing the spontaneously increased muscle tone of the affected limbs is sus-

tained and is maintained until the first month of follow-up.

In the CG, the decrease in muscle tone was observed on day 10.

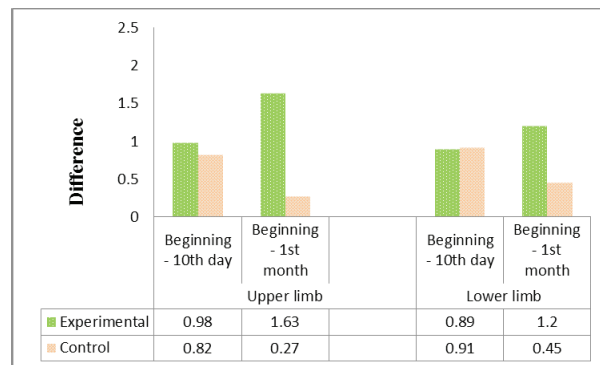


Figure 1. Changes in motor recovery presented as the difference between the results obtained and the baseline values in the two study groups, *** $P < 0.001$ – Significant change between the two groups during treatment, assessed by the U-criteria of the Mann-Whitney Test.

Similar changes in muscle tone are seen when compared between the two groups (Fig. 2). The effect of specialized kinesitherapy methodology (SKTM) is significantly better than standard KT at the 1 month of treatment (Fig. 2).

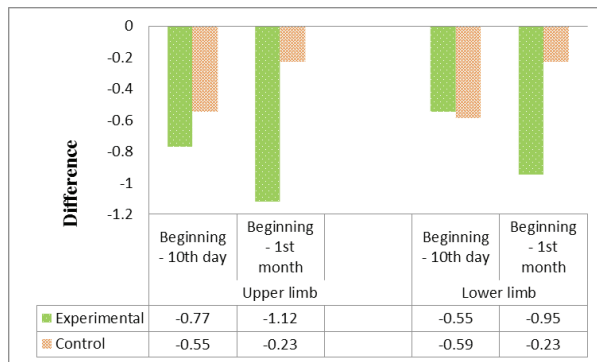


Figure 2. Changes in muscle tone, presented as difference between results and baseline values in the two groups studied, *** $P < 0.001$ – Significant change between the two groups during the course of treatment as assessed by the Mann-Whitney U-Criterion Test

Discussion

The lasting positive effect in the EG may be related to various mechanisms where the applied targeted movements affect the functional capabilities of patients with chronic stroke in a chronic period. These basically include: functional upper and lower limb movements, body and pelvic control that normalize the control of the body's intact and affected parts, and the motor response sequence. It is essential to include walking instruction in the methodology, which leads to: normalizing the control of the lower limbs and facilitating the movement (Vasileva et al., 2015; Vasileva et al., 2015; Vasileva et al., 2017; Lubenova et al., 2008). The improvement on the 10th day of onset treatment in the two groups is probably due to the fact that the methodologies used are moderate in intensity and are tailored to the patient's individual abilities.

Beneficial effect in patients in the EG remains significant in the one month follow-up, which necessitates the need for a sustained KT use of at least 4 weeks and appropriate individual training. Training in new methods, with the necessary length of time, changes the brain and creates a new motor stereotype (Lubenova, Titianova, 2015). Improved locomotor activity on the 10th day in a hospital setting under the control of a therapist is maintained in the middle of life, which has been linked to the positive influence of the surrounding and psychosocial factors relevant to the performance of motor tasks. Apparently these home-based factors are beneficial and provide an opportunity to generalize acquired skills (Dijoseph, 1982; Iwarsson, Isacson, 1997). Grigorova-Petrova K., (2014) confirms that the duration is essential for the recovery of patients with stroke in an acute period with a 4-week KT

program. There is a significant improvement in everyday activities evaluated throughout the Barthel Index to moderate dependence on day-to-day activities of the 1st month following the incident. The author demonstrates the positive effect of the applied KT in an acute period after ischemic stroke and the need for continuation of the KT to achieving patient independence in everyday life, which has been reported for most follow-up activities of the FIM test in this study (Grigorova-Petrova, 2014). Differences in mild and moderate changes can be explained by the fact that functional recovery involves more than the restitution of body functions. In particular, recent studies exploring human kinematics show that improving fine movements and gait is largely based on the use of compensatory motion strategies to help patients learn to cope with the existing neurological deficit (Kwakkel et al., 2004). The use of specialized KT has a beneficial effect on the functional mobility of patients with stroke in a chronic period. The effect is positive and continues until the end of the intervention period in the EG (Indredavik et al., 1998; O'Sullivan, 2007; Pollock et al., 2014).

Conclusion

The presented data clearly underline the different tendency of the changes in the all patients and the significant early and late effects of SKTM in patients with supratentorial unilateral stroke in the chronic period. In the EG, a significant improvement was observed on the 1st month post-initiation of kinesitherapy, with a $p < 0.001$ level of significance during treatment, whereas in the controls the observed positive effect on day 10 decreased and patients regained baseline. The applied short-term kinesitherapy has no long-lasting effect.

Literature

- Bersano, A., Ballabio, E., Lanfranconi, S., Corti, S., Locatelli, F., Baron, P., Bresolin, N., Parati, E., Candelise, L. (2010), Clinical studies in stem cells transplantation for stroke: a review, *Curr Vase Pharmacol*, Vol. 8, pp. 29–34.
- Cowland, C., Stratford, P., Ward, M. (1993), Measuring physical impairment and disability with the Chedoke-McMaster Stroke Assessment, *Stroke*, Vol. 24 No. 1, pp. 58–63.
- Dijoseph, L. (1982), Independence through activity: mind, body and environment interaction in therapy, *Am J Occup Ther*, Vol. 36, pp. 740–744.
- Dobkin, B. (2010), What matters in cellular transplantation for spinal cord injury: the cells, the rehabilitation or the best mix?, *Neurorehabil Neural Repair*, Vol. 24, pp. 7–9.
- Duncan, P. (1997), Synthesis of intervention trials to im-

- prove motor recovery following stroke, *Top Stroke Rehabil*, Vol. 3, pp. 1–20.
- Eckel, R., Jakicic, J., Ard, J., Miller, N., Hubbard, V., Nonas, C., de Jesus, J., Sacks, F., Lee, I., Smith, S., Lichtenstein, A., Svetkey, L., Loria, C., Wadden, T., Millen, B., Yanovski, S. (2013), AHA/ACC Guideline on Lifestyle Management to Reduce Cardiovascular Risk. In Press. *Circulation*. 2013;00:000–000 DOI: 10.1161/01.cir.0000437740.48606.d1
- Gordon, N., Gulanick, M., Costa, F., Fletcher, G., Franklin, B., Roth, E., Shephard, T. (2004), Physical Activity and Exercise Recommendations for Stroke Survivors: An AHA Scientific Statement From the Council on Clinical Cardiology, Subcommittee on Exercise, Cardiac Rehabilitation, and Prevention, *Stroke*, Vol. 35, pp. 1230–1240.
- Grigorova-Petrova, K., Lubenova, D., Dimitrova, A., Baldaranov, D., Lozeva, J. (2014), Feasibility of Early Physical Therapy Program In-Hospital Patients with Acute Ischemic Stroke, *Macedonian Journal of Medical Sciences*, Vol 7 No.3, pp. 452–455.
- Indredavik, B., Bakke, F., Slordahl, S. (1998), Stroke unit treatment improves quality of life: a randomized controlled trial, *Stroke*, Vol. 315, pp. 895–899.
- Iwarsson, S., Isacson, A. (1997), On scaling methodology and environmental influences in disability assessments: the cumulative structure of personal and instrumental ADL among older adults in a Swedish rural district, *Can J Occup Ther*, Vol. 64, pp. 240–251.
- Katsiki, N., Ntaios, G., Vemmos, K. (2011), Stroke, obesity and gender: a review of the literature, *Maturitas*, Vol. 69, pp. 239–243.
- Kernan, W., Inzucchi, S., Sawan, C., Macko, R., Furie, K. (2013), Obesity: a stubbornly obvious target for stroke prevention, *Stroke*, Vol. 44, pp. 278–286.
- Krakauer, J. (2006), Motor learning: its relevance to stroke recovery and neurorehabilitation, *Curr Opin Neurol*, Vol. 19, No. 1, pp. 84–90.
- Kwakkel, G., Kollen, B., Lindeman, E. (2004) Understanding the pattern of functional recovery after stroke: facts and theories, *Restor Neurol Neurosci*, Vol. 22, pp. 281–299.
- Li, J., Siegrist, J. (2012), Physical activity and risk of cardiovascular disease: a meta-analysis of prospective cohort studies, *Int J Environ Res Public Health*, Vol. 9, pp. 391–407.
- Lubenova, D., Dimitrova, A., Ganchev, D. (2008), Characteristics of kinesitherapy in patients with agnosia after ischemic stroke in the undetermined hemisphere, *Kinesitherapy*, Vol. 1, pp. 12–20.
- Lubenova, D., Titianova, E. (2012), Principles of modern neurorehabilitation, *Neurosonology and cerebral hemodynamics*, Vol. 8, No. 1, pp. 45–55.
- Lubenova, D., Titianova, E. (2015), Neurorehabilitation, in Titianova, E. (Ed.), *Neural Diseases Textbook – General Neurology*. University Publishing House „St Kliment Ohridski”, Sofia, pp. 249–259.
- O’Sullivan, S. (2001), Strategies to improve motor control and motor learning, in O’Sullivan, S., Schmitz, T. (Ed.), *Physical rehabilitation: assessment and treatment*. 4-th Ed, Philadelphia, Davis Company, pp. 363–368.
- O’Sullivan, S. (2007), Stroke, in O’Sullivan S., Schmitz T. (Ed.), *Physical rehabilitation*. Philadelphia, Davis Company, pp. 704–768.
- Peppen, R., Kwakkel, G., Harmeling-van der Wel, B., Kollen, B., Hobbelen, J., Buurke, J., et al. (2004), KNGF Clinical Practice Guideline for physical therapy in patients with stroke. Review of the evidence, *Nederlands Tijdschrift voor Fysiotherapie*, Vol. 114, No. 5 (Suppl).
- Pollock, A., Baer, G., Campbell, P., Choo, P., Forster, A., Morris, J., Pomeroy, V., Langhorne, P. (2014), Physical rehabilitation approaches for the recovery of function and mobility following stroke, *Cochrane Database of Systematic Reviews*, 4–001920.
- Roth, E., Harvey, R. (2000), Rehabilitation of stroke syndromes. In: Braddom R, ed. *Physical Medicine and Rehabilitation*. 2nd ed. Philadelphia, Pa: WB Saunders, pp. 1117–1163.
- Titianova, E. (2007), Reorganization of motor control after unilateral stroke, *Neurosonography and cerebral hemodynamics*, Vol. 3, No. 1, pp. 42–47.
- Titianova, E., Velcheva, I., Stamenov, B., Hristova, E., Karakaneva, S., Staikov, I., Grozdinski, L., Petrov, I. (2008), Algorithm for ultrasound diagnostics and therapeutic behavior in carotid pathology. Konsensus of the Bulgarian Association of Neurosonology and cerebral hemodynamics, *Neurosonology and cerebral hemodynamics*, Vol. 4 No. 2, pp. 12–134.
- Vasileva, D., Izov, N., Maznev, I., Lubenova, D., Mihova, M., Markovski, V., Nistor Cseppento, C. (2017), Changes in Kinetic Parameters of Gait in Patients with Supratentorial Unilateral Stroke in Chronic Period, *Open Access Macedonian Journal of Medical Sciences*, Vol. 5, No. 2, pp. 201–206.
- Vasileva, D., Lubenova, D., Mihova, M., Dimitrova, A., Grigorova Pertova, K. (2015), Influence of kinesitherapy on balance reactions in patients with ischemic stroke in the chronic period, *Open Access Macedonian Journal of Medical Sciences*, Vol.3, No. 4, pp. 601–606.
- Vasileva, D., Lubenova, D., Mihova, M., Dimitrova, A., Grigorova Pertova, K. (2015), Influence of kinesitherapy on gait in patients with ischemic stroke in the chronic period, *Open Access Macedonian Journal of Medical Sciences*, Vol.3, No. 4, pp. 619–623.
- Vasileva, D., Lubenova, D. (2014), Adapted program for independent home rehabilitation in patients with chronic stroke. *Sports and Science*, Vol.58, No. 3, 61–72.
- Wade, D. (1992), *Measurement in neurological rehabilitation*. University Press, Oxford.
- Willey, J., Moon, Y., Paik, M., Yoshita, M., Decarli, C., Sacco, R., Elkind, M., Wright, C. (2011), Lower prevalence of silent brain infarcts in the physically active: the Northern Manhattan Study, *Neurology*, Vol. 76, pp. 2112–2118.

Address for correspondence:
 Ass.prof. Danche Vasileva, PhD
 Faculty of Medical Sciences
 University “Goce Delchev”
 St. Krste Misirkov 10-A
 2000 Shtip, R. Macedonia
 e-mail: dance.vasileva@ugd.edu.mk

USE OF PHYSIOTHERAPY TO IMPROVE FATIGUE IN PATIENTS WITH MULTIPLE SCLEROSIS

Denka Marinova

National Sports Academy "Vassil Levski", Sofia, Bulgaria

ABSTRACT

Introduction: Multiple sclerosis (MS) is a serious disease of the brain and the spinal cord whose results in almost all patients is fatigue. In MS, fatigue is a frequent disorder which can affect the quality of life and increase disability. **Objectives:** To investigate if individually tailored physiotherapy and exercise alleviates the condition of fatigue in MS patients. **Methodology:** 28 subjects' whit secondary progressive MS with stabilized condition received individual physiotherapy. The Expanded Disability Status Scale (EDSS) and Fatigue Severity Scale (FSS) were registered at baseline and immediately after treatment. Patients are given a specific therapeutic program: one hour a day, three times a week. **Results:** Mean FSS at baseline was 4.77 (\pm SD1.45) and improved during treatment to 4.43 (\pm SD1.24) ($p < 0.001$). Mean EDSS at baseline was 5.16 (\pm SD0.74) and improving treatment to 4.90 (\pm SD0.86) ($p < 0.001$) in the sixth week. Although the tendency to worsen fatigue was great, an improvement in the condition was observed. EDSS was significantly reduced compared to baseline 4.82 (\pm SD0.93) ($p < 0.001$). **Discussion and conclusions:** Fatigue and neurological deficit improved as a result of individually tailored physiotherapy in MS. The conducted study and the results indicate that goal-oriented physiotherapy, positively influences fatigue patients with multiple sclerosis.

Key words: multiple sclerosis, fatigue, physiotherapy, exercise

Introduction

Multiple sclerosis (MS) is a chronic, inflammatory, demyelinating disease of the central nervous system. It causes various combinations of symptoms which can be manifested as damage to the myelin of the white brain substance, the ocular nerves, the pyramid paths, the sensory conductors, the cerebrum and the spinal cord. (Milanov, 2005). In recent years, the interest in MS has increased significantly. This is due to the great social importance of the disease, the progress in the development of computer tomography, as well as the introduction of medications that modify the development of the disease. Fatigue is one of the most frequent symptoms of MS, occurring in about 80% of the affected people, and leading to grave disability (Branas, 2000). A number of research works show that fatigue is a serious problem that is the reason for the functional inability of patients, the authors including it among the three most important symptoms of the disease (Krupp, 2003; Fiske, 1994). Fatigue is actually general, intense, and continual weakness manifested after physical and intellectual activity. It is defined as resistant to all influence, and the feeling of loss of vitality and energy. This objective loss of physical and psychic energy hampers the carrying out of everyday routine activities and worsens the quality of life of patients. Physiotherapy in MS

refers to physical activity that is planned, structured, and carried out over a long period of time, with a view to improving and maintaining physical status. (Carspersen, 1985). It has been documented that regular aerobic exercises decrease health risks in MS patients and positively affect the feeling of fatigue (Paffenbarger, 1986). The main strategy of treating MS is to stop the development of the disease and to control the concomitant symptoms, part of which is fatigue. This can be achieved by prevention of exacerbations and slowing down the process of the disease. (Daskalova, 2009). The study of literary sources on the issue testify that at present the treatment of fatigue in MS remains one of the most urgent and complex problems in modern medical science. Their analysis shows that physiotherapy still remains insufficiently investigated as compared with medicinal treatment.

Methodology and methods

Participants

The research has been conducted among MS patients over a three-year period. Subjects of the research were 28 diseased people with clinically ascertained MS diagnosis of relapsing-remitting kind. The age of the patients ranges from 24 to 55, the period of the disease being from 2 to 20 years. All subjects meet the following criteria in order to be

included in the research: ascertained MS diagnosis; years of age between 20 and 60; remission phase; the ability to move on their own; lack of heavy cardiovascular complaints; and stable hemodynamic indicators. The research does not include patients with contra-indications for physical therapy, concomitant cardiovascular diseases, high blood pressure, damaged general condition, or advanced stage of MS. Patients with deep depressions or psychic problems were also excluded. The approved patients have been observed by a specialist in neurology and have taken prescribed medications. Each subject has submitted an informed consent for participation in the research in the written form.

Study design

This research aims to prove that fatigue in MS patients favorably affected by specialized motor activity, in conformity with individual capacities, regardless of the disability degree. The patients were assessed at the beginning and the end of the test according to the Expanded Disability Status Scale (EDSS) and the FSS (Fatigue Severity Scale).

Methodology

The physiotherapeutic program is based on conducted research, the current condition of patients, and is personally adapted to each subject. There have been carried out 10 physiotherapeutic procedures, three times a week, in outpatients' wards or at home. The duration of each procedure is 50 to 60 min. The pressure during exercises is controlled according to the subjective fatigue indicators, as well as indicators concerning the pulse rate and the arterial blood pressure, at the beginning and the end of each procedure. The purpose of PT is to reduce fatigue and to achieve maximal functional independence through stabilizing patients' condition. The procedures consist of standardized aerobic training program. The program includes dynamic exercises for the large muscular groups, exercises on the PNF methodology, veloergometer pedaling, and breathing exercises. The subjects make up to 30-minutes therapeutic exercises, 15 to 20 min. velo's pedaling, and breathing exercises. The initial intensity of the training course on the exercise bike is fixed on VO2 max, from 50% to 70% consumption of oxygen. In case of pains in the heart area, constriction, fatigue, deviations in the blood pressure, or some other signs of overloading, the procedure is cancelled.

Results

While statistically processing the results, we have used the following indicators: minimal value (Min), maximal value (Max), range (R), average arithmetic value (X), standard error of the average arithmetic value (Mx), standard deviation (SD), co-efficient of variation (V%), asymmetry (As), excess (Ex), $p \leq 0.05$ referring to the level of significance. For the check of statistical hypotheses, the criterion of Student t – for dependent and independent samples, and X – Pearson criterion for comparison of frequency distributions at non-parametric indicators for group.

The changes having taken place as a result of the conducted physiotherapy to MS patients are laid down in Table 1–2 and Diagram 1–2.

Table 1. Changes in the average values and standard deviations of fatigue level measured at the beginning and the end of treatment

	Min	Max	R	X	mx	SD	V%	As	Ex
Начало	2.5	7	4.5	4.77	0.29	1.45	29.43	-0.42	0.85
Край	0	4	4	4.43	0.14	1.24	19.89	-0.21	0.06

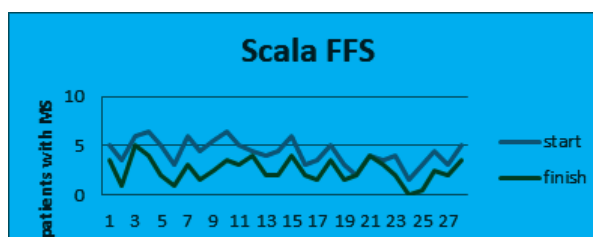


Diagram 1. Dynamics of fatigue at the beginning and the end of treatment

Table 2. Changes in the average values and standard deviations in the degree of neurological deficit according to the scale of Kurtzke (EDSS), measured at the beginning and the end of treatment

	Min	Max	R	X	mx	SD	V%	As	Ex
Начало	3.5	6.6	4.5	5.16	0.29	0.74	35.89	0.25	-1.33
Край	1	5	3.1	4.82	0.33	0.86	45	0.23	-1.25

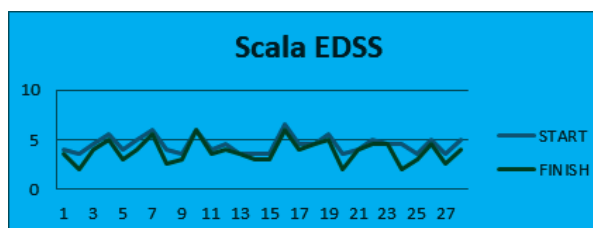


Diagram 2. Dynamics of neurological deficit at the beginning and the end of treatment

DISCUSSION

Chronic fatigue is one of the most important symptoms in the condition of MS patients, and it is hard to cure (Milanov, 2005). The decrease of the feeling of fatigue is a major criterion of the physiotherapy efficiency. Regular motor activity can well be an alternative strategy for the treatment of fatigue in MS patients (Stroud, Minahau, 2009). Table 1 clearly shows that the co-efficient of variation is high, which can be explained by the small difference in the absolute values of this value. The co-efficient of As and Ex show, however, that there is a great concentration of values, i.e. the distribution of results is symmetrical and concentrated. The follow-up of the fatigue dynamics shows the existence of heavy fatigue at the beginning of the therapy, with a tendency to decrease after starting the treatment (chart 1). On comparing the results at the beginning and the end of the research, statistically credible difference in the average values of results is identified. This makes the initial results comparable and the differences objective. At maximal fatigue degree equal to 7, the average value is 4.77 (\pm SD1.45), and at the end of the therapy it is 4.43 (\pm SD1.24) ($p < 0.001$). At the end of the treatment course, as a result of the ministered therapy, statistically significant decrease in the patients' fatigue is ascertained. The average value reached $1.20 \leq 1.87$. The significant change to fatigue decrease can be explained by the favorable influence of aerobic physiotherapy Ponichtera-Mulcare (1993). The successful research of Petajan, (1996), along with the earlier works of Ponichtera-Mulcare, Petajan (1993), set the standard trends in the treatment of fatigue in MS patients.

The analysis of the neurological deficit results identifies a large difference in evaluations, the degree of neurological deficit ranging between 3.5 and 6.5, at the maximum degree of 10. The average value at the beginning is 5.16 (\pm SD0.74), while at the end of the therapy, it is 4.90 (\pm SD0.86) ($p < 0.001$). On comparing results, it is ascertained that at the beginning of the therapy, patients have graver functional deficit, while at the end of the final course, a decrease in this deficit is identified. On the course of treatment, a better motor function is observed, which is ascribed to the fatigue decrease and the improvement of the functional condition. A treatment of MS patients is considered successful when the development of the disease slows down or even stops completely. This shows that the patients enter

a stable condition. Having in mind the progressing nature of the disease and the general tendency to aggravation of the patients' conditions, this result is optimistic in relation to the therapeutic effect of physiotherapy suggested by us. Regular physical exercises can not only prevent worsening disability but also act as prophylaxis to the development of complications (Mackereth, 2009). This is achieved through the improvement of both physical (Liu, C., 2003) and mental health.

Conclusion

So far, there are no data for a therapeutic method resulting in the successful cure of MS patients. Efforts are directed to the treatment of symptoms, prevention of bouts, and annihilation of the disease development. The obtained results are auspicious, though they give no ground for final conclusions because of the small number of tested patients and the comparatively short course of therapy. The ascertained favorable effect of the applied physiotherapeutic methods is related to the decrease in fatigue and stabilizing the general condition of MS patients.

References

- Branas, P., Jordan, R., Fry-Smith A., Hyde C. (2000), Treatments for fatigue in multiple sclerosis: a rapid and systematic review. *Journal of Health Technol Assess*, Vol. 25 No.6, pp.41–61.
- Carspersen, C.J., Powell K, E., Christenson, G.M. (1985), Physical activity, exercise and physical fitness: definitions and distinctions for health-related research. *Public Health Journal*, Vol. 48 Suppl., pp, 126–131.
- Daskalova, V., Aleksandrov, A., Kostadinova, C. (2009), Multiple sclerosis, *Median PRESS*, pp. 296–348.
- Fiske, J.D., Ritro, P.G. et al. (1994), The impact of fatigue on patient with multiple sclerosis, *Journal of Neurol. Science*, Vol. 21 No.1, pp. 9–14.
- Krupp, L.B. (2003), Fatigue in Multiple sclerosis: definition, pathophysiology and treatment. *CNC Drugs Journal*, Vol. 17, pp. 225–34.
- Liu, C., Playford, E.D., Thompson, A.J. (2003). Does neurorehabilitation have a role in relapsing remitting multiple sclerosis? *Journal of Neurology*, Vol.25, pp.214–218.
- Mackerethy, P.A., Boothy, K., Hilliery, V.F., Caress, A.L. (2009). Reflexology and progressive muscle relaxation training for people with multiple sclerosis: a crossover trial, *Complement Ther. Clin. Pract*, Vol.15, pp.14–21.
- Milanov, I. (2005), Multiple sclerosis, *Medicine and Physical Education*, 2005, 28–30.
- O'Connell, R., Murphy, R.M., Hutchinson, M et al. (2003), A controlled study to assess the effects of aerobic training on patients with multiple sclerosis. Paper presented at: 14th International World Confederation for Physical Therapy; June Barcelona, Spain, pp. 7–12.

Paffenbarger, R.S., Hyde, R.T., Wing, A.L. Hsieh, C.C. (1986), Physical activity, all-cause mortality, and longevity of college alumni. *New England. Journal of Medicine*. Vol. 14 No.10, pp. 605–613.

Petajan, J.H., Gappmaier, E., White, A.T. et al. (1996), Impact of aerobic training on fitness and quality of life in multiple sclerosis. *Journal of Neurology*. Vol. 39, pp. 432–441.

Ponichtera-Mulcare, J.A., Glaser, R.M. et al. (1993), Maximal aerobic exercise in persons with multiple sclerosis. *Journal of Kinesiology*, Vol. 45, pp. 12–21.

Schulz, K.H., Gold, S.M., Witte, J, et al. (2004), Impact of aerobic training on immune-endocrine parameters,

neurotrophic factors, quality of life and coordinative function in multiple sclerosis. *J Neurol Sci. Suppl.* 225, pp.211–218.

Stroud, N.M., Minahau, C.L. (2009), The impact of regular physical activity on fatigue, depression and quality of life in person with multiple sclerosis. *Health Qual. Life, Outcome*. pp. 57–68.

Correspondence:

Denka Marinova

National Sports Academy “Vassil Levski”,

Sofia, Bulgaria

E-mail: denka_marinova@abv.bg

PHYSIOTHERAPY IN PEDIATRICS AND GERIATRICS

APPLICATION OF A PHYSIOTHERAPEUTIC PROGRAM IN CHILDREN WITH PNEUMONIA

Nezabravka Gencheva¹, Ani Malinova², Rositsa Mitrova²

National Sports Academy "Vassil Levski"¹

University Hospital "Lozenetz"²

Introduction

Pneumonia is a pulmonary system disease with an unusually great number of various etiologic agents. Regardless of continuous advances in medicine, pneumonia continues to be a serious challenge to diagnose and to treat, even if it is identified in time and treatment is undertaken in due course.

The peculiarities of the infant constitution in the different stages of the early age provoke various preconditions for an explicitly defined specific character of the disease course. (Bobev, Ganev, 2000). Vastly increased share of viral and virus-bacterial pneumonia complicates the process of disease course per se, as well as the pneumonia medication in the children-aged group (Minchev, 1999). Pneumonia is still a serious illness among the children and the grow-ups even today and continues to be a challenge and great responsibility for all involved in the curing process; in this respect, it is of great obligation for the physiotherapists as well. Morrison, Agnew (2011) share that even after the inflammation process fades away recuperation of the child body functions takes a long time and is accompanied by a reduced effectivity of the respiratory system, obstruction, etc.

Chest physiotherapy is an important part of the treatment of most respiratory diseases (Balachandran et al, 2005) and is commonly used in children with chronic respiratory disease. According to Morrison, Agnew (2011) physiotherapy can be classified as conventional, modern and instrumental techniques. The aim of Chest Physiotherapy is to facilitate mucociliary clearance (Main 2009). The use of Physiotherapy (PT) in pediatric pneumonia helps to eliminate the inflammatory exudates and tracheo-bronchial secretions, eliminate airway obstruction, reduce their resistance, improve gas exchange, and normalize breathing (Chaves, 2013). The information in literature sources regarding the physiotherapy application to children with pneumonia is rather contradictory as for the type of the pneumonia, the duration of the physiotherapeutic treatment,

the selection of physiotherapeutic techniques, as well as with respect to statistical research data, etc. Moreover, there is no persuasive evidence that may support or refute the application of physiotherapy to children with pneumonia. Each illness decreases motor activity and disadvantageously influences on the growing organism (mainly on the cardiovascular system and respiratory system), averts activation of sanogenesis mechanisms (Hrushchev, Simeonova, 2006). It is necessary to pay attention also to the stimuli needed for the general psycho and physiological development of the child; its progress may be retarded due to the affection process.

The aim of the study is to monitor the effect of PT in combination with medication therapy in children with pneumonia

Methodology of the research: A Physiotherapy Program was applied to 7 children of average age of 8,4 years old, diagnosed as suffering from viral pneumonia that was radiographically proven immediately after their entrance in the Lozenetz University Hospital, and prescribed instruction for 3–4-day hospitalization and respective medical treatment. We compared the results got in this group with the data from a control group of 6 children of average age 7.5 years' old who were under medication treatment at home. History of the presenting illness, like cough, fever, fast/difficulty in breathing, chest pain, and inability to feed were documented.

Research Methods:

After being hospitalized and after the relevant clinic checkups and diagnosing, at the beginning of the medical treatment course and at the end of it the children in both groups – the experimental and the control – were thoroughly examined by using the following tests: Physical inspection of the *breath frequency*, where as a measure unit was used the number of motion of the thoracic cavity (*cavum thoracis*) per minute at the beginning and the end of the therapy course; *Spirometry* necessary to test

lung functionality, specifically the volume and the flow of air that can be inhaled and exhale; thus we defined the Forced vital capacity (FVC) and forced expiratory volume per one second (Forced expiratory volume during the first second (FEV1)); *Respiratory rate* in centimeters, in state of maximum inhalation; Measuring and evaluation of hemodynamic indicators such as *pulse frequency* and *arterial blood pressure*; *Oxygen blood saturation* (O sat) of the patients was measured using pulse oximeter with appropriately sized pediatric probe. Hypoxemia was defined as O sat <90%; Computer mathematic and statistic processing of the final test data with the help of standard processing programs such as SPSS12.0. and Microsoft Excel, on PC.

Physiotherapy Methodology

The final kinesitherapeutic goal is to recover the respiratory functionality and recreation of children's vitality. Having in mind all peculiarities of child's breathing physiology, we worked out a physiotherapy programme (PTP) especially for the group of children with pneumonia in clinic conditions; there we included the experimental group (EG). The children from the control group (KG) did not conduct physiotherapy because after assigned parents' consent, they were discharged from the hospital for home treatment and came back to the clinic for control checkups just in the end of the medical therapy. The PT Program includes inhalation treatment, Huff Cough Technique, drainage massage, various games, imitation exercises and static or dynamic breathing exercises using positions on Physio Roll. After the inhalation treatment PT Program continued with Huff Cough Technique: this is a technique helping the mucus (muscles secretion) to move out from the lungs. It may be individually exercised by the patient. This technique must be repeated two or more times and followed by a strong cough to clear the mucus from the larger airways. The whole cycle is repeating up to four or five Huff coughs. We decided to employ *exercises with Physio Roll*, because it has the form of a peanut; this shape allows the child to hold different positions and gives chance the lung to be drained. Moreover, the exercises with such a ball represent a holistic motive experience and help to build up a good body position, coordination, balance and muscle strength. The children explore their environment while moving

around in the space (Ceron, 2003). By the usage of the low frequency fluctuations, passively got by the patients while performing the ball exercises, they get their spastic muscles on the back and the cervix relaxed. Jumping up and down on the ball with a clear-cut tempo helps them to improve their sense of rhythm. Sitting on the ball is a dynamic action and provokes the young body to keep a correct and proper pose for a long time (Gencheva, Zaharieva, 2014). The exercises with Physio Roll are more easily accepted by the little patients and they are more willing to practice them. These exercises create positive emotions in them – in most cases they are perceived and played as games and imitation exercises; and so, without any doubt, they give a chance the child to improve his/her activity while carrying out different and various dynamic and respiratory exercises in a set (Gencheva, 2003). *Massage* was also conducted using the Physio Roll before to start performing the whole gymnastic complex. We situated the children in a suitable body position with respect to the affected lung segment and so provided the needed declination of the segmented draining bronchi to the joints, the roots of the bronchial tree. Draining was facilitated by cough and diaphragm breathing in a draining position. We applied also vibration techniques and patting the thorax in the respective affected segment. The vibrations and the pats we carried out during the expiation phase. Physiotherapeutic procedures were carried out simultaneously in combination with medicated treatment: antipyretics, anti-coughing medicines, vitamins, one or two antibiotics.

Results and discussion

In Table 3 and Table 4 we present the results from the spirometry, breathing frequency and chest inhalation measurements (CHIM) at the beginning and end of the treatment course respectively in the experimental and control groups. The data in the beginning of the treatment, obtained prior to the appointment of a kinesitherapeutic treatment point out the fact that all children have had decreased FVC and more distinctly a decrease in the forced expiratory volume in one second (FEV1). The FEV1/ FVC ratio (Tiffeneau Index) manifests a presence of a sort of obstructive pulmonary insufficiency (72,14% in EG and 73% in KG).

Table 3 Changes in respiratory parameters in EG children with pneumonia at the beginning and end of treatment in EG

EG Parameters	Beginning of treatment		End of treatment		d	t _{emp}	P%
	\bar{X}_1	S	\bar{X}_2	S			
FVC	1978,57	208,35	2175,57	183,52	-197,00	-4,379	99,5%
FEV1	1422,71	118,43	1682,43	170,85	-259,71	-7,419	99,0%
FEV1/ VC	72,14	4,85	77,29	4,39	-5,14	-4,076	99,3%
Ross. Rate	23,86	3,81	19,57	2,15	4,29	6,301	99,9%
CHIM	71,28	2,81	72,57	2,57	-1,29	-6,971	99,9%

Table 4 Changes in respiratory parameters in EG children with pneumonia at the beginning and end of treatment in KG

KG Parameters	Beginning of treatment		End of treatment		d	t _{emp}	P%
	\bar{X}_1	S	\bar{X}_2	S			
FVC	1921,83	224,97	2059,50	201,49	-137,67	-4,454	99,3%
FEV1	1391,67	72,46	1524,8333	109,43	-133,17	-4,956	99,6%
FEV1/ VC	73,00	5,80	73,83	4,26	-,83333	-,412	30%
Ross. Rate	23,83	3,92	21,50	1,87	2,33	2,445	94,2%
CHIM	70,83	1,84	71,50	2,16	-0,67	-,649	44,8%

At the beginning of the research work it may be seen that the respiratory frequency in EG and KG is above the values registered for the respected age group (23,86 acts/min and 23,83 acts/min) Due to the medical therapy and the applied kinesitherapeutic Program FVC and FEV1 increase and in the end of treatment are more close to the standard Statistically significant differences were observed between initial and fi-

nal values of all tested breathing parameters in the experimental group (P > 99%). Statistically insignificant differences between initial and final values for PT group were found only for FVC and FEV1. Statistically insignificant differences between initial and final values for KG were found for Respiratory rate (94,2%) and Chest inhalation measurements (CHIM) (P = 44,8%).

Table 5 and Table 6 present the comparison between the results of spirometry, respiratory rate, and chest inhalation measurements between EG and KG, respectively, at the beginning and end of the treatment course.

Table 5 Comparison between the results of spirometry, respiratory rate, and chest inhalation measurements between EG and KG, respectively, at the beginning of treatment

Parameters	EG n =7		KG n=6		d	t _{emp}	P%
	\bar{X}_1	S	\bar{X}_2	S			
FVC	1978,57	208,35	1921,83	224,97	-56,74	-,472	53%
FEV1	1422,71	118,43	1391,67	72,46	-31,04	-,557	44%
FEV1/ VC	72,14	4,85	73,00	5,80	,86	,291	22%
RES Rate	23,86	3,81	23,83	3,920	-,03	-,011	01%
CHIM	71,28	2,81	70,83	1,84	-,45	-,336	26%

Table 6 Comparison between the results of spirometry, respiratory rate, and chest inhalation measurements between EG and KG, respectively, at the end of treatment

Parameters	EG		KG		d	t _{emp}	P%
	n=7		n=6				
	\bar{X}_1	S	\bar{X}_2	S			
FVC	2175,57	183,52	2059,50	201,49	-116,07	-1,087	70%
FEV1	1682,43	170,85	1524,83	109,43	-157,60	-1,938	93%
FEV1/ VC	77,29	4,39	73,8333	4,262	-3,45	-1,433	82%
RES Rate	19,57	2,15	21,50	1,87	1,93	1,710	89%
CHIM	72,57	2,5	71,50	1,87	-1,071	-1,044	56%

In the beginning, there is not date differences in spirometry, respiratory rate, and chest inhalation measurements between EG and KG. But in the end of treatment there is a strong tendency for better FEV1 values in the experimental group vs. control which is result of the medical therapy and the applied kine-sitherapy program with fit-ball, although the difference is statistically insignificant (P = 93%). To reach a complete normalization of the Tiffeneau index levels and to achieve the foreseen values of FVC and FEV1 we recommended a set of respiratory exercises for the spirometry proceeding; these exercises are practiced in home environment. In the control group, without physiotherapy, spirometry values were lower.

Although at the time of discharging from the hospital the average values are in the norms of the upper borderline limits for the respective age standard because of the slow diminishing disease process, the difference in respiratory rate between our patients from the experimental and control groups is statistically unreliable. In the control group, we have registered higher respiratory frequency compared

to the experimental group in the end of the study, as well as insignificant differences compared to the first measurement. This is a manifestation that the respiratory techniques do have their positive impact on the reduction of the respiratory frequency and on deepening the breathing itself, as well. The results thorax measuring in maximum inspiration, demonstrate forced respiratory muscle system at the end of the treatment course in the PT group. The distance is almost one centimeter and this is an excellent result for a short-term treatment. (P = 99,9%). Such an improvement is not registered in the control group

(P=94,2%) because specialized exercises for strengthening the respiratory muscle system are not included in the set.

In the beginning of the treatment course the children either from the control or from the experimental group manifests *tachycardia* (tabl.7-8). A serious reason for this may be the sub febrile temperature of some of the children.

Table 7 Changes in pulse rate, arterial blood pressure and oxygen saturation in children at the beginning and end of the therapeutic course in EG

EG Parameters	Beginning of treatment		End of treatment		d	t _{emp}	P%
	\bar{X}_1	S	\bar{X}_2	S			
PP	100,29	9,10521	85,86	6,47	14,43	7,220	99,9%
RR sis	105,71	9,76	107,14	11,50	-1,43	-,679	47,8%
RR dias	61,43	4,76	66,43	5,56	-5,00	-3,240	98,2%
O ₂ sat%	89,29	1,60	94,86	1,46	-5,67	-2,456	99,9%

Table 8 Changes in pulse rate, arterial blood pressure and oxygen saturation in children at the beginning and end of the therapeutic course in KG

Parameters	Beginning of treatment		End of treatment		d	t _{emp}	P%
	\bar{X}_1	S	\bar{X}_2	S			
PP	99,83	8,84	91,67	6,77	8,16	3,024	97,1%
RR sis.	104,17	7,36	105,00	9,49	-,83	-,415	30,5%
RR dias.	60,83	5,85	64,17	4,92	-3,33	-2,000	89,8%
O ₂ sat%	92,17	1,47	93,83	0,98	-1,67	-5,000	99%

The pulse frequency normalization, with statistical reliability in EG (P = 99,9%) and in KG (P = 97,1%) is due to the reduction of the body temperature and to the increase in the compensatory mechanisms of the heart vascular system while the loading is growing up. The lack of a direct physical loading for the

children in the control group is reflected by higher values of the pulse frequency as a compensatory mechanism, but the differences are statistically reliable. The difference in arterial blood pressure between our patients from the experimental and control groups is statistically unreliable (Tabl. 9–10).

Table 9 Comparison of pulse rate, arterial blood pressure and oxygen saturation in children in EG and KG at the beginning of therapeutic course

Parameters	EG n =7		KG n=6		d	t _{emp}	P%
	\bar{X}_1	S	\bar{X}_2	S			
PP	100,29	9,10521	99,83	8,84	-,090	-,452	7%
RR sis.	105,71	9,76	104,17	7,36	,757	-,318	24%
RR dias.	61,43	4,76	60,83	5,85	-,595	-,203	16%
O ₂ sat%	89,29	1,60	92,17	1,47	2,88	3,351	99.4%

Hypoxaemia (O₂sat <90%) was observed in the children of the EG and they were hospitalized. The KG subjects were targeted for home treatment because the O₂sat values were about 92%. At the end of the

treatment course, O₂sat at the EG was in norm. (O₂sat= 94.86%) as the growth was greater compared to the control group.

Table 10 Comparison of pulse rate, arterial blood pressure and oxygen saturation in children in EG and KG at the end of therapeutic course

Test	EG n =7		KG n=6		d	t _{emp}	P%
	\bar{X}_1	S	\bar{X}_2	S			
PP	85,86	6,47	91,67	6,77	5,81	1,580	86%
RR sis	107,14	11,50	105,00	9,49	-2,14	-,362	28%
RR diast	66,43	5,56	64,17	4,92	-2,26	-,770	55%
O ₂ sat	94,86	1,46	93,83	0,98	-1,02	-1,451	82.5%

Conclusion

The applied physiotherapeutic program includes a broad spectrum of physical exercises with Physio-Roll, respiration techniques and massage for children with pneumonia in a clinic environment; such physical exercises accelerate the process of rehabilitation the correct breathing and the hemodynamic criteria such as pulse frequency and arterial blood pressure in the group of children with pneumonia. The lack of specialized respiratory rehabilitation for the respiratory diseases should not be disregarded; it may have a negative reflection both – on the recovery process as well as on the normal psycho-physical development of the children.

Bibliography

Bobev Dr, Ganev E (2000) *Pediatria for students of medicine*, Arso.3 th ed.Sofia

Gencheva N., (2003) *Fit-ball and Kinesithgerapy*, BullIns, Sofia

Gencheva N, Zaharieva D. (2013) *The Fit-ball balance training in children with bad posture*, FIS Communications, book of proceedings, Nis, October, pp: 257–263

Minchev P (1999) *Pneumonia in childhood -Diagnostic and Therapeutic Problems; Practical pediatria*, 4 pp: 5

Hrushev S., Simeonova O (2006) *Физическая культура детей с заболеваниями органов дыхания*, Академия, М.

Balachandran A, Shivbalan S, Thangavelu S. (2005) *Chest physiotherapy in pediatric practice*. *Indian Pediatrics*;42, pp:559–68.

Chaves G, Fregonezi, G; AL Dias, F; Ribeiro, C; Guerra, R; Freitas, D; Parreira, V Mendonca.K (2013) *Chest physiotherapy for pneumonia in children*, *Cochrane Database of Systematic Reviews (CDSR)*, 9,, available at: DOI:10.1002/14651858.CD001401.pub2 (accessed 12

August 2017)

Gajdos V, Katsahian S, Beydon N, Abadie V, de Pontual L, Larrar S, Epaud R, Chevallier B, Bailleux S, Mollet-Boudjemline A, Bouyer J, Chevret S, Labrune P. (2010) *Effectiveness of chest physiotherapy in infants hospitalized with acute bronchiolitis: a multicenter, randomized, controlled trial*. *PLoS Med.* 7(9); pp:1–12

Duke, T.; Mgone, J.; Frank, D.(2001) *Hypoxaemia in children with severe pneumonia in Papua New Guinea [Oxygen Therapy in Children]* *The International Journal of Tuberculosis and Lung Disease*, 5/ 6, 2001, pp: 511–519 accessed 16 August 2017

Main E, Prasad A, van der Schans C (2009), *Conventional chest physiotherapy compared to other airway clearance techniques for cystic fibrosis*. *Cochrane Database of Systematic Reviews*, Issue 2. available at: DOI: [10.1002/14651858.CD002011.pub2](https://doi.org/10.1002/14651858.CD002011.pub2) (accessed 12 August 2017).

Michelow IC, Olsen K, Lozano J, et al. *Epidemiology and clinical characteristics of community-acquired pneumonia in hospitalized children*. *Pediatrics*. 2004;113:701–707

Morrison L, Agnew J. (2011) *Oscillating devices for airway clearance in people with cystic fibrosis*. *Cochrane Database of Systematic Reviews*, Issue 1. available at: DOI: [10.1002/14651858.CD006842.pub2](https://doi.org/10.1002/14651858.CD006842.pub2) (accessed 12 August 2017)

Spence H, Baker K., et al. (2017). *Childhood pneumonia diagnostics: community health workers' and nationalstakeholders' differing perspectives of new and existing aids* *GLOBAL HEALTH ACTION*, VOL. 10, available at: <http://www.tandfonline.com/doi/pdf/10.1080/16549716.2017.1290340> (accessed 10 August 2017)

Contact information

Prof. Nezabravka Gencheva, PhD

Department of Physiotherapy and rehabilitation, National Sports Academy, Sofia

e-mail: nezig@mail.bg

Mobile Tel +359 896776604

**INTERNATIONAL SCIENTIFIC CONGRESS
“APPLIED SPORTS SCIENCES”**

1-2 December 2017

Sofia, Bulgaria

PROCEEDING BOOK

EDITORS OF THE PROCEEDING BOOK:

Prof. Tatiana Iancheva, DSc

Assist. Prof. Stefka Djobova, PhD

Assist. Prof. Milena Kuleva, PhD

Design: Vladimir Ivanov, Stanislav Hristov
and Ognyan Karamanchev

Printed and bounded by: BPS Ltd

Publisher: NSA Press

ISBN (Print): 978-954-718-489-3

ISBN (Online): 978-954-718-490-9

PARTNERS



Ministry of Youth and Sport



Sofia Municipality



Ministry of Education and Science



MEDIA PARTNERS

