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СЪДЪРЖАНИЕ

BATTERY OF TESTS FOR EVALUATION OF MOTOR ABILITIES AT 7 YEARS OLD CHILDREN

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Motor abilities are one of the basic criteria for evaluation of the effects of physical education teaching process and also an objective manner to determine the students' final achievement. Motor tests used to estimate motor abilities are related to children's age. Every age period requires standardized motor tests. Therefore, the aim of this paper is to suggest a battery of tests with suitable for evaluation of motor abilities at 7 years old children. The research is conducted at sample of 123 examinees, 7 years old male children, pupils in second grade in five primary schools in Skopje, Republic of Macedonia. 33 motor tests were used for estimation of nine motor abilities. Tests characteristics: discriminativity, reliability, validity and representativity were determined using adequate statistic procedures and methods. According the obtained result, a battery of 12 motor tests with significant metric characteristics it's proposed as adequate for further use in evaluation of motor abilities at 7 year old children. .

Key words: *motor tests, tests characteristics, motor abilities, 7 years old children.*

INTRODUCTON

Motor abilities are the essence of human motor space. Related to physical and health education process, motor abilities are one of the main goals of physical education (PE) in primary school education; development of motor abilities is also defined as one of the concrete goals in the segment named „movement" (Klincarov, 2007), or assignments that are recognized in pedagogy as educational assignments. Considering the process of development of motor abilities it's noted that they are highly related with acquisition of different motor skills and habits (Matič, 1978), is also based on native characteristics and are result of development and training (Kukolj, 2006). Higher level of motor abilities is a fundament for faster and successful acquisition of different movement tasks and movement skills that are part of PHE process.

Motor abilities in children are manifested and developed differently compared with adults (Jürimäe, & Jürimäe, 2001; Pišot & Planinšec, 2005). The motor space in young children is arranged differently than the motor space of the older children or adults. These differences are result of children's uncompleted development, uncompleted regulations of CNS, ongoing functional

development, individual tempo of development, concerning different „biological time“ on every individual and other characteristics. These emphasize the need of specific motor tests and procedures for assessment and evaluation of children motor ability in every specific year of age. Having this in mind, one of the very important questions is to create a battery of motor tests relevant for young children in every age period. Such standardized battery for evaluation of motor ability in every age period will be the most objective and relevant manner to estimate and evaluate children motor abilities, their individual improvement, the criteria for creation of final grade from PE, criteria for sport selection and manner for evaluation of efficiency of PE curriculum. Speaking about battery of tests and testing motor abilities of children, many authors noted difficulties in realization of measurements of children‘s motor abilities (Bala, 1999; 2007; Rajtamer, 1997; Popeska, 2009, 2011, Jurimae, T., & Jurimae, J, 2001) as a result of childrens development characteristics, while the authors Ikeda & Aoyagi (2007) reported that it is especially difficult to design a test for evaluation of motor abilities in young children that has sufficient reliability, validity, objectivity and practicality because young children have no understanding of time, no sense of rivalry and do not notice differences in their abilities to perform certain motor tasks.

Upon these difficulties, considering the importance of manifestation, assessment and development of motor abilities in children for their motor behavior and future physical activity, their meaning in PE teaching process as well as the fact that in Republic of Macedonia does not exist a recommended battery of motor tests that could be used for estimation and following of motor abilities in young children, we defined the issue of this paper. Therefore, the aim of this work is to suggest a battery of tests with satisfy „Test Characteristics“ suitable for estimation of motor abilities and motor achievements of 7 – years old children, second grade pupils in primary education.

METHOD OF WORK

The research was realized on a sample of 123 examiners, 7 years old male children, pupils in second grade in five primary schools in Skopje, Macedonia. The research was conducted as a part of larger study realized by Popeska (2011). A total number of 33 motor tests were used for estimation of nine

motor abilities: co – ordination, running speed, frequency of movement, explosive, repetitive and static strength, balance, flexibility and preciseness. Selection of applied tests was made considering children's possibilities, results obtained from previous researches realized with same age group of children, as well as recommendations of researchers that previously explored this issue. The motor tests used in our research were previously used in different researches [Bala, 1981, 1999; Perić, D. 1991; Dukovski, 1984; Zurc, Pišot, Strojnik, 2005; Popeska, 2009, 2011]. (Bala, 1981; Dukovski, 1984; Rajtmajer & Proje, 1990; Rajtmajer, 1993; Perić, 1991; Zurs, Pišot & Strojnik, 2005, Popeska, 2009). Recommendations from the authors were implemented in the research procedure. Following tests were used: ***1) CO – ORDINATION*:** Co – ordination with stick (KOPAL)[1], Obstacle course backwards (KOPON), Two balls slalom rolling (KOSL2), Rolling with ball on floor (KOTRT); **2)** ***SPEED OF RUNNING***:10m running from flying start (BT10LS), running 4 x 10(BT4x10), Cries – cross running 4 x 5м (BTZMT); **3)** ***FREQUENCY OF MOVEMENT***: Arm plate – tapping (BSTAR), One foot – tapping(BSTAN), Both feet – tapping on wall (BSTNZ); ***4) EXPLOSIVE STRENGTH***: Standing broad jump (ESSDM), Throwing medicine ball 1 kg from standing position (ESFMST), Throwing medicine ball 1 kg from sitting position (ESFMG) и 20m dash running (ES20VS); ***5) REPETITIVE STRENGTH***: Modified pushups (RSSKL), Sit-ups(RSPTR), Trunk lift (PSITR), Hands pulling over the diagonal Swedish bench (RSVKK); ***6) STATIC STRENGTH*:** Bent arms hang (SSVZG), Horizontal hold lying on stomach (SSZLM), Horizontal hold lying on back (SSZLG); **7)** ***FLEXIBILITY***: Deep bend on bench (FLDPK), Both legs extension lying on bag (FLRLG), Legs extended forward bend on floor (FLPRP); ***8) BALANCE*:** Walking on upturned Swedish bench (RAOSK), Standing on bench in width (RASKS), Standing on bench in length (RASKD) and **9)** ***PRECISENESS*:** Throwing circles on stick (PIOBS), Throwing tennis ball in vertical goal with arm (PITET), Throwing ball in horizontal goal with arm (PITHC), Throwing ball in vertical goal with leg (PIVCN), Leading with short stick (PVGKS), Leading with short stick (PVGKD).

Depending from the characteristics of motor abilities, all applied tests were

1 The authors have the detailed description of tests and procedure of measurement and estimation.

realized with two or three repetitions – two or three item tests, except the tests for estimation of repetitive and static strength that are realized with one repetition, therefore they were not considered in calculation for tests characteristics. These tests were used as one item tests because of certain functional and physical characteristics of 6 – years old children in a sense of unpreparedness for intensive and long-lasting strains (Gallahue, 1987), weak motivation and defocus from the goal and achievement (Rajtmajer, 1997) as well as findings for children disability for repeat maximal muscle activity. Considering the main goal – determination of metric characteristic, the number of repetitions is small but yet acceptable considering the age, functional capacities and development characteristics of examiners. These number of two and three repetitions is recommended by authors that previously realized researches with the same age groups of examiners (Bala 1999, Pisot & Planinsec, 2005; Popeska, 2009; 2011)

Methric characteristics: discriminativity, reliability, validity and representativity were estimated for all composite motor tests. These tests characteristics were tested only for tests where activity is repeated two, three or more times or at so called composite tests. Discriminativity is calculated on bases of ratio between mean (x) and standard deviation (SD) (3:1). Crombah α и Spearman – Brown (SB) coefficients are used for estimation of reliability[1]. Validity of motor tests is calculated using Pearson‘s – coefficient of correlation (r), the value of characteristic roots, factor scores of projections of isolated factor and communalities using Hotelling procedures[2], while Kaiser-Meyer-Olkin‘s measure is used for estimation of reliability and representativity[3].

RESULTS AND DISCUSSION

Coefficients for discriminativity, reliability, validity and representativity for each test applied in the research are presented separately[4]. Because of limited number of pages, only one table for one test for coordination that has a best metric characteristics from all four tests applied for estimation of this

1 Coefficients larger than 0.80 are considered significant and points out on high reliability (Bukvič, 1982)

2 Internal validity, validity between items from same test is satisfy when values are higher or equal at 0.80

3 KMO – Kaiser-Meyer-Olkins –coefficients around **.**90 represent excellent reliability, around .80 very good reliability; around .70 good reliability; around .60 middle reliability; around .50 bad reliability and coefficients under .50 represent not satisfactory level of reliability.

4 The authors have all needed tables.

ability is presented as origin (Table 1). Other additional tables‘ contains only final results needed for result discussion.

Table 1. Two balls slalom rolling (KOSL2), validity, reliability and representativity

items	r and SMC			H 1	h²
KOSL2 1	(.90)			.98	.95
KOSL2 2	.94	(.93)		.98	.97
KOSL2 3	.92	.95	(.91)	.98	.96
Cronbach′s α	.98			Lambda	2,88
SB	.98			%	95,86
KMO	.78				

Co – ordination was estimated using following four tests: co – ordination with stick (KOPAL), Obstacle course backwards (KOPON), Two balls slalom rolling (KOSL2), Rolling with ball on floor (KOTRT). From four used tests, only one test co – ordination with stick (KOPAL) showed unsatisfied sensitivity. Other three tests have good sensitivity. According the values for skewness applied tests are easy for performance for examines and they achieved homogenous results positioned in the zone of lower values – good results.

Values for Cronbach α и SB coefficient of reliability (Table 2), from .91 up to .98 point out on *highly reliable tests*. Using Hotteling procedure at the results of three repetitions at all four tests for co – ordination, one characteristic root was isolated, that explains the variability of the system from 85.18% up to 95.86%. Highly explained variability points out that results from of three measures at all four tests for co – ordination do not differ significant which is confirmed with high and approximately same projections (from .90 to .98) at isolated factor. High coefficient for internal validity (from .90 to .98) are obtained for all tests for coordination. Highest coefficient .98 is obtained for the test two balls slalom rolling (KOSL2). Homogeneity is also confirmed with high values of communalities (from .83 to .93) and the high coefficients of correlations between three repetitions respectively high validity is obtained for all three measures. The tests co – ordination with stick (KOPAL) is least reliable, representative and valid, but yet satisfactory in the whole group of tests. According the values of KMO measure of (from .74 to .78) tests for co – ordination used in the research has good representativity. Result analysis point out that tests applied at 7 – years old children used for estimation of co – ordination

have satisfy test characteristics. Best characteristics are achieved for tests two balls slalom rolling (KOSL2), followed by the test Obstacle course backwards (KOPON) and they are recommended for further use with 7 years old children.

Table 2. Characteristics of tests used for estimation of co – ordination

test	discriminativity	reliability		validity				represenativity
	mean: SD	Cronbach's α	SB	H 1			%	KMO
				1	2	3		
KOPAL	-	.91	.91	.90	.94	.93	85.18%	.74
KOPON	+	.95	.95	.93	.97	.96	91,16%	.75
KOSL2	+	.98	.98	.98	.98	.98	95.86%	.78
KOTRT	+	.92	.92	.90	.95	.94	85.98%	.74

Speed of running. Following three tests: 10m running from flying start (BT10LS), running 4 x 10(BT4x10), Cries – cross running 4 x 5м (BTZMT) were used to estimate the running speed. According the proportion between mean and SD, the tests Cries – cross running 4 x 5м (BTZMT) has unsatisfied sensitivity, while other two tests have good sensitivity or they measure the differences in achievements between the examiners. Values for Cronbach α и SB coefficient of reliability from .91 to .99 (Table 3) suggest on high reliability of applied tests. All three tests have very good validity with one isolated factor of every of three applied tests. Lower values of KMO index (.50) point out on bad representativity of all three used tests. Best test characteristics are obtained for the test Cries – cross running 4 x 5м (BTZMT), followed by running 4 x 10(BT4x10) and lowest but yet satisfy characteristics are noted for the test 10m running from flying start (BT10LS). Therefore, because of the good metric characteristics all three tests are recommended for future use with 7 years old children. When short battery of tests is needed, as a tests with best metric characteristics we recommend the tests best test characteristics Cries – cross running 4 x 5м (BTZMT).

Table 3. Characteristics of tests used for estimation of speed of running

test	discriminativity	reliability		validity			represenativity
	mean: SD	Cronbach's α	SB	H 1		%	KMO
				1	2		
BT10LS	+	.90	.90	.96	.96	92.47%	.50
BT4x10	+	.91	.92	.96	.96	92.63%	.50.
BTZMT	-	.99	.99	.99	.99	98.83%	.50

Frequency of movement. Values obtained for tests applied for estimation of frequency of movement are presented in Table 4. Following three tests were used: Arm plate – tapping (BSTAR), One foot – tapping (BSTAN) and Both feet – tapping on wall (BSTNZ). According the results, all three are sensitive and 7– years old children achieved homogeneous results. Values of Cronbach α (.77) и SB (.78) coefficients for reliability obtained for the test one foot – tapping (BSTAN) are lower than required, so this test have unsatisfied reliability. Lower coefficient for reliability of this test is also obtained for the same group of examinneres, measured a year earlier, at the age of six years (Popeska & Jovanova – Mitkovska, 2014). Other two tests have good reliability. Representativity at the line of significance (.50) is obtained for of all three applied tests and it is also confirmed in previously mentioned research. All three tests have good validity and high projections of isolated factor for each tests. According the results, the both feet – tapping on wall (BSTNZ) has the best test characteristics, followed by the test Arm plate – tapping (BSTAR). Both tests are recommended as adequate for estimation of frequency of movement at 7 – year‘s old children.

Table 4. Characteristics of tests used for estimation of frequency of movement

test	discriminativity	reliability		validity			represenativity
	mean: SD	Cronbach‘s α	SB	H 1		%	KMO
				1	2		
BSTAR	+	.92	.92	.96	.96	92.70%	.50
BSTAN	+	.77	.78	.90	.90	81.66%	.50
BSTNZ	+	.93	.93	.97	.97	93.61%	.50

Explosive strength. Following four movement tasks are used for estimation of explosive strength in children: Standing broad jump (ESSDM), Throwing medicine ball 1 kg from standing position (ESFMST), Throwing medicine ball 1 kg from sitting position (ESFMG) и 20m dash running (ES20VS). All four tests are sensitive for differences of children‘s achievements. Except the tests 20m dash running (ES20VS), at other three tests better average achievements are obtained in second repetition of the tests. Values obtained for Cronbach α SB coefficients for reliability (Table 5) from .86 to .95 suggest of good reliability of the tests for explosive strength. Applied Hotteling procedure results with isolation of one significant root at each of applied tests and it

explains the variability from 87.70% to 95.32%. Highly explained variability points out that tests result in both measures in all four tests do not differ significant. This is confirmed with high projections (from .94 to .98) on isolated factors.Obtained results point out on valid tests for estimation of explosive strength. The KMO index is on the limit of significance (.50) in all four applied tests. According the results, best test characteristics are obtained for the test Standing broad jump (ESSDM) used for estimation of explosive strength on legs and the tests Throwing medicine ball 1 kg from standing position (ESFMST) used for estimation of explosive strength of the muscles extensors of the arms and shoulders. These two tests are recommended for further use with young children. Similar results are obtained in the research of Perič, 1991; Popeska&Jovanova – Mitkovska, 2014.

Table 5. Characteristics of tests used for estimation of explosive strength

test	discriminativity	reliability		validity			represenativity
	mean: SD	Cronbach's α	SB	H 1		%	KMO
				1	2		
ESSDM	+	.95	.95	.98	.98	95.32%	.50
ESFMST	+	.91	.91	.96	.96	92.32%	.50
ESFMG	+	.86	.86	.94	.94	87,86	.50
ES20VS	+	.88	.88	.95	.95	89.30%	.50

Flexibility. Three motor tests were used for estimation of flexibility: Deep bend on bench (FLDPK), both legs extension lying on bag (FLRLG), Legs extended forward bend on floor (FLPRP). All three tests were realized with three repetitions. According the results, applied tests for flexibility are sensitive and easy to perform by 7 years old children, except the test Legs extended forward bend on floor (FLPRP) which was hard for children to perform. In all tests, children achieved homogeneous results. Analysis of results presented in Table 6, suggests on highly reliable tests valued from .95 to .98. Internal validity is also very good, with one factor for each test. All tests have significant and high projections on isolated factor (from .94 to .98) which point out on high valid tests for flexibility. The values for KMO index are from .68 to .78, that suggest on good and very good representativity of applied tests. According the results, all three tests have good characteristics. Highest values for sensitivity,

reliability, validity and representativity are noticed for the test Legs extended forward bend on floor (FLPRP).

Table 6. Characteristics of tests used for estimation of flexibility

test	discriminativity	reliability		validity				represenativity
	mean: SD	Cronbach's α	SB	H 1				KMO
				1	2	3	%	
FLDPK	+	.95	.95	.94	.98	.94	90.79%	.68
FLRLG	+	.96	.97	.95	.98	.97	93.63%	.76
FLPRP	+	.98	.98	.97	.98	.98	95.67%	.78

Balance was estimated using following three tests: Walking on upturned Swedish bench (RAOSK), Standing on bench in width (RASKS) and Standing on bench in length (RASKD). All tests are used as two item tests, or with two repetition. Results point out of bad sensitivity of the tests Standing on bench in length (RASKD). A continuous improvement of children achievements is noted from the first to second performance of motor task. Result presented in Table 7 suggest on reliable tests, with high coefficients of reliability (from .89 to .95) and high validity of applied tests where isolated factor explains the variability of the system from .90.41 to 93.02. KMO index (.50), suggest on tests with bad representativity. According summarized results, best tests characteristics are obtained for the test Walking on upturned Swedish bench (RAOSK) which id recommended for further use with 7 years old children and it's classified as easier to perform compared with other two tests. Identical results are noted in research conducted by Perič, D (1991) who recommended this test as appropriate for use with children.

Table 7. Characteristics of tests used for estimation of balance

test	discriminativity	reliability		validity			represenativity
	mean: SD	Cronbach's α	SB	H 1		%	KMO
				1	2		
RAOSK	-	.93	.93	.96	.96	93.02%	.50
RASKS	+	.92	.92	.96	.96	92.53%	.50
RASKD	+	.89	.89	.95	.95	90.41%	.50

Preciseness. Six tests were used to estimate preciseness at 7 years old children, four of them used for estimation of preciseness with pitching and two tests used for estimation of preciseness with leading. Throwing circles on stick (PIOBS), Throwing tennis ball in vertical goal with arm (PITET), Throwing

ball in horizontal goal with arm (PITHC), Throwing ball in vertical goal with leg (PIVCN) are used for estimation of preciseness with pitching and other two tests: Leading with short stick (PVGKS) and Leading with short stick (PVGKD) are used for estimation of preciseness with leading.

All four tests for preciseness with pitching are not sensitive, or they don‘t differentiate the examiners according their achievements (low sensitivity) and are hart for performance by 7 years old children. Using factor analyses, there is one isolated factor at each applied tests that explains the variability of the system with values from .48.35% to.67.36. Values for Cronbach′s α coefficients from .46 to .76 are low and under the limit of significant, respectively results are highly conditioned by the influence of other unsystematic factors (concentration, problems with vision, emotional distraction etc. Values of KMO index (from .58 to .68) points out on average level of representativity of selected tests. The test

Bad characteristics of the tests for estimation of preciseness with pitching could be explained with children‘s age and the nature of preciseness. Precisely, the individual tempo of growth, vision problems for certain examiners and general farsightedness of children at the age between 5 and 7 years (Gallahue, 1987 Age group development) could explain the variability and larger aberrance of results for these motor tasks. Findings for causality of preciseness from coordination eye – hand and eye – foot (Gajič,1985), children emotional condition and touchiness additionally explained the notices condition with preciseness. Because of insufficient synchronization between certain body parts and smaller procession of information, six years old children have not yet established eye – hand coordination (Gallahue, 1987). Emotional condition has a great role in preciseness of performed movements. Children are emotional easy disturbing, especially in new and unknown situations (Gallahue, 1987) such as motor measurements. Therefore, emotional condition is a significant factor in variability of result in tests for preciseness. The test Throwing tennis ball in vertical goal with arm (PITET) have best metric characteristics and it‘s recommended for future e use with 7 years old children.

Table 8. Characteristics of tests used for estimation of preciseness with pitching

test	discriminativity	reliability		Validity				represenativity
	mean: SD	Cronbach's α	SB	H 1			%	KMO
				1	2	3		
PIOBS	-	.47	.46	.60	.74	.74	48.35%	.51
PITET	-	.76	.76	.83	.85	.79	67.36%	.68
PITHC	-	.62	.62	.72	.74	.78	56,79%	.63
PIVCN	-	.70	.71	.75	.79	.83	62.95%	.66

Precisenes with leading was estimated using two tests: Leading with short stick (PVGKS) and Leading with short stick (PVGKD). Both tests are sensitive or discrimines the examiners by their abilities and are easy for performance by 7 years old children. Results for tests characteristic are presented in Table 9. Values for validity are satisfied, while coefficients for reliability (.62 and .74) is below the limited value which means unreliable tests. Values of KMO measure for representativity .68 and .70 suggest on good representativity of used tests. According obtained results, the test leading with long stick (PVGDS) is recommended for further use with 7- year old children.

Table 9. Characteristics of tests used for estimation of preciseness with leading

test	discriminativity	reliability		validity				represenativity
	7 год	Cronbach's α	SB	H 1			%	KMO
				1	2	3		
PVGKS	+	.75	.76	.85	.84	.77	67.27%	.68
PVGDS	+	.80	.80	.80	.86	.86	71/03%	.70

CONCLUSION

General conclusion is that applied tests are noted as tests with satisfy test characteristics for the sample of 7 – years old children. High reliability and validity obtained in number of used tests is also confirmed in researches with similar aim conducted by Perič, 1991; Rajtmajer, 1997; Bala, 1999; Popeska, 2009, 2011. Suggested tests could be used in other similar researches with 7 years old children. Certain notifications of authors that investigated characteristics of motor tests applied with young children correspond with notifications and results obtained in this research. In this since, the authors Ikeda & Aoyagi (2007) established that less reliable tests are more valid, which is confirmed in our research. Reliability on the margin or below the limit of significance could be explained with children's motivation and their properness for total activation

and participation I task‘s (Jürimae & Jürimae, 2001), emotional instability (Gallahue, 1987), defocus from the goal, understanding the testing process as game which is one of the major practical problems when applying motor tests and researches with children (Rajmajer, 1997). Knowing that children could not focus their attention on a same activity for a long time, certain actions such as motivation, demonstration and previous attempts of the movements, actions that are not acceptable in work with older subjects, could be justified and recommended in work with children (Bala, 1999; Jürimae & Jürimae, 2001). From these reasons, in these types of researches there is a need of studying of children‘s emotional and psychological development and there influence of motor abilities.

From the total number of 33 movement tasks used for estimation of nine motor abilities, according the values for validity, sensitivity, reliability and representativity, a short battery of motor tests was created and it is adequate for further application in researches and in education work with 6 years old children. Following tests with good test characteristics are recommended as a short battery for motor testing: Two balls slalom rolling (KOSL2), Cries – cross running 4 x 5м (BTZMT), Both feet – tapping on wall (BSTNZ), Standing broad jump (ESSDM) used for estimation of explosive strength on legs and the tests Throwing medicine ball 1 kg from standing position (ESFMST) used for estimation of explosive strength of the muscles extensors of the arms and shoulders; Legs extended forward bend on floor; Walking on upturned Swedish bench (RAOSK); Throwing tennis ball in vertical goal with arm (PITET) for preciseness with pitching and the test leading with long stick (PVGDS) recommended for future e use with 7 years old children.

The main idea for presenting this paper was to suggested battery of test in order to facilitate the work of teachers and sports pedagogics in a since of estimation, evaluation and following of children‘s motor achievements. This is especially important knowing the tendency of structuring physical education programs in three segments (1) movement skills, (2) development of motor abilities and (3) socio – emotional development (Klinčarov & Popeska, 2011). Therefore, findings and suggestions from this research have a practical application in the segment of development of motor abilities and possibility for their precise measurement.

REFERENCES

1. *Age group development program for mens & womens artistic gymnastics*, Phase three, Federation Internationale De Gymnastique, FIG.
2. Bala, G. (1999a) Some problems and suggestions in measuring motor behaviour of pre – school children. *Kinesiologija Slovenica*, 5 (1–2), 5–10.
3. Bala, G. (2001) Dependence of the motor dimension definition on the mode of result registration procedure of motor test performance, *Kinesiologija Slovenika* 7(1–2), 5–12.
4. Bala, G., Stojanović, V. M. i Stojanović, M. (2007a) Merenje i definisanje motoričkih sposobnosti dece. Novi Sad: Fakultet sporta i fizičkog vaspitanja.
5. Bala, G. & Katič, R. (2009b) Hypotetical model in testing integrated development of preschool children. *Collegium Antropologicum*. 33, (2), 353–362.
6. Ikeda, T. & Aoyagi, O. (2008) Relationships between test characteristics and movement patterns, physical fitness, and measurement characteristics: suggestions for developing new test items for 2–6- year – old children. Human performance Measurement, Vol. 5, 9–22.
7. Jürimäe, T. & Jürimäe,, J. (2001) *Growth, physical activity and motor development in prepubertal children*. New York: CRC Press.
8. Kurelic, N., Momirovic, K., Stojanovic, M., Sturm J., Radoevic, H. i Viskic – Stalec, N. (1975) Struktura i razvoj morfolockih i motorickih dimenzija omladine, Beograd: Institut za naucna istrazivanja Fakulteta za fizicko vaspitanje.
9. Klincarov, I. & Popeska, B. (2011) Model for physical education content standards at early stages of primary education in the Republic of Macedonia, In Proceedings book of the 6th FIEP-EUROPE Congress „Physical Education in the 21st cenutry – pupils competence“ (250–256). Poreč: Croatian Kinesiology Federation.
10. Perić, D. (1991). *Komparativna analiza metodoloških sistema eksplikacije biomotoričkog statusa dece predškolskog uzrasta.* Doktorska disertacija, Beograd: Fakultet fizičke kulture Univerziteta u Beogradu.

11. Popeska, B. (2009). Numeric and structural differences in motor tests for evaluation at same motor abilities implemented to the children at 6 and 7 years age. *Научна конференция на Русенския Университет, Научни трудове, Физическое восспитание и спорт*, Том 48, серия 8.2. 121–125.
12. Попеска, Б. (2009). Утврдување на валидноста на некои тестови за проценка на статичката силина кај деца на 6 и 7 годишна возраст. *Наука и спорт, списание за научни и стручни прашања од физичката култура и врвниот спорт*, год. 1. бр.1. 107–110.
13. Попеска, Б (2011) Развој на морфолошките и моторичките димензии кај деца одмашки пол на 6 и 7 годишна возраст, Докторска дисертација. Скопје: Факултет за физичка култура.
14. Popeska, B., & Jovanova – Mitkovska, S. (2014). Draft battery of tests for evaluation of motor abilities in 6 years old children. *Research in Kinesiology* 4 (1), 15–21.
15. Rajtmjer, D. & Proje, S. (1990) Analiza zanesljivosti in faktorska struktura kompozitnih testov za spremljanje in vrednotenje motorićnega razvoja predškolskih otrok. *Šport*. 38, (1–2), 48–51.
16. Rajtmajer, D. (1997) Dijagnostićno – prognostićna vloga norm nekaterih motoričnih sposobnosti pri malšjih otrocih, Maribor: Pedagoška fakulteta.
17. Zurc, J., Pišot, R. & Strojnik, V. (2005). Gender differences in motor performance in 6.5 – year – old children. *Kinesiologija Slovenica*, 11, (1), 90–104.

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