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CONGRUATION OF MOTOR STRUCTURES WITH BOYS AT THE AGE OF 6 AND 7 YEARS

Biljana Popeska, Orce Mitevski, Georgi Georgiev
"Goce Delchev" University in Stip, Macedonia
Ss. Cyril and Methodius University in Skopje, Macedonia
biljana.popeska@ugd.edu.mk; ogimnastika@yahoo.com; ggeorgiev2005@yahoo.com

КОНГРУЕНЦИЯ НА МОТОРНИТЕ СТРУКТУРИ ПРИ МОМЧЕТА НА 6 И 7 ГОДИНИ

Abstract: *The aim of this study is to compare the factorial structures and changes in the latent motor space at 6 and 7 years old male children. The study was realized as a transversal research, using 33 motor tests. Using factor analysis separately for both age groups, 12 latent motor dimensions were isolated and defined in the motor space at 6 years old children. The motor space for 7 years old children was covered by 11 latent motor dimensions. Calculating the coefficient of congruention, a different structure to the isolated factors in the researched motor space was obtained. Because of these differences there is a need of different program contents at physical education classes in the researched period.*

Key words: *motor abilities, children, motor space, factor analysis, coefficient of congruation, motor development.*

1. Introduction

In different age periods changes occurs in all subspaces from the anthropologic status of every individual. Certain changes occur more intensively and in shorter period of time, while others happen during longer time period. According the knowledge's from relevant researches for the structure and changes that occurs in the motor space, it can be concluded that they are influenced by many internal and external factors. External factors such as regular physical activity, social environment and others, cause changes at the level of motor abilities, while internal factors causes quantitative and qualitative changes in the structure of the motor abilities. Knowing the fact that certain motor abilities exist in particular age periods, as well as changes and differences that occurs in the motor space, has practical use in planning and realization of the physical education teaching process in schools and in the leisure time. This knowledge's has also a great role in giving directions and suggestions for pupils how to be physically active, and to participate in a certain sport activity according its individual abilities.

2. Entities Samples and Work Methods

With aim to determine the identity of the factorial structures in the latent motor space at 6- and 7-years-old male children, we conducted this research at total number of 200 entities, 100 six-years-old children and 100 seven-years-old children. All children included in the study were in good health and without any obvious physical or mental deficiencies.

The sample of variables used to assess motor abilities consisted of 33 motor tests recommended by Metikoš et all (1989), Dukovski (1984), Perić (1991), Bala (1999). Proposed test were applied for estimation of following 10 latent motor dimensions: coordination, speed, frequency of movement, explosive strength, repetitive strength, static strength, flexibility, balance, preciseness with pitching and preciseness with leading. For every segment from the motor space, minimum three tests were used. All of the tests used to assess coordination, flexibility and preciseness with pitching and leading were performed three times. The tests assessing speed, frequency of movement, explosive strength and balance were performed twice and only the best results were taken for analysis. The tests assessing static and repetitive strength were performed only once. These tests were used previously used on a sample of entities 6- and 7-years-old children and shown satisfactory metric characteristics. Results obtained from the measurement of motor test were processed using basic statistical parameters. The structure of motor space is determined using factor analysis, separately for both age groups. The coefficient of congruention is used to determine identity and differences of isolated factors in both samples.

3. Results and discussion

The latent structure of the motor space is determined using factor analysis separately for both age groups. The latent structure of the motor space for six-years-old children is defined by 12 motor factors named as: f1 – fast, explosive and coordinated movements with arms, legs and trunk; f2 – preciseness with leading; f3 – explosive strength; f4 – balance; f5 – flexibility; f6 – preciseness with pitching from sitting position; f7 – legs explosive strength; f8 – frequency of movement; f9 – undefined factor; f10 – preciseness with pitching from standing position; f11 – running speed; f12 – strength of the muscles flexors of trunk and shoulder. Eleven motor factors define the latent stricter of motor space at seven-years-old children. This factors are named as: f1 – flexibility; f2 – running speed; f3 – coordinated speed; f4 – explosive strength; f5 – preciseness with leading; f6 – preciseness with pitching; f7 – coordinated speed strength; f8 – undefined factor; f9 – strength of arms and legs muscles; f10 – balance and f11 – repetitive strength for trunk and arms. Results could be found at authors.

3.1. Comparative analysis of obtained factorial structures of motor space at 6- and 7-years-old children.

Analyzing coefficients of congruention (Table 1) obtained among isolated motor factors at six and seven years children, it could be concluded that there is no significant coefficients of congruention. Coefficients of congruention higher than 0.80 are consider significant. Obtained coefficients valued from .70 to 80 show existence of certain similarities between isolated factors. The analysis of these coefficients could give some additional information's for latent motor structure for 6- and 7-years-old children.

Table 1. *Coeficients of congruention obtained from isolated and defined motor factors with oblimin rotation - matrixs of structure for 6 and 7 years old children*

	O2 1	O2 2	O2 3	O2 4	O2 5	O2 6	O2 7	O2 8	O2 9	O2 10	O2 11
O1 1	-.03	-.68	.16	.38	.21	-.34	**-.73**	-.19	**.79**	.44	.51
O1 2	-.17	.11	-.31	.08	.53	-.04	.10	.21	.26	-.04	.13
O1 3	.16	-.33	-.19	**.75**	.27	-.27	-.51	-.04	.08	.38	-.37
O1 4	.09	-.23	-.02	.30	.28	-.31	-.40	-.30	.37	.70	-.46
O1 5	.40	.15	.22	-.02	-.08	-.03	.17	.13	-.24	-.07	-.10
O1 6	-.06	.13	.23	.16	.05	-.10	.11	-.26	-.41	.12	-.17
O1 7	-.14	.58	.05	-.27	-.28	.37	.40	-.15	-.32	-.33	.47
O1 8	-.06	-.55	-.58	.48	.37	-.16	-.58	.10	.38	.37	-.27
O1 9	-.11	.49	-.02	-.12	-.11	.37	.30	.39	-.12	-.24	.16
O1 10	-.19	-.53	.04	.47	.15	-.70	-.56	.19	.34	.34	.28
O1 11	.10	-.48	.04	.25	.18	-.17	-.62	.06	.05	.39	.62
O1 12	-.02	-.54	.03	.43	.28	-.17	-.53	.02	.31	.47	-.57

Symbols: O1 1 - oblimin rotation, first grade, first isolated factor
O2 1 – oblimin rotation, second grade, first isolated factor

1. The highest coefficient of congruention (79) between isolated factors is obtain among the first factor at six – years- old children (O1 1) and the ninth factor for seven-years-old children (02 9) (Table 1).

The first isolated factor for six-years-old children is named as fast, explosive and coordinated movements with arms, legs and trunk, based on a significant projections of tasks applied to assess coordination (2 tests), running speed (2 tests), explosive strength of legs (2 tests), repetitive strength of arms and shoulders (3 tests) and balance (1 test). The ninth factor for seven-years-old children is defined as strength of arms and legs muscles, based on significant projections of motor variables used to assess strength of arms and shoulder (2 variables) as well as variables that assess explosive strength of legs (jump from place, fast running) and preciseness – balls pitching in vertical goal.

Following tests - pulling with arms on bench, long distance jump from place, arm hang and running 4x10m, have a significant influence in determination on both factors (O1 1 and O2 9). There significant and different influence on both factors mostly explains the similarity between the first factor for six-years-old children and the ninth factor for seven-years-old children. Other four factors (2 for assessment of coordination and 2 for strength) take part in defining and explication of the first defined factor for six-year-old children and are responsible for different structures of mentioned factors. Differences among isolated factors also occur in their partial influence in explanation of the variability of the total system.

The main contribution in explanation of the total variability in the motor space for six-years-old children have tests used to assess coordination and strength, while for seven-years-old children they explain only 3.81% of variability of the system. It could be concluded that similarity between these two factors occurs as a result of variables used to assess strength, while differences are influenced by variables for coordination and other tests for strength that defines the structure of first factor isolated at 6-years-old children.

2. Lower coefficient of congruention (75) ids obtained between the third factor isolated at 6-years-old children (O1 3) defined as explosive strength and the fourth factor isolated at 7-years-old children (O2 4) also named as explosive strength.

These two factors are defined based on a significant influence of three tests used to assess explosive strength, while differences occurs as a result of significant influence of other tests on these two factors, and resulted with lower value of coefficient of congruention.

3. The lowest coefficient of congruention (73) is obtained between first isolated factor at 6-years-old children (O1 1) named as fast, explosive and coordinated movements with arms, legs and trunk and the seven isolated factor for 7-years-old children (O2 7) named as coordinated speed strength. Significant projections of these two factors have variables that assess coordination (2 tests), running speed, explosive strength (2 tests) and balance. Projections of these tests points out on certain similarities in the structure of these two factors. While significant influence on other motor tests results with differences in the latent structure of these differently named and defined factors.

Using factor analysis, different number of factors that defines there latent motor structures, are isolated in the motor space at six and seven years old children. From the total number of isolated factors, for both age groups, eight factors are equally defined and named according the number and projections on the motor tests and their influence on certain motor abilities and muscle groups responsible for realization of the movements.

Analyzing the coefficients of congruention, isolated and defined factors are not identical. Insignificant and lower coefficients of congruention points out the differences in motor structures at six and seven years old children. Different number of factors with different structures that exist in the motor space at six and seven years old children, particularly differentiation of some motor abilities and disappearing of others points out to the specific changes that occurs in children's motor space. These changes are also influenced by development characteristics, influence of the genetic factor, internal relations and reactions between certain segments of children's anthropologic status, changes that occurs in morphologic and motor space in different age period, structure of movement tasks used in the study, as well as numerous internal and external influences during realization of the tests.

Difference that occurs the structure of the motor space, points out the need of realization of different movement tasks with different quality. Seven-years-old children have achieved significantly better test results in most of the tasks, while in certain number of tests results that were achieved are very similar. This point out the idea of similar motor structure manifested with different quality according the age period and the level of development. This should be confirmed by a longitudinal study conducted on a same sample of entities.

Results obtained with this study corresponds with Thompson's (according to Bala 1981: 197), idea for existing of general motor ability in age period from 6 to 10 years old, where elementary motor abilities are still potentials that later in the development process starts to differentiate and to exist as a specific motor abilities with similar or different structure in different age periods.

Result confirms the idea for motor concept which is based on the development order and not on chronologic age (Herlohova 1970 / according to Perić 1991: 24-26/; Piaget 1960; Smiljanić–Toličić 1983). According to Perić (1991), Herlohova analyzes the process of motor development and presents it according the topologic criteria (motor development of head, arms, trunk, legs) and concludes that five- years-old children already have well developed motor movement and their locomotor system have reached the level when it could realize all fundamental movements.

4. Conclusion

1. In the motor space at six-years-old exists twelve latent motor dimensions, while eleven latent motor dimensions are isolated in the motor space of seven-year-old children.
2. From isolated latent dimension for both age periods, eight dimensions are same defined and named with the same name.
3. Coefficients of congruention obtained among isolated and defined dimensions at six and seven-years-old children are low and insignificant. These coefficients points out on different latent structure in motor space between children from both age groups.
4. The structure of the motor space at six- and seven-years-old children, obtained in our research, points out that motor development is developing globally, not well differenced.

5. Some abilities show tendencies of integration in specific, complex motor abilities. They are defined by topologic orientation of the muscles included in movement and position of the body during the movement realization.

6. Obtained results confirm the idea of motor development based on " development order", not development by chronologic age.

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