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Sex Differences in Anthropometric Characteristics, Motor and Cognitive Functioning in Preschool Children at the Time of School Enrolment

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A B S T R A C T

The study included a sample of 333 preschool children (162 male and 171 female) at the time of school enrolment. Study subjects were recruited from the population of children in kindergartens in the cities of Novi Sad, Sombor, Sremska Mitrovica and Bačka Palanka (Province of Voivodina, Serbia). Eight anthropometric variables, seven motor variables and one cognitive variable were analyzed to identify quantitative and qualitative sex differences in anthropometric characteristics, motor and cognitive functioning. Study results showed statistically significant sex differences in anthropometric characteristics and motor abilities in favor of male children, whereas no such difference was recorded in cognitive functioning. Sex differences found in morphological and motor spaces contributed to structuring proper general factors according to space and sex. Somewhat stronger structures were observed in male children. The cognitive aspect of functioning yielded better correlation with motor functioning in female than in male children. Motor functioning correlated better with morphological growth and development in male children, whereas cognitive functioning was relatively independent. These results are not fully in accordance with the current concept of general conditions in preschool children, nor they fully confirm the theory of integral development of children, hence they should be re-examined in future studies. Although these study results cannot be applied to sports practice in general, since we believe that it is too early for preschool children to take up sports and sport competitions, they are relevant for pointing to the need of developing general motor ability and motor behavior in preschool children.

Key words: *sex differences, preschool children, anthropologic dimensions*

Introduction

The final year of preschool education is a preparation for regular schooling, for both children and their parents. During this period, children should be prepared for enrolment in first grade, in terms of their biological and motor abilities, and intellectual faculties. They must be prepared for a slightly different and more difficult daily schedule and activities to adapt to the new environment where they will fight for their status among their peers, accept and fulfill certain obligations and rules of conduct, control certain forms of their own behavior, and especially, they should be able to learn.

This paper is based on the theory of integrated development of children (Ismail and Gruber, 1967)[1], which stresses the fact that children's functioning has a general character, i.e. that the child takes part in all activities with his/her entire being. Based on a number of studies, Ismail and Gruber (1967)[1] developed the theory of integrated development, according to which there is a correlation between morphological characteristics, motor, cognitive and conative abilities of a person. Namely, brain spaces engaged in motor tasks and learning are closely interrelated[2–7]. Regular physical activity activates these spaces and refreshes the central nervous system. In addition, learning complex motor structures activates the pre-frontal cortex, which is also active during problem-solving processes, which has a favorable effect on subse-

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quent learning. Generally, motor activities should represent a necessary means of the education process that affects the complete bio-psycho-social status of children, especially in the period of growth and development in preschool age. Regular physical activity has a number of favorable effects on the complete development of children; hence motor activity itself, which determines the structure of motor space and the relation of motor space with other abilities and capacities of a person, represents a very significant segment in the research of development processes.

Since the present study included male and female children, it was necessary to determine quantitative and qualitative sex differences in terms of morphological characteristics, and motor and cognitive abilities, in order to obtain proper definition of the concept of preschool children and to select adequate sample/samples of young subjects. Some studies report on similarities (Bala, 2002)[8], whereas others emphasize differences in these characteristics and abilities of preschool children (Strel and Sturm, 1981[9]; Rajtmajer and Proje, 1990[10]; Videmšek and Cemić, 1991[11]; Planinšec, 1995[12]; Rajtmajer, 1997[13]). Bala (2003)[14] analyzed three anthropometric measures and seven motor tests in a sample of 367 children (223 male and 144 female) aged 4–7 years. Upon stratification of the motor test variables according to children's age and body composition variables, the results obtained pointed to the existence of »motor potential capacity« in which quantitative differences showed male children to achieve significantly better results in motor tests measuring explosive strength and functional coordination of primary motor abilities, whereas female children performed better in flexibility tests.

Previous studies have generally confirmed the existence of a significant positive correlation between motor and cognitive abilities. They have also demonstrated this correlation to increase with more complex motor tasks and decrease with age (Eggert and Schuck, 1978[15]; Planinšec, 1995[12]). Research in youth, while rarely in small children, has indicated a correlation of complex motor tasks and intelligence. However, there are reports that establish relations between intelligence and speed of simple movements, balance, flexibility, and explosive strength (Mejovšek, 1979[16]; Momirović and Horga, 1982[17]; Planinšec, 1995[12]; Planinšec, 2001[18]).

Relatively few studies have dealt with the issue of correlation between motor abilities and intelligence in male *versus* female children. In one of the few study reports on this issue, Planinšec (2001)[18] states that despite subtle differences, preschool boys and girls are characterized by an almost identical correlation between motor abilities and intelligence. This correlation is somewhat higher in boys, but the structure of this correlation is almost identical.

The principal aim of this study was to determine sex differences and relations between cognitive and motor functioning in children of different sexes prior to regular schooling, focusing on the effect produced by their anthropometric characteristics.

Materials and Methods

Subjects

A sample of 333 preschool children (162 boys, mean age 6.92±0.28 yrs; and 171 girls, mean age 6.92±0.27 yrs) were tested at the time of enrolment in school. Study subjects were recruited from the population of children in kindergartens in the cities of Novi Sad, Sombor, Sremska Mitrovica, and Bačka Palanka (Province of Vojvodina, Serbia).

Measures and tests

Children's age is presented in decimal years, i.e. the period between the date of birth and the date of measuring and testing, and transformed into the corresponding result according to the International Biological Program (Lohman et al. 1988)[19].

Anthropometric measures

Anthropometric measures were also evaluated by the International Biological Program (Lohman et al. 1988)[19], using the following variables:

– assessment of skeleton dimensionality:
1) body height (mm),
– assessment of voluminosity and subcutaneous adipose tissue:
2) body weight (0.1 kg),
3) chest girth (mm),
4) midarm girth (relaxed arm girth) (mm),
5) forearm girth (mm),
6) abdominal skinfold (0.1 mm),
7) subscapular skinfold (0.1 mm), and
8) triceps skinfold (0.1 mm).

Motor tests

A battery of seven motor tests used in this study were selected based on the experience with adults and modified for children (Bala, 1999[20] and 1999[21]; Bala et al., 2009[22]). In adults, these tests estimate the effectiveness of the following functional mechanisms: movement structuring, tonus and synergic regulation, regulation of excitation intensity and duration (Gredelj et al., 1975)[23]. The following tests were used:

1) obstacle course backwards (to estimate functional coordination of primary motor abilities),
2) arm plate tapping (to estimate the frequency of simple movements),
3) forward bend (from straddle sitting position) (to estimate flexibility),
4) standing broad jump (to estimate explosive power, but also functional coordination of primary motor abilities),
5) crossed-arm sit-ups (to estimate muscular endurance of the trunk),
6) bent-arm hang (to estimate static strength of arms), and
7) 20-m dash (to estimate the velocity of dash, but also functional coordination of primary motor abilities).

Cognitive test

Cognitive functioning was evaluated by Raven's colored progressive matrices (Raven, J. C., n.d., 1956 revision)[24]. In a previous study including a sample of 2 334 children from the Province of Voivodina aged 3.5–11, the basic metric characteristics were determined according to the classic test theory (CTT) and item response theory (IRT). Dimensionality testing revealed the test to have one main object of measurement, and test reliability exceeded 0.85 in the 6–11 age group (Fajgelj, Bala and Tubić, 2007)[25].

Procedures

All study children were tested at the time of school enrolment in the same academic year. The parents were asked to sign the informed consent form for their children's participation in the study and to provide necessary information on their children. Cognitive functioning was tested by psychologists, whereas anthropometric measurements and motor abilities were assessed by senior and master students of the Faculty of Sports and Physical Education in Novi Sad. All measurements were taken under standard conditions, on standard equipment, and under the author's supervision.

Data analysis

The significance of sex differences at the time of school enrolment was determined by multivariate (MANOVA) and univariate (ANOVA) analyses, as well as by canonical discriminant analysis. Statistical significance was set at $p<0.05$. Correlations among study variables (anthropometric characteristics, motor and cognitive abilities) were analyzed in separate for boys and girls by factor analysis, with promax rotation of significant principal components of the correlation matrix. Scree-test was used as a criterion of significant number of factors. All statistical analyses were carried out by the SPSS, version 15.0 statistical package.

Results

Quantitative sex differences were recorded in the sample of variables. The sample of variables as a while proved statistically significant on determination of sex differences ($F=13.73$, $p=0.00$), whereas analysis of individual variables showed male children to be significantly faster (as estimated by 20-m dash), with better whole-body coordination (obstacle course backwards and standing broad jump). They were also taller (body height), and had greater chest girth and forearm girth. Female children had significantly greater flexibility (forward bend) and higher subcutaneous fatty tissue content (abdominal skinfold and triceps skinfold) (Table 1).

Systematic difference in favor of male children was observed in motor variables except for forward bend and crossed-arm sit-ups. These differences may have been attributed to female body characteristics, especially flexibility of the spine, pelvis and leg muscles, as well as to better motivation and work discipline on performing crossed-arm sit-ups that are carried out until exhaustion but no longer than 60 seconds. Systematic difference in

TABLE 1
DESCRIPTIVE STATISTICS AND DIFFERENCES

Variable	Boys (n=162)		Girls (n=171)		f	p
	$\overline{X}$	SD	$\overline{X}$	SD		
1. Decimal years	6.92	0.28	6.92	0.27	0.01	0.93
2. 20-m dash (0.1 s)	47.34	4.88	50.58	6.41	26.72	0.00
3.Obstacle course backwards (0.1 s)	235.38	94.01	279.05	92.33	18.18	0.00
4. Arm plate tapping (freq.)	18.38	3.44	17.80	3.09	2.69	0.10
5. Forward bend (cm)	38.68	7.94	43.96	7.85	37.20	0.00
6. Standing broad jump (cm)	125.81	17.76	116.23	18.75	22.79	0.00
7. Bent-arm hang (0.1 s)	179.27	158.10	163.82	149.21	0.84	0.36
8. Crossed-arm sit-ups (freq.)	25.42	8.77	25.78	9.04	0.14	0.71
9. Body height (mm)	1260.93	54.83	1245.65	62.80	5.56	0.02
10. Body weight (0.5 kg)	267.08	62.78	256.43	56.51	2.65	0.10
11. Chest girth (mm)	606.29	55.95	583.47	56.39	13.72	0.00
12. Midarm girth (mm)	201.89	27.97	203.04	23.72	0.16	0.69
13. Forearm girth (mm)	192.04	18.39	186.05	16.28	9.93	0.00
14. Abdominal skinfold (0.1 mm)	79.69	56.17	91.77	55.77	3.87	0.05
15. Subscapular skinfold (0.1 mm)	70.56	39.93	75.80	35.80	1.59	0.21
16. Triceps skinfold (0.1)	96.52	42.46	105.74	38.80	4.29	0.04
17. Progressive matrices (point)	24.19	5.70	24.46	5.61	0.18	0.67
	F=13.73		p=0.00			

favor of male children was also observed in anthropometric characteristics in all variables except for those evaluating subcutaneous adipose tissue and upper arm girth, which could most likely be attributed to the tendency of subcutaneous adipose tissue deposition in female children.

Analysis of structural differences in discriminant factor (DF; Table 2) showed forward bend to have highest significance in defining general differences of the variables applied. Other significant variables in discrimination between male and female children were 20-m dash, standing broad jump, obstacle course backwards, chest girth and forearm girth. Interestingly, body height, midarm girth, abdominal skinfold and body weight made a considerably lower contribution in defining general differences between male and female children. Arm plate tapping and crossed-arm sit-ups had no major role, which also applied to the variable evaluating general cognitive functioning. It should be noted that control variable to define the subject's age appeared to have no effect on discrimination, pointing to chronologic homogeneity of male and female children.

Within the discriminant space defined in such a way, and according to the centroids of the subject groups (Table 2), the most significant differences in motor and anthropometric variables as the most important ones in the analyzed space belonged to male children (20-m dash, standing broad jump, obstacle course backwards, chest girth and forearm girth). However, as mentioned above, in terms of statistical significance, female children had better results for forward bend, which produced best discrimination of children according to sex in DF.

TABLE 2
SUMMARY OF CANONICAL DISCRIMINANT ANALYSIS

Variable	DF
Forward bend	0.402
20-m dash	0.328
Standing broad jump	–0.295
Obstacle course backwards	0.270
Chest girth	–0.234
Forearm girth	–0.207
Body height	–0.147
Midarm girth	0.124
Abdominal skinfold	0.120
Body weight	–0.105
Arm plate tapping	–0.095
Subscapular skinfold	0.073
Bent-arm hang	–0.054
Progressive matrices	0.036
Crossed-arm sit-ups	0.032
Triceps skinfold	0.020
Decimal years	–0.007
Canonical correlation	0.65
Wilks' Lambda	0.57
Chi-square	178.38
p	0.00
Group	Centroids
Boys	–0.888
Girls	0.841

Qualitative differences between male and female children in the sample of variables applied were determined by factor analysis (Tables 3 and 4). Rotation of the principal components of the correlation matrix of the variables to the promax (oblique) solution resulted in basic information on the value of significant characteristic eigenvalues and their corresponding explained variance (% of variance), structure of significant principal components (H), communalities for each variable (h^2), pattern (A) and structure (F) of the rotated significant factors, as well as coefficients of correlation between isolated factors (r).

It is easily observed that two significant factors were isolated in both sexes, i.e. general factor of biological growth and development, and general motor factor. The explained share of the total variance was higher in male than in female children (58% *vs*. 53%), and so was the significance of the variables in the explanation (h^2). At this age, the general morphological factor, i.e. growth and development, was better structured in male than in female children. The structure of the general motor factor was also slightly better defined in male children. Age (decimal years) provided better definition of the general motor factor than that of the general biological one, i.e. growth and development, in both male and female children.

General cognitive functioning of children, evaluated by Raven's progressive matrices, is interesting at this age. Namely, this variable had no significance at all in defining any factor in male children, whereas in female children it did play a significant role in defining the general motor factor, which is predominantly saturated by the variables evaluating coordination, fast and powerful motions and movements.

With such a structure of isolated factors, a statistically significant correlation between isolated factors was determined in male children, whereas in female children the two factors, although very similar to those in male children except for the share of cognitive variable, manifested as independent ones.

Discussion

Quantitative difference in the sample of variables between male and female children can be analyzed according to the pattern and structure of isolated factors. In male children, the morphological factor, which can be considered a general biological growth and development, was defined by exceptionally high parallel and orthogonal projections of all anthropometric variables on this factor. Somewhat lower projections were recorded for body height, indicating a lower progression of this characteristic in growth relative to other anthropometric characteristics at this age in boys.

TABLE 3
FACTOR ANALYSIS IN BOYS

Variable	H1	H2	h^2	A1	A2	F1	F2
Decimal years	0.16	0.43	0.21	0.28	0.43	0.19	0.37
20-m dash	0.31	–0.66	0.53	0.11	–0.70	0.25	–0.72
Obstacle course backwards	0.35	–0.59	0.46	0.17	–0.63	0.30	–0.66
Arm plate tapping	0.00	0.53	0.28	0.16	0.54	0.05	0.51
Forward bend	0.22	0.37	0.18	0.32	0.35	0.25	0.29
Standing broad jump	–0.32	0.78	0.70	–0.08	0.82	–0.25	0.84
Bent-arm hang	–0.45	0.42	0.37	–0.31	0.47	–0.41	0.54
Crossed-arm sit-ups	–0.08	0.61	0.37	0.10	0.62	–0.03	0.60
Body height	0.66	0.18	0.46	0.70	0.13	0.67	–0.01
Body weight	0.96	0.16	0.94	0.98	0.08	0.97	–0.12
Chest girth	0.93	0.18	0.90	0.97	0.10	0.95	–0.10
Midarm girth	0.93	0.13	0.87	0.95	0.05	0.94	–0.14
Forearm girth	0.94	0.16	0.91	0.97	0.07	0.95	–0.12
Abdominal skinfold	0.93	0.03	0.87	0.92	–0.06	0.93	–0.24
Subscapular skinfold	0.92	–0.01	0.85	0.90	–0.10	0.92	–0.28
Triceps skinfold	0.90	–0.02	0.80	0.87	–0.10	0.89	–0.28
Progressive matrices	0.14	0.26	0.09	0.22	0.25	0.16	0.21
Eigenvalue	7.11	2.74				r = –0.20	
% of Variance	41.86	16.13					

H – structure of significant principal components, h^2 – communalities for each variable, A – pattern, F – structure of the rotated significant factors, r – coefficients of correlation between isolated factors

The same pattern was observed in female children, but all loadings of anthropometric variables were lower as compared with male children. However, this variation did not produce significant differences between male and female children. The main sex difference was found in the boys being predominantly characterized by body weight and chest girth, forearm girth and upper arm girth, whereas the girls were characterized by subcutaneous fatty tissue. These results are consistent with those reported from studies in elementary school first-graders (Katić, 1996[26]; Katić et al., 1994[27] and 1996[28]; Vlahović et al., 2007[29]; Bavčević et al., 2008[30]). Hence, it can be concluded that body weight and girths were higher in boys due to muscle tissue (lean body mass), whereas in girls it was due to body fat. In addition, by comparing the explained parts of the first principal component, which was mostly defined by the high correlation of anthropometric variables, one can easily notice that a greater share of variance is explained in boys than in girls. This may point to the more convenient and more proportionate biological growth and development in male children, in this case manifested by body constitution, i.e. anthropometric characteristics.

In male children, the structure of the general motor factor was mostly defined by the variables estimating coordinated, fast movements and motions (standing broad jump, 20-m dash, obstacle course backwards, and arm plate tapping), as well as powerful trunk movements of repetitive nature until exhaustion (crossed-arm sit-ups), and static (isometric) strength of arms and shoulders (bent-arm hang). In female children, the general motor factor was similar to that in male children, but the role of variables evaluating the strength of the trunk, arms and shoulders in defining this factor was much lower. In female children, the most important characteristic of the general motor factor was that it encompassed significant cognitive functioning (progressive matrices), which was not the case in male children.

It should be noted that the share of the variable for evaluation of flexibility (forward bend) was barely satisfactory in both male and female children, although in the latter this variable was most significant in discrimination of the whole sample of the variables applied. This finding demonstrates that flexibility is not a major characteristic of the general motor ability in children, although it makes its constituent part.

In male children, the coefficient of correlation between the general morphological factor and general motor factor was statistically significant and negative (r; Table 3). This relation points to a tendency towards better motor abilities with lower and average morphological characteristics for this age. Consequently, taller children with higher circumference characteristics, mostly due to subcutaneous adipose tissue resulting in greater body weight, have lower motor abilities, as indicated by poor performance in the motor tests used. However, it should be noted that in male children cognitive functioning was not included in morphological and motor factors,

TABLE 4
FACTOR ANALYSIS IN GIRLS

Variable	H1	H2	h^2	A1	A2	F1	F2
Decimal years	0.08	0.38	0.14	0.11	0.37	0.09	0.37
20-m dash	0.19	–0.70	0.52	0.13	–0.71	0.16	–0.72
Obstacle course backwards	0.25	–0.66	0.50	0.19	–0.67	0.22	–0.68
Arm plate tapping	0.05	0.63	0.40	0.11	0.63	0.08	0.62
Forward bend	0.11	0.33	0.11	0.14	0.32	0.13	0.31
Standing broad jump	–0.34	0.75	0.67	–0.26	0.76	–0.30	0.78
Bent-arm hang	–0.44	0.16	0.21	–0.42	0.18	–0.43	0.20
Crossed-arm sit-ups	–0.06	0.59	0.34	0.00	0.59	–0.03	0.59
Body height	0.58	0.53	0.62	0.63	0.51	0.61	0.48
Body weight	0.84	0.21	0.74	0.86	0.17	0.85	0.13
Chest girth	0.80	0.09	0.64	0.80	0.05	0.80	0.01
Midarm girth	0.89	0.01	0.78	0.88	–0.03	0.89	–0.08
Forearm girth	0.85	0.14	0.74	0.86	0.10	0.85	0.06
Abdominal skinfold	0.91	–0.03	0.82	0.90	–0.07	0.90	–0.12
Subscapular skinfold	0.90	–0.08	0.82	0.89	–0.12	0.90	–0.17
Triceps skinfold	0.83	–0.04	0.69	0.82	–0.08	0.83	–0.12
Progressive matrices	0.03	0.47	0.22	0.07	0.47	0.05	0.46
Eigenvalue	5.94	3.09				r = –0.05	
% of variance	34.95	18.16					

H – structure of significant principal components, h^2 – communalities for each variable, A – pattern, F – structure of the rotated significant factors, r – coefficients of correlation between isolated factors

i.e. that at this age, it is relatively independent of biological and motor development.

In female children, cognitive functioning was included in motor development and motor behavior, defined as the general motor factor, which is in this case independent of the general morphological factor (r; Table 4). In female children, the correlation was also negative; hence, the statements given for male children apply to female children as well. However, this relation was not statistically significant in the latter at this age.

Based on the results obtained in the present study and current experience with preschool children, it has been assumed that motor development and motor behavior in this age group are of general character. Such a comprehension of the motor behavior of preschool children is in accordance with Luria's studies (1976)[31], which point out that the second and third zones of the brain cortex have not yet been functionally formed in this age group. For this reason, specific functioning of the central nervous system is not evident in preschool children, and it has to work integrally.

Our results support the theory of integrated development of children (Ismail and Gruber, 1967)[1], stressing that the functioning of children is of a general character, i.e. that a child takes part in all activities with his/her entire being. According to this theory, the development of motor abilities and intellectual capacities, emotional development and social development of a child are very closely related. Integral development consists of relations between motor and cognitive abilities, and morphological characteristics of children, although not completely in this case, in either male or female children. The results of this study in preschool age group point to higher correlation between the motor and cognitive functioning in girls. It seems that the brain spaces involved in motor tasks and learning (kinetic and analytic centers) are interrelated in female than in male children at this age.

Relations among the anthropologic space subsegments are very complex and can only be explained by thorough knowledge of the biologic developmental functions, which follow different patterns according to sex in particular age group for each individual variable of the morphological, motor and cognitive spaces. In particular stages of development, the processes of differentiation and integration occur alternately both within and among morphological, motor and cognitive spaces, which differ according to sex (Katić, 2003[32]; Katić et al., 2004[33]; Katić et al., 2004[34]; Katić et al., 2005[35]). Results of the present study showed the processes of integration of motor and cognitive abilities to occur at a faster and higher rate in 7-year-old girls than in age-matched boys. This finding is consistent with the studies performed in elementary school first-graders, demonstrating the process of aerobic endurance[34] and coordination[35] integration into the morphological-motor system to occur earlier in female than in male children, with earlier formation of the factor of general motor efficiency defined by the force and speed regulators and coordination in the former[32,33]. Indeed, in the present study, the factor of general motor efficiency based on the force, speed and coordination integration was better defined in female children, indicating the integration processes involving these basic motor abilities to be more pronounced in female children at this age. Force regulation was related to simultaneous (parallel) information processing, as on performing motor tests, i.e. standing broad jump and obstacle course backwards, whereas speed was related to serial information processing, as on arm plate tapping and 1-min crossed-arm sit-ups (Katić et al., 2004)[33]. Each movement integrates force and speed, while a superior mechanism regulates the force to speed relations for the movement to be efficient. This superior mechanism is responsible for solving not only motor but also cognitive problems[33].

Horvat (1986)[36] states that approximately 50% of intelligence is developed until the age of 4, the next 30% until 8, and the remaining 20% until 17 years of age, when the highest level of intellectual capacities is reached. This means that intellectual development at preschool age is a significant period in the total development process of this ability. However, although such general evaluations can be found, the relationship of this development relative to age or sex has not yet been fully elucidated.

According to Horn (1991)[37], the growth of the myelin sheath of nerve fibers and the corresponding maturation of the central nervous system produce increased possibilities of intellectual development. When intellectual maturity is reached, this support slows down until completely stopped. Certain loss of neurologic structure occurs at each stage of the central nervous system development, however, maturation and fast learning in early development often makes reduced increments in childhood, and even later in the 20s it is virtually unnoticeable. When the process of maturation slows down and eventually stops, and when learning of many basic skills reaches its peak, the effects of accumulated neurologic losses become more prominent.

Like other development spaces, cognitive development is not independent, but is related to motor development and development of social observation. Kagan (Kagan, 1971; as *per* Planinšec, 2001[18]) says that the development of cognitive abilities in children is indispensable for the development of motor potentials, which is explained by the fact that the level of development of cognitive abilities attained is favorable for the adoption of motion structures. On the other hand, cognitive abilities are related to motor functioning of children in such a way that motor activities significantly activate cognitive processes. Thus, motor activities and other challenges of this nature are highly significant for children, especially at the age of 7.

It is known that regular physical activity activates these spaces, refreshing the central nervous system. In addition, it is believed that learning complex motor structures activates the prefrontal cortex, which is also active in problem-solving tasks, resulting in positive effects on subsequent learning. Motor activities in general are an unavoidable means of the education process, especially in the period of growth and development, which affects the complete bio-psycho-social status of children. Regular physical activity has a series of favorable effects on the overall development of children, hence motor activity itself. Determining the structure of the motor space and its relations to other personality traits is an extremely significant segment in the research of developmental processes.

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SPOLNE RAZLIKE U ANTROPOMETRIJSKIM KARAKTERISTIKAMA, MOTORIČKOM I KOGNITIVNOM FUNKCIONIRANJU PREDŠKOLSKE DJECE PRIJE POLASKA U ŠKOLU

S A Ž E T A K

Ovo istraživanje je obuhvatilo 333 predškolske djece (162 dječaka i 171 djevojčica) u vrijeme polaska u školu. Uzorak djece izabran je iz populacije djece u dječjim vrtićima u gradovima Novi Sad, Sombor, Sremska Mitrovica i Bačka Palanka u Vojvodini, Srbija. Skup od 8 antropometrijskih, 7 motoričkih i jedne kognitivne varijable analizirao se kako bi se dobili podaci o kvantitativnim i kvalitativnim spolnim razlikama u antropometrijskim karakteristikama, motoričkim sposobnostima i kognitivnom funkcioniranju. Na osnovi rezultata istraživanja može se zaključiti da su utvrđene statistički značajne razlike u antropometrijskim karakteristikama i motoričkim sposobnostima u korist dječaka, ali nije zabilježena značajna razlika u kognitivnom funkcioniranju. Utvrđene spolne razlike u morfološkom i motoričkom prostoru doprinose strukturiranju odgovarajućih generalnih faktora po prostorima i spolu. Uočene su pregnantnije strukture kod dječaka. Kognitivni aspekt funkcioniranja više korelira s motoričkim funkcioniranjem kod djevojčica negoli kod dječaka. Motoričko funkcioniranje dječaka više korelira s morfološkim rastom i razvojem, a kognitivno funkcioniranje je relativno nezavisno. Dobiveni nalazi nisu sasvim u skladu sa shvaćanjima o generalnom stanju predškolske djece niti u potpunosti potvrđuju teoriju o integralnom razvoju djece, pa ih je neophodno provjeriti u budućim istraživanjima.