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Motor abilities of preschool children

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Abstract. *The research was conducted with the aim of performing an analysis of previous research related to the motor space of preschool children, and based on them to draw certain conclusions about gender differences related to motor skills. An empirical method of work was used for the quality realization of the research. Based on a review of research by domestic and foreign authors, it can be concluded that motor skills develop in general - the existence of a general motor factor. Cognitive and conative development, according to most authors, proceeds smoothly in accordance with biological and chronological age and under the direct influence of socio-economic conditions of the environment. It is possible to change the motor abilities of children under the influence of different training loads and work programs of different time duration.*

Key words: *performance, review, ability, boys, girls*



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Introduction

In the last few decades, the lifestyle of children and adults has changed drastically. Increasing physical activity and a sedentary lifestyle cause major health problems that manifest at an earlier age. Most activities in a child's life require motor skills (Vučinić, 2001), which is why early childhood is an ideal time to create healthy living habits. The integrative development of the complete anthropological status of children is one of the fundamental imperatives in the entire field of sports and physical education. Achieving this goal is possible only with extensive knowledge of internal relations and the degree of conditionality of a number of specific dimensions of human bio-psycho-social status. Only on the basis of such generated and scientifically proven knowledge it is possible to plan and program the contents of the work that will qualitatively enable the fulfillment of the authentic needs of each individual, as a priority goal of action (Pelemiš, 2012). A preschool child should move most of the day because it is his basic need that is necessary for growth and development, while at the same time movement is a source of fun and pleasure for the child. Also, in order for a child to develop motor skills, it is necessary to take into account his physical condition and the environment that surrounds him. It is necessary to develop abilities in the field of coarse and fine motor skills that will help him cope with daily activities. Children who have more developed motor skills will be more successfully involved in various games with peers, climb, catch balls, run and jump, ride a bike. However, a child with less developed motor skills eventually withdraws from a group of peers and stops socializing¹⁵.

According to Tomac²¹, an important role in promoting physical activity of preschool children are preschool institutions that, after the parental environment, create and represent an environment for child development, and they represent the basic condition for growth and development of preschool children. In the presented papers that investigated motor abilities and their differences between boys and girls of preschool age, a statistically significant difference with respect to gender was obtained as a result^{17,7,1,2,8,11,18,12,25,24}. The aim of the research is to determine motor skills between boys and girls of preschool age. This research will determine the motor skills between boys and girls of preschool age.

Research method

Database search

To collect relevant literature that is adequate for research of this type, the following databases were searched: Google Scholar, Web of Science and PubMed.

The databases were searched using the following keywords in Serbian and English: performance, review, ability, boys, girls.

The initial search identified papers that correspond to the research problem. After identifying the works, their screening was performed. Those works that do not meet the inclusion

criteria are excluded. The remaining papers that met certain criteria in order to achieve the benefit were analyzed by the descriptive method and the method of theoretical analysis and were included in the qualitative synthesis.

Research tasks

Based on the defined goal of the research, the following tasks were set:

- Define database search keywords;
- Provide adequate literature relevant to the research objective;
- Make a selection of searched literature;
- Translate foreign literature into Serbian;
- References of complete downloaded works were reviewed in order to possibly find some more suitable works;
- Analyze, interpret and discuss research results;
- To determine the influence of motor abilities of preschool children

Criteria for inclusion and exclusion of works

The selection of works was performed on the basis of certain criteria for inclusion and exclusion of works.

According to the inclusion criteria, all studies had to study the motor abilities of preschool children.

Exclusion criteria were: professional papers, inadequate sample (primary school children) and lack of relevant data in the paper.

Based on the set criteria, 155 papers were identified. The number of studies that were immediately excluded on the basis of titles and duplicate papers was ($n = 52$), while ($n = 50$) papers were included in further analysis. Further analysis ($n = 50$) of papers excluded ($n = 35$) papers based on several criteria: abstract, because it was a systematic review of research, as well as the lack of adequate information needed for research. The remaining 11 papers met the defined criteria and were included in the systematic review.

Each research is presented using the following parameters: research (first author and year of publication of the paper), research goal, sample of respondents [number of respondents (N), age (A) and gender (M and F)], treatment and research results.

Research results

In this review study, 11 papers were studied that studied the motor abilities of preschool children.

Of all the works analyzed, only the study of Hraski et al., (2010) did not prove that there are differences in motor abilities between boys and girls of preschool age.

A number of authors tested explosive strength and flexibility in their study, concluding that preschool boys have developed explosive power compared to girls^{17,12,22,25,20} who deviate significantly more in flexibility tests compared to boys.

(Priveli et al.,^{17,2,25} tested coordination in their study, and the test results showed that preschool boys perform better on the coordination test in relation to girls.

The largest sample of respondents (N = 1171) was in the study of Bala¹ and the study of Priveli¹⁷ who conducted a study on a sample of 136 preschoolers. The smallest sample of 30 respondents was in the studies²⁵.

Table 1. Review of research from children's motor space

Ref.	The aim of the research	Sample of respondents	Treatment	Results
Priviteli et al., (2007)	The aim of this study was to determine the impact of playing sports on changing the motor skills of preschool children.	N = 136 F = 61 M = 75 A = 4-6	MSDM - long jump, MPBPO - side jumps over the rope, MPKL - forward bend on the bench, MPUL - crawling with the ball, MTPS - running with a change of direction, MSPK - standing with one foot across the square	Boys score better on explosive strength and coordination tests, and girls on repetitive strength, flexibility, and balance tests.
Bala, (2009)	The aim of this research is to point out not only the quantitative values of anthropometric characteristics and manifestations of children's motor abilities, but also to analyze the trend of their relations, which should indicate the possible regularity during the growth and development of preschool boys and girls.	N = 1,170 M = 565 F = 605 A = 4 - 7.5	<ul style="list-style-type: none"> - Running 20m with a high start - Back polygon - Taping with your hand - Leaning forward in a sitting position - Jump away from the place - Endurance in the joint - Lifting the hull 	The boys had significantly better coordination (assessed by tests of the polygon backwards, jumping away from the place and running 20m), in all analyzed age periods. Girls have more pronounced repetitive power at a younger age, and boys at an older age. The girls were statistically significantly better in the manifestation of flexibility, during all analyzed ages.
Hraste et al., (2009)	The aim of this research is to determine the difference in some anthropological characteristics between boys and girls of preschool age.	N = 81 M = 45 F = 36 A = 6	MSDM - jumping out of place, MPBPO - side jumps over the rope, MPKL - forward bend on the bench, MPUL - crawling with the ball, MTPS - running with a change of direction, MSPK - standing with one foot across the square	Between boys and girls of preschool age age 6 years there are no statistically significant differences in terms of explosive power, repetitive power, flexibility, coordination and balance.



Horvat et al., (2010)	The aim of the research is to determine the difference between the sexes in motor abilities in older preschool children after conducting a one-year physical exercise program.	N = 59 M = 45 F = 36 A = 4-5	<ul style="list-style-type: none"> - Running 20m with a high start - Back polygon - Taping with your hand - Leaning forward in a sitting position - Jump away from the place - Endurance in the joint - Lifting the hull 	In the initial measurement, the boys achieved significantly better results in tests to assess explosive power, and girls in tests to assess flexibility and balance. The results of the final measurement showed progress in all motor tests of both sexes. The boys again achieved significantly better results in explosive power, and the girls in balance. After a one-year physical exercise program, the boys improved their ability to coordinate agility while the girls' abilities improved their coordination, agility and frequency of movement.
Jertec, (2011)	The aim of this study was to gain insight into the ability to balance preschool children and to examine the existence of differences with respect to gender	N = 50 M = 25 F = 25 A = 6-7	Standing with one foot on the floor and the other raised off the floor with your knee pointing straight forward with your eyes open.	There was a statistically significant difference between boys and girls in the ability to balance, with a predominance of girls.
Pavlovic, (2013)	The subject of this research is the connection with the relations of skin folds and motor abilities of preschool children in both sexes, and the aim of the research was to indicate the significance of this correlation.	N = 150 M = 74 F = 76 A = 4-6	Standing with one foot on the floor and the other raised off the floor with your knee pointing straight forward with your eyes open.	There is a significant correlation between skin folds and joint endurance in boys, while in girls a correlation was found between the skin folds of the back polygon.
Matrjan et al. , (2015)	The aim is to determine the changes and the impact of the sports program "Playing to Sports" on the motor abilities of children who attended the same program, as well as the impact of different sexes on the results in measuring a certain ability.	N = 135 M = 80 F = 55 A = 3-6	Walking on all fours around the stand, eight with bending, sun jumps in the hoop and running of 10m, walking on one leg in a narrow space,	Girls performed significantly better in the Flexibility Assessment Test (MPKL), in the initial and final measurements, while boys in the same test made significantly greater progress compared to the initial measurement. In the Explosive Power Assessment (MSDM) test, boys performed better in the final measurement than girls.
Jakovljevic, (2016)	The aim of the research is to show the current state of different types of strength in the younger group of preschool children	N = 58 A = 3-4	Running at 5m, throwing balls and sunk side jumps	The girls showed a statistically significant difference in running at 5m, while in the remaining two variables no significant difference based on gender was confirmed.
Veric, (2016)	The aim of this research was to determine the current state of different types of strength children of older preschool age.	N = 61 M = 28 F = 33 A = 5-7	<ul style="list-style-type: none"> - Explosive power: long jump (MSD), high jump (MSB), sprint 10m (T10), repetitive power: foot side rope skipping 15 seconds (SBP) and torso lift 30 seconds (MPT) 	Boys achieve significantly better results in explosive power tests such as horizontal jumping and sprinting compared to girls

Zekic et al., (2016)	The main goal of this research is to determine the differences in the dimensionality of morphological characteristics and motor abilities of children aged 4 to 7 years.	N = 30 M = 20 F = 10 A = 4-7	Leaning forward (MPR), long jump (MSDM), standing on a lying square - transverse (MSPK), side jumping (MBPO), crawling with a ball (MPUL) and running with a change of direction (MTPS).	Boys scored better than girls in the variables for estimating explosive power (jumping away from a place), variables for estimating repetitive power (foot side jumps), variables for assessing agility (running with a change of direction) and variables for estimating coordination (creeping with a ball)). An equivalent result was achieved in the variable for estimating balance (standing on a lying square - transversely). The girls achieved the expectedly better result in the flexibility assessment variable (predilection). A significant difference is visible in the variable for estimating explosive power (jumping away from a place), as well as the variable for estimating coordination (creeping with a ball).
Šuško et al., (2019)	The aim of this research was to determine the differences in motor abilities and anthropological characteristics in children, in order to formulate the most rational procedure for planning kinesiological content.	N = 60 M = 28 F = 32 A = 4-6	Cube transfer (CT), reverse (VALK), long jump (JUMP), (STOMACH 15) and the mechanism of functional synergy and control of muscle tone - front flexor.	Boys performed better in the tests (CT, JUMB, STOMACH15, Spatial Polygon 1 and 2), while girls performed better in the flexibility test (BEND).

Discussion

In the basis of the existence and development of man, the great importance of physical movement and movement is noticed. This is especially important in the period of growth and development of the child, which includes preschool age. During the preschool period, the development of motor skills contributes to the general quality of the child's functioning. It is a known fact about the need of children to move.

Verić²² in her study investigated the explosive and repetitive power of older preschool children ranging from the fifth to the seventh year of life. The sample of dependent variables included five motor tests. Significant differences in motor space were confirmed in the explosive power of the horizontal jump and sprint type, while the same were not observed in the repetitive power and the explosive power of the vertical jump type. It is also evident that boys achieve quantitatively better results in all motor tests. A similar study was conducted by⁷ on the basis of which the obtained results showed that there are no significant differences in terms of explosive and repetitive power and flexibility, coordination and balance.

De Pivittello¹⁷ conducted a study to determine the impact of sports on changes in motor skills in children aged 4 to 6 years. The obtained results proved the positive effect of training effect on motor skills. A more significant difference was achieved in the repetitive strength test while the subjects made the least progress in the mobility test. By identifying differences by gender, it was observed that boys were significantly better than girls in explosive strength and coordination tests, and girls in repetitive strength, mobility, and balance tests.

Horvat⁷ in their study aimed to determine the gender difference in motor skills in older preschool children after conducting a one-year exercise program. In the initial measurement, boys performed significantly better in tests to assess explosive power, and girls in tests to assess flexibility and balance. The results of the final measurement showed progress in all motor tests of both sexes. The boys again achieved significantly better results in explosive power, and the girls in balance. After a one-year physical exercise program, the boys improved their coordination and agility skills while the girls' abilities improved their coordination, agility and movement frequency.

Matrljan¹² conducted a study to determine the relationship between motor tests and gender of respondents and changes and the impact of sports program on motor skills of preschool children. The obtained results show that significant progress has been made in the final measurement with respect to the initial measurement. Observing the sex differences, a significant difference is noticeable in the bench press test in which the girls achieved better results in both measurements. The boys, in contrast to the girls, achieved much better results in the final long jump test. Multivariate analysis of variance showed a bench press-to-half ratio between the test subjects, which means that both girls and boys performed better in the final measurement, with boys making more significant progress.

Zekić²⁵ in their research aimed to determine the difference in the dimensionality of morphological characteristics and motor abilities of children aged 4 to 7 years. The results of the study showed that boys are taller and heavier than girls. boys performed better in tests to assess motor skills which is most noticeable in the variables for assessing explosive power and coordination. The girls scored better in the flexibility assessment variable while there was no difference in the balance assessment variable. Also, the results show that the height and weight of children grow in harmony with the age of the children, and progress in the motor space is also noticed.

Jertec⁸ in a study on a sample of 50 subjects of both sexes aged 6 years and 3 months, using a t-test, found the existence of a statistically significant difference between boys and girls in the ability to balance with the dominance of girls. The result obtained in this way is consistent with most of the previous works that dealt with the study of motor abilities of preschool children. Based on the presented results, it is recommended that balance exercises and activities in which it is dominant be started as early as possible in order to influence the better development of this ability. This is especially important for boys who, compared to pre-school girls, show poorer results in their ability to balance, and they need to be offered and exposed to activities that significantly require the ability to balance in their performance.

Bala¹ in his research came to the conclusion that quantitative improvement of motor abilities is manifested in each analyzed age of boys and girls. This improvement was also accompanied by different variability in all variables. This is especially noticeable in the variables for assessing coordination and strength (static and repetitive). In general, it can be concluded that the boys had significantly better coordination (assessed by the tests Polygon backwards, Long jump from the place and Running 20 m) in practically all analyzed age periods. Girls were statistically significantly better in the manifestation of flexibility during all analyzed ages.

Pavlovic¹⁸ in their study on a sample of 150 children of preschool age from 4 to 6 years, applied 7 tests to assess motor skills. The subject of this research is the connection with the relations of skin folds and motor abilities of preschool children in both sexes, while the aim of the research was to indicate the significance of this correlation. Using Pearson's correlation, it was found that there is a statistically significant correlation between skin folds and joint endurance, then skin folds and back polygons in boys, while in girls a correlation was found between skin folds and joint endurance, however, the relationship between skin folds and polygons backwards does not exist to a significant extent.

Jakovljevic¹¹ in her research came to the results according to which there is a significant difference between boys and girls in the variables for assessing body height and body weight and in the test of running 5 meters, in favor of girls. It is possible that the girls in this group are somewhat more advanced in terms of physical characteristics of height and weight and the explosive power of the sprint type. In the other two variables for the assessment of explosive and repetitive strength, no significant differences were found according to gender in this group of study participants, ie there was no complete dimorphism in the force of ejection and repetitive leg strength.

Šuško²⁰ in their study came to the result that boys deviate in all tests compared to girls who had better results in the flexibility test.

Unlike all the previously mentioned research by⁷ in their research obtained results that do not show significant differences in terms of explosive and repetitive power and flexibility, coordination and balance. On average, boys are taller and heavier than girls and show slightly better results in the explosive power test of the horizontal jump and balance type, while girls in other motor tests achieved better results on average.

Conclusion

The aim of the research was to show the differences in motor abilities between boys and girls of preschool age by critical analysis of previous research and generalization of the results of all analyzed research that studied the motor abilities of preschool children.

By searching electronic databases: Medline, PubMed and Google Scholar, 11 papers that met the conditions for inclusion were identified, so their results were critically analyzed and discussed in this research, in order to draw general conclusions about the motor abilities of preschool children.

Based on the results of all analyzed works, a general conclusion was defined which shows statistically significant differences in motor abilities of girls and boys of preschool age.



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