

PHYSICAL DEVELOPMENT AND PHYSICAL FITNESS OF 8-YEAR-OLD STUDENTS

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ABSTRACT

Human physical development is a complex and intricate concept that can be viewed as a dynamically changing state from the moment of birth till death. The purpose of this study was to determine the level of physical development and physical fitness of 8-year-old students and to apply a comparative analysis along the factor gender. The study sample consisted of 95 primary school students (44 boys and 51 girls) in the city of Varna. The applied methods were a review study of specialized literature and sports-pedagogical testing along 18 indicators that carry information about the children's physical development and some motor qualities. Mathematical-statistical data were processed by means of variation and comparative analyses, which gave us grounds to assert that the differences obtained from all indicators that carry information about physical development and physical fitness, the advantage was in favor of the boys. For three of the characteristics, the differences were statistically significant.

Keywords: *physical development, primary education, students, girls and boys, mini basketball*

INTRODUCTION

The younger generation's physical development and physical abilities are closely linked to health status, health improvement, and increased vitality. Forming habits for regular physical exercises and sports is an investment of long-term social, health, and economic effects (Borukova & Mavrudiev, 2020). The entry of modern technology into all spheres of our lives resulted in minimal physical activity. National statistical studies carried out in recent years have shown that 80% of the children in the Republic of Bulgaria suffer from overweight and obesity, flat feet, spinal curvatures, etc., in childhood and adolescence. Over time, this physiological imbalance leads to cardiovascular diseases, mental disorders, damage to the musculoskeletal system, and much more.

Human physical development is a complex and intricate concept that can be viewed

as a dynamically changing condition from the moment of birth until a person's death. Its determination is mainly done with the help of longitudinal observations. The main morphological traits that determine the physical development of a human being are three: height, weight, and chest circumference (Slunchev et al., 1998).

Significant and dynamic changes occur in the stages of human physical development during the child-adolescent period.

The person's motor abilities are manifested in the form of certain motor activities of different complexity. They are part of the household, labor, sports, and other activities that a person performs. In the physical culture and sports, these activities are more purposeful and are united in compound complexes of physical exercises (Rachev, 1991).

In the modern stage of our country's development, physical education's strategic

goal is to improve health and mental and physical fitness through regular physical exercises for all ages (Marinov, 2020).

In the process of training in physical education and sports, emphasis should be placed on the importance of physical fitness for the health status of the young generation and on providing stimulation for students' active participation in physical education and sports lessons and boys' involvement in regular extracurricular activities in physical exercises and sports (Borukova & Peikov, 2020). The effectiveness of the study process in physical education and sports largely depends on the methods in use, the means, and the active participation of the students (Simeonova, 2020).

Many active and competitive ball games are used in primary PE lessons. For 6-12-year-old children, exercises should be introduced as a game so that they can have fun, think creatively, and find the best solutions on their own (Petkova & Alexieva, 2015).

METHODOLOGY

The purpose of this study was to establish the level of physical development and physical fitness of 8-year-old students and make a comparative analysis along the factor gender. This study was conducted in May 2021.

The subject of the study was the physical development and physical fitness of 8-year-old primary school students (second grade).

The object of the study was to identify the main characteristics of physical development and physical fitness of 8-year-old boys and girls.

Ninety-five students aged 8 (44 boys and 51 girls) from 2nd grade were studied.

For the needs of the study, the participants were tested along 18 indicators (Table 1),

which are objective criteria for determining the level of physical development and some motor qualities. Indicators from 1 to 7 provided basic information about the level of physical development.

We studied the sample of primary educational level students in second grade. In addition to the compulsory physical education and sports classes, they had an additional module - mini-basketball. They had that class once a week. For the purposes of this study, sport-pedagogical testing with a battery (Table 1) of 11 indicators (indicators from 8th to 18th) by M. Alexieva (2009) was conducted with the students during a single class. The children of this age group are trained to play cooperatively by dribbling, passing, shooting, and defending. The sport pedagogue should provide them with all these actions in a common mode of play so that they could gather experience of the diverse game situations characteristic of the basketball game (Alexieva, 2012). The anonymity of the children was guaranteed. Each of them was listed under a different number known to the researcher only. All of them participated voluntarily in the study and received no money or financial compensation for their participation. None of the participants declined his/her participation in the study, except those who were injured or not feeling well. The researchers had the consent of the children's parents for the tests.

Mathematical-statistical results of the test were subject to processing by analysis of variance, method of indices, and comparative analysis by Student's t-criterion for independent samples (Gigova, 2002) with the critical value of the t-criterion ($t = 1.98$), at high statistical reliability ($Pt \geq 95\%$).

Table 1. *List of Indicators*

№	Indicators	Measuring units	Accuracy of measurement	Direction of increase
1.	Height	cm	1.00	+
2.	Weight	kg	0.5	
3.	BMI	kg/m ²	0.01	
4.	Chest tour- pause	cm	1.00	+
5.	Chest girth difference	cm	1.00	+
6.	Horizontal stretch	cm	1.00	+
7.	Vertical stretch	cm	1.00	+
8.	Long jump	cm	1.0	+
9.	Vertical jump 1 foot	cm	1.0	+
10.	Vertical jump 2 feet	cm	1.0	+
11.	Running 10m	s	0.01	-
12.	Throwing a solid ball	cm	1.0	+
13.	Lean forward	cm	1.0	+
14.	Goal pass	N.	1	+
15.	Running between stances	s	0.01	-
16.	Dribbling between stand	s	0.01	-
17.	Crunches	N	1	+
18.	Ball Handling Index	s	0.01	-

RESULTS AND DISCUSSION

The variation analysis revealed the average level and variability of our sample's characteristics of physical development and

capability. The results of the variational processing of the source data of all studied characteristics are presented in Table 2.

Table 2. *Means and variances of the studied indicators*

№	Indicators	N	R	Min	Max	Mean	S	As	Ex	V
1.	Height	95	0.27	1.200	1.470	1.3560	0.064	-0.202	-0.728	4.72
2.	Weight	95	33.00	23.00	56.00	33.989	6.764	1.184	1.636	19.90
3.	BMI	95	27.43	0.00	27.43	18.113	3.450	-0.73	8.032	19.04
4.	Chest tour- pause	95	38.00	54.00	92.00	66.180	6.387	1.152	3.279	9.65
5.	Chest girth difference	95	11.00	1.00	12.00	5.484	1.895	0.786	1.187	34.56
6.	Horizontal stretch	95	36.00	119.00	155.00	136.547	7.339	0.027	-0.302	5.38
7.	Vertical stretch	95	41.00	148.00	189.00	172.389	7.979	-0.236	-0.009	4.63
8.	Long jump	95	70.00	100.00	170.00	138.158	16.980	-0.016	-0.560	12.29
9.	Vertical jump 1 foot	95	20.00	8.00	28.00	17.726	4.714	0.246	-0.761	26.59
10.	Vertical jump 2 feet	95	23.00	4.00	27.00	13.032	4.990	0.395	-0.303	38.29
11.	Running 10m	95	1.71	2.01	3.72	2.734	0.374	0.179	-0.603	13.67
12.	Throwing a solid ball	95	400.00	250.00	650.00	393.684	74.492	1.014	1.003	18.92
13.	Lean forward	95	109.00	6.00	115.00	96.979	15.117	-4.544	5.538	15.59
14.	Goal pass	95	27.00	10.00	37.00	23.126	4.990	-0.014	-0.064	21.58
15.	Running between stances	95	4.85	11.01	6.16	8.134	0.991	0.587	0.085	12.18
16.	Dribbling between stands	95	20.21	29.07	8.86	16.761	4.361	0.461	-0.475	26.02
17.	Crunches	95	42.00	8.00	50.00	28.474	7.753	0.136	0.306	27.23
18.	Ball Handling Index	95	19.27	20.47	1.20	8.562	4.470	0.628	-0.361	52.21

The analysis of Table 2 shows that the average height of 8-year-old children was 1.35m, the shortest child was 1.20 m tall, and the tallest was 1.47 m. In terms of weight, children had an average weight of 33.99kg. According to the average value of body mass index of 18.11kg/m², children were within the norms for the age group subject of the study. It was interesting to note that as for the chest circumference – pause indicator, which gives information about the degree of chest development, the average value was 66.18 cm. The indicator that provides us with information about the functional capacity of the chest - “Chest circumference - difference” was of very good values - 5.48 cm. Interestingly, there was a child with a value of 1 cm and a child of 12 cm, which was quite a big difference for children at the age of 8. In the case of the indicator “Horizontal Stretch”, an average value of 136.54 cm was established, which was slightly above the average height; this was normal and was very good for the children of this age group as they were in a period of rapid growth.

The analysis of Table 2 reveals that the average achievement in the case of the indicator “Long Jump” that the students registered was 138.16 cm. In the case of single-leg hops (17.726 cm) and two-leg jumps (13.032 cm), there were differences in the average values. Still, we considered it normal as in a one-leg vertical jump, a step and arms swing are performed, which makes it easier for the children, while in the case of a standing vertical jump, good coordination, more power of the lower limbs, and the abdominal musculature are involved, and that is achieved at a higher

stage of the physical development. For the indicator “Throwing a solid ball - forward” the average value was 393.684 cm, and we had a student who achieved 650.00 cm and one who reached 250.00 cm. Significant differences in R were also observed in the indicators for which agility was required. These were “Two-handed chest-to-wall pass” and “Dribble between stands”. No special skills were required in the performance of these tests except for accuracy and coordination of the movements.

In the case of the studied 95 children, the distribution of the values was normal for most of the characteristics, but there were some cases where the situation was different from normal. That referred to the indicators related to weight, flexibility, and the upper limbs’ explosive strength, in which cases the values of As and Ex were ≥ 1.00 . We considered this normal because the sample size was big $n \geq 30$, and the study group included boys and girls, which was a prerequisite for an asymmetric distribution of the values along some indicators. This was confirmed by the values of the coefficient of variation “V”, whose values for all the indicators in both groups were above 12% and up to 30%, and that, according to sports statistics, indicated that our study group was relatively homogeneous regarding these characteristics.

For the purposes of the study and in order to more accurately ascertain the level of physical development and certain motor qualities, we divided the group along the factor gender.

A comparative analysis of physical development characteristics is presented in Figure 1.

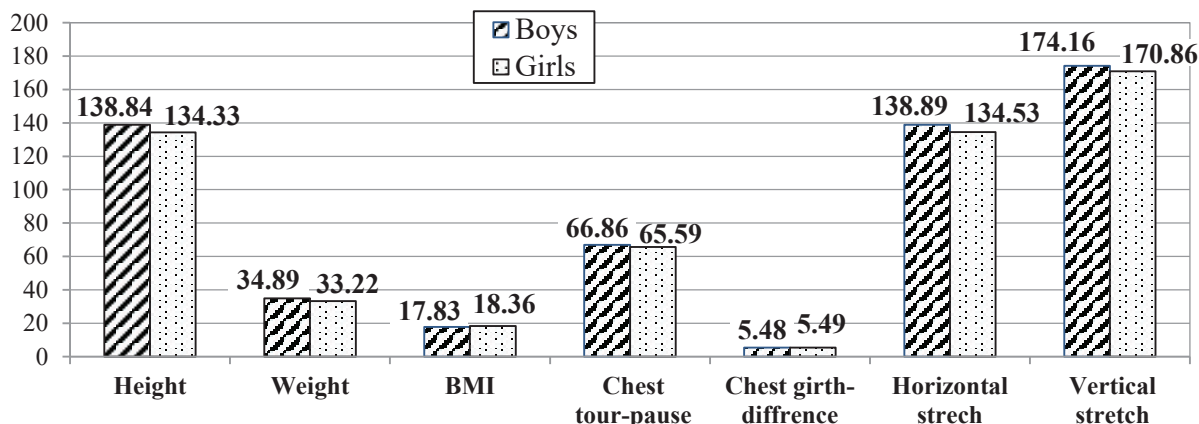


Figure 1. Comparative analysis of the average values of physical development characteristics along the factor gender

In the process of analyzing Figure 1, it was established that the boys surpassed the girls in all five characteristics except BMI and ‘Chest circumference - difference’, where the difference was 1 mm. This indicated that

in terms of body lengths, the boys of this age group were in a period of more significant growth in height compared to the girls.

Figure 2 presents a comparative analysis of the characteristics of physical capability.

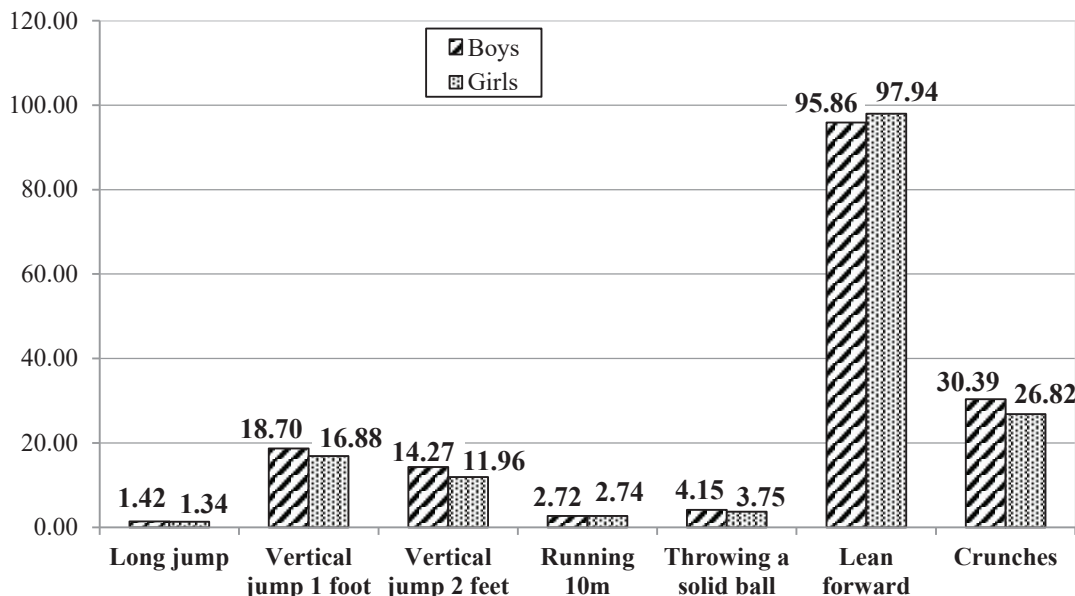


Figure 2. Comparative analysis of the average values of the characteristics of physical capability along the factor gender

The analysis of Figure 2 reveals that the boys of this age surpassed the girls regarding all characteristics of the strength of lower and upper limbs, abdominal musculature, and speed qualities. In contrast, the girls surpassed them only regarding flexibility.

Figure 3 presents a comparative analysis of

the characteristics that provided information about the children’s agility, coordination, attention concentration, and accuracy.

The analysis of Figure 3 shows that the advantage was in favor of the boys regarding these characteristics too. They were more accurate and executed more wall passes than the

girls; they ran faster and oriented themselves while running between stands with and with-

out a ball. Accordingly, the index of leading was better among them.

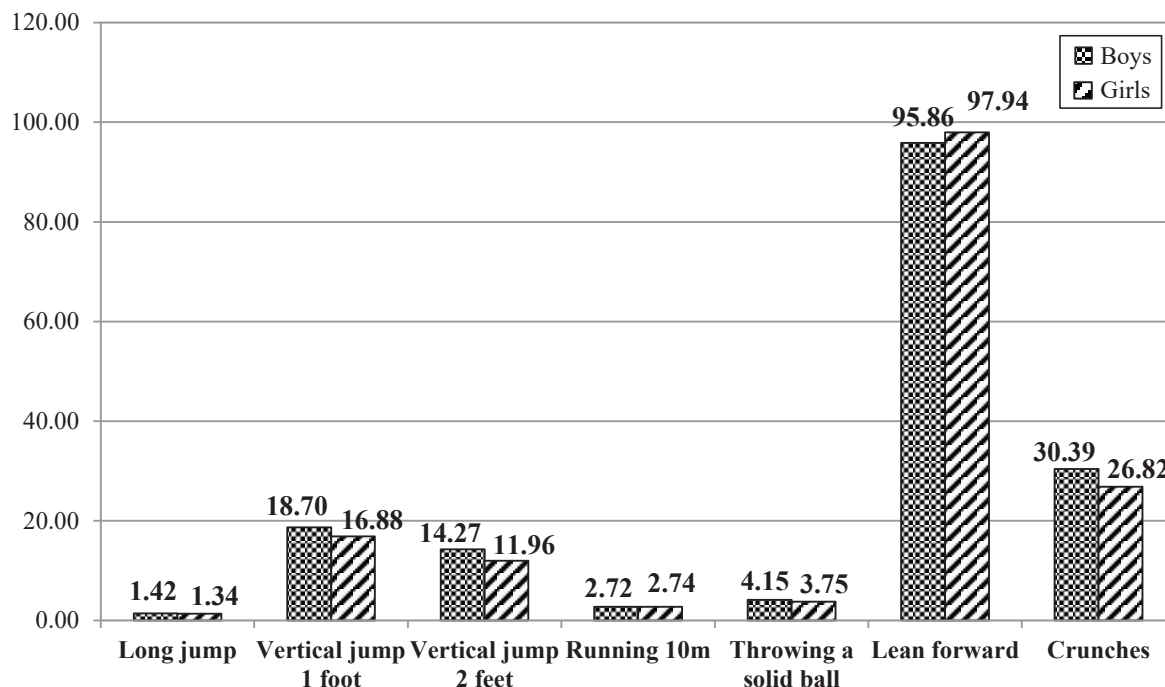


Figure 3. Comparative analysis of the average values of coordination, agility, and concentration of attention characteristics along the factor gender

However, the availability of certain differences between the average values of the single characteristics of the population under study did not allow us to draw serious conclusions before checking the reliability of these differences. The variation analysis, already applied for the groups (boys and girls), showed that the values had a normal distribution. Therefore, a comparative Student’s t-criterion for independent samples with a guaranteed probability of $P \geq 95$ and $t_{critical} = 1.98$ analysis was applied.

Regarding indicators of physical development, some statistically significant differences were registered in the characteristics related to body lengths, such as stature and horizontal and vertical stretch. That showed that the boys of this age group were statistically substantially taller than the girls. No statistically significant differences were found for the characteristics mostly

related to body girths, regarding which girls had an advantage.

Figure 4 shows the statistical significance of the differences between the groups along the factor gender regarding the characteristics carrying information about some motor qualities. In analyzing the figure, we found out that the girls (on the left side of the figure) surpassed the boys only as regards flexibility quality, but the difference was not statistically significant. On the other hand, the boys (in the right part of the figure) surpassed the girls in all other tested characteristics but only as regards the speed capabilities (Run 10 m). No statistically significant difference was established in the lower limbs’ explosive power in a single-leg hop (Single leg hop). Regarding all other characteristics, the boys were statistically better than the girls, and the results were also supported by a 100% probability guarantee.

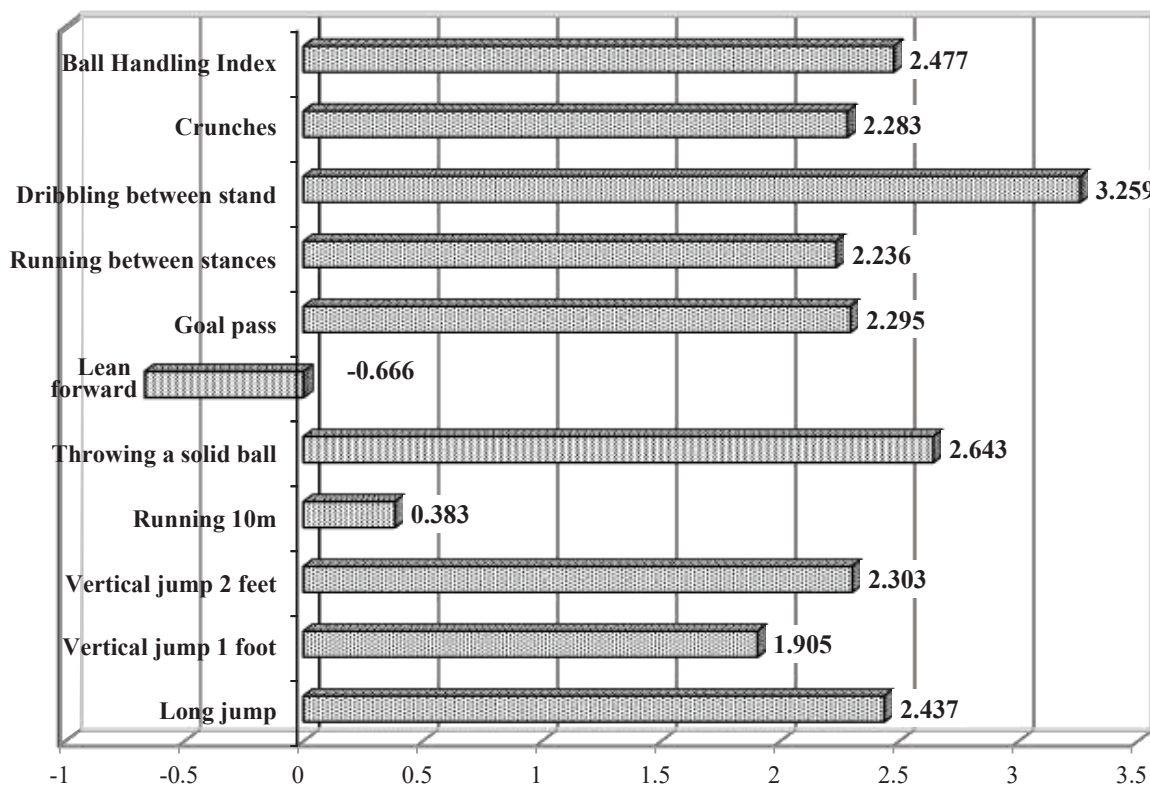


Figure 4. Statistical significance of the differences of the characteristics carrying information about some motor qualities along the factor gender

After the study was carried out and we made an analysis of the obtained results, we could summarize that at this age, our study group was highly homogeneous in terms of indicators of physical development related to body measures - height, horizontal and vertical stretch, and chest circumference - difference. It was proven that the boys of this age group were statistically substantially taller than the girls, thus having a greater horizontal and vertical stretch. Regarding the rest of the characteristics, the group was relatively homogeneous. At the same time, it was also inhomogeneous regarding the functional chest capacity, the lower limbs' explosive power of both legs, and the ability of students to move quickly, performing a dribble with a ball along a set route. At this age, the boys, and that is statistically important, had a better explosive power of the lower and upper limbs as well as of the abdominal musculature. The

girls were more flexible, but this was not proven statistically. The boys at the age of 8 were more accurate when executing a pass into a goal; they were faster and more agile when following a set route, both without the ball and while dribbling.

During the child-adolescent period, significant and dynamic changes occur in a person's biological development and physical ability, mental maturation, and intellectual and social development (Tsarov, 2008). Our study group was in the first phase of school age - childhood from 6-7 to 10-11 years of age. The characteristic of this phase is that in terms of individual development, it does not always coincide with the biological development of the child's body. In addition to numerous exercises and games, the teacher must be able to classify the exercises, apply them in the appropriate context, and vary the number of exercises and games according to

the children's abilities (Maßmann & Mayer, 2020).

Children aged 7-8 years have the anatomical and physiological prerequisites to manage the mini-basketball game's conditioning demands. The fundamentals of catching, passing, dribbling, and shooting are laid, and their total mastery is not expected. An emphasis is placed on exercises for developing coordination, flexibility, and conditioning abilities. Practicing and developing basic motor abilities (improving the technique) is continued so that they can gradually be transformed into specific motor skills (Borukova & Zhecheva-Tupankova, 2021).

The game and the setting of a proper start of sports education are essential stages of the overall educational process at school (Tsvetkov, 2000).

CONCLUSION

Children at this age can perform sufficiently complex actions in terms of coordination and matching the movements of the arms and the legs, so it is necessary that PE classes of this age group at school be highly emotional. The demonstration method should prevail over the method of explanation, and various visualization forms should be used. The teaching process must involve many:

- ✓ Active games: running, jumping, different throws of the ball, catching and handling the ball, and counteracting;
- ✓ relay games that involve practiced exercises and games and combine different actions - running, jumping, throwing, etc.;
- ✓ sports-training games.

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