



STUDY ON THE JUNIOR HIGH SCHOOL STUDENTS' PHYSICAL ABILITY

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ABSTRACT

Physical ability is a comprehensive indicator of a person's general functional state and motor abilities, which also depend on the level of development and manifestation of the primary motor skills. The study aims to determine students' physical ability levels at the junior high school stage of education. Methods: research and analysis of literary sources on the problem and research conducted through the national system for assessing students' physical ability, which included the following tests: 30-meter running, standing long jump, throwing a medicine ball, 200-meter shuttle run, and T-test. Fifty-three students, aged 12-13 years from 119 Secondary School 'Acad. Mihail Arnaudov' in the city of Sofia, were studied. All statistical operations were carried out by mathematical-statistical processing with SPSS.22 by applying variation analysis and statistical hypothesis testing. Results: The state of the physical ability of the examined students in this junior high school is at a good level. Conclusion: More attention should be paid to developing motor skills and their sensitive periods in physical education and sport lessons.

Keywords: physical education, norms, boys

INTRODUCTION

Physical education, in the past and present, has been an integral part of the overall education process in the Republic of Bulgaria. The purpose of physical education in our modern society is related to improving the population's health and mental and physical ability, which is realized in physical education and sport classes by the requirements of the curricula approved by the Ministry of Education and Science. However, the control over the content implementation is vastly underestimated, and the objective assessment of the students' physical ability indicates the quality of work in the classes. The concept of physical ability is one of the most common in the field of physical education and sport. Physical ability reflects motor skills development and represents their comprehensive manifestation. Authors

considering the matter of students' physical, ability as a whole or its components are Borisov Marinov, Naydenova (1), Slanchev (2), Naydenova (3), Borisov (4). Physical ability reflects the general capacity of the human body based on the comprehensive development of motor skills and the motor abilities and habits necessary for their manifestation. It combines a person's potential to efficiently carry out a given activity (motor, professional, labor). In its essence, physical ability results from the degree of functional adaptation of individual organs and systems in the body, especially those directly connected with the performance of motor actions (5). Following the laws of medicine, defines physical ability as 'a state of mental and somatic health and good self-esteem, built based on improving motor abilities and increasing a person's functional capabilities, which is a prerequisite for increasing the quality of life, to counteract deepening hypodynamia and reduce health risks' (6).

Due to modernization, a person's possibility of physical activity is significantly limited.

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Although information technologies provide excellent opportunities for expanding knowledge in any field, a person still needs to realize the positive role of physical activity on their health. A clinically healthy body and athletic appearance are prerequisites for effective social interaction (7).

The decrease in the population's physical activity leads to several adverse health consequences, such as cardiovascular diseases, increased body mass, increased blood pressure and blood sugar levels, and spinal distortions. In this line of thought, it is necessary to conduct more in-depth studies on the problem of the physical capacity of adolescents. This is also confirmed by the statements of Marinov (8), according to whom '... the strategy for improving the health of the individual or the population as a whole should be focused on the level of physical ability'. Atanasova (9) also believes that the students' motor activity is limited within the framework of the physical education lesson, which leads to a significant reduction in physical exertion, which, according to the author, 'affects the health of adolescents'. Physical culture and sports are a special type of social activity, the foundation of the main sphere of the sociological system of society - reproduction of people. It interacts comprehensively, qualitatively demarcated not only within the limits of its own main sphere, but also with the main areas that are found in other main spheres of public life (10).

The study aims to determine students' physical ability levels at the junior high school stage of education. **The following tasks** were set to achieve the goal:

1. Research and analysis of literary sources.
2. Sports-pedagogical testing of students' physical ability by carrying out the test battery of Miladinov (11).
3. Tracking the students' physical ability changes for one school year.

The adolescents' physical ability can be determined as **the subject** of the study, considering the literary sources review, the aim, and the tasks of the study. **The object** of the research is the sign of physical ability for one school year.

METHODS

The research was conducted at the beginning of 2022 – 2023 in 119 Secondary School 'Acad. Mihail Arnaudov' in Sofia. The students in VI and VII grades were tested twice on the following five tests: 30 meters running, standing long jump, throwing a medicine ball, 200-meter shuttle run, and T-test. All the test results were processed using the statistical software SPSS.22. Variation analysis and statistical hypothesis testing were also applied.

Fifty-three boys between 12 and 13 years were studied; 25 were in VI and 28 in VII grade.

RESULTS

Data analysis starts with the indicators from the variation analysis. It can be seen that the values of the coefficient of variation (V%) range between 5.98 and 19.73% for the studied 12-year-old boys. In four of the five tests, the coefficient values are up to 12%, which shows that the results are highly homogeneous. This gives us a reason to assume that the work, the applied means, and methods for developing the motor skills - speed, endurance, and explosive power in the given physical education classes positively affect the students. Only the coefficient of variation from the first test of medicine ball throwing is 19.73%, and from the second test, it is 18.14%. This can be seen as a drop, but it does not affect the interpretation of the coefficient of variation. The values of the coefficients of asymmetry (As) and excess (Ex), which carry information about the normality of the distribution of achievements, show normality in all tests except for the T-test carried out at the beginning and end of the school year.

The values of the coefficient of variation (V%) range between 8.46 and 17.17% for the 13-year-old boys in all tests, which shows a significant leveling of the average achievements in the respective class. The coefficient of variation (V%) from the 30-meter running test, standing long jump, 200-meter shuttle run, and T-test is up to 12%. As noted for the 12-year-old students, the achievements are highly homogeneous. Again, the highest values of the coefficient of variation (V%) are from the medicine ball throwing test, 16.58 and 17.17%. The achievements in four out of five tests done with this age group are highly homogeneous. This gives us a reason to assume

that the work carried out during the school year in physical education classes positively impacted individual motor skills as components of the adolescents' physical ability. The coefficients of asymmetry (As) and excess (Ex) again indicate

the presence of a normal distribution, which allows us to use parametric and non-parametric statistics in the subsequent analysis. The following analysis starts with the 30-meter run test results.

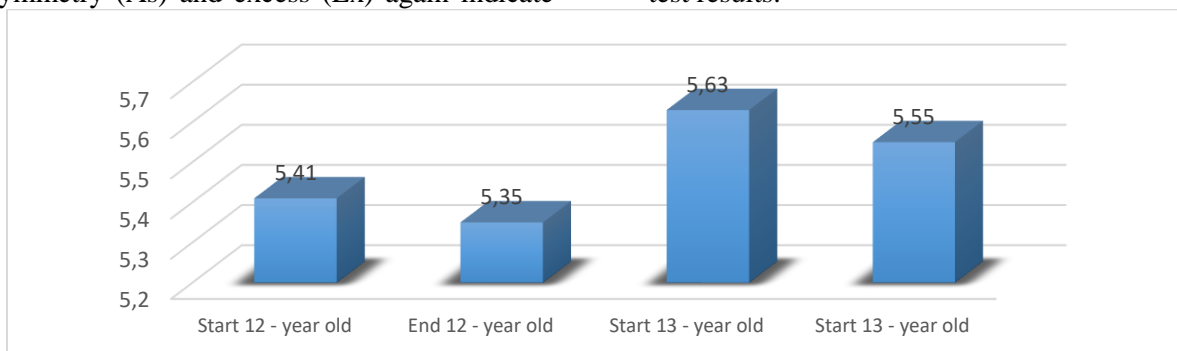


Figure 1. Mean results from the 30-meter run test

The results in **Figure 1** show the changes in the achievements of the boys we tested in these two age groups. The 12-year-old boys show better results at the end of the school year with the absolute increase (d) of 0.06 seconds, which, based on the guaranteed probability $P(t)$ 92.1%, presented in **Table 1**, can be defined as random and insignificant. The mean value of the achievements in the first test was $\bar{X}1 = 5.41$, and the standard deviation was $S1 = 0.36$. At the end of the school year, the results were as follows: $\bar{X}2 = 5.35$ and $S2 = 0.32$.

The students from the other age group improved their performance with an absolute increase of 0.8

seconds. This difference is again not confirmed with the required level of guaranteed probability $P(t) - 90.5\%$. In the first test, the mean value of achievement was $\bar{X}1 = 5.63$, and the standard deviation was $S1 = 0.51$. At the end of the school year, the boys' results were as follows: $\bar{X}2 = 5.55$ and $S2 = 0.47$.

Although both considered groups improved their results, taking into account the statistical indicators, these differences in achievements cannot be attributed to the applied means and methods in the physical education lessons.

Table 1. Data from the comparative analysis in 12-year-old boys

Test	n	Initial data			Final data			Increase		t	P(t)
		\bar{X}	S	V%	\bar{X}	S	V%	d	d %		
30-meter running	25	5.41	0.36	6.65	5.35	0.32	5.98	- 0.06	- 1.10	1.83	92.1
Standing long jump	25	183.08	20.51	11.20	183.88	19.73	10.73	0.8	0.43	- 0.46	35.2
Medicine ball throwing	25	4.51	0.89	19.73	4.74	0.86	18.14	0.23	5.09	- 3.61	99.9
200-meter shuttle run	25	47.19	5.22	11.06	45.66	5.10	11.16	- 1.53	- 0.32	3.77	99.9
T-test	25	14.89	1.50	10.07	14.09	1.12	7.94	- 0.8	- 5.37	3.40	99.8

The standing long jump results are shown in **Tables 1 and 2** and **Figure 2**. The data in **Figure 2** show a minimal improvement in the achievements in both age groups.

In the first test, the VI-grade students showed results with a mean value of $\bar{X}_1 = 183.08$ cm and a standard deviation of $S_1 = 20.51$. At the end of the year, the boys' results were as follows: $\bar{X}_2 = 183.88$ and $S_2 = 19.73$. The absolute increase in this group's results was 0.8 cm within the school year. This difference cannot be defined as reliable with the guaranteed probability of $P(t) - 35.2\%$, so this improvement cannot be attributed to the teaching in physical education classes during the school year.

The mean value of the results in the first test carried out at the beginning of the school year

with the VII grade students was $\bar{X}_1 = 163.32$, and the standard deviation was $S_1 = 20.07$. At the end of the year, the boys' results were as follows: $\bar{X}_2 = 165.25$ and $S_2 = 18.54$. The difference between the results at the beginning and the end of the school year for the older students was 1.93 cm. Still, contrary to the results of the VI-grade students, as seen from **Table 2**, the guaranteed probability is higher - 87.7%, which gives us a reason to attribute it to random factors.

This minimal improvement in the explosive power of the lower limbs can be assumed to be a result of the anthropometric changes in the students. The results obtained from both groups show that the achievements of 12-year-old students are much higher than those of 13-year-old ones, which is an indicator for evaluating the lower limbs' explosive power.

Table 2. Data from the comparative analysis in 13-year-old boys

Test	n	Initial data			Final data			Increase		t	P (t)
		\bar{X}	S	V%	\bar{X}	S	V%	d	d %		
30-meter running	28	5.63	0.51	9.05	5.55	0.47	8.46	- 0.08	- 1.42	1.73	90.5
Standing long jump	28	163.32	20.07	12.28	165.25	18.54	11.15	1.93	1.18	-1.59	87.7
Medicine ball throwing	28	3.86	0.64	16.58	3.96	0.68	17.17	0.1	2.59	-2.05	99.51
200-meter shuttle run	28	48.70	6.15	12.62	47.39	5.61	11.83	- 1.31	- 2.68	5.14	100
T-test	28	15.27	1.40	9.16	15.07	1.32	8.75	- 0.21	- 1.37	3.42	99.8

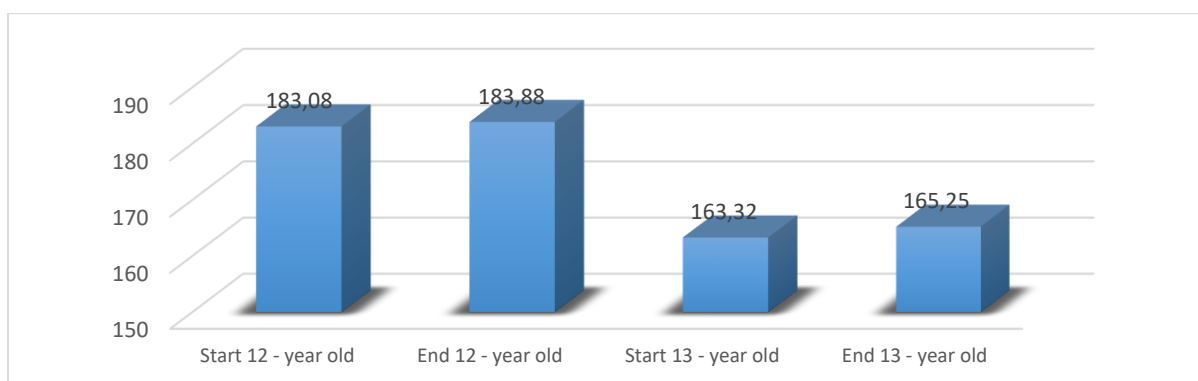


Figure 2. Mean results from the Standing long jump test

The results from the Medicine ball throwing test are presented in **Figure 3**. The numbers show that the studied 12-13-year-old students improved their performance.

The mean value of the achievements for the 12-year-old students on the first test was $\bar{X}_1 = 4.51$ m, and the standard deviation was $S_1 = 0.89$. At the end of the year, the boys' results were as follows: $\bar{X}_2 = 4.74$ and $S_2 = 0.86$. The results show an improvement of the achievement by 0.23 cm within the conducted research; we can define the obtained difference as reliable based on the $P(t)$ value presented in **Table 1** - 99.8%.

On the first test conducted, the 13-year-old students showed a mean value of achievements

$\bar{X}_1 = 3.86$ and a standard deviation of $S_1 = 0.64$. At the end of the year, the boys' results were as follows: $\bar{X}_2 = 3.96$ and $S_2 = 0.68$. The difference in the achievements between the two tests was 0.1 cm. This difference in the results from the beginning and the end of the school year can be supported by the necessary guaranteed probability $P(t) = 99.5\%$.

Although in both considered age groups, the improvements in achievements were minimal, taking into account the statistic indicators, we can assume that they are a result of the applied means and methods of work in the physical education classes because the guaranteed probability above 99% supports them.

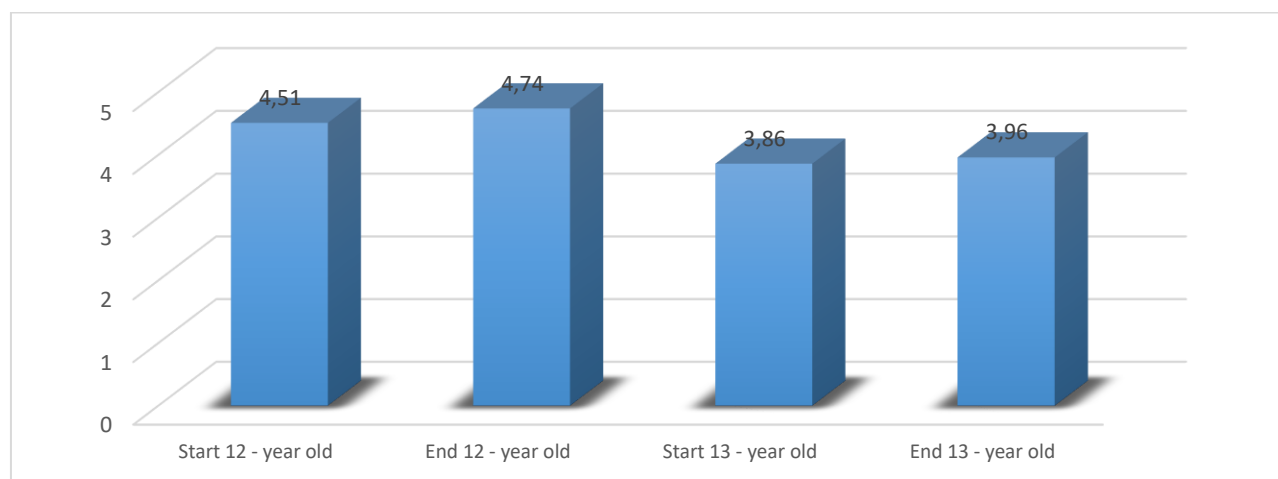


Figure 3. Mean results from the Medicine ball throwing test

The 200-meter shuttle run test provides information on the students' speed endurance changes. The study results for the two groups showed an improvement in performance at the end of the school year compared to the one at the beginning, as shown in **Figure 4**.

The younger studied students showed a mean value of achievements $\bar{X}_1 = 47.19$ and a standard deviation of $S_1 = 5.22$. At the end of the school year, the boys' results were as follows: $\bar{X}_2 = 45.66$ and $S_2 = 5.10$. The performance improvement was 1.53 seconds, which can be confirmed by the required level of guaranteed probability $P(t) = 99.9\%$.

The older students tested gave a mean value of achievements $\bar{X}_1 = 48.10$ and a standard deviation $S_1 = 6.15$. At the end of the school year, the boys' results were as follows: $\bar{X}_2 = 47.39$ and $S_2 = 5.62$. Here the difference in the mean values of the achievements from the first and second measurements was 1.31 seconds. It was also confirmed by the required guaranteed probability of $P(t) = 100\%$.

The revealed difference and statistical reliability give us a reason to attribute the improvement in physical education training to the applied means and methods for developing the motor skill of endurance.

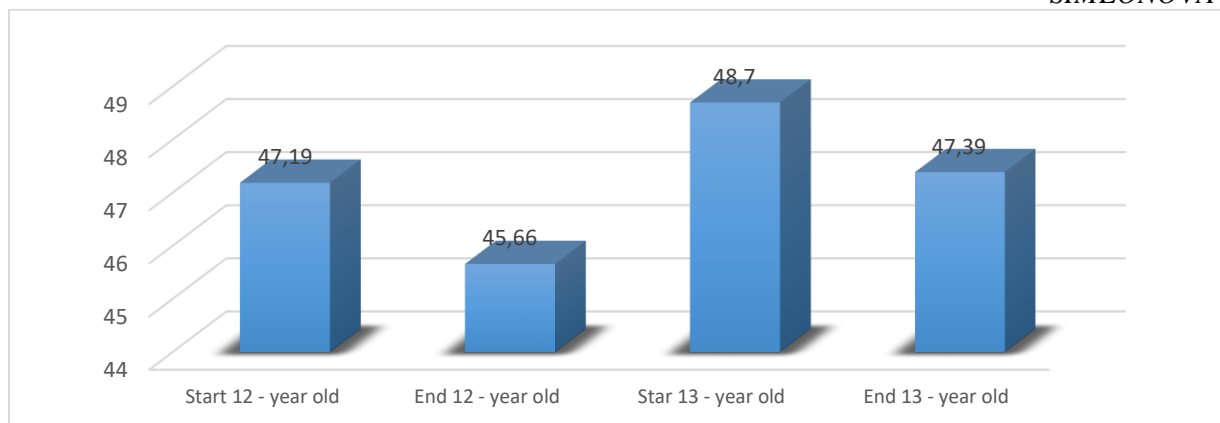


Figure 4. Mean results from the 200-meter shuttle run test

The students' results from the T-test in both age groups are presented in **Tables 1 and 2 and Figure 5**. This test gives information about the changes in the motor skill of agility.

The mean value of the achievements reported for 12-year-old students was $\bar{X}_1 = 14.89$, and the standard deviation was $S_1 = 1.50$. At the end of the year, the results were as follows: $\bar{X}_2 = 14.09$ and $S_2 = 1.12$. The performance improvement was of 0.8 seconds, which, despite the statistical credibility of $P(t) - 99.9\%$, is alarming because the improvement in the result is minimal. Appropriately selected methods and means to develop the motor quality of agility in the specific class can improve the results.

The results of the 13-year-old students showed the mean value of achievement $\bar{X}_1 = 15.27$ and a standard deviation $S_1 = 1.40$. At the end of the school year, the results were as follows: $\bar{X}_2 = 15.07$ and $S_2 = 1.32$. The students' performance improved at the end of the school year. The difference between the two measurements was 0.21 seconds, again confirmed by the required guaranteed probability $P(t) - 99.8\%$.

The improvement in the results and the level of statistical reliability allow us to give a positive assessment of the work in the physical education lesson, as well as the means and methods used by the teacher in the classes.

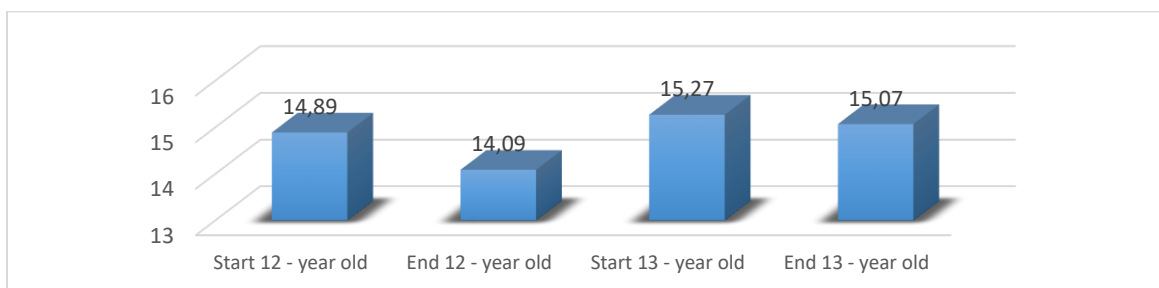


Figure 5. Mean results from the T-test

CONCLUSION

After analysing the research results and interpreting the data, we recommend work focused on developing motor skills in boys from the junior high school stage. To improve the motor activity of students, we recommend the appropriate selection of the means and methods for motor skills development in physical education and sport lesson at school.

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