

Original article

The influence of physical activity on the thinking of schoolchildren

Georgiy Georgievich Polevoy

Abstract:

Objective: to determine the influence of physical activity in physical education classes on the thinking indicators of schoolchildren. **Methods:** This was a cross-sectional study conducted in a secondary school in Russia, it was attended by ninth graders aged 15-16 years in the number of 141 schoolchildren. The main method of research was the test “Cross out an extra word”, which determines the level of development of students’ thinking. The test was used before and after the physical education lesson 1 time per month for 5 months. Statistical analysis used: The student’s T-criterion was used in the study. **Results:** children who did not engage in physical education in the classroom were not able to significantly improve their performance in the test, which indicates a possible adaptation to the test after its first performance before the lesson. Children who were engaged in physical exercises were able to significantly increase the test results. **Conclusion:** the effectiveness of the influence of a physical education lesson at school on thinking indicators. This study will serve as an additional motivation for children to engage in physical culture, since the impact of physical exercises has a positive impact not only on the development of physical qualities, but also on the development of schoolchildren’s thinking.

Keywords: Health; Physical culture; Physical exercises; Mental processes; Students.

*Bangladesh Journal of Medical Science Vol. 22 No. 03 July'23 Page : 612-616
DOI: <https://doi.org/10.3329/bjms.v22i3.65334>*

Introduction:

The topic of children’s health and development is always relevant, especially during the coronavirus pandemic^{1,2}. From early childhood and throughout life, people try to make their health stable, resistant to the effects of adverse factors. One of the most important elements in every person’s life is the observance of a healthy lifestyle. The main components of a healthy lifestyle include the following:

1. Physical activity;
2. Proper nutrition;
3. Healthy sleep;
4. Giving up bad habits;
5. Some other factors.

This classification has been proposed by quite a large number of studies. However, none of the researchers put physical activity in the last place in importance, noting its value for human development and health³⁻⁵.

Unfortunately, today children who enroll in colleges and universities after school increasingly have a preparatory or special health group. Children with a basic health group that allows them to engage in physical culture and sports without restrictions have become less likely to meet. Most health problems are the result of a sedentary lifestyle, that is, low physical activity^{6,7}, which entails a problem with obesity, hypertension and other problems^{8,9}. Thus, from an early age it is important to instill in children a desire for physical activity and exercise^{10,11}.

Correspondence: Georgiy Georgievich Polevoy, Candidate of Pedagogical Sciences, Associate Professor, Department of Physical Education, Moscow Polytechnic University, Moscow, Russia and Candidate of Pedagogical Sciences, Associate Professor, Department of Physical Education, Vyatka State University, Kirov, Russia. E-mail: g.g.polevoy@gmail.com <https://orcid.org/0000-0002-3300-3908>

One of the main aims of physical culture and sports is the development of motor skills and increasing the level of physical fitness. Physical education lessons at school are indispensable tools for the implementation of such a component of a healthy lifestyle as physical activity. To date, a large number of studies have been presented on the benefits of physical education lessons at school for the development of physical qualities. The authors note the effectiveness of a specific methodology, a school curriculum for the development of physical qualities of schoolchildren of different genders and ages^{12,13}.

Some studies mention that physical activity has a positive effect not only on the development of physical qualities, but also on the development of cognitive and some mental processes^{14,15}.

The purpose of our study is to determine the influence of physical activity in physical education lessons on the thinking indicators of schoolchildren. Perhaps this would serve as an additional motivation for schoolchildren to attend physical education classes at school, college or university.

Methods:

Participants:

The study involved ninth grade students of secondary school number 60 (Kirov, Russia), aged 15-16 years. A total of 141 students took part in the pedagogical experiment. The 9th grade students are graduates of the school and treated the study with maximum responsibility, all exercises and tests were performed consciously. The pedagogical study involved children regardless of gender and age, weight and height and level of physical fitness. Children with basic and preparatory health groups were admitted to physical education classes by the doctor.

All procedures met the ethical standards of the 1964 Declaration of Helsinki. Informed consent was obtained from all parents of the children included in the study.

Procedure:

The study was conducted for five months (January – May 2022). According to the schedule, physical education classes in the ninth grade were held 2 times a week for 45 minutes according to the physical education curriculum at the school for children of grades 1-11¹³.

The current study did not take into account the favorable period and the natural increase in thinking indicators in children. Differentiation of children into control and experimental groups was not provided. In our study, the main fact was the active physical participation or non-participation of the student in the process of physical education. Therefore, only the impact of physical activity of schoolchildren on their thinking indicators was considered.

All physical exercises were performed under the supervision of a physical education teacher. Before the lesson, the children sat down in a regular classroom and performed a test for 2 minutes: “Cross out an extra word”¹⁶.

There are 30 lines in front of the students, each of which has 5 words, but only 4 are related in meaning (a fragment of the test is presented in the form of table 1). It is necessary to cross out the extra words as quickly as possible within 1 minute. Each time the words in the lines changed.

Result: the number of correctly crossed out words within 1 minute.

Before the start of the physical education lesson, testing was conducted in order to assess the current level of thinking.

After the end of the physical education lesson, the children sat in the same class and performed this test again. After the end of the physical education lesson, testing showed the influence of children’s active activity on thinking indicators. It should be noted that the time interval (before and after the lesson) was not chosen by chance, since during the day or week students carry out other activities that could affect the test results. For the accuracy of the result,

Table 1. Fragment of the test “Cross out an extra word”

1.	Apple	Orange	Banana	Milk	Peach
2.	Airplane	Bread	Bicycle	Ship	Car
3.	Table	Chair	Wardrobe	Bed	Toy
4.	Football	Painting	Hockey	Volleyball	Basketball
5.	Door	Keyboard	Monitor	System Unit	Printer
...

the procedure was performed once in the middle of each month from January to May. All students took the test, including those who were not allowed to attend classes for one reason or another. But, as a rule, such children are simply present at the lesson, without active participation in it. Children who were not present at school on the day of the test were not included in the results

Mathematical and statistical processing of results

All the indicators of schoolchildren according to the test results were entered in an Excel spreadsheet. The average value of the indicators before and after the study and their percentage increase were determined,

the reliability of the increase in indicators was determined by the Student's T-criterion ($p > 0.05$).

Ethical clearance:

This research was conducted in compliance with the needed research ethics. In addition, consent for participation was obtained from the participants before the beginning of their involvement in the study. All data were recorded and analyzed anonymously.

Results:

Before the beginning of the physical education lesson and after its completion, all children passed the control test "Cross out an extra word". The test results are presented in Table 2.

Table 2. Test results "Cross out an extra word"

Month	Physical education lesson	Number of children in lessons	Test before the lesson	Test after the lesson	%	p
January	engaged	361	14.1	16.1	14.2%	<0.05
	not engaged	34	13.9	14.4	3.3%	>0.05
February	engaged	348	14.2	16.3	15.1%	<0.05
	not engaged	41	13.1	13.7	4.3%	>0.05
March	engaged	372	12.5	14.6	16.7%	<0.05
	not engaged	33	13.9	14.2	2.1%	>0.05
April	engaged	368	13.6	16.2	18.8%	<0.05
	not engaged	29	12.9	13.2	2.6%	>0.05
May	engaged	350	13.9	16.2	16.2%	<0.05
	not engaged	42	13.8	14.4	4.2%	>0.05

Table 2 shows that children who did not exercise, but completed the test, were able to only slightly improve their performance. This trend is observed every month. The indicators improved on average from 2.1% to 4.3% ($p > 0.05$).

The situation is different for children who were engaged in physical education lessons. In each of the five months, the test indicators improved significantly, on average from 14.2% to 18.8% ($p < 0.05$).

Such results of the pedagogical experiment indicate the effectiveness of the influence of physical exercises and physical education lessons on the thinking of schoolchildren

Discussion:

The purpose of this study was to determine the influence of physical activity of schoolchildren on their thinking indicators. The main conclusion of this study is that children who were engaged in physical education were able to significantly improve their thinking indicators. This indicates the effectiveness of the influence of physical exercises on the thinking

indicators of schoolchildren aged 15-16. Children who did not perform physical exercises in physical education class were able to slightly improve their performance in the "Cross out the extra word" test. This can probably be explained by the fact that performing the test before the start of the lesson served as a kind of training or adaptation to it, since all the children performed it again after the physical education lesson. This trend was observed throughout the study.

A review of the literature on this problem shows the relevance of the issue of children's health and development^{1-5,17}. The literature notes the great role of physical education in school for the health and improvement of motor activity of children. The positive effect of physical exercises on some indicators of cognitive^{14,15} and mental processes was

also noted^{18,19}.

In our study, for the first time, the influence of a physical education lesson at school on the thinking indicators of ninth grade students is investigated. During the study period, thinking indicators improved every month, regardless of the goals and objectives of a particular lesson, whether it was athletics, endurance running, forward somersaults or the use of outdoor games, or sports games as a means of physical culture in the classroom.

The results obtained will serve as additional motivation for physical education, since in the process of motor activity, not only physical qualities develop, but also the thinking of schoolchildren. This study is relevant and promising for further study of the health and physical activity of schoolchildren at school, as well as its impact on other physiological processes.

Conclusion:

This study examines the problem of children's health, their sedentary lifestyle. The role of the physical

education lesson for the health and development of schoolchildren is determined. As a result of the study, the effectiveness of the influence of physical activity of schoolchildren in a physical education lesson on thinking indicators has been proved.

In the future, research should focus on the impact of physical activity and physical activity in physical education lessons not only on the physical qualities of schoolchildren, but also on different mental processes of children of different ages.

Source of fund: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of interest: The author declares that he no conflict of interest.

Authors's contribution:

Data gathering and idea owner of this study, Study design, Data gathering, Writing and submitting manuscript. Editing and approval of final draft – Polevoy G.G.

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