

The Effect of Physical Activity on the Memory of Schoolchildren

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The purpose of this study was to determine the effect of physical activity in physical education classes on the memory indicators of schoolchildren. The main research method was the “Memory” test, which determines the level of memory development of schoolchildren. The reliability of the increase in indicators was determined by the Student’s T-criterion ($p>0.05$). As a result of the study, children were engaged in physical exercises were able to significantly increase the test results. The results obtained determine the effectiveness of the influence of a physical education lesson at school on memory 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 effect not only on the development of physical qualities, but also on the memory of schoolchildren. In the future, it is possible to study the influence of physical activity on the mental processes.

Keywords: health, physical culture, physical exercises, mental processes, students

INTRODUCTION

The topic of children's health and development is always relevant (Leisterer and Gramlich, 2021; Jussila et al., 2022; Peterson et al., 2022; Silva et al., 2022). From early childhood and throughout life, people try to make health stable, stable to the effects of adverse factors. Of course, this is achieved in many ways. For example, there is such a thing as a healthy lifestyle. It includes such components as:

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

Such a classification is offered by a fairly large number of studies. At the same time, the percentage of components practically does not change. However, none of the researchers put physical activity in the last place in importance, noting its value for human development and health (Fuchs, 2003; Bailey, 2006; Hills et al., 2007; Poitras, 2016; Ferraz et al., 2020).

Unfortunately, today, children who enroll in colleges and universities after school increasingly have a preparatory or special health group. Children with the main health group, which allows them to engage in physical culture and sports without restrictions, have become less common (Warburton and Bredin, 2017; Ács et al., 2020). At the same time, these are not only congenital problems and pathologies, most of them are acquired health problems, such as obesity, hypertension, that is, for the most part, a consequence of a sedentary lifestyle (Flynn et al., 2006; González-Gross et al., 2013). At the same time, a sedentary lifestyle

since childhood leads to an increase in chronic diseases, a decrease in functional and physical fitness (de Rezende et al., 2014; Husu et al., 2016; Piercy et al., 2018). Thus, it is important to form children's desire and needs for physical education and sports from childhood (Kumar et al., 2015).

One of the most important tasks of physical culture is the development of motor skills (Barnett et al., 2009; Hardy et al., 2012; Pan et al., 2017) and increasing the level of physical fitness (Oliveira et al., 2017; Pangrazi and Beighle, 2019),

Physical education lessons at school are indispensable tools for the implementation of such a component of a healthy lifestyle as physical activity. A lesson at school is mandatory to attend and is conducted under the influence and supervision of a teacher (Kainov and Kuryerova, 2019). A fairly large number of studies have been presented on the benefits of physical education lessons at school for the development of physical qualities (strength, speed, motor abilities, endurance, flexibility, and others). The authors note the effectiveness of a particular methodology, school curriculum for the development of physical qualities of schoolchildren of different genders and ages (Strong et al., 2005; Janssen and LeBlanc, 2010; Dobbins et al., 2013; Errisuriz et al., 2018).

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 (Kashihara et al., 2009; Coe et al., 2012; Mura et al., 2015; Rodríguez-Negro et al., 2020). It is known that physical exercises have proved to be an effective means for developing the creative abilities of schoolchildren (Spanaki, et al., 2016; Román et al., 2018; Kokkonen et al., 2019).

The purpose of our study is to determine the effect of physical activity in physical education classes on the memory of schoolchildren. Perhaps this would serve as additional motivation for schoolchildren to take physical education classes at school, college or university.

MATERIALS AND 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.

Research 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 1-11 (Kainov and Kuryerova, 2019).

The current study did not take into account the favorable period and the natural increase in memory 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 memory indicators was considered.

All physical exercises were performed under the supervision of a physical education teacher. Before the start of the lesson, the children sat down in a regular classroom and performed the “Memory” test for 2 minutes. The test consists of two parts “Numbers” and “Words” (Nemov, 2020).

1. **“Numbers”**. Within 20 seconds, the teacher calls 10 two-digit numbers. Then the student writes down these numbers in any order. Result: the number of correctly written numbers.

2. “Words”. Within 20 seconds, the teacher calls any 10 words. Then the student writes down these words in any order. Result: the number of correctly written words.

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

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 effect of children's active activity on children's memory 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, 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.

Statistical Analysis

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 ($p > 0.05$)

RESULTS

Before the beginning of the physical education lesson and after its completion, all children took a control test “Memory”. The test consisted of two stages “Numbers” (Table 1) and “Words” (Table 2).

**TABLE 1
RESULTS OF THE “NUMBERS” TEST**

Month	Physical education lesson	Number of children in lessons	Test before the lesson	Test after the lesson	%	p
January	engaged	361	4.5	5.3	17.1%	<0.05
	not engaged	34	4.2	4.3	3.2%	>0.05
February	engaged	348	4.7	5.4	15.1%	<0.05
	not engaged	41	4.6	4.8	3.7%	>0.05
March	engaged	372	4.3	5.1	18.2%	<0.05
	not engaged	33	4.4	4.5	2.9%	>0.05
April	engaged	368	4.7	5.4	14.6%	<0.05
	not engaged	29	4.5	4.7	3.6%	>0.05
May	engaged	350	5.1	5.9	16.3%	<0.05
	not engaged	42	4.6	4.8	3.9%	>0.05

TABLE 2
RESULTS OF THE “WORDS” TEST

Month	Physical education lesson	Number of children in lessons	Test before the lesson	Test after the lesson	%	p
January	engaged	361	6.8	8.1	19.1%	<0.05
	not engaged	34	6.3	6.6	4.7%	>0.05
February	engaged	348	6.9	8.1	16.9%	<0.05
	not engaged	41	6.7	7.1	5.3%	>0.05
March	engaged	372	7.4	8.6	15.9%	<0.05
	not engaged	33	7.1	7.4	3.9%	>0.05
April	engaged	368	7.2	8.5	18.3%	<0.05
	not engaged	29	7.3	7.7	5.3%	>0.05
May	engaged	350	6.9	8.2	19.2%	<0.05
	not engaged	42	7.2	7.5	4.4%	>0.05

From both Tables 1 and 2, it can be seen that children who did not exercise, but completed the test, were able to only slightly improve their performance. This trend is observed every month in both tests. On average, the indicators improved from 2.9% to 5.3% ($p>0.05$).

The situation is different for children who were engaged in a physical education lesson. In each of the five months, the test indicators improved significantly, on average from 14.6% to 19.2% ($p<0.05$).

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

DISCUSSION

The purpose of this study was to determine the effect of physical activity of schoolchildren on their memory indicators. The main conclusion of this study is that children who were engaged in physical education were able to significantly improve their memory performance. Of course, this indicates the effectiveness of the influence of a variety of physical exercises on memory performance. Children who did not do physical exercises at the physical culture lesson were not able to significantly improve their performance in the “Memory” test. This can probably be explained by the fact that performing the test before the start of the lesson served as some 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 the problem shows the relevance of the issue of children's health and development (Vasankari et al., 2018; Leisterer and Gramlich 2021; Silva et al., 2022). Physical education has a great impact on the sedentary lifestyle of children. (Fuchs, 2003; Hills et al., 2007; Bull et al., 2020; Rhodes et al., 2020). Despite the fact that a fairly large number of studies prove the effectiveness of physical education lessons for the health of children and the development of their physical qualities (Strong et al., 2005; Dobbins et al., 2013; Errisuriz et al., 2018), there are studies that speak about the impact of physical exercise on the development of cognitive processes (Coe et al., 2012; Mura et al., 2015; Rodríguez-Negro et al., 2020) and creative abilities of children (32,33,34).

However, it is also important that physical exercises have an impact on some mental processes, which is confirmed by some studies conducted. (Pesce et al., 2009; Vanhelst et al., 2016).

In this study, for the first time, the influence of a physical education lesson at school on the memory indicators of schoolchildren is investigated. During the study period, children's memory indicators improved in each month, regardless of the goals and objectives of a particular lesson, whether it was athletics, endurance running, forward somersault or the use of outdoor games, or sports games as a means of physical culture in the classroom.

From a physiological point of view, in all likelihood, physical exercises increase the activity of metabolic processes (Bailey, 2006; Kelly et al., 2021; Jussila et al., 2022). Under the influence of physical exercises, blood circulation improves (Yachmenev and Rubanovich, 2018; Leahy et al., 2019; Grüne et al., 2020), as a result of which mental processes are mobilized.

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

CONCLUSIONS

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 the memory indicators of schoolchildren 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.

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