

Original article

The influence of speed and power load on the indicators of the distribution of attention of schoolchildren with different typologies

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Abstract

Objective: is to determine the effect of speed and strength training on the indicators of attention distribution in children aged 13-14 years, taking into account the strength of their nervous system. **Method:** the pedagogical experiment took place in an ordinary school in the city of Kirov for three months. Schoolchildren were engaged in physical education twice a week for 40 minutes each lesson. 20 schoolchildren from class 7a were engaged in the usual physical education program. Schoolchildren from the 7b class in the number of 20 people additionally performed a set of exercises in physical education lessons aimed at developing speed and strength abilities. The tapping test differentiated the schoolchildren into two subgroups according to the strength of the nervous system. Indicators of the distribution of attention of schoolchildren were determined by the test «different counts». **Results:** after the end of the study, there were changes in all subgroups. In the group of class 7a, children with a strong nervous system improved from 27.3±1.5 seconds to 25.9±1.4 seconds (5%), and children with a weak nervous system improved from 29.0±3.2 seconds to 27.3±3.0 seconds (6%). In the group of children of class 7b, there were more significant changes. In schoolchildren with a strong nervous system, the indicators improved from 31.4±2.9 seconds to 25.4±2.3 seconds (19%), and in children with a strong nervous system, the indicators became higher from 30.3±2.2 seconds to 25.1±1.8 seconds (17%). **Conclusion:** the indicators of the distribution of attention of schoolchildren will improve if they perform physical exercises at each lesson in physical culture, which are aimed at the development of speed and strength abilities. The load should be differentiated taking into account the strength of the nervous system of schoolchildren.

Keywords: health; schoolchildren; attention distribution; school, physical education.

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Introduction

In recent years, there are more and more studies by different authors that raise the problem of children's health, including physical and functional development¹⁻³.

At a certain stage of life, when a child goes to school, it is the school that takes on greater responsibility for the education, upbringing and development of the child. It is particularly important to note the importance of physical education lessons at school, where schoolchildren master the system of exercises that accompany them throughout their lives, the so-called school of movements⁴⁻⁶.

If we are talking about younger schoolchildren, then the development of motor skills, coordination

abilities comes to the fore, most of the lessons are held in a playful or competitive form. However, already in the middle level, when children get older, they have a desire to actively develop muscle mass, speed skills, and succeed in sports. It should be noted that speed and power indicators reach peak values at the age of 13-14 years, at this age it is best to purposefully develop these abilities⁷⁻⁹.

In the previous study, we proved the effectiveness of using a set of exercises for the development of speed and strength abilities in physical education classes at school¹⁰. In addition to the usual work program on physical culture at school¹¹, you should use this set of exercises, this contributes to the effective growth of speed and strength abilities.

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In physical education classes at school, it is strongly recommended to use a differentiated approach, as it fully allows you to activate the physical abilities of the schoolchildren and realize his potential in the classroom¹²⁻¹⁴. However, there are quite a lot of criteria for differentiating children into subgroups. In our opinion, the direction of typology is promising. Typology refers to the strength of nervous processes in the process of arousal¹⁰.

Separately, it should be noted the research of recent years, which speaks about the influence of physical activity of schoolchildren on the indicators of mental development of children¹⁵⁻¹⁶.

In this study, it was important for us to determine the effect of speed-strength training on the indicators of attention distribution in children aged 13-14 years, taking into account the strength of their nervous system, and this was the purpose of the study.

Methods

Participants:

The study involved 40 schoolchildren aged 13-14 years. The children attended the regular school number 60 in Kirov, Russia.

The control group – CG) consists of schoolchildren from class 7a (12 boys and 8 girls).

The experimental group (EG) consists of schoolchildren from class 7b (12 boys and 8 girls).

Before the beginning of the pedagogical experiment, all children underwent a medical examination and were allowed to take physical education classes at school.

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 between January 12 and March 20, 2020. For three months, 2 times a week, schoolchildren were engaged in physical education for 40 minutes. At the same time, the lesson schedule was unchanged. The control group trained on Tuesday (8:50-9:30) and Friday (9:40-10:20) and experimental group on Tuesday (9:40-10:20) and Friday (8:50-9:30).

Schoolchildren from CG was engaged in a standard program of physical culture for schoolchildren and additionally performed no exercise¹¹.

Schoolchildren from the EG also studied according to the standard program, but additionally performed a set of exercises aimed at developing speed and strength abilities. Physical activity in children was differentiated. Within 10 minutes, children with a strong nervous system performed more exercises than children with a weak nervous system, and children with a weak nervous system performed more series. At the same time, the exercises were well-known and there were no difficulties in performing them (jumps, push-ups, running, pull-ups, torso turns, squats, working with dumbbells and weights, and other exercises)¹⁰.

Before the beginning of the pedagogical experiment, all schoolchildren passed the tapping test, which determines the strength of the nervous system by the process of arousal.

The essence of the test is to quickly tap a pencil on a piece of paper in a certain square. There are only 6 squares and every 5 seconds you need to move from one square to another. Then you need to build a graph and determine the strength of the nervous system by the process of arousal¹⁰.

After the tapping test, it was necessary to perform the second test «different counts» (an indicator of the ability to distribute attention)¹⁷.

At the teacher's signal, the schoolchildren should write down the numbers from 1 to 20 as quickly as possible, and at the same time call the numbers out loud in reverse order, that is, from 20 to 1. The result is the time spent on the test.

Microsoft Excel was the main program for statistical processing of test results. The average values, the standard deviation, and the percentage that determined the difference between the indicators before and after the study were identified.

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:

According to the results of the tapping test in CG, 10 children were identified as having a strong nervous system, and 10 – a weak one. In EG, 10 children also had a strong nervous system, and in CG 10 – a weak one.

Table 1 shows the indicators of the ability to distribute attention in children aged 13-14 years from the beginning to the end of the pedagogical experiment.

Table 1 Indicators of the ability to distribute the attention of schoolchildren aged 13-14

Groups	Nervous system	Before	After	%
		Control	Strong	27,3±1,5
	Weak	29,0±3,2	27,3±3,0	+6%
Experimental	Strong	31,4±2,9	25,4±2,3	+19%
	Weak	30,3±2,2	25,1±1,8	+17%

Table 1 shows that during the period of the pedagogical experiment, the indicators in the test for the distribution of attention in all subgroups changed. The indicators in CG in children with a strong nervous system improved from 27.3±1.5 seconds to 25.9±1.4 seconds (+5%). In children with a weak nervous system, positive changes also occurred in three months, the indicators improved by 6%, namely from 29.0±3.2 seconds to 27.3±3.0 seconds. Such results can indicate a fairly good effectiveness of the work program in physical education at school and a natural increase in the studied indicators.

At the same time, in the EG, the indicators in both subgroups in the «different counts» test improved significantly. Thus, in children with a strong nervous system, the indicators increased by 19% (from 31.4±2.9 seconds to 25.4±2.3 seconds), and in children with a weak nervous system, the indicators became higher by 17 % (from 30.3±2.2 seconds to 25.1±1.8 seconds). Such results can speak about the effectiveness of the use of speed-strength exercises for children aged 13-14 years, taking into account the characteristics of the strength of the nervous system of schoolchildren.

Discussion

The relationship between mental abilities and physical qualities, as well as the health of people at

different ages, is a topical topic of the 21st century around the world¹⁸⁻²¹.

Physical culture plays a great role in the school years for the growth and development of children. This is especially important at school, when children are under the supervision of a teacher who is responsible not only for the safety and health of children, but also comprehensively develops them physically⁴⁻⁶.

The results obtained in the course of the pedagogical experiment are confirmed by previously studied studies.^{15-16, 22-24}. Indeed, physical activity, exercise, and movement have a positive effect on some mental processes, such as the distribution of attention. The standard physical education program at school for schoolchildren in grades 1-11 has shown its effectiveness in this matter, even if not significant. Children from the control group for a short period of time, actively engaged in physical culture were able to improve the indicators of attention distribution.

The results of the children in the experimental group may indicate some positive points:

- 1) the effectiveness of using a differentiated approach in physical education lessons at school in working with children is confirmed. Using this approach in the classroom allows you to increase the potential of physical activity of each child and the group as a whole¹²⁻¹⁴.
- 2) when differentiating children into groups, taking into account the typological criterion has proved its effectiveness. Children from class 7b significantly improved their performance in the distribution of attention in contrast to children from the control group. Thus, the use of the power of the nervous system as a criterion for differentiating children into subgroups in the educational process at school, as well as correctly selected exercises for the development of speed and strength abilities in children aged 13-14 years can significantly increase the ability to distribute attention¹⁰.

Thus, for the first time, the influence of speed-power abilities on the indicators of attention distribution in children aged 13-14 years with different strength of the nervous system was determined. This goal was achieved by the results of the study.

Conclusion

If at each lesson with schoolchildren aged 13-14 years additionally perform a set of physical exercises aimed at developing speed and strength abilities, while differentiating the physical load taking into account the strength of the nervous system involved, the indicators of the distribution of schoolchildren attention will significantly improve. It should be noted that children with a weak nervous system are not characterized by frequent changes in physical exercises, unlike children with a strong nervous system. At the same time, children with a strong nervous system are not able to perform a large number of series of one exercise. This should be taken into account when distributing the load in physical education classes at school. The study is relevant for physical education teachers, athletes and

coaches and is promising for further study of various relationships.

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Authors's contribution:

Data gathering and idea owner of this study: Polevoy G.G.

Study design: Polevoy G.G.

Data gathering: Polevoy G.G.

Writing and submitting manuscript: Polevoy G.G.

Editing and approval of final draft: Polevoy G.G.

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