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ORIGINAL ARTICLE

The Influence of speed-power abilities on the intellectual abilities of school children with different strength of the nervous system

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ABSTRACT

The aim is to determine the effect of speed and strength training on the intellectual abilities of children aged 13-14 years, taking into account the strength of their nervous system.

Methods: the pedagogical experiment took place in a school (Kirov, Russia) and lasted for 3 months. The study involved 40 children aged 13-14 years, who studied in the 7th grade. Children from the control group were engaged in the usual physical education program at school. Children from the experimental group were engaged in the usual program, but additionally performed exercises to develop speed and strength abilities. The load was differentiated taking into account the strength of the schoolchildren nervous system. The tapping test determined the strength of the schoolchildren nervous system. "Choose unnecessary" determined the indicators of intellectual abilities of schoolchildren.

Results: after the study, the indicators in all subgroups improved, but in different ways. In schoolchildren with a strong nervous system in CG, the indicators of intellectual abilities improved from 7.1±1.1 to 7.5±1.0, the increase in indicators was only 6%. In children with a weak nervous system, the indicators improved from 7.5±1.0 to 8.1±1.0, and the increase in intellectual abilities was 8%. At the same time, the results in the EG in both subgroups were much more significant. Thus, in children with a strong nervous system, the indicators improved from 7.4±0.7 to 8.5±0.8, an increase of 17%. And in children with a strong nervous system, the indicators improved from 7.7±1.2 to 9.2±1.4, an increase of 20%.

Conclusion: the indicators of intellectual abilities of schoolchildren aged 13-14 years will improve if they perform physical exercises aimed at developing speed and strength abilities at each physical culture lesson at school. At the same time, the physical activity for children with a strong and weak nervous system should be differentiated according to the process of arousal.

Keywords: health, speed abilities, schoolchildren, physical development.

INTRODUCTION

Physical education at school plays a great role in the development of the functional capabilities of the body, its hardening, and efficiency. During school years, physical education classes are actively working on the development of all physical abilities of children, strength, speed, endurance, flexibility and agility[1-2].

If we are talking about working with children in primary school age, then the emotional load, various game exercises (outdoor games and relay races) will be relevant. It is important to develop agility, flexibility and endurance. However, in the middle and senior level, the sensitive period is more suitable for the development of speed-power abilities. At the same time, if you purposefully develop certain physical abilities in a favorable period, then their indicators will significantly improve, the effect will be higher[3-4].

A set of physical exercises aimed at developing speed and strength abilities at the age of 13-14 years positively affects the development of these abilities in this age period of time. We proved this in a previous study[5]. This complex is an excellent addition to the standard work program for physical education at school[6].

A differentiated approach is an integral part of working with schoolchildren of different ages. This approach allows you to discover the inner physiological potential of each schoolchildren and gives you the opportunity to express yourself in a particular physical exercise[7-8]. According to different criteria, children are differentiated into groups, including gender, physical development, and technical or physical data. However, in our opinion, the most promising is the direction of typology, in this case, the strength of the nervous system in the process of arousal[5].

It should be noted that a large number of studies are devoted to the study of physical activity of schoolchildren and the impact of such activity on attention, memory and other mental processes of schoolchildren[9-11].

In the new study, we aimed to determine the effect of speed and strength training on the intellectual abilities of children aged 13-14 years, taking into account the strength of their nervous system.

METHODS

Participants: The study involved 40 schoolchildren. 20 children from class 7a (12 boys and 8 girls) were assigned to the control group (CG). The experimental group (EG) included schoolchildren from class 7b (as well as 20 people: 12 boys and 8 girls). Before the start of the study, all the children who took part in the pedagogical experiment were healthy and allowed by a medical professional to take physical education lessons.

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: In Russia, in the city of Kirov in the secondary school number 60, a pedagogical study was conducted. The experiment was conducted in 2020 (January 12 – March 20). During the three months of the study, 20 physical education lessons were conducted in each class.

Classes were held twice a week for forty minutes each lesson.

Children from class 7a (CG) were engaged in the usual physical education program at school[6].

Children from the 7b (EG) class also studied according to the usual program. But in addition, they performed physical exercises for the development of speed and strength abilities (jumping, running, squats, push-ups, pull-ups, working with dumbbells, and some others). For children with different strength of the nervous system, there was a different physical activity. In schoolchildren with a strong nervous system, it was intense (frequent changes of exercises and fewer series), in schoolchildren with a weak nervous system-a volume load[5].

Before starting the study, all schoolchildren took control tests: Tapping test-determined the strength of the nervous system by the process of arousal.

The essence of the test: children at the command of the teacher should quickly put the dots in the square number 1 (on a piece of paper with a pencil). Then move on the signal to the second square and so on to the 6th square. You must move from square to square at the teacher's command every 5 seconds. Based on the test results, a graph is plotted and the strength of the nervous system is determined[5].

Choose unnecessary-determined the level of intellectual abilities of schoolchildren[12].

There are 100 drawings in front of the schoolchildren. There are 20 rows in total, each row has 5 drawings. Of the five drawings, there are 4 that are similar in meaning, the fifth is different, for example, a car, an airplane, a train, a ship and an apple. The task is to quickly identify an extra drawing. The test execution time is 10 seconds. The result is the number of correct drawings that the schoolchildren chose.

Mathematical and statistical processing of the results was carried out using Microsoft Excel. The average values and standard deviation in the intellectual ability test scores were determined, and their percentage increase by the end of the experiment was determined.

RESULTS

All 40 schoolchildren were differentiated into subgroups based on the strength of the nervous system. In the CG, as in the EG, there were 10 people with a strong nervous system and 10 people with a weak nervous system.

Table 1 shows the indicators of intellectual abilities of schoolchildren aged 13-14 years at the beginning and at the end of the study.

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

Groups	Nervous system	Before	After	%
Control	Strong	7,1±1,1	7,5±1,0	+6%
	Weak	7,5±1,0	8,1±1,0	+8%
Experimental	Strong	7,4±0,7	8,5±0,8	+17%
	Weak	7,7±1,2	9,2±1,4	+20%

Table 1 shows that the indicators in CG and EG and in subgroups improved, but this happened in different ways. In schoolchildren with a strong nervous system in CG, the indicators of intellectual abilities improved from 7.1±1.1 to 7.5±1.0, the increase in indicators was only 6%. In children with a weak nervous system, the indicators improved from 7.5±1.0 to 8.1±1.0, and the increase in intellectual abilities was 8%. These results indicate a good impact of the standard physical education program at school on the intellectual abilities of schoolchildren aged 13-14 years.

At the same time, the results in the EG in both subgroups were much more significant. Thus, in children with a strong nervous system, the indicators improved from 7.4±0.7 to 8.5±0.8, an increase of 17%. And in children with a strong nervous system, the indicators improved from 7.7±1.2 to 9.2±1.4, an increase of 20%. Such results allow us to speak about the great effectiveness of the complex of speed-strength exercises introduced into the educational process for schoolchildren 13-14, differentiated taking into account the strength of the nervous system in the process of arousal.

DISCUSSION

In recent years, the authors of many studies attach great importance to the health of children at school, in this case, the subject of physical culture comes to the fore[1-2]. There are standard methods and programs for schoolchildren in grades 1-11[6]. However, they are not perfect and in our opinion need to be supplemented.

Of course, the results in the CG indicate that the standard physical education program at school had a positive effect on the increase in the indicators of intellectual abilities of schoolchildren, but their increase was not significant. Only 6% in children with a strong nervous system and 8% in children with a weak nervous system. It is also possible to assume a natural increase in intellectual abilities for 3 months of the pedagogical experiment.

The results of the study that showed children from the EG are significantly higher. Children with a strong nervous system were able to improve their intellectual abilities by 17%, and children with a weak nervous system improved their performance by 20%. Some conclusions follow from this:

a set of physical exercises aimed at the development of speed and strength abilities has a significant and positive impact on the intellectual abilities of children aged 13-14 years.

a differentiated approach based on the typological features of the manifestation of the properties of the nervous system, namely, the strength of the nervous system in the process of excitation is effective for the development of not only speed-power abilities, but also has a positive effect on the indicators of intellectual abilities of schoolchildren. The effectiveness of using a differentiated approach in working with schoolchildren and school-age athletes has been proven in previous studies[7-8].

Thus, the aim of the study was achieved, namely, to determine the effect of speed and strength training on the intellectual abilities of children aged 13-14 years, taking into account the strength of their nervous system.

CONCLUSION

When working with schoolchildren in physical education classes, it is necessary to use a differentiated approach. One of the criteria for differentiating children into subgroups is the typological criterion (strength of the nervous system).

Thus, the load for children with different nervous systems should be different. For schoolchildren with a strong nervous system, it should be intense, that is, more exercises and fewer series. And in children with a weak nervous system, it is more effective to use the opposite load, that is, volume. The development of speed and strength abilities of schoolchildren has a positive effect on their intellectual abilities. The new study is promising for studying the relationship between children's physical activity and their mental processes, and is also relevant for studying materials for schoolchildren, athletes, coaches and teachers on physical culture at school and at university.

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