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INFLUENCE OF SPEED-POWER ABILITIES ON THE SPEED ENDURANCE OF CHILDREN AGED 13-14 YEARS WITH DIFFERENT TYPOLOGY

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ABSTRACT

The aim is to evaluate the influence of strength and speed exercises on the speed endurance indicators in students, considering the multidirectional load based on the strength of the children's nervous system. The pedagogical experiment lasted for 3 months in an ordinary school in Russia. The study involved seventh-graders in the number of 40 children aged 13-14 years. In the experimental group, students performed exercises with a differentiated load depending on their typology, which was determined using a tapping test. Strength and speed qualities were evaluated by three tests: long jump, trunk lift, flexion, and extension of the arms. Speed endurance was evaluated by the test – «jump over the rope». After the study, in the control class, in children that have a strong nervous system, indicators of speed-strength improved by 2-3%, and speed-endurance indicators increased by only 8%, and with a weak by 2-4%, and speed-endurance indicators became higher by 6%. The indicators in children from the experimental class in the subgroup that have a strong nervous system improved by 13-14%, and the indicators of speed endurance increased by 19%. In children that have a weak nervous system, the speed-strength qualities indicators increased by 11-16%, and the qualities of speed endurance increased by 23%. If you perform a set of exercises for the development of speed and power abilities in physical education classes at school, both speed-power abilities and the qualities of speed endurance indicators will increase.

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Introduction

In recent years, the authors of many studies have attached particular importance to the physical activity and health of students from different age groups. At school, during physical education classes, children learn the material they need for further active life [1]. The main task of physical education at school is the qualitative and comprehensive development of children, the development of physical qualities - strength, flexibility, endurance, speed, and coordination. Physical qualities are interrelated, that is, by developing one physical quality, we influence the indicators of another physical quality [2-6].

In early researches, we have shown the effect of coordination training on indicators of other physical abilities in primary school children [7]. However, if coordination abilities or motor skills should be purposefully developed in primary school age, then middle and high school age are favorable for the development of speed-strength abilities [8-10].

Of course, many studies emphasized the importance of employing different approaches in working with students from different age goups [11-13]. One of the most effective and proven by us earlier is the typological criterion for differentiating children into groups. Namely, the selection of optimal physical activity depending on the nervous system type is typology [7].

Materials and Methods

Participants

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The new study involved students aged 13-14, who were healthy and admitted to physical education classes at school. 40 children from the seventh grade were divided into two groups. The control group (CG) – children from class 7a. The experimental group (EG) - children from class 7b.

Procedure

The experiment was conducted in Kirov, Russia, at secondary school number 60. The duration of the experiment was 3 months (January 12 – March 20, 2020). During the study period, 20 physical education lessons were conducted in each class, 2 lessons per week and 40 minutes each lesson. The lesson schedule did not change during the experiment period. 7a were engaged in physical education on Tuesday (8.50-9.30) and Friday (9.40-10.20). At the same time, schoolchildren from 7b were engaged in physical education on Tuesday (9.40-10.20) and Friday (8.50-9.30)

Children from CG participated in the standard physical education program at school.

The children from EG additionally performed some well-known exercises, they were aimed at developing speed and strength qualities. The complex included such exercises as running in different directions, torso turns, working with dumbbells, pull-ups, jumps, squats, and some other exercises. Students with a strong nervous system performed exercises with a high intensity of load, namely, frequent changes of exercises are characteristic, unlike children that have a weak nervous system. Children that have a weak nervous system performed a different load - a volumetric one, namely, they performed a larger number of series [7].

All the study participants passed a tapping test, which divided the children into subgroups depending on the type or strength of their nervous system.

The essence of the test is as follows: at the teacher's signal, children should quickly use a pencil to put dots on a piece of paper in a square with the number one. At the command of the teacher, after 5 seconds, go to the second square, and so on to the sixth square. As a result of the data obtained, a graph is plotted and then the type of nervous system is determined by excitation [7].

Speed-power abilities were evaluated by three tests:

1. Long jump [14].
2. Lifting the torso [15].
3. Flexion and extension of the arms [16].

Speed endurance was determined by the test – «jump over the rope» [1].

Before you start moving, you need to stand up straight, throw the rope behind your back, bend your arms at the elbows. Start spinning the rope. The total number of jumps in 1 minute is calculated

Mathematical processing using the Excel program. We determined the average value in each subgroup in CG and EG in schoolchildren with strong and weak nervous systems. The standard deviation from the averages was determined. The percentage of the effectiveness of the impact of physical education during the study period was determined.

Results and Discussion

As a result of the tapping test, out of 20 children in the EG, 10 were identified in the subgroup with a strong nervous system and 10 in the group with a weak nervous system. In the CG, the children have differentiated into subgroups the same plan.

Table 1 shows the indicators of speed-strength abilities and speeds endurance in CG in schoolchildren aged 13-14.

Table 1. Indicators in CG

Test	Strong nervous system			Weak nervous system		
	Before	**After**	**%**	**Before**	**After**	**%**
Long jump from a place with a push with two legs (cm)	185,1±4,7	190,7±4,8	+3%	189,6±4,5	197,2±4,7	+4%
Lifting the torso from the supine position (20 sec)	12,8±1,1	13,1±1,2	+2%	12,3±1,1	12,8±1,1	+4%
Flexion and extension of the arms at the stop while lying on the floor (20 sec)	7,8±0,8	8,0±0,8	+3%	8,2±0,8	8,4±0,8	+2%
jump over the rope (number of times)	43,6±3,8	47,1±4,1	+8%	42,6±3,5	45,2±3,7	+6%

Table 1 shows that there were improvements in all indicators in the CG. Over 3 months, students who study according to the usual program have improved their qualities «Long jump» from 185.1±4.7 to 190.7±4.8. In children with a strong nervous system, the increase in indicators was only 3%, and the increase in indicators was 4% in children with a weak nervous system., The performance improved in schoolchildren with a strong nervous system by 2% in the «Lifting the torso» test, and increased by 4% in schoolchildren with a weak nervous system. The performance of children with a strong nervous system in the test «Flexion and extension of the arms» improved from 7.8±0.8 to 8.0±0.8, an increase of 3%, and in children with a weak nervous system, the performance improved by 2%.

If we consider speed endurance, then here the indicators have not improved significantly at all. In the «jump over the rope» test, the indicators in students with a strong nervous system improved from 43.6±3.8 to 47.1±4.1, the increase in indicators was 8%, and in students with a strong nervous system improved only 6%.

The data obtained in this group may indicate a rather weak influence of the studied abilities on the development of endurance qualities.

Table 2 shows the indicators of speed-strength abilities and speed endurance in EG.

Table 2. Indicators in EG

Test	Strong nervous system			Weak nervous system		
	Before	**After**	**%**	**Before**	**After**	**%**
Long jump (cm)	197,0±6,8	224,6±7,8	+14%	188,0±4,9	218,1±5,7	+16%
Lifting the torso (20 sec)	12,7±1,1	14,4±1,2	+13%	13,0±0,8	14,4±0,9	+11%
Flexion and extension of the arms (20 sec)	8,0±0,8	9,1±0,9	+14%	8,5±0,5	9,5±0,6	+12%
jump over the rope (number of times)	41,3±2,1	49,1±2,4	+19%	40,7±1,5	50,1±1,8	+23%

Table 2 shows that the children from the EG significantly improved their performance on all tests, in contrast to the schoolchildren of the CG. In the test «Long jump», the indicators in children with a strong nervous system improved from 197.0±6.8 to 224.6±7.8, the increase in indicators was 14%, and children with a weak nervous system improved their performance by 16%.

The performance of children that have a strong nervous system improved by 13% in the test «Lifting the torso», and the performance was higher by 11% in students that have a weak nervous system.

In the test «Flexion and extension of the arms», the indicators improved by 14%, in students that have a strong nervous system, and they were higher by 12% in children that have a weak nervous system.

The performance of speed endurance in EG also improved significantly concerning CG in both subgroups. In the «jump over the rope» test, the indicators improved from 41.3±2.1 to 49.1±2.4, the increase in indicators was 19%. The indicators improved by 23% in 3 months in children that have a weak nervous system.

The data that we received in this group suggests that the use of strength and speed exercises in physical education classes at school has a positive and positive effect on the endurance indicators of students aged 13-14.

Physical education at school is very important for the growth and development of a young schoolchildren's body. During the period of study at school, children should qualitatively master new elements of motor actions by their ligaments or combinations. Most of the movements learned in physical education classes will be used in everyday life, in everyday life [17-19].

As a rule, the standard physical education methodic at school covers the entire range of active and versatile activities of schoolchildren [1]. In previous studies, we have proved the effectiveness of introducing strength and speed exercises for students aged 13-14 years into the educational process of physical education of schoolchildren [7]. Such a complex helps to purposefully influence the speed and strength abilities of schoolchildren and significantly increase them in this age period, which is favorable for their development [8-10]. The results obtained during the new experiment confirm the opinion of many authors that during the period of sensitive development of qualities, they should be developed, since the indicators in KG increased, yes, not significantly, but sufficiently in a short time, while they were not emphasized in the lessons.

The results shown by the children in the EG indicate the effectiveness of using a differentiated approach based on the typology of the nervous system. Previously, it was proved that in working with children of any age, a differentiated approach should be used in physical education classes or sports sections [11-13]. The results in the EG significantly improved both in children with weak and strong nervous systems concerning the CG, not only due to the targeted impact on speed-strength abilities but also considering the nervous system's strength as a criterion for differentiating students into subgroups when working in the classroom.

But the task of our experiment was to determine the impact of strength and speed training in students aged 13-14 on the indicators of speed endurance, considering the differentiated load, which is based on the typology of the nervous system of children of this age. We were able to establish this relationship. That is, by purposefully influencing the speed and power indicators of children, we also affect their speed endurance. At the same time, the load should be differentiated depending on the strength of the student's nervous system. The relationship between different physical abilities is confirmed by other authors who have studied similar problems [2-4].

Conclusion

At school, in physical education, children aged 13-14 should additionally perform exercises to develop strength and strength qualities, such abilities not only develop these qualities but also have a positive impact on the speed endurance development.

At the same time, it is important to use different approaches in working with schoolchildren from different age groups, including from 13-14 years old. The typology of the nervous system will be an effective method of influence. The load for students with a strong nervous system will be intense (change exercises more often), and for the weak - voluminous (more approaches and series of exercises).

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