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Development Of Coordination Abilities Of Children With Visual Impairment.

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ABSTRACT

Physical education and sports in the form of classes in physical education classes and in the form of specialized mobile and sports games - goalball, torball and rollingball are of great importance in the development of the personality of students with visual impairments. They provide the movements necessary for the child, contributing to the development of his physiological systems, determining the pace and nature of the functioning of the growing organism. A blind child, like any child, is committed to an orderly activity. However, the first obstacles when moving in space with unskillful or insufficient guidance of movements lead to the fact that the child begins to be afraid of space. The formation of spatial concepts, orientation and mobility in blind children is closely related to physical development, their kinesthesia and the ability to self-analyze and interpret their sensations and perceptions. The system mechanism of perception of space always includes the interaction of various analyzers; Moreover, each modality can and reflects the spatial characteristics of objects. 42 children (28 boys and 14 girls) aged 12–15 years (mean 13.5 ± 0.9 years) with visual impairment were examined. The children were divided into groups based on their sports specialization and its absence. The subjects were assessed as the state of the nervous system (tapping test Ilyina), the level of coordination abilities (Romberg's test) and the response time to an external stimulus (electromillichronometry). Significant differences in children involved in sports and children who do not have experience in sports training activities are recorded in terms of the "Romberg test" and in the ability of children to react to external stimuli. In terms of Ilya's tapping test, the differences between the groups of subjects were insignificant. For children with visual impairment, physical education lessons are especially important, and they will be adapted to their condition with strict control over them during these sessions.

Key words: disabled, visual impairment, goalball.

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INTRODUCTION

The development of modern science of man is firmly based on the results of studies of the physiological characteristics of the organism in various environmental conditions [1,2,3]. This information is of great practical value, since it was obtained at different biological objects [4,5,6], which are at different stages of ontogenesis [7,8], in different physiological status [9,10] and with different health conditions [11,12]. With their help, it is possible to get a clearer picture of the dynamics of the functioning of the body under different conditions [13,14] and the possibilities to influence it with the help of modern options for recovery [15,16]. For this reason, well-known model animal experiments [17–21] are of great practical value, since they open up the possibilities of practical bioregulation [22] using accessible and safe methods of recovery [23,24].

Of particular importance in this vein are the studies on the adaptation and rehabilitation of children with the pathology of sensory systems, and in the first place with loss of vision. It is known that when a person loses sight, first of all, spatial orientation suffers. The level of its development depends on the time of vision loss. The earlier this happens, the more difficult it is for a blind person to have a spatial orientation [25]. A complete connection between a person who has lost his sight and the environment is violated [25]. This negatively affects the activity of a person, his mental and physical development, affects the speed, accuracy, coordination of movements, the formation of dynamic stereotypes [26].

The formation of spatial concepts, orientation and mobility in blind children is closely related to physical development, coordination abilities, their kinesthesia and the ability to self-analyze and interpret their sensations and perceptions [27]. The system mechanism of perception of space always includes the interaction of various analyzers; however, each modality can and reflects the spatial characteristics of objects [28]. The study of these qualities among blind schoolchildren has shown that their ability to perform coordinated and precise movements is significantly lower than that of sighted peers. Thus, the lag in the coordination of movements in children 8–9 years old is 28.2%, in 10–11 years old it is 39.7%, and by the age of 16 it reaches 52%. Schoolchildren have difficulty in making concerted movements of the arms and legs [29,30].

The method of developing coordination abilities and spatial orientation was based on the sports game goalball. Goalball is a special game for blind and visually impaired athletes, a Paralympic sport [31]. Goalball is an effective means of improving the health and physical development of athletes involved. Practically all muscle groups are involved in the goal, coordination of movements and hearing, the ability to analyze the space, correlate oneself, partner and gaming tools in this space, quickly, accurately and accurately respond to the changes taking place are being worked out [32]. In this regard, the goal is set in the work: to determine the effect of the developed methodology on the coordination abilities of children with visual impairment.

MATERIALS AND METHODS

The study involved 42 students (boys and girls) from 12 to 15 years old who have visual impairment. The voluntary consent of the students, the consent of the parents (guardians) for the participation of their children in the study. The subjects were divided into two groups: the control group (20 people) and the experimental group (22 people). In the control group, children who are not involved in sports were identified; in the experimental group, children involved in goalball were identified.

To study the orientation in space and coordination abilities of blind and visually impaired students in accordance with the tasks, the following methods were used [33-36]:

- Ilya's tapping test. This technique allows you to determine the strength of nerve processes. The strength of nerve processes is an indicator of the health of nerve cells and the nervous system as a whole. The technique is based on determining the dynamics of the maximum rate of movement of the hands;
- Romberg samples. This test is widely used in sports to assess coordination abilities. Reveals changes in balance (staggering or even falling - "Romberg's symptom") when you turn off your eyesight;

- electromillometrics was carried out to determine the time of the motor reaction of children to an external irritant (cotton). To estimate the reaction time when performing various motor actions, an electronic millichrometer was used.

The data obtained in the course of the study were subjected to statistical processing with the calculation of the arithmetic mean value (M), the error of the mean value (m).

RESULTS AND DISCUSSION

In the course of the study, the coordination abilities of children involved in and not engaged in Goalball were tested. A study was conducted of the properties of the nervous system of children with visual impairment, engaged in Goalball and not having sports training experience (Ilya's teping test). Tests of Romberg: heel-toe and stork. These children were divided into 3 categories (according to the sports classification of athletes with visual impairment):

- B1 - totally blind children;
 - B2 and B3 - visually impaired children.
- Test results are presented in tables.

Table 1. Results of testing children engaged in and not engaged in goalball

Test subjects		Indicators		
		$\bar{X} \pm \delta$		
		Tapping - Ilyin test (number of points)	Heel-toe test (s)	Stork (sec)
Practicing goalball	Girls	27.87±4.06	63.9±18.1	6.4±3.5
	Boys	27.38±4.9	65.0±21.0	6.7±4.2
Not engaged goalball	Girls	23.9±3.47	22.6±13.6	4.4±1.9
	Boys	26.0±2.7	56.5±26.9	9.7±4.5

From the indicators of average values, it turned out that blind and visually impaired young men, in almost all indicators, coped with the test better than girls in this category. The average value of boys is 4.6% higher than the average value of girls.

In the course of comparing the results of blind and visually impaired girls, the results of visually impaired athletes significantly exceed the results of totally blind. The average rate of visually impaired girls is 13.6% higher than that of girls in category B1. In young men, three indicators of total blind athletes out of eight significantly exceed those of the visually impaired. However, the average value of young men of categories B2 and B3 is 4.6% higher than the average value of young people of category B1. Totally blind girls in almost all indicators are significantly inferior to boys in the same category. This proves the average value, which is 10.2% lower for girls than for boys.

Ilyin's tapping test results show that neither visually impaired girls nor young men of the same category have a clear advantage. This confirms the relatively equal average value of athletes. Girls are only 0.7% of boys.

Based on the obtained results, we determined the type of nervous system in each of the children with visual impairment involved in the ballball.

It turned out that 36% of children have a strong type of nervous system, 29% - medium-strong type, 25% - medium type, 7% - medium-weak type, and only 3% of athletes have weak type.

We also conducted a tapping test in the control group - in children with visual impairment, who were not involved in goalball. We compared the obtained data with the results of testing in children involved in goalball.

The average value of girls and boys who are not involved in ballball is significantly lower than that of the athletes involved.

Then we divided the children into categories of disability and separately compared the average values of boys and girls involved in and not engaged in goalball.

Totally blind and visually impaired young men engaged in goalball, coped with the Ilya's tapping test much better. The average value of visually impaired girls also exceeds the figures of girls who are not engaged in goalball. Girls category B1 coped worse with the test. However, this lag is so small that it is only 1.6%.

In non- goalball-finding children, we identified the following types of nervous system: in 58% - the average type, 25% - the medium-weak, 8% - the medium-strong and 8% - the weak type and only 1% - the strong.

Thanks to the obtained results, we see that among these children the average type of the nervous system prevails, while in children - sportsmen a significant percentage is made up of owners of a strong nervous system.

When carrying out the Romberg test (heel-nosochny), children who are not engaged in a goalball lag behind in terms of children attending a goalball training session. Between girls, these figures differ significantly. Perhaps this is due to the fact that the children, while performing the test, closed their eyes, finding themselves without any guidelines, that for children playing a goalball, where the dressings put on each game, is a familiar setting and they feel more confident and comfortable. In boys, no significant differences were found, but children who are not involved in sports showed worse results than their peers who are passionate about goalball.

When conducting a sample of Romberg (posture "Stork"), the results differed from the heel-toe test. Girls who are not engaged in goalball, on average, showed a result lower by only 2 seconds than girls who regularly practice goalball. Young men who are not related to the goalball showed better results than their peers playing the "dubbed ball". Such low rates of children with visual impairment, we explain with a reduced footprint, which for children is undoubtedly a difficult coordination position that needs to be kept with eyes closed.

To determine the response time to an external stimulus, a test was performed using an electromillimeter.

It is noted that the reaction time with right and left hands with eyes open in girls involved in goalball is significantly longer than the exercise, but with eyes closed, the reaction time to external stimuli with the left hand (and with eyes closed and open) occurs faster than with the right (table 2). In girls who do not have sports specialization, the picture is reversed, the reaction time of both hands with open eyes is significantly better than the reaction time with eyes closed, but the right hand responds faster to the "cracker". The reaction time of girls involved in sports games is significantly better in all indicators than in girls who are not involved in goalball.

Table 2. The results of testing children engaged and not engaged in goalball

Test subjects		Indicators			
		$X \pm \delta$			
		Reaction time with the right hand (millisec)		Reaction time with the left hand (millisec)	
floor		eyes open	eyes closed	eyes open	eyes closed
Practicing goalball	Girls	0.172±0.04	0.165±0.04	0.162±0.04	0.146±0.05
	Boys	0.147±0.05	0.142±0.05	0.148±0.05	0.148±0.05
Not engaged goalball	Girls	0.179±0.05	0.195±0.05	0.188±0.05	0.196±0.05
	Boys	0.165±0.06	0.177±0.04	0.191±0.08	0.180±0.06

For boys engaged in goalball, the reaction time is faster than for girls involved in goalball and boys who are not related to the sports games of the blind. The results of the right and left hand are almost the same and do not have significant differences.

In children with visual impairment, due to the nature of the disease, there is a slight delay in the formation of motor programs. In this case, the interaction of the sensory and motor components of the motor action is reflected in the effectiveness of the implementation of the motor program [37,38,39]. However, children involved in sports showed high results of reaction time to an external irritant, which is an important criterion in systematization of compensation processes, impaired body functions, compared to children not involved in sports.

CONCLUSION

The developed method of developing the coordination abilities of blind and visually impaired children on the basis of the sports game goalball has greater efficiency and practical significance. Almost all students showed good results in the ability to coordinate their movements, thanks to the systematic exercise of sports in physical education classes using the game of goalball. The study identified the types of the nervous system among children with visual impairment, engaged and not engaged in goalball. The results show that the nervous system of children involved in goalball is more resistant to stress than in children who are not involved in sports. Test results: Ilyin test; Romberg samples (heel-toe, stork); the time of the motor reaction showed that children engaged in goalball cope with tasks better than children who are not engaged in goalball. Proper construction of the educational process of teaching blind and visually impaired children in a boarding school, the use of rational methods and techniques by means of a goalball, the inclusion of a child in full-fledged communication, joint activities and mutual assistance of teachers and parents in this direction will avoid worsening deviations and significantly increase the level of pupils' assimilation new sports knowledge and skills. Purposeful correction of physical development, the formation in children of the necessary arsenal of motor skills and skills, the development of physical qualities, the improvement of the general somatic and mental state by means of physical education largely predetermines the effectiveness of adaptation to life in a society of blind and visually impaired children. These studies can contribute to the formation of motivation in the early stages of sports training with the definition of ways to correct the motor sphere of this category of children, and their adaptation to other activities. Physical education lessons with elements of goalball not only strengthen children's health, increase their working capacity, develop physical qualities, but also teach vital motor skills and abilities, apply them in different complexity conditions and nurture the need for systematic exercise and sports.

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