



Research into psychomotor differences in adolescents with childhood cerebral palsy who participate in adaptive sports and those who do not

UDC 796:159.9



PhD, Professor **N.O. Rubtsova**¹

PhD, Associate Professor **T.V. Artamonova**¹

PhD, Associate Professor **I.K. Spirina**¹

¹The Russian University of Sport «GTSOLIFK», Moscow

Corresponding author: rubcova.no@gtsolifk.ru

Received by the editorial office on 30.05.2025

Abstract

Objective of the study is to identify the characteristics of psychomotor development in adolescents with cerebral palsy who participate and do not participate in adaptive sports.

Methods and structure of the study. 20 adolescents aged 12-14 with cerebral palsy (10 sledge hockey players from the CSKA team and 10 students from Boarding School No. 17, Moscow) participated in the scientific study conducted in November 2024. All respondents had been diagnosed with spastic diplegia and had normal intellectual abilities. To assess the level of psychomotor development in adolescents with cerebral palsy who participate in sports and those who do not, the following indicators were studied: reaction time to light, reaction time to sound, reaction time to choice, duration of an individual minute, and the tapping test. The PsychoTest hardware and software complex was used.

Results and conclusions. It has been found that sledge hockey has a positive effect on the psychomotor development of adolescents with cerebral palsy, contributing to improved psycho-emotional health. Athletes with cerebral palsy have a higher level of ability to regulate their actions based on the information they receive and their concentration compared to their peers, the productive quality of their nervous system is higher, and their psychological state is much closer to that of their typical peers.

Keywords: *psychomotor skills, cerebral palsy, adaptive sports, tapping test, practising and non-practising adolescents, sledge hockey.*

Introduction. Recently, specialists have noted a significant increase in interest in studying the motor condition of children and adolescents with cerebral palsy (CP). This is due, on the one hand, to the fact that the percentage of children with this pathology is increasing year by year, and on the other hand, to the expansion of the search for opportunities for their rehabilitation, including the use of adaptive sports [2].

The motor function of adolescents with CP can vary significantly depending on the severity of the disease, the presence of concomitant disorders and, as recent studies have shown, participation in sports activities. In this regard, studies of the psychomotor development of young Paralympians deserve special attention.

One of the most popular types of adaptive sports is sledge hockey, a Paralympic version of classic hockey

that appeared in Russia in the 2000s. This sport is included in the program of the Winter Paralympic Games [6].

A necessary condition for effective performance in sledge hockey is not only physical, technical and tactical readiness, but also psychological readiness of the athlete [7].

An objective and accurate assessment of the key psychomotor development indicators for sledge hockey players is one of the aspects of competently designing a training program and monitoring the condition of those involved [6].

Studying the psychomotor development of adolescents with cerebral palsy can reveal the specific characteristics of each individual, allowing for the development of more effective and personalized programs for subsequent stages of rehabilitation [3].



In this regard, a study was conducted to diagnose and compare the main indicators of psychomotor development in adolescents with CP who participate and do not participate in adaptive sports.

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Results of the study and discussion. The following results were obtained during the scientific work (Table 1).

The results of the 'Individual Minute' test showed that young athletes with cerebral palsy are on average 32.8% more accurate in determining this time parameter. As is well known, this technique is used in working with athletes to assess their psychological state, which can indicate a good state of concentration, combat readiness, or increased anxiety, rest-

lessness, depression, excessive relaxation, or lack of focus. The fact that adolescents with cerebral palsy exceeded 1 minute in this test may indicate an overly relaxed state, when time passes very slowly. However, young sledge hockey players are much closer to the norm in this parameter compared to non-athletes with similar nosology.

Measuring the time of motor responses is one of the most convenient and widely used methods for studying the dynamics of nervous processes in general, and is widely used in the physiology of higher nervous activity in humans [1].

The most pronounced difference in the psychomotor indicators of young sledge hockey players and their peers who do not play sports was found in the results of RMO measurements. It was found that the RMO indicator in young sledge hockey players is 372.61 ms lower than in non-athletes, and the results themselves differ by 61.3%.

The speed of motor reaction is of great practical importance for virtually any professional activity involving the performance of any motor actions [4].

The speed of a person's reaction to different stimuli varies. However, reaction time may vary depending on individual characteristics (fatigue, nervous system characteristics, emotional and mental characteristics), sound intensity, and other factors.

Our study found that adolescents with cerebral palsy who play sledge hockey have shorter motor reaction times to sound and light than their peers with the same diagnosis who do not play sports. The results of reaction times to sound differ by 16.7%, and to light

Table Results of psychomotor testing in adolescents with cerebral palsy who play sledge hockey

Test indicators	Statistical indicators	Group of respondents		Δ , %
		Participate (n=10)	Do not participate (n=10)	
Reaction time to light, ms	$\bar{X} \pm m$	380,00	456,24	16,7
		42,03	51,09	
Reaction time to sound, ms	$\bar{X} \pm m$	438,05	544,72	19,6
		24,92	53,28	
Reactions to a moving object (RMO), ms	$\bar{X} \pm m$	234,95	607,56	61,3
		44,32	185,47	
Reaction time to choice, ms	$\bar{X} \pm m$	575,85	779,88	26,2
		34,56	51,64	
Individual minute error, s	$\bar{X} \pm m$	16,60	24,70	32,8
		6,67	7,06	
Tapping test, number of movements	$\bar{X} \pm m$	38,50	39,62	-2,8
		4,90	2,81	



by 19.6%. At the same time, it was found that adolescents with CP reacted faster to light than to sound, which contradicts the data obtained in a study of normotypical adolescents (it is indicated that they react faster to sound than to light).

The reaction time for making a choice increases in comparison with the time for a simple motor reaction to light and sound due to the appearance of an additional information processing stage. This stage is mainly associated with the processes of recognition and classification of a stimulus into a specific group or category. Nevertheless, young sledge hockey players have a choice time that is more than 200 ms (26.2%) shorter than that of their peers with the same nosology who do not participate in sports. This parameter is believed to be related to cognitive processes [4, 8].

The tapping test allows you to assess the maximum speed of hand movements and identify shifts in the central nervous system, rather than in the muscles [5]. It is known that a normal child over 10 years of age, like an adult, should normally score at least 50 points in 10 seconds. A result of 40-49 dots in 10 seconds indicates minor motor problems. If the result is below 40, there are obvious motor problems.

In our study, the results of adolescents with cerebral palsy who participate in sports and those who do not were identical, at 38.50 and 39.62 movements in 10 seconds, respectively. Indeed, adolescents with cerebral palsy have serious motor problems due to their central nervous system (CNS) disease. Sports training in sledge hockey, aimed at improving physical, technical, tactical and mental preparedness, does not affect the deep processes in the CNS.

Conclusions. Thus, the study of psychomotor indicators in adolescents with cerebral palsy who participate and do not participate in sports showed that sled hockey has a positive effect on some important parameters of psychomotor development.

It was found that athletes with CP have a higher level of ability to regulate their actions based on the information they receive compared to their peers who do not participate in sports. In addition, the productive quality of the nervous system of young sledge hockey players, judging by the results of simple motor reactions to light and sound, is higher than that of their peers with cerebral palsy who do not participate in sports.

Judging by the results of the 'Individual Minute' test, young sledge hockey players are much closer in

their psychological state to their normotypical peers and have a higher level of concentration compared to non-athletes with similar nosology.

Based on the study, it can be concluded that sledge hockey has a positive effect on the psychomotor development of adolescents with cerebral palsy, contributing to the improvement of their psycho-emotional health.

For a more detailed study of adaptation resources, it is necessary to conduct a wide range of comprehensive testing of various aspects of the preparedness of athletes with cerebral palsy.

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