

# Influence of physical recreation of students with disabilities on indicators of their psychophysiological status

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## Abstract

**Objective of the study** was to identify indicators of the psychophysical status of students with disabilities, which must be taken into account when designing and organizing physical recreation for students with health limitations and disabilities.

**Methods and structure of the study.** The scientific work was carried out at Vyatka State University using the psychomotor test module UPFT-1/30 "Psychophysicologist"; 14 students aged 17-22 years old with disabilities of different nosological groups and 14 students of the same age who did not have pathology took part in it. Based on the tests performed (tapping test, simple visual-motor reaction and reaction to a moving object), the functional state of the nervous system of the study population was assessed, and the level of reactive and personal anxiety was determined.

**Results and conclusions.** Indicators of the psychophysiological status of students with disabilities differ significantly from those of students without pathology in the leading hemisphere of the brain and the leading analyzer, in the level of activation of the nervous system and the level of personal anxiety. Taking into account the data we received, we developed a method of physical recreation with elements of rehabilitation for students with disabilities, and also formulated recommendations for its organization.

**Keywords:** *psychophysiological characteristics, students with disabilities, recreation, physical rehabilitation.*

**Introduction.** The realities of today are the increase in the number of students with health limitations and disabilities in educational institutions both in Russia and in the world.

A study of the adaptation features of students with disabilities showed the presence of problems in self-esteem and communication: they often define themselves as "neglected" [1]. According to international studies, among the important personal factors influencing the adaptation and performance of university students, self-awareness and self-determination, their self-esteem and performance were noted. Among external factors, students noted the influence of family, communication with teachers and fellow students [2]. Some of the problems with adaptation and communication of students with disabilities can be success-

fully solved by organizing physical recreation. An optimal organized mode of movement and control is an important condition for maintaining and developing health reserves, successful socialization of such students, and their physical improvement [3]. In studies by Pans et al. (2021) showed that the physical activity of students with disabilities at universities is below the WHO recommended level (150 minutes per week). The authors attribute such low activity of students to their lack of awareness of special sports programs for physical recreation, which are implemented taking into account their personal and social environmental factors [4].

The works of a number of authors describe isolated results of studying the psychological status of students with disabilities [5]. At the same time, taking into ac-



count the characteristics of the psychophysical status is necessary not only for the adequate organization of educational, but also extracurricular activities, recreation, and the organization of physical activity [6].

To determine approaches to organizing and creating a physical recreation program, it is necessary to know what characteristics of students with disabilities will affect its success.

**Objective of the study** was to identify indicators of the psychophysical status of students with disabilities, which must be taken into account when designing and organizing physical recreation for students with health limitations and disabilities.

**Methods and structure of the study.** The scientific work was attended by 14 students of both sexes with disabilities of different nosologies, studying in the 1st-3rd years of various profiles and 14 students without pathology, of the same age (18-21 years) and studying at the same faculties of Vyatka State University. At the same time, students with disabilities were considered the experimental group, and students without pathology were considered the control group. When conducting the study, theoretical (analysis of psychological and pedagogical literature, analysis, comparison) and empirical (comparative qualitative and quantitative analysis of the obtained data on psychophysiological status) methods were used.

The study of the psychophysiological characteristics of students in both groups was carried out using

the psychophysiological testing device UPFT-1/30 "Psychophysiologicalist" twice before and after (1st measurement and 2nd measurement) the application of the rehabilitation methodology we developed. They were assessed for strength, mobility and balance of nervous processes using the tapping test sequentially, first with the right and then with the left hand [7]; the reaction time to visual and auditory stimuli (simple visual motor reaction (SVMR) and simple auditory motor reaction (SAMR)) was determined to assess the functional state of the central nervous system; we determined the level of reactive (situational) and personal anxiety using the Spielberger-Khanin test.

Statistical processing of the research results was carried out using the method of variation statistics using the Statistica programs using the Mann-Whitney U test.

**Results of the study and discussion.** During the initial testing (1st measurement), the majority (about 80%) of students in both groups had a weak type of nervous system. According to the coefficient of functional asymmetry, right-handers were 7.14% among students with disabilities, and 42.86% among students in the control group ( $p < 0.05$ , Table 1); no left-handers were identified in the study population. It has been shown that the majority of students with disabilities we studied have a mixed profile of asymmetry (92.86% have ambidexterity), which reduces the level of mobility of their nervous processes and mental functions,

Table 1. Percentage of students with disabilities and without pathology who have different indicators of psychophysiological status

Indicator	Level/ Grade	Students with disabilities		Students without pathology		p
		M	m	M	m	
Leading hand (%)	Right	7,14	6,88	42,86	13,23	<0,05
	Ambidexterity	92,86	6,88	57,14	13,23	<0,05
Level of central nervous system activation based on SVMR (%)	High	21,43	10,97	14,29	9,35	>0,05
	Average	50,00	13,36	85,71	9,35	<0,05
	Low	28,57	12,07	0,00	0,00	<0,05
Level of central nervous system activation based on SAMR (%)	High	35,71	12,81	50,00	13,36	>0,05
	Average	57,14	13,23	35,71	12,81	>0,05
	Low	7,14	6,88	14,29	9,35	>0,05
Lead Analyzer (%)	Auditory	46,15	13,83	28,57	12,07	>0,05
	Visual	7,69	7,39	57,14	13,23	<0,05
	not identified	46,15	13,83	14,29	9,35	>0,05
Reactive anxiety (%)	High	14,29	9,35	7,14	6,88	>0,05
	Optimal	85,71	9,35	92,86	6,88	>0,05
Personal anxiety (%)	High	71,43	12,07	28,57	12,07	<0,05
	Optimal	28,57	12,07	71,43	12,07	<0,05

Note: Differences are statistically distinguishable at  $p < 0.05$ .



and also increases the time of sensorimotor reaction (243 ms versus 222 ms in the control group based on SVMR data).

Analysis of the level and stability of human sensorimotor reactions in response to light and auditory stimuli showed that students with disabilities have a better developed reaction to auditory stimuli than to visual ones ( $46.15 \pm 13.83\%$  versus  $7.69 \pm 7.39\%$ ,  $p < 0.05$ , Table 1), while such a dependence was not revealed among students in the control group. Based on a simple visual-motor reaction, significantly more students with disabilities had a low level of central nervous system activation ( $28.57 \pm 12.04\%$  versus  $0\%$ ,  $p < 0.05$ , Table 1). As a result, they may be characterized by slow reactions with average stability values, a predominance of inhibition processes, inertia of nervous processes, and reduced functionality.

Among the students we studied, the majority ( $85.71 \pm 9.35\%$  and  $92.86 \pm 6.88\%$ ) had optimal values of the level of reactive anxiety at the time of the examination, i.e. at the time of the examination they did not experience stress and were in the "comfort zone". However, among students with disabilities, a significantly larger percentage of respondents with a high level of personal anxiety was identified ( $71.43\%$  versus  $28.57\%$ ,  $p < 0.05$ , Table 1).

Taking into account the data obtained, we developed a method of physical recreation with elements of rehabilitation for students with disabilities, and also

formulated recommendations for its organization (Table 2).

The methodology was based on a system of physical recreation, consisting of three blocks, which was implemented taking into account an individual approach, the adaptive characteristics of the body and the type of physical recreation preferred by the student. A survey of students with disabilities revealed the preferences of the majority of respondents to engage in gymnastics ( $71.42\%$ ), swimming ( $85.71\%$ ), and sports games, including adaptive ones ( $78.57\%$ ).

Students with disabilities for 6 months, 2-3 times a week, studied according to the physical recreation method we developed, while students from the control group, who did not have pathologies, studied in a free mode, which was not evaluated by them. It should be noted that when organizing recreation and rehabilitation, the coach must perform the role of an individual consultant to monitor the functional state and health of the student.

Repeated testing (2nd measurement) showed that the type of nervous system, leading analyzer, leading hand and profile of interhemispheric dominance did not change in the tested students of both groups. The average values of sensorimotor reactions to light and auditory stimuli also did not change significantly. However, analysis of a simple visual-motor reaction showed that the percentage of students with disabilities who have a low level of central nervous system

Table 2. Methodological aspects of organizing physical recreation for students with disabilities

Block	Tasks	Methodological aspects
Preparatory	Studying the characteristics of the body's reactions to increased physical activity; increasing tolerance to physical activity; normalization of the ratio of excitation and inhibition in the nervous system; mastering sets of physical exercises taking into account the main and concomitant pathologies	General developmental exercises, breathing exercises of a static and dynamic nature. The use of sets of breathing exercises is due to the need to learn self-control over the frequency, depth, and rhythm of breathing. Classes are held 2 times a week for 45-60 minutes
Developmental	Increasing the level of performance of the cardiovascular and respiratory systems; development of conditioning abilities; exploring available sports, including the Paralympic sport Boccia	Cyclic exercises with a pronounced aerobic component; exercises in the pool in the form of aqua gymnastics and dosed swimming to enhance the work of the diaphragm, ease the work of the heart, reduce static muscle tension, promoting an anti-stress effect. Studying the Paralympic sport Boccia allows you to develop coordination abilities, stabilize the nervous system, and the existing competitive component helps maintain interest in physical recreation. Classes are held 2 times a week for 45-60 minutes
Basic	Increasing the level of development of strength abilities; training loads during the Paralympic sport of Boccia; involving students in a volunteer program for accompanying children involved in Boccia (or other game activities)	Swimming combined with the use of aqua simulators and resistance exercises (dumbbells). Training loads in Boccia classes are combined with competitive activity, providing an emotional component to the classes. Classes are held 2-3 times a week for 60-90 minutes, depending on individual capabilities



Table 3. Percentage of students with disabilities and without pathology who have different indicators of psychophysiological status

Indicator	Level/ Grade	Students with disabilities		Students without pathology		p
		M	m	M	m	
Level of central nervous system activation based on SVMR (%)	High	14,29	9,35	14,29	9,35	>0,05
	Average	78,57	10,97	85,71	9,35	>0,05
	Low	7,14	6,88	0,00	0,00	>0,05
Level of central nervous system activation based on SAMR (%)	High	46,15	13,83	50,00	13,36	>0,05
	Average	53,84	13,83	42,86	13,23	>0,05
	Low	0,00	0,00	7,14	6,88	>0,05
Reactive anxiety (%)	High	7,14	6,88	7,14	6,88	>0,05
	Optimal	92,86	6,88	92,86	6,88	>0,05
Personal anxiety (%)	High	35,71	12,81	35,71	12,81	>0,05
	Optimal	64,23	12,81	64,23	12,81	>0,05

Note: differences are statistically distinguishable at  $p < 0.05$ .

Table 4. Percentage of students with disabilities who have different indicators of psychophysiological status before and after rehabilitation intervention

Indicator	Level/ Grade	1st measurement		2nd measurement		p
		M	m	M	m	
Level of central nervous system activation based on SVMR (%)	High	21,43	10,97	14,29	9,35	<0,05
	Average	50,00	13,36	78,57	10,97	<0,05
	Low	28,57	12,07	7,14	6,88	<0,05
Level of central nervous system activation based on SAMR (%)	High	35,71	12,81	46,15	13,83	>0,05
	Average	57,14	13,23	53,84	13,83	>0,05
	Low	7,14	6,88	0,00	0,00	>0,05
Reactive anxiety (%)	High	14,29	9,35	7,14	6,88	>0,05
	Optimal	85,71	9,35	92,86	6,88	>0,05
Personal anxiety (%)	High	71,43	12,07	35,71	12,81	<0,05
	Optimal	28,57	12,07	64,23	12,81	<0,05

Note: differences are statistically distinguishable at  $p < 0.05$ .

activation decreased ( $28.57 \pm 12.04\%$  at the 1st measurement versus  $7.14\% \pm 6.88$  at the 2nd measurement). Thus, the values of a simple visual motor reaction in students with disabilities approached those of students in the control group. Similar changes occurred with a simple auditory-motor reaction - 7.14% of respondents in the experimental group initially had a low level of central nervous system activation, but at the 2nd measurement no such changes were detected. At the same time, the percentage of students with a high level of central nervous system activation increased ( $35.71\% \pm 12.81$  at the 1st measurement versus  $46.15\% \pm 13.83$  at the 2nd measurement, Table 3).

The study of reactive (situational) anxiety in the control and experimental groups at the end of the experiment did not reveal significant changes, i.e. The students felt comfortable in the testing situation. However, in the experimental group, the percentage of stu-

dents with a high level of personal anxiety decreased by half ( $71.4\%$  at the 1st measurement versus  $35.7\%$  at the 2nd measurement (Table 4)) and became similar to that of students in the control group.

All of the above indicates that the use of physical rehabilitation methods using three blocks is an effective means in the rehabilitation of students with disabilities, since it is based on the adaptive capabilities of the body, is individual in nature and takes into account the preferences of students when engaging in physical recreation.

**Conclusions.** This study examined the characteristics of the psychophysiological status of students with disabilities. It has been shown that a number of indicators significantly distinguish them from students without pathology. We considered it possible and necessary to take into account the level of activation of the nervous system, the strength of nervous process-



es, the dominant hemisphere and the level of anxiety to create an optimal physical recreation program for students with disabilities. The developed program is based on the standard principles of adaptive physical culture; The program was divided into blocks, each of which solves its own tasks and problems identified on the basis of studying the psychophysiological status of students.

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