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## Psychophysiological Status and Organization of Physical Recreation of Students with Disabilities

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### Abstract

The purpose of this research is to develop a methodology for physical recreation of disabled students at university. The methodology for organizing recreation is based on the results of studying students' psychophysiological characteristics. The psychophysiological status of 19 university students was determined using psychomotor tests of the psychophysiological testing device "Psychophysiologicalist". The authors compared data obtained with the indicators of the control group of students without pathology. They found out that 80% of students with disabilities had a weak type of nervous system, which indicated a rapid level of fatigue due to mental or physical stress. 93.3% of students with disabilities did not have a leading hemisphere and a leading analyzer. The majority of students in the experimental group (66.7%) showed an increased and high level of personal anxiety. The data obtained significantly differed from the corresponding indicators of students without disabilities. On the basis of the data obtained, the authors have worked out recommendations for the organization of physical recreation. It is proposed to build physical recreation classes on the principle of blocks, starting with the elements of remedial gymnastics. After gymnastics classes there is a warm-up. In the second block, the main part of the lesson should be in water, using aquatics. The third block includes using outdoor games. The article formulates recommendations for the organization of recreation, taking into account the psychophysiological status. The presented data may be used by teachers of physical culture and specialists in adaptive physical culture.

*Keywords:* students with disabilities, physical recreation, psychophysiological status.

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## **Introduction**

According to Medvedeva & Dvurechenskaya (2016), 7306 students with disabilities study at Russian universities. This constitutes 0.38% of the total number of students (Rumyantseva, 2019). 25.18% of students have somatic diseases, and 39.77% – "unspecified diagnosis".

Some students hide their diagnosis as they want to be "like everyone else." However, the lack of information about the diagnosis in the student's data complicates the process of modeling the conditions of their high-quality education in accordance with the nosology. An important condition for the development of health reserves is optimally organized physical exercises. Physical activity also contributes to the successful socialization of students with health limitations (Aismontas & Odintsova, 2017).

Most articles devoted to teaching disabled students focus on issues of architectural accessibility, teacher competence, and teaching methods (Bardamov, 2018). Insufficient attention is paid to the peculiarities of the organization of physical recreation for students with disabilities. An optimally organized regime of movements is an important condition for maintaining and developing health reserves, successful socialization of students and their physical improvement (Mitrokhin, 2020).

## **Purpose and objectives of the study**

The purpose of the research was to create the methodology for organizing optimal motor recreation to maintain the health of students with disabilities. This technique is based on the characteristics of their psychophysiological status.

## **Literature review**

When entering a university, students with disabilities can have an adapted program. It prescribes a list of teaching methods, the provision of devices and means for places of practice, forms and methods of conducting classes, control, a special procedure for mastering the discipline "Physical education" (Sharova, 2017). The organization of physical activity takes place within the discipline of adaptive physical culture. However, most of the students do not show the need for such a program. Therefore, they study like everyone, or they do not attend PE classes. The Russian system of higher education is challenged by the question whether a student who requires the creation of an adapted program, should meet the requirements set for healthy students.

The results of sociological research (Meshcheryakova & Rogotneva, 2018) have shown that for optimal psychological adaptation, students with disabilities should have psychological and pedagogical support and tutoring, they should be involved in scientific, creative, leisure activities and volunteering together with healthy students. The organization of competitions and sports events leads to adaptation through victories. The authors believe that it contributes to the growth of self-esteem, confidence, and reduction of barriers for students with disabilities.

The quality of physical recreation and rehabilitation depends on a correct load of physical activity and the control of the effectiveness of the process (Vlasova, 2018). As Mikhailchi (2019) notes, this is hampered by the constraints of teachers. They do not have access to information about the current state and the main disease of the disabled student. In this regard, a teacher cannot change teaching methods, individualizing them. As a result, students with low motivation, poor health and disabilities may have low academic performance and success in the group (Semerikov, 2017).

The studies of the status of disabled students (Mu, Siegel, & Allinder, 2000; Bakker, Denessen, Bosman, Krijger, & Bouts, 2007; Razzhivina & Ulanova, 2018; Rummyantseva, 2019) showed that students often have a low sociometric status among their peers and belong to the group of "isolated" or "neglected". The personality traits that contribute to the disadaptation of students with disabilities at university include the expectation of overprotection, "getting stuck" in their state, low self-esteem, communication barriers, isolation in micro-groups of peers with similar problems (Meshcheryakova & Rogotneva, 2018).

Serdyukova (2021) describes the opposite results of studying the psychological characteristics of students with disabilities. Kupreeva (2011) notes that students with disabilities have maladaptive types of attitudes towards their defects and illness. Emotional assessments of the experience of the defect dominate in the structure of the internal picture of the disease (defect). This correlates with high levels of personal anxiety. Personal anxiety contributes to the development of destructive defensive forms of behavior. In this regard, the author recommends training students taking into account psychological characteristics, development of communication skills and teaching them the techniques of self-regulation. The author recommends conducting complex psychodiagnostic studies of disabled students to monitor the dynamics of changes.

Voevodina & Gorina (2013) point out that the adaptation of students with disabilities is more susceptible to the influence of stressors of the spatial and organizational type, rather than the socio-psychological one. Students with disabilities strive for inclusion, studying like other students.

Some researchers (Sorokina, Buinov, Kuptsova, & Syromyatnikova, 2020) underline that health-preserving behavior improves the indicators of balance, hypoxic tests, indicators of the strength of nervous processes in the tapping test, and reduces the severity of tremors. We have not found data on using psychophysiological status indicators to determine the load during physical recreation.

Many studies are devoted to the problems of disability, but there is no single conceptual framework that would allow studying the disabled as a category of subjects of specific health-preserving activities (Yakovleva, Ulanova, & Spishkova, 2016).

The participation of students in recreation should be carried out taking into account the characteristics of the personality development of disabled students, observing special organizational and pedagogical conditions. These include step-by-step diagnostics, correction, control of the level of physical condition, health status, and self-control of a disabled student in physical fitness, sports, and recreational activities (Dzhaubaev, Dzhirikova, Uzdenov, Dzhirikov, & Bessarabova, 2018).

When designing recreational activities, a number of actions should be carried out (Dzhaubaev, Balba, Lundina, & Petkov, 2015). These are choosing forms of activity, defining the content of classes, selecting methods and techniques, identifying scientific and methodological foundations, monitoring effectiveness, developing the competence of teachers and reflecting the results of activities.

As part of physical recreation, students are invited to master the options for warm-ups, morning hygienic gymnastics; professionally applied exercises; exercises to correct posture and figure flaws; self-massage techniques; methods of self-control in the process of physical exercise; testing; physical therapy exercises; sports activities; exercises for the direct development of psychophysical qualities. For self-control of success, students are advised to keep a "Self-control Diary" of classes where they should record self-observations of health, results of physical fitness and psychological state. Balba, Lundina, & Dzhaubaev (2016) believe that this way helps to regulate performance, individualize and correct physical and mental stress in physical recreation and in everyday life.

Physical recreation of students should be divided into macro-, meso- and microcycles. Each cycle must solve its own goal and objectives (Bobrovsky, 2017). At the same time, it is necessary to advise students, conduct pedagogical control of their recreation, including that of students with disabilities. Physical recreation can be organized during educational and elective PE classes, health and sports activities, in student's free time. It is recommended to spend 2.5-7.5 hours per week for physical recreation, or up to 18-38 hours per month. The author does not indicate the basis for such differences in duration.

Doroshenko & Bessarabova (2016) recommend using adaptive physical training, sociocultural motor development, and professionally applied physical training for the individualization of physical culture and recreational activities of students with disabilities. However, they do not give any criteria for dividing into the indicated tracks.

Analysis of the literature has shown that authors describe the general requirements for the organization of physical recreation and its content. There is the lack of scientific substantiation of the methods of conducting recreational classes with students with disabilities in most articles. It remains unclear why the authors have come to such conclusions.

### **Methodology**

To study the psychophysiological characteristics of students with disabilities, we used the module of psychomotor tests of the device for psychophysiological testing UPFT-1/30 "Psychophysicologist" (Kuleshova, 2016; Shayakhmetova, Nugaeva, Tulitbaeva, & Samigullin, 2021). The hardware method was used to determine the response to visual and auditory stimuli; we studied personal and reactive anxiety according to Spielberger (Drozдовski, 2015; Mancevska, 2016; Weinberg & Gould, 1998). The tapping test was performed first with the right and then with the left hand (Ilyin, 2010). The functional state of the nervous system was assessed by the parameters of simple visual-motor and auditory-motor reactions. This is substantiated by the works of Talalaev (1992). Using the tapping test, we assessed strength, mobility and balance of nervous processes of 14 students with disabilities (the experimental group) and 19 students without pathologies (the control group). Students of both genders were 18-20 years old. The experimental group included students with disabilities who have somatic, sensory and musculoskeletal disorders. The control group was formed by the method of random sampling from the number of students of the same age, of the same educational program specialization as in the control group. The study was conducted in accordance with international ethical standards (World Medical Association Declaration of Helsinki. Ethical Principles for Medical Research Involving, 2001). We received the approval of the ethical committee of Vyatka State University (protocol No. 1 dated 17.01.2020). Students in both groups gave their written consent to participate in the study.

The analysis of the obtained data was carried out using Microsoft Excel, StatSoft Statistica 6.1. The significance of the differences was determined using the Student's t-test. Differences with the significance level  $p < 0.05$  were considered significant.

### **Results**

The tapping test methodology is based on determining the dynamics of the maximum rate of hand movement and, on the basis of this, it identifies the type of the nervous system. The majority (80%) of the tested students of both groups had a weak type of nervous system ( $85.71 \pm 9.35$  and  $78.57 \pm 10.97$ ,  $p > 0.05$ ).

The working capacity of the right and left hands was studied, graphs for each hand and calculated the coefficient of functional asymmetry were compiled and analyzed. Right-handers accounted for 7.14% of the number of students in the experimental group and 42.86% of students were in the control group ( $p < 0.05$ ). There were no left-handers in the studied groups. The majority of students with disabilities (92.86% versus 57.14%,  $p < 0.05$ ) did not have a leading hemisphere.

Students with disabilities had a better-developed response to auditory stimuli than to visual stimuli ( $46.15 \pm 13.83\%$  versus  $7.69 \pm 7.39\%$ ,  $p < 0.05$ ). No dependence was found among students of the control group.

More students with disabilities had a low level of activation of the nervous system ( $28.57 \pm 12.04\%$  versus 0%,  $p < 0.05$ ). They had delayed reactions with medium stability values. Processes of inhibition prevailed over the processes of excitation, the inertia of the nervous processes was high, and the functionality was reduced.

50% of students with disabilities and 85.71% of students in the control group had average and above-average levels of activation of the nervous system. They were characterized by the predominance of excitation processes, speed, and a high level of functional capabilities of the nervous system. According to the results of a simple auditory-motor reaction, there were no significant differences between the groups.

Assessment of the level of reactive and personal anxiety made it possible to determine the severity of anxiety in the personality structure. The majority of students in both groups ( $85.71 \pm 9.35$  and  $92.86 \pm 6.88$ ) had an optimal level of reactive anxiety. At the time of the examination, they were not stressed and were in the "comfort zone". Among students with disabilities,  $71.43 \pm 12.07\%$  (versus  $28.57 \pm 12.07\%$ ;  $p < 0.05$  in the control group) had a high level of personal anxiety.

Based on these indicators, a physical recreation program for students with disabilities was designed. The developed program of physical recreation for disabled students consists of three blocks: preparatory, developmental, and basic. Dividing into the blocks allows differentiating tasks and determining the optimal means for solving them. The movement to the next block is carried out based on the monitoring data. Testing indicators should indicate positive dynamics of adaptation indicators. If there is no positive dynamics, the program of loads is corrected.

The aim of the preparatory block of physical recreation is to solve the following tasks:

- 1) studying the characteristics of the body's reactions to increasing motor activity;
- 2) increased exercise tolerance;
- 3) normalization of the ratio of excitation and inhibition in the nervous system;
- 4) mastering sets of physical exercises, taking into account the main and concomitant pathology.

General developmental exercises, static and dynamic breathing exercises are recommended. The use of sets of breathing exercises is due to the need to learn self-control over the frequency, depth, and rhythm of breathing. By the end of the block, we expect an improvement in the indicators of the nervous system and a decrease in the severity of autonomic dysfunctions. The inclusion of anti-stress gymnastics is associated with a high level of anxiety. The basis of this set is a combination of breathing, relaxation exercises, and auto-training elements. In the main part of each lesson, it is necessary to include special exercises taking into account the existing pathology (Bardamov, 2018).

Control testing at the end of the preparatory block allows determining the possibility of moving to the developmental block. If there is maladjustment to physical activity, then the classes using the exercises of the preparatory block continue.

The developmental block of physical recreation allows expanding the motor regime and solving the following tasks:

- 1) to increase the level of performance of the cardiovascular and respiratory systems;
- 2) to promote the development of conditioning abilities;
- 3) to apply cyclic exercises with a pronounced aerobic component;
- 4) to explore available types of Paralympic sports.

The assigned tasks are successfully solved by exercises in the pool in the form of aqua gymnastics and dosed swimming. These means allow strengthening the work of the diaphragm, facilitating the work of the heart, and reducing static muscle tension. They also contribute to the anti-stress effect. To increase the emotional component, it is proposed to study the Paralympic sport of Boccia. The use of this kind of sport allows developing coordination abilities, stabilizing the indicators of the nervous system. The competitive component contributes to maintaining interest in physical recreation.

If the program of the second block has been successfully mastered, after the control testing, the main block of classes starts. In the case of unsatisfactory results, the student is recommended to continue the developmental block. The main block of the recreation program solves the following tasks:

- 1) to increase the level of development of strength abilities;
- 2) to increase the training load in the Paralympic sport Boccia
- 3) to involve students in a volunteer program for accompanying children involved in Boccia (or other game types).

Swimming in this block is combined with aquatics and resistance exercises (dumbbells). Training loads in Boccia classes are combined with a competitive activity, and the possible accompaniment of disabled children, providing the emotional component of the classes. It forms values, professionally important qualities; conscious self-determination in society (Ptitsyna & Markova, 2018).

## **Discussion**

A significant amount of academic load at university and reduced functional reserves of the body of disabled students determine the search for new approaches to organizing physical recreation (Bobrovsky, 2017; Kurkova & Nemcek, 2016). The basis for building a block program of physical recreation is the provision of an individual approach, taking into account the morphofunctional, adaptive characteristics of the body, and the preferences of the type of physical recreation (Chirushkina, 2014).

The implementation of physical activity through adaptive physical culture is based on the following principles (Evseev, 2016; Gorovoy, 2017):

- 1) continuous impact, ensuring the adaptation of the body, meaningful relationship of the applied physical exercises;
- 2) adequate and optimal impact aimed to create an optimal level of the functional state of the body and motor fitness;
- 3) corrective focus, taking into account the main defect, secondary disorders, and concomitant diseases when selecting funds;
- 4) systematicity and consistency, planning, the inclusion of various forms of classes, their stages;
- 5) a non-manipulative approach that takes into account the characteristics and needs of the person.

The complexity and variability of physical recreation means is also important for students with disabilities.

The conducted studies of the psychophysiological status can be used for physical recreation, counseling students with disabilities on self-control issues. The strength of the nervous processes is an indicator of the efficiency of the nervous system. Therefore, we recommend for students with a weak nervous system, short-term loads with frequent rest and a longer recovery period. In this regard, organized physical recreation classes should take place no more than two times a week.

Also, students need to have a good sleep.

When organizing motor activity, it is necessary to take into account the dominance of the cerebral hemispheres. This affects the characteristics of the perception of incoming information, coordination and other qualities. With the dominance of the right hemisphere, spatial orientation and body senses are better developed, but adaptation to stressors is reduced. With the dominance of the left hemisphere, the sense of time, muscle endurance, and adaptation to stressors are well developed (Antropova, Andronnikova, Kulikov, & Kozlova, 2011; Kabanov, 2009; Sharova, 2017).

Most of disabled students have a mixed profile of asymmetry, which reduces the level of mobility of their nervous processes and mental functions, and increases the time of the sensorimotor reaction. In this regard, the first block of recreation should include exercises at a low pace, associated with the development of sensations of one's own body. Exercises of the first block are best carried out in a group with a mandatory explanation of the technique of performing the exercises by the coach.

One of the most important indicators affecting the success of any activity is the level of anxiety. Anxiety is a negative emotional state characterized by feelings of nervousness, excitement and anxiety combined with arousal of the body. The study shows that the majority of students with disabilities have high personal anxiety. Personal anxiety predisposes to the perception of objectively safe circumstances as threatening inappropriate overreaction (Weinberg & Gould, 1998). Therefore, when organizing physical recreation for students with disabilities, it is necessary to form a sense of confidence, to shift the emphasis on the importance of each exercise in the complex for the state of health. Group work promotes motivation, social networking, and communication.

The proposed block system of the physical recreation program does not contradict and takes into account the data of Balba et al. (2016), Dzhaubaev et al. (2015), Dzhaubaev et al. (2018).

## **Conclusion**

The results of the study of the psychophysiological status of disabled students have formed the basis of the methodology for organizing the proposed program of physical recreation. Unlike other authors (Balba et al., 2016; Dzhaubaev et al., 2015; Dzhaubaev et al., 2018), the developed methodology is based on the identified objective indicators of psychophysiological status.

The exercises included in the program are designed to solve the identified problems of students with disabilities.

We have revealed a high level of personal anxiety, the dominance of a weak type of the nervous system, and the absence of a dominant hemisphere of disabled students. The proposed program assumes control by the type of monitoring to make a decision on the movement of the student to the next block of classes. The monitoring results reflect the degree of program effectiveness and make it possible to promptly correct the block program. The proposed method of recreation can be fully implemented if there is a swimming pool at the university and interaction with social partners who carry out volunteer activities.

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### **Competing interests**

The authors have declared that no competing interests exist.

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