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Original Article

Effect of sports games on the adaptation of students to the conditions of education at higher education institutions

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Abstract
For many freshmen, the first years of higher education are crucial and associated with the emergence of complex and diverse stressful situations in the new learning environment. The introduction of scientifically based measures of pedagogical support for the adaptation component of freshmen into the educational process is becoming an urgent need. The purpose of our study was to experimentally test the effectiveness of the impact of academic physical education classes using sports games, including elements of psychological training, on the intervention of the psychophysiological state of students during the period of adaptation to the conditions of education in university. The study was carried out using the data from Sochi State University. The study involved 32 first-year students aged 17–19 from Sochi State University, who were studying in the field of "teacher education". Testing the level of the psychophysiological state of students was carried out according to the following indicators: determination of the strength of nerve processes by measuring the dynamics of the hand movement rate ("tapping test" from the interpretation by E.P. Ilyin), self-assessment of mental states according to G. Eysenck's test, and diagnostics of mental performance via speed of information processing using the proofreading test of V.Ya. Anfimov. The significance of changes was determined using the Wilcoxon test using a significance of $p<0.05$. During the experiment, the students experienced a statistically significant decrease in the severity of personal anxiety and frustration. In the final stage of the study, there was a significant improvement in mental performance in terms of information processing speed. In general, our results show the effectiveness of the developed program for correcting the psychophysiological state of students in physical education lessons using sports games.
Keywords: chronic stress, maladjustment, sports games, psychophysical training

Introduction

In the face of the rapid informatization of society and the development of new knowledge-intensive technologies, the role of training mobile, competitive specialists in the labor market, who are ready for professional growth and opportunities for self-improvement, is increasing. The success of solving tasks set for higher educational institutions is largely determined by the effective adaptation of students to the educational process at the initial stage of training. Effective adaptation of first-year students contributes to self-determination, self-development, and successful social integration of a person in a professional environment, which is the key to successful professional development of a future specialist. However, results have shown that the majority of first-year students are not ready for a variety of situations of socio-psychological and professional adaptation (Andrea-Gabriela. Mihailescu, 2019; Danilenko, 2020). One of the main reasons for the complexity of the adaptation process is the difference in the content and organization of learning processes in higher educational institutions and comprehensive schools. Analysis of the scientific and methodological literature on this issue (Sergeeva, Voskrekasenko, 2013; Reddy, Menon, Tattyle, 2018) allowed us to systematize the difficulties awaiting a freshman student during the process of studying higher education into the following main groups:

- problems of a didactic nature (a sharp change in the content and volume of the studied material; a variety of new forms and methods of teaching; unusual scientific style of presentation of lecture material; lack of necessary skills for independent work);
- problems of a socio-psychological nature (change in prevailing habits due to a change in place and style of life and educational and social environment; a sharp transition to an independent life; doubts and uncertainty about their capabilities, fear of being expelled, and fear of term exams);
- problems of a professional nature (doubts about the correctness of the chosen profession; inability to comprehend the direction of the education process; lack of understanding that the foundation for becoming a future specialist begins from the first days of training).

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Thus, for many students, the first years of study at a university are critical and associated with the emergence of complex and diverse stressful situations in new learning conditions. According to Clinciu (2013) and Rafiq, Al-Asum, Latif, Al-Sunni, Wasi (2019), it is the stress that occurs at the beginning of student life that triggers the body's adaptation process.

According to the conceptual provisions of Anokhin P.K. (1978), the adaptation represents the process of forming a new functional system that provides an adaptive effect during changing external conditions. Adaptation to a number of higher school-specific factors is a multilevel socio-psychophysiological process and is accompanied by a significant tension in the body's compensatory–adaptive systems (Bailey T., Phillips, 2015; Tarasova, Dukhina, Limonova, Kolesnikova, 2017). In a study by Platonov V.N. (2017), they showed that adaptation is characterized by a significant involvement of the physiological reserves of the body and the restructuring of human functional systems. The physiological side of adaptation processes result in a change in a number of functions, which are primarily vegetative and motor, that are closely related to the mental aspect, which is expressed in the form of emotional stresses and feelings. The most pronounced psychophysical changes, indicating the tension of adaptation mechanisms and the occurrence of a chronic stress, are observed in freshmen with low functional reserves of the main physiological systems of the body (Clinciu, 2013; Reddy, Menon, Tattyle, 2018). Outwardly, this is expressed as a prolonged state of frustration and psychoemotional overstrain (Sergeeva, Voskrekasenko, 2013; Eganov, Cherepov, Romanova, Bykov, 2020). Asthenization is due to a state of mental weakness, which is expressed by increased fatigue, memory impairment, difficulty in memorizing and reproducing functions, and the loss of the ability to maintain mental and physical performance. Mental performance is the most important indicator of the functional state of the body, reflecting the ability to adapt to the environment and to manage situations (Belozerova, 2001). According to Orlov, Pazukhina, Yakushin, and Ponomareva (2018), a long-term stay in a state of mental and psycho-emotional overstrain leads to a delay and disruption of the adaptation process, which result in the development of maladjustment in the form of a violation of adaptive mechanisms to changing conditions. In a number of works, it has been noted that constant psycho-emotional stress leads to a decrease in the defense mechanisms of the body of students, which can lead to an increase in the number of cardiovascular and digestive system diseases, cases of bronchial asthma, and allergic diseases (Kozlov, Lakhtin 2010; Orlov, Pazukhina, Yakushin, Ponomareva 2018). The number of students assigned to a special medical group for physical education at universities increases annually (Glazkova, Mamonova, Gracheva, Pukhovskaya, 2020).

The abovementioned facts indicate the urgent need to introduce pedagogical support for the adaptation of freshmen into the educational process of universities. The most important element of this process may be the system of physical education of students, which is one of the few educational technologies that allow to comprehensively influence the physical, mental, and social essence of a person’s identity during the period of its formation. Physical activity may be one of the elements of self-regulation of the human body, providing an optimal mode of life under changing conditions (Myakotnykh, Meltzer, 2012; Futornyi. 2013). Many experts agree that physical education and sports activity is most consistent with the model of activity for constant overcoming critical situations (Myakotnykh, 2011; Belykh, Chernigovskaia, 2013; Osipov, Potop, Nagovitsyn, Zemba, 2020). The positive impacts of physical education and sports on the physical and mental health of student youth has been proven in numerous works (Tomilin, Myakotnykh, Karpov, Malyshev, 2010; Glazkova, Mamonova, Gracheva, Pukhovskaya, 2020; Ovsyannikova, Tomilin, Tumasyan, Vasilkovskaya, Malygina, 20). Additionally, publications regularly express doubts about the advantage of physical activity over specially created exercises for psychophysical regulation (PPR) (Martineau, Beauchamp, Marcotte, 2017; Pedrelli, Maren Nyer, Yen, Zulauf, Wilens, 2015). A promising direction of pedagogical support for the adaptive component of freshmen in the context of adaptation theory can be academic physical education classes that combine sports games with elements of psychological training. In our opinion, this will allow to integratively influence the processes of self-regulation of the psychophysiological state, enhancing and complementing the effects of the class. The most important component of this process is the organization of classes, taking into account the individual nervous system strengths of the students.

Purpose of the study: Our aim was to experimentally test the effectiveness of physical education classes using sports games that included elements of psychological training on the correction of the psychophysiological state of students during their adaptation to university life.

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Materials and Methods

Participants. The study involved 32 first-year students, aged 17–19 years, from Sochi State University, studying in the field of "teacher education" (11 men and 21 women). Informed consent was obtained from all participants to participate in this pedagogical experiment.

Study organization. The study was conducted from October 2020 to May 2021. In the course of the pedagogical experiment, elements of exercises for the psychophysical regulation of students' states during the period of their adaptation to the conditions of education in the university were introduced by conducting sports games in academic classes in the discipline "physical education". At the beginning of the study (October 2020), initial testing of the initial level of psychophysical state was carried out, according to the following indicators:

- evaluation of the strength of nerve processes by measuring the dynamics of the rate of hand movements ("tapping test" via the interpretation by E.P. Ilyin (1975);

- self-assessment of mental states according to G. Eysenck's test (2009);

- diagnostics of mental performance using the speed of information processing via a proofreading test developed by V.Ya. Anfimov and edited by V.A. Bodrov (2006).

Depending on the results of the tapping test, students were divided into groups with weak, medium, and strong nervous systems. The choice of methodological techniques of psychophysical training, depending on the strength of the nervous system, was carried out based on the following points.

1. For students with a strong nervous system, winning a sports game in class is not a strong enough stimulus. Mobilization for the manifestation of significant volitional, psychoemotional, and physical efforts, leading to a change in the mental and physiological state of the body, can be achieved only by creating additional difficulties. It can be a game with a stronger team, for fun, with tightening the rules, etc. Conditionally, this can be called a game of "catching up".

2. For students with a weak nervous system, participation in a sports game in the classroom can be quite a strong irritant. For such students, it is necessary to create conditions for stimulating game activity that will set them up not to feel fear of failure and to control their own reaction and actions related to it, even in conditions of excessive stress (playing with a weaker team, simplifying the rules of the game, etc.). Conditionally, this is called a game of "leading".

3. For students with a nervous system of medium strength, the best option should be alternate participation in each of the other teams, depending on the current psychoemotional state of the nervous system.

Exercise elements for psychophysical regulation of students' states, which were introduced into the process of physical education with the use of sports games, are shown in Table 1.

Table 1. Program of psychophysical regulation of students' states in the physical education class

<table>
<tr><th>Part of the class.
Psychoregulation tasks</th><th colspan="2">Content of psycho-regulatory training elements</th></tr>
<tr><td>End of the preparatory part: exercises to remove sensitivity</td><td colspan="2">Recognition of sensations associated with states of muscle tension and relaxation. The method of progressive muscle relaxation (PMR) was according to Jacobson. (Sequential tension of the main muscle groups with their complete relaxation at the end of the exercise.)</td></tr>
<tr><td rowspan="2">Main part:
creating conditions for stimulating the competitive activity of students with a weak nervous system and additional stimulation for students with a strong nervous system</td><td colspan="2">Arranging teams into "leading" and "catching up".
Creating of deliberately unequal conditions by increasing the number of "leading" players in the team and reducing "catching up". Tightening the rules of the game for "catching up" players and simplification for the "leaders".</td></tr>
<tr><td>Medium activity games.
Active participation of all students in physical action; active participation of individual students or small groups of students in physical action (street ball, badminton, table tennis).</td><td>Games of great activity.
Active and simultaneous participation of all students in physical action; active and alternating participation of groups engaged in physical action (volleyball, basketball, football, rugby).</td></tr>
<tr><td>Final part.:
achieving a psychophysiological state of relaxation</td><td colspan="2">Arbitrary regulation of breathing. Relaxation method of diaphragmatic breathing.</td></tr>
</table>

To assess the effectiveness of psychophysical regulation of the students' states in the physical education classes at the final stage of the study (May 2021), final testing of students was carried out for all the studied indicators.

Statistical Analysis. The reliability of changes in psychophysical state indicators was determined by the Wilcoxon T-test (Unguryanu, Grzhibovsky, 2011) using a significance of $p \leq 0.05$. The indicators were analyzed in Microsoft Excel 2010 by determining the arithmetic mean (X) and standard deviation (σ).

Results

Comparative indicators of the initial and final level of strength/weakness of the nervous systems of the students during the experiment are shown in Table 2.

Table 2. Severity of the types of nervous systems of students at the initial and final stages of the study

Type of nervous system	Number of subjects (n)		Percentage, (%)	
	Beginning of the study	End of the study	Beginning of the study	End of the study
Strong	5	6	15.6	18.8
Medium	16	17	50.0	53.1
Weak	11	9	34.4	28.1
Total	32	32	100.0	100.0

The results of testing the nervous system type according to the dynamics of the rate of hand movements using the "tapping test" showed that:

- the largest number of studied students who entered the first year had a nervous system of medium strength for exactly half of them (50.0%);
- a strong nervous system was inherent for the smallest number of studied students (15.6%);
- the number of students with a weak nervous system at the beginning of the study was 34.4%.

During the experiment, there were minor changes in the distribution of groups. The number of students with a strong nervous system increased (due to the transfer of a student with a "borderline" state from the "middle" group). The "weak" group decreased by two people due to the transfer to "average" students with "borderline" indicators at the beginning of the study.

Self-assessment of the severity of psychophysical states according to G. Eysenck before and after using the program of psychophysical regulation of students' states in the physical education class is presented in Table 3.

Table 3. Self-assessment of the severity of psychophysical states of students at the initial and final stages of the study (according to G. Eysenck)

Psychophysical states	Initial $\bar{X}\pm\sigma$	Final $\bar{X}\pm\sigma$	Significance of differences
Anxiety	15.36±2.08	13.41±1.67	p<0.05
Frustration	15.82±1.94	12.57±1.76	p<0.05
Aggressiveness	12.33±1.98	10.73±2.72	p>0.05
Rigidity	8.92±2.64	8.68±2.91	p>0.05

At the beginning of the study, a high level of personal anxiety was revealed in the group of first-year students, indicating a tendency to experience emotional discomfort, a presentiment of an impending or seeming danger. At the end of the study, there was a significant decrease in anxiety to an acceptable level.

The state of frustration is manifested in negative experiences: disappointment, irritation, anxiety, and despair. During the experiment, there was a significant decrease in the severity of this indicator from high to medium levels.

Aggressiveness manifests itself via unprovoked hostility of a person towards people and the world around them, which is not caused by objective circumstances. By the end of the experiment, a decrease in the aggressiveness of students to the average level was observed in the group; however, the changes were statistically insignificant (p> 0.05).

The rigidity of a personality is manifested in the difficulty or complete inability to change the program of activity outlined by the subject under conditions that objectively require restructuring. The indicator of the severity of rigidity in the group of studied students was low both at the beginning and at the end of the study and did not change during the experiment.

Comparative indicators of mental performance based on the results of assessing the number of letters viewed (M), mistakes made (n), and attention intensity (AI) were determined by calculating the speed of information processing according to the V.A. Bodrov (2006) formula, and the results are presented in Table 4.

Table 4. Comparative indicators of student mental performances at the initial and final stages of the study

Indicators	Initial $\bar{X}\pm\sigma$	Final $\bar{X}\pm\sigma$	Significant differences
Number of viewed letters (M)	874±95	967±87	p<0.05
Number of mistakes made (n)	4.07±1.31	3.91±1.26	p>0.05
Attention intensity (AI), %	54.6±7.29	60.4±5.22	p<0.05
Information processing speed (S), bit/sec	2.11±0.25	2.37±0.19	p<0.05

At the final stage of the study, the results of the proofreading test for the group revealed a statistically significant increase in the average indicator for the number of letters viewed and a statistically insignificant decrease in the number of mistakes made (p> 0.05). This was expressed in a statistically significant improvement in the students' mental performances in terms of attention intensity (AI) and information processing speed (S).

Discussion

The results of our study coincide with the results of several authors, where the initial stage of education in a university for many students is critical and associated with the emergence of complex and diverse stressful situations under the new learning conditions (Andreea-Gabriela. Mihailescu, 2019; Danilenko, 2020; Sergeeva, Voskrekasenko, 2013; Reddy, Menon, Tattyle, 2018). This was confirmed by the high level of anxiety, frustration, and unmotivated aggressiveness that we identified at the initial stage of student learning. The unpreparedness of first-year students to various situations of socio-psychological and professional adaptation

was also manifested in an insufficient state of mental workability for the university, as expressed by indicators of intensity of attention and speed of information processing (Clinciu, 2013), Rafiq, Al-Asum, Latif, Al-Sunni, Wasi, 2019).

It is known that people with a strong, balanced nervous system tolerate situational psychological difficulties much easier and adapt more quickly to changing conditions (Segerstrom, Smith, 2019; Santarnecchi, Sprugnoli, Tatti, Mencarelli, Neri, Momi, 2018). However, experts believe that the strength of the nervous system is an innate property of a person that is very conservative and difficult to correct (Santarnecchi, Sprugnoli, Tatti, Mencarelli, Neri, Momi, 2018; Tukaev, Dolgova, 2020). The results of our research actually confirmed this. The novelty of our approach lies in the fact that we looked at the problem from a slightly different point of view. If it is impossible to rebuild the fundamental properties of the personality, then external conditions should be created that make a weak nervous system function in the parameters characteristic of the strong. This is created due to methodological techniques in physical education classes via artificially transforming students with a weak nervous system into "leaders" (Table 1).

There are two main pedagogical approaches to the normalization of the psycho-emotional state of students. On the one hand, in several works, it has been shown that active physical activity is in itself the most important factor for ensuring the psychosocial health of an individual (Tomilin, Myakotnykh, Karpov, Malyshev, 2010; Andres, 2017). However, there are experts who argue that improving the state of students' mental health can be solved via special psycho-regulatory techniques that promote adaptive emotional and behavioral responses to stressful events ((Martineau, Beauchamp, Marcotte, 2017; Pedrelli, Maren Nyer, Yen, Zulauf, Wilens, 2015). Recently, attempts have been made to combine these two areas in health-improving training (Omelyanenko, 2014; Kuzmin, Kopylov, Kudryavtsev, Galimov, Iermakov, 2015). The novelty of our research involved the inclusion of elements of psychological training in the structure of a standard academic lesson on physical education, without introducing the special techniques of health-related training. This approach simplified the classes and did not allow us to be distracted by the solution of the current problem of correcting the psychophysical state to the detriment of solving physical education issues. In our opinion, this approach has proven its worth. The introduction of elements of psychophysical training in physical education classes made it possible to effectively organize the pedagogical support of students with the aim of their successful adaptation to the educational process. This was expressed via a significant improvement and entry into the "norm" zone for the main indicators of the psychophysiological state of students.

Moreover, our proposed complex system of psychophysical regulation in class did not allow us to assess the contribution of each of our proposed approaches to the normalization of the students' psychophysiological states. Therefore, as a promising continuation of our study, we will consider scientific research along two main lines:

- development and assessment of the effectiveness of creating external conditions and pedagogical techniques that stimulate the correction of the psychophysical state of students with different nervous system strengths under conditions of active physical activity and
- assessment of various options for the implementation of exercises for psychophysical correction during the process of physical education of university students.

Conclusion

The results of this pedagogical study confirmed the presence of maladaptive neuropsychic states in freshmen at our university, as expressed by increased personal anxiety, irritability, unmotivated aggressiveness, and difficulty in changing a planned activity program under conditions that objectively require its restructuring.

The unpreparedness of freshmen for various situations of socio-psychological and professional adaptation is also manifested in the low values of components of the psychophysiological state, such as the speed of information processing during the process of educational activity.

Significant improvement and entry into the "norm" zone of indicators of the psychophysiological state of students by the end of the academic year showed the effectiveness of the developed program of pedagogical support of students with the aim of their successful adaptation to the educational process.

A promising continuation of our study will be the further search for the most effective means and methods that stimulate the correction of the psychophysiological state of students with different nervous system strengths via physical education classes at a university.

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