Increasing the efficiency of students' learning process at a university through physical education

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Abstract

Objective of the study was to develop and implement the main ways to increase the efficiency of the learning process of students at a university using physical education.

Methods and structure of the study. The experiment was conducted in the 2022/23 academic year. First-year students of the Russian State Hydrometeorological University (EG, n=12) and Saint Petersburg State University (CG, n=10) took part in the study. The authors analyzed the sanitary and hygienic conditions of training, professionally important qualities, as well as information about the physical activity of students. Research results. As a result of generalization and analysis of the data obtained, it was found that not only a properly organized educational process, but also a complex of health and hygiene measures, as well as sufficient physical activity of students, plays an important role in increasing the efficiency of the learning process of students at a university. Regular physical education classes in conditions of intense educational activity are an accessible and effective means of preventing mental and psychophysiological fatigue, which increases the effectiveness of learning.

Results and conclusions. As a result of generalization and analysis of the data obtained, the dynamics of individual indicators of the hygienic conditions of student learning were established. Semester, weekly and daily changes in these indicators were obtained, however, only the daily dynamics of temperature and relative air humidity, as the most influential on the condition and performance of students, can be classified as natural. Regular physical education classes in conditions of intense educational activity are an accessible and effective means of preventing mental and psychophysiological fatigue, which increases the effectiveness of learning.

Keywords: *students, fitness technologies, professional performance, physical activity, efficiency.*

Introduction. Modern rapidly changing economic conditions, progress in science and technology, the growing demand for nanotechnology and the introduction of artificial intelligence increase the requirements for the competitiveness of a future specialist, which dictates the need to modernize the content of educational programs [1, 3, 7]. This issue is especially acute when mastering technical training programs. Thus, the educational process for preparing bachelors in the direction 03.03.02 - "Physics" is currently characterized by very high requirements for the professional performance of students, which are constantly updated and increasing, which is expressed in an increase in the share, volume and intensity of mental work of students. The success of students in mastering the educational program is determined by the level of their performance, expressed in scores on exams and tests. Modernization of the educational process should be carried out in parallel with the introduction of a set of measures that ensure a corresponding increase in the professional performance of students. Therefore, it is necessary to pay special attention to the regularity and completeness of students' physical activity, which contributes to the ability to maintain good physical shape. Physical education classes, having an impact on the psycho-emotional state, influencing the

thinking and memory of those involved, improve the results of mastering the educational program [3, 7].

Objective of the study was to develop and implement the main ways to increase the efficiency of the learning process of students at a university using physical education.

Methods and structure of the study. The experiment was carried out from September 2022 to May 2023. 22 first-year students took part in it. The experimental group (EG) consisted of 12 first-year students of the Faculty of Information Systems and Geotechnologies of the Russian State Hydrometeorological University, and the control group (CG) included 10 students of the Faculty of Physics of St. Petersburg State University. Representatives of the EG and CG are mastering the bachelor's training program in the direction 03.02.02 - "Physics".

During the 2022/2023 academic year, an analysis was carried out of sanitary and hygienic conditions (temperature and relative humidity), professionally important qualities (memory (short-term for words and numbers, operational and long-term for words), thinking (speed of mental operations), processing speed visual information and reactive anxiety), as well as information about motor activity.

Information on all studied indicators was obtained weekly (to establish the dynamics of each during the semester), daily (during the week) and several times a day (to establish daily dynamics). The experimental material was processed using the methods of mathematical statistics.

Results of the study and discussion. In order to study the pattern that determines the manifestation of performance in the process of students mastering professional knowledge, skills and abilities, an installation experiment was conducted for 8 weeks in the fall semester of the 2022/2023 academic year. As a result of generalization and analysis of the data obtained, the dynamics of individual indicators of the hygienic conditions of student learning were established. Semester, weekly and daily changes in these indicators were obtained, however, only the daily dynamics of temperature and relative air humidity, as the most influential on the condition and performance of students, can be classified as natural (Figure 1). As can be seen in Figures 2–4, relatively higher rates of professionally important qualities among students are grouped during the first two pairs of classes in the daily mode and in the middle of the week - in the weekly dynamics: a relatively better state of long-term memory and speed of thinking is noted on Wednesday and Thursday, and speed of visual information processing – on Tuesday and Wednesday. No such periods were established during the semester, and no reliably regular relationships were found between these indicators. Figure 5 clearly confirms the relationship between mental performance and physical activity in weekly dynamics. Thus, not only a properly organized educational process, but also a set of health-improving and hygienic measures (reasonable organization of diet, work and rest, etc.), as well as sufficient physical activity, play an important role in increasing the efficiency of the student learning process at a university.

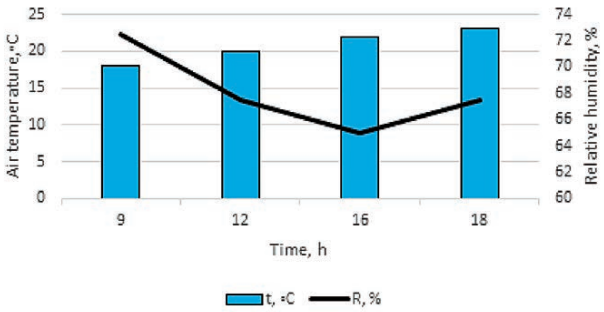

Figure 1. Changes in temperature and relative humidity

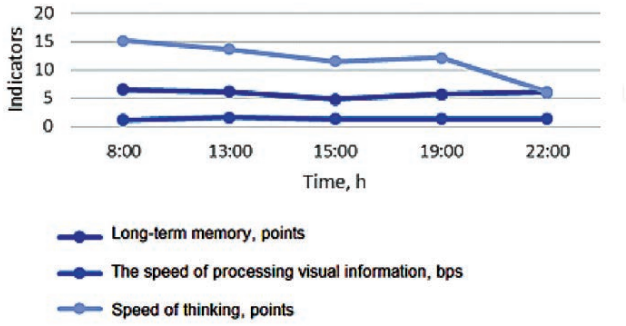

Figure 2. Dynamics of psychophysiological indicators in students per day

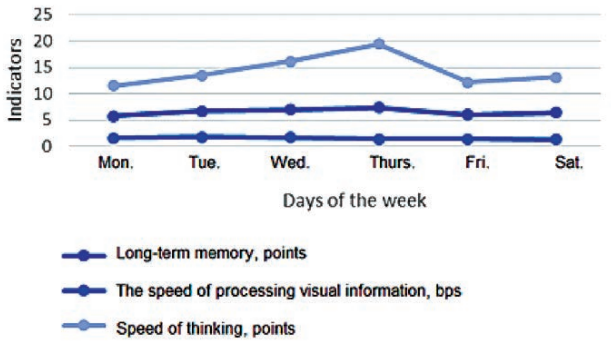

Figure 3. Dynamics of psychophysiological indicators among students over a week

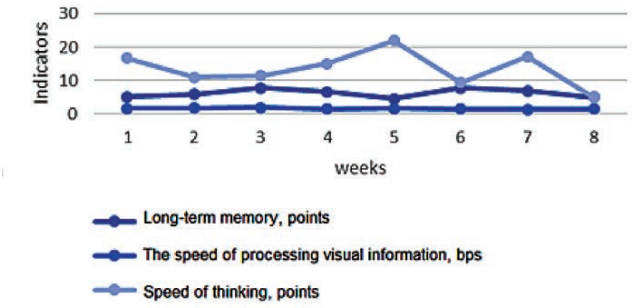

Figure 4. Dynamics of psychophysiological indicators among students during the fall semester

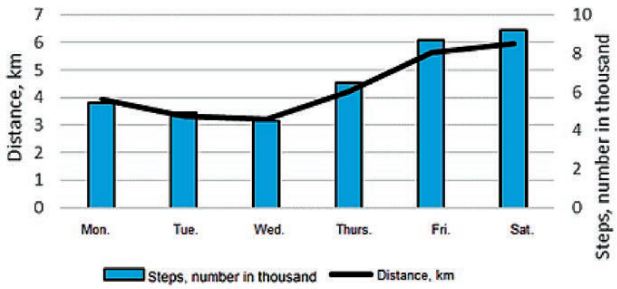

Figure 5. Dynamics of physical activity of students per week

With the assistance of the educational and methodological department of the Russian State Hydrometeorological University, within the framework of mastering the discipline "Elective courses in physical culture and sports" in the spring semester, the students of the EG were agreed upon a study schedule that took into account the experimental data obtained, so the fourth pair was assigned for physical education classes. Mondays and Wednesdays, and on Friday an additional lesson was organized for them in the format of a section by teachers of the Department of Physical Education and Life Safety. The CG studied without making changes to the schedule (Saturday - fourth pair) and the content of the discipline curriculum.

Based on the research experience of a number of authors, modern fitness technologies were chosen for classes with EG [4, 6,]. Tokareva A.V. et al., in their studies, experimentally confirmed that "aerobic exercises are one of the effective means of improving the mental performance of students" [5]. Therefore, to increase both physical and mental performance, on Monday the main emphasis was placed on the development of aerobic endurance, on Friday - on the development and strengthening of the muscular corset of those involved, while Wednesday, as the most effective and at the same time, busy day in terms of mental performance, was devoted to less energy-consuming types - fitness yoga and stretching or joint gymnastics. It must be emphasized that regular yoga classes contribute to the formation of a state of alertness and the development of coordination of movements, improvement of posture and level of physical fitness, and also allow maximum concentration, concentration and calmness [2, 7].

The results of the study after 10 weeks of study in the spring semester are presented in tables 1, 2. Properly organized and rationally selected physical activity contributed to more effective learning. During the survey, students subjectively noted that regular classes allowed them to tone up their body or relax, depending on their workload, time and day during the week, also 80% noted that they began to get sick less often, and 95% did not miss a single day couples due to fatigue. When examining in detail the results of a study of psychophysiological indicators in students per day and per week, one should note the uniformity and sufficient stability of their distribution.

Table 1. Dynamics of psychophysiological indicators in students per day (before - average indicators of both groups, and after the study - separately in the EG and CG)

Indicators/time		8:00	13:00	15:00	19:00
Long-term memory, points	Before	6,5	6,2	4,8	5,7
	EG	6,6	6,5	6,2	5,9
	CG	6,3	6,0	5,1	5,2
The speed of processing visual information, bps	Before	1,2	1,6	1,4	1,4
	EG	1,6	1,7	1,6	1,6
	CG	1,1	1,6	1,2	1,3
Speed of thinking, points	Before	15,2	13,7	11,5	12,2
	EG	16,1	16,5	16,2	14,7
	CG	13,5	12,8	12,2	9,1

Table 2. Dynamics of psychophysiological indicators in students over a week (before - average indicators of both groups, and after the study - separately in the EG and CG)

Indicators/time		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Long-term memory, points	Before	5,7	6,7	7	7,4	6	6,4
	EG	6,4	7,1	7,3	7,2	6,8	6,8
	CG	5,3	5,2	6,4	5,7	6	6,6
The speed of processing visual information, bps	Before	1,6	1,8	1,7	1,4	1,4	1,3
	EG	1,8	1,9	1,9	1,8	1,7	1,7
	CG	1,2	1,3	1,6	1,2	1,1	1,1
Speed of thinking, points	Before	11,5	13,5	16,1	19,5	12,2	13,1
	EG	15,7	15,9	16,1	16,4	16,1	15,7
	CG	13,5	14,1	15,7	13,5	12,4	10,9

There were no significant changes in the CG, but due to the incorrect distribution of the study load during the week and the inability to compensate for mental fatigue with physical activity, there was a decrease in attendance and, accordingly, academic performance in the study group.

Conclusions. Based on the study, the main ways to increase the efficiency of the student learning process at the university were identified, this made it possible to develop, together with the educational and methodological department of the university, recommendations for scheduling and content of physical education classes, taking into account the characteristics of the daily and weekly dynamics of performance indicators and physical condition of students. Regular physical education classes in conditions of intense educational activity are an accessible and effective means of preventing mental and psychophysiological fatigue, which increases the effectiveness of learning.

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