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Legal Preconditions of Creation of the System for the Prevention of Gene Doping in Sport and Counteraction to Forming an Artificial Athlete

 Olga A. Shevchenko¹ and  Dmitriy I. Vorontsov²

Formation of health preserving competence of students of higher educational institutions of information technologies specialties

 Stanislav Prysiashniuk¹,  Dmytro Oleniev²,  Anzhela Tiazhyna³,  Mykola Popov⁴,  Oksana Hunchenko⁵,  Yuriy Parczevskyy⁶,  Oleksandr Pryimakov⁷,  Valentyna Lyshevska⁸,  Valeriy Krasnov⁹,  Erzy Ejder¹⁰,  Ihor Bloshchynskiy¹¹ and  Kostiantyn Prontenko¹²





Exploring Facilitators of Getting a Vocation in People with Substance-Related Disorders: A Qualitative Study

 Bahman Bahmani¹,  Younes Doostian^{2*},  Ali Farhoudian³,  Manoochehr Azkhosh⁴ and  Mohammad Saeed Khanjani⁵

The Hildebrant Index in Adolescent Students While Studying at Various Universities

 E. A. Semizorov¹,  N. Ya. Prokopiev²,  D. G. Gubin³,  S. V. Solovieva⁴ and  D. S. Rechapov⁵

The Effect of Eccentric Strength and Depth Jump Training on Strength, Vertical Jump, and Modified Y Balance on Male Basketball Players

 Oğuzhan YÜKSEL¹,  Mustafa Said ERZEYBEK²,  Fatih KAYA³, Sinan AKIN² and  Sadettin KİRAZCI⁴






The Effects of Training and Achievement Motivation on Vertical Jumping Ability

 MUSLIMIN

The Relationship between Hand/Arm and Leg Strengths with Hand/Foot Reaction Time

 Izzet Ucan¹





Getting The Experience of Culture: From Theory of Activity to Synergy Anthropology

 Evgeny E. Nesmeyanov¹,  Galina S. Kharlamova²,  Tatiana Y. Isaeva³,  Natalia A. Malishevskaya⁴ and  Vladimir G. Tahtamishev⁵



The Effect of Burnout Fatigue After Static and Dynamic Squat Exercises to Isokinetic Leg Strength

 Yıldız Yaprak^{1*} and  Nigar Küçükkubaş²


The Relationship between Body Composition and Physical Fitness Performance in Handball Players

 Mustafa Ertuğrul Çıplak¹,  Serdar Eler²,  Marko Joksimović³ and  Nebahat Eler^{1*}

The Investigation of the Acute Effect of Sparring Training on Some biochemical parameters in Elite Boxers

 Muhammed Fatih Bilici¹ and  Mehmet Şirin Güler²

Formation of health preserving competence of students of higher educational institutions of information technologies specialties

 Stanislav Prysiazhniuk¹,  Dmytro Oleniev²,  Anzhela Tiazhyna³,  Mykola Popov⁴,  Oksana Hunchenko⁵,  Yuriy Parczewskyy⁶,  Oleksandr Pryimakov⁷,  Valentyna Lyshevsk⁸,  Valeriy Krasnov⁹,  Erzy Ejder¹⁰,  Ihor Bloschynskiy¹¹ and  Kostiantyn Prontenko¹²

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Abstract

Study aim. The purpose of the study is to substantiate and develop the theoretical and methodological foundations for the implementation of health care technologies in improving the mental capacity of first-year students.

Research methods: theoretical analysis and synthesis of scientific and methodological literature, pedagogical observation, pedagogical experiment, biomedical methods and methods of mathematical statistics. For the study, we involved first-year male students of the State Telecommunications University (STU), Kyiv Ukraine, who were divided into two groups: experimental (EG) and control (CG). A total of 117 students participated in the research. The study of the pedagogical experiment continued throughout the academic year. During the experiment, the influence of active leisure on the mental capacity of students in the experimental group was determined.

Results. It is proved with a high degree of statistical reliability ($P < 0.001$) that students who regularly attend additional physical development classes are more organized, diligent, have easier contact with fellow students, better master the program material of academic disciplines, etc. The use of small forms of active leisure in the form of physical training break or a physical micro-pause during training sessions from theoretical disciplines, as well as additional physical exercises during free hours, contributes to mental capacity by removing or reducing the impact of fatigue processes.

Conclusions. The use of small forms of active leisure (physical training break and physical micro-pause) when conducting theoretical and laboratory training sessions with students of the experimental group have been experimentally substantiated; they are based on:

– use of physical training break and physical micro-pause between semi-pairs and pairs of theoretical disciplines and laboratory classes;

- use of a physical pause and physical training break during independent work on preparing for training sessions the next day in the hostel and in the conditions of his apartment;
- organization of independent recreational and training sessions on physical self-improvement in free time;
- participation in sports and recreational and sports events of the faculty, teaching and research institute and university.

To form, maintain, improve health and promote the development of physical qualities of each student in the process of learning at higher educational institution, which accounts for the "peak" of functional development of the body, the stabilization of all its systems is the most important task of each higher educational institution, which is defined today by society and the economy of the state.

Active leisure contributes to the functional restructuring of the body. Identifying the characteristic features of this restructuring is the way to solve the problem of improving students' mental capacity. Work and rest are integral and interdependent. Thus, fatigue involves the process of restoring the forces of the body, and the acceleration of this recovery is possible with the help of a certain type of motor activity. Hence, there is the need to substantiate the type of additional activity, which will ensure the restoration of body forces and activation of working capacity with maximum effect.

Keywords: competence, higher education institution, students, health, leisure, physical culture break, physical culture micro-pause

1. Introduction

Health is the public wealth and "state property", but everyone must maintain it on their own [2]. Adequate way of life, rejection of everything that destroys the body, primarily alcohol, smoking and drugs, and daily, systematic physical training based on that principle should solve the problem of maintaining health.

Hoping only for the help of doctors, as well as complaining about the imperfection of our body or the negative effects of the scientific and technological revolution (STR), is unwise and hopeless. Nature is not to blame for the diseases of our heart. STR does not deprive a person of physical activity at all, but, on the contrary, gives her the opportunity to create this in the most targeted and concentrated form - in the form of physical culture [3; 4].

In the middle of the XIX century, with all the energy that was produced and used on Earth, 94% came from the muscular strength of humans and domestic animals, 6% produced water wheels, windmills and a small number of steam engines. In 1952, only 1% of the energy was produced using the muscular strength of A.I. Berg (1964), in 1975 - only 0.5% of the energy was associated with the immediate muscular activity of a person I.V. Muravov (1978), and in subsequent years this percentage continues to decrease [1, 2].

Intensive development of computer technologies, their introduction not only in various areas of production, but also in the field of education, contribute to an increase in the processes of physical inactivity and hypokinesia among school and university students. That is why improving physical culture is now becoming extremely practical. After all, the formation of students' health preserving competencies enhances their physical and mental capacity.

The human body with great difficulty adapts to the modern conditions of life, although its adaptive capabilities are very great. However, they depend on several factors, including heredity, upbringing, working and living conditions, lifestyle, physical activity [6; 11]. When the adaptive abilities of a person are exhausted, the so-called diseases of civilization begin to develop: coronary heart disease, neurosis, vegetative dystonia, cancer, obesity, etc.

How can one explain the threatening increase in the number of cardiovascular diseases in highly developed countries and in Ukraine in particular? First of all, information overload and neuro-emotional stress are to blame. Or maybe the reason lies elsewhere? After all, modern man in most cases does not sufficiently train many mechanisms laid down by nature itself, does not stimulate the most important physiological processes. American scientist V. Raab, who studied the problem of atherosclerosis, in the early 60s of the XX century, called the heart of modern man "the heart of an active slacker" [12; 13].

Health is the result of the cumulative influence of many factors (economic, social, biological, pedagogical, etc.). Of course, in the complex of these factors, physical culture is assigned to one of the leading places. The basic position of medical ethics "Do not harm!", And the slogan of physical culture - "to develop, improve, strengthen, constantly improve!"

Now more than ever the problem of strengthening the health of the population with the help of physical culture. Physical culture and mass sports are of paramount importance in the general complex of

conditions that determine the optimal level of vital activity of the body of students [5; 10; 14].

Any movement, any muscular activity is not only energy, but also its accumulation. When a person goes, runs, jumps, performs exercises with dumbbells, he exercises on simulators, her breathing becomes quicker, the heart beats faster, the blood moves more intensively through the vessels, the body consumes more oxygen and is saturated with nutrients, that is, it returns itself to itself, but with excess, with interest. Some energy capital is formed, it provides even more energy expenditure at each next moment [3; 15].

The article discusses the problematic issues of modern education on the formation of health and physical education and sports competence of future highly qualified information technologies specialists.

2. Literature Review

The society, the higher school, has urgent tasks not only to introduce a competence-based approach to the field of education, new methods and technologies of education, but also to form and develop a steady desire among students to preserve and strengthen their health. After all, health is the very first, most important human need, which determines his ability to work and ensures the harmonious development of the personality. It is the most important prerequisite to the knowledge of the surrounding world, to self-affirmation and happiness of a person. The problem of preserving and strengthening the health of young people is important and is of paramount importance for society [1; 3; 4].

The problem of shaping the health of students' health preserving competencies is a very important task of the state and society. Every year, more and more health, health-preserving activity engaged into the educational process of all types and levels of higher educational institutions [2; 6].

An important factor in the preparation of future highly qualified specialists is quality education. The Law of Ukraine "On Higher Education" [8] states that "... The quality of higher education is a set of personality traits with a higher education, reflecting its professional competence, holistic orientation, social orientation and predetermines the ability to satisfy both personal spiritual and material needs and the needs of society".

In the State National Program "Education" (Ukraine XXI century) [7], one of the main tasks of the state is "... the development of creative abilities and skills of independent scientific knowledge, self-education and self-realization of the personality; training qualified personnel capable of creative work, professional development, mastering and implementing high-tech and information technologies competitive in the labor market", etc.

In state documents, in particular, in the Decree of the President of Ukraine dated February 9, 2016 No. 42/2016 "On the National Strategy for Improving Motor Activity in Ukraine for the Period up to 2025 "Physical Activity - Healthy Lifestyle - Healthy Nation" [16] specified that "The purpose of the National Strategy is to create conditions in society for improving motor activity and a healthy lifestyle in order to shape the health of citizens as the highest social value in the state".

Achieving this purpose involves the following main tasks:

promoting the creation of an all-Ukrainian fund for the development of motor activity and a healthy lifestyle "Active Ukraine is a healthy nation" with the aim of attracting extrabudgetary funds for the development of the material and sports base of mass sports and encouraging individuals, who have an adequate level of recreational motor activity, lead a healthy lifestyle and are characterized by a low risk of non-communicable diseases, properly take care of the health of their children; formation of a value attitude of youth and young people to their own health, improvement of physical development and physical fitness, taking into account the requirements of future professional activities, etc."

3. Method

At the beginning and at the end of the academic year with the students of the experimental and control groups during the school day the state of mental capacity of young men-students was determined using the correction method (V.Ya. Anfimov, A.G. Ivanov-Smolensky) and chronograph (tapping test). During the studies, the statistical significance of differences between the experimental and control groups was determined using Student's t-test, and the dynamics of the results in each of the study groups was also assessed.

3.1. Participants

To conduct the study, we identified the first-year students' educational groups of the State University of Telecommunications, divided into EG - 65 people and CG - 52 people. A total of 117 students participated



in the research.

The young men of the control group used passive rest for recreation, while the young men of the experimental group used active leisure in the form of physical exercise, micro-pause or physical training break, as well as additional self-study exercises with during free hours.

3.2. Materials

To conduct a study of the mental capacity of students during the school day and weekly training cycle, the correctional method was used (V.Ya. Anfimov, A.G. Ivanov-Smolensky). The test was conducted as follows: a letter table was laid before the student. Within one minute, the student had to look through the letters in each tape and cross out or underline certain letters. For example: underline the letter "a" and cross out the letter "e". The work began and ended with the teacher's signal. The number of letters scanned, and the number of errors made were taken into account.

With the help of the tapping test, studies of sensory-motor reactions characterizing the mobility of the nervous processes were carried out. The maximum frequency of movements of the hand of the primary hand depends on the functional state of the afferent and efferent pathways of the autonomic nervous system. To perform the test, it is necessary to draw a square of 10x10 cm on a piece of paper. A student sitting at the table and putting his hand on the table on command, not tearing the forearm from the table surface, with a pencil or ballpoint pen, puts dots with the maximum frequency in the intended square in any order within 10 seconds. Then counted the number of points. An indicator of the functional state of the motor sphere of the brain is the frequency of movements. The normal value of the maximum frequency of hand movements is 67-70 points in 10 seconds. In educational activities, the role of the time factor increases significantly due to the increasing demands for speed and accuracy of students' body reactions.

3.3. Procedure

The study of the pedagogical experiment continued throughout the academic year. During the experiment, the influence of active leisure on the mental capacity of students in the experimental group was determined. During theoretical classes at a certain time, students performed specially selected physical exercises in the form of a physical micro-pause or a physical fitness one. The duration of the exercise complex ranged from 20-30 seconds (physical micro-pause) to 50-65 seconds (physical training break). It has been established that the use of small forms of active leisure during theoretical studies during the school day effectively affects the improvement of students' mental capacity, confirmed by statistical certainty ($p < 0.05-0.001$).

4. Results

To form, maintain and strengthen the health of each student during the period of higher education, which accounts for the "peak" of functional maturation of the body, the stabilization of all its systems - the most important task of each higher educational institution, which is defined today by society and the state. Indicators of the functional capabilities of the body and the physical qualities of young people in Ukraine compared to developed countries are at a low level, which is characterized by a tendency to accelerate the pace of aging of his body [3; 7; 8], an increase in various kinds of deviations in their state of health, poor physical fitness, an increase in the number of missed training sessions for the disease, an increase in the number of young men who, due to their state of health, cannot be recruited into the ranks of the Armed Forces of Ukraine, etc. Today, society cannot worry about the health of students. Annual medical examinations show that with each subsequent year, the number of first-year students with disabilities (Table 1) increases.

Table 1. The dynamics of the disease young men of the 1st year of study of the State University of Telecommunications during the study period

No.	Study period (academic year)	Students, %	
		Ill	Almost healthy
1.	2013/2014	45.0	55.0
2.	2014/2015	54.5	45.4
3.	2015/2016	54.4	45.6
4.	2016/2017	56.9	43.1

Thus, the data in the table indicate that the number of students who have had health problems during medical examinations is increasing every year.

Study and creative use of active leisure great importance in solving the problem of health promotion, increasing the efficiency of students of information technologies specialty at higher educational institutions, as well as extending their creative activity for many years, is acquired by. After all, I.M. Sechenov (1903) also drew attention to the fact that not a complete rest of tired muscles, but rest, is associated with the activity of another group of muscles, contributes to the greatest increase in efficiency.

Forced limitation of motor activity during mental activity of students reduces the flow of impulses from the muscles to the motor centers of the cerebral cortex. This reduces the excitability of the nerve centers, as a result, and mental capacity.

The study of changes in higher nervous activity under the influence of small forms of active leisure is of great importance due to the leading role played by the central nervous system and its highest section - the cerebral cortex in enhancing mental and physical performance.

In order to assess the impact of small forms of active leisure on improving the mental capacity of students, we used one of the simplest methods for studying higher nervous activity of a person, namely, the correction method (V.Ya. Anfimov, A.G. Ivanov-Smolensky).

The results of the study pedagogical experiment are given in tables 2-3. The obtained research data indicate uneven changes in indicators of young men.

So, if at the beginning of the experiment the young men of the experimental group had a decrease in the number of viewed characters in the Anfimov table with a slight increase in the third pair, the control group had a sharp decrease in the second pair of classes and an increase in the third. The number of viewed men of the control group on the third pair slightly exceeds the data at the beginning of the school day, but this is only a trend, not confirmed by statistical confidence ($p > 0.05$).

Table 2. Analysis of the study of indicators of higher nervous activity (Anfimov's table) of the first year students of SUT during the academic year (number of characters viewed)

Study groups	Statistical indicators	Study period					
		1 pair		2 pair		3 pair	
		beginning of academic year	end of academic year	beginning of academic year	end of academic year	beginning of academic year	end of academic year
Experimental group	M	258.4	248.4	203.0	267.5	211.3	271.3
	± m	14.0	9.07	9.71	9.6	8.51	7.51
	t			4.67	2.05	4.20	2.76
	p			< 0.001*	< 0.05*	< 0.001*	< 0.01*
Control group	M	257.8	237.8	156.5	246.3	262.8	232.8
	± m	21.0	9.0	19.0	8.0	21.9	7.9
	t			5.06	1.0	0.23	0.59
	p			< 0.001*	> 0.05*	> 0.05*	> 0.05*
Comparative statistical probability between study groups	t	0.03	1.17	3.24	2.40	3.39	4.18
	p	> 0.05	> 0.05	< 0.01	< 0.02	< 0.001	< 0.001

* Comparison regarding the 1st pair of studies.

Table 3. Analysis of the study of indicators of higher nervous activity (Anfimov's table) for young men of the 1st course of SUT during the school year (number of mistakes made)

Study groups	Statistical indicators	Study period					
		1 pair		2 pair		3 pair	
		beginning of academic year	end of academic year	beginning of academic year	end of academic year	beginning of academic year	end of academic year
Experimental group	M	6.90	6.81	3.09	4.17	5.95	3.73
	± m	2.60	1.23	1.36	1.36	1.72	1.32

	t			1.92	2.04	0.43	2.42
	p			> 0.01*	< 0.05*	> 0.05*	< 0.02*
Control group	M	8.17	8.09	5.52	6.37	5.70	6.97
	± m	4.29	2.29	2.24	2.24	1.28	1.28
	t			0.81	0.76	0.89	0.62
	p			> 0.05*	> 0.05*	> 0.05*	> 0.05 *
Comparative statistical probability between study groups	t	0.36	0.72	1.35	1.22	0.16	2.49
	p	> 0.05	> 0.05	> 0.02	> 0.05	> 0.05	< 0.02

* Comparison regarding the 1st double lesson.

Regarding the mistakes made when viewing the letter table at the beginning of the experiment, the young men of the experimental group made fewer mistakes on the second pair of training sessions, but on the third pair the number of errors slightly increased to 5.95 ± 1.72 , whereas in the young men of the control group there is a noticeable slight decrease relative to the young men of the experimental group from 5.52 ± 2.24 to 5.70 ± 1.28 . This improvement is insignificant and is not confirmed by statistical reliability; there is just a certain tendency towards improvement ($p > 0.05$). In general, during the school day, the number of viewed characters and the number of errors made at the same time occurred in waves - a decrease in the second pair and a slight increase in the third pair, although fewer errors than in the first pair.

By the end of the pedagogical experiment, the effectiveness of using small forms of active leisure to improve the performance of higher nervous activity of first-year students.

In particular, the number of viewed characters from the Anfimov table during the school day in the experimental group of young men increased from 248.4 ± 9.07 in the first pair of training sessions to 271.3 ± 10.5 in the third pair, as evidenced by the high degree of statistical confidence ($p < 0.01$). At the same time, in the control group of young men at the end of the school day there was a tendency to decrease the number of viewed characters (from 237.8 ± 9.0 to 232.8 ± 7.9 ; $p > 0.05$).

Regarding the mistakes made when looking at the table of Anfimov, then in the experimental group of young men from the first couple to the third one there was a clear trend of reducing the number of errors made, which is confirmed by statistical confidence ($p < 0.02$). While in the control group of young men, although a slight decrease in the number of errors was noted, only a tendency was noted, it was not confirmed by statistical certainty ($p > 0.05$).

The increase in the number of viewed characters and, at the same time, a decrease in the errors made over a certain time relative to the initial data of the young experimental group indicates a beneficial effect of active leisure on the functional activity of students' higher nervous activity. At the same time, in the young men of the control group, during the school day, under the influence of the training load, mental capacity decreased, as evidenced by the data in Table 3.

The positive effect of small forms of active leisure was observed in the analysis of sensory-motor reactions in the study groups during the school year (Table 4). At the same time, it should be noted that the indicators of sensory-motor reactions in the young men of the control group, at the beginning of the experiment, are significantly higher than in the young men of the experimental group, which is confirmed by a high degree of statistical confidence ($p < 0.001$). In our opinion, this indicates that the mental capacity of the young men in the control group at the beginning of the experiment was higher than that of the young men in the experimental group.

It should also be noted that the decline in mental capacity of young men in both groups of research occurred in waves: in the second pair, in both groups of research there was a tendency to improve the sensory-motor responses ($p > 0.05$), and on the third pair there was a rapid deterioration in sensory-motor responses in both the experimental and control groups ($p < 0.01$). The difference was only in dynamics. So, if in the experimental group the decrease occurred by 6 conventional units, in the control group - by 3.2. The deterioration of the indicators of the tapping test suggests that as a result of the development of fatigue processes during the school day, the functional activity of the afferent and efferent pathways of the students' autonomic nervous system deteriorates. And this in turn affects the efficiency of students' mental capacity.

Table 4. Analysis of the study of indicators of sensory-motor reactions (tapping test) of young men of the 1st year of SUT during the academic year

Study groups	Statistical indicators	Study period					
		1 pair		2 pair		3 pair	
		beginning of academic year	end of academic year	beginning of academic year	end of academic year	beginning of academic year	end of academic year
Experimental group	M	68.9	78.7	70.7	85.7	62.9	87.5
	± m	2.21	2.15	2.03	1.83	1.98	1.78
	t		4.49		7.77		13.0
	p		< 0.001		< 0.001		< 0.001
Control group	M	80.1	77.1	81.2	78.2	76.9	75.3
	± m	2.18	2.13	2.35	1.60	1.72	1.53
	t		1.86		1.52		0.98
	p		> 0.01		> 0.05		> 0.05
Comparative statistical probability between study groups	t	5.11	0.74	4.79	4.38	7.56	7.39
	p	< 0.001	> 0.05	< 0.001	> 0.001	< 0.001	> 0.001

By the end of the school year, the young men of the experimental group had a noticeable increase in the indices of the sensory-motor responses throughout the school day, while the young men in the control group had a decrease in their numbers, which indicates a steady trend towards an increase in fatigue processes, and this in turn influenced the decrease in students' mental activity, although this was not confirmed by statistical probability, but only a tendency was observed. At the same time, in the young men of the experimental group, the indicators of sensory-motor responses increased throughout the school day. In our opinion, this is an action of small forms of active leisure (physical culture pause, physical training break), which is more effective than passive rest, which was used by students of the control group.

In particular, comparing the study groups at the end of the school year show the following: if the average pair of young people in the experimental group was 78.7 ± 2.15 movements in 10 seconds in the first pair of classes, in the second pair - 85.7 ± 1.83 , then already in the third pair of classes, this figure was already 87.5 ± 1.78 movements in 10 seconds. In the young control group, the average rate was 77.7 ± 2.13 movements in 10 seconds in the first pair of classes, 78.2 ± 1.60 in the second pair, and the third pair experienced a sharp decrease to 75.3 ± 1.53 movements in 10 seconds.

If we compare the results of the study of sensory-motor reactions during the school year between the experimental and control groups, then at the beginning of the experiment there was a significant advantage of the young men of the control group, which is confirmed by the statistical confidence ($p < 0.001$), and already at the end of the school year, the indicators of the young men of the control group were significantly worse than those of the young group of the experimental group, as evidenced by a high degree of statistical confidence ($p > 0.001$).

5. Discussion and Conclusion

Health should be one of the top priorities among the many values of today's youth. Any work performed without interruption to rest contributes to the development of fatigue and a decrease in the functional capabilities of the body. If, despite fatigue, a person continues to work, an overstrain of the body may develop, it is not always safe for human health. Mental work is also associated with significant loads on the higher parts of the central nervous system and mental functions of the human body. Forced limitation of motor activity during mental activity reduces the flow of impulses from the muscles to the motor centers of the cerebral cortex. This reduces the excitability of the nerve centers, as a result, and mental capacity.

The absence of muscle tension and mechanical compression of the blood vessels of the posterior thigh surface while in a sitting position decreases the blood circulation intensity, and the blood supply to the brain deteriorates, thus making it more difficult to function. There is a feeling of fatigue caused by intense mental work and a long stay in a monotonous working posture that occur in the body [1; 2; 17].

To eliminate them, you need a rest. Therefore, the alternation of periods of work and rest - a necessary condition for increasing productivity. It is known that the most effective recovery occurs during active leisure. You can activate it with the help of specially selected physical exercises [3; 13].

The most deeply developed mechanism, the stimulating influence of one of the forms of motor switching, was first recreated by I.M. Sechenov (1903-1904) and hereinafter referred to as the Sechenov's phenomenon of active leisure. It is known that in special experimental conditions, under the influence of such a switch, the recovery process of muscular working capacity can be significantly accelerated.

The facts of high efficiency of active leisure as a method of accelerated rehabilitation in many types of mental activity are known to date. In particular, E.G. Bulich, Yu.V. Boyko and E.K. Redko (1973) proved that under the influence of a short physical activity pause during hard work, different sides of mental performance change differently: the ability to respond quickly with a motor response to the appearance of a simple stimulus in the field of view is significantly increased, the ability to perform complex operations related to information retrieval requiring attention is somewhat less improved.

Active leisure is important for increasing mental performance, increasing neuro-psychic stability to emotional stress during the whole academic year, and in particular, during the session.

Analysis of literary sources showed that coverage of the issues of using metered physical loads during the school day and during extracurricular time of students and their impact on physical and mental performance is insufficient and requires additional scientific and pedagogical research.

In the course of the research conducted during the studies of first-year students of the SUT, it was found that by changing the content of active leisure, that is, specially selected for physical training break and physical culture micro-pause of exercise, you can purposefully influence the increase in the functional activity of the central nervous system and the whole organism, and thus influence the mental performance of students in accordance with the specific requirements of educational activities.

Comparing the performance of both groups of the study, a statistically significant advantage of the proposed method was observed using small forms of active leisure during the school day (physical micro-pause, physical training break) in relation to the passive rest of students in the control group.

So, the educational process in a higher educational institution must be built in such a way as not only to provide students with a certain amount of knowledge, but also to form their health preserving competence. Formation of the health preserving competencies of students of higher professional education is considered by us as a complex integral process characterized by the presence of knowledge and skills, health preserving activities necessary for the implementation of health, contributes to the self-development, self-education of students, their adaptation in a changing external environment and the effective acquisition of professional skills in a holistic educational process of higher educational institutions of information technologies.

Indicators of functional capabilities of the body, performance, physical qualities and motor abilities of young people in Ukraine compared with developed countries are at an insufficient level, which is characterized by a tendency to accelerate the pace of aging of their body [3; 10; 13; 17], an increase in various kinds of deviations in their state of health, poor physical fitness, an increase in the number of missed training sessions for the disease, an increase in the number of young men who, due to their state of health, cannot be recruited into the ranks of the Armed Forces of Ukraine, etc. [11; 13; 15].

Thus, the obtained results of the study testify to the unconditional positive influence of small forms of active leisure (physical training break and physical micro-pause) during the school day on the functional activity of the higher nervous system of the young men of the experimental group, as a result it contributes to improving the mental performance of the young men of the experimental group.

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