DOI: https://doi.org/10.31392/UDU-nc.series15.2024.12(185).48

Khimich Igor
Candidate of Pedagogical Sciences, ***Associate Professor at the department of health and sports technologies, National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" Kyiv, Ukraine.***
orcid:0000-0002-6094-9088
Parakhonko Vadym
Senior Lecturer at the department of health and sports technologies, National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" Kyiv, Ukraine.
orcid:0000-0001-7816-5014

ENERGY EXCHANGE PROCESSES IN THE GROWING ORGANISM OF FIRST- AND SECOND-YEAR STUDENTS

Studying at a university is a complex and lengthy process that requires a lot of effort from all body systems. The first year is a special period: former schoolchildren, accustomed to a certain system, entering a university, face new forms and methods of teaching, new emotional experiences, their work and rest, sleep, and nutrition regimes change. There is a need to adapt to a new team, new teachers. At the same time, the functional abilities of the body of first-year students are reduced, since most of them had to pass important exams and did not have enough summer rest.

One of the most important problems of education in a modern university is the adaptation of students to the academic load. A multi-level functional system of adaptation is formed by the interaction and mutual influence of physiological and psychological components of adaptive reactions. The contribution of each of these components is determined by the ratio of two goals of adaptation - maintaining homeostasis and performing activity tasks. It is known that during the period of study at a university, students are exposed to a number of both non-specific (climatic-geographical, environmental) and specific factors (age, physiological and psychological characteristics, emotional overload, sedentary lifestyle): adaptation to a set of new factors is accompanied by significant stress on the compensatory-adaptive systems of the students' body. These issues are most relevant for maintaining the health of students, as the most active creative part of the nation. Students are a reserve of highly qualified specialists for various sectors of the national economy, determining the labor and intellectual potential of the country, reproduction and health of the future generation in the coming years. The process of adaptation to studying at a university is a very complex, multifaceted phenomenon. The period of acute adaptation, according to many researchers, falls on the first and second years of university. Its duration is determined by the individual characteristics of the student, including abilities, mental attitudes, financial security and, of course, health. The degree of expenditure of physiological and mental resources of the human body to perform specific work, balancing with the external environment is described by the parameters of the current functional state.

Key words*: students, energy exchange, metabolism, educational load, mental processes, influence.*

Хіміч Ігор, Парахонько Вадим. Процеси енергообміну в організмі студентів першого і другого курсів. *Навчання у ВНЗ - це складний і тривалий процес, який вимагає великих зусиль від усіх систем організму. Перший рік – це особливий період: колишні школярі, які звикли до певної системи, вступаючи до ВНЗ, стикаються з новими формами і методами навчання, з новими емоційними переживаннями, змінюється режим праці та відпочинку, сну, харчування. Потрібно адаптуватися до нового колективу, нових викладачів. Водночас знижуються функціональні можливості організму першокурсників, оскільки більшість із них мали здавати важливі іспити та не мали достатнього літнього відпочинку.*

Однією з найважливіших проблем навчання в сучасному університеті є адаптація студентів до навчального навантаження. Багаторівнева функціональна система адаптації формується взаємодією і взаємовпливом фізіологічних і психологічних компонентів пристосувальних реакцій. Внесок кожного з цих компонентів визначається співвідношенням двох цілей адаптації - підтримання гомеостазу і виконання завдань діяльності. Відомо, що в період навчання у ВНЗ студенти піддаються дії ряду як неспецифічних (кліматo-географічних, екологічних), так і специфічних факторів (вікові, фізіологічні та психологічні особливості, емоційні перевантаження, малорухливий спосіб життя): адаптація. До комплексу нових факторів супроводжується значним навантаженням на компенсаторно-пристосувальні системи організму студентів. Ці питання є найбільш актуальними для збереження здоров'я студентів, як найактивнішої творчої частини нації. Студентство є резервом висококваліфікованих спеціалістів для різних галузей народного господарства, що визначає трудовий та інтелектуальний потенціал країни, відтворення та здоров'я майбутнього покоління в найближчі роки. Процес адаптації до навчання у ВНЗ – явище дуже складне, багатогранне. Період гострої адаптації, на думку багатьох дослідників, припадає на перший і другий курси університету. Його тривалість визначається індивідуальними особливостями учня, включаючи здібності, психічні установки, фінансову забезпеченість і, звичайно, здоров'я. Ступінь витрат фізіологічних і психічних ресурсів організму людини на виконання певної роботи, балансування із зовнішнім середовищем описується параметрами поточного функціонального стану. Проблема навчальної адаптації студентів є актуальною як з точки зору стану їх здоров'я, так і в аспекті вдосконалення навчального процесу. Ефективна постановка навчального процесу потребує вдосконалення системи організаційних та педагогічних заходів, які мають базуватись на даних динаміки працездатності студентів.

Ключові слова*: студенти, енергетичний обмін, обмін речовин, навчальне навантаження, психічні процеси, вплив.*

Formulation of the problem. In connection with the above, it is relevant to study the physiological mechanisms of resistance and predisposition of students' bodies to the negative consequences of emotional overload, identify those factors of the

educational process that lead to a decrease in the functional reserves of the body and develop criteria for assessing and predicting the physiological cost of adaptation.

An integral part of metabolism is energy exchange. Relation the amount of energy that enters the body with food and the amount of energy spent by the body is called energy balance. With excessive nutrition, there is an accumulation of energy reserves (an increase in body weight) - a positive energy balance; in conditions of insufficient nutrition, a decrease in energy in the body (decrease in body weight) is observed - a negative energy balance.

Analysis of literary sources. The processes of energy exchange and the impact on the general health of students were studied by such authors as: Grzegotskyi M.R., Filimonov V.I., Petryshyn Yu.S. [1], Sukhomlynova I.E., Kush O.G., Bessarab G.I., Morozova O.G., Tikhonovska M.A., Yeromina A.K., Zhernova N.P., Voteva V.E. [2], V.P. Ivashchenko, O.P. Bezkopylnyi [3].

A person's need for energy depends on a person's constitution, weight, height, age, type of activity, and other factors. Under all other conditions, reducing the caloric content of the diet should be carried out mainly at the expense of products rich in carbohydrates (sweets, bread, flour products, potatoes, etc.). No less effective method of reducing excess body weight is to increase energy expenditure due to physical exercises. In order to lose fat reserves, the cost of the food ration should be less than the energy expenditure. At rest and during light work, 50% of the energy supply is provided by carbohydrates. When performed maximally during intense physical work, almost all energy comes from carbohydrates. Long-term performance of strenuous muscle work leads to the exhaustion of carbohydrate reserves and the onset of fatigue; when the functioning of organs and systems is ensured mainly due to the energy of fats, a lot of harmful substances accumulate in the body, in particular acetone. This leads to a decrease in physical performance and poisoning by products of fat metabolism. The most effective energy supply is muscle activities are created under the condition of simultaneous oxidation of both fats and carbohydrates. Significant ergothermic effects on an unprepared body can cause negative consequences - a slow increase in the functional effects of training, deterioration of health. An increase or decrease in body temperature beyond biological limits leads to disturbances in the normal course of the main physiological processes in the body and death. Features of heat exchange during exercise. The temperature factor should be taken into account in the practice of health training for prevention of negative effects of its excessive values on the body, to optimize the training process and temperature control of the state of physical fitness of students. The temperature stimulus is widely used as a means of increasing the body's natural resistance. This is especially relevant in conditions of a significant decrease in energy expenditure for physical work, an increase in emotional stress, pollution of water, air and food products with chemical substances plant protection and industrial waste [3].

To ensure good health and well-being, an adult must spend 1200-2000 kcal on muscle activity during the day. This includes industrial, household and specially selected physical exercises. It is quite difficult to select from the total volume the part that should be allocated to physical training. However, there are such generalized data, and they should be used in the practice of physical education. It is believed that an adult should spend 1000-2000 kcal of energy during the week or 150-300 kcal during the day for health-improving physical exercises. Lower energy expenditure causes the development of detraining with a decrease in the body's reserve capabilities. Only physically fit young and middle-aged people can consume more than 500,000 kcal per day without harm to health. With a daily energy consumption of 10,000 kcal, a person is unable to absorb the food necessary to compensate for the spent energy and loses about 500 g of body weight during the day. Of course, highly qualified athletes sometimes perform greater loads, but they are usually associated with the use of various means that accelerate the course of recovery processes. People who regularly participate in health groups and spend an average of 300 kcal of energy per day on health training, according to the general state of health and volume of physiological reserves have significant advantages compared to those who neglect physical activity [1].

The exchange of substances and energy is closely related to the entry into the body of various substances with their complex chemical transformations, which are accompanied by the formation of a considerable number of unnecessary, and sometimes harmful to the body, intermediate and final products of metabolism. To maintain normal vital activity in the body, they constantly pass processes of removal of slags - unnecessary and poisonous substances of metabolism. This function is performed by various organs united into a single system of excretory organs. Carbon dioxide is removed from the body through the lungs; substances insoluble in water are excreted through the intestines. Excess water from salts dissolved in it and toxic products of protein metabolism are excreted by the kidneys and sweat glands of the skin.

Kidneys are especially important for maintaining the stability of the chemical composition of the body's internal environment. Other important excretory organs are sweat glands. They are unevenly distributed on the surface of the skin. The activities of the kidneys and sweat glands are interconnected, and they can partially replace (complement) each other's work. Sweating is important for body thermoregulation. In depending on the ambient temperature and the intensity of motor activity, sweat secretion can vary from 0.5 to 3 liters or more per day. With the release of 1 ml of sweat, the body loses 0.58 kcal of energy. A lot of sweat is released during intense muscle work and physical exercises. Accordingly, the qualitative composition of sweat, with which lactic acid, urea and ammonia are excreted from the body during strenuous work, can also change [2].

Functional effects of adaptation of neurohumoral systems regulation of physical activity. The release of energy for muscle work is carried out in the cells of the body as a result of the course of oxidative processes. Therefore, the body's need for oxygen during physical activity increases sharply. Simultaneously with the increase in the transfer of oxygen from the blood to the muscles and from the working muscles to the blood, carbon dioxide and other products pass exchange, an excessive amount of which leads to a violation of constancy internal environment of the body. These changes in homeostasis are immediate are perceived by the nervous system, which mobilizes the activity of the necessary organs and systems to maintain the disturbed balance of the internal environment. First of all, the activity of the body's oxygen-supplying systems - the respiratory, cardiovascular and blood systems - is enhanced, and subsequently the mechanisms of thermoregulation, excretion, etc. are activated. With each new one training these adaptive mechanisms more and more are being improved, the volume of functional reserves is growing oxygen-providing and other systems of the body. Such orientation of changes in functions, of course, has an adaptive nature, it helps a

trained person to effectively adapt not only to heavy physical exertion, but also to the action of other factors (stimuli) - overheating, hypothermia, changes in atmospheric pressure, humidity air etc. The basis of the body's effective adaptation to increased physical exertion is the changes occurring in the central nervous system and endocrine glands, which regulate the activity of other organs and systems. Humoral and nervous regulation of functions provides maintenance the minimum level of vital activity of the body's organs and systems at rest, a change in the activity of the vegetative systems during work, aimed at providing the body with energy and maintaining homeostasis [3].

Peculiarities of humoral regulation of human activity. Humoral regulation of functions is provided by a non-specific chemical (properly humoral regulation) and hormonal way. Chemical regulators of functions that can affect the speed and nature of metabolic processes can be substances that enter the body together with food, when breathing, through the skin, or are formed in the process of metabolism (carbonic acid, urea, ammonia, etc.). Some specific metabolic products are formed in cells. These include the mediator's acetylcholine, adrenaline, etc. Hormonal regulation of functions is more specific, it is implemented with the help of hormones produced in endocrine glands. Special importance for energy supply of muscle activity and maintenance of the body's homeostasis belongs to the adaptogenic hormones (noradrenaline and adrenaline) of the adrenal glands. The synthesis of these hormones by the adrenal glands at rest is minimal, during physical exertion and emotional excitement it increases significantly. This ensures the acceleration and strengthening of the work of the heart and lungs, contributes to the rational redistribution of blood in the body, the breakdown of glycogen in the liver and the influx of glucose into the blood. Adrenaline and norepinephrine can increase muscle activity enzymes, thereby increasing the anaerobic breakdown of glycogen and accelerating the breakdown of fats and their use for the specific needs of muscles. Adrenaline is also a hyperglycemic hormone [2]. Its activity depends on the functional state of the cerebral cortex and the concentration of glucose in the blood. Before the competition (in the pre-start state), the adrenaline content in the blood increases with long-term work in the zone of moderate power (marathon distances) excretion of this hormone with urine increases.

Nervous regulation of functions under conditions of physical exertion. The nervous system, the main functions of which are fast, accurate transmission of information and integration, ensures the relationship between organs and organ systems, the functioning of the body as a whole, its interaction with the external environment. It regulates and coordinates the activity of the entire organism as a whole system to the constantly changing conditions of the external and internal environments. With the help of the nervous system, reception and analysis of various signals from the environment is carried out environment and internal organs, corresponding reactions to these signals are formed. The performance of mental functions, awareness of the signals of the surrounding world, their memorization, decision-making and organization of purposeful behavior, abstract thinking and speech are related to the activity of the higher departments of the nervous system. All these complex functions are performed by a huge number of nerve cells (neurons), united in the most complex neural circuits and centers [1]. Humoral and nervous regulation of functions ensures the maintenance of the minimum level of vital activity of organs and systems of the body in a state of rest, changes in the activity of the vegetative systems during work, aimed at providing the cells of the body with energy and preserving constancy of the internal environment. A brain trained for muscle activity is larger in mass compared to an untrained one, and its nerve cells have more a branched network of dendrites, it has increased buffering properties and higher activity of oxidative enzymes. In trained by 10-15% more strength, mobility and balance of excitation and inhibition processes. Sympathetic and parasympathetic divisions of the autonomic nervous system they innervate the same organs and act as antagonists - sympathetic nerves provide energy consumption by the body - energotropic effect, and parasympathetic - its accumulation and preservation - trophotropic effect. At rest and after physical exertion, the parasympathetic nervous system ensures the efficiency of recovery processes. In development training, especially in the first stages of training, an important role belongs to the adaptive and trophic function of the sympathetic nervous system, which ensures adaptation of the intensity of exchange processes in tissues to the functional needs of the body. With the growth of sports qualifications, the influence of the sympathetic nervous system on the development of training decreases. This is evidenced by the fact that the body's sensitivity to adrenaline decreases.

Conclusive.

The educational process of the university causes a significant increase in the functional stress of the first-year students. The adaptation of the students' body to the educational process is accompanied by stress of the cardiovascular, central nervous systems, neuromuscular apparatus, against the background of activation of attention functions. This is due to the specifics of the educational process in these specialties, as well as the level of pre-university preparedness of students. In addition, the process of adaptation to the academic load depends on the students' previous place of residence.

In general, the central nervous system is activated by light physical work and oppressed by heavy However, even with maximum physical strength loads of changes in cerebral blood flow compared to other organs are insignificant. At the same time, the blood circulation of actively functioning parts of the brain increases most intensively. When performing maximally intense work, the processes of obtaining and processing information can be disturbed so clearly that the athlete loses orientation in space, makes mistakes in solving simple tactical tasks. When work is continued due to volitional efforts, hypoxia of the higher parts of the brain occurs with loss of consciousness - subconscious exclusion organism, aimed at stopping the activity. Thus, adaptation of the body to the action of various stimuli the external environment is carried out by the body through various links. Hormonal status here is a prerequisite for the subsequent inclusion of specialized response mechanisms by the nervous system.

The studied data indicate the severity of the influence of the educational process of the university on the functional stress of the students' organism. The developed methodological approach and quantitative gradation based on the developed mathematical model allows us to evaluate and predict the level of students' performance, both at the time of the examination and at expected (possible) values.

At present, despite a significant number of works devoted to the study of the functional state of the body of university students, the issues of student adaptation to the educational process, the importance of individual typological features in the development of adaptive reactions that limit the functional state of the body of students in the initial period of study remain open.

The human body is a dynamic system that continuously adapts to living conditions by changing the level of functioning of individual systems and the corresponding stress of regulatory mechanisms. When studying the functional state, preference should be given to complex research methods, since they allow us to fairly accurately assess the potential capabilities of the body and diagnose early changes in the functional state under the influence of various loads.

Reference

1.Grzegotskyi M.R., Filimonov V.I., Petryshyn Yu.S. 2005.

Human physiology [for students of higher educational institutions and pharmaceutical faculties of higher medical institutions of education III - IV levels of accreditation] – K., Book plus - 495 p.

2.Sukhomlynova I.E., Kush O.G., Bessarab G.I., Morozova O.G., Tikhonovska M.A., Yeromina A.K., Zhernova N.P., Voteva V.E. 2014. ENERGY EXCHANGE AND PHYSIOLOGICAL BASIS OF NUTRITION. A guide for students. Zaporizhzhia, ZDMU -81 p.

3.Ivashchenko V.P., Bezkopylnyi O.P. 2006. Theory and methods of physical education. Textbook part 1 - Cherkasy publishing house – 420 p.

DOI: https://doi.org/10.31392/UDU-nc.series15.2024.12(185).49

Mykhailenko V.
Senior Lecturer at the department of health and sports technologies, National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" Kyiv, Ukraine.
orcid 0000-0002-1001-1999
Zhuravl'ov S.
Senior Lecturer at the department of health and sports technologies, National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" Kyiv, Ukraine.
orcid 0000-0002-0194-6397
Khoruzheva L.
Senior Lecturer, Department of Ukrainian and Foreign Languages, National University of Ukraine on Physical Education and Sport
orcid 0009-0008-2392-0201
Yunak V.
Senior Lecturer, Department of Ukrainian and Foreign Languages, National University of Ukraine on Physical Education and Sport
orcid 0009-0008-4544-0305
Dotsenko L.Z.
Senior Lecturer, Department of Ukrainian and Foreign Languages, National University of Ukraine on Physical Education and Sport
orcid 0000-0002-2127-0582

PREPARATION AND HOLDING OF MASS SPORTS EVENTS AT THE UNIVERSITY AMONG STUDENTS OF ALL FACULTIES

Much has been done to develop the system of events in recent years. Nevertheless, it is necessary to return once again to the problem of using events as a tool, a method of managing the sports movement. However, it should be noted that in sports management the role of general laws and methods based on them is great: administrative and legal; economic; ideological. The essence of managing the sports movement with the help of a system of events is that: changes in the system of events have the property of causing a corresponding restructuring in the social institution of physical culture and sports itself; the level of sports results and the nature of their change lead to the need to make appropriate adjustments to the activities of sports organizations.

The system of events as a management method functions at all levels, from management on a national scale to management in a work collective, the educational and training process. Analysis of the system of events indicates both the highest stability in the principles of their implementation, and in the constant changes of the system itself. The main organizational principle of the system is the phased implementation of events, starting from physical education and sports clubs of enterprises, organizations, educational institutions to republican events and year-round Universiades and Spartakiads. The system of events is implemented based on the following principles: stability of event calendars at all levels, their organization, allowing to create conditions for systematic continuous training of athletes throughout the year; phased formation of the event calendar, creating prerequisites for mastering increased (in volume and intensity) loads; strict adherence to age continuity in planning competitive loads, from beginners to top-level athletes.

Key words: *sport, system, measures, students, competition, influence, state, physical culture.*

Михайленко В.М., Журавльов С.О., Хоружева Л.Є., Юнак В.Г., Доценко Л.З. Підготовка та проведення спортивно-масових заходів в університеті серед студентів всіх факультетів. *За останні роки багато зроблено для розвитку системи заходів проведення змагань. Тим не менш, необхідно ще раз повернутися до проблеми використання змагань як інструменту, методу управління спортивним рухом. Проте слід зазначити, що в спортивному менеджменті велика роль загальних закономірностей і заснованих на них методів: адміністративно-правовий; економічний; ідеологічний. Сутність управління спортивним рухом за допомогою системи заходів полягає в тому, що зміни в системі заходів мають властивість викликати відповідну перебудову в самому соціальному*