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PHYSIOLOGICAL REACTIONS OF THE BODY TO THE EXTERNAL ENVIRONMENT.

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ABSTRACT

The formation of any morphophysiological functions and the organism as a whole depends on their ability to develop further, which is largely genetic and is especially important for achieving both optimal and maximum indicators of physical and mental performance. It should be aware that the ability to perform physical work can increase many times, but to certain limits, whereas mental activity actually has no limitations in its development. Systematic muscular activity allows, by improving physiological functions, to mobilize those reserves, the existence of which many do not even realize. Moreover, an organism adapted to the loads has much greater reserves, can use them more economically and fully. An organism with higher morphofunctional indicators of physiological systems and organs has an increased ability to carry out more significant physical activities in terms of capacity, volume, intensity and duration. Features of the morphofunctional state of different body systems that are formed as a result of motor activity are called physiological indicators of fitness. They are studied in a person in a state of relative rest, when performing standard loads and loads of various capacities, including ultimate ones. Some physiological indicators are less variable, others are more and depend on the motor specialization and the individual characteristics of each student. During training, the development of the body's performance has different dynamics, but it characterizes the changes occurring in the body during exercise, and reflects both the hereditary qualities of the body and. methods of their development and improvement. Thus, the effectiveness of an exercise, which finds expression in the form of a result (health, success in mental, sports and other activities), can have different paths and dynamics along the entire path of the training process. An important task of the exercise is to maintain health and performance at an optimal level by enhancing recovery processes.

Keywords: organism, external environment, physiology, muscular activity, adaptation.

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INTRODUCTION

The body is subject to biological laws inherent in all living beings. A person differs from representatives of the animal world not only in structure, but in developed thinking, intelligence, speech, and peculiarities of social and living conditions and social relationships [1]. Labor and the influence of the social environment in the process of human development have influenced the biological characteristics of the organism of modern man and his environment. The basis of the study of human organs and interfunctional systems is the principle of integrity and unity of the organism with the external natural and social environment [2].

An organism is a harmonious unified self-regulating and self-developing biological system, the functional activity of which is caused by the interaction of mental, motor and vegetative reactions to environmental influences, which can be both beneficial and detrimental to health. A distinctive feature of a person is a conscious and active influence on external natural and social conditions that determine the state of people's health, their working capacity, life expectancy and fertility (reproduction) [3].

Without knowledge about the structure of the human body, about the patterns of functioning of individual organs and body systems, about the peculiarities of the course of complex processes of its vital activity, it is impossible to organize the process of forming a healthy lifestyle and general health of the population.

Objective: To consider aspects of the body's physiological reactions to external influences.

The body as a single self-regulating biological system

The development of the organism is carried out in all periods of its life - from the moment of conception until the end of life. This development is called individual, or development in ontogenesis. There are two periods: intrauterine (from conception to birth) and extrauterine (after birth) [4].

Every born person inherits from his parents congenital, genetically determined traits and characteristics that largely determine individual development in the process of his later life.

After being born, figuratively speaking, in the autonomous mode, the child grows rapidly, increasing the weight, length and surface area of his body. Human growth continues until approximately 20 years. Moreover, girls have the highest growth rate in the period from 10 to 13, and in boys from 12 to 16 years. An increase in body weight occurs almost in parallel with an increase in its length and stabilizes by the age of 20–25 years [5].

It should be noted that over the past 100 - 150 years in some countries, there is an early morphofunctional development of the body in children and adolescents. This phenomenon is called acceleration, it is associated not only with the accelerated growth and development of the organism in general, but also with the earlier onset of the period of puberty, the accelerated development of sensory, motor coordination and mental functions. Therefore, the boundaries between age periods are fairly arbitrary and this is associated with significant individual differences, in which the “physiological” age and the “passport” do not always coincide [6].

As a rule, adolescence (16-21 years) is associated with a period of maturation, when all organs, their systems and apparatus reach their morphological and functional maturity. Mature age (22 - 60 years) is characterized by minor changes in the structure of the body, and the functionality of this rather long period of life is largely determined by the characteristics of lifestyle, nutrition, physical activity [7]. The elderly (61 - 74 years) and senile (75 years and more) are characterized by physiological processes of restructuring and a decrease in the active capacities of the organism and its systems — immune, nervous, circulatory. A healthy lifestyle, active motor activity in the process of life slows down the aging process significantly.

The basis of the vital activity of the organism is the process of automatically maintaining vital factors at the required level, any deviation from which leads to immediate mobilization of the mechanisms that restore this level (homeostasis).

Homeostasis is a set of reactions that maintain or restore relative to the dynamic constancy of the internal environment and some physiological functions of the human body (blood circulation, metabolism, thermoregulation) [8].

This process is provided by a complex system of coordinated adaptive mechanisms aimed at eliminating or limiting factors affecting the body from both the external and internal environment. They allow you to maintain the constancy of the composition, physico-chemical and biological properties of the internal environment, despite changes in the external world and physiological changes that occur in the process of vital activity of the body. In a normal state, the fluctuations of physiological and biochemical constants occur in narrow homeostatic boundaries, and the cells of an organism live in a relatively constant environment, as they are washed by blood, lymph and tissue fluid. The constancy of the physico-chemical composition is maintained due to self-regulation of metabolism, blood circulation, digestion, respiration, excretion, and other physiological processes.

An organism is a complex biological system. All his organs are interconnected and interact. The violation of the activities of one body leads to a violation of the activities of others [9].

A huge number of cells, each of which performs its own, intrinsic only functions in the overall structural and functional system of the body, are supplied with nutrients and the necessary amount of oxygen in order to carry out the vital processes of energy formation, elimination of decay products, providing various biochemical life-responses, and t .d These processes occur due to regulatory mechanisms that carry out their activities through the nervous, circulatory, respiratory, endocrine and other systems of the body [10].

The impact of the external environment on the organism and its vital activity

External environment. A person is affected by various environmental factors. When studying the diverse types of its activities, one does not take into account the influence of natural factors (barometric pressure, gas composition and humidity, ambient temperature, solar radiation — the so-called physical environment), biological factors of plant and animal environments, and social factors with the results of household, economic, industrial and creative activity of man.

Substances necessary for its vital activity and development, as well as stimuli (useful and harmful), which violate the constancy of the internal environment, enter the body from the external environment. By interacting functional systems, the body strives to maintain the necessary constancy of its internal environment [11].

The activity of all organs and their systems in the whole organism is characterized by certain indicators that have some or other "ranges of oscillations. Some constants are stable and fairly hard (for example, blood pH 7.36 - 7.40, body temperature - within 35-42°C) others are normally characterized by significant fluctuations (for example, the stroke volume of the heart — the amount of blood emitted per contraction — 50-200 cm³) [12].

Lower vertebrates, in which the regulation of indicators characterizing the state of the internal environment is imperfect, are at the mercy of environmental factors. For example, a frog, not having a mechanism that regulates the constancy of body temperature, duplicates the temperature of the external environment so much that in winter all life processes in it are slowed down, and in summer, when it is far from water, it dries out and perishes. In the process of phylogenetic development, higher animals, including humans, seem to have placed themselves in a greenhouse, creating their stable internal environment and thereby ensuring relative independence from the external environment.

Natural and socio-biological logical factors affecting the human body are inextricably linked with environmental issues [13].

Ecology is both a field of knowledge, a part of biology, an academic discipline, and a complex science. Ecology considers the relationship of organisms with each other and with the inanimate components of nature: the Earth (its biosphere). Human ecology studies the patterns of human interaction with nature, the problems of maintaining and promoting health. Man depends on habitat conditions just as nature depends on

man. Meanwhile, the impact of industrial activity on the environment (pollution of the atmosphere, soil, water reservoirs by industrial wastes, deforestation, increased radiation as a result of accidents and violations of technology) threatens the existence of man himself. For example, in large cities, the natural habitat is significantly deteriorating, the rhythm of life, the psycho-emotional situation of work, life, recreation are disturbed, and the climate is changing. In cities, the intensity of solar radiation is 15–20% lower than in the surrounding area, but the average annual temperature is 1-2°C higher, daily and seasonal fluctuations are less significant, lower atmospheric pressure, polluted air [14].

All these changes have an extremely adverse effect on the physical and mental health of a person.

Muscular activity in ensuring sustainable viability

The main means of physical culture - exercise. There is a physiological classification of exercises in which all the diverse muscular activity is combined into separate groups of exercises according to physiological features [15].

The body's resistance to adverse factors depends on: congenital and acquired properties. It is very mobile and can be trained both by means of muscular loads and by various external influences (temperature fluctuations, lack or excess of oxygen, carbon dioxide). It has been noted, for example, that physical training by improving physiological mechanisms increases resistance to overheating, overcooling, hypoxia, the action of certain toxic substances, reduces morbidity and increases efficiency. Trained skiers, while cooling their body to 35 ° C, retain high performance. If untrained people are not able to perform work when their temperature rises to 37-38°C, then the trained successfully cope with the load even when their body temperature reaches 39°C and more.

People who are systematically and actively engaged in physical exercise increase mental, mental and emotional stability when performing strenuous mental or physical activity [16].

The main physical or motor skills that provide a high level of physical performance of a person include strength, speed and endurance, which manifest themselves in certain ratios depending on the conditions of a particular motor activity, its nature, specificity, duration, power and intensity. To these physical qualities should be added flexibility and dexterity, which largely determine the success of certain types of exercise. The diversity and specificity of the effects of exercise on the human body can be understood by familiarizing yourself with the physiological classification of physical exercises (from the point of view of sports physiologists). It is based on certain physiological classification signs that are inherent in all types of muscular activity belonging to a specific group. So, by the nature of muscle contractions, muscle work can be static or dynamic. The activity of the muscles in the conditions of maintaining a fixed position of the body or its parts, as well as the exercise of the muscles while holding a load without moving it, is characterized as static work. Static efforts are characterized by the maintenance of various postures of the body, and the efforts of the muscles during dynamic work are associated with movements of the body or its links in space [17].

A significant group of physical exercises is performed in strictly constant (standard) conditions both at trainings and at competitions; motor acts are produced in a certain sequence. Within the framework of a certain standard of movements and conditions for their implementation, the implementation of specific movements is improved with the manifestation of strength, speed, endurance, and high coordination during their implementation. external environment sustainability performance.

There is also a large group of physical exercises, the peculiarity of which is in non-standard, inconstancy of the conditions for their fulfillment, in a changing situation, requiring an instantaneous motor response [18].

Two large groups of physical exercises related to the standard or non-standard movements, in turn, are divided into cyclical movements (walking, running, swimming, rowing, skating, skiing, cycling) and exercises of acyclic nature (exercises without compulsory repeatability of certain cycles with clearly defined beginning and end of movement: jumping, throwing, gymnastic and acrobatic elements, lifting weights) [19].

The common thing for cyclical movements is that they all represent work of constant and: variable power with different durations. The diverse nature of the movements does not always allow to accurately determine the power of the work performed, in such cases the term "intensity" is used [20].

The maximum duration of work depends on its power, intensity and volume, and the nature of the performance of work is associated with the process of fatigue in the body. If the power of the work is great, then its duration is short due to the rapidly advancing fatigue, and vice versa. When cyclical in nature, sports physiologists distinguish the zone of maximum power (the duration of work does not exceed 20-30 s, and fatigue and a decrease in working capacity for the most part occurs within 10-15 seconds); submaximal (from 20-30 to 3-5 s); big (from 3-5 to 30-50 min.) and moderate (duration 50 min and more) [21].

Features of the functional shifts of the body when performing various types of cyclic work in various zones of power: determines the sporting result. So, for example, the main characteristic of work in the zone of maximum power is that muscle activity takes place in anoxic (anaerobic) conditions. The power of work is so great that the body is not able to ensure its performance due to oxygen (aerobic) processes. If such power were achieved due to oxygen reactions, the circulatory and respiratory organs would have to ensure delivery of more than 40 liters of oxygen to the muscles per minute.

But even with a highly qualified athlete, with full enhancement of respiratory and circulatory function, oxygen consumption can only approach the indicated figure. During the first 10–20 s of work, oxygen consumption in terms of 1 minute reaches only 1-2 liters. Therefore, the work of maximum power is performed "in debt", which is eliminated after the end of muscular activity. The processes of respiration and blood circulation during the work of maximum power do not have time to increase to the level that provides the necessary amount of oxygen to give energy to working muscles [22].

During a sprint run, only a few shallow breaths are done, and sometimes such a run is performed with a full breath hold. At the same time, afferent and efferent parts of the nervous system function with maximum stress, causing rather rapid fatigue of the cells of the central nervous system. The cause of fatigue of the muscles themselves is associated with a significant accumulation of anaerobic metabolism products and the depletion of energy substances in them. The main mass of energy released during the operation of maximum power is formed due to the decay energy of adenosine triphosphate and creatine phosphate.

Oxygen debt, eliminated during the recovery period after the work performed, is used for the oxidative resynthesis (recovery) of these substances.

The decrease in power and the increase in the duration of work are due to the fact that, in addition to anaerobic reactions of energy supply of muscular activity, the processes of aerobic energy formation also unfold [24].

This increases (up to the full satisfaction of the need) the supply of oxygen to the working muscles. Thus, when performing work in a zone of relatively moderate power (running over long and extra long distances), the level of oxygen consumption can reach about 85% of the maximum possible.

At the same time, a part of consumed oxygen is used for oxidative resynthesis of ATP, KF and carbohydrates. During long-term (sometimes many hours) work of moderate power, the body's carbohydrate stores (glycogen) are significantly reduced, which leads to a decrease in blood glucose, adversely affecting the activity of the nerve centers, muscles and other working organs. To replenish the consumed carbohydrate reserves of the body in the process of long runs and swimming, provides special food solutions of sugar, glucose, juices.

Acyclic movements do not have a consistent repeatability of cycles and represent the following stereotypical phases of movements with a clear conclusion. To perform them, it is necessary to show strength, speed, high coordination of movements (movements of power and speed-power character). The success of these exercises is associated with the manifestation of either maximum strength or speed, or a combination of both, and depends on the required level of functional readiness of the body systems as a whole [25].

The value of motor function in increasing the level of body resistance to environmental conditions

The development of motor and autonomic functions of the body in children and their improvement in adults and the elderly is associated with motor activity. The health value of physical culture is well known. There is a huge amount of research showing the positive effect of exercise on the musculoskeletal system, central nervous system, blood circulation, respiration, excretion, metabolism, heat regulation, and internal secretion organs. The importance of exercise and as a means of treatment.

In life, situations constantly arise when a person, being prepared for existence in some conditions, must prepare himself (adapt) to activity in others [26].

At the same time, the problem of adaptation is related to the fact that physiological and biological issues are compared with the social problems of the development of a person and society. Adaptation mechanisms were first described by Canadian scientist Hans Selye.

In his view, adaptation develops under the action of humoral mechanisms. The concept of adaptation Selye was repeatedly revised from broader ideas and analysis of experimental data, including the role in the adaptation process of the nervous system. The action of the factors causing the development of the adaptation mechanisms of the body has always been complex. So, all living organisms in the course of evolution adapted to the terrestrial conditions of existence: barometric pressure and gravity, the level of cosmic and thermal radiation, the gas composition of the air, the surrounding atmosphere. The animal world has adapted to the change of seasons - seasons, which include changes in light, temperature, humidity, radiation. The change of day and night is in a certain way connected with the restructuring of the body and changes in the biological rhythms of the activity of its functional systems [27].

A person can migrate, find themselves in flat or mountain conditions, in conditions of heat or cold, while he is associated with the peculiarities of food, water, various conditions of individual comfort and civilization [28]. All this is connected with the development of additional adaptation mechanisms that are quite specific. Depending on the strength of exposure to environmental stimuli, conditions and the functional state of the body, adaptive factors can cause both favorable and unfavorable reactions of the body [29].

Systematic training forms the physiological mechanisms that expand the body's capabilities, its readiness for adaptation, which ensures that during various periods (phases) of the deployment of adaptive physiological processes. Well-known sports physiologist, specialist in adaptation A.V.Korobkov singled out several such phases: initial, transitional, stable, deadaptation, and re-adaptation. By readiness for adaptation is understood as such a morphofunctional state of the organism, which ensures its successful adaptation to new conditions of existence [30,31].

CONCLUSION

The formation and improvement of various morphophysiological functions and the organism as a whole depend on their ability to further develop, which is largely genetic (innate) basis and is especially important for achieving both optimal and maximum indicators of physical and mental performance. It should be aware that the ability to perform physical work can increase many times, but to certain limits, whereas mental activity actually has no limitations in its development. Each organism has certain reserve capabilities. Systematic muscular activity allows, by improving physiological functions, to mobilize those reserves, the existence of which many do not even realize. Moreover, an organism adapted to the loads has much greater reserves, can use them more economically and fully. So, as a result of purposeful systematic physical exercise, the heart volume can increase 2 to 3 times, pulmonary ventilation - 20 to 30 times, the maximum oxygen consumption increases by an order of magnitude, resistance to hypoxia increases significantly. An organism with higher morpho functional indicators of physiological systems and organs has an increased ability to carry out more significant physical activities in terms of capacity, volume, intensity and duration. Features of the morphofunctional state of different body systems that are formed as a result of motor activity are called physiological indicators of fitness. They are studied in a person in a state of relative rest, when performing standard loads and loads of various capacities, including ultimate ones. Some physiological indicators are less variable, others are more and depend on the motor specialization and the individual characteristics of each student. During training, the development of the body's performance has different dynamics, but it characterizes the changes occurring in the body during exercise, and reflects both the hereditary qualities of

the body and. methods of their development and improvement. Thus, the effectiveness of an exercise, which finds expression in the form of a result (health, success in mental, sports and other activities), can have different paths and dynamics along the entire path of the training process. An important task of the exercise is to maintain health and performance at an optimal level by enhancing recovery processes. During the exercise, the higher nervous activity, the functions of the central nervous, neuromuscular, cardiovascular, respiratory, excretory and other systems, the metabolism and energy, as well as the system of their neurohumoral regulation are improved.

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