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Cardiorespiratory System in the Context of Regular Exercise in Kayaking

RESEARCH

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ABSTRACT

Introduction: The ideas of humanistic education in the 1950s made significant changes in study of the components of health. Analysis of health indicators showed how the students are overwhelmed in their studies. The process of implementation of pedagogical technologies presupposes, first of all, an increase in professionalism in the field of physical education, which is impossible without the assimilation of various types of educational technologies by teachers. The aim of this article is generalisation of existing approaches and advanced scientific experience and their application in the study of athletes performance.

Methods: The present study used analytical approach and the method of comparison. In the course of the study, 64 athletes aged 17–18 were tested. The article used analytical approach and the method of comparison.

Results: It was found that rowers on kayaks improved their results in most indicators in all observed groups. At the same time, there were significant changes in physical fitness within each group.

Discussion and conclusion: The scientific novelty of the study is due to the fact that the paper presents the general cardiorespiratory system from the side of all physical exercises, and rowing in particular. The practical implication of the study of health and fitness education provides the ability to identify personal health problems, the ability to notice the health-related needs of the family and people around, the willingness to make choices and decisions to ensure a healthy lifestyle.

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INTRODUCTION

Investigating the historical retrospective of the emergence of physical training, in 1932 the complex "Ready for Labour and Defence of the USSR" (GTO) was introduced into the system of physical education. It provided for the inclusion of all segments of the population in the sports activities, taking into account the sequence of forms, methods, and tasks. 1933–1940 was a period of active state regulation of physical education and health preservation (Davidek et al., 2018). In 1941–1945, World War II intervened in the development of physical education. The period of 1945–1949 was the stage of the beginning of a comprehensive study of human health. It is the second consecutive period of physical education in the line of health-improvement (the period of studying the health aspect). 1950–1965 was a stage of active study and practical implementation of the ideas of humanistic education in educational practice. The focus of humanistic education is a unique holistic personality seeking to maximise their capabilities (self-actualisation), is open to the perception of new experience, and capable of making a conscious and responsible choice in a variety of life situations. In the Soviet Union, the idea of educating a highly moral, comprehensively and harmoniously developed personality was proclaimed. But in actual practice, a socially oriented approach to youth prevailed, when public interests were prioritised over personal ones (Bouchard, 2015; Harrison et al., 2019).

The period of 1960–1979 was a stage of preparation for Labour and Defence of the USSR. It is characterised by the re-introduction of the GTO complex in 1973. The complex covered all age groups from 7 through 65 years old, where the corresponding standards were introduced. The obligation of physical education classes at school for practically healthy children was emphasised, and it was proposed to conduct individual classes for children with special needs. The main structure of physical education classes practically did not change, their focus only shifted on the development of motor qualities and the absence of exercises aimed at improving health. The need to consolidate the skills of correct posture and the habit of systematic physical exercises was noted, but the solutions were not indicated (Bouchard, 2015).

The third consecutive period of physical education in the line of health-improvement (implementation of the values-based attitude to health). The beginning and the end of the 1980s was characterised as the stage in the emergence of valeology – the science of health and wellness. With the help of valeological education in the 1990s, the interest of scientists in the issue of health increased and due to this, new terms appeared for defining a healthy lifestyle. "Health culture", "personal culture" – these are the sections included in the curricula of the school subject "Physical culture" and educational discipline "Physical education". Due to the awareness of the values-based attitude towards health, pedagogical science strives for full and uncomplicated human development in the process of education and upbringing (Dunn et al., 2017).

The period between 19th–20th centuries was the stage of the origins of the ideas of the values-based attitude to health. The most prominent results in the implementation of the sequence of health improvement were achieved by the distinguished scholars and teachers Konstantin Ushinsky (1824–1870), Ivan Bobersky (1873–1947), Anton Makarenko (1888–1939), Vasyl Sukhomlynsky (1918–1970). The educators laid the foundation for educational work with humanistic values, deep faith in the moral and physical capabilities of a person, and care for own health (Hogan et al., 2020).

The period between 1904–1918 was defined by scientific ideas aimed at the values-based attitudes towards health. The period of 1919–1932 was a stage justifying the value of health and a healthy lifestyle. The issues of health preservation and physical education are becoming more popular in society (Zhang et al., 2017). The prominent members of community were trying to promote the ideas of physical education both through the outreach campaigns and through creation of clubs, courses, and other associations for the young and adults. The traditions of taking care of health, hardening the body, developing physical qualities, and improving total motor fitness were continued by the youth organisations "Sokol", "Plast", "Lug". They were founded in Russia in the late 19th – early 20th centuries. The main goal of youth organisations was to foster a physically fit and healthy-minded personality. To achieve this goal, various activities and physical exercises were introduced in the forms interesting for children and young people: outdoor games, sports, competitions, hiking trips, etc. They existed until 1939, and after the establishment of Soviet power, these organisations were liquidated (Després, 2016).

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Beginning in the mid-1920s, compulsory physical education classes were introduced at schools, and since 1929, departments of physical education were created at the universities. The establishment of institutions of physical culture and science was of great importance for the staffing of the physical education sphere. These institutions include: the State Institute of Physical Culture in Moscow (1931) and technical schools of physical education in St. Petersburg, Moscow, Kirov. Since 1931 the Scientific Research Institute of Physical Culture has been successfully operating.

METHODS

In the middle of the 20th century, the term "technology" appeared in the educational practice. The term was borrowed from the engineering and technical field, where it outlined a set of methods necessary for the implementation of the production process, as well as a scientific description of the methods of a certain type of production (Hogan et al., 2020). The fourth consecutive period of physical education in the line of health-improvement (between 20th–21st centuries) is the stage of a conscious values-based attitude to health. The consistency and continuity of this period is characterised by the active introduction of innovative technologies for health improvement of the young population. The main factors that contribute to the creation and implementation of new fitness programmes were the results of studies on the problems of sedentary lifestyle and optimal motor activity, the emergence of new sports equipment (step platforms, exercise machines, fitballs, stationary bikes, etc.), as well as initiative and creative search for professionals in the fitness industry.

Using the analytical approach, it has been established that international fitness and health organisations are constantly making a significant contribution to the development of new fitness programmes. Among them are such organisations as the International Health, Racquet and Sportsclub Association (IHRSA), the International Dance Exercise Association (IDEA), the World Fitness Organisation (WFO), the European Confederation of Sports and Health (CESS) and others. The leading research centres for the development of fitness programmes include the K. Cooper Institute for Aerobic Research, founded in 1970, the scientific centre of the U. Kekkonen University (Finland), and others. International institutes have created specialised subdivisions for the development and introduction of advanced fitness programmes.

The comparison allowed to determine that in Finland, Japan, Canada, Australia and other countries, the mortality rate of young and middle-aged people has decreased several times, the average life expectancy has increased by 15–20 years, and the viability of the population has sharply increased. This was achieved due to the state policy aimed at creating conditions for the widespread introduction of various forms of physical activity in everyday life in the combination with rational nutrition, the fight against bad habits, and improvement of ecological environment. This measure has certainly provided significant economic growth in the considered countries (Wang et al., 2020). For a long time, the countries of the European Union have been carrying out systematic work to foster a healthy lifestyle of young people, using health-improving technologies. The development of a healthy lifestyle is ensured by joint actions of state, public, confessional organisations, educational institutions, and transnational corporations (Ignjatovic et al., 2011). A major role is played by international projects that provide the health education in the context of formal and non-formal education. The idea of health education for young people is relevant in the EU countries, which is aimed at practical action to prevent harmful and life-threatening addictions (Kangas et al., 2015). Theoretical knowledge should provide the necessary level of awareness in the implementation of specific tasks of health protection.

Scientific organisations and individual scientists make a significant contribution to the development and implementation of modern health and fitness programmes (Tari et al., 2019). Thus, for many years, the Kyiv Scientific Research Institute of Medical Problems of Physical Education, the Union State University of Physical Education and Sports (since 1998 – the Moscow University of Physical Education and Sports) have been engaged in the development of new fitness programmes. Scientists have identified and substantiated the most common means of physical education and health activities: walking and running, cross-country running, relay races, swimming, cross-country skiing, cycling, gymnastics, rhythmic gymnastics, orienteering, hiking, and training with machines (Wilson et al., 2015).

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At the same time, in the post-Soviet countries there was no significant progress in attracting the population to health related physical activity until the 1990. According to official statistics, the number of so-called athletes has traditionally been overestimated to demonstrate the advantages of the dominant ideology. The apparent increase in the number of citizens involved in sports has never matched the level of public health.

RESULTS

In the 1990s, the insufficient level of physical activity of the population was caused by the anachronistic methodology of the physical education system of various population groups; deficiencies in the regulatory, organisational, and managerial systems; limited resource support (financial, material and technical, personnel, scientific methodological, and informational), the lack of personal liability of executives responsible for the health of the population (Hoffman, 1986). The imperfection of the health care system, the low level of awareness of the value of health as a capital investment, the overwhelming majority of the population in the setting of social and economic instability have led to the creation of conditions unfavourable for a healthy lifestyle (Senakham et al., 2020).

Thus, with the development of human civilisation, the outlined problem has appeared, which allowed to predict its transformations and design an educational space with an updated methodological system of students' physical education. The principle of consistency and continuity of the system of health-improving physical education is a determining factor for its fundamentalisation, initiating organisational transformations and innovative approaches in practical activity (Chu et al., 2020).

Technologies in sport pedagogy and didactics form an intellectual vector of physical education, which is based on fundamental sciences. According to the four levels of classification of knowledge in the field of physical education and sports, technologies are the facets of the second and third levels. That is, they include social and biological determinants of the processes of mastering values of physical culture, as well as individual scientific disciplines (their technological continuation). Modern technologies in physical education are aimed at finding the optimum in physical activity and knowledge of physical culture of a person (Wu et al., 2019).

The teaching technologies should provide a systematic approach to training specialists based on modern achievements in the theory of physical education, which correspond to the level of knowledge, real educational tasks, and the needs of society. Some authors believe that the specificity of a high degree of preparation for social and professional activity is provided by the development of the content of innovative technologies (Burnie et al., 2018). For this, it is necessary to design such technological models that would significantly change the problem situation, the attitude of the individual to professional training. It is especially important to create pedagogical technologies that take into account all forms of organisational and teaching activity (educational and extracurricular), as well as conditions that ensure the inclusion of students in the teaching process (Papandreou et al., 2020).

Physical culture as a system, the basic components of which are physical education, sport, applied professional physical training, adaptive and health-improving physical education. It contains not only the tasks of development and improvement of motor skills, but also improvement of health, conditioning of the body, increasing resistance to the unfavourable factors of the natural environment and professional activity.

Scientific inquiry for the modernisation of the educational process indicates a significant transformation of the term "health-improving technology" (Tonello et al., 2016).

A clear understanding of the definition of health-improving technology" is constrained by the existing uncertainty of the concept of "pedagogical technology". According to the proposed approach, the concept of "health-improving technology" can be considered as a part of pedagogical science, as a method of organisation, a model of the educational process, as a toolkit of the teaching process. The variability of the content of these concepts prompted the study of the classification of health promotion technologies. Analysis of the existing

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classifications of health promotion technologies used in the educational process of a general education school allows to distinguish the following types (Lee et al., 2015):

- health-improving technologies that create safe conditions for study, work at school, and solve the problems of rational organisation of the educational process (taking into account age and gender, individual characteristics and hygiene standards), as well as the correspondence of educational and physical activity to the child's capabilities;
- health-improving technologies aimed at solving the problems of improving the physical health of students and increasing the potential (resources) of health, which include physical training, physiotherapy, aromatherapy, conditioning, gymnastics, massage, herbal medicine, music therapy;
- technologies for teaching health preservation – hygienic education, development of life skills (managing emotions, resolving conflicts, etc.), prevention of injuries and substance abuse, sex education. These technologies are implemented due to the introduction of relevant topics into the subjects of the general educational cycle, the introduction of new subjects into the variable part of the curriculum, the organisation of optional education;
- education of a culture of health – teaching students' personal qualities that contribute to the preservation and improvement of health, the formation of ideas about health as a value, increase motivation to maintain a healthy lifestyle, increase responsibility for personal health, health of family.

Today, among the many approaches to the interpretation of health-improving technologies, there is one generally recognised classification. It is based on a variety of approaches to health protection that determine the characteristic forms and methods of activity.

1. Medical and sanitary technologies – refer to the field of health care, the competence of medical workers who monitor and assist in ensuring that the sanitary conditions of the educational process meet the requirements of state standards.
2. Physical culture and health-improving technologies are used in physical education classes and in the organisation of extracurricular activities of an educational institution. Their implementation has a positive effect on physical development, contributes to the development of a values-based attitude towards one's own physical "I".
3. Environmental health-improving technologies – system of measures, comprehensively aimed at ensuring environmental and natural conditions for life, harmonising the relationship between human and nature.
4. Technologies to ensure life safety – implementation of these technologies is provided by architecture workers, builders, utilities, engineering and technical workers, specialists in civil protection, labour protection, and others who determine the organisational component of health protection, subject to mandatory control and inclusion in health-improving technologies.
5. Health-improving educational technologies, which are usually subdivided into organisational and pedagogical, psychological, and educational.

The concept of "health saving technology" is considered not as an independent pedagogical technology, but as a qualitative characteristic of educational technologies.

Teaching health protection in the system of physical education is a process of assimilation by students of the values of physical culture, mastering special knowledge, and vital motor actions, the result of which is their ability to independently "manage" their health, carry out diagnostic, preventive, and, if necessary, rehabilitation, and correctional measures. Designing the process of health savings education of students is a relatively new direction in pedagogical science, which necessitates the development of special pedagogical methods and technologies for use in the system of physical education.

The versatility of the physical education system and the need for the development of a responsible attitude to personal health among students determine the concretisation and fundamentalisation of the content of physical education classes. The key factor is a formation of fundamental theoretical knowledge of health protection, methodological and practical skills

on the basis of interdisciplinary relations, integration, and synergetic components in the system of physical education.

The main approaches to the interpretation of the concept of "health-improving technologies" are the following (Figure 1):

- creation of a healthy educational environment;
- provision of training and education, taking into account the individual, age, and psychophysiological characteristics of students;
- technologies for teaching healthy lifestyle, formation of a healthy nation;
- optimal combination of traditional educational technologies with the principles, methods, and techniques aimed at preserving and maintaining the health of students;
- educational and methodological complex of fitness and health recreation events.

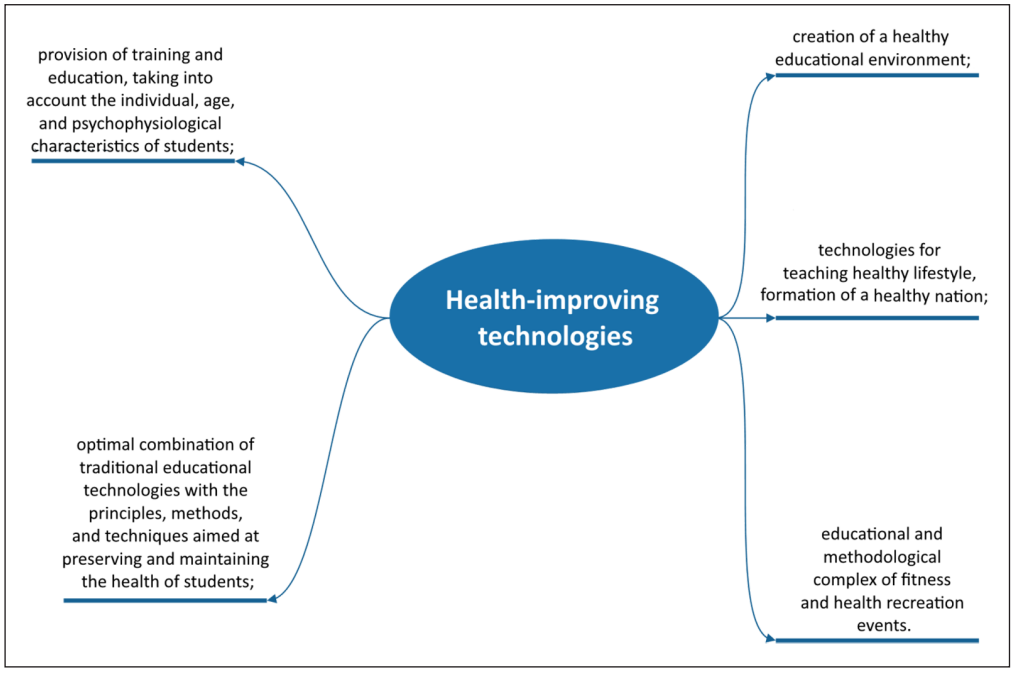

Figure 1 Health-improving technologies.

The study classifies health-improving technologies by their nature and direction of activity. By the nature of the activity, health-improving technologies can be both individual (highly specialised) and complex (integrated). According to the direction of activity among individual health-improving technologies, the following are distinguished:

- medical (technologies for the prevention of diseases, correction and rehabilitation of physical health, sanitary and hygienic measures);
- educational, health promoting (informational and educational);
- social (technologies for organising a healthy lifestyle, prevention and correction of deviant behaviour);
- psychological (technologies for prevention and psychocorrection of mental deviations of personal and intellectual development).

Thus, the analysis of the current approaches, ideas about the essence and content of technologies allowed to find out that health-improving technologies are an indicator of the quality of educational technologies; the optimal combination of traditional teaching technologies with the methods and techniques aimed at preserving and maintaining health; technologies for teaching the maintenance of health, a healthy lifestyle, the formation of a healthy nation; educational and methodological complex of fitness and health recreation events; creation of a healthy educational environment; provision of training and education, taking into account the individual, age, and psychophysiological characteristics of students.

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Sources of scientific information suggest that there is no general consensus regarding the content and target orientation of educational and pedagogical technologies. There are no detailed and concretised definitions of the concept of "health-improving technology" in the scientific literature. The classification of educational technologies includes psychological, medical, and social-pedagogical technologies. By the type of technology, they relate to social-pedagogical activity and in a certain way assume a health-improving orientation. However, they do not rely on the motional component of health provision, which does not allow to completely borrow their structural content. The basic elements of their description were applied in the development of innovative technologies.

The proposed classification of fitness technologies does not claim to be complete. It is an open, dynamic system that is constantly supplemented by new exercises and movements, different in structure and degree of effect on the body.

A prerequisite for the development of new fitness programmes is:

- the best developments in related scientific disciplines, which accumulate and integrate the technology of creating fitness programmes;
- scientific and practical achievements, which allows to improve and create modern types of activities;
- development of innovative methods of health-improving and recreational activities, elements of various sports;
- the latest technical training equipment in gyms, which allows to develop new exercises using sports equipment;
- creation of musical accompaniment using computers, which led to the emergence of dance activities.

The generalisation of existing approaches and advanced scientific experience, as well as authors' pedagogical observations allow to assert that today health-improving technologies are not an individual achievement of scientists, but are developed in accordance with the achievements of separate fields of activity and branches of science. At the same time, the integration and interaction of various types of physical activity has intensified, which led to the emergence of new global concepts – health-improving technologies. Health-improving technologies include setting goals and objectives of health improvement and the actual implementation of physical education in one form or another. In addition, modern health-improving technologies include determination of health level, fitness testing, management and administration.

Analysis of the terminology of the study allowed to clarify the essence of the concept of "health-improving technologies". It is considered as one of the directions of educational technologies, which is a dynamically developed pedagogical, scientifically and theoretically determined system of physical exercises. It is designed to maintain and improve physical health and psychological state, prevent diseases, and prepare to future professional activity.

1. Analysis of the regulations related to the education system in general, and the physical education in particular, indicates that after the collapse of the USSR, all the prerequisites have been created for the functioning of the national system of physical education. Insufficient efforts were put in preserving and improving the health of young population due to the lack of mechanisms for their control, despite the increased interest in physical education on the part of the state, which is manifested in the content of the corresponding regulations. It was found that today in the draft standards there is no competence, which will provide for the preservation of the health of students based on the use of various types and forms of physical activity. The state task for the implementation of professionally applied physical training according to the profiles of specialties is not reflected, and there is no personal responsibility for preservation of the health of students.
2. World historical experience and the modern trend of using health-improving technologies in the system of physical education testify to the relative consistency and continuity of their use. The historical development of the system consisted of several stages that were associated with the functioning of certain social institutions. Research data indicates

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that various historical stages consistently and continuously determined the solution of priority tasks of physical education. Despite the health-improving orientation of physical education, declared in the majority of regulations and policy papers, its organisation was, in fact, a continuation of the former Soviet system of physical education. The theoretical, methodological, normative, and organisational foundations of physical education of students in the line of humanisation, liberalisation, harmonisation, the use of valeological values of physical culture, bringing the established goals and objectives in accordance with those declared in the legislative acts require a thorough revision.

3. Health is a personal value of a person, which allows for self-expression through sustainable biological, social, psychological states in any kind of activity (educational, professional, sports, etc.). The main tendencies of improving the system of physical education have been determined: reduction of regression and deterioration in health is impossible without the establishment of a culture of health preservation as an ideological orientation among students; updating the forms of motivation and attracting students to regular physical education and sports, taking into account the interests, wishes, abilities, and individual characteristics, both during compulsory physical education and its types in extracurricular time.
4. Analysis of the existing approaches, ideas about the essence and content of pedagogical technologies, methods, and programmes in physical education will contribute to improving the somatic health of students, physical and professional and applied training of future specialists. The necessity of introducing such health-improving technologies into the educational process, which will take into account the needs and preferences of students for physical exercises, the specifics of future professional activities, and individual characteristics, has been proved.

At the same time, the problem of the methodological system of using health-improving technologies in the process of physical education of students has not been properly reflected in scientific works. This factor necessitates the development of new methodological system in a health-improving educational space.

In fact, school age is a favourable period not only for the development of most of the basic motorial qualities, but also, to a large extent, for the implementation of the educational component of the student's integral personality development. A feature of the modern era is the desire of a person to know oneself. Nevertheless, in order to work with own health, a person must have at least a minimum amount of biomedical information. The natural desire for physical improvement, the need to improve personal well-being, increase efficiency, to get rid of all sorts of illnesses demands physical activity.

Jogging has a significant positive effect on the circulatory system and immunity. At the age of 30–60 years (exercise experience – from 2 to 20 years), an increase of immunoglobulins in blood serum was revealed, which contributes to a decrease in morbidity. Due to jogging, important changes also occur in the biochemical composition of the blood, which affects the body's susceptibility to cancer.

The special effect of running exercises is to increase the functional capacity of the cardiovascular system and aerobic productivity of the body. An increase in functional capabilities is manifested primarily in an increase in the contractile and "pumping" functions of the heart, an increase in physical performance. With the help of echocardiography, it was found that regular jogging leads to an increase in the mass of the left ventricle (due to the thickening of its posterior wall and interventricular septum), which is accompanied by an increase in the performance of the heart and the ability of the myocardium to absorb oxygen. Moreover, these changes do not contribute to a pronounced increase in the size of the heart, typical for athletes.

Runners aged 60–69 have a higher working efficiency indicator than runners of different age, as well as people aged 40–49 who lead a sedentary lifestyle. There is a pronounced rejuvenating effect of running – a delay in the age-related decline in working efficiency by as much as 20 years.

Under the influence of running exercises in middle-aged people, as the weekly jogging volume increased (from 8 to 48 km), a parallel decrease in the heart rate (HR) at rest was observed – on average, from 58 to 45 bpm. A decrease in resting heart rate during the first year of jogging occurs from 78 to 62 bpm, and a noticeable decrease in heart rate was noted only from the

6th month of training. For the runners with many years of experience and a volume of running loads of 30–50 km per week, resting heart rate is 42–54 bpm.

Runners have the best lipid metabolism (fat metabolism). Thus, radical changes in lipid metabolism under the influence of endurance training can be a turning point in the development of atherosclerosis. In experiments on animals with experimental atherosclerosis (specially induced), it was found that long-term endurance training of moderate intensity significantly reduced the prevalence of the sclerotic process. Under the influence of endurance training, the viscosity of the blood decreases, which facilitates the work of heart and reduces the risk of thrombosis and heart attack.

Due to the activation of fat metabolism, running is an effective means of normalising body weight. People who regularly engage in jogging have a body weight close to ideal, and their fat content is 1.5 times less than those who do not run. Studies have shown that dosed physical activity allows to normalise body weight not only by increasing energy expenditure, but also as a result of suppression of hunger (when endorphins are released into the blood). At the same time, reducing body weight by increasing energy expenditure (through exercise) is more physiological. Considering that 1 year of slow running at a speed of 9–11 km/h consumes twice as much energy as walking (600 versus 300 kcal), then it is obvious that running exercises can achieve a similar effect much faster. After the end of the exercise, muscles continue to consume more oxygen for several hours "by inertia", which leads to additional energy expenditure. In the case of severe obesity, the most effective combination of both methods is endurance training and restriction of food intake (due to fats and carbohydrates). In addition to the main health-improving effects of running, associated with the impact on the circulatory and respiratory systems, is also its positive effect on carbohydrate metabolism, liver, and gastrointestinal tract function, and the skeletal system. The improvement in liver function is explained by an increase in oxygen consumption by the liver tissue during running by 2–3 times. In addition, with deep breathing while running, the liver is massaged with the diaphragm, which improves the bile outflow and the bile ducts function, normalising their tone. Regular jogging has a positive effect on all links of the musculoskeletal system, preventing the development of degenerative changes associated with age and physical inactivity (decreased mobility). Restriction of the flow of articular fluid during physical inactivity leads to impaired cartilage nutrition and loss of ligament elasticity, a decrease in the shock-absorbing properties of the joints and the development of arthrosis.

DISCUSSION

Jogging has a positive effect on the circulatory and respiratory systems, carbohydrate metabolism, the function of the liver and gastrointestinal tract, the skeletal system. Cyclic exercises (running, cycling, swimming) increase the flow of fluid to the articular cartilage and intervertebral discs, which is the best preventive measure against arthrosis and radiculitis. The positive effect of running on the function of joints is possible only if adequate (not exceeding the capabilities of the motor apparatus) loads are used, and their gradual increase during exercise. The modern experience and development of the rowing and canoeing is characterised by a constant search for more effective means, methods, and organisational forms of training sports reserves (Tuleutaev et al., 2020; Yessentayeva et al., 2021). The main role in the long-term training of athletes is played by the stage of sports improvement. It implements the capabilities of athletes in achieving the first high sports results, ensures the maximum manifestation of their individual characteristics. To determine the individual motor signature of 17–18 year old kayak rowers, 64 leading rowing athletes were tested. The full set of tests included: running 100 meters, standing long jump, pulling up on the bar, lifting a 30 kg barbell to the chest from a prone position, 12-minute run, bending forward from a standing position on a gymnastic bench, rowing 250 m and 1000 m. These control exercises were used to assess all the basic physical qualities. According to the results of lifting the barbell and pulling up, power capability was assessed; speed abilities was assessed by running 100 meters; speed-power capabilities were assessed by jumping indicators; endurance – by running for 12 minutes; flexibility was assessed by forward bend; special fitness was assessed by 250 m rowing (special speed-power training); the performance in rowing at 1000 m allowed to judge the integral fitness (competitive fitness) of athletes. The analysis of individual differences of total motor fitness allowed to single out three main types of athletes: "power" type (27 rowers; 51.9%), "endurance" type (11 people;

21.2%), "all-round" type (14 athletes; 26.9 %). Individual differences of total motor fitness of 17–18 year old kayak rowers were determined on the basis of the structure of the motor skills of each subject.

For kayak rowers ("power" type), the results are directed towards speed-power capabilities (52% of the surveyed rowers). The athletes of "endurance" have superior stamina (about 21%). "All-round" is characterised by equal development of both speed and speed-power capabilities, and endurance (about 27%). The analysis of various types allowed to establish the peculiarities of physical fitness of 17–18-year-old kayak rowers, depending on the typological features of motor skills. Thus, the hierarchy of qualities that constitute motor fitness of athletes – "power" group represents the following sequence: power capability (41.2%), special sports performance (10.9%), aerobic capacity (8.2%). For the "endurance" group – aerobic capacity is in the first place (33.6%), in the second – speed capability (13.9%), in the third – power capability (7.2%). For the "all-round" group, the leading one is the complex development of physical qualities (strength, endurance, special working capacity) – 65.2%, then power capability – 11.4%, coordination abilities and flexibility – 8.2%. This served as the basis for the distribution of the training of kayak rowers into three lines: power, endurance, and complex. Kayak rowers, assigned to different typological groups, at the beginning of the experiment did not significantly differ from each other when rowing at 1000 m ($P > 0.05$). Before the start of the experiment, based on the assessment of physical qualities, the individual characteristics of each athlete were determined and three experimental groups were formed. Training programme was based on the leading physical abilities:

- the first group ("power" – "A") included athletes with pronounced power capability. The training programme for athletes assigned to this typological group provided for the use of training means that develop strength by 17–20%) (that is, 11–12% of the total training time) in a larger volume than in other groups;
- the second group ("endurance" – "B") included athletes with greater endurance. Training in this group was carried out on the basis of a programme of endurance exercises – 11–12% of the total training time;
- the third group ("all-round" – "C") the training programme for athletes in this group provided for the use of a uniform volume of versatile training means for the complex development of physical qualities (7.8% more than in other groups) (Yessimov et al., 2020; Balynska et al., 2021).

In the control group ("D"), the athletes trained according to the rowing programme of Specialised Children and Youth Sports School of the Olympic Reserve for children aged 17–18.

Kayak rowers, assigned to different typological groups ("A", "B", "C", "D"), at the beginning of the experiment did not differ significantly from each other in terms of rowing results at 1000 m ($P > 0.05$).

CONCLUSION

The overall effect of running on the body is associated with changes in the functional state of the central nervous system, compensation for missing energy costs, functional shifts in the circulatory system and a decrease in morbidity. Endurance training is an indispensable means of defusing and neutralising negative emotions that cause chronic nervous tension. The calming effect of running is enhanced by the action of pituitary hormones (endorphins), which are released into the bloodstream during exercise. With intense training, their content in the blood increases 5 times compared to the resting level and is kept at an increased concentration for several hours.

In the course of the study, 64 athletes aged 17–18 were tested. It was found that rowers on kayaks improved their results in most indicators in all observed groups. At the same time, there were significant changes in physical fitness within each group. Thus, in the group "A", "B", "C" significant improvements were found in all eight of these indicators; in group "D" – only six: in rowing at 1000 m – by 5.98%, rowing at 250 m – by 9.54%, in running at 100 m – by 3.17%, in lifting the barbell – by 11.26%, in the long jump from the spot – by 1.17%, in running for 12 minutes – by 1.0% (the reliability of differences in all cases from $P < 0.05$ to $P < 0.001$). Thus, the effectiveness of the developed programme of training sessions with kayak rowers aged 17–18 has been fully proven.

COMPETING INTERESTS

The authors have no competing interests to declare.

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