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2. Improving the training of athletes of different qualification.
3. Biomedical Aspects of Physical Education and Sports.
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# SLOBOZHANSKYI HERALD OF SCIENCE AND SPORT

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# Dialectical approach for structural and functional management in the health-improving and recreational motor activity system of the population

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***Purpose:*** *substantiate the content of structural and functional management system of health-improving and recreational motor activity.*

***Material & Methods:*** *analysis of literature sources and documents, system approach, dialectical approach, system-functional analysis, organizational analysis.*

***Results:*** *the dialectic of cognition of structural and functional management system of recreational motor activity presupposes a connection between theory and practice; the principles of cognition of the real world, the determinism of phenomena, the interaction of external and internal, objective and subjective.*

***Conclusion:*** *achievement of the main goal of recreational motor activity system of the population at the state and regional levels is provided by the solution of a complex of tasks.*

**Keywords:** *system of recreational motor activity, functional management, dialectical approach.*

## Introduction

Forming and ensuring the implementation of public policy in the system of health-improving and recreational motor activity of the population needs to improve the structural design of the implementation of these functions. In Ukraine, a system of public administration has been established in this sphere, which facilitates the implementation of state policy, and certain mechanisms for its implementation have been developed. But at the present stage of development of the Ukrainian state, there arises the need for a dialectical approach to the comprehension and rethinking of changes in the socio-economic, political, demographic and spiritual life of people with the purpose of inventing ways to improve the conditions for ensuring adequate motor activity. It is important not to lose the positive experience gained over the decades, and also to highlight the current problems of the sphere and outline possible solutions to them [1; 7; 9].

For the functionaries of the sphere of physical culture and sports, the problem of a healthy nation is now extremely urgent – the stressful nature of life, low wages and economic strategy – all this has a negative impact on the health of people today. History has given our generation in Ukraine a unique case: the transformation period. In recent decades, in the social sciences and humanities, there has been a significant increase in interest in the problems of the safe existence of man. The need for a new outlook on the world and the place that a person occupies in him forces the researchers to seek new ways of understanding and solving the oldest worldview problems. Vector of knowledge moves to phenomena related to the prevention of threats in everyday life, with the provision of personal and social security [2; 6; 8].

Socio-economic analysis of the grounds for the safe development of society creates the possibility of theoretical substantiation and practical implementation of such measures that allow maximum avoidance of the negative influence of the external environment. An effective step in solving these problems is the implementation of the National Strategy for improving motor activity in Ukraine for the period until 2025 "Motor activity – a healthy lifestyle – a healthy nation", in which, based on the results of the analysis of the world experience and the current state of development of the national system of health-improving and recreational motor activity, the goals and the main tasks aimed at creating conditions for increasing the level of attracting the population to health-improving and recreational motor activity that will contribute to solving humanitarian and socio-society and state problem.

**Relationship of research with scientific programs, plans, themes.** The research was carried out in accordance with the plan of the research work of the KSAPC for 2016–2018, the theme: "Methodological bases of the strategic development of the sphere of physical culture and sports in the region", the state registration number 0113U004615.

**The purpose of the research:** substantiate the content of structural and functional management system of health-improving and recreational motor activity.

## Material and Methods of the research

Analysis of literature sources and documents, system approach, dialectical approach, system-functional analysis, organizational analysis.

## Results of the research and their discussion

Deepening economic reform significantly affects the development of market relations in the field of physical culture and sports in Ukraine, characterized by changes in ownership forms, forms of management, rules, methods of managing physical culture and sports, the quality of popularization of a healthy lifestyle. Sustainable development of a market economy has certain social guidelines for the quality of life of the

population, for the upbringing of a person who has a harmonious combination of spiritual wealth, moral purity and physical perfection through the formation of the need for a healthy lifestyle. The mission of physical culture and sports provides for the creation of conditions for ensuring the harmonious development of the individual, the optimal movement activity of each person as the potential of a socially and economically developed society [7].

Domestic scientists formed a modern idea of the system of health-improving and recreational motor activity – as a set of interrelated and interacting subjects to attract people to the appropriate motor activity:

- subjects that organize and conduct activities that attract to motor activity;
- subjects that contribute to attracting a person to motor activity;
- subjects that contribute to attracting a person to motor activity [3].

Organizational and managerial and economic activities in the system of health-improving and recreational motor activity of the population are aimed at meeting the growing needs of the population for high-quality sports and health services that promote human development, the introduction of a European value system and the development of physical culture and sports in regions and in the country.

Based on the theory of structural functionalism of Tolcott Parsons [5], we can distinguish four functions of the system of health-improving and recreational motor activity of the population, namely (the AGIL scheme):

1) adaptation (A) (provides an economic subsystem of society that affects the system through external factors);

2) achievement of the goal (G) (provides the political subsystem of society);

3) integration (I) (provide legal institutions and customs);

4) reproduction of the structure (L) (provide a system of beliefs, morality, institutions of upbringing).

Structural and functional analysis of the system of health-improving and recreational motor activity of the population at the state level allows us to assert that the achievement of this goal: "Motor activity – a healthy lifestyle – a healthy nation" provides for the implementation of the following functions:

- ensuring coordination of actions of all stakeholders;
- planning and forecasting of the assessment of the level of physical health and physical readiness of various population groups;
- organization of new institutions (the All-Ukrainian Foundation for the Development of Movement and Healthy Lifestyles "Active Ukraine is a Healthy Nation");
- streamlining the current organizational structure of the system of health-improving and recreational motor activity and its regulatory and legal regulation;
- regulation of public sports events for active family recreation in places of mass recreation of citizens;
- motivation;
- organizational design;
- monitoring;
- marketing.

An effective measure to adapt and integrate the system of health-improving and recreational motor activity of the population is the creation of organizational conditions for conducting an annual assessment of the physical preparedness of the population, started in the regions from January 2017 and can be represented as a decomposition of living standards through a comprehensive analysis of indicators of physical condition [4].

Undoubtedly, the subjects of management, forming their own circle of strategic tasks to ensure the optimal motor activity of the population, also perform the function of coordination and control of the activities of regional institutions. An integral part of this task is the creation of a monitoring system with reference points in the regions. In the Kharkov region, the structural and functional management of the system of health-improving and recreational motor activity of the population is formed as follows:

- management of the system of health-improving and recreational motor activity of the population in the region by ties unites all spheres of life and must be in a state of information exchange with structures of power, business, public institutions and the population directly;
- regional health development policy, which provides for a negotiated and coordinated mechanism at the expense of the resource potential (financial-economic, innovation-investment, medical-pedagogical, human and recreational) through the formation of a database, guided by social standards and organizational and economic standards;
- strategy for the development of sports and fitness organizations in the region, which is implemented through the introduction of health saving technologies, improving the quality of services; formation of balance mechanism of demand and interests of the population.

## Conclusions

Achievement of the main goal of the system of health-improving and recreational motor activity of the population at the state and regional levels provides the solution of the following tasks:

- integrated assessment of the resource potential of all the subjects of the system;
- analysis of the organizational mechanism of regional management of physical culture and sports on the basis of management-audit methodology;
- development of a social and market mechanism for the innovative development of the system of health-improving and recreational motor activity of the population, in which, in contrast to existing approaches, the solvent demand for the "basket of services" of fitness and health services, the corrective factor of consumer needs, the volume of physical culture and health services, taking into account the economic the state of the sphere of physical culture and sports and its innovative potential, which allowing to strengthen the socio-market component in the activities of the regional administration of physical culture and sports;
- determination of the balance of interests of the manufacturer of physical culture and health services, regional authorities, the population and competitors;

- formation of approaches to the determination of specific sectoral, regional and innovative characteristics of the system of recreational and health-improving and recreational motor activity, including: the guidelines for the development of the competitive environment in the region, the degree of commercial influence of competitors on pricing, the development of an effective monitoring system;
- development of practical recommendations for the improvement of management and marketing systems for physical culture and sports organizations of various forms of ownership;
- development of recommendations on the formation of a system of internal and external communications of regional sports and sports organizations.

Organizational mechanism of the system of health-improving and recreational motor activity of the population is provided with resources, taking into account the priorities of increasing employment, social integration, gender equality, equal access to facilities and services, intergenerational solidarity, access to information and participation in various aspects of sport for personal development, identity and belonging, physical and mental well-being, empowerment.

**Prospects for further research** in this direction include the development and introduction of technology to increase the effective performance of subjects of the recreational and health-improving and recreational motor activity system.

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# Physio-balneotherapy factors in the complex treatment of patients with gouty arthritis at the sanatorium stage of rehabilitation

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***Purpose:*** *to analyze and summarize the main approaches to the appointment of the main physiotherapeutic and balneological factors in the complex treatment of patients with gouty arthritis in the conditions of sanatorium treatment.*

***Material & Methods:*** *analysis of modern scientific and scientific-methodological literature on the problem of physical rehabilitation of patients with gout.*

***Results:*** *the main approaches to the appointment of modern methods of physiotherapy in combination with hydropathic and mud factors in the complex treatment of patients with gouty arthritis at the sanatorium stage of rehabilitation.*

***Conclusions:*** *the results of the study can be used as a basis for compiling a comprehensive physical rehabilitation program for patients with gouty arthritis in a sanatorium stage of rehabilitation.*

**Keywords:** *gouty arthritis, physio-balneotherapy, sanatorium stage of rehabilitation.*

## Introduction

It is known that gout is a chronic disease associated with a violation of purine metabolism, an elevated uric acid in the blood and the deposition of its salts in the tissues of the body, most often in the tissues of small joints of the toe or hand and in the kidney [4]. The most common manifestation of gout is gouty arthritis [1]. In the course of the disease, two periods are identified: the period of exacerbation (gouty period) and postoperative (inter-attack) period. In the inter-attack period, patients complain of the stiffness of movements in the damaged joints, stiffness, and the appearance of a crunch during movement and the gradual development of deformation [12], which leads to disability. Favorable conditions for preventing the progression of deformation in the joints and recovery of motor functions, according to the majority of authors [6; 10; 14], is the treatment of patients with gouty polyarthritis during the inter-attack period in a sanatorium. Studies of some authors [6; 14] established indications and contraindications to the recommendation of patients with sanatorium-and-spa treatment.

In the literature there are single papers [4; 9], which deal with the use of individual physical rehabilitation in the treatment of gout patients, but there is insufficient research devoted to the generalization and systematization of the appointment of a complex of physiotherapeutic and balneological factors to patients with gouty arthritis during the interictal period in a sanatorium, and was the prerequisite of our work.

**Relationship of research with scientific programs, plans, themes.** The work was carried out in accordance with the priority thematic area 4.48.3 "Medico-biological justification for the implementation of rehabilitation measures and the appointment of physical rehabilitation to young people of varying degrees of fitness". Number of state registration – 0116U004801.

**The purpose of the research:** to analyze and summarize the main approaches to the appointment of the main physiotherapeutic and balneological factors in the complex treatment of patients with gouty arthritis in the conditions of sanatorium treatment.

*Objectives of the study*:

1. On the basis of the analysis of modern medical and scientific-methodical literature, to present the etiopathogenetic and clinical characteristics of the gout and its complications – gouty arthritis.

2. To reveal the main tasks of physiotherapy during the interictal period of gouty arthritis at the sanatorium stage of rehabilitation.

3. To provide basic approaches to the appointment of modern methods of physiotherapy in combination with hydrotherapy and mud therapy for patients with gouty arthritis at the sanatorium stage of rehabilitation.

## Material and Methods of the research

Analysis of modern scientific and scientific-methodological literature on the problem of physical rehabilitation of patients with gout.

## Results of the research and their discussion

It is known that gouty arthritis is one of the manifestations of a severe chronic disease – gout, which is based on a violation of uric acid metabolism with the accumulation of its salts in the tissues of the joints [1; 12]. According to the etiopathogenesis of the disease, a number of authors [4; 9; 10] distinguish two types of gout – primary and secondary. Primary (as an independent disease) gout arises from the genetic heredity of abnormalities of purine metabolism, secondary – to the main of certain diseases and disorders, risk factors which may be the presence of a person with diabetes, psoriasis, chronic kidney failure, congenital heart disease, leukemia, endocrine diseases, alcoholism, as well as long-term use of certain drugs (as-

pirin, citramone, Ascophene, riboxin, furosemide, etc.). The dominant etiologic risk factor for gout, according to research by some authors [1; 16], is a metabolic disorder due to a significant intake of meat and fatty foods against hypodynamia. In recent years, studies by several authors [1; 4] have shown that the development of gout in men is sometimes associated with the characteristics of the endocrine system, namely, the lack of a sex hormone-estradiol, which is capable of spreading this disease several times more than women.

Gradually, as a result of violation of purine and lipid metabolism, uric acid salts accumulate in the joints with the formation of gouty knots – tophus, which are most often located in the joints of the toes (especially in the first-finger joint of the 1st finger), fingers of the hand, tibia, knee, radiocarpal joints, that is, gouty polyarthritis develops [6]. In the development of clinical manifestations of gout, A. S. Svinitsky co-authored. There are three stages: premorbid, intermittent and chronic. It is in the intermittent and chronic stages of the disease that periods of exacerbation of the disease (attacks of gouty arthritis) and interictal period [1].

During periods of exacerbation there are complaints of passionate, unbearable pains in the joint or joints, hyperemia and swelling of the joint tissues, chills, sometimes a fever, a violation of motor function. Gradually, during intergeneric periods, as a result of repeated gouty attacks, joint deformation develops stiffness, contracture and loss of efficiency [1; 16].

It is in the intergeneric gouty period that some authors [3; 9; 10; 15] emphasize the important role of physiotherapeutic and balneological factors in the complex treatment of patients. The tasks of physiobalneotherapy in the interictal gouty period are [8; 15]:

– improvement of blood and lymph circulation in the tissues of the joints
– improvement and normalization of trophic processes in the joints;
– improvement of metabolism and, above all, purine and lipid metabolism;
– prevention of exacerbation of arthritis;
– prevention of deformities and stiffness in gout-damaged joints;
– improvement and normalization of musculoskeletal function;
– improvement of the patient's psychological status;
– Tempering the body;
– restoration of working capacity.

To solve these problems, patients with gouty arthritis in the interictal period are prescribed a wide arsenal of preformed physical factors, balneotherapy, mud therapy, physiotherapy exercises and therapeutic massage [3; 7; 10]. These therapeutic acting physiologic-neologic methods are desirable to be prescribed to patients in the conditions of sanatorium-and-spa treatment. According to the studies of J.-R. M. Fedorov, 2004, the greatest value of balneological factors for gout at balneological resorts are radon, sulphide, sodium chloride and other baths. In the author's opinion, radon and sulphide baths in combination with the use of alkaline mineral waters, rational dietary nutrition, increased motor conditions, the use of therapeutic gymnastics and massage significantly improve the exchange of purine metabolism, normalizes microcirculation and trophic processes in joints, improves locomotor function and prevents progression the process [14].

In balneological resorts, patients with gouty arthritis, according to the majority of authors [3, 8; 13], peloidotherapy (mud therapy) should be prescribed, using mud, peat mud in the form of mud baths, mud wraps of the joint or application technique, galvanic mud procedures and electrophoresis with a mud solution according to generally accepted procedures. Mud, according to M. V. Loboda et al., 2007, contribute to the optimization of local blood circulation, improves microcirculation in the joint tissues and processes of cartilage tissue regeneration, dissolves salts of uric acid in articular and periarticular tissues [3]. However, most authors [14; 15; 17] emphasize the need to take into account some individual characteristics of the body of a sick person when using balneological factors. Contraindications to the appointment of hydrotherapy and peloid therapy is the presence in patients with gout concomitant somatic pathology with significant changes in the cardiovascular system (moderate-onset CHD, hypertension II B-III, heart rhythm disorder, congenital heart disease, severe atherosclerotic cardiosclerosis), as well as malignant neoplasms, pulmonary tuberculosis, severe cachexia, a period of exacerbation of the gouty process, the presence of a "gouty kidney" [14].

According to several authors [13; 15; 17], in the general complex of sanatorium-and-spa activities, attention should be paid to the treatment of gout patients and physiotherapy apparatus, with which conditions are created for the restoration of metabolic processes, the reduction and complete elimination of residual inflammation in the joints, the improvement of local microcirculation and restoration of locomotor function. At the sanatorium stage, rehabilitation specialists, physiotherapists [7; 9; 14] recommend to assign differentially physiotherapeutic apparatus methods to patients from a wide arsenal of physical factors depending on the nature of the residual phenomena of the inflammatory process in the joints, the presence or absence of complaints, joint deformation, disorders of the musculoskeletal function, concomitant somatic chronic pathology and individual characteristics of the organism of the sick person. The most favorable physiotherapeutic methods for solving these prerequisites are:

– drug electrophoresis with novocaine or analgin solution, potassium-lithium to relieve pain syndrome, electrophoresis with a solution of zinc to stimulate metabolism in the tissues of the joint [1]. Contraindication to the appointment of this method of treatment is the individual intolerance of galvanic current and the presence of pyoderma [17].

– magnetotherapy in order to eliminate residual inflammation in the joint tissues, increase local microcirculation and relieve pain. Contraindications to the appointment of magnetotherapy in patients with gout is the presence of a concomitant chronic pathology in which all physiotherapeutic methods (that is, general contraindications) are contraindicated, as well as the presence of a pacemaker in a patient [13];

– ultrasound therapy or phonophoresis with hydrocortisone in a labile technique, using a continuous or pulsed regimen. By changing the permeability of cell membranes, the energy of mechanical ultrasonic vibration enhances the diffusion and osmosis processes, improves local microcirculation and metabolism, promotes resorption of uric acid salts in articular, periarticular tissues of the joints, activates mechanisms

of nonspecific immune reactivity. Therapeutic effect of mechanical vibrations is manifested by anti-inflammatory, analgesic, trophic, resolving, immunostimulating effects [11]. Ultrasound therapy and phonophoresis are not prescribed to patients during the period of exacerbation of gouty arthritis, with gouty lesions of the vascular system, as well as patients with concomitant IHD, chronic cardiovascular insufficiency of II B–III st., In disorders of cerebral circulation, arterial hypotension, diabetes, in the presence of "gouty" kidney and other diseases, in which all methods of apparatus physiotherapy are contraindicated [1];

– laser therapy. Zone irradiation of joints and reflexogenic zones is carried out by contact scanning method in the infrared range or helium-neon laser. The mechanism of the action of laser radiation is associated with the ignition-induced effects at the level of molecules and atoms, the action of thermal energy, the influence of the electromagnetic field, the presence of photochemical and photoelectric effects, and the therapeutic effect is manifested by anti-inflammatory, analgesic, trophic, immunostimulating effects [11]. To date, a number of physiotherapists and balneologists [8; 15; 17] argue that the only reasonably valid contraindication to the appointment of laser therapy is neoplasm, but should not be used in pregnant women, in patients with epilepsy, in persons with pacemakers and with hormonal disorders.

– transcerebral pulse electrotherapy. According to M. M. Orekhov, 2012, Lediuk's pulsed low-frequency rectangular currents have a positive influence on the central mechanisms of various metabolic processes, improve carbohydrate, lipid, purine metabolism, carry out sedative, analgesic effect, improve and normalize endocrine and immune status the body of a sick person. Contraindications to the appointment of transcerebral pulse electrotherapy is individual intolerance to the current, inflammatory eye diseases, glaucoma, facial skin dermatitis, hysteria, arachnoiditis and general contraindications to apparatus physiotherapy [13].

Physiotherapists [13; 14] emphasize that the choice and purpose of the physiotherapy apparatus method from the aforementioned to the patient gouty arthritis depends not only on the period of the flow and the stage of the disease, but also on the individual characteristics of the organism and the presence or absence of concomitant chronic pathology. Physiological factors combine with therapeutic massage and therapeutic physical culture, which significantly affect the improvement of purine and lipid metabolism and are capable of increasing and restoring motor activity in the joints [2; 9].

## Conclusions

1. At the heart of the development of gouty arthritis is a violation of the metabolism of uric acid with the accumulation of its salts in the tissues of the joint. The course of the disease is chronic, with periods of exacerbation (gouty attacks) and interictal periods.

2. In the complex treatment of patients in the interictal gouty period, an important role belongs to balneotherapy, peloidotherapy, apparatus physiotherapy combined with rational dietary nutrition, enhanced motor regimen, therapeutic gymnastics and therapeutic massage, which are successfully used in balneological resorts.

3. The analysis of the scientific and methodological literature on this problem made it possible to determine that the main approaches to the appointment of methods of apparatus physiotherapy in combination with water and mud therapy in the complex physical rehabilitation of patients with gouty arthritis is the recording of the stage, course of the disease, individual characteristics of the organism, the presence of chronic concomitant somatic pathology, as well as contraindications to the appointment of each of the above methods of physiotherapy.

**Prospects for further research** are related to the scientific substantiation of the submitted and consistent use of physiologic-neologic methods with therapeutic physical culture and therapeutic massage in the inter-aridity period of gouty arthritis in patients of junior and middle age with different degrees of fitness in conditions of sanatorium-and-spa treatment.

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# Organizational and curricular support and efficiency of educational and health-improving activity complexes in the physical education process of students

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***Purpose:*** *to develop organizational and methodological support of the activity of educational and health-improving complexes in the physical education process of students in physical education and to test its effectiveness.*

***Material & Methods:*** *questioning with the purpose of determining the motivation of students, their observance of a healthy lifestyle, the peculiarities of leisure activities; testing the level of theoretical knowledge of students; G. L. Apanasenko methodology (2011) to assess the level of physical health. The pedagogical experiment involved 161 students who studied at the I–IV courses of the University of the State Fiscal Service of Ukraine.*

***Results:*** *pedagogical conditions that determine the participation of students in extracurricular activities in physical education are revealed.*

***Conclusion:*** *the positive influence of the introduction of the model of the activity of educational and health-improving complexes on the degree of involvement of students in extracurricular activities has been established, in turn, has helped to raise their level of health, theoretical awareness, motivation and skills of leisure.*

**Keywords:** *physical education, students, educational complex, motor activity.*

## Introduction

The current system of physical education within the framework of extracurricular activities requires the development of new scientific approaches, not only in methodological, but also in organizational aspects [7; 10], which is emphasized by the introduction of separate norms of the law of Ukraine "On Higher Education", according to which physical education was assigned to non-mandatory disciplines and in some universities is outside the educational process [8]. The necessity of carrying out work in this direction is emphasized by the results of research conducted by scientists, it shows that only a small number of students attend physical education classes on the basis of a university outside of school hours, in addition, most note their monotony, declarativity and inconsistency with the current needs of the younger generation [1; 4; 7].

One of the ways to solve the problem of optimizing the motor activity of students can be the activation of club forms of physical education, as a basic link in organizing and conducting classes outside the academic schedule, namely, the activities of the relevant structural units – training and recreation complexes, which will provide variability and high efficiency the process of physical education [2; 3]. This is also stated in the recommendations on the organization of physical education in higher education institutions, developed by the Ministry of Education of Ukraine, according to which the organization of club activities is considered as a basic model for ensuring the teaching of physical education at the proper level [9].

This practice is also found in the works of Ukrainians scientists. In particular, V. B. Bazilchuk [3] in his studies justifies the structure of the physical education of students, which, in addition to the Physical Education Department and the sports club, including a sports and fitness center and an educational sports and recreational complex, whose main goal is the development of sports in the university, health promotion, the formation of a healthy lifestyle, the training of highly qualified athletes, the promotion and popularization of various sports among students. Work of S. V. Karolinsky [6] is devoted to the problem of searching for an effective implementation of the club form of the organization of physical education. Author substantiates the concept of the club form of organization of extracurricular activities of students, which is based on the maximum consideration of physical culture and health and sports interests of students, the level of their physical condition, the experience of motor activity and the existing material and technical base of the educational institution.

However, in the above-mentioned works, the authors only declare the existence of such club structures on the basis of the educational institution, partially describing only some aspects of their software, at the same time, in the existing scientific-theoretical literature, there is practically no fundamental system research on the definition of organizational and methodological support and pedagogical conditions of activity educational and recreational complexes in the process of physical education [4].

**Relationship of research with scientific programs, plans, themes.** The work was carried out in accordance with the thematic plan of research works financed from the state budget of the Ministry of Education and Science of Ukraine on the topic: "Historical, theoretical and methodological foundations for the formation of recreational activities of various population groups" (State registration № 0112U007808) and in accordance with the plan of scientific work NUPESU for

2016–2020 on the theme "Theoretical foundations of recreational and recreational motor activity of various population groups" (State registration № 0116U001630).

**The purpose of the research:** to develop organizational and methodological support of the activity of educational and health-improving complexes in the physical education process of students in physical education and to test its effectiveness.

## Material and Methods of the research

To solve the tasks set in the work, the following methods were used: theoretical analysis of special scientific literature and documentary materials, modeling, sociological, pedagogical (observation, testing, experiment) research methods, expert evaluation, methods of determining health level, motor activity, methods of mathematical statistics. The questioning of students was conducted with the purpose of determining their attitude to the organization of extracurricular classes in physical education, their motivation, observance of a healthy lifestyle, and particular leisure activities. Testing the level of knowledge of students was conducted to assess their theoretical awareness. An expert evaluation was conducted with the aim of determining the criteria for the effectiveness and system-forming directions of the training and health complexes. G. L. Apanasenko's method (2011) was used to assess the level of physical health of students. The pedagogical experiment was conducted in two forms (ascertaining and conversion). In the ascertaining experiment, 161 students participated in the I–IV courses. The indicators of the level of physical health, motivational factors, the attitude of students and the degree of their involvement in extracurricular physical education classes were studied, according to which the effectiveness of such studies was determined. Conversion experiment was conducted with the students of III-IV courses in the number of 80 people. The purpose of the experiment was to determine the effectiveness of the introduction of the model of the activity of the educational and health complex in the process of extracurricular work in physical education.

## Results of the research and their discussion

A thorough analysis of literary studies and practical experience in the implementation of the process of physical education in higher educational institutions has allowed us to determine the pedagogical conditions for increasing the effectiveness of extracurricular activities of students, among which the activities of the relevant departments and structures of the university, which will assume the responsibility of organizing active leisure of students; the refusal to unify the development of program material, the creation of a number of alternative types of occupations, taking into account regional characteristics, traditions and material support of HEIs, which will contribute to the formation of positive student motivation; creation of conditions for provision of regular motor activity at the time of vacations; ensuring accessibility of classes for all categories of students, regardless of their level of physical fitness and motor experience; development of methodical support of theoretical training in the framework of extracurricular activities; development and implementation of mechanisms for attracting additional financial resources, which will be directed at raising the pay of teachers, improving the material and technical base, purchasing new inventory, etc. [2–5].

Obtained results are the basis for the model of the activity of educational and health-improving complexes on the basis of higher educational institutions, which provided for the development of organizational and methodological support and criteria for the effectiveness of their activities and included experimental approbation in the educational process. Developed model included the following blocks: definition of the purpose, content, tasks, directions and principles of activity, criteria for the effectiveness of pedagogical influence, the mechanism of implementation and conditions for effective implementation (Figure 1). The organizational support of the complex included appropriate resource support (regulatory

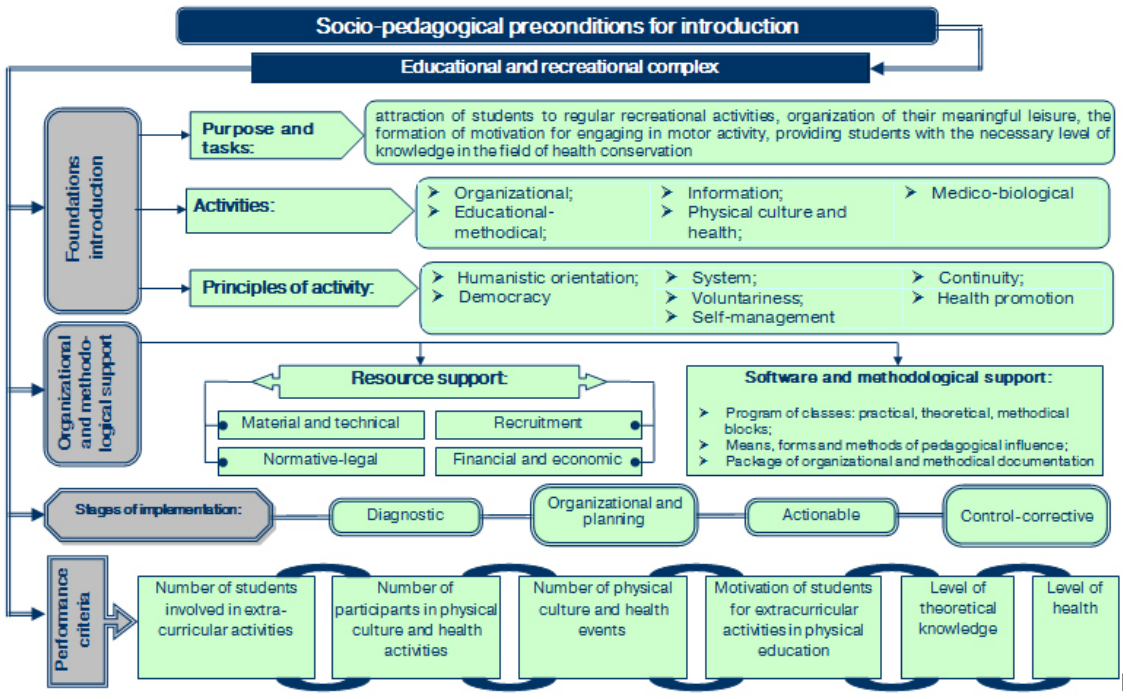


**Fig. 1. Organizational model of the activity of educational and health-improving complexes in the process of physical education of students**

legal, financial and economic, personnel, material and technical).

Methodical support provided for the development of program material that contained practical, theoretical, methodological blocks, the definition of the main aspects of providing educational and recreational activities on the basis of complexes, a package of relevant documentation, the selection of adequate forms, means and methods of pedagogical influence.

Educational and health complex should be regarded as a non-profit organization of physical culture, the club form of the organization, which provides extracurricular work in physical education and carries out its activities on the basis of relevant regulatory documents (regulations, orders, and others). Purpose of the complex is to attract a wide range of students to extracurricular forms of organizing recreational activities, organize their content leisure and provide students with the necessary level of knowledge.

Educational and health-improving complex carries out its activity in the following directions: organizational (planning, organizing and conducting recreational activities), educational and methodological (carrying out educational activities to improve the level of knowledge and skills, the level of physical preparedness of students), information, fitness and health physical activity according to the calendar plan), medical and biological (monitoring of health indicators of students both at the initial stage, and in the lessons).

Practical component of the model developed by us is the program of classes on the basis of the educational and health complex, which took into account the motivational demands of students, the peculiarities of the organization of the educational process and leisure activities, as well as the possibilities of its implementation in the conditions of the pedagogical process and provided for the conduct of classes during extracurricular time.

Program consisted of three interrelated blocks: theoretical, practical and methodical. The health-improving orientation of classes on the basis of the complex was provided by the use of innovative types of motor activity, in particular, fitness tools (functional training, crossfit, various types of group programs, training in the gym), the choice of which was due to the availability of their practical implementation, significant health potential, a wide range of means used by the possibility of differentiating loads and matching students' interests. Need to introduce theoretical training in the framework of the activities of the complexes was due to a number of provisions: the lack of training in some educational institutions, the physical education in the list of optional disciplines, the low level of theoretical knowledge of students, the lack of skills for self-mastery of knowledge. Theoretical and methodical preparation of students was carried out using interactive teaching methods in the form of workshops, information messages, round tables, seminars, etc.

We also identified organizational reserves to improve the effectiveness of the complexes. With the purpose of targeted use of available funds, we proposed a scheme for managing the activities of sports facilities, which provided for planning their activities, taking into account the simultaneous and daily capacity, the load factor of the structure and the time of its use during the day, week and year. Possible ways of attracting additional financial resources, including the provision of physical education, counseling and counseling services to various categories of the population, including university staff, on a paid basis, which will allow partially to pay employees, to update the existing material and technical base, to conduct events propaganda and informational character, to carry out advertising, propaganda, publishing activity. Implementation of the personnel policy within the framework of the complex is aimed at improving the skills of specialists, attracting leading specialists of the industry on the basis of hourly wages, the introduction of a differentiated wage system.

Mechanism for introducing the model of the activity of the health-improving complex included several stages:

- diagnostic – collection and processing of primary information, implementation of complex pedagogical, functional and medical-biological diagnostics of students, conducting sociological studies, studying the characteristics of the study contingent, taking into account their needs, motives and interests, learning and recreation features, analysis of results;
- organizational and planning – setting goals, objectives, developing a plan of measures and implementation time, selecting appropriate tools, forms and methods of pedagogical influence, developing appropriate documentation, software and methodological support, organizational support, a system of interaction with other actors;
- activity – implementation of the developed program of activities, carrying out all types of work in these areas;
- control and correction – development of a monitoring system for implementation, analysis and synthesis of information received, formulation of conclusions, appropriate correction of management actions.

The criteria for the effectiveness of the complexes were determined by the results of a generalization of the experts 'opinions ($W=0,71$, $p<0,05$) and included an estimate of the number of students involved in the activities of the complexes (35,0%), students' health (22,5%), the level of theoretical knowledge (12,5%), motivation of students (12,0%), the number of physical culture and sports and mass events held on the basis of the complex, the number of participants (10,0%).

Assessment of the effectiveness of the introduction of the health-improving complex was carried out based on the results of the conducted pedagogical experiment lasting one academic year, which was conducted with the students of III–IV courses of the National University of the State Fiscal Service of Ukraine.

The obtained data testify to the dynamics of growth in the number of students involved in extracurricular activities, by 11,0% among boys and 20,0% among girls. According to the results of the preliminary study, out of those students who attend classes outside of school hours, 46,0% of the boys and 52,0% of the girls noted that they attend classes occasionally and accidentally. Introduction of our model allowed to reduce these indicators to 29,0% for boys and 18,0% for girls. Analysis of the physical culture, health and sports events on the basis of the educational institution showed an increase in their number from 5 to 17 in comparison with the previous academic year, as well as an increase in the number of their participants.

After the experiment, there was a significant increase in the level of theoretical knowledge of students, as evidenced by

Table 1

**Changes in indicators of the physical state of students before and after the pedagogical experiment (n=40)**

| Indexes | Before experiment | | | | After experiment | | | |
|---|---|---|---|---|---|---|---|---|
| | Girls (n=20) | | Boys (n=20) | | Girls (n=20) | | Boys (n=20) | |
| | $\bar{X}$ | S | $\bar{X}$ | S | $\bar{X}$ | S | $\bar{X}$ | S |
| Body mass index, kg | 22,6 | 2,1 | 24,3 | 3,1 | 21,3* | 1,8 | 24,5* | 2,5 |
| Strength index,% | 49,4 | 6,7 | 63,2 | 5,6 | 52,0* | 6,2 | 70,7* | 5,4 |
| Vital index, ml·kg$^{-1}$ | 44,3 | 4,0 | 52,1 | 4,2 | 47,9* | 3,7 | 59,5* | 3,8 |
| Robinson index, c. u. | 91,4 | 3,4 | 89,5 | 4,1 | 86,7* | 3,2 | 81,1* | 3,6 |

***Remark.*** ** – changes in the indicator as a result of the pedagogical experiment are statistically significant at the level of p<0,05.*

a decrease in the number of young men with a low level of knowledge of 55,0% to 42,0%; among girls – from 34,0% to 29,0% due to their transition to a higher level – satisfactory. Number of boys who have a sufficient and high level of theoretical knowledge has grown from 2.0% to 7,0%, and the number of girls who have received the same rating, – from 5,0% to 13,0%.

Assessment of the state of health of students was carried out by us taking into account the body weight, the functions of the cardiovascular system, carpal dynamometry, vital capacity of the lungs and the calculation of the corresponding indices (Table 1).

After the completion of the experiment, a positive trend was established in the values of the functional activity of the students' body, namely: the calculated indices of the Robinson index both in the group of girls and boys decreased reliably, became a characteristic sign of optimizing the activity of the cardiovascular system (p<0,05). Also, the body mass index in the group of girls is characterized by positive dynamics. So, the body mass index values (from 22,6±2,1 kg to 22,3±1,8 kg) significantly decreased, as much as possible with the results of the norm (p<0,05). A reliable increase in the calculated indices of the force and vital indices was also established (p<0,05). In general, the level of physical health of both women and boys has improved significantly (Figure 2).

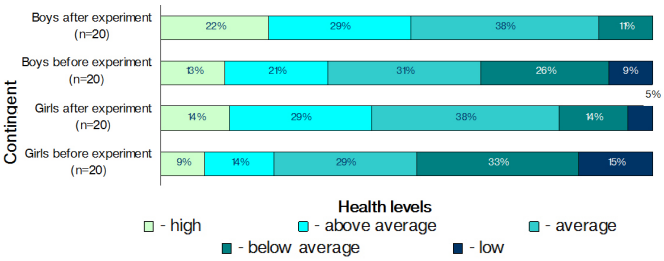


**Fig. 2. Dynamics of indicators of physical health of students by the method of G. L. Apanasenko, 2011 (n=80)**

In 64,0% of the girls and 59,0% of the boys, a transition to a higher level of physical health took place. At the end of the experiment, we observed a decrease in the incidence of illness among students: the number of girls and boys who did not get sick once during the experiment increased by 12,0%. At the same time, the number of students and students decreased significantly, they ached more than 3 times a year. Indicators of the breadth of motivation have undergone significant changes. So, the number of motives, students choose as leading, has increased. More significant for students, except for a group of health and aesthetic motives, were psychological motives associated with gaining pleasure from classes, switching attention, as well as cognitive motives.

## Conclusions

In the course of the research, the model of the activity of the health-improving complex was developed and scientifically justified, its organizational and methodological support was determined in the process of extracurricular studies of students in physical education. Transformational pedagogical experiment allowed to establish that the proposed model, the practical component of which is the program of organizing physical culture and health classes using modern fitness programs of various orientations, in conjunction with educational, recreational and information activities can ensure the formation of a positive attitude of students to their health, as evidenced by an increase in the number of students involved in extracurricular activities in physical education, raising their theoretical awareness and reducing the incidence of diseases. The positive tendency of the indices of the functional activity of the body of students was also established, namely: significantly (p <0.05), the body mass index among students decreased, as well as the calculated values of the Robinson index; increased the value of the vital index; the value of the indicator of the strenght index of students increased. The level of physical health of both girls and boys has improved significantly, in general, 64,0% of girls and 59,0% of boys have experienced a transition to a higher level of physical health.

**Prospect of further research** is the scientific substantiation of new approaches to the improvement of club forms of physical education in general educational institutions.

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# Improvement of special physical training of female gymnasts in sports aerobics at the stage of preliminary basic training

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***Purpose:*** *to investigate the influence of the proposed methodology on the indicators of special physical preparedness of female gymnasts in sports aerobics at the stage of preliminary basic training.*

***Material & Methods:*** *in the study took part girls 7–9 years in the number of 20 athletes 1st and 2nd junior category in sports aerobics. The control group consisted of 10 people and the experimental group consisted of 10 people. To conduct our research, we used the following methods: analysis of scientific and methodological literature, pedagogical observations, pedagogical testing, pedagogical experiment, method of peer review, methods of mathematical statistics.*

***Results:*** *as a result of the study, a positive effect of the means of gymnastic exercises without a subject and with the subject on the indices of special physical preparedness of female gymnasts in sports aerobics at the stage of preliminary basic training.*

***Conclusion:*** *five out of six indicators of special physical readiness have been significantly changed at a given reliability 95%.*

**Keywords:** *sports aerobics, special physical training.*

## Introduction

Sports aerobics are a complex co-ordinated sport, in which the execution of aerobic exercises is combined with a rhythmic pattern of musical accompaniment [1]. Competition program consists of high-intensity acyclic exercise complexes that combine the complex coordination movements of the arms and legs, strength exercises, flexibility and acrobatic elements of varying complexity [8]. The basis for the choreography of competitive compositions is the traditional "basic" aerobic steps and their varieties [2].

Process of improving the technique of exercise in sports aerobics is complex and time-consuming. It requires a rational methodical approach, knowledge of the technique of movements and the laws of its formation [3; 7]. Basis of the technique of performing exercises is developed to optimal parameters leading physical qualities [5; 9]. Solution of this issue becomes possible in the process of special physical training.

The problem of improving the process of special physical training is devoted to a large number of fundamental researches in sports. Specialists in the field of sports aerobics also pay attention to this issue; however the studies are fragmentary, does not give a clear idea of the process of special physical training during the long-term sports improvement and its organization and maintenance at the stage of preliminary basic training [4; 6]. At this stage of training, the number of aerobic exercises dramatically increases, which must be learned by athletes. Therefore, the search and combination of rational means for the successful training of gymnasts is topical.

**Relationship of research with scientific programs, plans, themes.** The work was carried out in accordance with the Consolidated Plan of research works in the field of physical culture and sports for 2011–2015. On the topic 2.6 "Theoretical and methodological basis for improving the training process and competitive activities in the structure of long-term training of athletes" (state registration number 0111U001168).

**The purpose of the research:** to investigate the influence of the proposed methodology on the indicators of special physical preparedness of female gymnasts in sports aerobics at the stage of preliminary basic training.

*Objectives of the study:*

1. Conduct an analysis of the process of special physical training of athletes in sports aerobics at the stage of preliminary basic training.

2. Determine the level of special physical preparedness and psychomotor abilities of athletes in sports aerobics at the stage of preliminary basic training.

3. To study changes in the indices of special physical preparedness and psychomotor abilities of athletes in sports aerobics at the stage of preliminary basic training.

## Material and Methods of the research

The study was carried out on the basis of the Comprehensive children's and youth sports school No. 13 and the research laboratory of the KSAPC. The study involved girls 7–9 years in the number of 20 athletes who have 1 and 2 youth categories in sports aerobics. In the control and experimental group were distributed to 10 female athletes, who were selected for homogeneity of characteristics during the initial testing. To conduct our research, we used the following methods: analysis of scientific and methodological literature, pedagogical observations, pedagogical testing, pedagogical experiment, method of peer review, methods of mathematical statistics.

## Results of the research and their discussion

The analysis of scientific and methodological literature was carried out with the purpose of generalization, the main factors and conditions for raising the level of special physical preparedness of female gymnasts.

In sports aerobics, starting from the junior school age, children perform competitive exercises in accordance with international FIG rules. Young athletes take part in the following nominations: individual performances, mixed pairs, threes and groups.

One of the main criteria for the successful performance of exercises in sports aerobics is the demonstration of a balance between the combination of aerobic tracks, elements of complexity from groups A, B, C and D and elements of acrobatics. They are performed at a sufficiently high rate and should coincide with the rhythmic structure of the musical accompaniment. The duration of the competition program for children 1 minute 10±5 seconds. According to the rules of the competition for each age category there are mandatory elements that must be demonstrated by athletes in the performance of a competitive program.

Therefore, in this work, to determine the level of special physical preparedness, test exercises were selected, when drawing up of which attention was paid to these elements (Table 1). The method of peer review was introduced for independent evaluation and unbiased attitude to the performance of tests by athletes. For the assessment in the test exercises, the principle of the evaluation of competitive programs was laid; the maximum score that the participant of the research could receive from experts is 8 points.

Based on the data presented in Table 1, we can say that the qualitative indicators of the results of the athletes CG and EG correspond to the "average".

Coefficients of variation in the results of testing the CG and EG of athletes range from 13% to 25%, indicating an average degree of homogeneity of the characteristics.

Given that in sports aerobics, all movements of competitive programs have a complex coordination structure, training must take into account aspects of managing these movements. Since it is impossible to control motor activity and to correct it without the systems of perception and processing of information, we also measured the parameters of sensory and nervous systems (Table 2).

When comparing the test results with the standards, it can be stated that the quality indicators: in KG and EG in the three tests have a "low level" rating, in the test "Determination of the time of simple sensorimotor reaction to light by hand", the evaluation is the "average level". Coefficients of variation range from 13 % to 21 %, indicating an average degree of homogeneity.

Based on the findings, in accordance with the physical capabilities of girls 7–9 years old [7] and according to the principles of physical education and sports [3; 9], a methodology was developed. The essence of this technique is to improve the means of developing the leading physical qualities: coordination, speed and strength, flexibility and the creation of the necessary technical base to ensure the reliability of the performance of competitive compositions. This technique also included the inclusion of elements of acrobatic training. The main means on which we focused attention were: exercises on the reaction rate; exercises for coordinating the movements of various parts of the body exercises on the development of flexibility exercises with objects (skipping rope, gym-

**Table 1**

**Indicators of special physical fitness of female athletes in aerobic athletes at the beginning of the study at the CG and EG**

| No. i/o | Test | Result of CG (n=10) $\bar{X}\pm\sigma$ | CV, % | Result of EG (n=10) $\bar{X}\pm\sigma$ | V, % |
|---|---|---|---|---|---|
| 1. | Jump with 360° turn (points) | 4,35±0,86* | 17 | 4,53±0,79 | 19 |
| 2. | Jump in the grouping (points) | 4,44±0,95* | 19 | 4,51±0,96 | 16 |
| 3. | Turn with a leg on the pass on 360° with the final position in the vertical twine (points) | 4,65±1,03* | 21 | 4,62±1, 02 | 25 |
| 4. | From the longitudinal twine, turn to the side by 360° (points) | 4,69±0,91* | 14 | 4,79±0,94 | 18 |
| 5. | Aerobic track (points) | 4,91±0,92* | 14 | 4,62±0,89 | 15 |
| 6. | Acrobatic track (points) | 4,01±0,89* | 15 | 4,73±0,86 | 13 |

***Remark.*** ** – between the parameters of CG and EG there is no significant difference in p>0,05.*

**Table 2**

**Parameters of the psychomotor abilities of female athletes in sports aerobics in CG and EG at the beginning of the study**

| No. i/o | Test | Result of CG (n=10) $\bar{X}\pm\sigma$ | CV, % | Result of EG (n=10) $\bar{X}\pm\sigma$ | V, % |
|---|---|---|---|---|---|
| 1. | Determination of the time of a simple sensorimotor reaction to light by hand (mls) | 294,6±34,31 | 12 | 296,52±36,13 | 14 |
| 2. | Determination of the time of a simple sensorimotor reaction to the sound signal by hand (mls) | 277,8±40,72 | 16 | 281,11±42,21 | 13 |
| 3. | Determination of the duration of an individual minute (s) | 75,67±15,87 | 21 | 73,84±14,26 | 18 |
| 4. | Tapping test hand (s) | 72,9±11,17 | 14 | 70,26±10,62 | 13 |

nastic ball) varieties of jumping acrobatic and semi-acrobatic exercises.

During the duration of the study, the training sessions conducted pedagogical observation of the accuracy and speed of mastering the exercises and retaining the skills in time, as well as the body's response to the proposed load. The developed technique was applied at each lesson in the EG female athletes.

At the end of the experiment, we re-tested the special physical preparedness and made a comparative analysis between the indices of athletes CG and EG, which is reflected in Table 3.

As the data of Table 3 show, there is a positive dynamics of changes in the investigated indicators of special physical readiness, both in the CG and in the EG, but thanks to the introduction of the methodology, the EG indicators changed more significantly.

Throughout the study, qualitative assessments of the athletes' performance have changed: in CG in all tests – the level "above average", in the EG in all tests – the level of "high".

A comparison with Student's t-test determined the reliability of the differences in all indicators for $p<0,05$.

At the end of the study, we also conducted repeated testing of the athlete's functional systems (Table 4).

On the parameters of repeated testing, the athletes of both groups improved their results. In the CG female athletes in three tests, characterizing the visual, auditory system and sense of time, the quality indicator remained at the initial level. In EG female athlete in test "Determination of the time of a simple sensorimotor reaction to light by hand" evaluation – "average level", in test "Determination of the time of a simple sensorimotor reaction to the sound signal by hand" and "Determination of the duration of an individual minute" – "high level", in test "Tapping test hand" – group was highly appreciated, but in the EG, the average performance improved more significantly. After the comparison of the indices in the Student's t-test, reliable changes were established for all indicators at $p<0,05$.

## Conclusions

1. To date, sports aerobics on the path of its development and requires the development of the foundations of the organization of the training process. Particularly acute is the question of organizing the process of special physical training at the stage of preliminary basic training, since properly developed leading physical qualities create the foundation for mastering the technique of this sport.

2. According to the expert assessment, at the beginning of the study the results of the indices of the special physical preparedness of the athletes EG and CG are at an average level. The coefficients of variations in the results obtained in the CG and EG of athletes range from 13% to 25%, indicating an average degree of homogeneity of the characteristics.

3. Qualitative indicators of the psychomotor abilities of the athletes CG and EG group at the beginning of the study in the three tests have a "low level" rating, in the test "Determination of the time of simple sensorimotor reaction to light by hand", the assessment is the "average level". The coefficients of variation range from CV 13% to 21%, indicating an average degree of homogeneity.

4. Sport gymnast's lessons in sports aerobics for 6 months allowed to improve the performance of special physical readi-

**Table 3**

**Comparative analysis of special physical readiness of female athletes in sports aerobics CG and EG after the experiment**

| No. i/o | Test | Result of CG (n=10) | | Result of EG (n=10) | | t | P |
|---|---|---|---|---|---|---|---|
| | | $\bar{X}$ | ±σ | $\bar{X}$ | ±σ | | |
| 1. | Jump with360° turn (points) | 5,28 | 0,58 | 7,55 | 0,35 | –2,35 | <0,05 |
| 2. | Jump in the grouping (points) | 5,22 | 0,68 | 7,44 | 0,26 | –2,29 | <0,05 |
| 3. | Turn with a leg on the pass on 360° with the final position in the vertical twine (points) | 5,51 | 0,45 | 7,56 | 0,36 | –2,28 | <0,05 |
| 4. | From the longitudinal twine, turn to the side by 360° (points) | 5,27 | 0,42 | 7,28 | 0,33 | –2,32 | <0,05 |
| 5. | Aerobic track (points) | 5,25 | 0,48 | 7,28 | 0,29 | –2,31 | <0,05 |
| 6. | Acrobatic track (points) | 5,35 | 0,49 | 7,54 | 0,31 | –2,45 | <0,05 |

**Table 4**

**Comparative analysis of indicators of functional readiness of female athletes in sports aerobics of CG and EG after the experiment**

| No. i/o | Test | Result of CG (n=10) | | Result of EG (n=10) | | t | P |
|---|---|---|---|---|---|---|---|
| | | $\bar{X}$ | ±σ | $\bar{X}$ | ±σ | | |
| 1. | Determination of the time of a simple sensorimotor reaction to light by hand (mls) | 289,72 | 31,82 | 277,43 | 33,84 | 2,57 | <0,05 |
| 2. | Determination of the time of a simple sensorimotor reaction to the sound signal by hand (mls) | 274,68 | 38,58 | 263,22 | 35,32 | 2,53 | <0,05 |
| 3. | Determination of the duration of an individual minute (s) | 70,54 | 13,56 | 64,82 | 12,45 | 2,34 | <0,05 |
| 4. | Tapping test hand (s) | 74,17 | 10,81 | 79,11 | 9,13 | –2,16 | <0,05 |

ness of athletes CG and EG. During the term of the study, the qualitative parameters of the CG athletes changed, which were trained according to the existing program, in all tests – above the average level, in which the exercises were conducted according to the experimental method, in all tests – a high level.

5. A comparison with Student's t-test determined the reliability of differences in all indicators of special physical fitness and psychomotor abilities at $p<0,05$. With the help of this test, we determined the properties of the children's nervous system, help us correctly form pairs, troikas and group performances, and the results of these tests will be an indispensable criterion when staging demonstrations and competitive programs.

**Prospects for further research.** In the future, it is planned to correct the methodology of special physical preparation for its introduction into the training process of female athletes in sports aerobics at the stage of specialized basic training.

**Conflict of interests**. The authors declare that no conflict of interest.
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# Improvement of training process of powerlifters on the basis of an interactive program "PersTrainer"

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***Purpose:*** *to develop and scientifically substantiate the program "PersTrainer" for improving the training process of powerlifters.*

***Material & Methods:*** *the study involved the powerlifters of 16–18 years. The following research methods were used: analysis and generalization of the literary sources and data of the Internet, pedagogical observation and the method of information modeling.*

***Results:*** *the interactive program "PersTrainer" is developed and theoretically justified, which allows individually calculating the training load in different training cycles.*

***Conclusion:*** *it is possible to plan training loads on the basis of individually proposed exercise complexes, which are presented in the interactive program "PersTrainer".*

**Keywords:** *powerlifting, training process, information and communication technologies, mobile training.*

## Introduction

To improve the training process, a scientific search for the most optimal loads is constantly carried out in order to increase the level of special physical performance of athletes [7; 10; 11; 13; 18; 19; 22–27].

Powerlifting, as a power sport, includes three competitive exercises in the program: squats, a bench press and a deadlift. The sports result in powerlifting is determined by the sum of the lifted weight. To achieve a sporting result, powerlifters need to develop strength qualities that provide the ability to raise the maximum weight in three basic exercises [3; 20; 28]. Results in each weight category are evaluated separately. With the same strengths, a victory is awarded to an athlete who has a lighter body weight.

Analysis of scientific literature shows that increasing the effectiveness of the training process in powerlifting depends on the rational planning of physical activities and the formation of techniques of competitive exercises [2; 5; 6; 8]. In addition, a clear application of physical exertion should be carried out taking into account the individual characteristics of powerlifters. The construction of a program for the physical training of powerlifters requires the analysis of a large number of individual indicators. Practice of improving the training process in various sports shows that for this the most effective is the use of modern interactive technologies [1; 4; 9; 12; 14; 16; 17; 21]. The modern development of information and communication technologies provides the possibility of using mobile devices in the training process [15], which allows the coach to improve the process of managing the training process, as well as to control the rational load distribution taking into account the individual features of the powerlifters.

**Relationship of research with scientific programs, plans, themes.** The research was carried out in accordance with the theme of the scientific research work of the Kharkov State Academy of Physical Culture 1.1 "Scientific and methodological foundations of the use of information technologies for the training of specialists in the field of physical culture and sports", the state registration number 0111U003130.

**The purpose of the research:** to develop and scientifically substantiate the program "PersTrainer" for improving the training process of powerlifters.

*Objective of the study* is to develop a "PersTrainer" interactive program.

## Material and Methods of the research

To solve the task, the following research methods were used: analysis and generalization of the literary sources and data of the Internet, pedagogical observations and the method of information modeling.

## Results of the research and their discussion

The interactive program "PersTrainer" is designed for athletes, powerlifters and coaches. With its help, you can analyze the training process of powerlifters, thanks to the calculations that the program executes.

Program includes an information block in which the base of training programs developed by highly qualified trainers and athletes is presented. The variety of these programs makes it possible to analyze their training and find the right program, given their sporting experience.

One of the features of the program – the ability to create an individual account for each athlete and the ability to quickly switch between them, which allows to speed and simplify the work of the coach with several athletes at once.

The main difference of the interactive program is the ability to distribute the load in a one-year training cycle, which increases the efficiency of the training process.

The main component of the program is the personal recording of the athlete's data in the training session, which makes it possible to control the volume and intensity of the load in the training session (tonnage and the number of bar lifts per training session), thus avoiding overloading.

The interactive program includes a tab "graphics", which reflects the data calculated in training sessions during the year. This makes it possible to monitor and plan the loads for each athlete.

When you start the program – opens the "Accounts" tab (Figure 1), in which there is a button "+" and previously created accounts. If there are no accounts, click on the "+" button, then a window for the account name will appear (the optimal name for the account is the name or surname of the athlete).

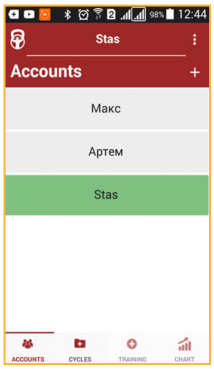


**Fig. 1. Window "Accounts"**

The next tab that can be found at the bottom of the screen is "Cycles" (Figure 2), in which there is a button "+" and the cycles created earlier (where the personal data of the physical load are indicated). If there are no cycles, you need to press the "+" button, after which a window will appear for the name of the cycle.


**Fig. 2. Window "Cycles"**

After that, it becomes possible to go to the "Training" tab (Figure 3), where the trainings for this cycle and the account are recorded. The "+" button opens the training designer (Figure 4).

This training constructor consists of a place for recording the name of the exercise, a table for filling in the weight and the number of repetitions, a field with the exercises done, cells with countable data and the "Add", "End of training" and

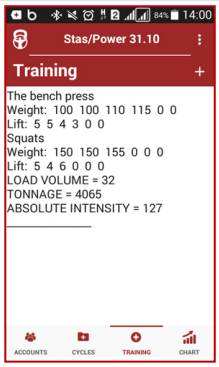


**Fig. 3. Window "Training"**

"Change" buttons (available by changing the attached exercises). Button "Add" – adds a written exercise with repetitions and weight (recorded in the field below). "End of training" button – closes the training designer and adds the received data to the training record ("Training" tab).

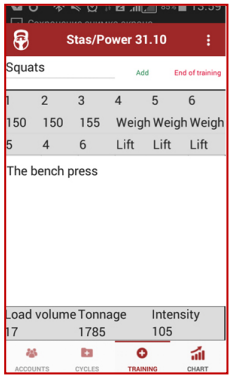


**Fig. 4. Designer training**

The last tab at the bottom of the "Chart" (Figure 5) – consists of a field for the graph and data settings, with which the "number of trainings in a microcycle" chart is constructed and the data displays a graph.

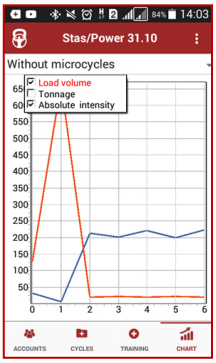


**Fig. 5. Window "Chart"**

"Number of trainings in a microcycle" – opens a window with the choice of the number of trainings in the microcycle (Figure 6).

Data, displays a graph (tonnage, number of bar lifts, intensity) – construct a schedule based on the selected settings.

The app has an English translation, is in the "Settings" window (Figure 7) and "Manual" – to use the app.

Interactive program "PersTrainer" is developed for the ac-


**Fig. 6. Window with the choice of number of trainings in the microcycle**

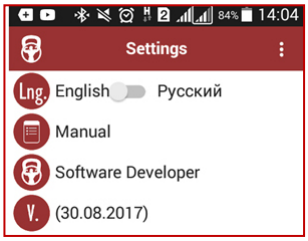


**Fig. 7. Window "Settings"**

count and control of physical qualities, enables the coach to make a training program, calculating the number of bar lifts, the total weight lifted the entire workout, and the average weight that the athlete raised in one repetition. The program on a numerical array of tabular data allows the analysis of statistical indicators. Thus, the interactive program "PersTrainer" is developed provides the process of planning and correcting the training of athletes in powerlifting.

## Conclusions

Developed an innovative software product allows you to plan training loads on the basis of the proposed exercises. The modern interactive program "PersTrainer" allows the coach to keep a record of the level of physical preparedness of the athlete, on the basis of which the coach can receive recommendations on the use of complex special exercises in the individual training program for each athlete.

Thus, the use of the interactive program "PersTrainer" on the mobile device in the training process will contribute to the opportunity to learn in one's own rhythm, supports communication and the dialogical nature of learning. At the same time, it provides access to additional information resources, promotes motivation and stimulates cognitive activity and interest.

**Prospects for further research** are the introduction of the interactive program "PersTrainer" in the training process on powerlifting to improve its quality and efficiency.

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# The genesis of content of school physical education in the context of social order

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***Purpose:*** *to analyze the genesis of the content of school physical education in the context of social order, separating the features of the modern physical education program in the general educational institutions of Ukraine. On the basis of the use of chronological periodization in the article, the features of the content of the systems of school physical education are emphasized in connection with the contextuality of historical epochs.*

***Material & Methods:*** *analysis of special literature, which reveals the features of the content of school physical education in different historical epochs; chronological periodization; analysis of regulatory legal acts.*

***Results:*** *in the process of development of the system of school physical education, the curricula for physical culture also changed; there were contextual features of political, economic and social development of Ukraine during the last century.*

***Conclusion:*** *the dynamics of the content of physical education programs at the secondary school shows the growing differentiation and humanization of the system of physical education in modern Ukraine.*

**Keywords:** *physical culture, physical education, school curriculum, content, lesson.*

## Introduction

At the current stage of development of Ukrainian society, one of the main tasks of the education system is the comprehensive development of man as a person and the highest value of society, the preparation of a deeply moral, competent, initiative, patriotically and socially active citizen. Undoubtedly, a special role in the education of a healthy generation belongs to the school. It is during this period the foundations of physical and mental health of a person are formed, and they understand the needs and motives lead a healthy way of life. As you know, human health is laid in the childhood, in particular, is formed in the process of school physical education.

The phenomenon of using the physical culture in the system of education has existed for a long time. From ancient times, physical exercises were used during the training of a hunter, then in the educational institutions of ancient Greece, and later in the training of knights and nobles, etc. [1].

**The purpose of the research:** to analyze the genesis of the content of school physical education in the context of social order, separating the features of the modern physical education program in the general educational institutions of Ukraine. On the basis of the use of chronological periodization in the article, the features of the content of the systems of school physical education are emphasized in connection with the contextuality of historical epochs.

## Material and Methods of the research

Methods: analysis of special literature, which reveals the features of the content of school physical education in different historical epochs; chronological periodization; analysis of regulatory legal acts.

## Results of the research and their discussion

An analysis of the historical work of scientists says that there was no single system of physical education in schools at the end of 19 century, as a single program that would regulate it. In programs of public schools, physical education lessons were absent, and in educational institutions for privileged groups of the population they were conducted only if material and technical conditions were favorable [2].

After the introduction in 1874 of the law on general military conscription, the need to strengthen the physical training of students of secondary-school became necessary to the government. In 1888, Minister of War. Vannovskiy, noting "the one-sided development of the spirit to the detriment of the body " in civilian schools, proposed to enter the military gymnastics for "improvement the teaching of gymnastics" and improvement the health of students of these educational institution[3]. At that time there was an unsatisfactory state of physical culture in a civilian school, represented by gymnastics, especially compared with military educational institutions. In addition, the negative health status of population was noted by public figures and experts on hygiene of that time [4]. To understand the issues connecting to this problem, a special commission was organized under the authority of I. Novikov with representatives from the Ministry of Public Education, Ministry of Interior and the War Ministry. Based on the findings made by this commission of transformation the secondary school, in educational institutions the educational reform began, the implementation of which was intended for 1901 – 1905 years. The result of the commission was as follows: 1) the proposal to open Temporary courses for the training of gymnastics teachers; 2) Instruction and program of teaching gymnastics in male educational institutionsof the Ministry of National Education. The instruction was approved on April 26, 1889 by Minister of Public Education I. Delyanov [5].

Analysis of works by R. Nagovitsyn [5, 6] concerning the specifics of physical culture as a subject in secondary school in the second half of the 19th – the early 20th showed that there were four models of physical culture education in schools: health-saving; socially-oriented; individually differentiated and health-developing .Consequently, at the turn of the 19th and 20th centuries a system of teaching physical culture and its main models arose. This stage can be characterized both as a stage of the formation of school physical culture and as a stage when physical culture was first realized consciously by the government in the domestic practice of education as an instrument for solving global social problems, mainly military-utilitarian.

Since the first years of the Soviet school, physical education has been included to the curriculum. In schools with ten-year period of studyforphysical education lessons 2hours were set aside a week. In 1919, the first educational program on physical education was adopted, which revealed the content of physical exercises with children and adolescents. The basis of the programs was gymnastics, in the vast majority close to Sokolsky one, in particular: foot-drill exercises, a list of military skills and abilities, and some sports games. The ideas of the proletarian culture formed the basis of the "Schematic programs of physical education and labor skills at the age of 7 upto 18 years on the basis of a proletarian physical education". In 1923 the author's collective A. A. Sigmund and A. I. Sigmund released "Schematic program of the physical education and labor skills at age 7 up to 20 years on the basis of the proletarian physical education" [7]. Further, in the 20's a group of scientists and doctors (M. Golovinskaya, V. Ignatev, B. Horinevskiy at al) starteda scientific substantiation of the Soviet system of physical education, which determined the path of development. Thus, in 1927 People's EducationCommissariat approved the first necessary school tips of curriculum of physical education in schools of I and II degree. They have been allocated the following sections: goals, tasks, means and methods of physical education, orientated educational standards. Number of lessons was not less than 2–3 per week. Except the lesson forms, other forms of motor activity were recommended: gymnastics before lessons, mass games and sports, dances, excursions. The basis of these programs was a health- saving model ( hygienic) of physical education. Its main principles in the 1930s were politicization, militarization and labor orientation. In 1931 D. Dubnov and A. Ciphers released "Guidelines and programs for physical education in schools" [8], in which the first physical education at school was revealed as the system from the standpoint forms of physical education and from the standpoint of its contents (age differentiation, hygiene regulations, content of curricular and extra-curricular activity etc.).

An important factor, which has caused the content and structure of school curricula in physical culture since 1932, was the introduction of the "Ready to Work and Defense" USSR Sports Complex. At the beginning of 1934, a "Ready to Work and Defense" complex was developed for the schoolchildren, which became a part of the practice of physical education in schools, based on the decision of the Deputy People's Education Commissar RSFSR 26/5 – 1935 and the department on athletic work with children ASPCunder CCE USSR 15/6 – 1935 [9].

The aggravation of the military-political situation in Europe caused the need for merger process of physical and military training, respectively, since 1939 school physical education has become educational and militaryaimed. The mentioned direction of physical education was preserved until 1954. During this period a new program in secondary schools was introduced in which the emphasis was on sports education of students and mass sport. The purpose of these measures was to increase the prestige of Soviet sport in the international arena. Thus, in the program of 1954, the study of the subject "Physical Culture" in all classes was set aside 66 hours per year. The main tasks of school physical education are defined as educational one which was aimed at training skills and skills in the main types of sports. The lesson of physical culture is given priority as the main form of physical education of schoolchildren.

In the program of 1960 particular attention was paid to the integrated approach. It consisted of two parts: the first included a general one for all (invariant) educational material for the hygiene of physical exercises, gymnastics, athletics, ski training, mobile games, basketball; the second one is the material of in-depth studies from one section of the program chosen by the school. In 1970, the system of mass physical culture, which included, in particular, the system of school physical education, was improved. By decree of the Board of the Ministry of Education of the USSR and the Physical Culture Committee and Sports under the Council of Ministers of the USSR, the "Regulation of the physical education of schoolchildren of Secondary Schools" was approved [10], to which amendments and additionswere made during 1979–1981. As a result of the adoption of the aforementioned normative act in 1974 new improved program for 1–3, 4–8 and 9–10 grades were prepared and approved. Program for 4–8 and 9–10 grades (later amended in 1979) envisaged the study of sports such as basic gymnastics, track and field, ski training, sports wrestling, sports games in order to ensure the education of a communist personality and the training of hardened, disciplined and skillful defenders of the socialist Fatherland [11]. The peculiarity of this program was the fact that for the first time in each section of the program a specific material was proposed in the form of list of specially selected physical exercises.

Later, as the analysis of the normative base of the USSR showed, physical education was chosen not only as the means of physical training for future Soviet citizens, but also as the means of combating with negative manifestations in society: increasing the incidence level of population, deviance, drug addiction, drinking, etc., in particular among children and young people. So, on September 11, 1981, the Central Committee of the CPSU and the Council of Ministers of the USSR adopted Resolution No. 890 "On the further rise of physical culture and sport masses ". Based on the above-mentioned Resolution, the system of education began an active transformation of the school physical education and the search for optimal ways that has been continuing to this day. Thus, the following changes to program of 1983 were made: the content of the theoretical requirements was included, the traditional sections were supplemented with elements of football, skating, swimming. Modern and national dances are added to the elements of gymnastics for senior pupils. For the first time 2 sections were introduced: "Self-study skills and abilities", "Intersubject relationships"

The reform of the general education and vocational school of 1984, as well as the Resolution of the Council of Ministers of

the USSR "On Measures to Overcome Drunkenness and Alcoholism, Eradication of Moonshine" dated May 7, 1985, required the organization of day-to-day doing physical exercises for schoolchildren[12]. This approach became the base of the "Integrated Program of Physical Education for 1–11 grades of secondary school", which came into force on September 1, 1985. The program contained the following components: physical and recreational activities in the mode of curriculum and extra-curriculum; program material for physical education lessons; extra-curricular forms of physical education; general school physical and sports events. The structure of the program material included the basics of knowledge, skills, abilities, development of physical qualities, educational standards. Particular attention was paid to self-study of schoolchildren. The mentioned program for the first time reinforced the necessity of forming the habits of schoolchildren for daily motor activity; the notion of "differentiated approach" was introduced in the lessons of physical culture; the minimum (standard) knowledge was defined in the field of hygiene, medicine, physical culture and sports; the need for a special program was stipulated for pupils which were assigned to special medical groups [13]. Unfortunately, for 5 years general educational institutions have not had time to realize fully the indicated program. After the Soviet Union ceased to exist, most of the normative acts, in particular those which governed physical culture and sports, ceased to exist, in particular, the program and the complexes of the SDC became invalid. The Soviet system of physical education changed the system of physical education of general educational institutions, and the complexes of the GPO were replaced with State tests and standards of physical preparedness of the population of Ukraine.

Historical sources and the work of scholars show that after Ukraine took its independence, the socially-economic and political conditions of life in the country have radically been changed. Many normative acts of the USSR have become invalid. V. Dmitruk characterizing the transformation of the content of curricula in the process of historical development [11], noted that since 1992 there was implemented a program in learning process in which the main goal of school physical education was education and recreational ones. A year later (in 1993) Physical Culture Programs were integrated for Secondary Schools [14], which were built of four interrelated sections: sports and recreation events, which are conducted in the mode of the school day, physical education lessons, extracurricular forms of physical education lessons, general school physical culture and health and sports activities. Since 1998 in secondary schools of Ukraine another curriculum of physical education of students was introduced. Its feature was that the content of the program included only educational material for the lesson form, material for repetition, benchmarks and requirements, oriented comprehensive testing for assessing the physical preparedness of students [15], it meant that the program excluded the complexity of the approach to the programming of educational material.

Further, in the transition to a 12-point scale for assessing academic achievement of students, in 2001 a new curriculum for grades 1–11 was adopted, which was named "Fundamentals of Health and Physical Culture". Subsequently, in connection with the transition of general secondary education to a 12-year term, since 2005 the next program for the $5^{th}$–$12^{th}$ forms [16] and in 2006 for 1–4 grades has been approved. The content of the programs did not have a fundamental difference with the previous two programs, but among the tasks of physical education it has a declaration of the formation of physical culture of the individual [17].

Since 2009, the reform of physical education at school has begun, a prerequisite for which was a series of accidents at physical education lessons. The Government of the country has abolished the Provision on state tests of physical preparedness of Ukraine. As a result of these decisions, in 2009, a new school curriculum for physical education for 5–9 grades, in 2010 – 10–11 for grades and in 2012 – 1–4 grades was accepted and adopted. After the introduction of updated State Standard for Secondary Education in 2011 and new Typical educational planes, the programs have been improved and re-released.

The analysis of current curricula for secondary and high school shows that their characteristic feature is the construction of a modular system in which the invariant module (theoretical and methodological knowledge and general physical training) takes the leading place, and it is accompanied with several differentiated modules [18]. The content of the invariant component of the program includes athletics and gymnastics exercises, the set of which is a logical continuation of the contents of programs for grades 1–4. The concept of the curriculum for grades 1–4 is based on the possibility to integrally plan the lesson, namely, to use the lesson for solving the tasks of the lesson not only the main part but also the preparatory and final ones. At the same time, small tasks are integrated into more important and more global tasks (or motor activity), which have received in the program the name "Schools of Movement" which are united by types and physiological effects of exercise. In 1–4 grades, students learn the basic ways of motor activity ("school of culture movements with elements of gymnastics", "school of movements", "school of development of physical qualities", and others), and this period can indeed be considered to be a certain school of the original culture of execution of movements formation (running, jumping, throwing, walking, various limb movements, etc.) [19]. This approach allows you to use the material of the program in accordance with the age of the students and their individual abilities, to differentiate the load depending on the physical fitness of students, using exercises as a kind of "constructor" of the lesson content. All program content is invariant.

## Conclusions

1. The conducted analysis shows that during the process of development of the system of school physical education, physical education curricula have also changed.

2. These programs at different times were regulated as separate lessons of physical culture, as well as the system of physical education in general.

3. Almost from the very beginning of the introduction of unified educational programs, in the content of school physical culture the state began to solve general social tasks, mainly hygienic, aimed at the development of physical qualities and human body.

4. The dynamics of the content of physical education programs at the general educational school shows the growing differentiation and humanization of the system of physical education in modern Ukraine.

**The prospect of further research** is an analysis of the content of new state standards in the field of physical education of schoolchildren and the study of the peculiarities of the implementation of educational competences in the field of physical education in gaining general secondary education in Ukraine.

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# Improvement of living standards of patients with chronic obstructive pulmonary disease

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***Purpose:*** *to study the effectiveness of the proposed method of physical rehabilitation on the quality of life of patients with chronic obstructive pulmonary disease (COPD).*

***Material & Methods:*** *162 patients with COPD participated in the study. To determine the effectiveness of the physical rehabilitation, the approved Ukrainian version of the quality of life questionnaire of the World Health Organization. Result: patients of the main group noted a decrease in discomfort, dependence on medications, increased mobility, increased vitality, performance, ability to perform everyday tasks, reducing fatigue, improving sleep, thinking, and improving personal relationships.*

***Conclusion:*** *after applying the proposed program of physical rehabilitation for each patient with chronic obstructive pulmonary disease, we observed an increase in the overall quality of life and health in patients in the main group due to an increase in indicators in problem sub-spheres.*

**Keywords:** *patients, chronic obstructive pulmonary disease, physical rehabilitation, quality of life.*

## Introduction

The medico-social and economic terms, COPD (chronic obstructive pulmonary disease) is a major cause of morbidity and mortality throughout the world; people suffer from this disease for years and die prematurely from it or from its complications. Worldwide, accelerated growth of COPD is observed as a result of long-term exposure to risk factors and aging populations. Proportion of COPD, as one of the leading causes of death, is constantly increasing. COPD suffers from 8 to 22% of adults aged 40 years and over [1; 9; 10].

According to the WHO data, more than 50% of patients with COPD turn to specialists in the late stages of the disease. Meanwhile, it is the early onset of COPD treatment that prevents the progression of the disease and ensures the possibility of active lifestyles for many years. COPD has a significant negative impact on quality of life, including the imposition of restrictions on working capacity, normal physical activity, home occupations, social and family activities, as well as sleep regimes. In addition to these problems with everyday life, there is evidently a large amount of suffering associated with hospitalizations caused by exacerbations [9; 12].

Rehabilitation takes a leading place in the complex treatment of patients with COPD. Introduced in the daily treatment of patients, pulmonary rehabilitation can reduce manifestations of the disease, optimize the functional status of the patient and reduce the cost of treatment by stabilizing or reducing the systemic manifestations of the disease [1; 8; 14].

The quality of life is viewed as a health-related integral characteristic of the physical, psychological and social functioning of a healthy or sick person, based on its subjective perception. Control over the state of health in the process of treatment is impossible without determining the quality of life, as a criterion for the effectiveness of ongoing therapeutic and rehabilitation measures in modern medicine [4; 13]. We see it necessary to determine the quality of life of patients with COPD as a criterion for the effectiveness of the developed programs of physical rehabilitation.

**Relationship of research with scientific programs, plans, themes.** The research was carried out in accordance with the topic 4.4 "Improving the organizational and methodological foundations of programming the process of physical rehabilitation for dysfunctional disorders in different systems of the human body" of the Consolidated Plan of Research in the field of physical culture and sports for 2011–2015. Ministry of Education and Science, Youth and Sports of Ukraine (state registration number 0111U001737) and research topics of the Department of Human Health and Physical Rehabilitation of the National University of Water Management and Nature Management "Rehabilitation and Physical Culture and Recreational Aspects of Human Development" for 2014–2016. (Number of state registration 0114U001366).

**The purpose of the research:** to study the effectiveness of the proposed method of physical rehabilitation on the quality of life of patients with chronic obstructive pulmonary disease (COPD).

## Material and Methods of the research

The study was conducted on the basis of pulmonology department of the Rivne Regional Clinical Hospital. Accumulation of the results of the study was carried out as patients entered the inpatient treatment. Patients (COPD, II stage, moderate severity) were randomized to control (CG 2 consisted of female (n = 40) and male (n=44) sex) and primary (PG 2 – consisted of female (n=38) and the male (n=40) sex) group in accordance with the principles of bioethics. All patients were examined at the beginning and at the end of the study, were under the supervision of doctors. The formulation of the clinical diagnosis was carried out in accordance with the national recommendations of the Order of the Ministry of Health of Ukraine No. 128 of 19.03.2007. The stage of COPD and the degree of pulmonary insufficiency were determined in accordance with clinical changes in the patient, functional condition and spirographic data. To determine the effectiveness of the physical

rehabilitation, in accordance with international standards for assessing the quality of life of the population, we used the approved Ukrainian version of the quality of life questionnaire of the World Health Organization (WHOQL-100), designed to assess the quality of life of the adult population of Ukraine [7].

Patients in control groups underwent protocol treatment and rehabilitation according to the generally accepted method, and patients in the main groups were treatment according to the protocol and rehabilitation according to the proposed methodology, which included several steps: assessment of the patient's condition; patient training; measures for correction of body weight physical training programs; psychological support. For each patient, the COPD selected an individual program of physical rehabilitation taking into account specific physiological and psychopathological disorders caused by the main and/or accompanying disease [5; 6; 11].

## Results of the research and their discussion

Our rehabilitation programs for COPD patients were aimed at slowing the progression and alleviation of the symptoms of the disease in each individual patient, increasing exercise tolerance, prolonging the period of remission, reducing the number of days spent in a hospital bed and improving the quality of life of patients. An individual program of physical rehabilitation was formed taking into account the stage of the disease, severity, the presence or absence of complications, comorbid diseases.

To assess the quality of life of patients with COPD, the respiratory questionnaire of the St. George (SGRQ), proposed back in 1992 [12]. But, since it is not adapted to the Ukrainian realities, we used the Ukrainian version (according to the science of the editor of Dr. S. V. Phidenka) the quality of life questionnaire of the World Health Organization (WHOQL-100), designed to assess the quality of life of the adult population of Ukraine and recommended to determine the effectiveness of medical and social programs in Ukraine in accordance with international standards for assessing the quality of life of the population. This questionnaire meets all international requirements for such questionnaires, namely it is universal, since it covers all parameters of health. Quality of life is a subjective indicator that combines the components of a person's physical, mental, and social health. WHO recommends determining the quality of life as an individual relationship of one's position in the life of society with the capabilities of the individual. In other words, it is an objective indicator of subjective assess-

**Table 1**

**Quality of life of COPD patients in both male groups, $\bar{X}\pm m$**

| Spheres and sub-spheres of quality of life | Control group (n=44) | | Main group (n=40) | |
|---|---|---|---|---|
| | At the beginning | At the end | At the beginning | At the end |
| **G1. Sphere I. Physical sphere** | **6,51±0,11** | **6,57±0,12** | **6,77±0, 11** | **9,25±0,07*** |
| F1. Pain and discomfort | 4,73±0,13 | 5,02±0,14 | 4,80±0,14 | 7,30±0,13* |
| F2. Vital activity, energy and | 6,07±0,14 | 6,05±0,13 | 6,03±0,13 | 9,18±0,16* |
| F3. Dream and rest | 8,73±0,25 | 8,64±0,23 | 9,48±0,24 | 11,28±0,16* |
| **G2. Sphere II. Psychological sphere** | **9,25±0,11** | **9,30±0,09** | **9,34±0,12** | **9,91±0,09*** |
| F4. Positive feelings | 9,41±0,21 | 9,30±0,18 | 9,40±0,19 | 10,28±0,17* |
| F5. Thinking, learning, cognition | 13,25±0,20 | 13,16±0,21 | 13,65±0,23 | 14,03±0,18* |
| F6. Self-evaluation | 6,59±0,25 | 6,93±0,23 | 6,53±0,27 | 7,25±0,18* |
| F7. Body image and appearance | 8,75±0,16 | 8,77±0,12 | 8,78±0,20 | 9,13±0,16 |
| F8. Negative feelings | 8,25±0,16 | 8,36±0,13 | 8,35±0,20 | 8,88±0,15* |
| **G3. Sphere III. Level of independence** | **5,98±0,09** | **6,10±0,08** | **5,98±0,09** | **7,70±0,06*** |
| F9. Mobility, ability to move around | 7,55±0,19 | 7,48±0,16 | 7,58±0,18 | 8,40±0,14* |
| F10. Ability to perform everyday tasks | 5,84±0,17 | 6,16±0,18 | 5,68±0,15 | 8,75±0,13* |
| F11. Dependence on medications and treatment | 5,91±0,17 | 6,05±0,20 | 5,75±0,15 | 6,05±0,12 |
| F12. Efficiency (ability to work) | 4,64±0,16 | 4,70±0,16 | 4,90±0,16 | 7,60±0,11* |
| **G4. Sphere IV. Social relations** | **7,83±0,14** | **7,87±0,12** | **8,05±0,11** | **9,24±0,10*** |
| F13. Personal relationships | 6,64±0,26 | 6,59±0,25 | 6,80±0,22 | 8,13±0,15* |
| F14. Social support | 10,48±0,22 | 10,48±0,22 | 10,75±0,22 | 11,00±0,18 |
| F15. Sexual activity | 6,36±0,21 | 6,55±0,16 | 6,60±0,20 | 8,60±0,10* |
| **G5. Sphere V. Environment** | **7,93±0,08** | **7,94±0,08** | **7,98±0,08** | **8,46±0,07*** |
| F16. Physical security and security | 8,05±0,26 | 8,05±0,26 | 7,85±0,23 | 8,25±0,17 |
| F17. Home environment | 15,09±0,26 | 15,09±0,26 | 14,85±0,26 | 15,03±0,23 |
| F18. Financial resources | 6,91±0,30 | 6,80±0,29 | 7,03±0,28 | 7,35±0,22 |
| F19. Medical and social assistance | 6,07±0,22 | 6,07±0,22 | 5,88±0,22 | 6,13±0,19 |
| F20. The possibility of obtaining new information and skills | 5,34±0,18 | 5,34±0,18 | 5,50±0,16 | 6,80±0,12* |
| F21. Leisure / leisure facilities | 6,11±0,27 | 6,98±0,25 | 6,60±0,24 | 7,30±0,13* |
| F22. Surrounding physical environment | 10,30±0,21 | 10,30±0,21 | 9,80±0,24 | 10,03±0,20 |
| F23. Transport | 5,57±0,26 | 5,93±0,25 | 6,30±0,25 | 6,83±0,19* |
| **G6. Sphere VI. Spiritual sphere** | **10,64±0,35** | **10,64±0,35** | **11,18±0,33** | **11,58±0,29** |
| F24. Spirituality, religion, beliefs | 10,64±0,35 | 10,64±0,35 | 11,18±0,33 | 11,58±0,29 |
| **G. Overall quality of life and health** | **48,13±0,61** | **48,42±0,58** | **49,28±0,55** | **56,14±0,38*** |

***Remark.*** ** – significance of differences $p<0,05$ between the indicators at the beginning and at the end of the study in the group.*

**Table 2**

**Quality of life of COPD patients in both female groups, $\bar{X}$±m**

| Spheres and sub-spheres of quality of life | Control group (n =40) | | Main group (n =38) | |
|---|---|---|---|---|
| | At the beginning | At the end | At the beginning | At the end |
| **G1. Sphere I. Physical sphere** | **6,46±0,10** | **6,58±0,09** | **6,69±0, 09** | **9,82±0,07*** |
| F1. Pain and discomfort | **4,73**±0,13 | 4,90±0,13 | 4,92±0,13 | 7,42±0,13* |
| F2. Vital activity, energy and | 6,03±0,12 | 6,18±0,11 | 5,97±0,13 | 9,21±0,17* |
| F3. Dream and rest | 8,63±0,22 | 8,68±0,23 | 9,1±0,22 | 12,82±0,15* |
| **G2. Sphere II. Psychological sphere** | **9,03±0,90** | **9,04±0,08** | **9,24±0,11** | **10,53±0,09*** |
| F4. Positive feelings | 9,15±0,18 | 9,23±0,17 | 9,37±0,21 | 12,18±0,15* |
| F5. Thinking, learning, cognition | 13,10±0,19 | 13,23±0,19 | 13,26±0,21 | 14,18±0,17* |
| F6. Self-evaluation | 6,08±0,22 | 6,25±0,20 | 6,68±0,25 | 7,89±0,23* |
| F7. Body image and appearance | 8,85±0,15 | 8,70±0,14 | 8,71±0,17 | 9,16±0,16* |
| F8. Negative feelings | 7,98±0,14 | 7,80±0,13 | 8,16±0,18 | 9,24±0,19* |
| **G3. Sphere III. Level of independence** | **6,01±0,10** | **6,07±0,09** | **6,01±0,11** | **8,15±0,09*** |
| F9. Mobility, ability to move around | 7,63±0,20 | 7,48±0,18 | 7,63±0,19 | 9,24±0,15* |
| F10. Ability to perform everyday tasks | 5,63±0,17 | 5,60±0,15 | 5,55±0,16 | 8,95±0,18* |
| F11. Dependence on medications and treatment | 5,88±0,17 | 5,78±0,16 | 5,84±0,16 | 6,45±0,16* |
| F12. Efficiency (ability to work) | 4,90±0,15 | 5,43±0,10 | 5,03±0,17 | 7,97±0,12* |
| **G4. Sphere IV. Social relations** | **8,01±0,13** | **8,08±0,11** | **8,11±0,12** | **9,20±0,10*** |
| F13. Personal relationships | 6,78±0,23 | 6,63±0,23 | 7,05±0,22 | 8,03±0,16* |
| F14. Social support | 10,68±0,22 | 10,55±0,20 | 10,79±0,20 | 11,26±0,16* |
| F15. Sexual activity | 6,58±0,21 | 7,05±0,16 | 6,50±0,21 | 8,32±0,16* |
| **G5. Sphere V. Environment** | **7,92±0,08** | **7,94±0,07** | **7,99±0,08** | **8,52±0,08*** |
| F16. Physical security and security | 8,03±0,24 | 8,03±0,24 | 7,97±0,21 | 8,45±0,16* |
| F17. Home environment | 15,33±0,26 | 15,23±0,24 | 15,05±0,25 | 15,26±0,20* |
| F18. Financial resources | 6,73±0,29 | 6,60±0,26 | 6,92±0,31 | 7,66±0,24* |
| F19. Medical and social assistance | 5,93±0,22 | 6,03±0,21 | 6,05±0,21 | 6,16±0,19 |
| F20. The possibility of obtaining new information and skills | 5,60±0,17 | 5,65±0,15 | 5,50±0,18 | 6,29±0,18* |
| F21. Leisure / leisure facilities | 6,55±0,25 | 6,38±0,24 | 6,61±0,23 | 7,47±0,18* |
| F22. Surrounding physical environment | 9,60±0,21 | 9,58±0,21 | 9,68±0,25 | 10,13±0,19 |
| F23. Transport | 5,58±0,23 | 6,05±0,19* | 6,16±0,24 | 6,76±0,21* |
| **G6. Sphere VI. Spiritual sphere** | **10,35±0,27** | **10,35±0,27** | **11,34±0,29** | **11,74±0,21** |
| F24. Spirituality, religion, beliefs | 10,35±0,27 | 10,35±0,27 | 11,34±0,29 | 11,74±0,21 |
| **G. Overall quality of life and health** | **47,77±0,51** | **48,06±0,45** | **49,39±0,51** | **57,96±0,28*** |

***Remark.*** ** – significance of differences p<0,05 between the indicators at the beginning and at the end of the study in the group.*

ments, covering a wide range of criteria. The level of quality of life depends on the state of health, psychological status and level of independence, social status, environmental factors and personal perceptions of a person. To study the general quality of life and health of patients with COPD, we used the Ukrainian version of the methodology for assessing the quality of life, including 100 questions, 4 questions for each of the 24 sub-spheres, and 4 "global issues" for assessing the overall quality of life and health. The indicators of spheres were studied: physical, psychological, level of independence, social relations, environment and spiritual sphere [2; 3; 7].

With the help of the quality of life assessment method, we determined the initial level of quality of life at each patient and at the end of the study to follow the changes and assess the effectiveness of the measures performed (Tables 1, 2 and Figures 1 and 2).

At the beginning of the study, both male and female COPD patients in both groups had a low average baseline overall quality of life and health.

So, in CG 2, he was 48,13±0,.61 in men. In some spheres of study, the indicators were as follows: sphere I (physical sphere) 6,51±0,11, sphere II (psychological sphere) 9,25±0,11, sphere III (level of independence) 5,98±0,09 sphere IV (social relations) – 7,83±0,14, sphere V (environment) – 7,93±0,08, sphere VI (spiritual sphere) – 10,64±0,35.

The same low average baseline level of overall quality of life and health was in male patients with MG 2 – 49,28±0,55. In separate areas of study, they were: sphere I (physical sphere) – 6,77±0,11, sphere II (psychological sphere) – 9,34±0,12, sphere III (level of independence) – 5,98±0,09, sphere IV (social relations) – 8,05±0,11, sphere V (environment) – 7,98±0,08, sphere VI (spiritual sphere) – 11,18±0,33.

The same low average baseline level of overall quality of life and health status was noted in both female and female patients. In patients with CG 2, he was 47,77±0,51 points and 49,39±0,51 points in women with MG 2. The indices of individual fields of study in patients with CG 2 were as follows: sphere I (physical sphere) – 6,46±0,10, sphere II (psychological sphere) – 9,03±0,90, sphere III (level of independence) – 6,01±0,10, sphere IV (social relations) – 8,01±0,13, sphere V (environment) – 7,92±0,08, sphere VI (spiritual sphere) – 10,35±0,27.

For individual fields of study, the baseline level of the overall

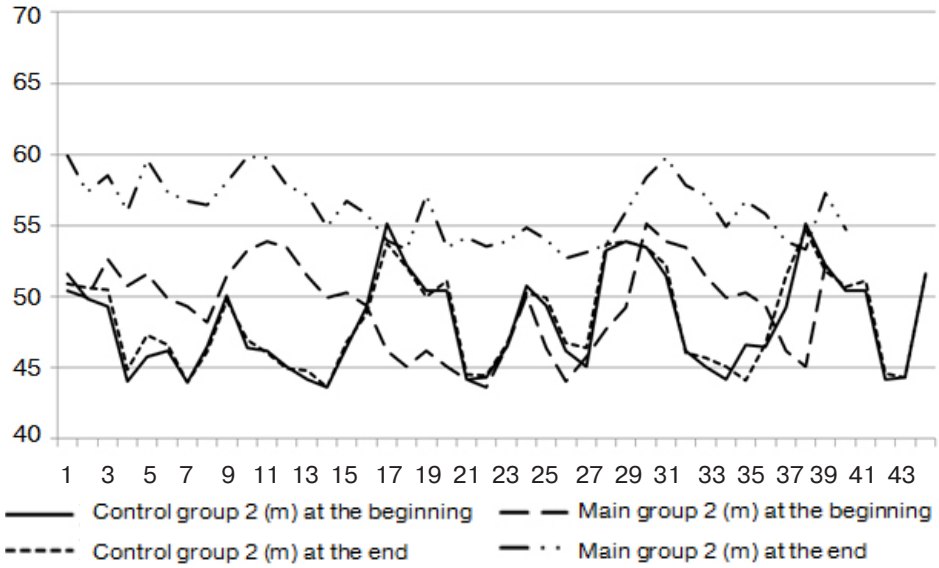


**Fig. 1. The overall quality of life and health of male COPD patients in the study**

quality of life and health of patients with MG 2 was: sphere I (physical sphere) – 6,69±0,09, sphere II (psychological sphere) – 9,24±0,11, sphere III (level of independence) – 6,01±0,11, sphere IV (social relations) – 8,11±0,12, sphere V (environment) – 7,99±0,08, sphere VI (spiritual sphere) – 11,34±0,29.

As we see, the decrease in the quality of life was due to the influence of the disease all the subspheres of the patient's life.

At the end of the study, in male patients, CG 2, the average level of overall quality of life and health status changed insignificantly – 48,42±0,58 points. In some areas of study, indicators were close to the initial, with a slight improvement: sphere I (physical sphere) – 6,57±0,12, sphere II (psychological sphere) – 9,30±0,09, sphere III (level of independence) – 6,10±0,08, sphere IV (social relations) – 7,87±0,12, sphere V (environment) – 7,94±0,08, sphere VI (spiritual sphere) – 10,64±0,35 points – at the same level.

At MG 2 males, at the end of the study, the average level of overall quality of life and health improved substantially and was 56,14±0,38 points ($p<0,05$). In some spheres of study, the indicators have become significantly higher than the original ones and made up: sphere I (physical sphere) – 9,25±0,07 ($p<0,05$), sphere II (psychological sphere) – 9,91±0,09 ($p<0,05$), sphere III (level of independence) – 7,70±0,06 ($p<0,05$), sphere IV (social relations) – 9,24±0,10 ($p<0,05$), sphere V (environment) – 8,46±0,07 ($p<0,05$), sphere VI (spiritual sphere) – 11,58±0,29 points. There was a significant increase in the overall quality of life and health in all areas and the sub-sphere of quality of life, except for spiritual, in patients in MG 2.

At the end of the study, in female patients in CG 2, the average level of overall quality of life and health improved somewhat and was 48,06±0,45 points. Separate indicators of spheres of study at them were: sphere I (physical sphere) – 6,58±0,09, sphere II (psychological sphere) – 9,04±0,08, sphere III (level of independence) – 6,07±0,09, sphere IV (social relations) – 8,08±0,11, sphere V (environment) – 7,94±0,07, sphere VI (spiritual sphere) – 10,35±0,27 points.

In some areas of study, the level of overall quality of life and health of female patients in MG 2 has grown significantly: sphere I (physical sphere) –9,82±0,07 ($p<0,05$), sphere II (psychological sphere) – 10,53±0,09 ($p<0,05$), sphere III (level of independence) – 8,15±0,09 ($p<0,05$), sphere IV (social relations) – 9,20±0,10 ($p<0,05$), sphere V (environment) – 8,52±0,08 ($p<0,05$), sphere VI (spiritual sphere) – 11,74±0,21 points – slightly. The average level of the overall quality of life and state of health rose to 57,96±0,28 ($p<0.05$) points. A significant increase in the overall quality of life and health of patients in MC occurred in all spheres and the subsphere of quality of life, except for the spiritual.

The overall quality of life of each COPD patient in both groups is shown in Figure 1 and 2.
From the above, it can be seen that at the beginning of the study, the level of overall quality of life in both male and female patients in both groups was approximately the same. Analyzing the results of the questionnaire of COPD patients to determine the general quality of life and health at the beginning of the study, we see, comparing them with the average data of a healthy population, in patients CG 2 and MG 2, the indicators of the physical sphere, the level of independence and social relations. Lowest indicators were obtained in the following sub-spheres: discomfort, ability to carry out everyday tasks, work capacity, dependence on medicines and medical treatment, medical and social assistance, recreation/leisure and transportation, requires an appropriate rehabilitation direction. Obtained data prove the necessity of using individualized physical rehabilitation taking into account the motor abilities, in combination with social and psychological rehabilitation of this category of patients.

After applying the proposed physical rehabilitation program for each COPD patient, we observed an increase in the overall quality of life and health in OG patients due to an increase in indicators in problem sub-spheres. Patients in MG noted a decrease in discomfort, dependence on medications, increased mobility, increased vitality, ability to work, ability to perform everyday tasks, reduce fatigue, improve sleep, thinking, and improve personal relationships. Slightly increased only the indicators of the spiritual sphere. In CG patients, no significant changes in the quality of life and health.

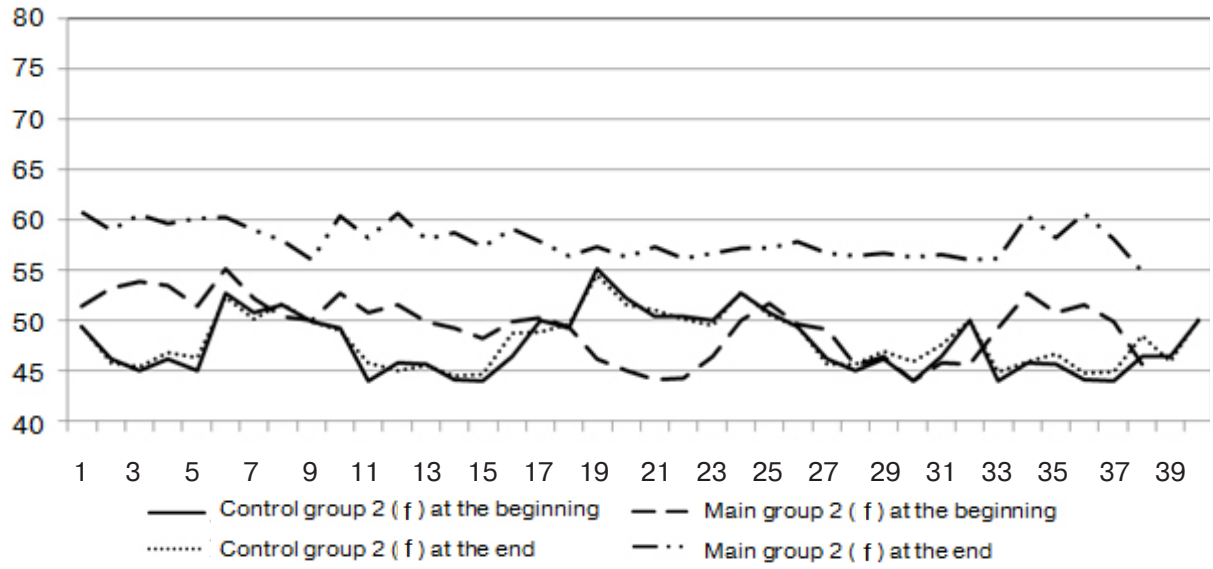


**Fig. 2. The overall quality of life and health of female COPD patients in the study**

## Conclusions

Physical rehabilitation occupies an important place in the complex treatment of patients with COPD. Thanks to the application of the proposed physical rehabilitation program for each COPD patient, it was possible to achieve a reliable increase in the overall quality of life and health in the patients of the main group due to the increase in the indicators in the problem sub-spheres. Physical rehabilitation should be recommended to COPD patients to help control symptoms, improve quality of life and increase physical activity.

**Prospects for further research.** Our research will focus on the effectiveness of physical rehabilitation of COPD patients.

**Conflict of interests**. The authors declare that no conflict of interest.
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# Dynamics of students' physical fitness during sectional crossfit and football sessions

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***Purpose:*** *to assess the influence of crossfit and football in the sectional work on physical education on the dynamics of physical fitness of students.*

***Material & Methods:*** *studies of the level of physical preparedness of students were carried out with the help of two tests before and after the introduction of experimental techniques in the survey groups. Two experimental (18 girls, 16 boys) and two control groups (22 girls and boys) from the 2nd year students of the Kherson State University.*

***Results:*** *the analysis of the physical readiness of the students of the University was carried out under the influence of the classes of crossfit and football in the framework of the sectional work on physical education on the dynamics of the indicators of the development of high-speed, strength and speed-strength qualities, the development of agility and flexibility.*

***Conclusion:*** *use of developed methodological approaches to the application of sectional forms of physical education contributed to significant changes in the indicators of physical preparedness.*

**Keywords:** *students, physical education, crossfit, football, physical readiness, sectional work.*

## Introduction

The process of physical education of student youth plays an important role in the formation of a harmoniously developed and competitive personality. As you know, increasing the level of health and the development of the necessary physical qualities are directly related to the motor activity of students, which, unfortunately, decreases both during school hours and during the studies at the university.

In the scientific literature (P. N. Oksyom, A. V. Shumakov, 2007, M. A. Nosko, A. A. Danilov, V. M. Maslov, 2011, A. A. Bilichenko, 2014), it is suggested that one of the most promising areas for optimizing the physical condition of students is the inclusion in the program of higher educational institutions for physical education section work from the most popular among modern youth physical education, in particular, various types of fitness, crossfit or football [2; 7; 8].

Common methods of physical training in many students are not encouraging, because they require a long and routine work. That's why you should pay attention to the means of section work, not only available, but also popular among young people, for example, pilates, cheerleading, football and fitness. One such means is a relatively new type of fitness that has evolved into a separate sport – crossfit, and is popular among young people [8; 9].

It has been experimentally proved (D. V. Bondarev, 2009, S. S. Galyuza, 2013) that the use of football facilities in physical education of students of a technical college with load parameters, taking into account the level of preparedness of students, contributed to a significantly more pronounced growth of physical and functional readiness than engage in the current program of "physical education". Also, under the influence of physical education with the use of football funds, there are changes in the structure of physical fitness of students, but, unfortunately, as an effective means of increasing physical fitness, health and constant interest in physical education, has not found its use in programs for physical education of university students [3; 4; 6].

According to N. A. Bazilevich, A. S. Tonkonog, 2016; A. S. Zinnatnurova, I. I. Panova, 2014, it is the crossover, as a new sport, that can become such a powerful stimulus to regular physical education and sports activities for student youth [1; 5]. He is able to improve the functional condition and physical fitness of youth and ultimately to strengthen health. It can be used as one of the methods of development of human power abilities [7].

However, there is still very little scientific research in this direction, and therefore this formulation of the problem necessitates a more detailed study and experimental verification of the influence of crossfit classes on optimizing the physical condition of university students [7]. Therefore, research on crossfit or football facilities and effective means of using them in the framework of the sectional work on physical education for the purposeful improvement of the physical fitness of students is an urgent task, the solution of which will contribute to enhancing student mobility and strengthening their health.

**Relationship of research with scientific programs, plans, themes.** The research was carried out in accordance with the plan of the scientific and complex theme of the Department of Theory and Methods of Physical Education of the Kherson State University "Theoretical and methodological foundations of physical culture and health work with various population groups" by the state registration number 0115U004401.

**The purpose of the research:** to assess the influence of crossfit and football in the sectional work on physical education on the dynamics of physical fitness of students.

## Material and Methods of the research

The study of the level of physical readiness (PR) of students

was conducted on the basis of KSU in the period from September 2015 to June 2016. In this study, II year students attended traditional forms of physical education ($CG_1$ – girls, $CG_2$ – boys, 22 people each) and students attending the section on female crossfit over ($EG_1$ – girls, 18 people) and the section with football ($EG_2$ – boys, 22 people) in the framework of physical education in high school. The level of PR was determined by methodological approaches L. P. Sergienko [10].

## Results of the research and their discussion

Main objective was to preserve the author's procedures and improving health, improving the physical condition of the students based on the use of means of female crossfit for girls and football facilities for boys.

Process of practical implementation of means of female crossfit in the group of girls and football means in the group of boys in the framework of the sectional work on physical education (PE) provides for unity of educational, health and educational tasks and observance of such obscuredactic principles as the principle of consciousness and activity, visibility, accessibility, individuality, systematic, gradual, the implementation of which contributes to the effectiveness of the PE process.

In our opinion, the use of experimental techniques in groups of girls and boys should positively influence the dynamics of their level of PR. For example, training women's crossfit to positively influence the development of power, speed and strength and endurance, and playing soccer with children will contribute to the development of stamina, speed and agility. Confirm or refute this hypothesis will allow the obtained results of the study of students' PR at the end of the experiment.

The average rates and growth rates of PR in student groups are presented in tables 1, 2.

A comparative analysis of the results shows that the EG girls for the period of the main experiment improved their index of running at 50 m from 8,39±0,06 s at the beginning to 8,21±0,06 s at the end (t=2,14, p≤0,05). The average index of running at 100 m in them at the beginning of the experiment was 17,06±0,07 s, while at the end – 16,91±0,08 s (t=1,48, p≥0,05). The girls of CG at the beginning of the main experiment ran at a speed of 8,46±0,06 s, while at the end of the experiment this indicator averaged 8,49±0,07 s (t=0,32, p≥0,05). Concerning the results of running on 100 m, on the contrary, there is even a slight improvement in the indices of girls CG with 16,98±0,07 s to 16,92±0,09 s (t=0,55, p≥0,05).

Comparative analysis of the results showed that over the period of the experiment, the run-off index by 50 m was improved in the children of the EG (t=3,36, p≤0,05) and CG, but the changes were not significant (t=0,40 at p≥0,05). The EG guys overcame the distance in 100 m by 3,53% faster (t=4,64, p≤0,001), the CG guys – 0,41% slower than at the beginning of the experiment (t=0,46 at p≥0,05) (Table 2).

From the data in Tables 1 and 2, it can be seen that the increase in the average running index per 1000 m (overall endurance) in the EG girls was 7,31% of the values of 5,43.2±0,08 min·s$^{-1}$ to 5,18.1±0,09 min·s$^{-1}$ (t=2,09, p≤0,05). The girls of the CG had some changes in this indicator in the direction of worsening of the results: at the beginning of the experiment, the run-on index for 1000 m averaged 5,42.2±0,08 min·s$^{-1}$, and at the end – 5,44.2±0,09 min·s$^{-1}$. In the groups of children we also observe relatively better indicators of the final data, but the children of EG have significant differences, while the children of CG do not have any significant differences. Thus, the average running index of 1000 m in male EG was 3,31.4±0,09 min·s$^{-1}$, 11,79% better than at the beginning of the experiment – 3,59.2 min·s$^{-1}$ (t=2.32, p≤0,05). The children of the CG had a running index of 1000 m improved by 1,69%: the output was on an average 3,58.0±0,11 min·s$^{-1}$, final data – 3,54.2±0,10 min·s$^{-1}$ (t=0,27, at p≥0,05) (Table 2).

In terms of dexterity development, EG students improved their results. Thus, the result of the shuttle run of 4x9 m at the beginning of the experiment in the girls of the EG was on the average 11,13±0,10 s, whereas at the end of the experiment this indicator was lower (i.e., the best performance of this test was observed) and amounted to – 10,84±0,11 s. Girls of this group overcame the test at 0,29 with faster. The boys of EG had output data at the level of 9,43±0,12 s, and the final data improved and amounted to an average 8,92±0,13 s (t=2,89, p≤0,05). Girls CG performed the test after the main experiment somewhat better, but the improvement in the result was only 0,36% than at the beginning of the experiment. The average parameters of the shuttle run of 4x9 m in the girls of this group were 11,18±0,09 s at the beginning of the experiment and 11,14±0,10 s at the end, but they did not differ reliably (t=0,31, p≥0,05) (Table 1). On the contrary, the boys of CG, at the end of the experiment, coped worse with the performance of this test. So, their output data were 9,51±0,12 s, and the final ones were 0,42% worse and averaged 9,55±0,14 s.

Both the EG and the CG students improved the result of the "zigzag run" test during the experiment: the girl EG – by 0,32 s (t=1,30, at p≥0,05), the guys EG – by 0,72 from; girls CG – 0,04 s, boys CG – 0,06 s, but the differences were not reliable, the level of development remained constant. In the children of EG, the zigzag run parameters at the end of the experiment were significantly different from the initial (t=2,54, p≤0,05) (Table 1, 2).

The data presented in Tables 1 and 2 show that in the development of strength endurance, which we studied after performing the tests "push-ups" in the group of girls, "pull-ups" in the group of young men and "lifting the trunk into the sad position 30 s" positive changes occurred in girls and boys EG, while in the representatives of CG, improvement in performance was observed only after the performance of the test "pull-ups" in a group of girls. Girls of EG performed the test "push-ups" by 4,84 times better (t=3,69, with p≤0.01). According to the intergroup evaluation tables, after the introduction of the methodology, the level of development of this quality in girls of the EG increased from below the average to the average and above the average. In female CG, changes that occurred over a given period of time were insignificant (t=0,17, at p≥0,05). At children EG the results of display of strength endurance that was diagnosed on pulling-ups have improved, but not on authentic differences(t=0,51–0,81, at p≥0,05).

The use of author's techniques with students positively contributed to the effectiveness of development of strength endurance muscles of the trunk. At the end of the experiment, the indices were in girls EG 24,82±0,28 times, which is 11,90% more than in the beginning – 22,18±0,42 times (t=5,28, p≤0,001). In the children of the EG, the mean value at the end of the experiment increased by a significant value

**Table 1**

**Dynamics of indicators of physical readiness of girls during the period of the basic pedagogical experiment**

| Indicators | Experimental group | | | | Control group | | | |
|---|---|---|---|---|---|---|---|---|
| | ID | KD | Reliability | | ID | KD | Reliability | |
| | Mx±Smx | | t | p | Mx±Smx | | t | p |
| Running on 50 m (s) | 8,39±0,06 | 8,21±0,06 | 2,14 | ≤0,05 | 8,46±0,06 | 8,49±0,07 | 0,32 | ≥0,05 |
| Running on 100 m (with) | 17,06±0,07 | 16,91±0,08 | 1,48 | ≥0,05 | 16,98±0,07 | 16,92±0,09 | 0,55 | ≥0,05 |
| Running on 1000 m (min $s^{-1}$) | 5,43.2±0,08 | 5,18.1±0,09 | 2,09 | ≤0,05 | 5,42.2±0,08 | 5,44.2±0,09 | 0,17 | ≥0,05 |
| Shuttle Run 4x9 m (s) | 11,13±0,10 | 10,84±0,11 | 1,36 | ≥0,05 | 11,18±0,09 | 11,14±0,10 | 0,31 | ≥0,05 |
| Running in a zigzag (s) | 22,34±0,18 | 22, 02±0,17 | 1,30 | ≥0,05 | 22,42±0,18 | 22, 38±0,18 | 0,24 | ≥0,05 |
| Push-ups / pull-ups, count | 14,40±1,01 | 19,24±0,84 | 3,69 | ≤0,01 | 14,64±0,92 | 14,84±0,80 | 0,17 | ≥0,05 |
| Raising the trunk from the sad position (times) | 22,18±0,42 | 24,82±0,28 | 5,28 | ≤0,001 | 22,86 ±0,50 | 22,34±0,46 | 0,78 | ≥0,05 |
| Standing long jump (cm) | 175,3±1,7 | 182,6±1,5 | 2,28 | ≤0,05 | 178,2±1,8 | 180,0±1,6 | 0,52 | ≥0,05 |
| Jump up from the place (cm) | 39,12±1,36 | 41,34±1,25 | 1,21 | ≥0,05 | 39,24±1,50 | 39,86 ±1,39 | 0,30 | ≥0,05 |
| Torso tilt forward (cm) | 13,53±0,68 | 14,17±0,49 | 0,77 | ≥0,05 | 13,62±0,72 | 13,54±0,55 | 0,09 | ≥0,05 |

***Remark.*** *ID – initial data, FD – final data.*

**Table 2**

**Dynamics of indicators of physical readiness of boys during the period of the basic pedagogical experiment**

| Indicators | Experimental group | | | | Control groupм | | | |
|---|---|---|---|---|---|---|---|---|
| | ID | KD | Reliability | | ID | KD | Reliability | |
| | Mx±Smx | | t | p | Mx±Smx | | t | p |
| Running on 50 m (s) | 7,34±0,06 | 7,03±0,07 | 3,36 | ≤0,01 | 7,42±0,08 | 7,38±0,07 | 0,40 | ≥0,05 |
| Running on 100 m (with) | 14,46±0,07 | 13,95±0,09 | 4,64 | ≤0,001 | 14,47±0,10 | 14,53±0,09 | 0,46 | ≥0,05 |
| Running on 1000 m (min $s^{-1}$) | 3,59.2±0,08 | 3,31.4±0,09 | 2,32 | ≤0,05 | 3,58.0±0,11 | 3,54.2±0,1 | 0,27 | ≥0,05 |
| Shuttle Run 4x9 m (s) | 9,43±0,12 | 8,92±0,13 | 2,89 | ≤0,05 | 9,51±0,12 | 9,55±0,14 | 0,22 | ≥0,05 |
| Running in a zigzag (s) | 20, 02±0,18 | 19,30±0,22 | 2,54 | ≤0,05 | 19,94±0,19 | 19,88±0,23 | 0,20 | ≥0,05 |
| Push-ups / pull-ups, count | 12,54±0,50 | 12,90±0,42 | 0,81 | ≥0,05 | 11,94±0,48 | 11,48±0,52 | 0,51 | ≥0,05 |
| Raising the trunk from the sad position (times) | 27,34±0,58 | 29,67±0,42 | 3,28 | ≤0,01 | 28,17±0,52 | 27,46±0,45 | 1,51 | ≥0,05 |
| Standing long jump (cm) | 232,1±2,4 | 239,3±2,2 | 2,16 | ≤0,05 | 229,3±2,5 | 230,3±2,6 | 0,29 | ≥0,05 |
| Jump up from the place (cm) | 49,20±1,69 | 53,85±1,56 | 2,07 | ≤0,05 | 48,65±1,49 | 49,39±1,58 | 0,34 | ≥0,05 |
| Torso tilt forward (cm) | 12,28±0,79 | 12,93±0,59 | 0,66 | ≥0,05 | 12,85±0,85 | 12,90±0,64 | 0,05 | ≥0,05 |

(t=3,28, p≤0,01) to 29,67±0,42 times. It should be noted that the students of the CG, both girls and boys, at the end of the experiment did not comply with this standard. Thus, in the girls of CG the indicator at the end of the experiment decreased to 22,34±0,46 times, while for men the CG decreased to 27,46±0,45 times (t=0,78–1,51) (Table 1, 2).

Based on the materials of the study, it was established that the introduction of experimental methods positively influenced the manifestation of the speed-strength qualities of the EG students and in most cases there were reliable differences between the output and final data. Thus, the average indicators in standing long jump in the girls was 175,36±1,76 cm at the beginning of the experiment, and at the end it was 4,16% better and made up 182,65±1,52 cm (t=2,28, at p≤0,05) (Table 1). We also observe significant differences between the indices at the beginning and at the end of the experiment when performing the standing long jump test and in the children of the EG: the indicator on average improved by a significant value (t=2,16 at p≤0,05). At CG students, we also observe an improvement in the length of the jump standing long jump during the experiment, but the differences turned out to be unreliable (t=0,29–0,52) (Table 2).

A comparative analysis of the results of the jump up showed that all students, both girls and boys, the final indices increased, but in the case of EG students this increase was more significant (t=0,30, at p≥0,05). The mean indices at the end of the experiment in the children of the EG differed significantly from the indices at the beginning of the experiment (t=2,07, with p≤0,05), whereas in the men of the CG the differences were unreliable (t=0,34, at p≥0,05).

When analyzing the results of the development of flexibility under the influence of experimental methods, there was some improvement in the indices of the CG students, but the growth proved to be unreliable (t=0,66–0,77, with p≥0,05). A slight decrease in the mean group index of the body torsion forward by 0,59 cm was observed in the CG girls, while in the case of boys in CG, the increase was 0,39%, but the differences were unreliable (t=0,05–0,09 at p≥0,05).

## Conclusions

The use of the developed methodical approaches to the use of female crossfit over resources in the group of girls and football means in the group of boys contributed to significant changes in the indicators of physical readiness, which indicates an increase in the effectiveness of the process of physical education of student youth.

**Prospects for further research** in this area are to study the effect of sectional physical education classes on optimizing the physical condition of students.

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# Model characteristics of anthropometric indicators of Juvenile category athletes in acrobatic rock'n'roll (preliminary preparatory stage)

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***Purpose:*** *to develop model characteristics of the anthropometric indicators of the Juvenile category in acrobatic rock'n'roll.*

***Material & Methods:*** *the following research methods were used: theoretical analysis and generalization of data from special scientific and methodological literature, methods of mathematical statistics. The study involved 20 sports couples (20 male partners and 20 female partners) of an acrobatic rock'n'roll category Juveniles aged 10–14 years.*

***Results:*** *obtained anthropometric indicators separately by male partners and female partners of sports pairs of acrobatic rock'n'roll. Based on the results obtained, model characteristics of anthropometric indicators of partners and partners of sports pairs of the Juvenile category of acrobatic rock'n'roll.*

***Conclusion:*** *it is established that the developed characteristics can be used to optimally select a male partner and female partner in pairs and also to improve the optimization of the training process in acrobatic rock'n'roll.*

**Keywords:** *anthropometric indicators of acrobatic rock'n'roll athletes, model characteristics.*

## Introduction

Acrobatic rock'n'roll is a pair sport, in which, when selecting a sports couple, you should take into account the weight-growth index of the male partner and female partner [2; 5; 6]. This is especially important at the initial stage of the formation of a sports couple. When preparing athletes for acrobatic rock'n'roll at the stage of preliminary basic training, it is important to find the optimal weight-growth index that will correspond, as much as possible, to the technique of conducting in pairs, to the sensation of the partners of simultaneous performance of basic and choreographic exercises in the competition composition of this category. In the future, with the increasing technical skill of the male partner and female partner in the performance of the basic dance technique and the transition to a different age category where acrobatic elements are used, the optimal selection of a sports couple and their weight-growth index play a big role in the indicator of the sport result [1; 3; 4].

Authors of N. P. Bateeva and V. A. Gradusov [1] indicate the criteria for performing acrobatic elements:

1. Musical performance of the acrobatic element (entry and exit from the element).
2. Tempo and amplitude of the acrobatic element.
3. Safety performance of the acrobatic element.
4. Technique for performing an acrobatic element.

On this basis, it is important to have an idea of the optimal difference in weight-growth rates between a male partner and female partner.

At the moment, we have not found any publications on the study of anthropometric indicators of the Juvenile category in acrobatic rock'n'roll. In this regard, one of the current problems in acrobatic rock'n'roll is the lack of model characteristics of the anthropometric indicators of the athletes of the category Juvenile of this sport.

**Relationship of research with scientific programs, plans, themes.** The work is carried out in accordance with the Consolidated Plan of research work in the field of physical culture and sports for 2016–2020. On the topic: "Psychosensory regulation of motor activity of sportsmen of situational sports" (State registration number 0116U008943)

**The purpose of the research:** to develop model characteristics of the anthropometric indicators of the Juvenile category in acrobatic rock'n'roll.

*Objectives of the study:*

1. To analyze the sources of special scientific and methodological literature on the research problem.

2. Determine the anthropometric performance of the Juvenile category in acrobatic rock'n'roll.

3. To develop model characteristics of the anthropometric indicators of the Juvenile category in acrobatic rock'n'roll.

## Material and Methods of the research

Research methods: theoretical analysis and generalization of data from special scientific and methodological literature, methods of mathematical statistics. The study involved 20 sports couples (20 male partners and 20 female partners) of an acrobatic rock'n'roll category Juvenile aged 10–14 years.

## Results of the research and their discussion

Analysis of the data of special scientific and methodological literature and generalization of practical experience made

it possible to establish that the selection of a sports couple (female partner, male partner) in acrobatic rock'n'roll at the stage of preliminary basic training is of great importance in their competitive activity [2; 5].

The analysis of the weight-growth index of the Juvenile category athletes from acrobatic rock'n'roll gives grounds to state about the importance of the optimal difference in weight-growth rates between the female partner and male partner (Table 1–3), which, in our opinion, can influence the technique of pairing, the feeling of partners during synchronous performance of basic and choreographic exercises in the competitive composition of this category, and also influence the technique of performing acrobatic elements in the transition of sports couples to the second age group.

Based on the obtained results of the study, model characteristics of anthropometric indices of the Juvenile category athletes in acrobatic rock'n'roll (Table 4).

**Table 1**

**Results of the anthropometric indicators of the Juvenile category in acrobatic rock'n'roll (male partners)**

| No. i/o | Full name male partner | Sports category | Age, years | Body lenght, cm | Body weight, kg | Weight-growth index, g·cm$^{-1}$ |
|---|---|---|---|---|---|---|
| 1. | Ya-y | II | 13 | 141,5 | 33,7 | 238,16 |
| 2. | N-ko | I | 12 | 142,5 | 34,5 | 242,1 |
| 3. | V-y | I | 12 | 154 | 35,8 | 232,47 |
| 4. | O-k | CMS | 14 | 170 | 63,7 | 374,7 |
| 5. | A-v | I | 11 | 145 | 32,4 | 223,45 |
| 6. | M-s | CMS | 14 | 147 | 36,4 | 247,6 |
| 7. | G-n | CMS | 13 | 167 | 51,9 | 310,8 |
| 8. | P-ko | CMS | 12 | 150,5 | 41,9 | 278,4 |
| 9. | C-v | | 12 | 173,5 | 68,4 | 394,24 |
| 10. | B-a | CMS | 14 | 152 | 42,2 | 277,63 |
| 11. | Yo-n | III | 12 | 137,5 | 31 | 225,45 |
| 12. | S-ko | II | 13 | 143 | 38 | 265,73 |
| 13. | Sh-v | CMS | 14 | 163,5 | 49 | 299,69 |
| 14. | M-ko | 1 | 13 | 162 | 50,3 | 310,49 |
| 15. | F-v | 1 | 12 | 143 | 38,6 | 269,9 |
| 16. | G-y | I | 14 | 162 | 53,4 | 329,63 |
| 17. | K-ko | CMS | 14 | 179,5 | 76,2 | 424,5 |
| 18. | G-v | I | 12 | 172,5 | 69 | 400 |
| 19. | Yu-n | III | 10 | 127,5 | 28 | 219,6 |
| 20. | G-v | CMS | 14 | 182 | 77,3 | 424,72 |
| | $\bar{X}$ | | **12,75** | **155,8** | **47,6** | **299,5** |
| | σ | | **±1,16** | **±15,2** | **±15,7** | **±69,6** |

**Table 2**

**Results of the anthropometric indicators of the Juvenile category in acrobatic rock'n'roll (female partners)**

| No. i/o | Full name female partner | Sports category | Age, years | Body lenght, cm | Body weight, kg | Weight-growth index, g·cm$^{-1}$ |
|---|---|---|---|---|---|---|
| 1. | K-ko | II | 11 | 146 | 28,6 | 194,56 |
| 2. | D-n | I | 11 | 149 | 35,8 | 240,27 |
| 3. | R-a | I | 13 | 146 | 40,3 | 276,03 |
| 4. | S-ko | CMS | 13 | 152 | 46,6 | 306,58 |
| 5. | D-ko | II | 10 | 137,5 | 32,2 | 234,18 |
| 6. | Sh-y | CMS | 13 | 146 | 39,8 | 272,6 |
| 7. | K-ko | CMS | 12 | 148,5 | 38,7 | 260,6 |
| 8. | M-ko | CMS | 12 | 145 | 33,8 | 233,1 |
| 9. | Y-ko | I | 13 | 162 | 52,8 | 325,92 |
| 10. | M-k | I | 13 | 153,5 | 48,9 | 318,56 |
| 11. | M-n | III | 11 | 132,5 | 30,7 | 231,7 |
| 12. | G-ka | II | 11 | 142,5 | 31,1 | 218,24 |
| 13. | S-ko | II | 11 | 145 | 33 | 227,58 |
| 14. | Kh-eт | I | 12 | 146,5 | 46,3 | 316,04 |
| 15. | S-r | I | 12 | 144 | 46,3 | 321,6 |
| 16. | Z-ka | III | 10 | 138,5 | 37 | 267,15 |
| 17. | V-va | III | 10 | 139 | 36,3 | 261 |
| 18. | Ch-ko | III | 10 | 137 | 26,5 | 193,4 |
| 19. | A-na | II | 10 | 131,5 | 33,3 | 253,23 |
| 20. | P-ko | I | 14 | 152 | 44 | 289,5 |
| | $\bar{X}$ | | **11,6** | **145,1** | **38,1** | **262,1** |
| | σ | | **±1,3** | **±8,1** | **±7,3** | **±41,2** |

**Table 3**

**Results of the anthropometric performance of the Juvenile category in acrobatic rock'n'roll**

| No. i/o | Full name of athlete | Sex | Sports category | Age, years | Body lenght, cm | Body weight, kg | Weight-growth index, g·cm$^{-1}$ |
|---|---|---|---|---|---|---|---|
| 1. | Ya-y | m | II | 13 | 141,5 | 33,7 | 238,16 |
| 2. | K-ko | f | II | 11 | 146 | 28,6 | 194,56 |
| 3. | N-ko | m | I | 12 | 142,5 | 34,5 | 242,1 |
| 4. | D-n | f | I | 11 | 149 | 35,8 | 240,27 |
| 5. | V-y | m | I | 12 | 154 | 35,8 | 232,47 |
| 6. | R-a | f | I | 13 | 146 | 40,3 | 276,03 |
| 7. | O-k | m | CMS | 14 | 170 | 63,7 | 374,7 |
| 8. | S-ko | f | CMS | 13 | 152 | 46,6 | 306,58 |
| 9. | A-v | m | I | 11 | 145 | 32,4 | 223,45 |
| 10. | D-ko | f | II | 10 | 137,5 | 32,2 | 234,18 |
| 11. | M-s | m | CMS | 14 | 147 | 36,4 | 247,6 |
| 12. | Sh-y | f | CMS | 13 | 146 | 39,8 | 272,6 |
| 13. | G-n | m | CMS | 13 | 167 | 51,9 | 310,8 |
| 14. | K-ko | f | CMS | 12 | 148,5 | 38,7 | 260,6 |
| 15. | P-ko | m | CMS | 12 | 150,5 | 41,9 | 278,4 |
| 16. | M-ko | f | CMS | 12 | 145 | 33,8 | 233,1 |
| 17. | S-v | m | I | 12 | 173,5 | 68,4 | 394,24 |
| 18. | U-ko | f | I | 13 | 162 | 52,8 | 325,92 |
| 19. | B-a | m | CMS | 14 | 152 | 42,2 | 277,63 |
| 20. | M-k | f | I | 13 | 153,5 | 48,9 | 318,56 |
| 21. | U-n | m | III | 12 | 137,5 | 31 | 225,45 |
| 22. | M-n | f | III | 11 | 132,5 | 30,7 | 231,7 |
| 23. | S-ko | m | II | 13 | 143 | 38 | 265,73 |
| 24. | G-ka | f | II | 11 | 142,5 | 31,1 | 218,24 |
| 25. | Sh-в | m | CMS | 14 | 163,5 | 49 | 299,69 |
| 26. | S-ko | f | II | 11 | 145 | 33 | 227,58 |
| 27. | M-ko | m | 1 | 13 | 162 | 50,3 | 310,49 |
| 28. | Ch-et | f | I | 12 | 146,5 | 37,7 | 257,33 |
| 29. | F-v | m | 1 | 12 | 143 | 38,6 | 269,9 |
| 30. | S-r | f | I | 12 | 144 | 34,8 | 241,66 |
| 31. | P-yo | m | I | 14 | 162 | 53,4 | 329,63 |
| 32. | Z-ka | f | III | 10 | 138,5 | 32 | 231,04 |
| 33. | K-ko | m | CMS | 14 | 179,5 | 76,2 | 424,5 |
| 34. | V-va | f | III | 10 | 139 | 33,5 | 241 |
| 35. | G-v | m | I | 12 | 172,5 | 69 | 400 |
| 36. | Ch-ko | f | III | 10 | 137 | 32,7 | 238,7 |
| 37. | Ju-n | m | III | 10 | 127,5 | 28 | 219,6 |
| 38. | A-na | f | II | 10 | 131,5 | 31,2 | 237,26 |
| 39. | G-v | m | CMS | 14 | 182 | 77,3 | 424,72 |
| 40. | P-ko | f | I | 14 | 152 | 46,6 | 306,6 |

**Table 4**

**Model characteristics of the anthropometric indicators of the Juvenile category in acrobatic rock'n'roll**

| No. i/o | Indicators | Male partner | Female partner |
|---|---|---|---|
| 1. | Age, years | 12,8±1,2 | 11,6±1,3 |
| 2. | Body length, see | 155,8±15,2 | 145,1±7,3 |
| 3. | Body weight, kg | 47,6±15,7 | 38,1±7,3 |
| 4. | Weight-growth index, g·cm$^{-1}$ | 299,5±69,6 | 262,1±41.2 |
| 5. | Difference in body weight, kg | 9,5±0,7 | |
| 6. | Length difference, cm | 10,7±2,0 | |
| 7. | Difference in height-growth index in a pair, g·cm$^{-1}$ | 37,4±21,8 | |

## Conclusions

1. As a result of the weight-growth study of the Juvenile category in acrobatic rock'n'roll, the pair selection model.

2. Developed model characteristics can be used for an optimal selection of a partner and partner in a pair, and also for optimization of the training process of athletes at the stage of preliminary basic training.

**Prospects for further research** will be directed to the development of model characteristics of special physical and technical preparedness of athletes of acrobatic rock'n'roll category, Juveniles aged 10–14 years.

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# Dynamics of cardiovascular parameters in combined aortic malformations under the influence of a physical therapy program during the rehabilitation process

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***Purpose:*** *to study hemodynamic parameters and the reaction of the cardiovascular system to the dosed physical load of patients combined aortic defect with heart failure of the I degree under the influence of the complex physical therapy program developed by us during the rehabilitation process.*
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***Material & Methods:*** *the study involved 26 middle-aged men with a diagnosis: combined aortic valve disease, HF I dg.*

***Results:*** *dynamics of functional parameters of the cardiovascular system of patients under the influence of the physical therapy program is analyzed.*

***Conclusion:*** *the combination of morning hygienic gymnastics, therapeutic gymnastics, independent activities and dosed walking with a therapeutic massage contributes to the normalization of vascular tone, motor-vascular reflexes and blood pressure, increasing the tolerance of the cardiovascular system to physical activity.*

**Keywords:** *physical therapy combined aortic malformation, functional parameters of the cardiovascular system.*

## Introduction

The first descriptions of the aortic valve defects date back to the 17th century. For a long time these diseases were considered rare and benign. However, studies conducted in recent years have shown that aortic valve pathology occurs in 30–35% of patients with heart valve defects, and the aortic valve ranks second in rheumatic fever after mitral valve. In developed countries, calcified aortic malformation is the third most common nosological form after arterial hypertension and ischemic heart disease [5; 11].

Isolated aortic stenosis is more common in men (2.4:1), whereas a combination of this defect with aortic valve deficiency or mitral valve defects is observed equally often in both men and women. The average age of patients at the time of death is 47,2 years. Aortic stenosis is poorly recognized when combined with aortic valve insufficiency or mitral malformation. All these data gave grounds to V. Kh. Vasilenko (1983) to assert that "stenosis of the aortic aorta is not so rare that it is rarely recognized". Stenosis of the aortic estuary can occur in isolated form, but most often it is combined with aortic valve insufficiency, expressed in varying degrees. In cases of poorly expressed deficiency of aortic valves, hemodynamic disorders will be determined mainly by the presence of stenosis [1; 5].

The life expectancy of patients, even with severe aortic insufficiency, is usually more than 5 years from the date of diagnosis, and in half of cases - even more than 10 years. The prognosis worsens with the addition of coronary insufficiency (angina attacks) and heart failure. Medication in these cases is usually ineffective. The life expectancy of patients after the onset of heart failure is about 2 years. Timely surgical treatment significantly improves life expectancy [18; 19].

Conservative methods of treatment are aimed primarily at the prevention of rheumatism and infective endocarditis (as possible etiological factors of aortic malformation), as well as to reduce the manifestations of cardiovascular insufficiency. It is generally accepted that the use of forms and means of physical therapy, along with medication to achieve these goals, enhances the therapeutic effect [12; 13].

Physical therapy, including restorative therapy in conditions of medical and preventive institutions, has an arsenal of means of active influence on the functional systems of the body, such as therapeutic physical culture, phytotherapy. Timely measures of adequate activation of patients with the help of metered training regimens that directly and indirectly affect the cardiovascular, respiratory and other systems contribute to increasing exercise tolerance and improve the overall functional state of the whole organism [4; 10; 13].

With combined aortic valve defects, a three-stage rehabilitation system is used: I – hospital; II – sanatorium (local rehabilitation center) III – polyclinic. At the polyclinic stage of rehabilitation of patients with aortic malformation, three motor regimens are applied: gentle, gentle-training and training regimens [15]. But the existing physical rehabilitation programs for combined aortic defects do not take into account the degree of heart failure, which necessitates the development of a new program of physical rehabilitation, taking into account the characteristics of the course of the underlying disease.

**Relationship of research with scientific programs, plans, themes.** The work was carried out in accordance with the priority of the thematic area 76.35. "Medico-biological substantiation of remediation and purpose of physical rehabilitation of young people of different levels of fitness". Number of state registration – 0116U004081.

**The purpose of the research:** to study hemodynamic parameters and the reaction of the cardiovascular system to the dosed physical load of patients combined aortic defect with heart failure of the I degree under the influence of the complex physical therapy program developed by us during the rehabilitation process.

## Material and Methods of the research

Studies were conducted on the basis of the city polyclinic No. 6 in the Moscow region. Kharkiv. Under our supervision, there were 26 middle-aged men diagnosed with a combined aortic valve defect, CH I dg., Which were arbitrarily divided into two groups: the main (13 patients) and the control (13 patients). The mean age of the patients of the main group was 41,2±0,24 years, the control age was 41,6±0,28 years. By the number of patients, age, the presence of concomitant pathology, the main and control groups were homogeneous. Patients of the main group were rehabilitated according to the author's program of physical therapy, the patients of the control group were engaged in a physical therapy program with S. M. Popov [14; 15].

*Methods of research:* analysis of scientific and scientific-methodical literature; medical and biological methods and medical and pedagogical observations; determination of the heart rate (HR), conduct and analysis of arterial tonometry, hemodynamic indicators and functional tests and tests; methods of mathematical statistics [1; 7].

Determination of the heart rate was carried out by palpation of the pulse on the radial artery at rest, at the beginning, in the middle and at the end of exercise therapy according to the generally accepted method. Arterial tonometry was performed using a membrane tonometer BP AGI-80 (manufacturer – Microlife, Switzerland, serial number 86517325). In order to more fully obtain information on the functional state of the cardiovascular system in patients on combined aortic defect, and also to determine the amount of physical activity in the preparation of an individualized physical rehabilitation program, we determined and analyzed the following haemodynamic parameters: systolic (SBP), diastolic (DBP) and pulse (PP) pressure, stroke volume (SV) and minute (MBV) blood volume, cardiac (CI) and shock (SI) indices, Skibinsky index. Determination and evaluation of the type of reaction of the cardiovascular system to the dosed physical load, we conducted according to the results of the Martine-Kushelevsky test – 20 sit-ups for 30 s. The results of the functional test were evaluated according to the following indices: the rate of pulse increase (%), changes in systolic and diastolic pressure, recovery time of heart rate and blood pressure after exercise. The indicator of the quality of the reaction (IQR) was determined, which was calculated by the formula of Kushelevsky and Ziskin [1; 2; 7; 17].

## Results of the research and their discussion

A primary study was conducted before the start of the course of physical therapy. The duration of the disease in the main and control groups was 3–5 years, patients complained of periodic headaches in the parieto-occipital region, dizziness with a rapid change in body position, aching pain in the heart, poor sleep, general weakness, rapid fatigue, dyspnea fast walking and ascent to the 2nd-3rd floor, confirming the presence of a combined aortic defect with a predominance of aortic valve insufficiency with the presence of a heart failure syndrome of the 1st century. in the examined patients of both groups. The main etiological factor in the development of combined aortic malformation in patients of both groups was atherosclerosis of the aorta in combination with hypertensive disease [18].

Hemodynamic parameters obtained during the initial study testify to the lack of economization of the cardiovascular system, confirm the presence of the concomitant aortic defect of hypertensive disease of I dg. [6; 8; 9; 16]. The prevalence of aortic valve insufficiency and a slight constriction of the aorta in the examined patients led to an increase in the pulse pressure in the main and control groups to 72,15±3,32 Mmhg and 74,62±2,91 Mmhg respectively, and heart rate acceleration in the main group to 89,85±1,61 beats $min^{-1}$, in the control – to 92,00±1,41 beats $min^{-1}$ ($p>0,05$).

Shock volume was recorded at the lower limit of the norm in the main and control groups 64,26±2,42 ml and 59,75±2,19 ml, respectively. MBV and SI in both groups were determined within the limits of normal values ($p>0,05$). The primary values of SI obtained were 33,93±1,48 ml $m^{-2}$ in MG and 30,68±1,26 ml $m^{-2}$ in CG indicating a predominance of the hypokinetic type of hemodynamics ($p>0,05$). Evaluation of the Skibinsky index in the initial study indicates a "satisfactory" state of the cardio-respiratory system in patients of the main and control groups: 1596,77±78,23 c. u. and 1553,08±56,39 c. u. respectively ($p>0,05$) [2; 17].

The primary study of the response of the cardiovascular system to physical activity was assessed by the results of a Martyn-Kushelevsky test [6]. In the initial study, we found a decrease in IQR in both groups, which indicates an unsatisfactory response of the cardiovascular system to the dosed physical load. In determining the type of response to physical load stress after Karpman in the main and control group, we found the prevalence of an urgent hypertensive reaction to physical activity. Persons with physiological adequate or physiological inadequate reaction types were not found in the primary study.

With the purpose of stimulation of auxiliary circulatory factors, tissue respiration, external breathing apparatus training, reduction of the degree of cardiovascular insufficiency in the main group of patients in the polyclinic stage of restorative treatment in a complex of rehabilitation measures, we applied therapeutic exercises and therapeutic massage. TE was held in the form of morning hygienic gymnastics, therapeutic gymnastics, self-study, dosed walking and walking on the stairs. The basis of the complexes of therapeutic gymnastics and self-study were general developing physical exercises for medium and large muscle groups of the limbs (predominantly lower – when performing physical exercises for the upper limbs, there is a greater increase in blood pressure compared to exercises for the muscles of the lower extremities) and the trunk; exercises in throwing and transferring balls and gymnastic objects in alternation with relaxation of muscle groups of hands and feet and breathing dynamic exercises performed in the preparatory position (p. p.) "standing" and "walking", at a calm pace, with a large amplitude of movements in the joints.

Patients began to engage in therapeutic physical culture according to the sparing program (1–2 weeks), then sparing-training (3–4 weeks) and training (4–6 weeks) regime. Criteria

for transferring patients from one regime to another were: improvement of the general condition, reduction of complaints, normalization of blood pressure, and increased tolerance of the cardiovascular system to dosed physical activity.
In order to adapt the cardiovascular system to physical activity and decrease the degree of heart failure in the main group of patients in a complex of rehabilitation measures at a sparing motor regime, occupations of TG in the exercise room alternated with training walking on the stairs 1–3 times in walking, and on sparing-training and training – with dosed training walking.

Training walking on the ladder for patients with sparing regimen was carried out at a rate of 1 step per 1 s to 3–4 floors 1–3 times a day (depending on the general condition of the patient). Walking at a gentle pace was applied at a rate of up to 60–80 steps per minute for a distance of 2–3 km 1 time per day. Dosed walking at a sparing-training regime was carried out once a day at a rate of 60–80–100 steps per minute for a distance of 3–4 km per day. On the training schedule, the dosed walking was carried out at a rate of 80–90–120 steps per minute for a distance of 4–5 km 1–2 times a day.

At the polyclinic stage for patients of the main group, we applied therapeutic massage by the method of V. M. Kozakova, V. M. Sokrut, A. S. Povazhnoy (2003) [3].

Patients of the control group were rehabilitated according to the physical rehabilitation program for patients with combined aortic defect and cardiac insufficiency of the 1st degree for S. M. Popov (2005, 2008) [14; 15].

After three months of using rehab programs, we found some changes in the re-examination. The study of functional parameters of the cardiovascular system indicated an improvement in the functional state (Table 1).

So, in the main group there was a decrease in the heart rate by 15,6%, in the control group – by 8,9%, which indicates an increase in the physiological reserves of the cardiovascular system. In both groups there was a decrease in blood pressure. However, in the MG, the SBP figures reached their normal values and amounted to 133,15±2,68 Mmhg ($p<0,05$), and in the control group – occurred hypertension: SBP – 144,69±1,83 Mmhg DBP decreased in both groups, but in CG reduction in DBP was not statistically significant. In the main group of patients, a statistically significant decrease in the pulse pressure up to 63,15±2,11 Mmhg The shock volume in the main group was within the normal range and amounted to 69,06±1,17 ml, which indicates the normalization of the contractile function of the myocardium in the control group SV decreased to 59,60±2,30 ml, which may indicate a reduced contractility myocardium and worsening of the functional state of the cardiovascular system.

We observed a decrease in MBV in the main group from 5852,00±161,00 to 5017,69±148,59 ml $min^{-1}$ due to a decrease in HR ($p<0,05$). In the CG, MBV also decreased from 5712,71±189,96 to 5247,23±203,55 ml $min^{-1}$ due to a decrease in heart rate and SV, but its changes were statistically insignificant. CI has decreased in the MG to 2,73±0,10 $l \cdot min^{-1} \cdot m^{-2}$ and in CG – to 2,75±0,15 $l \cdot min^{-1} \cdot m^{-2}$ by reducing the MBV, but was within the normal range. In patients in MG, there was an increase in SI to 31,19±1,52 ml $m^{-2}$, indicating the hemodynamic type approach to the most optimal, eukinetic ($p<0,05$). In the CG, SI changes were statistically insignificant.

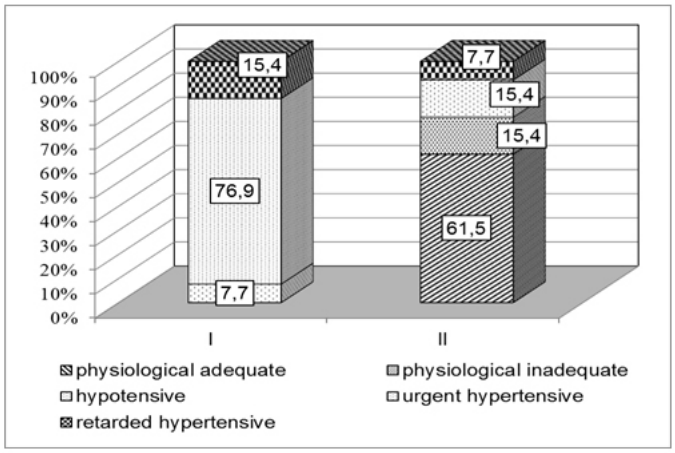
In determining the type of response to physical activity in the main group, we found 8 (61,5%) patients with a physiological adequate type, 2 (15,4%) with a physiological inadequate type, 2 (15,4%) with an urgent hypertensive type, 1 (7,7%) with a retarded hypertensive type of reaction.

In the control group, urgent hypertensive – 5 (38,5%) and

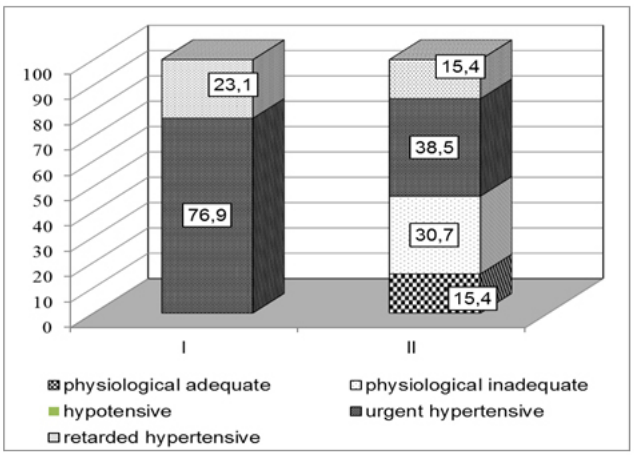
**Table 1**

**Dynamics of functional parameters of the cardio-respiratory system in patients of the main and control groups in primary and secondary studies (M±m)**

| Indicators | Norm | Periods of study | | t | p |
|---|---|---|---|---|---|
| | | Primary research | Secondary research | | |
| | | **Main group (n=13)** | | | |
| HR, beats·$min^{-1}$ | 60–84 | 89,85±1,61 | 75,85±1,27 | 6,83 | <0,001 |
| SBP, Mmhg. | 100–139 | 147,23±3,05 | 133,15±2,68 | 3,51 | <0,05 |
| DBP, Mmhg. | 60–89 | 75,08±1,95 | 70,00±1,47 | 2,08 | <0,05 |
| PP, Mmhg. | 40–60 | 72,15±3,32 | 63,15±2,11 | 2,29 | <0,05 |
| SV, ml | 60–120 | 64,26±2,42 | 69,06±1,17 | 1,78 | <0,05 |
| MBV, ml·$min^{-1}$ | 3000–7000 | 5852,00±161,00 | 5017,69±148,59 | 3,81 | <0,05 |
| CI, $l \cdot min^{-1} \cdot m^{-2}$ | 2,5–4,5 | 3,09±0,13 | 2,73±0,10 | 2,18 | <0,05 |
| SI, $ml \cdot m^{-2}$ | 40–50 | 33,93±1,48 | 37,48±0,70 | 2,17 | <0,05 |
| IS c. u. | ≥1100 | 1596,77±78,23 | 2816,39±116,40 | 8,70 | <0,001 |
| | | **Control group (n=13)** | | | |
| HR, beats·$min^{-1}$ | 60–84 | 92,00±1,41 | 83,85±1,78 | 3,59 | <0,05 |
| SBP, Mmhg. | 100–139 | 152,23±2,17 | 144,69±1,83 | 2,66 | <0,05 |
| DBP, Mmhg. | 60–89 | 77,62±2,10 | 76,69±1,57 | 0,35 | >0,05 |
| PP, Mmhg. | 40–60 | 74,62±2,91 | 68,00±2,86 | 1,62 | >0,05 |
| SV, ml | 60–120 | 59,75±2,19 | 59,60±2,30 | 0,05 | >0,05 |
| MBV, ml·$min^{-1}$ | 3000–7000 | 5712,71±189,96 | 5247,23±203,55 | 1,67 | >0,05 |
| CI, $l \cdot min^{-1} \cdot m^{-2}$ | 2,5–4,5 | 2,91±0,13 | 2,75±0,15 | 0,83 | <0,05 |
| SI, $ml \cdot m^{-2}$ | 40–50 | 30,68±1,26 | 31,19±1,52 | 0,26 | >0,05 |
| IS c. u. | ≥1100 | 1553,08±56,39 | 1972,31±57,93 | 5,19 | <0,05 |




Main group




Control group

**Fig. 1. Distribution of patients with MG and CG by types of reaction of the cardiovascular system to physical activity during primary (I) and secondary (II) research**

**Table 2**

**Indicators of quality response of patients in both groups in the primary and r and secondary research (M±m)**

| Indicators | Norm | Periods of study | | t | p |
|---|---|---|---|---|---|
| | | Primary research | Indicators | | |
| | | **Main group (n=13)** | | | |
| IQR, c. u. | 0,5–1,0 | 0,39±0,23 | 0,72±0,62 | 5,40 | <0,001 |
| | | **Control group (n=13)** | | | |
| IQR, c. u. | 0,5–1,0 | 0,41±0,31 | 0,54±0,45 | 2,49 | <0,05 |

physiological inadequate type of reaction prevailed – in 4 (30,7%) patients, the retarded hypertensive type and physiological adequate type was observed in 2 (15,4%) patients respectively (Figure 1).

In a second study, we found a statistically significant increase in IQR in both groups: in the main group 0,72±0,62, in the control group – 0,54±0,45 (Table 2).

When comparing repeated IQR in MG and CG, we found a statistically significant improvement in this index in the main group compared with the control group ($p<0,05$).

## Conclusions

The obtained data testify to the more effective influence of the author's program of physical therapy on the functional indices of the cardio-respiratory system and the tolerance of the cardiovascular system to the dosed physical activity, which causes a reduction in the severity of heart failure and an increase in the tolerance of the cardiovascular system to the measured physical load in combined aortic defects with syndrome heart failure degree I.

With combined aortic defects with heart failure syndrome I degree, the use of therapeutic physical training in the form of morning hygienic gymnastics, therapeutic gymnastics, self-study on the basis of general developmental exercises for medium and large muscle groups of limbs and trunk, performed at an average pace with a full amplitude, exercises with projectiles, throwing and transfer balls and gymnastic projectiles, corrective exercises for the spine, balance exercises and vestibular apparatus exercises performed in the preparatory position "standing" and "walking", in an average tempo, with a large amplitude of movements in the joints in combination with relaxation exercises and breathing exercises with an extended exhalation and varieties of walking around the gym. (walking with accelerations, attacks, squatting, on socks, heels) and jumps in place and in motion, as well as dosed walking and walking on the ladder with a load, gradually increased, in combination with a therapeutic massage by the method of V. M. Kazakov, V. M. Sokrut, A. S. Povazhnoy (2003).

**Prospect of further research** in this area is the study of the psychological state of patients with aortic malformations under the influence of the autogenic training program.

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# Application of the "Play and Stay" program in the training of tennis players up to 10 years

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***Purpose:*** *based on the analysis of literature sources and the experience of coaches, to determine the advantages of using the "Play and Stay" program in the training of young tennis players.*

***Material & Methods:*** *in the course of the study, the following methods were used: analysis and generalization of literary sources, generalization of the pedagogical experience of the trainers work.*

***Result:*** *processing accessible to us literary sources has allowed defining advantages and lacks of application of the program "Play and Stay" in preparation of tennis players up to 10 years.*

***Conclusion:*** *it is determined that the program "Play and Stay" is necessary for the training of tennis players up to 10 years, but when they go to standard balls there is a distortion of technical elements that requires a certain correction.*

**Keywords:** *tennis, tennis players under 10 years, the program "Play and Stay".*

## Introduction

The problem of manufacturing and selection of equipment constantly excited and worried about experts in the field of tennis. Since the advent of tennis, in 1887, until the mid-1970s tennis racquets were made of wood, the rebound coefficient of the ball from such rackets was only 0,35. Since the mid-1970s metal was used to make rackets, which contributed to a certain increase in the rebound coefficient. With the advent of composite materials based on graphite, which are used to manufacture racquets at the present time, the rebound coefficient of the ball increases to 0,7. The work of F. K. Agashin, L. S. Zaitseva, S. Groppel, A. Jones, B. Wood [3] is devoted to solving the problem of selecting rackets and balls for adult players. Features of selection of equipment for children studied G. P. Ivanova, A. F. Bocharov, L. A. Konovalova, T. S. Gryadkina [3].

In the early 90s of the last century, the world's manufacturers of tennis equipment have a line of children's racquets that have different lengths, weights, the area of the string surface, the thickness of the strings, the strength of their tension. Smallest racket has a length of 19 inches, which corresponds to 48,26 cm. The availability of such equipment made it possible to recruit children for tennis from the age of 4. Fast and heavy standard tennis balls do not allow young tennis players to effectively master the technique of the game at the initial stage [3]. They have a high and fast rebound, which causes certain difficulties in the game for young athletes. This discrepancy was eliminated by the International Tennis Federation (ITF) by adopting a program in 2008 "Tennis 10s", "Official program of the International tennis Federation, 2008". The motto of the program "Play and Stay" is play and develops. It assumes a step-by-step structure for developing a game of tennis for children under the age of ten. Aware of the need for such a program, it should be noted that as a result of its application in transition to training with standard equipment, athletes have technical problems [1].

**The purpose of the research:** based on the analysis of literature sources and the experience of coaches, to determine the advantages of using the "Play and Stay" program in the training of young tennis players.

## Material and Methods of the research

In the course of the research, the following methods were used: analysis and generalization of literary sources, generalization of the pedagogical experience of the work of trainers.

## Results of the research and their discussion

The program "Play and Stay" divides the preparation of children into three levels: red, orange and green. Yellow level – level of adult players. Each level of training corresponds to its own types of "slow" balls, the size of racquets and courts, special formats for the competition (shorter matches, simplified scoring system).

Red level corresponds to the initial stage of the game of tennis and is recommended in the age groups up to 8 years. Task of this level: to quickly teach the player to serve and play balls, play on the account. Players learn the skills of holding the ball in the game, introducing the ball into the game, solving simple tactical tasks. Rackets used at this level have a length of 48,26 cm to 58,42 cm. For the game use both foam rubber and felt balls. The balls used at this level have the largest diameter, compared to balls at other levels. Red balls are 75% slower than standard balls. Purpose of the red level is to learn the skills of simple movements and learn techniques related to solving tactical tasks that the player encounters at this level. The size of the court for the red level: length – 11–12 m, width – 5–6 m, height of the net 80 cm.

Second level of the program is orange. The optimal age for the transition to this level is eight years. For this level, rackets from 58,42 cm to 63,5 cm long are recommended. Court dimensions: length – 18 m, width – from 6,5 to 8,23 m, mesh height 80 cm. At the orange level, balls with standard diameter, but 50% slower, lighter in weight and having a lower re-

bound height. This level corresponds to the following system of competitions: matches, consisting of three tie-breaks, or sets up to four games. At this level of the program, players master the game from summer, learn to play along the entire length and width of the site, attack and defend themselves.

Third – the highest level of the program – green, recommended to players 9–10 years. At this level, players use racquets ranging in size from 63,5 cm to 66 cm and green balls. Green balls are 25% slower than standard balls, they have less weight, less bounce height from the court surface and less internal pressure, compared to standard balls. Court has standard sizes. Players at this level learn to control the entire area of the site, master the technical elements for solving tactical tasks when playing around the court. Competitions at this level are conducted on a system of one or three sets to 4 games. Players start participating in regional competitions.

By the age of 10 years, the player is ready to switch to a standard-size racket (67,5 cm) and standard yellow balls.

Using slow balls for each of the levels of the program allows children to meet the ball after bouncing off the court at points that correspond to their anthropometric data and generated motor skills. Playing these balls creates a lesser load on the locomotor apparatus of the child.

In Figure 1 shows the characteristics of the types of balls used in the ITF "Tennis 10s" program and standard yellow balls.

Program "Tennis 10s", its advantages in comparison with other programs, was dedicated to the 51st scientific and practical conference of the International Tennis Federation, where representatives of various countries and tennis schools offered to consider practical work of trainers for the use of slow balls in training children under 10 years [4–15]. Along with other issues discussed at the conference, the problem of matching balls used in the training of young tennis players, their growth (Table 1).

One of the reasons for using slow balls in tennis is the percentage ratio between the growth of a young athlete and an adult player of 19 years (Table 2) [11].

Quick and convenient development of the account in tennis and tennis rules for children under 10 is devoted to the performance of S. Procter [14].

Since 2010, the program "Tennis 10s" has been implemented in Ukraine. Tennis clubs in Ukraine use slow balls, shortened racquets, reduced court sizes for teaching children under

**Table 1**

**Conformity balls tennis player growth**

| No. i/o | Balls used in the program "Tennis 10s" | Athlete's height (cm) |
|---|---|---|
| 1 | Standard yellow balls with a pressure of 100% | 135–147 |
| 2 | Green balls with a pressure of 75% of the standard | 118–132 |
| 3 | Orange balls with a pressure of 50% of the standard | 110–115 |
| 4 | Red balls with a pressure of 25% of the standard | 85–105 |

**Table 2**

**Ratio of the growth of a young tennis player and an adult player of 19 years**

| No. i/o | Age | Height (cm) | % of the growth of an adult |
|---|---|---|---|
| 1 | 5 | 110 | 64,8 |
| 2 | 6 | 116 | 68,3 |
| 3 | 7 | 121,8 | 71,7 |
| 4 | 8 | 127,4 | 75 |
| 5 | 9 | 133 | 78,3 |
| 6 | 10 | 138,7 | 81,7 |
| 7 | 19 | 169,85 | 100 |

10 years old [2]. By the age of 10 young tennis players play green balls and rackets 66 cm long. Features of tactics and techniques of 10-year-old tennis players are considered in detail by W. Elderton [8]. He points out that during the game young tennis players exchange balls; the speed and height of the bounce from the court are at least 25% less than those of yellow balls. The area of contact of such a ball with the string surface of the racket is much larger than that of the yellow balls. This allows the young player to hit the ball not necessarily the center of the racket, allows you to accurately guide the balls without the necessary for the yellow balls of accompaniment. In addition, green balls allow you to move the racket more slowly.

According to the regulations of the Tennis Federation of Ukraine, competitions for athletes under 10 years old are held with green balls. After 10 years, when a young tennis player is allowed to participate in the official tournaments of the Tennis Federation of Ukraine, he starts playing with yellow balls [2]. A survey of 20 coaches in Kharkov made it possible to establish that with the transition to the game with yellow balls, an athlete should use racquets of standard size.

Change of balls and rackets leads to a change in the pace


**Fig. 1. Characteristics of the balls used in the ITF "Tennis 10s" program and standard balls [16]**

of the game of young athletes. Yellow balls bounce faster and higher from the surface of the court. They have a lower compression ratio, which leads to a reduction in the area of contact between the string surface of the racket and the ball. Standard racquets are longer than junior racquets, which increases the distance to the point of impact relative to the player's brush. These factors lead to a distortion of the technique of performing strikes on the ball by ten-year-old tennis players. There is a need for their correction. Correction extends to all the elements of tennis players' technique, such as a kick to the right with a rebound and from summer, a blow to the left with a rebound and from summer, serve and smash. There is a need to change the beat rhythm, accelerate the swing and the speed of carrying the racket to the ball, increasing the length of the ball with the racket. Athletes perform blows from a rebound in open racks. This leads to a change in the legs when the player approaches the ball. When striking from the summer, feeding and smesh need a greater concentration of the player's attention to the ball, an increase in the length of accompanying the ball with a racket, greater rigidity of fixing the handle of the racket with a brush at the moment of contact with the ball. Proceeding from the above, there is a need to correct the technique of ten-year tennis players in the transition to standard balls.

## Conclusions

1. Analysis and generalization of literary sources made it possible to establish that the application of the program "Play and Stay" makes it easier to train young athletes in technical and tactical methods of tennis.

2. Results of the research indicate that changing balls and standard racquets leads to a change in the pace of the game, the technique of carrying out strikes and feeds, the speed and rhythm of the tennis player's movements on the court, therefore, in order to successfully compete in competitions, it is necessary to correct all technical elements, taking into account the changed conditions.

**Prospects for further research.** It is proposed to search for the most rational ways of correcting the technique of 10 years tennis players with the transition to the game with standard balls and rackets.

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SLOBOZHANSKYI HERALD OF SCIENCE AND SPORT

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# Investigation of the cardiovascular system of schoolchildren aged 13–14 years

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***Purpose:*** *to determine the level of functioning of the cardiovascular system of schoolchildren of the 8th-9th grades.*

***Material & Methods:*** *59 schoolchildren of 8–9 grades took part in the study. Such methods of research as theoretical analysis and generalization of scientific and methodological literature, methods of studying the functional state of the cardiovascular system and methods of mathematical statistics were applied.*

***Results:*** *a comparison of the parameters of the cardiovascular system in the sexual, age aspects and with the corresponding scoring scale is presented.*

***Conclusion:*** *in the sexual aspect, it was found that the indicators of the functioning of the cardiovascular system in schoolchildren of the 8th grade are higher in girls, and in schoolchildren of the 9th grade in young men; with age, in men, there are somewhat larger values of indicators, in girls, on the contrary, less; comparison with the scoring scale showed that the results of schoolchildren of 8–9 grades correspond to the "average" level.*

**Keywords:** *cardiovascular system, schoolchildren, heart rate, systolic blood pressure, diastolic pressure, Ruffie's test.*

## Introduction

Reducing the health of children in our country has recently become sustainable. According to the results of the research, there is a steady tendency in the general educational institutions of Ukraine to increase the number of schoolchildren who have deviations in the state of health. It is established that for the period of schooling the number of students who belong to a special medical group increases from 7,2% in the classroom to 17% in the eleventh. A significant part of schoolchildren suffer from various diseases of the cardiovascular system [7].

Motor activity, systematic exercise with physical exercise is an effective and powerful means of mobilizing reserve capacity of the body. Therefore, physical education at school age is especially important. In the course of physical activity exercises, the necessary motor skills and abilities are formed, physical qualities develop, the level of physical development and health improves [3; 9; 10].

Ya. M. Kots [2], A. S. Solodkov, E. B. Sologub [9], V. Lastochkin, A. Rovny [5] note that the cardiovascular system provides a given level of functioning of the body, reflects the energy aspect of performing any activity and can serve as an objective characteristic of the intensity of mental and physical labor, a universal indicator of the adaptive activity of the organism generally.

The carried out analysis of literary sources shows the interest of leading experts in the field of physiology, physical training and sports with the problem of determining and evaluating the cardiovascular parameters of children of secondary school age [1; 4; 6; 11; 12].

Thus, the problem is timely and relevant, since indicators of the level of functioning of the cardiovascular system of middle school students make it possible to adjust the content of physical education lessons.

**Relationship of research with scientific programs, plans, themes.** The study was conducted in accordance with the thematic plan of the Kharkov State Academy of Physical Culture on the scientific theme "Improving the process of physical education in educational institutions of various profiles" for 2016-2020. (№ of state registration 0115U006754).

**The purpose of the research:** to determine the level of functioning of the cardiovascular system of schoolchildren of the 8th–9th grades.

## Material and Methods of the research

59 students of 8–9 grades took part in the study. Such methods of research as theoretical analysis and generalization of scientific and methodological literature, methods of studying the functional state of the cardiovascular system and methods of mathematical statistics were applied. To determine the level of functioning of the cardiovascular system of schoolchildren of the middle classes, the heart rate (HR), blood pressure was measured, and Ruffie's test was performed.

## Results of the research and their discussion

A comparison of the cardiovascular indices of 13–14 year olds in the sexual aspect is presented in Table 1.

The analysis of the heart rate by sex showed that the results for the boys of the 8th class are less than those of the girls. The schoolchildren of the 9th grade have the following tendency: the guys have more results than the girls. It should be noted that the differences are unreliable ($p>0,05$).

When comparing the parameters of systolic and diastolic pressure in the sexual aspect, it is found that the results of young men are greater than those of girls. The exception is the systolic pressure of the girls of the 8th grade, in which the data is somewhat larger than that of men. It should be noted that the differences are unreliable ($p>0,05$).

**Table 1**

**Parameters of the cardiovascular system of schoolchildren aged 13–14 in the sexual aspect**

| Indicators | | Boys n | Boys $\bar{X}_1 \pm m_1$ | Girls n | Girls $\bar{X}_2 \pm m_2$ | $t_{1,2}$ | p |
|---|---|---|---|---|---|---|---|
| ***13 years*** | | | | | | | |
| HR, beats·min$^{-1}$ | | 19 | 64,6±72,20 | 11 | 66,36±2,00 | 0,57 | >0,05 |
| BP systolic, Mmhg | | 19 | 122,67±1,68 | 11 | 124,73±1,52 | 0,90 | >0,05 |
| BP diastolic, Mmhg | | 19 | 83,00±0,88 | 11 | 81,64±0,87 | 1,10 | >0,05 |
| | $R_1$ | 19 | 12,22±0,62 | 11 | 12,45±0,58 | 0,27 | >0,05 |
| Ruffie's test | $R_2$ | 19 | 23,00±1,19 | 11 | 24,18±0,77 | 0,87 | >0,05 |
| | $R_3$ | 19 | 15,44±0,71 | 11 | 15,64±0,56 | 0,21 | >0,05 |
| ***14 years*** | | | | | | | |
| HR, beats·min$^{-1}$ | | 12 | 68,67±2,44 | 17 | 64,22±2,40 | 1,30 | >0,05 |
| BP systolic, Mmhg | | 12 | 122,11±1,54 | 17 | 120,22±0,81 | 1,08 | >0,05 |
| BP diastolic, Mmhg | | 12 | 82,33±1,09 | 17 | 81,44±0,90 | 0,63 | >0,05 |
| | $R_1$ | 12 | 13,78±0,46 | 17 | 12,89±0,54 | 1,25 | >0,05 |
| Ruffie's test | $R_2$ | 12 | 23,44±0,80 | 17 | 25,11±0,87 | 1,41 | >0,05 |
| | $R_3$ | 12 | 15,78±0,55 | 17 | 15,67±0,69 | 0,13 | >0,05 |

***Remark.*** *Here and in the future * $P_1$ – HR for 10 s at rest, $P_2$ – HR for the first 10 seconds immediately after the load, $P_3$ – HR for the last 10 seconds from the first minute of recovery.*

Considering the results of Ruthie's test for sex, it should be noted that girls 13 years of age have slightly higher rates than boys of this age. At schoolboys of 14 years indicators are higher at young men, except for the given pulse for the first 15 with right after loading where results are higher at girls. However, the reliability of differences between the indices is not observed (p>0,05).

A comparison of the cardiovascular indices of 13–14 year olds in the age aspect is presented in Table 2.

When comparing the HR indices of schoolchildren of 8–9 grades in the age aspect, it was revealed that the results of the 8th grade boys are less than those of the ninth-graders. In girls, the opposite trend is noted: in schoolgirls of the 8th grade, the data is higher than in the pupils of the 9th grade. However, the differences are unreliable (p>0,05).

An analysis of systolic and diastolic pressure with respect to age has shown that the data of schoolchildren of the 8th grade is greater than the results of 9th grade students. However, these differences are false (p>0,05).

An analysis of Ruffier's test in the age aspect showed that the results of students of the 9th grade are somewhat larger than those of the 8th grade pupils, but these differences are unreliable (p>0,05).

Comparison of the HR results of schoolchildren of 8–9 grades with the norms presented by T. Yu. Krutsevich [3], revealed that the indicators of boys and girls meet "below average".

A comparison of the results of blood pressure in schoolchildren of the 8–9 grades with the norms presented by T. Yu. Krutsevich [3] revealed that both men and women perform "above average".

Comparing the indices of Ruffie's test of pupils of 13–14 years with the norms presented by S. D. Polyakov [8], it should be noted that the data of boys and girls meet the "high" level of cardiovascular fitness.

**Table 2**

**Parameters of the cardiovascular system of schoolchildren aged 13–14 in the age aspect**

| Indicators | | 13 years n | 13 years $\bar{X}_1 \pm m_1$ | 14 years n | 14 years $\bar{X}_2 \pm m_2$ | $t_{1,2}$ | p |
|---|---|---|---|---|---|---|---|
| ***Boys*** | | | | | | | |
| HR, beats·min$^{-1}$ | | 19 | 64,67±2,20 | 12 | 68,67±2,44 | 1,22 | >0,05 |
| BP systolic, Mmhg | | 19 | 122,67±1,68 | 12 | 122,11±1,54 | 0,24 | >0,05 |
| BP diastolic, Mmhg | | 19 | 83,00±0,88 | 12 | 82,33±1,09 | 0,47 | >0,05 |
| | $R_1$ | 19 | 12,22±0,62 | 12 | 13,78±0,46 | 2,01 | >0,05 |
| Ruffie's test | $R_2$ | 19 | 23,00±1,19 | 12 | 23,44±0,80 | 0,32 | >0,05 |
| | $R_3$ | 19 | 15,44±0,71 | 12 | 15,7±80,55 | 0,37 | >0,05 |
| ***Girls*** | | | | | | | |
| HR, beats·min$^{-1}$ | | 11 | 66,36±2,00 | 17 | 64,22±2,40 | 0,69 | >0,05 |
| BP systolic, Mmhg | | 11 | 124,73±1,52 | 17 | 120,22±0,81 | 2,61 | <0,05 |
| BP diastolic, Mmhg | | 11 | 81,64±0,87 | 17 | 81,44±0,90 | 0,15 | >0,05 |
| | $R_1$ | 11 | 12,45±0,58 | 17 | 12,89±0,54 | 0,55 | >0,05 |
| Ruffie's test | $R_2$ | 11 | 24,18±0,77 | 17 | 25,11±0,87 | 0,80 | >0,05 |
| | $R_3$ | 11 | 15,64±0,56 | 17 | 15,67±0,69 | 0,03 | >0,05 |

## Conclusions

1. Considering the parameters of the cardiovascular system of schoolchildren of middle classes in the sexual aspect, it should be noted that in grade 8 students, the results are mostly higher for girls and for students of the 9th grade – for boys. The reliability of the differences between the indicators is generally not observed (p>0,05).

2. An analysis of the cardiovascular outcomes of 13–14 year olds in the age-related aspect revealed that in young men the indicators improve with age, while the girls on the contrary deteriorate. At the same time, the reliability of the differences is practically absent (p>0,05).

3. Comparison of the obtained indices of schoolchildren of 8–9 grades with the corresponding norms showed that the results of the cardiovascular system correspond to the "average" level.

4. The results of the study on the level of functioning of the cardiovascular system of middle school students indicate the need to adjust the content of physical education lessons.

**Prospects for further research** are to select the means of physical training to improve the functioning of the cardiovascular system of middle school students**.**

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# Changes in the physical readiness of female handball players 9–10 years due to participation in an increased number of competitions during the year

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***Purpose:*** *determine the impact of competitive activity on the indicators of physical readiness of female handball players 9–10 years.*

***Material & Methods:*** *in the study, 20 female athletes from the primary training group of the Youth Sports School took part in the age of 9–10 years. In the course of the study, the following methods and techniques were used: analysis of scientific and methodological literature; pedagogical testing, which included 8 physical tests; methods of statistical information processing.*

***Results:*** *found that at the beginning of the training year, most of the young female handball players who participated in the study successfully passed physical tests according to the normative requirements of the Youth Sports School. Training sessions, built according to the curriculum of the Youth Sports School for handball for initial training groups of 1 year of training and supplemented by a large amount of participation in competitions, lead to the improvement of most of the indicators of physical fitness of young female athletes.*

***Conclusion:*** *uneven changes in the results of testing the physical readiness of female handball players 9–10 years during the training year. Confirmed the presence of correlation links between individual indicators of physical fitness of young female athletes. The received results testify to a more significant increase in the results in physical tests of young female athletes, who took part in competitions more often.*

**Keywords:** *young female handball players, physical preparedness, changes in preparedness, correlation interdependence, initial training groups, physical fitness control.*

## Introduction

Controlling the state of physical preparedness is a necessary part of the planning process of sports training. It is on the basis of the control results that it is possible to make timely adjustments to the training process, increasing or decreasing the burden for athletes, changing the content of exercises used in training sessions, applying new methods and methods of training [8; 10]. Therefore, monitoring the state of preparedness of athletes at different stages of a multi-year training is an urgent issue requiring updating and corresponding correction of existing information.

The nature of the game activity of handball players requires athletes to perform complex technical and tactical actions, the effective use of which is possible only at a certain level of physical preparedness [1; 2]. The interrelation of the physical preparedness of the technical was considered by the authors quite often, according to the results of the research it can be assumed that it is the physical readiness that is the basis for the formation and improvement of the technical and tactical actions of the athletes [2; 7; 9; 11].

Formation of high qualification of athletes begins with childhood, therefore, in our opinion, it is necessary to pay more attention to the study of aspects of physical fitness in children as a future basis for improving technical and tactical skills.

Competitive activity requires a high level of physical qualities of athletes, which are manifested during gaming activities. However, participation in competitions at the initial training stage should be considered not as a result of the training process, but as a means of training influence and monitoring the state of preparedness of young players. Therefore, the study of the influence of competitive activity on the level of development of physical qualities is of practical and scientific interest.

**Relationship of research with scientific programs, plans, themes.** The research was carried out in accordance with the theme of the research plan of the Kharkov State Academy of Physical Culture "Psycho-sensory regulation of the motor activity of sportsmen of situational sports" (2016–2018).

**The purpose of the research:** determine the impact of competitive activity on the indicators of physical readiness of female handball players 9–10 years.

*Objectives of the study:*

1. Analyze scientific and methodological sources on the specifics of sports training handball players at the stage of initial training.

2. Determine the indicators of physical fitness athletes 9-10 years at the beginning and at the end of the training year.

3. To establish the relationship between the results of control

exercises, which assess the physical preparedness of young female handball players.

4. Determine the effect of competitive pressures on the state of physical preparedness of female handball players 9-10 years.

## Material and Methods of the research

The study involved 20 female athletes from the initial training group aged 9–10 years.

In the course of the study we used the following methods and techniques: analysis of scientific and methodological literature; pedagogical testing – standing long jump (cm), jumping over the rope during 1 minute (number of times), run on 30 m (s), throwing a tennis ball at a distance (m), dribbling 30 m (s), push-ups for 1 minute (number of times), shuttle run 4x9 m (s) and lifting the trunk into the saddle from the supine position for 30 s (number of times); methods of statistical processing of information – the search for averages, the calculation of the reliability of changes in the indicators that were studied by the Student's t-test, the correlation analysis of data.

Testing of physical preparedness of young female athletes was held twice – at the beginning and at the end of the training year. Based on the results of the initial testing, the group of female handball players was divided into control (n=10) and experimental (n=10) taking into account the lack of reliability of differences in the physical fitness of the athletes. Both groups of young athletes were trained in the same training program, which met the requirements of the Youth Sports School. However, the young athletes of the experimental group often took part in competitions of various levels. According to the normative requirements of the Youth Sports School in handball, in the first year of training 16 hours of participation in competitions are planned, in which the athletes of the control group took part. Female athletes of the same experimental group for the academic year 23 hours participated in various competitions. At the end of the training year, physical tests and a certain character of changes in physical fitness indicators of young handball players.

## Results of the research and their discussion

The results of our pedagogical tests show that the majority of girls who participated in the study successfully passed the normative requirements of the Youth Sports School for admission to the initial training groups at the beginning of the training year [4]. Thus, the average result of the group in standing long jump was 148,7±4,48 cm, in run on 30 m – 5,91±0,10 s, in shuttle run 4x9 m – 24,35±0,50 s. In the given time, young female athletes performed on average 76,75±3,54 jumping over the rope and 18,8±1,86 full cycles push-ups. The average distance in throwing a tennis ball at a range was 17,05±1,12 m, the lead time of dribbling 30 m – 6,93±0,13 s.

The training process of the control and experimental groups was based on three training sessions per week, lasting 90 minutes. For 9 months, young female athletes of both groups trained in the curriculum of the Youth Sports School [4]. The duration of participation in the contest female handball team of the control group during the training year was 16 hours, according to the curriculum of the Youth Sports School, while the female athletes experienced – 26 hours. At the end of the training year (in May) we again conducted control tests of female handball players, in which the results of the test exercises of the control and experimental groups had some difference (Table 1).

Thus, at the end of the school year, the female athletes of the experimental group had a standing long jump of 2,77% more than in the female handball player of the control ($p>0,05$), the number of jumps through the rope in one minute is more by 15,02% ($p<0,05$) is 5,50% better than the result in the run on 30 m ($p<0,05$) by 19,64% more than the average distance in throwing a tennis ball at a range ($p>0,05$). Dribbling the ball in the female athletes of the experimental group is 22,17% faster than in the female handball team of the control group ($p<0,05$), the amount push-ups on 17,33% higher in the female athletes of the experimental group ($p>0,05$) the number of lifting the trunk in the saddle from the supine position by 11,79% is better in the girls of the experimental group ($p>0,05$) by 7,43%. The time of the shuttle run of 4x9 m of the handball team of the control group is worse than in the female athletes of the experimental ($p<0,05$). Thus, the positive uneven influence of competitive loads on the level of physical readiness of female handball players was established.

The unevenness of the changes in the indices of the physical readiness of handball players, established in our studies, is indicated also by L. V. Popova with the co-author [8], V. A. Zaitsev, and A. A. Shevchenko [5]. In their work, they emphasize that changes in physical preparedness indicators for young

**Table 1**

**Indicators of physical readiness of female handball players of 9–10 years depending on participation in competitions**

| Indicators of readiness | Indicators, $\bar{X}$±m | | t | p |
|---|---|---|---|---|
| | Control group (n=10) | Experimental group (n=10) | | |
| Standing long jump, cm | 149,7±3,48 | 153,85±1,04 | 1,14 | >0,05 |
| Jumping over the rope during 1 minute, number of times | 78,55±3,54 | 90,35±3,71 | 2,30 | <0,05 |
| Run on 30 m, s | 5,73±0,10 | 5,43±0,10 | 2,12 | < 0,05 |
| Throwing a ball at a distance, m | 17,05±1,12 | 20,4±1,16 | 2,08 | >0,05 |
| Dribbling 30 m, s | 9,2±0,45 | 7,53±0,63 | 2,16 | <0,05 |
| Push-ups for 1 minute, number of times | 19,9±1,66 | 23,35±1,02 | 1,77 | >0,05 |
| Shuttle run 4x9 m, s | 22,35±0,45 | 20,69±0,61 | 2,19 | <0,05 |
| Lifting the trunk into the saddle from the supine position for 30 s, number of times | 19,5±0,86 | 21,8±0,61 | 2,18 | <0,05 |

Table 2

**Relationship between the indices of physical readiness of female handball players of 9–10 years (n=20)**

| Physical preparedness tests | Standing long jump, cm | Jumping over the rope during 1 minute, times | Run on 30 m, s | Throwing a ball at a distance, m | Dribbling 30 m, c | Push-ups for 1 minute, times | Shuttle run 4x9 m , s | Lifting the trunk into the saddle from the supine position for 30 s, times |
|---|---|---|---|---|---|---|---|---|
| Standing long jump, cm | 1 | | | | | | | |
| Jumping over the rope during 1 minute, times | **0,75** | 1 | | | | | | |
| Run on 30 m, s | –0,57 | –0,23 | 1 | | | | | |
| Throwing a ball at a distance, m | 0,60 | 0,28 | –0,51 | 1 | | | | |
| Dribbling 30 m, s | **–0,71** | –0,47 | **0,70** | **–0,75** | 1 | | | |
| Push-ups for 1 minute, times | **0,77** | 0,64 | –0,42 | 0,35 | –0,52 | 1 | | |
| Shuttle run 4x9 m, s | –0,59 | –0,27 | **0,70** | –0,55 | 0,68 | –0,46 | 1 | |
| Lifting the trunk into the saddle from the supine position for 30 s | 0,24 | 0,48 | 0,09 | 0,17 | –0,09 | 0,42 | 0,12 | 1 |

female athletes depend on the content of training sessions and load characteristics in training.

Solving one of the research problems, a correlation was established between the indicators of the manifestation of various physical qualities of young handball players at the end of the training year (Table 2).

Thus, a close positive relationship is observed between: standing long jump and number of times jumping over the rope (r=0,75), number of times push-ups (r=0,77); between run on 30 m and run on 30 m with dribbling a ball (r=0,70) and shuttle run 4x9 m (r=0,70). A close negative relationship was recorded between dribbling a ball for 30 m and throwing a tennis ball at a distance (r=–0,75) and standing long jump (r=–0,71).

Average positive relationship was established between standing long jump and throwing a tennis ball at a distance (r=0,60); between jumping over the rope and push-ups (r=0,64) and lifting the trunk into the saddle from the supine position for 30 s (r=0,48); between dribbling a ball on 30 m and shuttle run 4x9 m (r=0,68).

Average negative relationship was established between standing long jump and run on 30 m (r=–0,57) and shuttle run 4x9 m (r=–0,59); run on 30 m and throwing a tennis ball at a distance (r=–0,51) and push-ups (r=–0,42); throwing a tennis ball at a distance and shuttle run 4x9 m (r=–0,55); dribbling a ball on 30 m and push-ups (r=–0,52).

In the work of S. I. Lebedev [6], A. V. Khanyukova [9], T. I. Partola [7], in their work, the formation of correlation relations between the indicators of general and special physical preparedness under the influence of sports training, as evidenced by the results of our research, is indicated.

## Conclusions

The results of this study allow us to draw the following conclusions:

1. Issue of monitoring the physical preparedness of young athletes for the purpose of timely correction of the process of sports training remains relevant at the present time.

2. Uneven changes in the indicators of physical preparedness of young female handball players during the year.

3. Confirmed the existence of varying degrees of manifestation of correlation relationships between the indices of physical preparedness of female athletes aged 9–10 years.

4. It is established that additional competitive loads at the stage of preliminary training lead to more significant changes in the physical preparedness of young female athletes.

**Prospects for further research.** Further research will be aimed at studying the specifics of the selection of female handball players during the basic training phase.

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# Pedagogical characteristics of the systems for assessing the technical and tactical skills of qualified volleyball players

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***Purpose:*** *on the basis of the analysis of the special literature and their own experimental studies, to determine the characteristics of the systems for assessing the technical and tactical skills of qualified volleyball players.*

***Material & Methods:*** *study was conducted on the basis of the material of the national team of Zaporizhzhya State Medical University on volleyball. Analysis and generalization of the data of scientific and methodical literature are used; registration, analysis and interpretation of indicators of technical and tactical actions of qualified volleyball players in training and competitive processes; pedagogical observations; algorithms for calculating the quantitative and qualitative indicators of technical and tactical skill in volleyball; methods of mathematical statistics.*

***Results:*** *data on the existence of a strong statistical relationship between the systems of assessment of technical and tactical skills of qualified volleyball players, taking into account the specificity of the game role.*

***Conclusion:*** *shows the specifics of the application of various systems for assessing the technical and tactical skills of qualified volleyball players, taking into account the factors of the game role, noted the methodological features of special analysis and interpretation of indicators of technical and tactical actions in the adversarial process.*

**Keywords:** *volleyball, qualification, role, evaluation, skill, technique, tactics, training, competitions.*

## Introduction

Increasing the level of competition and social significance of official international competitions (Olympic Games, European championships and the world) requires further improvement of technologies and management system for the training of qualified athletes. Ukrainian volleyball has a long tradition of training qualified and highly qualified athletes – the names of famous Ukrainian volleyball players Mikhail Pimenov, Yuri Poyarkov, Viktor Mikhalchuk and many other outstanding athletes are well known to the world and European volleyball specialists. Unfortunately, in recent years the level of sports achievements of Ukrainian club and national teams has significantly decreased. As an exception, which confirms the general trend, it is possible to give examples of victorious performances of men's and women's national teams of Ukraine in the volleyball Euroleague 2017.

The reasons for the decline in the level of sports preparedness of Ukrainian volleyball players are complex, which is due to both economic factors in the country and directly to certain shortcomings in the system of long-term training of athletes. In our opinion, the influence of global factors significantly affects the training activity of qualified athletes in volleyball and requires a significant correction of the entire process of long-term preparation and the factors that determine it. This refers to the uncontrolled migration of young prospective athletes to leading clubs or abroad, which significantly reduces the level of competition at the national level and the development of national volleyball in general. In these conditions, the methodical systems for assessing the technical and tactical skills and the technology of training athletes for official competitions need correction.

The problems of assessing the level of technical and tactical skill in volleyball are not entirely new in the scientific and methodological literature. To the authors who started solving this scientific problem at the dissertation level, L. N. Slupsky (1974) [7], who conducted a study of the specialization of functions of athletes in the highly temporal conditions of gaming activity. To assess the level of technical and tactical skill of the players, the "point guard" role is suggested by a methodical approach, based on the method of conditionally-coded registration and stenographic recording of the game performance indicators with the determination of the effectiveness of technical and tactical skill according to formula (1):

$$E = \frac{N}{p_1 \times 1 + p_2 \times 0{,}5 + p_3 \times 0{,}2 + 0 + p_5^{(-1)}}, \quad (1)$$

where E – effectiveness of technical and tactical skill, N – total number of pass performed in the plane of the attacking actions; $p_1$ – number of pass for attacking technical and tactical actions without blocking; $p_2$– number of pass for attacking technical and tactical actions against the other blocker; $p_3$ – number of pass for attacking technical and tactical actions against group blocking; $p_4$ – number of ineffective gear for attacking technical and tactical actions; $p_5$ – number of false pass for attacking technical and tactical actions.

C. Dávila-Romeroetal et al. (2015) note that the proposed system for assessing the effectiveness of technical and tactical actions is specific because of its inability to apply to players of other gaming roles – diagonal, setter, central blocking [9].

But in the work of A. Yu. Melnyk (2011) [5] noted the significant influence of psychological factors on the effectiveness of technical and tactical actions in the competitive process of volleyball players. The author suggests additionally using the integral indicator of the quality of communication, which is calculated by the formula (2):

$$IQC = \sum_{i=1}^{3} n_i \times C_i \ , \qquad (2)$$

where the IQC – indicator of the quality of communication; $n_i$ and $C_i$ – number and value of the amount of communication (AC) of the other type (an index i = 1, 2, 3 is constitutive, encouraging or critical communication, respectively)

Such tendencies were noted in the work of R. Meletakosetal et al. (2013) [10], which focus on higher levels of sporting performance in volleyball teams with active communication between coaches and athletes. It is shown that this factor positively influences the psychological climate and the effectiveness of technical and tactical actions in the competitive process in general.

V. V. Gamaliy, O. L. Silesia (2014) [1; 2] proposed an alternative technology for assessing attacking technical and tactical actions in volleyball, with the possibility of further interpretation of the components presented, which are determined by the percentage of winning balls when individual attacking interactions are applied to the total number of attacking technical and tactical actions performed using formula (3):

$$EAA = \frac{P_{wv} + P_{esh} + P_{cr} + P_{tf} + P_{zn} + P_{rr} + P_{crs} + P_{js}}{n} \ , \qquad (3)$$

where EAA – effectiveness of attacking actions; $P_{wv}$ – winning points when applying GTTA "wave"; $P_{ech}$ – winning points when applying GTTA "echelon"; $P_{cr}$ – winning points when applying GTTA "crucifix"; $P_{tf}$ – winning points when applying GTTA "take-off"; $P_{zn}$ – winning points when applying GTTA "zone"; $P_{rr}$ – winning points when applying GTTA "rear"; $P_{crs}$ – winning points when applying GTTA "cross"; $P_{js}$ – winning points without applying GTTA "just"); n – total number of attacking actions.

For a more reliable representation of the effectiveness of technical and tactical actions in volleyball, the authors recommend that only effective GTTA be taken into account. The merits of this method of assessing the effectiveness of attacking TTA include a wide arsenal of used interactions, which allows us to more fully reflect the game statistics and the ability to determine the contribution of each attacking TTA in the overall population.

In the study, E. Yu. Doroshenko (2012) [6] proposed a comprehensive approach to assessing the level of technical and tactical skill of qualified volleyball players according to formulas (4 and 5):

$$IETTS = \left( \frac{1}{Q} \sum_{i=1}^{Q} K_{ij} \right) \times 100 \ \% \ , \qquad (4)$$

where IETTS – indicator of the effectiveness of technical and tactical skills in volleyball, %; Q – amount of basic technical and tactical actions (TTA) (Q=1, ... 5); i –number of technical and tactical actions (i=1, ... 5); j – optimality index for the performance of the technical and tactical action (j=1 – optimal execution, j=2 – performance with complication for the opponent's game); $C_{1j}$ – coefficient of effectiveness of serve in volleyball, cond. units; $C_{2j}$ – coefficient of efficiency of reception the ball after serve in volleyball, cond. units; $C_{3j}$ – coefficient of effectiveness of attacking strikes in volleyball, cond. units; $C_{4j}$ – coefficient of effectiveness of blocking attacking strikes in volleyball, cond. units; $C_{5j}$ – coefficient of effectiveness of defensive actions in volleyball (reception the ball after attacking and deceptive strikes), cond. units.

$$C_{ij} = \frac{1}{N} \sum_{i=1}^{2} N_{ij} \ , \qquad (5)$$

where *Cij* – coefficient of effectiveness of technical and tactical action in volleyball, cond. units; N – specific technical and tactical action in volleyball, n; $N_1$ – a specific technical and tactical action in volleyball, which is performed optimally, n; $N_2$ – a specific technical and tactical action in volleyball, which is performed with complication for the opponent, *n*.

As a result of the experimental studies carried out by the author, the possibilities for correcting the management system of the preparation and competitive activity of athletes in volleyball are shown, and the levels of technical and tactical skill are determined depending on the quantitative and qualitative indicators of the effectiveness of technical and tactical actions (Table 1).

Each of the described methods has both advantages and disadvantages. A common drawback is the lack of a certain algorithm for analyzing and interpreting the obtained indicators of technical and tactical skill. In the works of V. Kostyukevich (2016) [4], N. Schepotina (2015) [8] it is rightly noted that for further analysis of the indicators of technical and tactical actions in volleyball, it is necessary to use the model characteristics of technical and tactical actions in competitive activities. Moreover, such scientific developments on the material of team sports games have already been covered in the monograph of E. Yu. Doroshenko, D. G. Serdyuk, A. A. Mitova [3].

Despite the rather detailed scientific development of questions regarding the optimal assessment of the indicators of technical and tactical skill in volleyball, the problems in the analysis and interpretation of the indicators of technical and tactical actions, the practical implementation of which allows us to obtain more information, remain unresolved in the theory and methodology of sports training in the chosen sport

**Table 1**

**Scales for assessing the level of technical and tactical skill of volleyball players, taking into account the role, %**

| Levels of technical and tactical skill | Values of performance indicators of technical and tactical skill of volleyball players of different roles, % | |
|---|---|---|
| | Hitters, diagonal and central blocking players | Setters and "libero" players |
| Low | <25 | <30 |
| Below the average | 25,01–35 | 30,01–40 |
| Average | 35,01–45 | 40,01–50 |
| Above average | 45,01–55 | 50,01–60 |
| High | >55 | >60 |

(volleyball) for the implementation of assessment and control measures of technical and tactical preparedness.

**Relationship of research with scientific programs, plans, themes.** Pedagogical studies were conducted in accordance with the plan of research work of the Department of Physical Rehabilitation, Sports Medicine, Physical Education and Health of the Zaporizhzhya State Medical University of the Ministry of Health of Ukraine on the topic "Optimizing the physical condition of students by means of physical education and sports in the conditions of a medical higher educational institution". The research topic corresponds to the Consolidated Plan of research works in the field of physical culture and sports for 2016–2020. Ministry of Youth and Sports of Ukraine on the theme "Theoretical and methodological foundations of programming and modeling of training of athletes of various qualifications" (state registration number 0116U005299).

**The purpose of the research:** on the basis of the analysis of the special literature and their own experimental studies, to determine the characteristics of the systems for assessing the technical and tactical skills of qualified volleyball players.

## Material and Methods of the research

Experimental studies were conducted on the basis of the men's national team of the volleyball team of the Zaporizhzhya State Medical University, in the seasons 2015–2016 and 2016–2017 participated in the competitions of the city and regional levels, the championship of the Zaporizhzhya branch of the Committee on Physical Education and Sport of the Ministry of Education and Science of Ukraine, volleyball tournaments of the regional levels. Contingent of athletes participating in experimental studies – 15 people: 3 candidates for the master of sports; 10 athletes of the first category and 2 athletes – the second category. Schedule of the training process: Monday, Tuesday, Thursday, Friday. Competitive practice: Saturday or Sunday.

Research methods: analysis and generalization of scientific literature and Internet; the study of advanced pedagogical experience; pedagogical observations; analysis of competitive activities on the basis of written registration of indicators of technical and tactical actions; methods of mathematical statistics.

## Results of the research and their discussion

During the 2015–2016 and 2016–2017 seasons, volleyball players of the national team of the Zaporizhzhya State Medical University were registered indicators of competitive activity. To analyze the effectiveness of attacking technical and tactical actions, the following indicators of competitive activity were selected: the number of points scored (n) the effectiveness of the serve (%); effectiveness of attacking technical and tactical actions (%); blocking efficiency (%). Tables 2 and 3 show the competitive performance of volleyball players of the national team of the Zaporizhzhya State Medical University in the official competitions of the 2015–2016 and 2016–2017 seasons.

The pedagogical analysis of the indicators of competitive activity, which are presented in Tables 2 and 3, makes it possible to determine the effectiveness of technical and tactical

**Table 2**

**Indicators of the number of scored points and effective attacking technical and tactical actions in the competitive activity of qualified volleyball players different playing roles, n=10**

| Role | Scored points, $n_1$ | | Effective attacking TTA, $n_1$ | |
|---|---|---|---|---|
| | $\bar{X}$±m | S | $\bar{X}$±m | S |
| Diagonal | 10,24±0,94 | 2,92 | 11,08±0,71 | 2,76 |
| Setter | 8,19±0,48 | 1,67 | 8,95±0,51 | 1,72 |
| Central blocking | 5,4±0,33 | 1,22 | 5,25±0,51 | 1,46 |
| Libero | 2,23±0,22 | 0,87 | 1,42±0,19 | 0,62 |

***Remark.*** *n – number of games; $n_1$ – values of indicators.*

**Table 3**

**Indicators of blocking and effective serve in the competitive activity of qualified volleyball players different playing roles, n=10**

| Role | Blocking, $n_1$ | | Effective serve, $n_1$ | |
|---|---|---|---|---|
| | $\bar{X}$±m | S | $\bar{X}$±m | S |
| Diagonal | 1,29±0,18 | 0,49 | 1,07±0,17 | 0,53 |
| Setter | 1,19±0,19 | 0,55 | 0,98±0,15 | 0,47 |
| Central blocking | 2,78±0,36 | 0,93 | 0,91±0,17 | 0,54 |
| Libero | 1,02±0,15 | 0,48 | 0,78±0,18 | 0,56 |

***Remark.*** *n – number of games; $n_1$ – values of indicators.*

actions of qualified volleyball players by different methods of evaluation with obtaining quantitative and qualitative values. This is significant for determining the model characteristics of qualified volleyball players of various roles and creating on this basis the conditions for the rational planning of training and competitive loads in the structural formations of the macrocycle (mesocycles and microcycles). To determine the effectiveness of various methods of assessing technical and tactical skill in volleyball, a correlation analysis of the obtained indices was made with the determination of the Brava-Pearson correlation coefficient, which showed the presence of strong statistical relationships. For comparative analysis, a method of assessing technical and tactical skill in volleyball [6] and a technique for assessing the effectiveness of attacking technical and tactical actions [2] with a modification by definition of blocking indicators with the same logic as for determining the attack interactions. Indicators of technical and tactical actions of qualified volleyball players are recorded in 10 games of regional and regional levels, of which 5 – won and 5 – lost (Table 4).

With the general trend of a relatively strong statistical dependence of the indicators of competitive activity in the games won and lost, pay attention to the performance of players which playing role "setter": r=0,89 and r=0,68, respectively, which may indicate the presence of certain differences in the structure of competitive activity in depending on the outcome of the games.

In addition, we consider it important to combine the recorded indicators of quantitative and qualitative assessment of technical and tactical skills in a generalized structure. In our opinion, it must have internal hierarchical subordination and contain the following elements: 1) analysis of the effectiveness of the implementation of team gameplay: in attack, in defense;

**Table 4**

**Indicators of statistical dependence of the systems of assessment of technical and tactical skill of qualified volleyball players, n=10**

| Playing role | Indicators of statistical dependence of various systems of technical and tactical skill assessments | | | |
|---|---|---|---|---|
| | r – correlation coefficient (won games) | level of statistical dependence | r – correlation coefficient (lost games) | level of statistical dependence |
| Diagonal | 0,86* | strong, p<0,01 | 0,74** | strong, p<0,01 |
| Setter | 0,77* | strong, p<0,01 | 0,71** | strong, p<0,01 |
| Central blocking | 0,89* | strong, p<0,01 | 0,68** | strong, p<0,01 |
| Libero | 0,84* | strong, p<0,01 | 0,83** | strong, p<0,01 |
| Total | 0,84* | strong, p<0,01 | 0,74** | strong, p<0,01 |

***Remark.*** ** – method for assessing the technical and tactical skills in volleyball; ** – a technique for assessing the effectiveness of attacking technical and tactical actions.*

2) analysis of the effectiveness of the implementation of group interactions in the attack, in defense; 3) analysis of the effectiveness of individual actions in the attack, in defense (including players of different roles) 4) analysis of the effectiveness of the implementation of standard provisions (serve the ball); 5) chronological analysis of the development of the game in set from 0 to 8 points scored from 9 to 16 points scored from 17 to 25 points scored (in the case of a game situation, more than 25 points scored) 6) analysis of the effectiveness of game actions in different areas of the site: protection zone, zone attacks; zone players (from "1" to "6") 7) analysis of the decisive moments of the game and a general interpretation of the data obtained.

In our opinion, it is the above methodological approaches that open the way for scientists to final determination with the problems of optimal estimation of the level of technical and tactical skill in volleyball.

## Conclusions

1. To assess the level of technical and tactical skill of qualified volleyball players, scientists and trainers-practitioners use different methods and techniques, namely: a method of assessing technical and tactical skills in volleyball [6]; a technique for assessing the effectiveness of attacking technical and tactical actions [2]; studying the influence of the psychoemotional state of volleyball players on technical and tactical indicators in competitive activity [5] and others.

2. The general drawbacks of the existing methods for assessing the technical and tactical skill of qualified volleyball players include the lack of an algorithm of analytical procedures and the final disorder of their hierarchical elements. To eliminate these problematic issues, we propose the following algorithm for assessing the indicators of technical and tactical skill in the competitive activity of qualified volleyball players of various roles, namely: analysis and interpretation of the effectiveness of the execution of command (group and individual) schemes of conducting the game in attack, in defense; analysis of the effectiveness of the implementation of standard provisions (ball feeding) analysis of the development of the game in batches; analysis of the effectiveness of gaming activities in different areas of the site; analysis of the decisive moments of the game and a general interpretation of the obtained indicators.

**Prospects for further research** are based on the need to improve the proposed algorithm, its validation and introduction into the training and competitive activities of qualified volleyball players.

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# Main components and content of sports volunteer activities

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***Purpose:*** *identification of the main structural components and content of sports volunteer activities.*

***Material & Methods:*** *used analysis of literature and documents, organizational analysis.*

***Result:*** *basic structural components of sports volunteer activity are defined. The content of sports volunteer activity is disclosed.*

***Conclusion:*** *sports volunteer activity includes the following structural components: subject, object, purpose, motivation, means, actions; subject is a sports volunteer, the object is a sports competition, the goal is to provide gratuitous assistance for a quality competition, the means are the special knowledge, skills, communication abilities of sports volunteers, actions should be understood as types of volunteer activities and functions that volunteers perform during the preparation and conduct of competitions. Main types of sports volunteer activity are: 1) organizational; 2) judiciary; 3) coaching; 4) legal; 5) medical. Functions that volunteers perform in the competition system are general and special. Content of the functions of sports volunteering depends on the specifics of the sports, the rank of the competition, the specifics of the competition for people with special needs.*

**Keywords:** *volunteer, sports volunteer activity, structural components, content, functions.*

## Introduction

As is known, volunteering for Ukraine, as in many countries of the world, it is a relevant and important social phenomenon for several reasons: the employment of volunteers is an effective way to solve the complex problems of the individual, society and the environment; Volunteering brings new, creative and courageous ideas to the social sphere to solve acute and complex problems; volunteering – This is the way in which every citizen of the country can participate in improving the quality of public life [15]. The events of 2014 and the beginning of the ATO in Ukraine became an illustrative manifestation of social self-organization and a large-scale spread of the volunteer movement, a decisive role in this process was played by the patriotic rise in Ukrainian society [21].

To date, the volunteer movement is an integral part of the development of the sphere of physical culture and sports in Ukraine, including the system of physical culture and recreational activities and sports competitions [13; 18; 19].

The experience of attracting sports volunteers originates from the very first Olympic Games in 1894, as a social phenomenon sports volunteering began to form since 1980 – the Winter Olympics in Lake Placid. Developing large-scale scenarios of future Universiade and Olympic Games, the organizers began to rely on the participation of volunteers in their conduct. Already in the early 80-ies of the last century, sports volunteers were recognized as "official assistants" of the organizing committees of major competitions [14].

Modern scientists A. V. Bespalko (2007), R. Kh. Vainola (2008), S. F. Matveev (2010), T. L. Liakh (2011), etc. in scientific works considered certain aspects of the formation and development of volunteerism in Ukraine and in the world. Separately, we should single out the works of M. V. Dutchak (2007), A. S. Bondar (2010, 2015), E. V. Goncharenko (2010), V. I. Levkiv (2013), I. A. Kogut (2014, 2015), I. V. Petrenko (2015, 2016, 2017), in which the authors described sports volunteering as a social phenomenon, revealed the specifics of the activity of sports volunteers, the participation of students in the sport volunteering movement.

The theoretical analysis of scientific works on the research problem has shown that sports volunteer activity is a specific type of activity that requires a scientific analysis of the content and definition of its main components.

**Relationship of research with scientific programs, plans, themes.** The research was carried out in accordance with the thematic plan of the research work of the Kharkov State Academy of Physical Culture for 2016–2018. On the topic 1.5. "Methodological bases of strategic development of the sphere of physical culture and sports in the region" (state registration number 0113U004615), as well as within the framework of the fundamental scientific project for 2015–2017. "Theoretical and methodological fundamentals of the non-Olympic sport" (state registration number 0115U002372, the number of the sub-theme "Organizational and managerial, economic and humanitarian foundations of the non-Olympic sport in Ukraine" 0115U006861C).

**The purpose of the research:** identification of the main structural components and content of sports volunteer activities.

*Objectives of the study:*

1. Identify the main structural components of sports volunteer activity.

2. To disclose the content of sports volunteer activities.

## Material and Methods of the research

Methods of research: analysis of literary sources and documents; organizational analysis.

## Results of the research and their discussion

It is known that activity is a specific kind of human activity aimed at cognition and creative transformation of the surrounding world, including itself and the conditions of its existence. In accordance with the Law of Ukraine "On Voluntary Activities", voluntary activities are voluntary, socially directed, non-profitable activities carried out by volunteers through the provision of volunteer assistance [12]. Volunteer activity, like any activity, in its structure has the action and organization of activities in general, and therefore, it can be argued that it includes the following main structural and content components, such as: target, procedural, motivational, performance-appraisal.

Volunteer activity is a purposeful process of providing gratuitous assistance, conditioned by social necessity. In the modern world, volunteerism has received the status of an inalienable and ever relevant socio-cultural phenomenon that characterizes any highly developed and civilized society whose priorities are humanistic values [17].

For the implementation of any activity, including volunteer work, a set of official written (issued) documents that are adopted in a certain form by the *law-making body* is required [5], which regulates this type of activity: the basic principles of its implementation, requirements in volunteer organizations, regulation of relations with volunteers, consolidation of the legal status of the volunteer, sources of funding.

Volunteering requires motivation (willingness of the volunteer to work), which, on the one hand, determines the behavior of the individual (A. Adler, A. Maslow, V. Frankie), and on the other – stimulates and allows to maintain it at a certain level (E. Lower, L. Porter, H. Heckhausen) [2].

*Planning for attracting volunteers* – identifying the need for volunteers; the development of the content of volunteer activity; resource analysis; development of the list of requirements for the volunteer; the development of a time recording system for volunteers; planning a campaign to attract volunteers [15], *and further selection* of volunteers, taking into account their level of training, experience in volunteering, personal qualities.

The *main activities of volunteers*: medical volunteers, social volunteers, peacekeepers, cultural and cultural-historical volunteers, environmental volunteers, sports volunteers [6].

For effective volunteering requires *targeted training* of volunteers is necessary for each direction of their activities.

*Result and evaluation.* This criterion is a motivational value for volunteers. It is necessary to determine how well the volunteer fulfilled his assignment successfully or not, he is working. Evasion from assessing the work of volunteers (believing that this can demotivate them) leads to a loss of interest in the matter [16].

Summarizing the foregoing, we can assume that sports volunteer activity includes the following structural components: subject, object, purpose, motivation, means, actions, while the subject is a sports volunteer, the object is sports competition, the goal is to provide gratuitous assistance for a quality competition, means are the special knowledge, skills, communication abilities of sports volunteers, and actions should be understood as types of volunteer activities and functions that volunteers perform during the preparation and conduct of competitions, the result and evaluation of the activities of sports volunteers [8; 10; 14], which are shown in Figure 1.

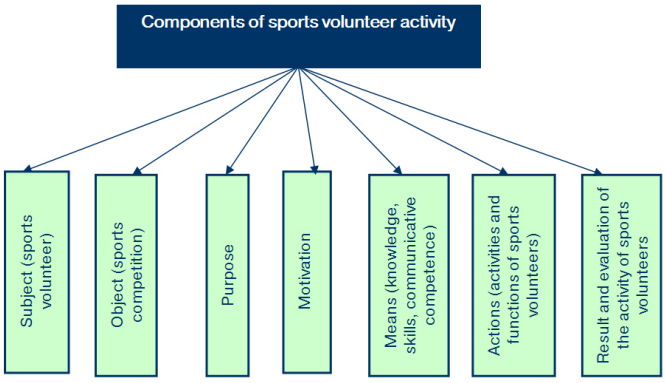


**Fig. 1. Main components of sports volunteer activity**

Sports volunteers perform various functions during sport competitions, depending on their level of preparation, knowledge, volunteer experience, based on which one can single out the main activities of sports volunteers:

1) organizers (sports managers). Each sports competition has an Organizing Committee, which has the primary responsibility for the quality and timely preparation of the event. The organization of competitions contains diverse tasks: preparation and construction of objects and adjacent territories, on the basis of which competitions will be held; development of necessary transport routes; training and involvement of specialists to ensure the functioning of services; attracting the attention of the public and the media. In this regard, the Organizing Committee, as a system, can not consist only of managers, it needs "working hands", volunteers are just one of the elements of the Organizing Committee system, indicates the recognition of their official status [11].

2) assistants. These are volunteers who perform various functions in competitions, depending on the above directions, in which they can participate (from placing guests to volunteer coordinators).

3) sports referees. These are volunteers who have received special training and have received the appropriate referee's category and authorized by the organizers of the competitions to ensure compliance with the rules of the sport, the regulation (regulation) of the sports competition.

4) trainers. These are volunteers authorized by the organizers of the competitions, who, having the appropriate education and qualifications, conduct educational and training work among athletes in the preparation and conduct of competitions.

5) volunteers who are conducting legal support of competitions. They can be professional lawyers (fans of this kind of sport), students of law schools.

6) sports doctors. These are volunteers, authorized by the organizers of the competitions, who have the appropriate education and qualifications. Check the applications of teams for the presence of medical admission of participants in the competition with the visa of the relevant medical institution; provide first aid to the participants of the competition.

The content of sports volunteer activity is presented in Figure 2. Analysis of the content of sports volunteers in the competition system suggests that the content of the functions of sports volunteering depends on the specifics of the sports, the rank of the competition – the level of the sport event held in Ukraine or abroad [20], the specifics of the competition for people with special needs. At the same time, with the change in the rank of the competition, the functions of sports volunteers remain the same, only the amount of work for their fulfillment changes.

The general functions of volunteers in the competition system, depending on their inclinations and the level of preparation for volunteer activity are: accommodation; accreditation; safety & security; hospitality; IT-volunteers; logistics; marketing; media; match organization; venue management; team service; ceremonies; VIP-services; ticketing; transportation; welcome & information; curators of all directions, including the leaders of the volunteer squads [1; 4; 9].

Proceeding from the foregoing, it is reasonable to assume that special functions are performed by sports volunteers who have skills in various sports and work directly in the competition area.

The main task of volunteers involved in the organization and holding of the Paralympics and Deaflympic Games is the organization of competitions and direct assistance to athletes, as well as the promotion of the Paralympics and de-Olympic movements outside the Games:

1. Transportation: meetings and seeing off of participants and guests, managing their flows. Assistance in transportation and support of athletes.

2. Administration and information support. Work on information racks, checking and registration of participants and staff, issuing uniforms, etc. Translators services. Informing the participants of the Games and spectators about the environmental situation.

3. Providing ceremonies and competitions. Help in setting the scenery, preparing the ceremonies and rehearsals. Management of recreation areas and stands. Preparation of the competition places and direct work on them during the Games. Ensuring safety in the competition area. Accompanying athletes to the podium, handing out flowers and medals, raising national flags.

4. Medical support and doping control. Fulfillment of the instructions of the chief physician. Organization of work of medical workers. Work as an auxiliary medical personnel, conducting procedures for selecting doping samples. Registration of persons arriving and departing at the Doping Control Station and their escorts.

5. Interaction with the media and dissemination of information. Work with the information services of the Games. Maintenance of quantitative indicators of competitions. Distribution of printed materials about the results of competitions.

6. Training activities. Work with the information services of the Games. Maintenance of quantitative indicators of competitions. Distribution of printed materials about the results of competitions [7].

Volunteers of the Special Olympics movement work on such volunteer programs:

1. "United sports" – the organization of training sessions and sporting events and participation in them together with persons having deviations in mental development.

2. "Healthy athletes" – medical examination of the health status of persons with intellectual disabilities by medical personnel.

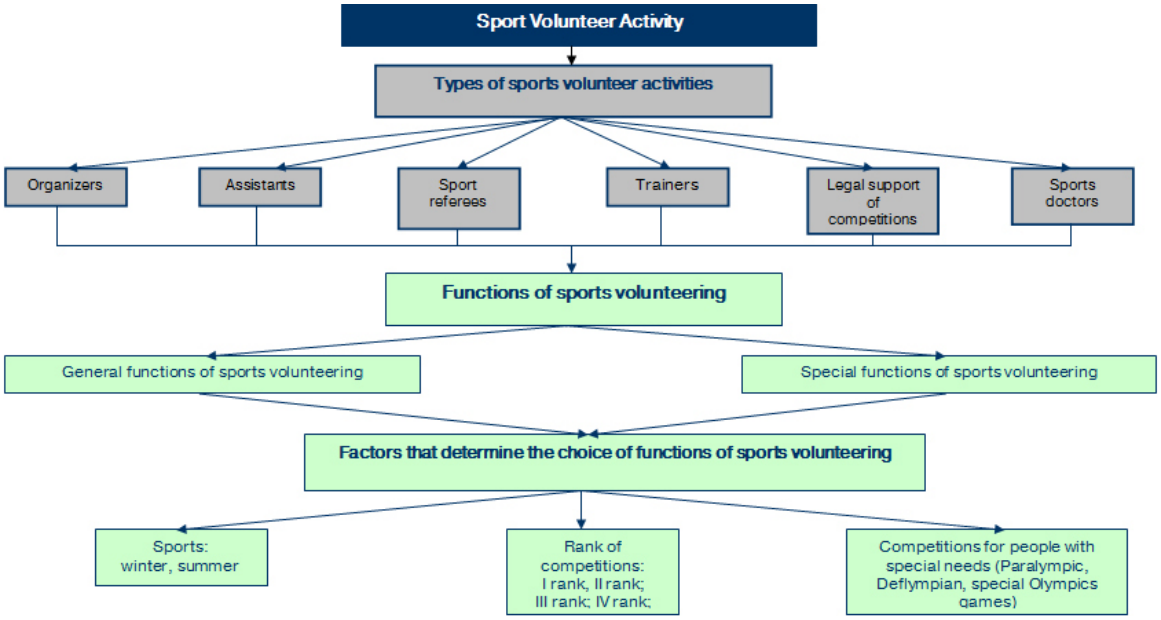


**Fig. 2. Content of sports volunteer activities**

3. "Flare run" – the Olympic torch relay from Olympia to the city – the organizer of the Games.

4. Educational program – sports events at the level of educational institutions.

5. "Leadership of athletes" – training of persons with intellectual disabilities of oratory for the purpose of their representation at conferences and other events.

6. "MATP" – organization of training sessions for people with severe forms of mental development disorder [3]

During training and preparation among volunteers it is possible to distinguish:

1) recruiters. During the training and preparation are selected people who conduct selection and interviews with volunteers (used in preparation for the Euro 2012).

2) volunteer coaches who conduct training, games and training courses for the preparation of sports volunteers.

## Conclusions

1. Sports volunteer activity includes the following structural components: subject, object, purpose, motivation, means, actions, while the subject is a sports volunteer, the object is sports competition, the goal is to provide gratuitous assistance for a quality competition, the means are special knowledge, skills, the communication skills of sports voluntaries, and actions should be understood as types of volunteer activity and functions that volunteers perform during preparation competitions.

2. Main types of sports volunteer activity are: 1) organizational; 2) judiciary; 3) coaching; 4) legal; 5) medical. The functions that volunteers perform in the competition system are general and special. The content of the functions of sports volunteering depends on the specifics of the sports, the rank of the competitions, the specifics of the competition for people with special needs.

**Prospects for further research** are to further disclose the organizational aspects of athletic volunteerism.

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# Effect of recreational activities on the physical development of girls 11–12 years of the preparatory medical group

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***Purpose:*** *conduct research on the impact of recreational activities on changes in the body's systems of girls 11 and 12 years of preparatory medical group.*

***Material & Methods:*** *20 girls aged 11 and 12 who participated in the program developed by us during the year participated in the experiment. Assessment of the physical state of the body was carried out with the help of pedagogical and medico-biological methods.*

***Results:*** *based on the results of the study, the dynamics of morphological and functional indices and the level of physical qualities of girls 11 and 12 years of the preparatory medical group.*

***Conclusion:*** *results of the conducted study confirm the effectiveness of using recreational exercises with the help of various means that positively influenced the state of the systems of the organism of the girls of the preparatory medical group.*

**Keywords:** *adolescence, morphology, physical qualities*.

## Introduction

According to the researchers, one of the most important tasks of physical education is the conditions for effective physical development and sports improvement of school-age children (7–18 years), taking into account their age and individual morphological and functional indicators [1; 8].

Physical development is a combination of morphological and functional indicators that characterize the development of the organism and allow us to determine the reserves of its physical strength, endurance, efficiency [3].

It is noted that uneven development in the adolescent period is due to various factors that can influence the body and properly treat a wide range of risk factors for the occurrence of violations of their health [4; 5].

The adolescent period is a rapid period of student development, during which certain physical changes occur, morphological data are increasing, which mostly have a weak relationship with the work of various body systems, especially after diseases [2].

These issues acquire special significance at the present time, in connection with a sharp deterioration in the physical development of school-age children, especially in secondary school, which results in various diseases of the cardiovascular, respiratory, digestive and other body systems during the school year [6]

It follows that the main direction of the physical education of adolescents during the school year is to provide and organize recreational activities in view of the state of health (medical group).

At the moment, the provision of adolescents with optimal management and control of recreational activities using elements of innovative methods is very complex, which is an actual problem of physical education.

**Relationship of research with scientific programs, plans, themes.** The research was carried out in accordance with the plan of the research work of the Department of Winter Sports, Cycling and Tourism of the Kharkov State Academy of Physical Culture and the Consolidated Plan of Research of the Ministry of Education and Science of Ukraine for 2014–2017. On the topic "The basics of sport tourism in the recreational activities of different age groups of the population of Ukraine" (state registration number 0114U000366).

**The purpose of the research:** conduct research on the impact of recreational activities on changes in the body's systems of girls 11 and 12 years of preparatory medical group.

## Material and Methods of the research

According to medical records, girls 11 years old with frequent diseases of the respiratory system (bronchitis, tracheitis, etc.) were selected, they were referred to the preparatory medical group, but according to the data of the school physician, they were admitted to physical education classes. The study, which took place during the four stages of the year, was attended by girls, who at the beginning of the experiment were 11 years old and 12 years old – at the end (n=20).

At the beginning of the school year the program was implemented, according to which there was a process of gradual improvement and development of complex motor skills, especially those related with the request by the teenage body, a more cautious dosing exercise with a heart rate monitor (Polar RX300X) throughout the study.

The program consisted of four blocks (1 – retractor, 2 – securing, 3 – supporting, 4 – developing). The first block was 1 month long (2 weeks – 1 classes at HR to 105±2,5 beats·min$^{-1}$; 2 weeks – 2 classes at HR to 115±2,5 beats·min$^{-1}$; second block – *3 month* (*1 month:* 2 weeks – 2 classes; 1 week – 3 classes; 1 week – 2 classes; *1 month:* 2 weeks – 2 classes;

1 week – 3 classes; 1 week – 2 classes; *1 month:* 1 week – 3 classes, 1 week – 1 classes; 2 weeks – 2 classes at HR to 120±2,5 beats·min$^{-1}$); third blocks – *4 month* (*2 month*: 8 weeks – 3 classes at HR to 125±2,5 beats·min$^{-1}$; *1 month:* 2 weeks – 2 classes; 1 week – 3 classes; *1 month:* 2 weeks – 2 classes; 1 week – 3 classes; 1 weeks – 2 classes at HR to 115±2,5 beats·min$^{-1}$); fourth blocks – *4 month* (*1 month:* 2 weeks – 2 classes, 2 weeks – 3 classes; *1 month:* 4 weeks – 3 classes; *1 month:* 4 weeks – 3 classes; *1 month:* 1 week – 2 classes at HR to 125±2,5 beats·min$^{-1}$).

Each class consisted of three parts: dynamic, static and relaxation. The dynamic part provided increase physical capacity and aerobic productivity of an organism, housed static exercises breathing exercises with prolonged expiratory phase and the relaxation – the reduction of the psychophysical stress, increase stress resistance, reduced anxiety levels.

**Table 1**

**Status of morphological and functional indicators of girls 11–12 years old (n=20)**

| Indicators | I stage (September) | II stage (January) | III stage (May) | IV stage (September) | Evaluation of static differences | |
|---|---|---|---|---|---|---|
| | 11 years | | 12 years | | | |
| | $\bar{X}_1 \pm m_1$ | $\bar{X}_2 \pm m_2$ | $\bar{X}_3 \pm m_3$ | $\bar{X}_4 \pm m_4$ | t | p |
| Body length, cm | 138,4±1,62 | 140,4±1,39 | 141,9±1,09 | 144,2±2,17 | $t_{1,2}$=0,94; $t_{1,3}$=1,79; **$t_{1,4}$=2,14;** $t_{2,3}$=0,85; $t_{2,4}$=1,47; $t_{3,4}$=0,95 | $p_{1,2}$>0,05; $p_{1,3}$>0,05; **$p_{1,4}$<0,05**; $p_{2,3}$>0,05; $p_{2,4}$>0,05; $p_{3,4}$>0,05 |
| Body weight, kg | 38,8±6,63 | 39,7±1,27 | 41,5±0,95 | 42,6±1,29 | $t_{1,2}$=0,53; $t_{1,3}$=1,83; **$t_{1,4}$=2,22;** $t_{2,3}$=1,13; $t_{2,4}$=1,60; $t_{3,4}$=0,69 | $p_{1,2}$>0,05; $p_{1,3}$>0,05; **$p_{1,4}$<0,05**; $p_{2,3}$>0,05; $p_{2,4}$>0,05; $p_{3,4}$>0,05 |
| Chest circumference, cm | 61,6±1,14 | 62,5±1,13 | 62,8±0,89 | 64,3±0,83 | $t_{1,2}$=0,56; $t_{1,3}$=0,83; $t_{1,4}$=1,91; $t_{2,3}$=0,21; $t_{2,4}$=1,28; $t_{3,4}$=1,23 | $p_{1,2}$>0,05; $p_{1,3}$>0,05; $p_{1,4}$>0,05; $p_{2,3}$>0,05; $p_{2,4}$>0,05; $p_{3,4}$>0,05 |
| Heart rate (HR) in rest, beats min$^{-1}$ | 81,8±4,20 | 80,9±4,11 | 77,3±3,06 | 75,9±1,91 | $t_{1,2}$=0,15; $t_{1,3}$=0,87; $t_{1,4}$=1,28; $t_{2,3}$=0,70; $t_{2,4}$=1,10; $t_{3,4}$=0,39 | $p_{1,2}$>0,05; $p_{1,3}$>0,05; $p_{1,4}$>0,05; $p_{2,3}$>0,05; $p_{2,4}$>0,05; $p_{3,4}$>0,05 |
| Systolic blood pleasure (SBP), Mmhg | 109,5±7,53 | 114,3±7,18 | 115,3±6,12 | 119,0±5,37 | $t_{1,2}$=0,46; $t_{1,3}$=0,60; $t_{1,4}$=1,03; $t_{2,3}$=0,11; $t_{2,4}$=0,52; $t_{3,4}$=0,45 | $p_{1,2}$>0,05; $p_{1,3}$>0,05; $p_{1,4}$>0,05; $p_{2,3}$>0,05; $p_{2,4}$>0,05; $p_{3,4}$>0,05 |
| Diastolic blood pleasure (DBP), Mmhg | 66,3±4,76 | 67,3±4,52 | 70,3±3,52 | 72,5±2,63 | $t_{1,2}$=0,15; $t_{1,3}$=0,68; $t_{1,4}$=1,14; $t_{2,3}$=0,52; $t_{2,4}$=0,99; $t_{3,4}$=0,50 | $p_{1,2}$>0,05; $p_{1,3}$>0,05; $p_{1,4}$>0,05; $p_{2,3}$>0,05; $p_{2,4}$>0,05; $p_{3,4}$>0,05 |
| Vital capacity of the lungs (VC), ml | 1670,3±58,78 | 1743,5±22,89 | 1753,5±20,21 | 1797,0±35,37 | $t_{1,2}$=1,16; $t_{1,3}$=1,34; $t_{1,4}$=1,85; $t_{2,3}$=0,33; $t_{2,4}$=1,27; $t_{3,4}$=1,07 | $p_{1,2}$>0,05; $p_{1,3}$>0,05; $p_{1,4}$>0,05; $p_{2,3}$>0,05; $p_{2,4}$>0,05; $p_{3,4}$>0,05 |
| Respiratory rate, br·min$^{-1}$ | 22,5±1,05 | 21,5±1,05 | 21,3±0,79 | 19,4±0,80 | $t_{1,2}$=0,67; $t_{1,3}$=0,91; **$t_{1,4}$=2,35;** $t_{2,3}$=0,15; $t_{2,4}$=1,59; $t_{3,4}$=1,69 | $p_{1,2}$>0,05; $p_{1,3}$>0,05; **$p_{1,4}$<0,05**; $p_{2,3}$>0,05; $p_{2,4}$>0,05; $p_{3,4}$>0,05 |
| Volume of inhalation/exhalation, ml | 228,3±7,62 | 239,5±10,11 | 257,1±7,19 | 261,4±5,13 | $t_{1,2}$=0,88; **$t_{1,3}$=2,75;** **$t_{1,4}$=3,60;** $t_{2,3}$=1,42; $t_{2,4}$=1,93; $t_{3,4}$=0,49 | $p_{1,2}$>0,05; $p_{1,3}$<0,05; **$p_{1,4}$<0,01**; $p_{2,3}$>0,05; $p_{2,4}$>0,05; $p_{3,4}$>0,05 |
| Respiratory minute volume, ml | 4029,4±80,57 | 4132,7±66,12 | 4215,7±79,42 | 4274,3±52,64 | $t_{1,2}$=0,99; $t_{1,3}$=1,65; **$t_{1,4}$=2,54;** $t_{2,3}$=0,80; $t_{2,4}$=1,68; $t_{3,4}$=0,62 | $p_{1,2}$>0,05; $p_{1,3}$>0,05; **$p_{1,4}$<0,05**; $p_{2,3}$>0,05; $p_{2,4}$>0,05; $p_{3,4}$>0,05 |

*Research methods*: theoretical analysis and generalization of literary sources; pedagogical observation; testing; medical and biological methods, methods of mathematical statistics.

## Results of the research and their discussion

During our research, the implementation of intersubject communications of cognitive, educational, recreational activities, formed and reinforced the skills and skills for independent classes of physical exercises; various organizational forms, means, methods and methods of training were used, where for comparative analysis a comparative analysis of all four stages was carried out during the year of the study.

When using medical-biological methods of research, we obtained the following indicators: thus, between the first and second stages, the difference was in: body length (BL) 2,0 cm (t=0,94; p>0,05), body weight (BW) 0,9 kg (t=0,53; p>0,05), chest circumference (CC) 0,9 cm (t=0,56; p>0,05), heart rate (HR) 0,9 beats·min$^{-1}$ (t=0,15; p>0,05), systolic blood pleasure (SBP) 4,8 Mmhg (t=0,46; p>0,05), diastolic blood pleasure (DBP) 1,0 Mmhg (t=0,15; p>0,05), vital capacity of the lungs (VC) 73,2 ml (t=1,16; p>0,05), respiratory rate (RR) 1,0 br.·min$^{-1}$ (t=0,67; p>0,05), volume of inhalation/exhalation (VIE) 11,2 ml (t=0,88; p>0,05), minute volume (MV) 103,3 ml (Table 1).

Whereas between the second and third stages, the indicators increased BL on 1,5 cm (t=0,85; p>0,05), in BW on 1,8 kg (t=1,13; p>0,05), in CC on 0,3 cm (t=0,21; p>0,05), in SBP on 1,0 Mmhg (t=0,11; p>0,05), in DBP on 3,0 Mmhg (t=0,52; p>0,05), in VC on 43,5 ml (t=0,46; p>0,05), in VIE on 17,6 ml (t=1,42; p>0,05), in MV on 103,3 ml (t=0,80; p>0,05) and decreased in the HR at 3,6 beats·min$^{-1}$ (t=0,70; p>0,05), in RR on 1,0 br·min$^{-1}$ (Table 1).

During the fourth stage of the study, the indicators of girls aged 12 years had the following result: BL – 144,2 cm ($t_{3,4}$=0,95; p>0,05), BW – 42,6 kg ($t_{3,4}$=0,69; p>0,05), CC – 64,3 cm ($t_{3,4}$=1,23; p>0,05), HR – 75,9 beats·min$^{-1}$ ($t_{3,4}$=0,39; p>0,05), SBP – 119,0 Mmhg ($t_{3,4}$=0,45; p>0,05), DBP – 72,5 Mmhg ($t_{3,4}$=0,50; p>0,05), VC – 1797,0 ml ($t_{3,4}$=1,07; p>0,05) (Table 1).

The systematic classes on the program we developed positively influenced the improvement of physical qualities, they changed during the second, third, fourth stages in stamina on 122,6 m (t=2,55; p<0,01), on 152,6 m (t=3,90; p<0,01), on 182,1 m (t=4,58; p<0,01), in flexibility 0,5 cm (t=2,37; p<0,05), on 1,3 cm (t=3,81; p<0,01), on 2,1 cm (t=8,48; p<0,001), in strength 2,3 times (t=1,90; p>0,05), on 2,6 times (t=2,16; p<0,05), on 5,4 times (t=3,13; p<0,01), in the speed-strength qualities on 3,8 cm (t=0,57; p>0,05), on 8,4 cm (t=1,38; p>0,05), on 16,8 cm (t=2,70; p<0,05) regarding the performance of the first stage (Table 2).

Also during our study, the physical development of 11 and 12-year-old girls was determined using centile intervals at each

**Table 2**

**Status of motor qualities of girls 11–12 years old (n=20)**

| Indicators | 11 years old | | 12 years old | | Evaluation of static differences | |
|---|---|---|---|---|---|---|
| | September $\bar{X}_1 \pm m_1$ | January $\bar{X}_2 \pm m_2$ | May $\bar{X}_1 \pm m_1$ | September $\bar{X}_2 \pm m_2$ | t | p |
| ***Endurance:*** Uuniform walking 10 min with taking into account HR, m | 339,1±36,82 | 461,7±32,41 | 491,8±13,27 | 521,2±15,11 | **$t_{1,2}$=2,50**; **$t_{1,3}$=3,90** **$t_{1,4}$=4,58**; $t_{2,3}$=0,86 $t_{2,4}$=1,66; $t_{3,4}$=1,46 | **$p_{1,2}$<0,05**; **$p_{1,3}$<0,05** **$p_{1,4}$<0,001**; $p_{2,3}$>0,05 $p_{2,4}$>0,05; $p_{3,4}$>0,05 |
| ***Flexibility:*** Angle body from sad position, cm | 2,1±0,18 | 2,6±0,11 | 3,4±0,29 | 4,2±0,17 | **$t_{1,2}$=2,37;** **$t_{1,3}$=3,81** **$t_{1,4}$=8,48**; **$t_{2,3}$=2,58** **$t_{2,4}$=7,90**; **$t_{3,4}$=2,38** | **$p_{1,2}$<0,05**; **$p_{1,3}$<0,01** **$p_{1,4}$<0,001**; **$p_{2,3}$<0,05** **$p_{2,4}$<0,001**; **$p_{3,4}$<0,05** |
| ***Strength:*** Modified pull-up for 1 min, number of times | 4,2±1,09 | 6,5±0,53 | 6,8±0,51 | 9,6±1,34 | $t_{1,2}$=1,90; **$t_{1,3}$=2,16** **$t_{1,4}$=3,13;** $t_{2,3}$=0,41 **$t_{2,4}$=2,15**; $t_{3,4}$=1,95 | $p_{1,2}$>0,05; **$p_{1,3}$<0,05** **$p_{1,4}$<0,01**; $p_{2,3}$>0,05 **$p_{2,4}$<0,05**; $p_{3,4}$>0,05 |
| ***Speed-strength:*** Standing long jump, cm | 145,2±5,69 | 149,0±3,37 | 153,6±2,19 | 162,0±2,53 | $t_{1,2}$=0,57; $t_{1,3}$=1,38 **$t_{1,4}$=2,70;** $t_{2,3}$=1,14 **$t_{2,4}$=3,08;** **$t_{3,4}$=2,51** | $p_{1,2}$>0,05; $p_{1,3}$>0,05 **$p_{1,4}$<0,05**; $p_{2,3}$>0,05 **$p_{2,4}$<0,01**; **$p_{3,4}$<0,05** |
| Lifting of the trunk in the sad position for 30 s, number of times | 3,5±0,84 | 4,6±0,57 | 4,7±0,52 | 5,6±0,51 | $t_{1,2}$=1,08; $t_{1,3}$=1,21 **$t_{1,4}$=2,14**; $t_{2,3}$=0,13 $t_{2,4}$=1,31; $t_{3,4}$=1,24 | $p_{1,2}$>0,05; $p_{1,3}$>0,05 **$p_{1,4}$<0,05**; $p_{2,3}$>0,05 $p_{2,4}$>0,05; $p_{3,4}$>0,05 |

stage, the results are shown in Figure 1.

In the first and second stages, according to the centile intervals, the physical development of girls of 11 years was distributed as follows: 3–10% – 1 girl; 10–25% – 11 and 6 girls; 25–50% – 4 and 8 girls, 50–75% – 3 and 2 girls; 75-90% – 1 girl. At the third stage, changes occurred. So, in the interval 3–10% – 6; in 10–25% – 4; 25–50% – 4; 50–75% – 6; 75–90% – do not have, whereas in the fourth stage 3–10% – 2; 10–25% – 6; 25–50% – 4; 50–75% – 8; 75–90% – none (Figure 1).

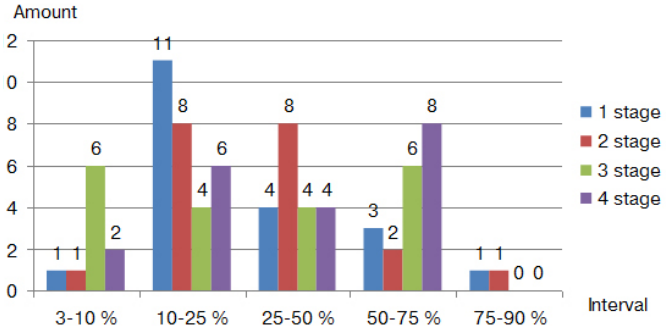


**Fig. 1. Physical development of girls 11 and 12 years old according to the centile intervals during the study (n=20)**

## Conclusions

1. An experimental program of recreational activities with the help of various means for girls of 11–12 years of the preparatory medical group has been made possible to effectively influence their physical development during the year of training.

2. During the year of the study, the girls received an increase on 5,8 cm ($t=2,14$; $p<0,05$) in body length, on 3,8 kg ($t=2,22$; $p<0,05$) in body weight, on 2,7 cm ($t=1,91$; $p>0,05$) chest circumference, on 9,5 Mmhg ($t=1,03$; $p>0,05$) in systolic blood pleasure, on 6,2 Mmhg ($t=1,14$; $p>0,05$) in diastolic blood pleasure, on 126,7 ml ($t=3,52$; $p<0,01$) in vital capacity of the lungs, in volume of inhalation/exhalation on 33,1 ml ($t=3,60$; $p<0,01$), in minute volume on 244,9 ml ($t=2,54$; $p<0,05$) and decrease on 5,9 beats·min$^{-1}$ ($t=0,15$; $p>0,05$) in heart rate, in respiratory rate on 3,4 br·min$^{-1}$ ($t=2,35$; $p<0,05$).

3. The influence of systematic recreational activities had positive changes in the development of the physical qualities of girls 11 and 12 years old in uniform walking ($t_{1,4}=4,58$; $p<0,01$), in angle body from sitting position ($t_{1,4}=8,48$; $p<0,001$), in modified pull-up ($t_{1,4}=3,13$; $p<0,01$), in lifting of the trunk in the sad position from 30 s ($t_{1,4}=2,14$; $p<0,05$).

**Prospects for further research.** In the future it is planned to continue research of girls aged 13–14 taking into account their state of health.

**Conflict of interests**. The author declares that no conflict of interest.
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# Analysis of the market of physical culture and health services in Lviv

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*Today, fitness services are in demand among the Ukrainian population. The saturation of the market for fitness clubs in large and small cities is different.*

***Purpose:*** *to study the market of physical culture and health services in Lviv.*

***Material & Methods:*** *theoretical analysis and generalization of scientific literature, sources and information of the world Internet, comparison method, documentary method.*

***Results:*** *in the article the analysis of the market of the establishments that provide physical culture and health services in Lviv is presented. Fitness club "FitCurves" provides services only to women, but the fitness club "Olympus" is the only one that offers Crossfit services. "Clubs Malibu", "Kiwi fitness" have schools for the training of group coaches. Social responsibility is one of the most important principles of the network "Sport Life".*

***Conclusion:*** *conditions for ensuring the content and active leisure of the population of Lviv are provided: 78 fitness clubs, 16 swimming pools, 64 sports clubs, 6 tennis courts, 10 stadiums, etc. All establishments offer a wide range of fitness services. Price policy of season tickets for fitness clubs is different.*

**Keywords:** *market of fitness and health services, fitness services, fitness club.*

## Introduction

Recently, there has been a positive tendency in Ukraine for the growth of the number of people engaged in various types of recreational motor activity [1; 2; 6]. Clients of fitness clubs are 1,02 million Ukrainians, which is 2,4% of the population of our state [1]. That is why, in our opinion, it is necessary to preserve the existing and to form a modern infrastructure of sports facilities at the place of residence, study, work, in places of mass recreation of citizens, etc. Creation of conditions for the population for doing recreational motor activity is one of the important tasks of state policy in the field of physical culture and sports [6]. The presence of sports infrastructure – institutions of physical culture and sports will help meet the needs of the population for daily physical activity and increase those that have a high level of recreational motor activity [6]. Today, fitness services are in demand among the population of Ukraine [7]. After all, appearance and well-being are integral signs of the success of any person, which encourages you to find time for fitness. Compared with the turnover of the industry, fitness services occupy a small place. But, if you compare incomes only to the market of services, then this is a significant proportion. Today, fitness clubs offer a fairly wide range of services and the number of clubs is growing. Therefore, the questions of studying the market of physical culture and health services rendered by specialized institutions, and their characteristics remain relevant.

Modern society is increasingly becoming a service society. One of the most promising branches in the sphere of services can now be considered physical culture and sports. It is her various institutions that ensure the development of mass sports (sports for all) in Ukraine. According to the Law of Ukraine "On Physical Culture and Sport", the institution of physical culture and sport is a legal entity that ensures the development of physical culture and sports by providing sports and fitness services [8]. Relationships with the State Social Standard in the field of physical culture and sports (2013) are provided by children's and youth sports schools, health centers, physical culture and sports centers for disabled people, sports clubs, sports and health facilities [5]. The standard establishes requirements for indicators of the necessary provision of the needs of the population in conditions for exercising physical culture and sports and obtaining physical culture and sports services. In general, the network of sports, health and sports facilities in Ukraine is characterized by a lack of quantity and uneven location throughout the country [9].

It has been established that the level of provision of the population with the most mass sports and sports facilities is: flat structures – about 70%, swimming pools – 20%, sports halls – 40% [3]. Unfortunately, Ukraine is inferior to sports clubs in leading countries 2–3 times, swimming pools – 30 times. The availability of pool areas in Ukraine is only 14% of the normative [1]. 80% of sports facilities do not meet the standards of this [3].

**Relationship of research with scientific programs, plans, themes.** The work is carried out in accordance with the scientific theme of the Department of Fitness and Recreation LSUPK "Technology of attracting the population to improving physical activity" (Minutes No. 8 of the meeting of the Academic Council of LSUPC of April 19, 2016 state registration № 0117U 003040).

**The purpose of the research:** to study the market of physical culture and health services in Lviv.

## Material and Methods of the research

Research methods: theoretical analysis and generalization of scientific literature, sources and information of the world Internet, comparison and comparison method, documentary method.

## Results of the research and their discussion

Sport and health services are provided both by state non-commercial (sports schools, swimming pools, etc.), and by commercial structures (fitness centers and fitness clubs). The main purpose of the latter is to generate income.

According to the regional department of statistics, the population of the Lviv region as of 1.03.2017 was 2532,2 thousand people, including the population of the regional center – 757,8 thousand people. Lviv region has 25 united territorial communities. The area of the city of Lviv is 182 kmI, the area is 21833 kmI, the population density is 3950,2 people/km$^2$.

The institutions of physical culture and sports in the city of Lviv serve both to promote health, develop and improve physical qualities, and to conduct meaningful leisure activities for various sections of the population. In total 56 stadiums are located in the region (they are not only in Brodovsky and Peremyshlyansky districts), 2009 sports grounds, 768 sports halls, positive dynamics of the number of football fields (729 – in 2000, 859 – in 2012). Greatest asymmetry is peculiar to the location of 39 swimming pools, of which the thirteenth of Lviv, and in 11 districts of the region there are none at all. More sports facilities are functioning in Lviv – 1170 and in Zhydachiv and Sokal regions, where 349 and 328 sports facilities are registered in accordance with.

State of the sports infrastructure of Lviv is presented in Table 1.

**Table1**

**Characteristics of the sports infrastructure of Lviv**

| Objects | Number |
|---|---|
| Sports clubs | 64 |
| Fitness clubs | 78 |
| Dance Clubs | 45 |
| Stadiums | 10 |
| Tennis courts | 6 |
| Pools (open / closed) | 3/13 |

For the implementation of paragraph 2.3.2. "Formation of a healthy lifestyle and development of the health sector," strategic objective 5.2 "Quality of life" of the Strategy for the development of Lviv region for the period to 2020, and in accordance with the Decree of the President of Ukraine "On the National Strategy for improving motor activity in Ukraine for the period until 2025 "Motor activity – a healthy lifestyle – a healthy nation", decree of the Cabinet of Ministers of Ukraine No. 653-r of September 8, 2016 "On approval of the plan of measures for 2017 for the implementation of the National Strategy for Healthy Motor Activity with a view to overcoming the inconsistency with modern requirements for equipping sports grounds for all strata of the population at the place of residence and in places of mass recreation , in particular, in the countryside, the Lviv Regional Council approved the regional program "Sports Ground" for 2017-2021 (Decision No. 351 of 31.01.2017). It is allocated 21 million UAH (Figure 1).

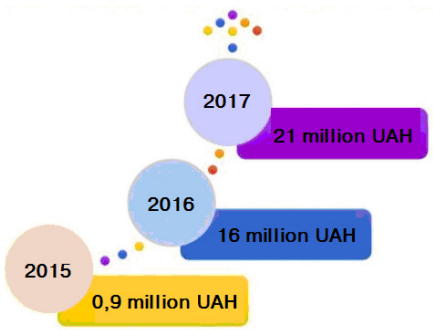


**Fig. 1. Expenditures for arrangement of sports grounds in Lviv**

Of these, 16 million UAH - for the construction of 24 sites with artificial surface, 65 of the training equipment, three planned replacement of coverage, and 5 million UAH is provided for co-financing from the State Regional Development Fund to establish 10 universal sports grounds, the list of which will be determined later.

The Cabinet of Ministers approved (09.2017) the procedure for sending funds (270 million UAH), provided for in the state budget for the construction of soccer fields with artificial cover in various regions of Ukraine.

Analyzing the market of sports and health services, it should be noted that the fitness industry dominates. The reason for this is the world fashion for a healthy lifestyle. The market of fitness services in Ukraine is actively growing. According to the research conducted by the FitnessConnectUA project team, the annual turnover of this market in Ukraine today is $ 201.8 million [1], and Smart marketing agency notes that about 19.7 billion UAH Ukrainians spend the year "on classes for their body" [7]. Despite the military actions and the economic crisis, fitness clubs, fitness centers, etc. are opening in Ukrainian cities more and more. This is explained by the fact that this service market is very promising, with a potential capacity of about $ 2 billion. It is predicted that in 5-6 years, with a favorable macroenvironment, the market will be able to reach this index [4; 7; 10]. Due to the consistently high rates of development, the fitness industry has a high investment attractiveness, the market volume of which is increasing every year.

Research identified Ukraine's potential place in European rankings. So, our state is among the twenty European countries both in terms of the number of fitness clubs and in the number of their visitors [1]. Today, the market of fitness services in Ukraine includes network centers and individual non-network establishments. So, fitness clubs are located in shopping centers, business centers, hotels, sports complexes, etc. The analysis of the market, found that in Ukraine there are 1419 fitness clubs (Figure 2).

As shown in Figure 1, the saturation of the market by fitness clubs in cities and towns is different. This is mainly due to the purchasing power of the population. Since Lviv occupies the 5th place with 9 seats (5%) among 24 cities in the country, it

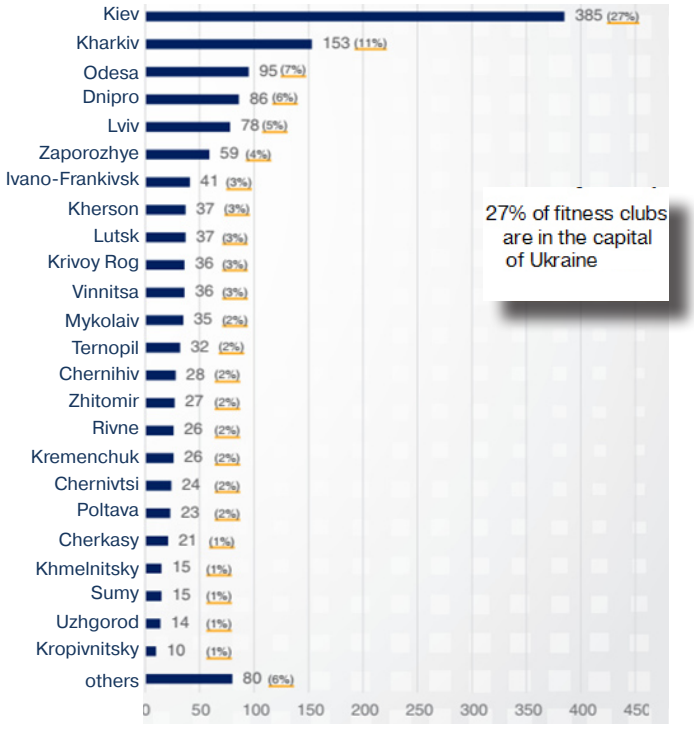


**Fig. 2. Number of fitness clubs in the cities of Ukraine [1]**

can be considered an average city. Therefore, we have studied in more detail the state of the fitness industry in Lviv.

So, consumers of fitness services in the city have 51576 people (about 6,8%) [1]. Analyzing the activities of fitness facilities, it should be noted the presence of two international networks: "FitCurves" (distributed in 80 countries) and "Sport Life" (founded by venture capital fund Kiev-Capital in Maryland, USA). The largest in terms of the number of clubs is the "FitCurves" network – 8 clubs (from 153 clubs in Ukraine) – fitness clubs for women, then "Sport Life" – 4 clubs (from 55 clubs), "Kiwi fitness" – 4 (out of 5 clubs) , "Olympus" – 4, "Malibu" – 2 (out of 38 clubs) "Forever" – 2, "League" – 2, etc. (Table 2).

**Table 2**

**Classification of fitness centers in Lviv**

| Network Type | Network description | Fitness clubs |
|---|---|---|
| International | Works in the market of several countries | "Sport Life" "FitCurves" |
| Ukrainian | Operates in the state market | "Olympus" "Malibu" "Kiwi Fitness" |
| Regional (local) | Working in the market of one region (city) | "Forever" "Sante" "League" "Beauty Formula" "Positive" "Unity" Other |

In Lviv, there are more than 70 organizations that provide various fitness services. Only 7,7% of them have more than one branch in the city. Another part of the institutions, has one office, is the bulk of the Lviv fitness industry. First of all, these clubs are oriented towards people with lower income.

We analyzed the official sites of the most popular fitness networks in Lviv, which have more than one club. The sites provide general information on the activities of the fitness club and its mission; coaches, leading personal and group classes; stock and news, schedule and prices. This made it possible to generate information on their general characteristics (Table 3).

These tables indicate the availability of a wide range of fitness services in all clubs. It should be noted the popularity of the classes they offer, for example, Pilates, yoga, TRX, 90-60-90, etc. Only two fitness clubs (Forever and Kiwi Fitness) offer jumping classes, and three clubs ("Malibu", "Sport Life" and "Forever") – a lesson for children. Unfortunately, only the fitness club "Sport Life" has a swimming pool and offer appropriate services. The fitness club FitCurves is also specific, as it provides services only to women. Fitness Club "Olympus" – the only one, offers services for licensed Crossfit. Most clubs provide related services to restore the body (sauna, massage, etc.).

The analysis of sites of fitness establishments revealed some peculiarities of the content of the presented information. So, the Fitness club "League" on its website gives additional information: rules of conduct, rights, duties, prohibitions. Fitness club "Malibu" informs about a single membership card, which makes it possible to visit relevant clubs in 7 cities of Ukraine. The club also informs about the provision of training services for trainers in its school. Fitness club "Kiwi fitness" has a similar school for the training of group trainers and is the training center "Jumping" for coaches of Ukraine under the licensed program. On the site of the club you can get acquainted with useful scientific information on nutrition, caloric content of products, benefits from motor activity, etc.

It should be noted that social responsibility is one of the most important principles of the network of fitness clubs "Sport Life", as network owners understand the primary role of patronage and sponsorship for the development of sports and provide material support to sports teams of various levels – from domestic to national teams. Support for the development of children's sports, professional sports teams, national federations and the national Olympic movement, physical and health work with the company's employees, development of mass sports is one of the key directions of the social policy of the Sport Life group of companies for many years.

The pricing policy that fitness clubs adhere to is different, which determines the cost of subscriptions. The study [1] found that 31% of respondents among the factors influencing the choice of a fitness club, consider the cost of its subscription. So, "Sport Life" offers only annual cards, not always financially possible, although convenient. Other clubs offer one-time classes, which, in our opinion, provides an opportunity to receive various types of services during the month, half-year and year. Prices range from 300 to 450 UAH/month. Positive in the activities of all fitness clubs are promotional offers that are provided to customers.

It should be noted that not all fitness clubs update information on their websites in time, slows down the timely acquaintance of potential and current customers with shares, new products, etc.

## Conclusions

1. In Ukraine, there is a positive trend of growth in the num-

**Table 3**

**Characteristics of the most popular fitness clubs in Lviv**

| Fitness clubs, location | Area | Card category / price | Fitness services (varieties of fitness programs) |
|---|---|---|---|
| Malibu<br>Sakharova, 45<br>V. Velikogo, 123 | 500 m² | VIP-card for the year - 4200 UAH<br>VIP-card for half a year - 2400 UAH<br>Fitness+gym – 299 UAH/month. | Body Sculpt; Yoga; Fitness intensive; Pilates; Slim Body; 90-60-90; Pil+Stretching; 50/50 step+abs; Fitness mix; Body Shape; Step aerobics<br>Total body; Fit-zoom; Stretching; Tai boo; Body Pump; Step aerobics<br>"Healthy back"; Cool fizra (10 to 16 years old) & Sport kids (2 to 10 years old); "Advanced course"; Fitness Manager |
| **Sport Life**<br>Heroes UPA, 72<br>Zubrivskaya, 38<br>Chornovil, 67b<br>Scientific, 7d | 4000m²<br>5500 m²<br>3000 m²<br>1000 m² | Lux&SPA,<br>Premium – 7990 UAH/year<br>Classic+b – 6490 UAH/year<br>Classic – 4190 UAH/year<br>(promotional prices) | Basic Yoga; Hatha Yoga; TABS; AA Aqua Strong; SuperTilo; Elastic Sidnichki; Step 1; Aqua Legs + Press; Basic Cycle; Thai Bo; TRX; Basic step; Step Puzzle; Pilates Matwork; Dance Mix; 90-60-90; Upper Body; Stretching 45; ABS; AC Power Stretch +; Body Sculpt; Tabata; Functional Force; Aqua Noodles; Squash; Aerobic Dance; TBW; AC Beginner Swimmers; ABT; Boxing; Bosu Interval; Functional Training; Dance Mix; Aqua Freestyle; Upper Body; Fly Yoga; Aqua Strong<br>Gym, Children's Fitness Academy;<br>SPA area: sauna, massage |
| **Olymp**<br>Shchyretska, 36<br>Old Market, 8<br>Khutorivka, 26<br>B. Khmelnitsky, 176 | 1700 m²<br>400 m²<br>400 m² | Morning – 390 UAH/month; 1640 UAH/6 months; 690 UAH/year<br>Day – 340 UAH/month; 390 UAH/6 months; 2290 UAH/year;<br>Unlimited – 490 UAH/month; 2090 UAH/6 months; 3390 UAH/year<br>Universal – 4900 UAH/year | Gym; Step aerobics; 90-60-90; Yoga Pilates; Zumba; Crossfit; power step aerobics; Express Slimming bodyexpiration; FitnessMix; functional training; dance aerobics<br>Table tennis<br>SPA area: sauna, massage |
| **Kiwi fitness**<br>Masaryka, 2<br>Scientific, 43b<br>Bandera, 18<br>Stefanik, 21 | 180 m² – 260 m² | Universal morning – 592 UAH/month; 2928 UAH/6 months; 4608 UAH / year<br>Universal classic – 672 UAH/month; 2928 UAH/6 months; 4608 UAH/year<br>Kids – 480 UAH/month;<br>Student – 544 UAH/month<br>Express (30 min) with different number of classes in the subscription – 384 UAH / month | Body Shape; Pilates; or pregnant women); Pole Junior (9–13 years old); No dance; Hatha Yoga; Stripplasty; Zumba<br>The program of weight loss "8 weeks"; Anti-cellulite program<br>SPA area: massage, phytobacteria |
| **FitCurves**<br>8 clubs | 218 m² | From 199 to 379 UAH/month. | 30-minute cycle training |
| **Forever**<br>Stepanivna, 45<br>Zelena, 20 | 235 m² | Unlimited – 400–450 UAH/month; 3570 UAH/year | Eastern dance; Yoga for children; Functional training; Pilates + Fitball; spinbike aerobics; track fit; dance mix; step fit; Complex for weight loss; Children's gymnastics (7–13 years old); yoga fit; Yoga Basic; Stretching + myofas; release; A slim body; Functional training; jumping; bodi scalp + jumping; children's group "TeenS"; jazz fenc; hip-hop<br>Gym, table tennis |
| **League**<br>Shafarika, 16a<br>Kalnyshevskogo, 16 | 500 m² | Liga Vip – 999 UAH/month; 9000 UAH / year<br>Unlimited – 650 UAH/month; 6000 UAH/year<br>Daily – 450 UAH/month; 4000 UAH / year | Body Sculpt, Hip Hop, Intensive Weight Loss, TRX, Karate, Boxing, Pilates, Choreography, Fit Form, Strech intensive<br>Gym<br>SPA area: sauna, massage, solarium |

ber of people engaged in various types of recreational motor activity. Creating conditions for improving the health of the population is one of the important tasks of state policy in the field of physical culture and sports. One of the most promising industries in the service sector can be considered physical culture and sports, in particular – the fitness industry. The market of fitness services in Ukraine is actively growing and remains promising in the future.

2. In Lviv, conditions are created to ensure the holding of meaningful and active leisure of the population, 78 fitness clubs, 16 swimming pools, 64 sports clubs, 6 tennis courts, 10 stadiums, etc. are functioning. However, consumers of fitness services is only 51576 people (6,8%).

3. Analysis of the most popular fitness clubs in Lviv: "FitCurves", "Sport Life", "Kiwi fitness", "Olympus", "Malibu", "Forever" and "League" allowed to form their characteristics. All these institutions offer and provide a wide range of fitness services to the city's population. Fitness club "FitCurves" provides services only to women, but the fitness club "Olympus" is the only one that offers Crossfit services. Clubs "Malibu", "Kiwi fitness" have schools for the preparation of group trainers. Social responsibility is one of the most important principles of the network "Sport Life". The pricing policy of establishments of the fitness industry of the city is different, which forms offers of different cost of season tickets (cards) and the duration of their action (from one-time annual attendance of classes).

**Prospects for further research.** The focus will be on studying the external and internal environment of the most popular fitness clubs in Lviv.

**Conflict of interests**. The authors declare that no conflict of interest.
**Financing sources.** This article didn't get the financial support from the state, public or commercial organization.

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# Substantiation of the developed program of physical rehabilitation of physically prepared persons with essential arterial hypertension of the I degree

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***Purpose:*** *scientifically substantiate the developed complex physical rehabilitation program aimed at accelerating the recovery process at different rehabilitation periods for people with essential hypertension of the first and second adulthood who have been engaged in fitness for more than three years.*

***Material & Methods:*** *in the patients of the main and control groups, the functional state was determined using the analysis of the heart rate variability on the Poly-Spectrum apparatus © Neurosoft, blood pressure measurement by the method of N. S. Korotkov, bioimpedance study of the body composition, and the quality of life according to the MOS SF-36. The main group consisted of 31 people (24 men and 7 women), the control group was 31 (23 men and 8 women).*

***Results:*** *program of physical rehabilitation has been developed, which includes kinesitherapy (training on simulators, independent exercises, dosed aerobic exercise, morning hygienic gymnastics), thermo-contrast agents and nutrition correction and was introduced in the sports and recreational complex "Monitor" in the main group.*

***Conclusion:*** *use of the developed program of physical rehabilitation helped to normalize blood pressure, improve the functional state and the level of quality of life to a greater extent than in the control group in which the standard program of the institution was applied.*

**Keywords:** *arterial hypertension, physical rehabilitation, sauna, strength exercises, orthostatic exercises, flexibility, coordination, heart rate variability, integral body rheography.*

## Introduction

Arterial hypertension (AH) is the most common disease of the cardiovascular system in industrially developed countries [3]. Among all AH patients, 95% of people are classified as essential hypertension (EG) [11; 13]. In most countries of the world, including in Ukraine, there is a clear tendency towards an increase in the number of patients with arterial hypertension [2]. It is a factor that worsens the quality of life, and one of the main factors of early disability and mortality due to a high risk of complications such as stroke, coronary heart disease, cardiac and renal insufficiency, etc. [3]. Arterial hypertension, despite significant achievements in studying the mechanisms of its development, improvement of diagnostic methods, therapy, primary and secondary prevention, remains one of the most important problems of modern cardiology [5].

Since long-term use of antihypertensive drugs is required to maintain the necessary therapeutic effect, the role of non-drug methods, including therapeutic physical factors, in the prevention, treatment and rehabilitation of patients with cardiovascular diseases is increasing. Physical factors do not have side effects, do not cause intoxication, allergic reactions, do not lead to cumulating, addictive, and are also able to enhance the action of medications; it helps to reduce their dosage [2].

However, for people who have changed their way of life and are engaged in sports, physical rehabilitation is not presented in accessible scientific literature. Parts of persons engaged in fitness and lead a healthy lifestyle, generally accepted recommendations for physical rehabilitation is not enough to normalize blood pressure, which requires the development of a special comprehensive rehabilitation program.

In order for the physical rehabilitation program to be effective, it needs to be developed on the basis of the mechanisms for regulating blood pressure: a decrease in cardiac output, a decrease in the activity of the sympathetic nervous system, a reduction in the overall resistance of peripheral vessels, an increase in the sensitivity of the baroceptors, decreased plasma volume [1; 12].

Well-proven programs of physical rehabilitation, including cyclic and strength exercises. Intensive physical activity can stimulate the activity of the sympathetic nervous system and renin-angiotensin-aldosterone to such an extent that the hypotensive effect of physical exertion of less intensity is increased. In a complex of rehabilitation tools with the use of a sauna as a thermo-contrast means of rehabilitation, one can achieve a more pronounced effect of reducing catecholamines and the volume of blood plasma [4; 6; 9; 10].

A powerful adaptive stimulus for training the sympathetic nervous system is endowed with means of physical rehabilitation that require increased concentration and neuro-emotional tension. Therefore, the physical rehabilitation program should be supplemented by complex coordination forms of physical activity. And to increase the sensitivity of baroreceptors it is advisable to use physical exercises with different initial positions for training orthostatic mechanisms of vascular response [1; 12].

Analyzed data of the literature testify to the need to use ther-

mal-contrast effects (sauna, shower, bath, hardening) on the body of patients with essential hypertension, as a powerful factor for training the functional system of regulation of blood pressure in the process of restoring their health [7; 8].

**Relationship of research with scientific programs, plans, themes.** The research was carried out in accordance with the "Consolidated Scientific Research Plan in the field of physical rehabilitation and sports for 2012–2016". On the topic 4.4. "Improving the organizational and methodological foundations of programming the process of physical rehabilitation for dysfunctional disorders in different body systems" (state registration number 0111U001737).

**The purpose of the research:** scientifically substantiate the developed complex physical rehabilitation program aimed at accelerating the recovery process at different rehabilitation periods for people with essential hypertension of the first and second adulthood who have been engaged in fitness for more than three years.

*Research tasks:* on the basis of the literature analysis, to select the methods of physical rehabilitation, which have a powerful effect on the mechanisms of blood pressure regulation, to develop and implement a physical rehabilitation program and to evaluate its effectiveness.

## Material and Methods of the research

The contingent of patients consists of 62 physically trained people (47 males at the age of 39,5±4,8 years and 15 women at the age of 41,7±5,5 years); they were engaged in fitness for more than three years with essential hypertension of the first stage without concomitant diseases and complications that would contribute to the development of secondary hypertension. In the main and control groups of 31 persons.

Patients were conducted: blood pressure measurement for Korotkoff method, determination of heart rate variability (HRV), bioimpedance analysis and integral body rheography.

The main group was involved in the physical rehabilitation program developed by us for six months (kinesitherapy, thermocontrast methods and diet therapy). The control group was engaged in accordance with generally accepted recommendations on physical rehabilitation of persons with arterial hypertension (medical gymnastics, therapeutic massage, physiotherapy).

## Results of the research and their discussion

Physical rehabilitation of persons with essential hypertension was carried out at the dispensary stage in three periods: preparatory, basic and fixing.

The program lasted six months and began with a training motor regimen, as the selected contingent of patients consisted of those people who had already been engaged in fitness for more than three years, but could not achieve normalization of blood pressure.

The complex program of physical rehabilitation of patients with essential hypertension contained information and practical component:

– *information component* of the program consists of personal consultation, instrumental monitoring and assessment of the patient's condition, provision of theoretical knowledge about the etiology, pathogenesis of the disease, as well as the impact of the means and the importance of observing the principles of physical rehabilitation.

– *practical component* of the program is based on the mastery and use of physical rehabilitation, as well as educational and motivational conversations to maintain a healthy lifestyle after the completion of the physical rehabilitation program.

*Kinesitherapy exercises* for persons with arterial hypertension had an elongated opening part (30–20 minutes), the main part shortened to 20–30 minutes, and the final part increased to 10 minutes. This kind of occupation is very important because it allows you to gradually increase the load without the risk of hypertensive crisis or loss of consciousness. In the process of increasing the patient's tolerance to physical exertion on the main and fixing the periods of rehabilitation, the duration of the introductory and final part decreased, and the main one increased. The volume and intensity of the exercises experienced the same changes. Intensity was increased due to weight gain, the combination of exercises in groups and by changing the initial position (lying, sitting, standing, upside down), which allowed to dose the load on the vascular centers from a small one – recumbent, to the very – upside down).

In the classes of kinesitherapy, physical exercises on the simulators were designed in a circular method with medium and moderate intensity in large and maximum amplitude. The exercises were necessarily performed with diaphragmatic breathing, and alternating not only the working muscles, but also the original position, the frequency of the change increased according to the patient's adaptation.

Carrying out complex co-ordination exercises allowed to expand the feeling of one's own body and the ability to control tight muscles (for example, the neck muscles were often stressed when doing leg exercises).

*Dosed aerobic load* was intended after kinesitherapy, or another day in the form of therapeutic walking, swimming or running.

*Thermo-contrast agents* were intended for patients one month after the onset of rehabilitation. With the disappearance or a significant decrease in orthostatic reactions, patients were assigned a contrast shower. The first two weeks the temperature difference was small – warm-cool water, and then the temperature range increased to hot-cold water. The number of repetitions increased to two or three contrasts. If the patient did not have complaints after the contrast shower, then he was assigned a sauna.

*Psychorelaxation* was integrated into motor activity. At all exercises, patients were taught to deliberately strain and relax the working muscles. This made it possible to learn to control the level of muscle tension during exercise and to transfer this skill to everyday life and, as a consequence, not be in a state of chronic muscle and mental stress.

*Educational and motivational conversations* to change the way of life were present at all stages of rehabilitation during the sessions of kinesitherapy in the form of counseling during

exercise and in breaks between them. During the interviews, the following tasks were set:

– mastering the basic knowledge of anatomy and physiology of the musculoskeletal system and the cardiovascular system;

– mastering knowledge about the mechanisms of therapeutic action of physical exercises;

– detailed explanation of the mechanisms of reduction and mechanisms of increasing blood pressure;

– mastering the methodology of independent studies.

For a better understanding of the program, the tools and their application for six months are presented in Table 1.

Analysis of blood pressure after rehabilitation showed positive changes in the main group. In 87% of patients the pressure was normalized. The mean systolic pressure dropped from 144,6 to 128,2 Mmhg, and the diastolic value from 87,8 to 81,5 Mmhg That is, the systolic pressure decreased by 16.5, and the diastolic pressure by 6.3 mm, while in the control group the systolic pressure decreased by 2,1 Mmhg, and the diastolic pressure by 0,7 Mmhg The parameters of the auscultative pressure measurement method are shown in Table 2.

Parameters of cardiac rhythm variability in the control group for physical rehabilitation were better than in the main group, as evidenced by the best functional state (3,4 versus 0,03), and the ratio of high frequency oscillations to low frequency oscillations was 2,5 versus 3,2. The total power of the spectrum of the control group was 3263 msl/Hz versus 2341 msl/Hz in the baseline.

Upon completion of rehabilitation, in the main group, the percentage of low frequency waves, indicating the activity of the sympathetic system, decreased by 12%, while in the control group it increased by 4,9%, which led to a worsening of the sympathetic parasymatic ratio by 12% in the control and an improvement of 2,5 times in the main group (from 3,2 to 1,2). In the main group, the total power of the spectrum doubled, while in the control group the total power of the spectrum decreased by 26,2%. There was an improvement in the level of functional status of the main group, increased by seven units.

**Table 1**

**Filling the rehabilitation program for physically trained individuals with essential hypertension**

| Period | Month | ME | Kinesitherapy | Self-study | Nutrition correction | Aerobic load | Thermo-contrast agents | |
|---|---|---|---|---|---|---|---|---|
| Preparatory | 1–2 weeks | Mastering | 3 hour/week 10 exercises for 10–20 repetitions. Intensity: 40–60% | Repeat warm-up at home | Establishment of existing nutrition | – | – | Educational-motivational conversations to change the way of life |
| Main | I month | Every morning | 3 hour/week 20 exercises for 15–20 repetitions. Intensity: 60–80% | Warm-up during the day, diaphragms. breath. | Normalization of the regime (3–5 times/day) | 20 minutes. 3 times a week. | – | |
| | II month | | 3 hour/week. up to 25 exercises for 15–20 repetitions. Intensity: 60–80% Co–coordinating exercises are added | Warm-up during the day, diaphragms. breathing, walking or running | Nutrition 3–5 times/day, normalization of the volume (deficit 200–500 kcal.) | 1-2 hours per week | Contrast shower in 2–3 temperature contrasts (Δt=10–20°C)/sauna one set up to 3 minutes | |
| | III month | | 3 hour/week Intensity is increased due to the combination of exercises in 2–3 groups, which are performed on 2–3 approaches | | Nutrition 3–5 times/day, shortage of 500 kcal./Day | 3 hours per week | Sauna 3 times/weeks first event in the sauna – 3 min. Second and third call – up to 5 minutes. Cooling in the waiting room – 5 min. | |
| | IV month | | | To remove psychoemotional and physical stress several times a day with breathing, exercises for flexibility, therapeutic walking or running | | Intensity + 10–20% | Sauna 3 times/week First event in the sauna – 5 min. Second and third call – up to 7 minutes. Cooling with cold water | |
| Fixing | V month | | Maintain volume and intensity | | List the caloric content, respectively, physical. load, create a deficit of 200 kcal./day | Maintain volume and intensity | Sauna 1–2 times a week 3–5 events for 5–7 minutes, cooling with water, rest in the waiting room 5 min. | |
| | VI month | | | | | | Sauna once a week 3–5 events for 5–7 minutes, cooling with water, rest in the waiting room 5 min. | |
| | Testing | Summing up of the program, analysis of the received indicators of diagnostics, comparison with the ascending state. Calorie counting according to the future physical activity is already without a calorie deficit. | | | | | | |

***Remark.*** *ME – morning exercises.*

**Table 2**

**Indices of blood pressure in patients of the main and control groups before and after rehabilitation, Mmhg.**

| Sex | Main group before rehabilitation | | Main group after rehabilitation | | Control group before rehabilitation | | Control group after rehabilitation | |
|---|---|---|---|---|---|---|---|---|
| | BP syst. | BP diast. | BP syst. | BP diast. | BP syst. | BP diast. | BP syst. | BP diast. |
| Men | 145±6,4 | 89±7,6 | 129±8,9 | 82±4,1 | 143±6,9 | 86±6,7 | 139±9,4 | 85±6,5 |
| Women | 143±4,3 | 85±6,7 | 127±10,8 | 80±4,9 | 141±1,8 | 84±5,2 | 142±2,2 | 84±3,6 |

***Remark.*** *BP syst. – systolic blood pressure, BP diast. – diastolic blood pressure; the indicators of the main group are statistically significant (p <0,01), the control group's performance is not statistically significant (p>0,05).*

In the control group, the functional status level decreased by 1,5 units. The deterioration in the parameters of the control group indicates the incorrectness of the dosage of exercise, disregard for the work and rest regime, and the lack of effective methods of psycho-relaxation. Parameters of cardiac rhythm variability in patients of the main and control groups before and after rehabilitation are presented in Table 3.

The study of integral body rheography made it possible to evaluate and analyze important parameters of hemodynamics and respiratory system, on the basis of which we can objectively evaluate the effectiveness of the rehabilitation program.

According to the received data r, the majority of hemodynamic parameters in patients of both groups were above the norm. Thus, the parameters of the minute volume of circulation (MVC) were higher than normal in 75% of the patients in the main group and in 55.5% in the control group. The respiratory rate was higher than normal in 75% of the patients and 74% in the control group.

Upon completion of the rehabilitation program, the indices of integral body rheography showed positive changes in the main group and negative changes in the control group. In the main group, the shock volume of blood circulation (SVB) decreased from 100 to 93,2 ml, in the control group the shock volume of blood circulation increased from 95,3 to 96,6 ml and exceeded the index of the main group by 3,4 ml. These data coincided with the indices of cardiac rhythm variability, and indicate a decrease in the influence of the sympathetic system in the persons of the main group.

Under the influence of rehabilitation exercises, the heart rate (HR) decreased from 68,9 to 64,7 beats $min^{-1}$ in the main group, and in the control group it did not differ much from the initial parameters (66,7 at the beginning and 67,1 beats $min^{-1}$ on completion). These data coincided with the indices of cardiac rhythm variability, and indicate an increase in the influence of the parasympathetic system in individuals of the main group.

Changes in heart rate along with changes in stroke volume (SV) led to a decrease in the minute volume of blood circulation (MVB) in the main group by 0,8 liters, while in the control group it remained unchanged.

The obtained data of the IRGPB of the patients of the main and control groups are presented in Table 4.

The physical rehabilitation program we developed improved the bio-impedance study of body composition more than twice as much as the standard program (Table 5).

Thus, the data obtained from the integral rheography of the body coincided with the dynamics of heart rate variability and bioimpedance examination of the body, and indicate an improvement in the state of the cardiovascular system, as well as a decrease in sympathetic activity and an increase in activity of the parasympathetic system, which led to a decrease in

**Table 3**

**Characteristics of parameters of variability of heart rhythms of patients of the main and control groups before and after rehabilitation**

| Indicators | Main group | | Control group | | Difference before and after | |
|---|---|---|---|---|---|---|
| | Before rehabilitation | After rehabilitation | Before rehabilitation | After rehabilitation | Main group | Control group |
| TP | 2341 | 4671 | 3264 | 2409 | 2330 | –855 |
| 25%; 75% | 1255; 2623 | 2170; 5854 | 1617; 4147 | 1354; 2579 | | |
| LF/HF | 3,2 | 1,2 | 2,5 | 2,8 | 2 | –0,3 |
| 25%; 75% | 1,5; 4,4 | 0,8; 1,3 | 1,0; 3,2 | 1,4; 4,1 | | |
| % VLF | 50 | 47,8 | 46,3 | 41,9 | 2,2 | 4,4 |
| 25%; 75% | 36,5; 59 | 33; 61,5 | 34,5; 56,5 | 28; 52 | | |
| % LF | 38 | 26 | 33,4 | 38,3 | 12 | –4,9 |
| 25%; 75% | 25;43 | 18; 31,5 | 27,5; 40 | 29; 42 | | |
| % HF | 14 | 26,4 | 19,7 | 19,4 | 12,4 | –0,3 |
| 25%; 75% | 8; 20 | 16; 36 | 9,5; 26 | 12; 25 | | |
| FS | 0,03 | 7,1 | 3,4 | 1,9 | 7,07 | –1,5 |
| 25%; 75% | –5; 3,5 | 4,3; 11,8 | –1,5; 8,0 | –3,3; 7,3 | | |

***Remark.*** *TP – the total activity of neurohumoral effects on the heart rhythm (msl Hz), LF/HF – the balance between activity of the sympathetic and parasympathetic divisions (c. u.), % VLF,% LF and% HF – percentage ratio of very low, low and high frequency heart waves rhythm, FS – functional state (c. u.), Indicators, deteriorated, have a negative value. Indices of the main group are statistically significant (p <0,05), the parameters of the control group are not statistically significant (p>0,05).*

**Table 4**

**Indices of integral rheography of the patient's body of the main and control groups before and after rehabilitation**

| Indicators | Main group | | Control group | | Difference before and after | |
|---|---|---|---|---|---|---|
| | Before rehabilitation | After rehabilitation | Before rehabilitation | After rehabilitation | Main group | Control group |
| VSV | 100 | 93,2 | 95,3 | 96,6 | 6,8 | –1,3 |
| 25%; 75% | 90,1; 107,7 | 86,5; 100,9 | 86,5; 100,1 | 83,9; 103,1 | | |
| MVB | 6,8 | 6 | 6,3 | 6,3 | 0,8 | 0 |
| 25%; 75% | 6,2; 7,4 | 5,6; 6,7 | 5,8; 6,7 | 5,9; 6,9 | | |
| SI | 53,5 | 51,2 | 49,1 | 54,1 | 2,3 | –5 |
| 25%; 75% | 45,9; 61,5 | 44,7; 53,1 | 42,9; 55,8 | 45,2; 59,8 | | |
| CI | 3,6 | 3,3 | 3,2 | 3,6 | 0,3 | –0,4 |
| 25%; 75% | 3,2; 3,8 | 2,9; 3,6 | 2,9; 3,8 | 3,2; 3,8 | | |
| KP | 128,8 | 117,2 | 116,4 | 122,1 | 11,6 | –5,7 |
| 25%; 75% | 116,4; 134,2 | 103,9; 128,5 | 99,6; 135 | 109,9; 131,4 | | |
| HR | 68,9 | 64,7 | 66,7 | 67,1 | 4,2 | –0,4 |
| 25%; 75% | 65,8; 73,3 | 60; 70 | 60; 73,5 | 67; 72 | | |
| KIT | 77,5 | 78,2 | 78,2 | 76,8 | –0,7 | 1,4 |
| 25%; 75% | 76,7; 79,3 | 74,5; 81,4 | 76,3; 80,5 | 74,5; 79,6 | | |
| RR | 18 | 16,4 | 17,7 | 17,2 | 1,6 | 0,5 |
| 25%; 75% | 15,8; 20 | 14; 19 | 16; 19 | 15; 19 | | |

***Remark.*** *VSV – value of the shock volume of the left ventricle (ml), MVB – minute volume of blood circulation (l min), SI – shock index (ml $m^{-2}$), CI – cardiac index ($l \cdot min^{-1} \cdot m^{-2}$), KP – the ratio of the MVB to the required value of the MVB (%), KIT – characterizes the state of the tone of the arterial system (c. u.), heart rate – heart rate (beat $min^{-1}$), RR – respiratory rate (breathing $min^{-1}$). Indices of the main group are statistically significant ($p<0,01$), the parameters of the control group are not statistically significant.*

the left ventricular stroke volume and decrease in heart rate.

## Conclusions

Despite the existence of various programs of rehabilitation for persons with essential hypertension, blood pressure is not always normalized.

For physically trained persons with arterial hypertension Physical rehabilitation programs have not been found based on the data of the analyzed scientific-methodical literature. People need a program with large adaptive stimuli and a wide range of physical rehabilitation facilities, since standard recommendations are not enough to normalize blood pressure.

Having learned from the experience of other authors, we believe that the physical rehabilitation program will be effective if it includes kinezotherapy (training on simulators with targeted alternation of starting positions, dosed aerobic exercise, independent exercises, morning hygienic gymnastics), thermal contrast media (contrast shower and sauna), psychocorrection (psycho-relaxation, educational-motivational conversations) and nutrition correction. These funds will affect the mechanisms of regulation of blood pressure.

The combination of the theoretical and practical component of the program helped to develop the right habits and adjust the lifestyle of people with essential hypertension, so they consciously controlled the level of psychological and physical activity, as well as rest and diet, which led to lower blood

**Table 5**

**Indices of bioimpedance study of the body of patients in the main and control groups before and after rehabilitation**

| Indicators | Main group | | Control group | | Difference before and after | |
|---|---|---|---|---|---|---|
| | Before rehabilitation | After rehabilitation | Before rehabilitation | After rehabilitation | Main group | Control group |
| BMI | 28,3 | 26,7 | 27,6 | 27 | 1,6 | 0,6 |
| 25%; 75% | 26,8; 30 | 25,2; 29,2 | 25,1; 30 | 25,2; 29,7 | | |
| Body weight | 90 | 85,3 | 87,1 | 85,1 | 4,7 | 2 |
| 25%; 75% | 79,7; 99,2 | 75; 94,7 | 74,3; 96 | 71,9; 91,6 | | |
| Fat mass | 25,1 | 21,5 | 23,7 | 22,1 | 3,6 | 1,6 |
| 25%; 75% | 20,4; 29 | 17,8; 24,3 | 19,3; 28,5 | 18,4; 26,3 | | |
| % of fat mass | 27,6 | 25,1 | 26,7 | 25,6 | 2,5 | 1,1 |
| 25%; 75% | 24; 31 | 23; 27,5 | 23; 30 | 23; 28 | | |
| Non-fat mass | 64,9 | 63,7 | 63,4 | 62,9 | –1,2 | –0,5 |
| 25%; 75% | 57,7; 72,3 | 55,7; 71,6 | 55,5; 69,2 | 53; 69,2 | | |

***Remark.*** *Indicators that have improved are of positive significance. Indicators have deteriorated, have a negative value. Parameters of the main and control groups are not statistically significant ($p>0,05$).*

pressure.

In accordance with the effectiveness criteria (normalization of blood pressure, improvement of heart rate variability and integral rheography of the body), a comprehensive program of physical rehabilitation is effective for people with essential arterial hypertension.

Use of the means given in the article is easily accessible for the majority of persons, contributes to the greater dissemination of this program of physical rehabilitation.

**The prospect of further research** is the introduction of a rehabilitation program for physically trained individuals with essential hypertension in rehabilitation and sports complexes and the adaptation of a program for physically unprepared persons with essential hypertension, as well as the development of information and propaganda programs for the prevention of cardiovascular diseases among children and students.

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# Integral technologies of psycho-physical training of athletes in sports aerobics

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***Purpose:*** *substantiate the use of integral technologies for the psycho-physical training of athletes in sports aerobics.*

***Material & Methods:*** *46 qualified aerobics participated in the study, 22 athletes made up a control group, 24 were experimental, and 19 aerobists, 9 athletes made up an experimental group, 10 were a control group. Methods: theoretical analysis of literature data; method for evaluating the results of competitive activities; pedagogical experiment; methods of mathematical statistics with the use of computer programs "EXEL" and "SPSS".*

***Results:*** *psychophysical training should be one of the main parts of the variable component of the general training program for aerobic athletes. It is based on the implementation of special sets of exercises in conjunction with mental imagery of the nature of the movements. The positive effect of the use of integral technologies of psychophysical training on the competitive performance of athletes.*

***Conclusion:*** *construction of the training process with the use of integral technologies of psychophysical training had a positive effect on the effectiveness of the competitive activity of athletes.*

**Keywords:** *sports, aerobics, equipment, team, psychophysical training, integral, technology.*

## Introduction

Sports aerobics is a complex and emotional sport that includes the following categories of competitive performances: individual men's, individual women's, mixed pairs, threes and groups (5 athletes), and dance gymnastics (Aerodance) and gymnastic platform (Aerostep) [4; 5; 7; 8]. Psychophysical training of athletes is of great complexity, since sports aerobics is not only a sport based on the performance of certain motor programs, but also art, requiring emotional transfer of various plot lines of programs. In modern scientific research, the problem of developing the ability of athletes to transmit different images through movements remains practically unlighted. In sports aerobics, from the ability not only to correctly convey the general structure of movements, but also to uncover the plot of the performance, success in competitions depends to a large extent.

At present, there are a large number of studies that show the effectiveness of the application of psychophysical methods of training athletes [6; 7; 12; 13; 14]. A special place is occupied by technologies of psychophysical training connected with the transmission of various images through movements. One of such technologies is special sets of exercises, performed under verses, reflecting various images [10; 11].

It is logical to assume that the use of psychophysical technologies will be effective for the training of athletes in sports aerobics, since sports aerobics requires the display of artistry, the ability to move emotions, create various images and plots.

**Relationship of research with scientific programs, plans, themes.** The research was carried out according to the Consolidated Plan of Research Work in the Field of Physical Culture and Sport for 2011–2015 on topic 2.4 "Theoretical and Methodological Principles of Individualization in Physical Education and Sport" (State Registration No. 0112U002001); research work, which is funded by the state budget of the Ministry of Education and Science of Ukraine for 2013–2014. "Theoretical-methodical bases of application of information, pedagogical and medical-biological technologies for formation of a healthy way of life" (State registration number 0113U002003); research work, which is funded by the state budget of the Ministry of Education and Science of Ukraine for 2015–2016. "Theoretical-methodical bases application of means of information, pedagogical, medical and biological orientation for impellent and spiritual development and formation of a healthy way of life" (State registration number 0115U004036); research work, which is funded by the state budget of the Ministry of Education and Science of Ukraine for 2017–2018. "Teoretikal-methodical bases of application of information, medico-biological and pedagogical technologies for realization of individual physical, intellectual and spiritual potential and formation of a healthy way of life" (State registration number 0117U000650).

**The purpose of the research:** substantiate the use of integral technologies for the psycho-physical training of athletes in sports aerobics.

## Material and Methods of the research

The following research methods were used: theoretical analysis of literary data; method for evaluating the results of competitive activities; pedagogical experiment; methods of mathematical statistics with the use of computer programs "EXEL" and "SPSS". The data obtained were analyzed using non-parametric Kolmogorov-Smirnov tests for independent samples and Wilcoxon for dependent samples.

46 qualified aerobics participated in the study, 22 athletes made up a control group, 24 were experimental, and 19 aerobists, 9 athletes made up an experimental group, 10 were a control group.

## Results of the research and their discussion

To improve mutual understanding of athletes in teams, as well as for psychophysical training, training programs for athletes were developed, taking into account their individual characteristics of the structure of integrated preparedness, including

indicators of functional and psychophysiological capabilities.

Developed training programs included basic and variable components. The basic component of the programs was a standardized structure for selecting the means and methods of training aerobic athletes, the same for all formed groups of athletes. The variational component of the training programs contained special tools and methods that differ in character and scope for the representatives of each group. One of the main parts of the variable component was psychophysical training. It was based on the implementation of special sets of exercises in conjunction with imaginative representations. We have applied special complexes of psychophysical exercises that affect not only the physical aspect, but also the conscious, the psychological in a holistic integrated form.

When constructing training session programs, we were guided by the fact that in order to ensure an integral impact on the consciousness of athletes and on motor development combined with the development of the ability to transfer various plot lines of programs, it is necessary to create conditions for a relatively comfortable state of the musculoskeletal system, a high level of energy consumption, development of physical qualities , functional capabilities and creating an atmosphere of unity of body and mind, self-knowledge, non-standard and unordinary [7; 12; 13].

Our method of psychophysical preparation of the integral effect on the consciousness of athletes and on motor development combined with the development of the ability to transmit various plot lines of programs is also based on the principles of movements described in the works of Zh. L. Kozina and co-authors [10; 11]. These principles are combined with the need to develop imaginative thinking in psychophysical training in sports aerobics.

The principles of motion of systems [10; 11], which were applied in the proposed procedure:

1. Movements are performed by the whole body along the basic planes of human movements. These are the most rational and energetically economical from the point of view of biomechanics and physiology of motion [1; 2; 3]. In each movement, all parts of the body participate successively to the fingertips according to the principle of a dynamic wave with circular motions.

2. In gymnastics wave-like movements of the spine predominate, which improve blood circulation, affect the body as a system like wavy movements of smooth muscles.

3. Gymnastics is constructed as a dance in which one movement flows smoothly from the other, developing the skill of economy and plasticity is extremely necessary for harmonious natural movements.

4. To each exercise (according to the method of Zh. L. Kozina and co-authors [10; 11]) there corresponds a line of poems about nature that sets the image of a similar movement in animals, plants or natural phenomena. Each exercise is also accompanied by mental representations of various images (natural landscapes, color combinations, etc.) according to the individual characteristics of the person.

To determine the impact of the application of psychophysical training on competitive effectiveness, statistical analysis of the ranking indicators in all-Ukrainian and regional competitions was conducted. The following competitions were analyzed: the championship of Ukraine, the Cup of Ukraine, and the championship of the Kharkov region and the Cup of the Kharkov region. The places in the ranking of the competitions of each athlete in 2015 were registered and their places in the rating in 2016.

Before the experiment, out of 25 analyzed performances by athletes in the experimental group, 13 fourth, 3 fifth places and 9 sixth were registered. In the control group, before the experiment was conducted, 3 fourth places and 11 fifth places were placed at 7 sixth places, 4 seventh places.

Before the experiment on the results of the competition in 2015, the control and experimental groups were not statistically different ($p>0,05$).

After the experiment, out of 25 analyzed performances by athletes in the experimental group, 6 sixth places, 3 fifth places and 16 fourths were registered. In the control group, after the experiment, 10 seventh places, 9 sixth places, and 6 fifth places were registered.

After the experiment, statistically significant differences in the competitive rating of athletes of the experimental and control groups ($p<0,05$).

In the experimental group, after the experiment, 3 cases of athletes' transition from fifth to fourth in the ranking of competitions were registered, 2 cases of transition from fourth to third places, 5 cases of transition from sixth to fourth places and 9 cases of fifth places that remained unchanged.

The results of the comparative analysis of the places in the rating of the main aerobics competitions of the experimental group before and after the experiment showed a significant improvement in the competitive performance ($p<0,001$), which indicates the effectiveness of the developed methodology for qualified aerobists.

The results of a comparative analysis of the places in the rating of the main aerobic competitions of the control group before and after the experiment did not show any significant changes in the competitive performance ($p>0,05$), which indicates the difficulty of increasing the place in the competitive rating in sports aerobics.

In the control group, after the experiment, four cases of transfer of athletes from the sixth to the fifth place in the ranking of competitions were recorded, 5 cases of transition from fifth to fourth places, 5 cases of transition from fourth to third places, 6 cases of sixth places that remained unchanged, and 5 cases of the seventh places that have remained unchanged.

Effectiveness of the application of the developed methodology was assessed based on the results of the All-Ukrainian level competitions. The results of competitive efficiency are presented in Tables 1 and 2.

As can be seen from the presented data, as a result of the developed technique, the athletes of the experimental group significantly increased their competitive effectiveness ($p<0,001$), while the competitive performance of the control

**Table 1**

**Determination results of competitive efficiency changes in experimental (n=33) and control (n=32) groups as a result of the experiment (conv. units).**

| Group | Before experiment | | After experiment | | Significance of differences, |
|---|---|---|---|---|---|
| | $\bar{X}$ | S | $\bar{X}$ | S | p |
| Experimental | 7,8 | 0,4 | 8,4 | 0,3 | <0,001 |
| Control | 7,9 | 0,5 | 8,03 | 0,4 | >0,05 |

group remained practically unchanged (p>0,05). The control and experimental groups did not differ between themselves before the experiment (p>0,05), and after the experiment the groups of the steel differ significantly (p<0,001) (Table 2).

**Table 2**

**Determination differences results of competitive effectiveness between the experimental (n=33) and control (n=32) groups before and after the experiment**

| Testing period | Experimental | | Control | | Significance of differences |
|---|---|---|---|---|---|
| | $\bar{X}$ | S | $\bar{X}$ | S | p |
| Before the experiment | 7,8 | 0,4 | 7,9 | 0,5 | >0,05 |
| After the experiment | 8,4 | 0,3 | 8,03 | 0,4 | <0,05 |

The received results testify to efficiency of application of integral technologies of psychophysical preparation and a complete set of commands in sports aerobics.

In the practical work of sports aerobics trainers, one should apply the principles of mathematical modeling for optimal team completion and integrated technologies for psychophysical training and team completion.

## Conclusions

1. Psychophysical training should be one of the main parts of the variable component of the general training program for aerobic athletes. It is based on the implementation of special sets of exercises in conjunction with mental imagery of the nature of movements.

2. Positive effect of the use of integral technologies of psychophysical training in sports aerobics on the competitive performance of athletes is shown. Before the experiment on the results of the competition in 2015, the control and experimental groups were not statistically different (p>0,05). After the experiment, statistically significant differences in the competitive rating of athletes of the experimental and control groups (p<0,05).

**Prospects for further research.** It is supposed to conduct an in-depth scientific substantiation of the impact of psychophysical training on the effectiveness of training athletes.

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# Characteristics of the organizational and managerial activity of the fitness club director

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***Purpose:*** *describe the organizational and managerial activities of the fitness club director.*

***Material & Methods:*** *analysis of literary sources; analysis of documents; system analysis; survey (questionnaire) methods of mathematical statistics. The study was conducted on the basis of 12 fitness clubs in Kharkiv. Respondents were 12 directors, managers of fitness clubs.*

***Results:*** *the obtained results of the study made it possible to reveal the levels of management of the fitness club activities, structural divisions and links, their functions, management ties. From the perspective of an integrated approach, the activity of the director of the fitness club on the complexity of the tasks to be solved.*

***Conclusion:*** *optimal organizational structure of management of fitness clubs is defined includes the following functional blocks: fitness staff service personnel technical staff and administration. It is determined that the financial and economic activities of the fitness club and the continuous improvement of their professional activities are the most difficult tasks in the activity of the director and manager of the fitness club.*

**Keywords:** *management, manager, director, activity, task.*

## Introduction

Fitness industry in Ukraine is in constant movement and development. Its characteristic features are providing consumers with a variety of additional and related services; active marketing policy, prompt response to changing market demand, introduction of new services; differentiation of prices for services; active economic stimulation of consumers of services; application of intensive technologies of production of services, which makes it possible to profit [8]. Fitness clubs also play an important role in strengthening the physical, spiritual and social health of the nation, forming a healthy image and sporting lifestyle for every citizen of the country. As a result, the need for qualified personnel is constantly growing, especially in managers and managers capable of ensuring the effective functioning of fitness clubs.

An analysis of recent research and publications shows only an occasional study of the organizational and managerial activities of the director, manager of the fitness club. Researchers focus on the consideration of certain issues of the prerequisites and trends in the development of the fitness industry in Ukraine [3; 8]; use of modern information technologies in the field of health-improving fitness [4]; marketing activities of fitness clubs [9], professional activities of a fitness trainer [3; 6].

Scientific interest in the literature is also the organization of managerial activities of the manager of a sports and sports organization [7; 11]. The authors of the works have provided reasoned features of managerial activity in the field of physical culture and sports, modern requirements to the personal and professional qualities of the sports manager.

However, the problems of the organizational and managerial activity of the fitness club remain, with the exception of certain works by V. Vavilov [1] and S. Demekhy, V. Gayevoy [5]. But the main attention of these authors is concentrated only on separate management functions.

So, the perspective of a comprehensive study of the managerial and managerial activities of the manager (director) to ensure the effective functioning of the fitness club determined the relevance of this work.

**Relationship of research with scientific programs, plans, themes.** This research was carried out within the framework of the implementation of the fundamental scientific project for 2015–2017. "Theoretical and methodological foundations of the non-Olympic sport" (state registration number 0115U002372), the number of the sub-topic "Organizational and managerial, economic and humanitarian fundamentals of the non-Olympic sport in Ukraine" (0115U006861C).

**The purpose of the research:** describe the organizational and managerial activities of the fitness club director.

*Objectives of the study*: 1) determine the optimal organizational structure of fitness club management; 2) to analyze the activities of the director of the fitness club on the complexity of the tasks to be solved.

## Material and Methods of the research

Study used the following research methods: analysis of literature sources; analysis of documents; system analysis; survey (questionnaire) methods of mathematical statistics. Analysis of literature sources was used to determine the degree of scientific elaboration of the questions studied, to obtain initial data for solving research problems, to interpret the obtained data when comparing different points of view on the problem under study. In the course of the study, 52 literary sources were analyzed. The administrative-administrative documents of Kharkiv fitness clubs were analyzed as well: charters, rules, contracts, marketing plans and business plans, which allowed defining the directions, content of activities, legal status of fit-

ness clubs. Method of system analysis was used to obtain the characteristics of a fitness club as a complex social system, as a result of which the organizational structure of management of fitness clubs was analyzed, its level, divisions and management links were identified, their functions and managerial ties between them determined. Survey (questionnaire) of directors, managers of 12 fitness clubs in Kharkiv city allowed to analyze their activity in terms of the complexity of the tasks being solved. Study used Excel program.

## Results of the research and their discussion

According to the general theory of management, the functioning and development of the organization as a whole is ensured by the organizational structure of management, which is a combination of levels and links in management, interrelated and interacts with each other. In this study, fitness clubs were viewed by us as a complex social system, and management of the fitness club as a process of ensuring smooth and coordinated work between its structural divisions to fulfill assigned tasks and functions. So, under the notion of "optimal organizational structure of fitness club management", we propose to understand the aggregate of management levels, divisions and management links interconnected for the implementation of an effective.

The results of the systemic analysis show that the internal environment of the fitness club is characterized by a linear-functional type of management structure. It is determined that the management of the fitness club is carried out at 3 levels of management: I – on the part of the founder (owner, general director) of the fitness club; II – from the director (manager) of the club; III – on the part of managers and department heads. Be sure to take into account that the organizational structure of the management of the fitness club is different in every single club, the presence or absence of certain structural units and management units. It depends on the diversity of sports and sports services, the availability of additional and related services, the policy of the club, etc.

In determining the optimal organizational structure of management, all the structural units of the fitness club are conventionally combined into 4 functional blocks: 1) fitness personnel 2) service personnel 3) technical staff and 4) administration.

The fitness staff includes: a fitness manager, trainers and instructors of the gym, group programs, martial arts, children's programs, a gaming hall, a swimming pool, etc. The main task of the fitness staff is the implementation of fitness programs for the club's clients. Fitness staff is headed by a fitness manager. Fitness manager sets the club's sporting mood. The directions in fitness change every season, like fashion. Therefore, a good fitness manager should always know what is popular and sells well today, and what will be sold well tomorrow. Based on this, he compiles, introduces and develops fitness programs that the club offers. It is responsible for all fitness activities.

Service personnel provide the club's bandwidth, provides and coordinates information to customers, ensures high-quality customer service for the club. We refer service personnel, service managers, administrators, and all structural units that provide additional and related services: barman, masseur, nutritionist, rehabilitator, sales managers and marketing managers. The main task of the service manager is the reception management, customer service and information support. As a result of the study, it was found that in many fitness clubs the function of the service manager is executed by the senior administrator or administrators. The main task of the administrator is to administer the work of the fitness club and interact with the staff and clients. This involves controlling the scheduling of employee schedules; customer service, presentation of a fitness club for potential and new clients at the highest level and selling club fitness services; support of communication with clients of the club; keeping records in an approved form, etc.

Results of the survey show that in the face of growing competition, sales managers and marketing managers play an extremely important role in the field of fitness services. But the practice of functioning fitness clubs shows that often their functions are performed by administrators and club directors. This indicates that the management of clubs underestimates the role of these structural units. We believe that the department or sales manager is one of the main structural units of the club, because it practically provides the work of other divisions, attracting clients to the club. In turn, marketing managers conduct market appraisals, determine the demand and, in accordance with it, form promotional offers for clients, that is, keep customers in the club. So, the effectiveness of the sales manager and marketing manager depends on the effectiveness of the club as a whole.

The technical staff includes a technical service manager and maintenance personnel. The manager of the technical service is responsible for the engineering and technical service and ensures the uninterrupted operation of all systems and equipment of the club, ongoing repairs, supplies of supplies, relationships with the fire inspection and sanitary epidemiological station, city water and energy supply organizations and the like. The attendants provide high-quality operation of both the building and the fitness club as a whole (equipment, simulators).

Administrative block fulfills the functions of development, planning and management of the club's activities, exercising managerial influence on other units. The administrative block includes: owner (general director), director (manager of the club) and accountant (financial director).

Main role in the development and coordination of the fitness club's activities belongs to the proprietor (general director), on the initiative of which the club is created. Critical to the success of the fitness club and business as a whole has a director or manager, whose activities as a manager, manager, has its own characteristics. This is due to the specifics and complexity of the tasks performed to ensure the financial result and smooth running of the club, as well as its promotion in the market of fitness services. That is, the effective functioning of the director depends on the effectiveness of the club's functioning, expressed in the implementation of the business plan, the number of clients, the resource provision etc.

It is determined that in the main duties of the director of the fitness club are:

— general management of the fitness club (disposal of property and financial means);
— economic and strategic planning of the fitness club (de-

velopment of business plans for the fitness club and ensuring their implementation);
— organizational work (ensuring the interaction and effective functioning of all structural units, the formation of the optimal organizational structure in accordance with the strategy of the fitness club, establishing interaction with the inspection bodies);
— coordination, namely the integration of the work of each part of the fitness club into one unit, compliance with the budget, regular meetings, meetings, conferences and various commissions; the maintenance of time sheets, the construction of work schedules;
— control over ensuring the proper performance of assigned tasks by all levels of the organizational structure. The control function consists in establishing the feedback between the information on the results of work and the relevant documents (plans, standards, norms) so that all deviations are considered and eliminated;
— control over the rational use of material, financial and labor resources;
— personnel management (search and selection of qualified personnel, formation of a professional team, training and development of employees);
— maintenance of operation of premises, maintenance of the decision of current questions with municipal services;
— equipping the club with sports and technical equipment, inventory, materials and monitoring their use, organizing timely capital and current repairs of buildings, facilities, club premises and equipment;
— conclusion of contracts, etc.

Be sure to take into account that the duties of the director in each fitness club may differ from those set forth above through the presence or absence of certain structural divisions and management units.

The results of the survey of directors and managers of fitness clubs in Kharkov indicate that the main tasks in their activity are: general management of the fitness club; providing financial and economic activities of the fitness club; communication with institutions and organizations; management of the fitness club staff; creation of favorable conditions for clients of the fitness club; constant improvement of their professional activity (Figure).

As can be seen from the figure, only 16,7% of respondents consider the general management of the fitness club to be a very simple task, the same number (16,7%) – have the opposite opinion and are considered difficult. The majority of respondents (66,6%) realize the general management of the club is sometimes difficult, because there are unforeseen circumstances and some problems.

Of course, such answers can be explained by the fact that in the process of fulfilling this task, the director (manager) carries out a number of functions: planning of the activity of the fitness club; provision of a financial result; coordination and control of the activities of all units of the fitness club; introduction of innovative methods and fitness programs, advanced fitness technologies; making management decisions, summarizing the results of the club's activities. This requires knowledge of the principles and technologies of planning, as well as the ability to determine the goals and objectives of the club's activities for the long, medium and short term, skills to navigate in the modern market conditions of the fitness industry.

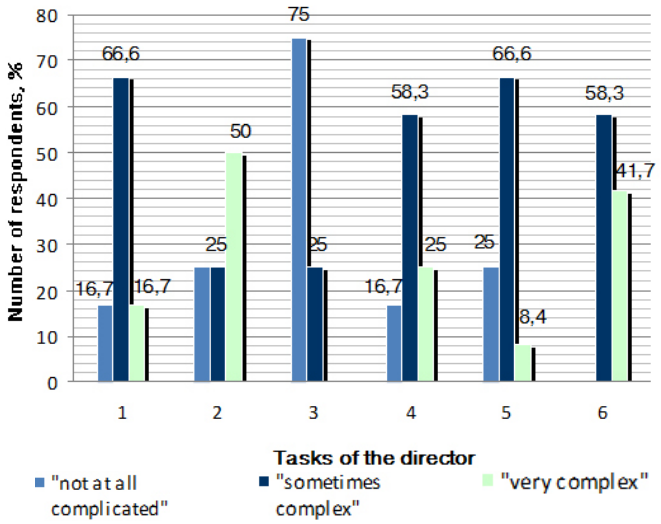


**Figure. Tasks of the fitness club director:** 1) general management of the fitness club; 2) financial and economic activities of the fitness club; 3) communication with institutions and organizations; 4) management of the fitness club staff; 5) creation of favorable conditions for clients of the fitness club; 6) constant improvement of their professional activity.

Another important task of the director (manager) is to ensure the financial and economic activities of the fitness club. As you can see, half of the surveyed directors (50%) consider it a difficult task and another 25% are sometimes difficult. After all, its implementation implies such functions as the preservation and strengthening of the material and technical base, the disposal of financial resources of the fitness club, is aimed at ensuring the continuous operation of all the club's systems, the budget of the club. This requires knowledge of economics, marketing and the fundamentals of accounting, features of construction of sports facilities, equipment for the operation and designation of sports equipment, adaptations and other sports equipment. Essential when performing this task is also to establish relationships with community agencies, the ability to efficiently plan and allocate available funds to determine the profitability of services, predict risks, etc. However, the remaining respondents (25%) consider the financial and economic activities of the fitness club to be a very simple task, which is explained by experience in the fitness industry (5 years and more) and the proper level of education of this part of the respondents.

The proper place, as shown by the survey, the directors of the fitness clubs of the city of Kharkov devote to establishing contacts with other organizations. The results of the survey showed that such a task as communication with institutions and organizations for the majority (75%) is quite simple, and for the rest (25%) it is sometimes difficult. This indicates their ability to negotiate, to find common ground, to represent the fitness club in institutions and organizations.

It is known that one of the main tasks in the activity of any head of the organization is the management of the staff of the fitness club. In the process of performing this task, the director (manager) of the fitness club performs a number of functions: search and selection of personnel; definition of functional duties of employees; staff motivation; provision of advanced training. This requires knowledge of the fundamentals of legislation on labor and psychology, the ability to select qualified

specialists, organize and monitor their work, ensure the interaction of all structural units of the fitness club, create a favorable moral and psychological climate in the club.

According to the results of the survey, the management of the fitness club staff for half of the directors (58,3%) is sometimes a difficult task and for 16,7% it is quite simple. This shows that the leaders of fitness clubs are able to find incentives for work for their employees, pay attention to control, but according to 25% of respondents this is a very difficult task.

The great influence on the effectiveness of the fitness club's activity is to create favorable conditions for the clients of the fitness club. This task for most of the respondents (66,6%) is sometimes difficult, because sometimes there are unforeseen circumstances with different people in character and social status; it requires from the director and staff of the club the ability to find a compromise, to place and understand the interlocutor, the client of the club, etc. The fourth part of the respondents (25%) believe that creating favorable conditions for clients of the fitness club is a very simple task, and only 8,4% say that it is very difficult. In our opinion, in order to successfully carry out this task, the club's director must organize repair works on time, supervise the work of the staff, comply with sanitary and hygienic standards etc.

Another important task of the director (manager) is the continuous improvement of his professional activity, which requires an increase in the professional level of the manager (manager), self-improvement and self-realization. The survey results show that this is very (41,7%) and sometimes difficult (58,3%) tasks, referring to the constant employment of their professional duties. We believe that the directors, managers of fitness clubs need to constantly work on their own development, mastery of modern technology management and organizational activities, innovations in the fitness industry, taking part in conferences, fitness conventions, training courses held both in Ukraine and beyond its borders.

## Conclusions

1. In the course of the study, the optimal organizational structure of fitness club management was determined, including 4 functional units: fitness staff service personnel technical staff and administration. Each unit independently performs the assigned tasks and functions, interacting with each other, forming an integral system.

2. Analysis shows that for directors and managers of Kharkov fitness clubs it is not difficult to communicate with institutions and organizations (75%). Sometimes it is difficult to implement general management of fitness club activities and create favorable conditions for clients of the fitness club (66,6%), personnel management (58,3%). Particularly noteworthy are such very difficult tasks, according to the respondents, how to ensure the financial and economic activities of the fitness club (50%) and the continuous improvement of their professional activities (41,7%).

**Prospects for further research** it is advisable to associate with the development of the functional-context model of the training of the manager of the fitness club.

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# Study of the relevance recreative aerobics exercises for women of the first mature age

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***Purpose:*** *to establish the level and priority types of motor activity of women of the first adulthood.*

***Material & Methods:*** *in the course of the research the method of analysis and generalization of scientific and methodological literature was used.*

***Results:*** *it is established that for today there is a negative dynamics of the motor activity of the adult population of Ukraine, including women of the first adult age. A wide distribution in the system of their recovery is acquired by fitness technologies.*

***Conclusion:*** *analysis of studies has shown that the overwhelming majority of the female population of Ukraine has a low level of functional status, which is associated with a lack of time and a lack of desire to attend sports and health classes.*

**Keywords:** *women, motor activity, health, lifestyle, recreative aerobics, fitness.*

## Introduction

Domestic system of physical education is now in the stage of reform. As noted in the National Strategy for improving motor activity in Ukraine for the period until 2025, "Motor activity is a healthy lifestyle – a healthy nation" [21], in the 21st century in our country there were no significant changes in the issues of attracting the population to health improvement by means of physical culture and sports.

As evidenced by the results of the all-Ukrainian survey, at the beginning of the 21st century only 3% of the population aged 16 to 74 had an adequate level of recreational motor activity (at least 4–5 lessons per week lasting at least 30 minutes), the average level (2–3 lessons per week) – 6%, low level (1–2 lessons per week) – 33% of the population [21].

Analysis of numerous data on the number of people engaged in physical culture and sports in different countries of the world made it possible to conclude that only a third of them are women [8]. In developed countries, where the total number of people involved in sports and recreational activities is 30% or more, the number of women varies between 10–15%, and in countries where the first indicator is 3-10%, it is 1–3% [8]. Ukraine also belongs to such countries.

**Relationship of research with scientific programs, plans, themes.** The research is conducted on the theme "Theoretical and applied principles of constructing monitoring of physical development, physical readiness and physical condition of various population groups" for 2013–2014 state registration number 011U001206.

**The purpose of the research:** to establish the level and priority types of motor activity of women of the first adulthood.

## Material and Methods of the research

Methods: in the course of the research, the method of analysis and generalization of scientific and methodological literature.

## Results of the research and their discussion

Investigating the way of life in Ukraine, Yu. Moseichuk, A. Moroz found that the overwhelming majority of them lead a sedentary lifestyle [17]. The main activities in the mode of the day are: professional activity (mainly mental work) – 25–30% of the time of the whole day; night rest (30%); road to and from work place (6–7%); household activities (10–14%) – personal hygiene, cleaning, washing, ironing, etc .; food intake (5–6%); recreation (12–15%). It was also found that among the types of recreation, passive reading predominates, watching television in sitting or lying position, and from active activities – shopping, apartment cleaning, disco visiting [17].

The results of the studies [3; 22] show that women of all ages are several times less than men who use physical culture and sports for the purpose of healing. In the rating of values of women a healthy lifestyle is assigned a smaller role than men.

So, today there is a negative dynamics of motor activity among the adult population of Ukraine. Unfortunately, most mature women lack awareness of the fact that physical education is a powerful factor in improving health, a factor in correction and compensation for impaired functions caused by a sedentary lifestyle [1].

Analysis of scientific and methodological literature showed that a number of scientists studied the impact of motor activity on the functional state and health of mature women. Thus, studies by I. Ilnitsky [11], V. V. Romanenko [28], T. V. Nesterova, K. Yu. Sleksar, A. V. Zayarnoy [18] and others have established that systematic exercise is a fundamental factor of compliance women of a healthy lifestyle, improving physical and mental well-being, since motor activity contributes to the strengthening of all systems and functions of the body, reducing the negative impact of bad habits, countering the involutional processes of motor functions, increasing efficiency.

In support of these conclusions, the data given in the joint work of foreign scientists "Global Recommendations on

Physical Activity for Health" (2016) also indicate. In particular, they convincingly proved the presence in women of adulthood of a direct relationship between:

– physical activity and cardiorespiratory health (reducing the risk of cardiovascular disease, stroke, hypertension);
– motor activity and healthy metabolism, including the risk of developing diabetes and metabolic disorders
– aerobic physical activity and maintaining a constant weight, achieving an energy balance;
– increased physical activity and increased skeletal muscle mass, their strength and internal neuromuscular activation, minimizing the density in the bones of the spine and thighs, and consequently, reducing the level of risk of cracks or fractures;
– regular exercise and a reduction in the risk of cancer (breast and colon cancer).

In general, significant scientific evidence proves that women who are actively engaged in physical culture and sports have lower rates of total mortality, coronary heart disease, hypertension, stroke, diabetes, metabolic syndrome, oncological diseases and depression; a high level of cardiorespiratory fitness and muscle training, a more healthy weight and body tissue ratio, and also such a profile of biomarkers, is favorable given the prevention of cardiovascular diseases and diabetes [5].

Thus, systematic physical exercises have not only a health but also a preventive effect – they contribute to improving the functional state and physical fitness, and therefore is a powerful tool for the formation, preservation and maintenance of women's health of the first adulthood.

With the efforts of leading scientists, medics, public figures, specialists in physical culture and sports, active work is currently being carried out in our country to attract women of the first adulthood to systematic motor activity. Notable shifts occurred at the beginning of the new millennium and were due to the creation of a multidimensional model of recreational physical culture [11]. The analysis of scientific literature allows to consider such variability as a consequence of the approval of a number of state and regional programs, concepts and strategies for raising the level of physical development and physical preparedness of the population, the emergence of new forms of organized groups, the spread of new types of recreational motor activity, the development of the industry of physical culture and health services.

In the modern conditions, fitness technologies are widely used in the health improvement system for women of mature age. Scientists [15] believe that fitness is a system of physical training aimed not only at maintaining a good physical form, but also includes intellectual, emotional, social and spiritual components. Today this concept allows to fully reflect the social (healthy lifestyle), biological (motor activity, physical condition and physical preparedness), psychological (motives, interests) and other characteristics of the use of physical education with a recreational purpose. S. V. Sinitsa, L. E. Shesterova note that the main goal of fitness is to achieve a person's inner harmony and external attractiveness, and this is the main motive for people who want to look good and feel good. Consequently, according to scientists, the main goal of fitness is to improve the health of the population, increase vitality, increase overall and special efficiency, nurture physical qualities, build a physique and correct deficiencies, increase mental and psychological mood, counteract possible daily stresses [25].

New fitness programs have a clear focus on reducing the risk of developing diseases, achieving and maintaining a certain level of physical condition, psycho-emotional regulation, increasing social activity of a person. Physical exercises with a focus on increasing the functional capacity of the body and preventing various diseases of women of adulthood are carried out independently or in formal groups in fitness centers, fitness clubs, fitness schools, etc. Classification of modern fitness programs is based on three basic elements of physical activity:

a) on one kind of motor activity (aerobics, wellness walking, health running, swimming, etc.);

b) on a combination of several types of motor activity (health swimming and running, aerobics and bodybuilding, aerobics and stretching, aerobics and dancing);

c) a combination of physical activity and the healing forces of nature or hygienic factors (aerobics and hardening, bodybuilding and massage, health swimming and a complex of hydropathic rehabilitation procedures, etc.).

In turn, fitness programs based on one of the types of motor activity are divided into programs based on: types of motor activity of aerobic orientation, recreational types of gymnastics, types of motor activity of the power orientation, types of motor activity in water, recreational types of motor activity [28].

The emergence and cultivation of new types of physical activity among women, V. V. Romanenko associated with such trends in the development of sports and recreational work, as individualization in the conduct of classes, the development of family sports, the adaptation of training programs to rapid aging, the convergence of sports and health clubs and medical institutions, lifestyle changes [23].

As a result of the strengthening of individualistic tendencies in society, there has been an increase in interest in sports in general and in some less popular forms of physical activity, primarily aerobics, rhythmic gymnastics, health running, hiking (or just walking long distances), cycling and others [28].

Domestic and foreign experience of physical culture and health work with various strata of the population testifies that the most popular among women are classes in various types of recreational aerobics [26]. The modern fitness industry offers a great variety of them. Every day, the number of women who prefer such types of physical culture as aerobics and its modern varieties increases: every day, step aerobics, fitball aerobics, jumping, shaping, stretching, with which you can not only improve your health and health, but also to improve your figure, adjust body weight, maintain the necessary hormonal background, improve blood circulation [6; 13; 30].

The term "aerobics" comes from the Greek root "aero", which means "air", and the definition of "aerobic" literally translates as "one who lives by air" or "one who uses oxygen". Modern recreational aerobics are complexes of exercises of gymnastic style that are performed in a current way at a fast pace with

musical accompaniment, the main part of the lesson consists of aerobic exercises that have a specific technique of execution (basic steps, legs, running, jumping and their combination) [9].

Scientists have different interpretations of the concept of "aerobics". So, Ju. S. Zhuravleva (2007) characterizes the term "aerobics" as a system of gymnastic, dance and other exercises that are performed to music by the current or mass-current method [10]. E. S. Kryuchok (2001), O. L. Smirnova (2006), Zh. A. Belokopytova (2006), N. V. Sizova (2007) T. A. Isaeva (2008) are of the opinion that aerobics is one from the directions of mass physical culture with a regulated load [2; 12; 24]. S. S. Prosvirnina, P. M. Mishnev (2002) interpret the concept of "aerobics" as a system of physical exercises, based on the connection of movements with music [29]. T. Kutek, L. Pogrebennik briefly characterizes the concept of "aerobics" as a system of physical exercises of an aerobic nature [14]. L. I. Pogasiy (2003) considers aerobics to be a system of specially selected physical exercises performed by the current method with musical accompaniment and are aimed at promoting health and harmonious development of the physical qualities of a person [20].

According to experts [16], health aerobics is a separate direction in the system of physical fitness for health, the purpose of which is to improve or attract broad sections of the population to active physical activity.

Among the types of health aerobics are four main areas:

1) gymnastic-athletic (classical aerobics, step aerobics, etc.)
2) dance (jazz, funk, hip-hop, salsa-aerobics, etc.)
3) cyclic nature (cycling)
4) "east-west", combining European and oriental culture in the field of fitness (taibo, wushu, taichi, kickbox aerobics, etc.) [4].

Modern health-improving aerobics is also one of the most attractive areas of mass physical education, as fitness programs of aerobic orientation are very popular among women of the first adult age. Thus, A. I. Degtyareva found that the most popular among women use these types of aerobic as: step aerobics (70%), shaping (60,5%), athletic exercises (50%), aerobics slide (36,5%), fitball-aerobics (30%), aqua aerobics (20%), cycling (2%) [7].
N. Gamaliy notes that women of the first adult age make up the majority among visitors to modern fitness clubs [4]. The analysis of literary sources made it possible to establish that the leading motives for attending aerobic fitness classes for women of the first adulthood are: the desire to improve the figure (to reduce the mass, to improve the proportions, etc.); improve health; increase the level of physical fitness (strength, endurance, agility, flexibility, speed); relieve stress and stress; gain self-confidence; expand the circle of communication and spend free time [15; 26; 27]. Aerobics attracts them with its accessibility, variety of directions, emotionality, the ability to dose physical activity depending on the physical condition and level of physical preparedness.

The researchers explain the popularity of aerobics by the fact that this type of physical activity corresponds to the concepts of gender identity, is compatible with the notions of femininity, the image of the female body and the figure, and is conditioned by the nature of the female organism, that is, the occupations of these species correspond to the aspirations, needs and real capabilities of women [8] . In addition, dynamic exercises are acceptable for women, because they are easier to transfer than static ones. Dynamics of practicing aerobic exercises are achieved not only by movement on the site, but also by changing the degree of muscle load, the amplitude of movements, speed, direction and nature of movements [25].

## Conclusions

1. Generalization of scientific sources has shown that attracting women of the first adulthood to systematic exercise leads to an improvement in their physical and functional status, promotes the formation, strengthening and preservation of health, attracting to a healthy lifestyle through training.

2. It is found that the most popular form of motor activity of women of 21–35 years is health-improving aerobics as a kind of fitness programs, in modern conditions has taken an important place in the domestic system of physical education and health improvement of the population.

3. Necessity of a more detailed analysis and generalization of the recreational potential of different kinds of aerobics are determined.

**Prospects for further research** are the creation and implementation of recreational aerobics classes for women of the first adulthood.

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# Dynamics of athletes choreographic preparedness level at the stage of specialized basic training (on the basis of sports aerobics)

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*Article shows the effectiveness of the author's program of choreographic training at the stage of specialized basic training in sports aerobics.*

***Purpose:*** *revealing changes in the level of choreographic preparedness of young athletes at the stage of specialized basic training.*

***Material & Methods:*** *method of expert evaluation, statistical methods of research.*

***Results:*** *a methodology for assessing the choreographic preparedness of athletes at the stage of specialized basic training was introduced. Objectivity of the methods consisted in counting the indices of choreographic readiness. On the basis of the data obtained, it was established that in the experimental group of gymnasts a significant increase in the choreographic skill took place, which was recorded by the group indicator of the formation of the choreographic readiness, and also by all the criteria for choreographic readiness.*

***Conclusion:*** *experimentally proved the effectiveness of the introduction of the author's program of choreographic training in the training process of gymnastics at the stage of specialized basic training to improve their choreographic skills.*

**Keywords:** *choreography, choreography training, technical and aesthetic sports, sports training stages.*

## Introduction

Choreographic preparation at various stages of long-term preparation refers to the system of values of athletes; they form the prerequisites for the successful formation and maintenance of the level of athletic skill and harmonious development of personality. The choreographic preparation acquires a special urgency in regard to technical and aesthetic sports, where the sports result is scored in points, depending on the beauty, complexity, accuracy and efficiency of the performance of competitive programs. The development of loyal programs for choreographic training is considered expedient and relevant at every stage of sports training. It should be noted that the stage of specialized basic training is particularly important, when the development of the individual motor style of an athlete.

**Relationship of research with scientific programs, plans, themes.** The work was carried out in accordance with the research topics "Theoretical and methodological fundamentals of managing the training process and competitive activities in the Olympic, professional and adaptive sport" in accordance with the LSUPC plan for 2016–2020 (number of state registration: 0116U003167).

**The purpose of the research:** revealing changes in the level of choreographic preparedness of young athletes at the stage of specialized basic training.

*Objectives of the study:*

1. Introduce a methodology for an objective assessment of choreographic preparedness in technical and aesthetic sports at the stage of specialized basic training.

2. To investigate the level of the formation of criteria for the choreographic preparedness of athletes in sports aerobics at the beginning and end of the macrocycle.

## Material and Methods of the research

Methods of research: pedagogical experiment, method of expert evaluation, statistical methods of research.

## Results of the research and their discussion

Characterizing the stage of specialized basic training, it should be noted that it is in the 15–17 years that the development of the choreographic "school", the formation of the necessary motor qualities of the athlete, the experience gained in various competitions and demonstration performances.

The goal of the choreographic training at the stage of specialized basic training is to improve the choreographic preparedness – performing dance elements in difficult conditions.

Main objectives of the choreographic training at this stage are: 1) improving the quality, stability and reliability of performing choreographic elements; 2) improving expressiveness, musicality, artistry; 3) correcting the shortcomings of physical development by means of choreography; 4) improving the stability of the body, "aplomb"; 5) improving the technique of performing adagio and allegro.

Dynamics of the level of choreographic preparedness at the stage of specialized basic training on the conditions for introducing the system of choreographic training in technical and aesthetic sports was determined on a sample of 61 athletes – junior gymnasts aged 15–17, CMS, MS, who expressed a desire to become participants in the approbation. Based on

preliminary expert evaluation, the sample was distributed to EG (30 participants) and CG (31 participants).

At the stage of specialized basic training, choreographic exercises were introduced into the training session both as a warm-up and in the final part of the training session in combination with general developmental and breathing exercises. The duration of the choreographic workout is from 15 to 20 minutes. The final part of the training session used parterre choreography – up to 15 minutes. Separately, classes were held on choreography for 60 min 3 times a week. In total for the academic year the duration of the choreographic training was 176 h.

Training of the CG was held according to the standard program on sports aerobics.

To identify the dynamics of the choreographic preparedness, a group of experts from five sports experts (choreographers and coaches for sports aerobics) were involved. The experts were invited to evaluate a set of criteria for choreographic preparedness with a detailed description of each of them: posture, turning and stretching of the legs, stability, accuracy of movements of hands and feet, completeness, lightness and fusion of movements, musicality and dance, illustrative and emotional expressiveness. All criteria were evaluated taking into account the requirements for the technique of performing "choreographic elements" on the part of choreography and in the aspect of the requirements of competition rules.

In order to study the effectiveness of the proposed experimental programs, we calculated the individual coefficient of the formation of the criterion (k), which indicated the ratio of the sum of expert assessments in their number for a single criterion and was calculated from the formula 1:

$$k=\Sigma E/N,$$

*where k – individual coefficient of formation criteria; Σ – sum; E – evaluation; N – number of experts.*

The individual index of the athlete's choreographic preparedness (*I*) was defined as the average arithmetic value of the individual formation factors (*k*) for all thirteen criteria. To characterize the level of formation of a group of individual criteria calculated group index formation ($I_{gr}$), which is defined as the arithmetic mean score of individual factors of formation (*k*) of all of the subjects in the sample.

To simplify the presentation and interpretation of factual information, the boundaries of a low, sufficient and high level of athletes' choreographic preparedness are defined. For this purpose, the arithmetic mean (M=1,52) and the standard deviation (SD=0,21) of the individual indicators of the technical component of the choreographic preparedness of all participants in the test are calculated and the estimation intervals that are based on the author's scheme for interpreting the results:

– low level (less than 1,2 points) – prevalence of gross errors in the performance of most choreographic elements;

– sufficient level (1,3–1,7) –athlete assumes inaccuracy of the execution of the details of the technique, reduces the effectiveness of the action as a whole;

– optimal level (more than 1,8) – unmistakable performance by the athlete of most of the basic choreographic elements.

Analysis of the individual data obtained after the completion of the experiment in EG, indicates that among them there are none who, according to the individual index of choreographic preparedness, had a low level. Most of them (90% of the subjects) reached a high level of formation of this criterion; the rest (10% of gymnasts) demonstrates a sufficient level. The average arithmetic value of this indicator in the group also corresponds to a high level (M=1,82±0,07).

Study of the distribution of subjects according to the levels of formation of choreographic preparedness according to certain criteria indicates that the majority of athletes at the final stage of the experiment achieved high or sufficient levels of choreographic skill (Table).

Summarizing the results of the experimental study of the dynamics of the level of choreographic preparedness at the stage of specialized basic training, we will focus on the fact that during the period of training according to the program

**Formation of the criteria for the choreographic readiness of athletes EG and CG at the stage of specialized basic training at the end of the choreographic preparedness experiment (%)**

| Criteria of choreographic readiness | Experimental group | | | Control group | | |
|---|---|---|---|---|---|---|
| | low | sufficient | high | low | sufficient | high |
| Posture | 0 | 30 | 70 | 25,8 | 41,9 | 32,3 |
| Reversibility | 0 | 36,7 | 63,3 | 25,8 | 38,7 | 35,5 |
| Leg stiffness | 0 | 33,3 | 66,7 | 25,8 | 51,6 | 22,6 |
| sustainability | 3,4 | 33,3 | 63,3 | 19,4 | 51,6 | 29 |
| Accuracy of leg movements | 0 | 33,3 | 66,7 | 48,4 | 38,7 | 12,9 |
| Accuracy hands movements | 0 | 26,7 | 73,3 | 16,1 | 54,9 | 29 |
| Completeness | 0 | 23,3 | 76,7 | 22,6 | 51,6 | 25,8 |
| Lightness | 0 | 30 | 70 | 35,5 | 35,5 | 29 |
| Mobility of movements | 0 | 36,7 | 63,3 | 19,4 | 51,6 | 29 |
| Musicality | 0 | 46,7 | 53,3 | 45,2 | 29 | 25,8 |
| Dance | 0 | 63,3 | 36,7 | 54,8 | 38,7 | 6,5 |
| Illustrative expressiveness | 0 | 60 | 40 | 54,8 | 35,5 | 9,7 |
| Emotional expressiveness | 0 | 53,3 | 46,7 | 64,5 | 16,1 | 19,4 |
| Index of choreographic readiness | 0 | 10 | 90 | 0 | 96,8 | 3,2 |

constructed in accordance with the system of choreographic training in technical and aesthetic sports, female athletes experienced an increase in the level of choreographic skill from a low (in 30% of athletes) and sufficient (in 70% of athletes) to a sufficient (in 10% of athletes) and high (in 90% of athletes), that in determining the group index of formation ($I_{gr}$) of the choreographic preparedness is expressed in the growth of its value from 1,31 points (sufficient level) to 1,82 points (high level), which is statistically significant (t=12,63) at the level p<0,001.

During the same period of training in the traditional program of specialized basic choreographic training, athletes experienced an increase in the level of choreographic skills from a low (in 32,3% of athletes) and sufficient (in 67,7% of athletes) to a sufficient (in 96,8% of athletes) and high (3,2% of athletes), that when determining the group index of formation ($I_{gr}$) of choreographic preparedness, it is expressed in a certain growth tendency from 1,31 points (sufficient level) to 1,45 points (sufficient level), can not assume statistically significant (t=1,98; p<0,1).

In addition, it was statistically confirmed that athletes in the EG, who demonstrated the state of choreographic fitness before the beginning of the experiment, the same as the gymnasts of the CG (t=0,10), after the experiment ended, they differed by a much higher level of the formation of choreographic skills (t=10,02; p<0,001).

Thus, in the molding experiment it is proved that at the stage of specialized basic choreographic training, provided that training is conducted in accordance with the proposed program, athletes can achieve a significant increase in choreographic skill than when organizing classes in accordance with the traditional form of training.

## Conclusions

A methodology for assessing the choreographic preparedness of athletes at the stage of specialized basic training was introduced. The objectivity of the technique was to calculate the choreographic readiness index. Experimentally tested the effectiveness of the introduction of the author's program of choreographic training in the training process of athletes (on the basis of sports aerobics). On the basis of the data obtained, it was found that in the experimental group of gymnasts there was a significant increase in the choreographic skill, which was recorded according to the group indices of the formation of the choreographic preparedness, as well as by all the criteria by which this index was determined. That is, experimentally proved the effectiveness of the author's program of choreographic training in the training process of gymnasts at the stage of specialized basic training to improve their choreographic skills.

**Prospect of further research** is to determine the dynamics of the level of choreographic preparedness at the next stages of sports training in technical and aesthetic sports.

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The reliability of the presented results correspond to authors

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