

ISSN 2311-6374

**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
KHARKIV STATE ACADEMY OF PHYSICAL CULTURE**

**SLOBOZHANSKYI
HERALD
OF SCIENCE AND SPORT**

Scientific and theoretical journal

Published 6 times in a year
English ed. Online published in October 2013

Volum 7 No. 6(74)

Kharkiv
Kharkiv State Academy of Physical Culture
2019

P 48

UDC 796.011(055)“540.3”

Slobozhanskyi herald of science and sport : [scientific and theoretical journal]. – Kharkiv :
KhSAPC. 2019, Vol. 7 No. 6(74), 59 p.

English version of the journal “**SLOBOZANS`KIJ NAUKOVO-SPORTIVNIJ VISNIK**”

The journal includes articles which are reflecting the materials of modern scientific researches in the
field of physical culture and sports.

The journal is intended for teachers, coaches, athletes, postgraduates, doctoral students research
workers and other industry experts.

Contents Themes:

1. Physical education of different population groups.
2. Improving the training of athletes of different qualification.
3. Biomedical Aspects of Physical Education and Sports.
4. Human health, physical rehabilitation and physical recreation.
5. Biomechanical and informational tools and technologies in physical education and sport.
6. Management, psychological-educational, sociological and philosophical aspects of physical education and sport.

Publication of Kharkiv State Academy of Physical Culture
Publication language – English.

ISSN (English ed. Online) 2311-6374

ISSN (Ukrainian ed. Print) 1991-0177

ISSN (Ukrainian ed. Online) 1999-818X

Key title: Slobozhanskyi herald of science and sport

Abbreviated key title: Slobozhanskyi her. sci. sport

© Kharkiv State Academy of
Physical Culture, 2019



SLOBOZHANSKYI HERALD OF SCIENCE AND SPORT

Scientific and Theoretical Journal

Volum 7 No. 6(74), 2019

Editor in Chief

Anatoliy Rovnyi, Doctor of Science (Physical Education and Sport), Professor, Academician of International Academy of Human Problems in Aviation and Aerospace (Kharkiv State Academy of Physical Culture, Ukraine)

Editorial board:

Oleksandr Azhippo, Doctor of Science (Pedagogical), Professor (Kharkiv State Academy of Physical Culture, Ukraine)

Volodymyr Ashanin, PhD (Mathematics and Physics), Professor, Academician ANPRE (Kharkiv State Academy of Physical Culture, Ukraine)

Eugeny Vrublevskiy, Doctor of Science (Pedagogical), Professor, Francisk Scorina Gomel State University (Belarus)

Valeriy Druz, Doctor of Science (Biology), Professor (Kharkiv State Academy of Physical Culture, Ukraine)

Oleg Kamaev, Doctor of Science (Physical Education and Sport), Professor (Kharkiv State Academy of Physical Culture, Ukraine)

Lesia Korobeynikova, Doctor of Science (Biology), Professor (National University of Physical Education and Sport of Ukraine, Ukraine)

Viacheslav Mulyk, Doctor of Science (Physical Education and Sport), Professor (Kharkiv State Academy of Physical Culture, Ukraine)

Ieonid Podrigalo, Doctor of Science (Medicine), Professor (Kharkiv State Academy of Physical Culture, Ukraine)

Yevhen Prystupa, Doctor of Science (Pedagogical), Professor (Lviv State University of Physical Culture, Ukraine)

Wojciech Czarny, Doctor of Science (Physical Culture), Professor (Uniwersytet Rzeszowski, Polska/ Poland)

Liudmyla Shesterova, PhD (Physical Education and Sport), Professor (Kharkiv State Academy of Physical Culture, Ukraine)

Yuliya Kalmykova, PhD (Physical Therapy), Associate Professor, Kharkiv State Academy of Physical Culture, Ukraine

Mosab Saleem Hamed Amoudi, PhD (Physical Therapy), Arab American university, Jenin, Palestine

Mohammed Zerf, PhD, Physical Education Institut University Abdelhamid Ibn Badis de Mostaganem, Mostaganem, Algeria

CONTENT

Olena Bismak

Algorithm for the use of physical therapy in patients with compression-ischemic neuropathies of the upper limb 4-8

Valeriy Druz, Yaroslava Volkova & Oleksii Hulciaiev

Prediction of prospects in dance and gymnastic sports based on the method of assessing the structure of an individual somatotype 9-15

Liudmila Kanunova & Victor Dzhyh

Construction of training process for young gyros 12–13 years during an annual macrocycle taking into account a specific biological cycle 16-20

Yaroslav Kraynik, Vyacheslav Mulik, Daria Okun & Svyatoslav Koval

Use of special exercises for the development of motor qualities and the formation of technical and tactical actions of defenders 13–14 years in the preparatory period 21-25

Margarita Mameshina

Differentiation of the content of classes on physical education, taking into account indicators of physical health and physical preparedness of students in grades 26–31

Volodymyr Revenko, Yaroslava Puhach,

Valeriy Druz & Vadym Artemiev
Modern methods of monitoring and evaluating the current functional state of athletes in various types of martial arts 32-36

Olena Shishkina, Igor Beihul & Alla Mullagildina

Effect of different kinds of fitness based on the ovarian-menstrual cycle on the psychophysical state of young women 37-41

Larysa Taran

Features of the activities of the First Gymnastic Society in the Kharkiv province at the end of the XIX and beginning of the XX century 42-46

Olena Tarasevich, Oleg Kamaev & Daria Okun

Gender identification of athletes of different qualifications regarding classification groups of sports 47-51

Kateryna Tymruk-Skoropad, Iuliia Pavlova & Nadiya Sydoryk

Self-management strategy in training programs for patients with chronic obstructive pulmonary disease 52-58

Algorithm for the use of physical therapy in patients with compression-ischemic neuropathies of the upper limb

Olena Bismak

National University of Ukraine on Physical Education and Sport, Kyiv, Ukraine

Purpose: to develop an algorithm of rehabilitation measures in people with compression-ischemic neuropathies of the upper limb.

Material & Methods: the study involved 67 patients with compression-ischemic neuropathy of the upper limb, among whom were 43 (64.2%) men and 24 (35.8%) women. The duration of the disease ranged from 3 to 18 months. The age of the examined varied from 18 to 67 years, on average 42,3±9,4 years. The study was conducted on the basis of the neurological department and the physiotherapy department of the Kiev city clinical hospital No. 4 of Kyiv in the period from 2017 to 2019. We used the following research methods: analysis and synthesis of literature data, content analysis of medical records, rehabilitation examination.

Results: an important condition for the treatment of tunnel neuropathies is an integrated approach, which should have the following components: a comprehensive rehabilitation examination to determine the main rehabilitation problems; statement of tasks with prediction of the final result; selection of appropriate individual and optimal physical therapy means for each patient. An algorithm of physiotherapeutic intervention has been developed, including the use of the following measures: kinesitherapy with neurodynamic mobilization, taping, stimulating massage, instrumental physiotherapy, mechanotherapy and hydrotherapy. The proposed algorithm of physical therapy measures differed from standard programs in that it allowed to formulate the goals of the rehabilitation process taking into account a differentiated approach to solving the problem of rehabilitation of patients with compression-ischemic neuropathies of the upper limb with varying severity of motor function disorders; had a comprehensive, multidisciplinary approach to solving the problems of patients with this pathology.

Conclusions: the development of an algorithm of physiotherapeutic intervention for people with compression-ischemic neuropathies of the upper limb is an urgent problem due to the fact that compression-ischemic neuropathies of the upper limb often lead to a decrease in the patient's quality of life and long-term disability. When developing an algorithm of rehabilitation measures, it is necessary to take into account: individual features of the functional state of patients with this pathology, the presence and severity of motor and sensory disturbances, which depend on which particular nerve of the arm is affected (median, ulnar or radiation), the nature of the lesion, age, professional activity and patient needs.

Keywords: neuropathy, upper limb, physical therapy, algorithm, conservative treatment.

Introduction

Diseases of the peripheral nervous system is a major medical, economic and social problem for humanity. Statistics indicate not only an increase in neurological diseases, but also at their early onset [1; 4; 9]. In this regard, the role of neurological rehabilitation aimed at restoring a high quality of life, which was excited as a result of damage to the peripheral nervous system, is significantly increasing throughout the world.

The current stage of physical therapy can be defined as the stage of an integrated approach to recovery, the ultimate goal of which is the return of patients to society, to labor and social activity. The search for new methods of treatment and restoration of the functional state of the upper limb with peripheral neuropathies is carried out in different directions. One of them is the improvement of neurosurgical treatment methods [6; 13; 15], the introduction of orthopedic operations [3]. In order to stimulate regeneration, they use drugs (including medicines) that improve nerve microcirculation and conduction along the nerve trunk – long-term chronic electrical stimulation [15], a large arsenal of methods of apparatus physiotherapy [5; 7; 8].

However, the results of the treatment of injuries of the peripheral nerves of the upper limb in wide clinical practice are not always satisfactory due to the fact that the available opportunities for the rehabilitation of such victims are often not realized. These drugs are mainly aimed at restoring the structure and function of the damaged nerve of the upper limb, the activity and participation of patients in everyday life with this pathology are not always taken into account in the treatment process, contrary to the main provisions of the International Classification of Functioning, Disability and Health, which has been introduced for some time in the activities of medical, social and educational workers of the Ministry of Health of Ukraine.

It should be noted that work on this problem is of a single nature, a clear algorithm of rehabilitation measures for this pathology has not yet been developed. A comprehensive, scientifically based approach to solving the problem of rehabilitation of persons with peripheral neuropathy of the upper limb, taking into account the type of treatment (conservative or surgical), the course of the disease, the impact of rehabilitation measures on the quality of life of patients, is currently not found in the available literature.

Purpose of the study: to develop an algorithm of rehabilitation measures in individuals with compression-ischemic neuropathy of the upper limb.

Material and Methods of the research

The study involved 67 patients with compression-ischemic neuropathy of the upper limb, among them there were 43 (64,2%) men and 24 (35.8%) women. The duration of the disease ranged from 3 to 18 months. The age of the examined ranged from 18 to 57 years, an average of $39,4 \pm 10,7$ years. The study was conducted on the basis of the neurological department and the physiotherapy department of the Kyiv City Clinical Hospital No. 4, Kyiv, from 2017 to 2019. We used the following research methods: analysis and synthesis of literature data, content analysis of medical records, rehabilitation examination.

Results of the research

Multidisciplinary rehabilitation today is a key approach in the application of medical and rehabilitation measures for various diseases. This approach is of fundamental importance in the restoration of motor functions, activity and participation of patients with compression-ischemic neuropathy of the upper limb. This holistic approach is supported by the World Health Organization's International Classification of Functioning, Disability and Health, which is the only basis for a multidisciplinary approach [2; 4].

It is known that an important condition for the treatment of tunnel neuropathies is an integrated approach, which should have the following components:

- comprehensive rehabilitation examination to determine the main rehabilitation problems;
- setting goals for predicting the final result;
- selection of appropriate individual and optimal physical therapy means for each patient (Figure 1).

The basic principles of physical therapy for this pathology are:

- partnership between a doctor and a patient;
- versatility of efforts or complexity;
- unity of psychosocial and biological methods;
- continuity and individualization of therapeutic effects [14].

Rehabilitation examination included:

- Interviewing the patient, determining the goals of physical therapy and patient requests.
- Physical examination: examination of the patient; determination of the range of motion in the affected upper limb; sensitivity tests.
- Motor examinations: manual-muscle testing; visual analogue pain scale; provocative tests: Falena, Tinelya.
- Functional assessment: using the Boston DASH questionnaire, the main functional deviations were determined, and based on this, goals at the level of activity and participation in the SMART format with the ICF were related.

At the stage of planning the rehabilitation process and setting goals, we took into account the results of the patient examination and their needs. The goals of rehabilitation measures were determined depending on professional activities, every-

day lifestyle and leisure.

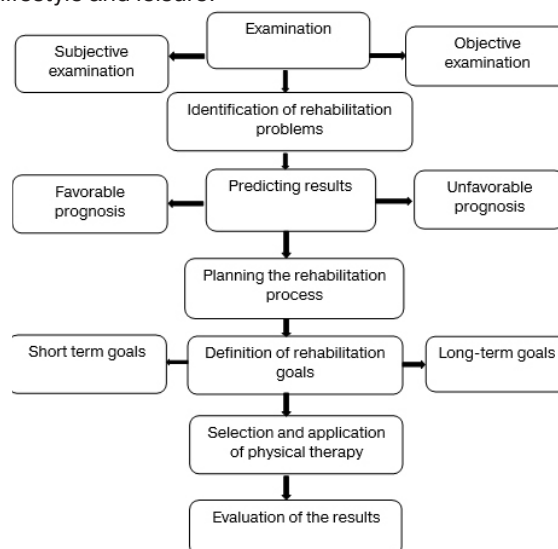


Fig. 1. Sequence of actions in the process of physical therapy with compression-ischemic neuropathy of the upper limb

The course of neuropathies of the peripheral nerves of the upper limb of the nerve has certain periods of the disease, each of which is characterized by a corresponding functional state of damage (acute, subacute, remission, recovery) and the use of physical therapy measures.

We started physiotherapeutic measures immediately after the diagnosis was established, since the further course of the recovery process depends on this in many respects.

The goals of physical therapy are:

- maximum possible restoration of impaired functions of the wrist and hand;
- improving the elastic properties of the joint-ligamentous apparatus;
- restoration of muscle strength of the hand and affected upper limb;
- improvement of sensory-motor control and proprioceptive sensitivity;
- adaptation to domestic and professional loads;
- restoration of overall performance based on the maximum restoration of the functionality of the upper limb.

The developed algorithm of physical therapy measures took into account:

- methodological approaches of the International Classification of Functioning in establishing the direction of the rehabilitation process;
- the basis for the formation of individual smart goals (smart tasks) for patients;
- individual needs of patients and lifestyle activity;
- motor and sensory disturbances and changes in the psycho-emotional state, affecting the prognosis of recovery.

The basis for the development of the algorithm of rehabilitation measures was the scientific, organizational, substantive and normative basis, the need for a differentiated approach taking into account motor and sensory disturbances, which depend on which particular nerve of the arm is affected (me-

dian, ulnar or radiation), the nature of the lesion and individual characteristics functional state of patients.

The median nerve (carpal tunnel syndrome) and the ulnar nerve (cubital canal syndrome) are most often affected, and the radial nerve compression syndrome is less commonly observed. During the initial examination, carpal tunnel syndrome was diagnosed in 39 (58,2%) patients, cubital canal syndrome in 19 (28,4%) patients, and radial nerve compression syndrome ("spiral syndrome" in 9 (13,43%) patients. channel").

It is known that with carpal tunnel syndrome, the hand hangs down, extension of it and the main phalanges of the fingers is impossible, fingers hang down, and it is impossible to retract the thumb. Sensitive disorders are less pronounced, there is swelling of the hand.

If the median nerve is damaged, there is no flexion of 1, 2, and partially 3 fingers, it is impossible to rotate the hand, contrast and retract 1 finger, which is in the same plane with the other fingers ("monkey paw"). Decrease in all types of sensitivity on the palmar side of the hand and terminal phalanges of 2, 3, 4 fingers on the back side. Pain and pronounced autonomic manifestations are characteristic.

With compression damage to the ulnar nerve, flexion of 4, 5 fingers, adduction and dilution of all fingers leads to a violation; 5, 4 and partially 3 fingers extended in the main and bent in the middle phalanges ("clawed paw"). Severe atrophy of the interosseous muscles. Sensitivity is reduced on the ulnar half of the hand, V and half of the fourth finger [5; 12].

The algorithm of physiotherapeutic intervention provided for the use of the following measures: kinesitherapy with neurodynamic mobilization, taping, stimulating massage, apparatus physiotherapy, mechanotherapy and hydrorehabilitation (Figure 2). The proposed algorithm of physical therapy measures differed from standard programs in that it allowed to formulate the goals of the rehabilitation process taking into account a differentiated approach to solving the problem of rehabilitation of patients with compression-ischemic neuropathy of the upper limb with varying severity of motor function disorders; had a comprehensive, multidisciplinary approach to solving the problems of patients with this pathology. The use of physical therapy is designed for 30 days.

Kinesitherapy helps to restore the functional parameters of the wrist and hand, strengthen the muscles of the affected

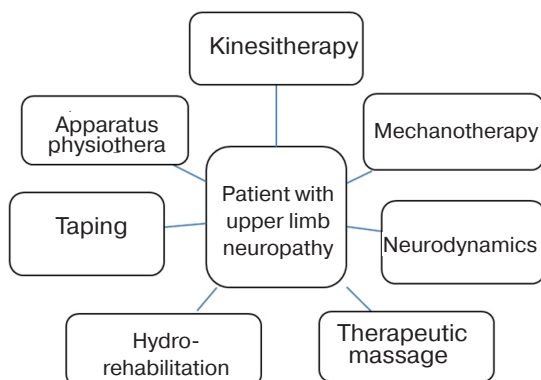


Fig. 2. Components of the algorithm of rehabilitation measures for compression-ischemic neuropathy

upper limb, increase the amplitude of movements, increase endurance. The basis of kinesitherapy are various forms of movement – therapeutic exercises [7; 8]. Therapeutic exercises allow you to implement most of the goals of rehabilitation with neuropathy of the upper limb. We selected exercises taking into account their facilitated implementation (starting position, sliding planes, etc.); damage localization; simplicity or complexity of movements (elementary, commonwealth, coordination, etc.) degrees of activity (passive, passively active, active) restoration or development of necessary motor skills. At the beginning of the rehabilitation course, we used passive, passively active, ideomotor exercises. When the patients' condition improved, the exercises were supplemented with isometric exercises - static alternating tension and muscle relaxation of the affected area. The tension grew gradually and reached maximum effort at 6–7 seconds. The rest period after each exercise is about 1,5–2 minutes.

Static tension allows you to focus and continue the moment of maximum muscle tension, which allows you to selectively affect various muscle groups. The complex consisted of 4–6 exercises, which were performed from different initial positions - sitting, lying on your back, on your stomach, on your side and was carried out 2–3 times a day for 10–15 minutes. The restoration of muscle strength in the affected area was achieved with the help of strength exercises, resistance exercises, additional burdens (expanders, dumbbells). Used mainly therapeutic strength exercises.

Before the start of classes, indicators of active and passive movements performed by the patient were determined. The indicators of passive movements, as a rule, exceeded the indicators of active movements. The greater the difference between these indicators, the greater the reserve extensibility, and hence the possibility of increasing the amplitude of active movements.

To consolidate the achieved range of movements, positioning was used using special langets or orthosis. The minimum fixation time is 10 minutes with a gradual increase to 40–60 minutes. When conducting kinesitherapy classes, general developmental exercises, breathing exercises, corrective exercises, exercises with objects and relaxation were also used. Classes were held daily or every other day, the duration depended on the stage of the disease: 15–25 minutes, 25–40 minutes.

With neurodynamic techniques, we have applied neurodynamic testing and neuromobilization. The primary tasks of neuromobilization in compression-ischemic neuropathy of the upper limb include: elimination of pain; prevention of edema of the nerve and perineural tissues; stimulation of nerve conduction and regeneration of nerve fibers; improvement of local and general blood and lymph flow; prevention of scar formation at the site of damage; prevention or elimination of trophic disorders, stiffness in joints, contractures and changes that impede the restoration of movements of the upper limb; compensation for lost movements by the like (with a complete and stable reaction of degeneration) due to synergistic muscles that have retained innervation.

Before starting the diagnostic part, it is recommended that electroneuromyography is performed to determine the parameters of the impulse conduction along nerve fibers. Neurodynamic testing was performed according to strict algorithms

and consisted of movements of the upper limbs in certain directions and at a certain angle with the help of a physical therapist [19].

If, according to the results of neurodynamic and manual-muscle testing, there were no contraindications to the use of neuromobilization, we started neurodynamic exercises. The implementation of the techniques of non-mobilization is carried out through the phased application of flexion, extensor movements and rotation with the help of the hands of a physical therapist according to clearly defined guidelines [20; 21]. The mobilization of nerve movements up and down, sliding along the length of the channel, sometimes stretching to full recovery is carried out. Patients engaged in therapeutic exercises with elements of neuromobilization daily for 30–40 minutes.

An important place among rehabilitation measures for compression-ischemic neuropathy is kinesioteipuvannia [17; 18]. Kinesiotheipuvannia is used to eliminate pain, improve blood circulation, activate proprioceptive sensitivity, increase muscle tone, increase the range of active movements in the affected upper limb.

The kinesiological taip was applied according to a certain scheme, depending on the existing motor disorders. So, with carpal tunnel syndrome, teipuvannya of the hand, wrist joint and forearm were performed, various types of teipes were used – I-teip and Y-teip [17; 18]. In case of cubital channel syndrome, the application was performed using I-tape on the inner surface of the hand and forearm from the IV-V finger to the medial epicondyle of the humerus through the wrist joint, as well as on the outer surface of the hand and forearm in the direction of the lateral epicondyle of the humerus.

Therapeutic massage was carried out in order to stimulate the paretic muscles of the affected limb mainly in the diseased areas of the arm, sometimes on symmetrical limbs [8; 9]. In case of neuropathy of the ulnar nerve, the forearm, shoulder and elbow joint were massaged, in case of damage to the radial nerve – forearms, wrists, hands, and in case of neuropathy of the median nerve – wrists, hands and fingers. The following techniques were applied to massaging these areas: stroking, rubbing, kneading and shaking. Massage was carried out every other day for 20–30 minutes.

We used mechanotherapy to increase flexibility and amplitude of movements, improve coordination of movements, increase sensorimotor control and proprioceptive sensitivity, increase muscle strength [10; 11]. We used the ARTROMOT®-F rehabilitation simulator, which has an extended range of movements in different planes. Exact adjustment of the range of motion in the joint allows the patient to practically not feel pain when performing exercises on the simulator. With each session, the range of motion gradually increased, if possible until the joint was fully restored. The technique of mechanotherapy for patients with compression-ischemic neuropathy of the arm was built taking into account the biological and physiological changes in the patient's body, the stage of the disease and the degree of damage, the time elapsed after the first clinical signs of the disease. Classes were held every other day, lasting 20–30 minutes.

To eliminate the stable limitation of the amplitude of movements in the joints of the hand and fingers, to reduce the

strength of the muscles, resulting in a total loss of finger grip and disability, passive and active exercises in water (hydrorehabilitation) were used [7; 8]. Much attention was paid to the application of exercises for training the basic functions of the hand: delight, content, moving objects of various densities. Exercise to the delight of elastic objects in lightened conditions of the aquatic environment helps to correctly orient the direction of movements made by the fingers, thanks to the purposeful nature of the movements and easy opposition of the used object (sponge, rubber ball, etc.).

In connection with the fixed nature of motor disorders, passive exercises in water are performed according to general methodological rules (slow pace of movement, gradually increasing effort, a short delay in movement in the extreme position). To restore the working (cylindrical) finger grip by passively bending all fingers, a sufficient amplitude of bending in the metacarpophalangeal joints is achieved. Further accomplishment of free active movements in water and with self-help, as well as exercises in water to delight and compress the ball helps to consolidate the range of movements in the joints achieved by passive exercises. Classes were held every other day, the duration depended on the stage of the disease: 15–20 minutes, 25–40 minutes.

In patients with damage to the peripheral nerves of the hand, the most common symptoms that require the appointment of physiotherapeutic procedures are a decrease in muscle tone, pain, motor and trophic disorders [16]. For this purpose, we used: a constant magnetic field on the flexor muscles of the arms and extensors of the legs, 20–30 mT, 15–20 minutes, every other day, 7–10 procedures; acupressure with an exciting technique, every day or every other day;

Stimulating services (indicated for motor and trophic disorders): electrostimulation of weak muscles with sinusoidal modulated currents in the rectified mode with “send-pause” modulations at a frequency of 100 Hz, a depth of 75–100%, the ratio of the duration of the current and pause as 1:2, 2–3 minutes per field, the total duration of the procedure is 8–10 minutes, 15–20 procedures, daily. It is advisable to use a bipolar technique with the location of the same area electrodes at both ends of trained antagonists of hypotonic muscles. For the purpose of electrical stimulation, multichannel stimulation devices of the Myotonia type can be used. The correct selection of stimulation parameters is important to avoid overfatigue of the hypotonic muscle.

Conclusions / Discussion

The development of an algorithm for physiotherapeutic intervention for persons with compression-ischemic neuropathy of the upper limb is an urgent problem in view of the fact that compression-ischemic neuropathy of the upper limb often leads to a decrease in the quality of human life and long-term disability.

When developing an algorithm of rehabilitation measures, it is necessary to take into account the individual characteristics of the functional state of patients, the presence and severity of motor and sensory disturbances, which depend on which particular nerve of the arm is affected (median, ulnar, or radiation), the nature of the lesion, age, professional activity, and patient needs. The main rehabilitation measures for this pathology are: kinesitherapy with neurodynamic mobilization,

teipuvannya, therapeutic massage, apparatus physiotherapy, mechanotherapy and hydrorehabilitation.

fectiveness of the developed algorithm of rehabilitation measures for this pathology and to develop recommendations for home rehabilitation.

Prospects for further research are to determine the ef-

Conflict of interests. The author declares that no conflict of interest.

Financing sources. This article didn't get the financial support from the state, public or commercial organization.

References

1. Bakhtereva, E.V. (2017), *Kompressionnyye perifericheskie nevropatii verkhnikh konechnostey: rol proizvodstvennykh faktorov, rannaya diagnostika i lechenie: avtoref. dis. d-ra med. nauk* [Compression peripheral neuropathies of the upper extremities: the role of production factors, early diagnosis and treatment: Dr. Med. Sciences thesis abstract], Yekaterinburg. (in Russ.)
2. Bogov, A.A., Vasiliev, M.V. & Filimonov, D.A. (2009), "Tunnel lesions of the nerve trunks of the upper limb", *Kazanskiy meditsinskiy zhurnal*, Vol. 90, No. 4, pp. 593-597. (in Russ.)
3. Gayovich, V.V., Strafyn, S.S., Borzikh, N.O., Gayko, O.G., Borzikh O.V. & Tsybalyuk, Y.V. (2018), "Priority of direct surgical treatment of injured wounds to the peripheral nerves of the upper end in case of structural injuries", *Travma*, Vol. 19, No. 3. (in Ukr.)
4. Golubev, V.L., Merkulova, D.M. & Orlova, O.R. (2017), "Tunnel Syndromes of the Hand", *Russkiy meditsinskiy zhurnal*, No. 2. (in Russ.)
5. Evtushenko, S.K., Evtushevskaya, A.N. & Marusichenko, V.V. (2015), "Tunnel neuropathies. Difficulties in diagnosis and therapy", *Mezhdunarodnyy nevrologicheskyy zhurnal*, No. 1 (71), pp. 25-30. (in Russ.)
6. Zozulya, Yu.P., Tretyak, I.B. & Sapon, M.A. (2013), "The International Journal of Hearing of the Gossip of the Shoulder Gossip from the Victoria Trivial Electric Stimulation", *Ukrainskiy neyrokhirurgichnyi zhurnal*, No. 2, pp. 19-22, available at: http://nbuv.gov.ua/UJRN/Unkhj_2013_2_5. (in Ukr.)
7. Isanova, V.A. (2012), *Kinezoterapiya v reabilitatsii nevrologicheskikh bolnykh s dvigatelnyimi narusheniyami* [Kinesotherapy in the rehabilitation of neurological patients with motor disorders], Kazan. (in Russ.)
8. Kadykov, A.S. (2018), *Reabilitatsiya nevrologicheskikh bolnykh* [Rehabilitation of Neurological Patients], Moscow. (in Russ.)
9. Lviv, S.E. (2007), *Reabilitatsiya bolnykh s povrezhdeniyami kisti: dis... d-ra med. nauk* [Rehabilitation of patients with hand injuries: Dr. Med. Sciences dis.], Nizhny Novgorod. (in Russ.)
10. Popadyukha, Yu.A. & Petsenko, N.I. (2009), "Technological Awareness for the Rukhovih Functionality of the Upper Kinzivok People", *Naukoviy chasopis NPU im. M. P. Dragomanova, Seriya 5, V. 14*, pp. 165-168. (in Ukr.)
11. Popadyukha, Yu.A. (2014), "Rehabilitation simulators in physical rehabilitation after arthroscopic reconstruction of athletes' rotator cuff", *Sat. materials III International scientific and technical conf.*, Minsk, February 13-14, pp. 62-66. (in Russ.)
12. Russell, S.M. (2017), *Diagnostika povrezhdeniya perifericheskikh nervov* [Diagnosis of peripheral nerve damage], Moscow. (in Russ.)
13. Tretyak, I.B. (2007), "Using of electrical stimulation in the case of peripheral nerves and gossip", *Ukrainskiy neyrokhirurgichnyi zhurnal*, No. 2, pp. 58-61. (in Ukr.)
14. Snytnikov, K.Yu., Khalyapin, D.V., Belchinsky, V.V., Pletnev, A.V. & Kochukova, M.V. (2016), "Treatment of patients with nerve damage", *Molodoy uchenyy*, No. 5 (109), pp. 234-236. (in Russ.)
15. Tsybalyuk, Yu.V. (2014), *Vidnovne neyrokhirurgichne likuvannya ushkodzen periferichnikh nerviv iz zastosuvannyam dovgotrivaloi elektrostimulyatsii: avtoref. dis. d-ra med. nauk* [Restorative neurosurgical treatment of peripheral nerve damage with the use of long-term electrical stimulation: Dr. Med. Sciences thesis abstract], Kiev. (in Ukr.)
16. Shirokov, V.A. (2015), "Pulse electromagnetic stimulation in the rehabilitation of patients with compression-ischemic neuropathies of the upper extremities", *Restorative medicine and rehabilitation: abstract. doc. II int. Congress*, Moscow, pp. 9-10. (in Russ.)
17. Ali, R.R. (2013), "Influence of kinesio tape in treating carpal tunnel syndrome", *Journal of Medical Science and Clinical Research*, Vol. 1, No. 1, pp. 1-9.
18. Clark, G.L. (2017), *Hand rehabilitation: a practical guide*, Churchill Livingstone, New York.
19. Coppieters, M.W., Hough, A.D. & Dilley, A. (2009), "Different nerve-gliding exercises induce different magnitudes of median nerve longitudinal excursion: an in vivo study using dynamic ultrasound imaging", *J. Orthop Sports Phys Ther.*, 39(3), pp. 164-1671.
20. Wilbourn, A.J. (2005), "Upper limb neuropathies: Long thoracic, suprascapular, axillary, musculocutaneous, radial, ulnar, and medial antebrachial cutaneous", *Peripheral Neuropathy*, Elsevier, Philadelphia, pp. 1463-1486.
21. Wolny, T.A., Shacklock, M., Linek, P. & Mysliwiec, A. (2017), "Efficacy of Manual Therapy Including Neurodynamic Techniques for the Treatment of Carpal Tunnel Syndrome: A Randomized Controlled Trial", *Journal of manipulative and physiological therapeutics*, No. 40(4), doi: 10.1016/j.jmpt.2017.02.004.

Received: 07.11.2019.

Published: 30.12.2019.

Information about the Authors

Olena Bismak: PhD in Physical Education and Sport, Associate Professor: National University of Ukraine on Physical Education and Sport: Fizkul'tury str. 1, Kyiv, 03150, Ukraine.

ORCID.ORG/0000-0002-6495-6170

E-mail: ebismak@gmail.com

Prediction of prospects in dance and gymnastic sports based on the method of assessing the structure of an individual somatotype

Valeriy Druz
Yaroslava Volkova
Oleksii Hulciaiev

Kharkiv State Academy of Physical Culture, Kharkiv, Ukraine

Purpose: to determine the relationship between the motor, trophic and mental qualities of an athlete in accordance with the constitution of his somatotype in order to establish at an early stage of the morphofunctional development of objective, phylogenetically determined signs of motor talent for sports dancing.

Material & Methods: the work was carried out on the basis of the "Ideal" sports club. The study involved dancers in the amount of 20 athletes involved in sports dancing at the initial training stage. In solving the tasks, the following methods were used: analysis and synthesis of scientific and methodological literature; generalization of the practical experience of the coaching contingent working with children in sports dance groups; a modified method of clinical anthropometry M. Ya. Breitman; natural pedagogical experiment, methods of mathematical statistics and mathematical modeling.

Results: the significance of competitive interdependent relationships of the constitutional structure of the somatotype in the distribution of universal tissue - body weight was established. The groups of the smallest parts of the body, the average sizes and the longest parts of the body are distinguished, and results are obtained on the frequency of occurring locations of each indicator. Compiled a universal code of the Collective somatotype.

Conclusions: the use of the modified method of M. Ya. Breitman allows not only to determine the unified somatotype code, but also to reveal the patterns of motor and trophic qualities most pronounced for certain somatotypes.

Keywords: somatotype, body structure, code, sports dancing, natural experiment.

Introduction

Any comparison requires a comparison of the quantitative expression of one quantity with another. At the same time, the question arises of how much at what time does one compared value differ relative to another. This problem is absolute and occurs in any field of activity. The widespread use of digital technology leads to the need to develop methods for digitally expressing information about the qualitative characteristics of the compared objects. An exceptional property of the digital expression of information is the fact that, regardless of its qualitative nature, the assigned number and the order of its sequence allow in a compact form to accumulate, transmit and subsequently analyze it. If necessary, you can complicate and expand the necessary information by introducing the inclusion of its digital representation in an existing code description.

In the field of sports, this problem is of exceptional interest, which determined the direction of the research.

Purpose of the study: to determine the relationship between the motor, trophic and mental qualities of an athlete in accordance with the constitution of his somatotype in order to establish at the early stage of morphofunctional development of objective, phylogenetically determined signs of motor talent for sports dancing.

Objectives of the study: 1) to formalize the constitutional morphological and functional features of the structure of the

somatotype in the digital code representing the phylogenetic conditionality of its structure as information about the internal environment of the body; 2) to develop methods and tests to determine the physical and functional development of athletes, the most appropriate for sports dancing; 3) to identify the correspondence between the motor and trophic qualities of the athlete in accordance with the structure of the somatotype.

Material and Methods of the research

The work was carried out on the basis of the sports club "Ideal". The study involved dancers in the amount of 20 athletes involved in sports dancing at the initial training stage. In solving the tasks, the following methods were used: analysis and synthesis of scientific and methodological literature; generalization of the practical experience of the coaching contingent working with children in sports dance groups; a modified method of clinical anthropometry M. Ya. Breitman; natural pedagogical experiment, methods of mathematical statistics and mathematical modeling.

Results of the research

The task of comparing the geometric structure of the body structure and the morphofunctional features of ongoing processes has been considered for millennia. In the new era, the successful steps in solving this problem were the research of Galileo, 1634; Gefroy-Saint-Hilaire, 1836; K. Darest, 1865; Bodrimon and Martin Saint Angers, 1851; A. Gerlach, 1882;

G. Koch, 1884; Quetelet, 1870; Galton, 1889; M. Ya. Breitman, 1924. This is an extremely small number of studies that have made an extremely significant contribution to the problem under consideration. Among the works summarizing the achievements of their contemporaries and predecessors, one can distinguish authors such as Galileo, Jaffroix-Saint-Hilaire, M. Ya. Breitman.

Galileo introduced the method of physical similarity and dimension, which formed the basis of the theory of allometric development and discreteness of the process of shaping in self-organizing systems. Geoffrey-Saint-Hilaire, summarizing the work of his contemporaries, drew attention to the need for the processes of development of self-organizing systems to separate the growth of mass and its formation as two independent, but interdependent phenomena in the formation of a holistic organism, which represents the individual structural features of somatotypes.

It is customary to use characteristics that reflect the "structural-functional" properties of an organism as the basis for assessing physical development. The correlation of morphological and functional aspects of the biological nature of man is a central issue of the anthropometric constitution, reflecting the law of the unity of form and content.

The constitutional diversity of somatotypes in a population reflects the manifestation of a measure of its reaction to environmental influences. In turn, the concept of "predisposition" reflects the causes of extreme variants of deviation of morphofunctional organizations from the normal characteristics of the observed human populations. Deviations arising in them are a reflection of the ontogenesis of constitutional diseases, which allows you to use the features of constitutional deviations in the structure of the somatotype structure as their prenosological diagnosis.

One of the main tasks of sports anthropology is the study of the action of various means of physical activity on the physique, which ensures success in various types of sports specialization. An equally important task is the organization of monitoring the development of children and adolescents in various environmental conditions and establishing the extreme boundaries of these conditions for each category of the contingent. This, in turn, requires the development of uniform standard tests to assess the level of physical fitness and physical development.

In medicine, which is the main branch of human practical biology, the attention to constitutional somatic diseases is increasingly being paid to the eradication of infectious diseases. In 1881, Benke was one of the first in the study of the somatotype constitution that formulated the main goal of this direction, namely that the diversity of the somatotype constitution reflects the specificity of the organism's resistance to certain diseases, which manifests itself when the individual is in adverse conditions.

In 1924, M. Ya. Breitman gives a deep justification for this phenomenon. Its justification was based on the position that the body is an external reflection of metabolic processes and its biokinematic links are indicators of a prenosological diagnosis of disorders of endocrine relationships in the internal environment of the body. These provisions were substantiated by a large number of observations as an endocrinologist who

investigated the pathology of endocrine disorders.

The method of clinical anthropometry developed by him consisted in the fact that when comparing, not the absolute values of the measured parts of the body were compared, but their relationship to the individual's body length. This allowed for any growth to highlight the qualitative structure of the constitutional structure of the somatotype. In this case, it is necessary to know the body height of the subject, age and body weight. The systematization of body parts taken for measurement consisted of nine sizes of vertical and six horizontal indicators, which include the following designations: I) upper face, II) lower face, III) neck, IV) medial vertical distance between the acromial and nipple line, V) such the same distance between the nipple line and the navel, VI) the same distance between the navel and the line through the middle of the inguinal folds, VII) the length of the thigh, VIII) the length of the lower leg, IX) the height of the foot. Horizontal dimensions: X) half interacromial distance, XI) half inter-nipple distance, XII) foot length from heel to thumb. Parts of the arm: XIII) the length of the shoulder, XIV) the length of the hand. The formation of the structure structure of somatotypes based on their proportions was carried out on the material of the examined both normal and pathological types. The structure of each type is represented in the form of a vertical column, consisting of sections representing the percentage of the length of the body part to the length (growth) of the whole body. The horizontal dimensions of the body were also evaluated relative to the length of the entire vertical growth of the body.

Pursuing a similar problem in analyzing body types, Sheldon in 1940 came to the conclusion that the concept of body types fulfilled its positive role in studying body structure and receded into the background and gave way to the concept of continuous distribution. Development went from the idea of a dichotomy of relations to the concept of variability in various spatial directions.

The continuity of the transition from one somatotype to another is laid down initially when constructing the semantic space of its representation. The main difficulty in this case is to measure the variability of traits in different directions of the axes of space and establish a measure of complexity between the compared somatotypes. The solution to this problem allows us to establish the similarity of the content of various somatotypes and their possible transition from one to another. It was this problem that was solved by M. Ya. Breitman 16 years before Sheldon.

In the ongoing research, these two practically complementary scientific approaches were combined. The development of a method for assessing individual characteristics of the structure structure of somatotypes and the measures for their comparison were made using 18 diagrams of somatotypes established by M. Ya. Breitman, which include both normal and pathological types. In their characteristics, 15 parameters are used, which have their sizes in proportion to the whole body. This determines their fixed sequence of order in the scale of names of body parts. The structure of this representation is given in Table 1.

The presented structure of the names of body parts reflects the result of the formation of body mass in the external display of the structure of the somatotype as a result of its internal redistribution with the proceeding differentiation of the

Table 1 Anthropometric proportions in various types of endocrine relationships, %

| Breitman Code | Name of body parts | Average* | Standard | Muscular type | Respiratory type | Digestive type | Brain type | Asthenic type | Infantlism | Premature aging | Adult rickets | Osteoporosis | Gigantism | Acromegaly | Pituitary-degeneration | Bazedova's disease | Myxedema and Creticism | Dystimism | Eunochoidism | Micromelia |
|---------------|------------------------------------|---------------|---------------|---------------|------------------|----------------|---------------|---------------|---------------|-----------------|---------------|---------------|---------------|---------------|------------------------|--------------------|------------------------|---------------|---------------|---------------|
| I | Upper face length | 10,17 | 8,85 | 8,33 | 8 | 8 | 11 | 7 | 10,3 | 11,7 | 12,8 | 11,6 | 7,8 | 13,8 | 9,4 | 9,85 | 11,6 | 10 | 8 | 15 |
| II | Lower face length | 4,77 | 4,21 | 3 | 4 | 4 | 3 | 4,5 | 4,2 | 4,5 | 6,1 | 4,5 | 4,4 | 6,4 | 5 | 4,54 | 6,3 | 5 | 4 | 8,25 |
| III | Neck length | 4,33 | 5,79 | 4,17 | 5,33 | 5,5 | 3 | 7 | 5,3 | 2,8 | 3,3 | 4,1 | 6,7 | 2,1 | 2,6 | 4,65 | 1,4 | 3 | 4 | 7,25 |
| IV | Ascromial nipple distance | 8,51 | 6,84 | 8,33 | 6,22 | 5 | 8,5 | 7 | 6,9 | 7,8 | 11,5 | 7,3 | 7,8 | 7,6 | 13,8 | 10,65 | 10,2 | 10 | 8,8 | 9 |
| V | Nipple-umbilical distance | 14,60 | 13,66 | 17,66 | 15,11 | 18 | 14 | 11,5 | 13,5 | 13,9 | 13,8 | 14,6 | 15,6 | 12,8 | 16,2 | 13,7 | 16,5 | 14 | 11,2 | 17 |
| VI | Umbilical-inguinal distance | 8,29 | 10 | 7 | 5,33 | 7 | 7,5 | 10 | 9,8 | 9,5 | 10 | 8,3 | 6,7 | 8,7 | 8,5 | 10,5 | 6,3 | 5 | 4 | 15 |
| VII | Thigh length | 23,53 | 26,14 | 23,5 | 26,66 | 22 | 25 | 27 | 25,4 | 25,9 | 18,3 | 25,3 | 22,2 | 25,5 | 21 | 23,8 | 23 | 22 | 30,4 | 10,5 |
| VIII | Shank length | 21,08 | 20,33 | 22,5 | 24 | 25 | 22 | 21 | 20,1 | 19,4 | 20,2 | 19,8 | 24,4 | 16,7 | 19,33 | 18,33 | 20 | 26 | 25,6 | 14,75 |
| IX | Foot height | 4,72 | 4,21 | 5,5 | 5,33 | 5,5 | 6 | 5 | 4,5 | 4,5 | 4 | 4,5 | 4,4 | 6,4 | 4,2 | 4,01 | 4,7 | 5 | 4 | 3,25 |
| | Total vertical indicators | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| X | Horizontal distance | | | | | | | | | | | | | | | | | | | |
| | Half acromial distance | 9,84 | 9,5 | 9 | 9,33 | 11 | 9 | 7,5 | 9,5 | 10,33 | 11,7 | 10 | 8,8 | 11,7 | 10,5 | 9,7 | 10,33 | 11 | 8,8 | 9,5 |
| XI | Half spacing | 6,84 | 6,33 | 7 | 7,11 | 7 | 6 | 4,75 | 6,32 | 6,7 | 8,1 | 6,7 | 6,5 | 8 | 8,8 | 7 | 7 | 8 | 6 | 5,85 |
| XII | Foot length from heel to toe | 15,01 | 14,5 | 16 | 14,5 | 15,5 | 14,5 | 14,33 | 15 | 14,4 | 14,7 | 15,6 | 16 | 16,5 | 15 | 14,5 | 15,5 | 16 | 14,7 | 13 |
| XIII | Shoulder length | 18,02 | 18 | 19 | 17 | 16,5 | 15,4 | 18,5 | 18 | 19 | 20,1 | 17,7 | 19 | 16 | 18,2 | 18 | 18 | 16 | 24 | 16 |
| XIV | Forearm length | 15,44 | 14,5 | 14,6 | 14 | 13,75 | 14,4 | 14,5 | 14,5 | 15,4 | 18,1 | 16,2 | 16 | 10,6 | 16,1 | 15,2 | 16 | 25 | 16 | 13 |
| XV | Brush length | 11,40 | 10,5 | 9,2 | 9,75 | 11 | 8,65 | 11,33 | 10,5 | 11,1 | 14,5 | 11,8 | 12 | 13 | 11,1 | 17,77 | 10 | 12 | 12 | 9 |
| | Total horizontal indicators | 76,56 | 73,33 | 74,80 | 71,69 | 74,75 | 67,95 | 70,91 | 73,82 | 76,93 | 87,20 | 78,00 | 78,30 | 75,80 | 79,70 | 82,17 | 76,83 | 88,00 | 81,50 | 66,35 |
| | Total indicators | 176,56 | 173,36 | 174,79 | 171,67 | 174,75 | 167,95 | 170,91 | 173,82 | 176,93 | 187,20 | 178,00 | 178,30 | 175,80 | 179,73 | 182,20 | 176,83 | 188,00 | 181,50 | 166,35 |

Body length along the midline

Horizontal distance

Hand parts

specialized functions of the incorporated organogenesis and the action of the external controlling factor of the educational environment. A special case of an external controlling factor may be the targeted motor activity of the training process. Depending on the period of age-related development, the effect and its qualitative content can have various consequences. Such an effect may have an effect since the first cell division.

To understand the nature of this effect and the possibility of controlling it, the need arises for a more detailed consideration of it. To this end, the task was set - to establish the significance of competitive interdependent relations of the constitutional structure of the somatotype in the distribution of universal tissue – body weight. Since the body of any individual is included in the set of body types established by M. Ya. Breitman, considering it as a certain variant of this combination, it is necessary to make a comparison of each element of the body under study with similar elements of the Breitman set of body types, building them in a sequential increase from their minimum values by mass of formation up to the maximum observed, including the entire contingent examined.

When conducting these studies, each time an element of the body of the subject appears as a reference point, and this element of each somatotype from the table of M. Ya. Breitman and all previous examined is compared with him. As an example of the implementation of this procedure, let us consider a comparison of the “hip length” of Investigated No. 1, the values of this indicator to eighteen somatotypes from table 1. The results of the procedure are presented in Figure 1.

The construction of the comparable components of the body structure described above was performed for all somatotypes, which allowed us to build unified digital codes for each somatotype. The algorithm for constructing the digital code is shown by the example of the Standard somatotype, which was defined by M. Ya. Breitman as the most harmonious and confirmed by geometric constructions as a result of straight lines measured through the indicated points and combining them into a single structure reflecting the body structure scheme (Table 2).

By complete analogy, a summary table of unified codes of all somatotypes of M. Ya. Breitman and the individuals participating in the study was compiled (Table 3).

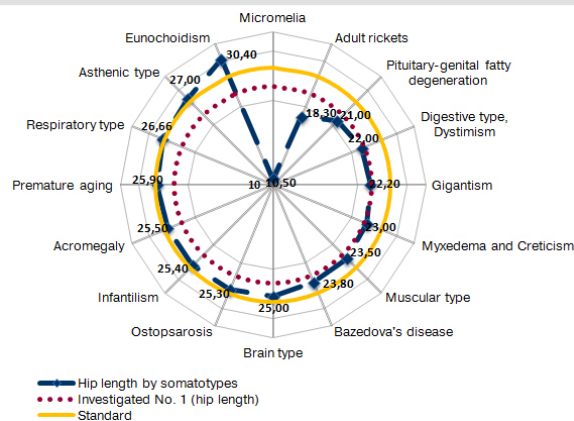


Fig. 1. The ratio of the indicator “hip length” of the Investigated No. 1 to the similar indicators of eighteen somatotype variants from the Table 1

ased on the results obtained, we can note the groups of the smallest parts of the body, average sizes and the longest parts of the body. Thus, the number of standardized codes of somatotypes that correspond to the contingent to be contemplated can only be within the limits of somatotypes defined by M. Ya. Breitman, reflecting the measure of their proximity to them.

During the analysis of studies, results were obtained on the frequency of occurring locations of each indicator, which was reflected in Table 4.

Also, based on the results obtained, one can see clearly expressed groups of the smallest parts of the body, average sizes and the longest parts of the body. Thus, the number of somatotype codes that correspond to the norm is limited.

From Table 4 it is seen that the smallest parts of the body are indicators numbered 2, 3 and 9 (2 is the length of the lower face, 3 is the length of the neck, 9 is the height of the foot). The figures given for the frequency of hit indicators for specific positions of the unified somatotype code were calculated according to Table 3.

If we look at the same table of the frequency of hits of the indicator number on the code position as a percentage of the

Table 2

An algorithm for constructing a digital code using the example of the Standard somatotype

| | No. i/o | Names of body parts in the general structure of the somatotype | Structure of the somatotype “Standard”, in% of body length | Structure of a universal digital code |
|-------------------------------|---------|--|--|---------------------------------------|
| Body length along the midline | I | Upper face length | 8,85 | 6 |
| | II | Lower face length | 4,21 | 1 |
| | III | Neck length | 5,79 | 3 |
| | IV | Ascromial nipple distance | 6,84 | 5 |
| | V | Nipple-umbilical distance | 13,66 | 10 |
| | VI | Umbilical-inguinal distance | 10 | 8 |
| | VII | Thigh length | 26,14 | 15 |
| | VIII | Shank length | 20,33 | 14 |
| | IX | Foot height | 4,21 | 2 |
| Horizontal distance | X | Half acromial distance | 9,5 | 7 |
| | XI | Half spacing | 6,33 | 4 |
| | XII | Foot length from heel to toe | 14,5 | 11 |
| | XIII | Shoulder length | 18 | 13 |
| | XIV | Forearm length | 14,5 | 12 |
| | XV | Brush length | 10,5 | 9 |

Table 3
Summary table of somatotype codes

| No. | Scale somatotypes names | A scale of about 15 somatotype elements arranged in sequence from the minimum value of the body element to the maximum in the redistribution of body weight to its formation in the construction of the somatotype | | | | | | | | | | | | | | |
|-----|--------------------------------------|--|----------|-----|----------|-----------|-----------|-----------|----------|-----------|----|----------|----------|----------|-----------|----------|
| | | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | XIII | XIV | XV |
| 1. | Breathing type | 2 | 3 | 6 | 9 | 4 | 11 | 1 | 10 | 15 | 14 | 12 | 5 | 13 | 8 | 7 |
| 2. | Eunoidism | 2 | 3 | 6 | 9 | 11 | 1 | 4 | 10 | 5 | 15 | 12 | 14 | 13 | 8 | 7 |
| 3. | Muscle type | 2 | 3 | 9 | 6 | 11 | 1 | 4 | 10 | 15 | 14 | 12 | 5 | 13 | 8 | 7 |
| 4. | Brain type | 2 | 3 | 9 | 11 | 6 | 4 | 15 | 10 | 1 | 5 | 14 | 12 | 13 | 8 | 7 |
| 5. | Investigated 1 | 2 | 3 | 9 | 11 | 1 | 6 | 10 | 15 | 4 | 13 | 14 | 12 | 5 | 7 | 8 |
| 6. | Investigated 2 | 2 | 3 | 9 | 10 | 11 | 4 | 6 | 1 | 15 | 13 | 14 | 5 | 12 | 7 | 8 |
| 7. | Investigated 3 | 2 | 3 | 10 | 9 | 11 | 4 | 6 | 1 | 15 | 14 | 5 | 12 | 13 | 7 | 8 |
| 8. | Investigated 4 | 2 | 3 | 10 | 9 | 11 | 6 | 1 | 12 | 15 | 5 | 4 | 14 | 13 | 7 | 8 |
| 9. | Investigated 5 | 2 | 3 | 10 | 11 | 9 | 4 | 1 | 6 | 15 | 12 | 14 | 5 | 13 | 8 | 7 |
| 10. | Investigated 6 | 2 | 3 | 11 | 9 | 4 | 15 | 10 | 1 | 6 | 12 | 14 | 5 | 8 | 13 | 7 |
| 11. | Digestive type | 2 | 4 | 3 | 9 | 6 | 11 | 1 | 10 | 15 | 14 | 12 | 13 | 5 | 7 | 8 |
| 12. | Investigated 7 | 2 | 6 | 10 | 3 | 9 | 11 | 4 | 1 | 15 | 14 | 12 | 13 | 5 | 7 | 8 |
| 13. | Investigated 8 | 2 | 9 | 3 | 10 | 11 | 6 | 1 | 15 | 4 | 12 | 5 | 13 | 14 | 8 | 7 |
| 14. | Standard | 2 | 9 | 3 | 11 | 4 | 1 | 10 | 6 | 15 | 5 | 12 | 14 | 13 | 8 | 7 |
| 15. | Infantilism | 2 | 9 | 3 | 11 | 4 | 10 | 6 | 1 | 15 | 5 | 14 | 12 | 13 | 8 | 7 |
| 16. | Gigantism | 2 | 9 | 11 | 3 | 6 | 1 | 4 | 10 | 15 | 5 | 12 | 14 | 13 | 7 | 8 |
| 17. | Asthenic type | 2 | 11 | 9 | 1 | 3 | 4 | 10 | 6 | 15 | 5 | 12 | 14 | 13 | 8 | 7 |
| 18. | Distimism | 3 | 2 | 6 | 9 | 11 | 1 | 4 | 10 | 15 | 5 | 12 | 13 | 7 | 14 | 8 |
| 19. | Investigated 9 | 3 | 2 | 6 | 9 | 10 | 11 | 4 | 1 | 15 | 12 | 5 | 14 | 13 | 8 | 7 |
| 20. | Acromegaly | 3 | 2 | 9 | 4 | 11 | 6 | 14 | 10 | 5 | 15 | 1 | 13 | 12 | 8 | 7 |
| 21. | Prematurely. aging | 3 | 2 | 9 | 11 | 4 | 6 | 10 | 15 | 1 | 5 | 12 | 14 | 13 | 8 | 7 |
| 22. | Osteoporosis | 3 | 2 | 9 | 11 | 4 | 6 | 10 | 1 | 15 | 5 | 12 | 14 | 13 | 8 | 7 |
| 23. | Investigated 10 | 3 | 2 | 10 | 6 | 9 | 11 | 4 | 1 | 12 | 15 | 13 | 14 | 5 | 7 | 8 |
| 24. | Investigated 11 | 3 | 2 | 10 | 9 | 11 | 4 | 6 | 15 | 1 | 14 | 13 | 5 | 12 | 7 | 8 |
| 25. | Investigated 12 | 3 | 2 | 11 | 9 | 4 | 6 | 10 | 15 | 1 | 12 | 5 | 13 | 14 | 7 | 8 |
| 26. | Pituitary-genital fatty degeneration | 3 | 9 | 2 | 6 | 11 | 1 | 10 | 15 | 4 | 12 | 14 | 5 | 13 | 8 | 7 |
| 27. | Myxedema and cretinism | 3 | 9 | 2 | 6 | 11 | 15 | 4 | 10 | 1 | 12 | 14 | 5 | 13 | 8 | 7 |
| 28. | Rickets (in an adult) | 3 | 9 | 2 | 11 | 6 | 4 | 10 | 1 | 5 | 15 | 12 | 14 | 7 | 13 | 8 |
| 29. | Average | 3 | 9 | 2 | 11 | 6 | 4 | 10 | 1 | 15 | 5 | 12 | 14 | 13 | 8 | 7 |
| 30. | Investigated 13 | 3 | 11 | 2 | 9 | 10 | 15 | 6 | 12 | 13 | 1 | 4 | 14 | 5 | 8 | 7 |
| 31. | Bazedova disease | 9 | 2 | 3 | 11 | 10 | 1 | 6 | 4 | 5 | 12 | 14 | 15 | 13 | 8 | 7 |
| 32. | Micromelia | 9 | 11 | 3 | 2 | 4 | 15 | 10 | 7 | 12 | 14 | 8 | 1 | 6 | 13 | 5 |

Remark. The same font indicates the coincidence of the sequence of code elements in the structures of the presented somatotypes.

Table 4
The number of hits of each indicator number at the position of the universal somatotype code (positions are numbered in ascending order of indicator values)

| Breitman Code | Name of body parts | Scale of order (following body parts) | | | | | | | | | | | | | | | Total |
|---------------|------------------------------|---------------------------------------|----|-----|----|----|----|-----|------|----|----|----|-----|------|-----|----|-------|
| | | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | XIII | XIV | XV | |
| I | Upper face length | 0 | 0 | 0 | 1 | 1 | 7 | 5 | 10 | 5 | 1 | 1 | 1 | 0 | 0 | 0 | 32 |
| II | Lower face length | 17 | 9 | 5 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 |
| III | Neck length | 13 | 10 | 6 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 |
| IV | Ascromial nipple distance | 0 | 1 | 0 | 1 | 8 | 8 | 8 | 1 | 3 | 0 | 2 | 0 | 0 | 0 | 0 | 32 |
| V | Nipple-umbilical distance | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 10 | 4 | 8 | 5 | 0 | 1 | 32 |
| VI | Umbilical-inguinal distance | 0 | 1 | 4 | 4 | 5 | 7 | 6 | 3 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 32 |
| VII | Thigh length | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 10 | 19 | 32 |
| VIII | Shank length | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 18 | 12 | 0 | 32 |
| IX | Foot height | 2 | 8 | 8 | 11 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 |
| X | Half acromial distance | 0 | 0 | 6 | 2 | 3 | 1 | 11 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 |
| XI | Half spacing | 0 | 3 | 3 | 10 | 11 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 |
| XII | Foot length from heel to toe | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 8 | 13 | 4 | 3 | 0 | 0 | 32 |
| XIII | Shoulder length | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 2 | 6 | 18 | 3 | 0 | 32 |
| XIV | Forearm length | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 7 | 9 | 12 | 2 | 1 | 0 | 32 |
| XV | Brush length | 0 | 0 | 0 | 0 | 0 | 4 | 1 | 6 | 16 | 4 | 0 | 1 | 0 | 0 | 0 | 32 |
| Total | | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 480 |

Remark. Dimming highlights values with indicators greater than 1.

number of indicators dropped, we get Table 5.

Conclusions / Discussion

Based on the results obtained in table 5, you can compile a universal code Collective somatotype, which consists of the most common indicators in ascending order (Table 6).

Using the modified method of M. Ya. Breitman allows not only to determine the unified code of the somatotype, but also to reveal the patterns of motor and trophic qualities most pro-

Table 5

The number of hits of each indicator number at the position of the universal somatotype code (positions are numbered in the order of increasing values of the indicators) expressed, %

| Breitman Code | Name of body parts | Scale of order (following body parts) | | | | | | | | | | | | | | | Total |
|---------------|------------------------------|---------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------|
| | | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | XIII | XIV | XV | |
| I | Upper face length | 0 | 0 | 0 | 3 | 3 | 22 | 16 | 31 | 16 | 3 | 3 | 3 | 0 | 0 | 0 | 100 |
| II | Lower face length | 53 | 28 | 16 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 |
| III | Neck length | 41 | 31 | 19 | 6 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 |
| IV | Ascromial nipple distance | 0 | 3 | 0 | 3 | 25 | 25 | 25 | 3 | 9 | 0 | 6 | 0 | 0 | 0 | 0 | 100 |
| V | Nipple-umbilical distance | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 31 | 13 | 25 | 16 | 0 | 3 | 100 |
| VI | Umbilical-inguinal distance | 0 | 3 | 13 | 13 | 16 | 22 | 19 | 9 | 3 | 0 | 0 | 0 | 3 | 0 | 0 | 100 |
| VII | Thigh length | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 6 | 31 | 59 | 100 |
| VIII | Shank length | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 56 | 38 | 100 |
| IX | Foot height | 6 | 25 | 25 | 34 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 |
| X | Half acromial distance | 0 | 0 | 19 | 6 | 9 | 3 | 34 | 28 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 |
| XI | Half spacing | 0 | 9 | 9 | 31 | 34 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 |
| XII | Foot length from heel to toe | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 6 | 25 | 41 | 13 | 9 | 0 | 0 | 100 |
| XIII | Shoulder length | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 6 | 6 | 19 | 56 | 9 | 0 | 100 |
| XIV | Forearm length | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 22 | 28 | 38 | 6 | 3 | 0 | 100 |
| XV | Brush length | 0 | 0 | 0 | 0 | 0 | 13 | 3 | 19 | 50 | 13 | 0 | 3 | 0 | 0 | 0 | 100 |
| Total | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |

Remark. The maximum values obtained by columns are highlighted by dimming..

Table 6

Universal collective somatotype code

| Universal code | 2 | 3 | 9 | 11 | 4 | 6 | 10 | 1 | 15 | 12 | 14 | 5 | 13 | 8 | 7 |
|--------------------|-------------------|-------------|-------------|----------------------------|---------------------------|-----------------------------|------------------------|-------------------|-------------|---|----------------|---------------------------|-----------------|-------------|--------------|
| Breitman code | II | III | IX | XI | IV | VI | X | I | XV | XII | XIV | V | XIII | VIII | VII |
| Name of body parts | Lower face length | Neck length | Foot height | Half inter-nipple distance | Ascromial-nipple distance | Umbilical-inguinal distance | Half acromial distance | Upper face length | Hand Length | Foot length from heel to large. fingers | Forearm length | Nipple-umbilical distance | Shoulder length | Shin length | Thigh length |

nounced for certain somatotypes.

Conducting further studies using standardized tests makes it possible to establish a direct relationship between the inherent phylogenetically predetermined correlation of the level of development of the athlete's physical qualities and his unified somatotype code.

The correspondence between the unified code of the somatotype and its physical qualities allows you to accurately select

team members in the formation of more stable and productive couples in sports dancing, and the choice of the most optimal types of training organization to develop the necessary ratio of the athlete's motor qualities in achieving high sports results.

During further research in this direction, the selection of athletes at its initial stage, this method will be fully automated. Building a somatotype model based on a natural pedagogical experiment, which ensures the selection of athletes who have achieved the highest results.

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.

References

1. Artemeva, G.P., Pugach, Ya.I. & Druz, V.A. (2014), *Problema adaptatsii v strukture nauchnykh issledovaniy sistemy olimpiyskogo obrazovaniya: monografiya* [The problem of adaptation in the structure of scientific research of the Olympic education system], KhSAPC, Kharkov. (in Russ.)
2. Breytman, M.Ya. (1949), *Klinicheskaya semiotika i differentsialnaya diagnostika endokrinnnykh zabollevaniy* [Clinical semiotics and differential diagnosis of endocrine diseases], Medgiz, Leningrad. (in Russ.)
3. Breytman, M.Ya. (1926), *Tablitsy dlya klinicheskoy antropometrii* [Tables for clinical anthropometry], Publishing House "P.P. Soykin", Len-

ingrad. (in Russ.)

4. Druz, V.A., Artemeva, G.P., Buren, N.V. et al. (2013), *Teoreticheskie i prikladnye osnovy postroeniya monitoringa fizicheskogo razvitiya, fizicheskoy podgotovlennosti i fizicheskogo sostoyaniya: uchebnoe posobie* [Theoretical and applied foundations for constructing monitoring of physical development, physical fitness and physical condition], KhSAPC, Kharkov. (in Russ.)
5. Yefimov, N.V. (1971), *Vysshaya geometriya* [Higher Geometry], Nauka, Moscow. (in Russ.)
6. Platonov, V.N. (2004), *Sistema podgotovki sportsmenov v olimpiyskom sporte. Obshchaya teoriya i ee prakticheskoe primenenie: ucheb. dlya studentov vuzov fiz. vosp. i sporta* [The system of training athletes in Olympic sports. General theory and its practical application], Olimpiyskaya literatura, Kiev. (in Russ.)
7. Savelov, A.A. (1960), *Ploskie krivye. Sistematika, svoystva, primeneniya* [Flat Curves. Systematics, properties, applications], State Publishing House of Phys.-Math. Lit., Moscow. (in Russ.)
8. Samsonkin, V.N., Druz, V.A. & Fedorovich, Ye.S. (2010), *Modelirovanie v samoorganizuyushchikhsya sistemakh* [Modeling in self-organizing systems], Donetsk. (in Russ.)
9. Sedov, L.I. (1981), *Metody podobiya i razmernosti v mekhanike* [Methods of similarity and dimension in mechanics], Nauka, Moscow. (in Russ.)
10. Stakhov, A.P. (2006), "The Golden Ratio, Sacred Geometry and the Mathematics of Harmony", *Metaphysics. Century XXI*, Binom, Moscow, pp. 174-215. (in Russ.)
11. Filchenko, Yu.A. (1925), *Galton i Mendel* [Galton and Mendel], Moscow. (in Russ.)
12. Kin-itsu Hirata & Kanae Kaku (1968), *The evaluating method of physique and physical fitness and its practical application*, Hirata Institute of Health.
13. Sheldon, W.H. (1954), *Atlas of Man*, Harper and Brothers, New York.
14. Galton, Sir F. (1889), *Natural Inheritance*, London.

Received: 08.11.2019.

Published: 30.12.2019.

Information about the Authors

Valeriy Druz: *Doctor of Science (Biology), Professor; Kharkiv State Academy of Physical Culture: Klochkivska 99, Kharkiv, 61058, Ukraine.*

ORCID.ORG/0000-0002-4628-6791

E-mail: valeriidruz@gmail.com

Yaroslava Volkova: *Kharkiv State Academy of Physical Culture: Klochkivska str. 99, Kharkiv, 61058, Ukraine.*

ORCID.ORG/0000-0001-9274-2076

E-mail: yguliaeva81@gmail.com

Oleksii Hulciaiev: *Kharkiv State Academy of Physical Culture: Klochkivska str. 99, Kharkiv, 61058, Ukraine.*

ORCID.ORG/0000-0002-5010-5965

E-mail: Alex.Gulyaev@gmail.com

The construction of the training process of young weight lifters 12–13 years old during a one-year macrocycle, taking into account the specific biological cycle

Liudmyla Kanunova
Viktor Dzhym

Kharkiv State Academy of Physical Culture, Kharkiv, Ukraine

Purpose: to consider the question of building the training process of young weight lifters of 12–13 years during a one-year macrocycle, taking into account the peculiarities of a specific biological cycle.

Material & Methods: the methods of theoretical analysis and generalization of scientific information, system analysis are used in the work.

Results: modern approaches to constructing the training process of young weight lifters of 12–13 years are presented, a detailed structure of the construction of a one-year macrocycle taking into account the CMC phases is presented.

Conclusions: it was determined that for young athletes involved in kettlebell lifting, it is necessary to carry out a detailed load distribution in accordance with the phases of the CMC during a one-year macrocycle, and it is necessary to take into account loads in basic and competitive mesocycles.

Keywords: young athletes, specific biological cycle, CMC phases, microcycles, mesocycles.

Introduction

Modern sport is characterized by a steady increase in sports achievements, accompanied by an increase in the volume and intensity of the training load. Such an approach to the training process often leads to overstrain of regulatory systems, the depletion of the adaptive reserve and the reduction in the time for athletes to perform, does not allow to achieve high sports results. The functioning of physiological systems and adaptation processes in the body of women differ from those in men. This is due to one of the main biological characteristics of the female body associated with reproductive function – the cyclical functions of the hypothalamic-pituitary-ovarian-adrenal system. A number of studies (A. G. Radzievsky, 1990; F. A. Iordansky, 2012; V. V. Mulik, 2001; 2016; L. Ya.-G. Shakhlin, 1995–2014), including foreign ones (A. M. Burrows, S. R. Bird, 2005; S. B. Da Silva, 2006; A. J. Anderson, M. A. Babcock, 2008) focuses on the effects of sex hormones in women's athletic training. Experts have determined the dependence of the manifestation of the performance of athletes of various sports specializations and the reaction of their body depending on changes in the concentration of sex hormones during the menstrual cycle (MC) (V. V. Mulik, 2001; V. M. Platonov 2004; M. S. Prudnikova, 2009) [4; 9; 10].

Purpose of the study: to consider the construction of the training process of young kettlebell-lifter 12–13 years old during a one-year macrocycle, taking into account the characteristics of a specific biological cycle.

Material and Methods of the research

Research methods: according to the methodological approach to solving the problem and tasks, the research pro-

gram included a set of research methods: analysis of scientific and methodological literature, determination of special physical fitness using pedagogical testing of young kettlebells, pedagogical testing of the training process and methods of mathematical statistics.

Organization of the study: in this study, young pupils of Children's and Youth Sports School No. 16 and Children's and Youth Sports School No. 8, Kharkov, participated. The experiment involved 30 young kettlebell-lifter female athletes aged 12–13 years, who were divided into control and experimental groups of 15 athletes in each group. Participants in the experiment trained 3-4 times a week according to the developed methodology.

Experimental studies were carried out at the training base of Children's and Youth Sports School No. 8 and the Children's and Youth Sports School No. 16.

Results of the research

Athletic training of young female athletes involved in weightlifting involves the use of tools and methods that influence the development of such physical qualities as strength, endurance and speed-power training. Under the influence of training in the body athletes undergo certain changes. In the process of adaptation to physical activity, the level of physical performance and fitness of the female athlete increases. Muscle hypertrophy is one of the manifestations of the body's adaptation to power. However, in order for the changes in the body of female athletes to have a positive character, the trainer must choose the optimal mode of training, taking into account the ovarian-menstrual cycle and properly selected rest, correctly select the recovery procedures that contribute

to faster growth of athletic skills.

At that time, today, there is no research on the construction of a one-year macrocycle for training young athletes involved in kettlebell lifting, taking into account the ovarian menstrual cycle, which takes into account the use of loads in the phases of the ovarian menstrual cycle.

At the beginning of the research, young athletes involved in kettlebell lifting were divided into two groups of 15 people each. The female athlete of the experimental group trained according to the developed experimental technique, which provided for the phase of the ovarian-menstrual cycle in the training process of taking into account the loads in the annual macrocycle.

Sports training involves the use of training means and methods aimed at improving the level of development of physical qualities. Long-term exposure to stresses on the body causes changes in the functional state of organ systems, as a result of which the general level of fitness and physical performance increases. However, in order for the influence of playing sports to be positive, the trainer should select an adequate level of load taking into account the phases of the ovarian-menstrual cycle, taking into account the individual characteristics of the athletes [3–7].

Considering the recommendations of leading experts in the field of building the training process for training athletes (V. M. Platonov, 2004; V. V. Mulik, 2017), it is reasonable to build a two-cycle summer training for young athletes involved in kettlebell lifting, taking into account the CMC profession during a one-year macrocycle.

In our study, the construction of a one-year macrocycle for training young athletes is based on the generally accepted theory of periodization (V. M. Platonov), which provides for the separation of the macrostructure into preparatory, competitive, and transitional periods, and when a menarche appears, we developed an experimental method for constructing mesocycles, taking into account ovarian phases menstrual cycle.

So, the *first macrocycle*, lasting 24 weeks (June 2017 – November 2017), had in its structure a preparatory period (June – September 2017), which consisted of two stages of general and specially preparatory, in which the training load gradually increased (Table 1).

The planning of the training process in the *general preparatory stage* (duration 12 weeks) included one retractor and two ba-

sic mesocycles. The basic mesocycle was of an experimental nature, where the phase of the ovarian-menstrual cycle was taken into account in the training process, and the tasks of the mesocycle provided for the creation of prerequisites for further hard work related directly to increasing the number of lifting weights and using other power devices.

The *special preparatory stage* (duration 4 weeks) is characterized by the predominant use of specialized exercises with the use of static, combined and semi-dynamic training modes, which allow to improve the weight lifting of young athletes. The special-preparation mesocycle consisted of retracting, shock, and reducing microcycles.

The structure of the competitive period, lasting 8 weeks (October – November 2017) of the annual cycle, has pre-competitive and competitive mesocycles, including retracting, underwater and competitive microcycles.

The *second macrocycle* (lasting 24 weeks, December 2017 – April 2018) in terms of its objectives and content is an organic continuation of the first macrocycle, the preparatory period of which was 12 weeks (December 2017 – February 2018).

The *B-preparatory stage* (duration 8 weeks, December-January) included two mesocycles: the retractor and the base one. The basic mesocycle was experimental in nature, where the phases of the ovarian-menstrual cycle in the training process were taken into account, the tasks of the mesocycle also provided for the creation of prerequisites for further hard work related directly to building strength and speed-strength qualities. The structure of the special preparatory stage, (duration 4 weeks), had a formative character and included a “special preparatory” mesocycle.

The *special preparatory stage* is characterized by the predominant use of highly specialized exercises and the use of static, combined and semi-dynamic training modes, as well as by practicing the exercise of lifting weights by the number of times per minute. The special-preparation mesocycle consisted of a restorative microcycle, a retractor, shock, and restorative. This stage created the prerequisites for recovery after the base mesocycle.

The structure of the *competitive period* (duration of 8 weeks) is formative. The load volume is reduced, special attention is paid to working out the technical lifts of the weight by a number of times. The objective of this period is to achieve the best peak shape of young athletes. The structure of the competitive period of the annual cycle has pre-competitive and competitive mesocycles, including underwater and competitive

Table 1

The structure of the annual dual macrocycle of young female athletes, 12–13 years old, taking into account the biological cycle

| Macrocycles | I | | | | | | II | | | | | | |
|-------------|-------------|-----|------|-------------|----|----|-------------|-----|----|-----|----|-----|----|
| | Preparatory | | | Competitive | | | Preparatory | | | CM | | ΠPX | |
| Stages | G-P | | | SP | CM | | | G-P | | SP | CM | | RS |
| Mesocycles | RT | B-1 | B-2 | SP | Π3 | 3M | RT | B-2 | SP | PC | CM | PC | |
| Months | VI | VII | VIII | IX | X | XI | XII | I | II | III | IV | V | |
| OMC | W | X | X | W | X | W | W | X | W | X | W | W | |

Remark. Mesocycles: *KT* – retractor; *B-1* – basic (general physical fitness); *B-2* – basic (special physical training); *SP* – specially preparatory; *PC* – precompetitive; *CM* – competitive; *RS* – Renewable-supportive. *B* – without taking into account the phases of the ovarian-menstrual cycle; *X* – taking into account the phases of the ovarian-menstrual cycle.

microcycles.

The *transition* period involves the restoration of the body after training and competitive activity.

The proposed approach to planning a one-year training macrocycle for young weight-lifting athletes, taking into account the phases of the ovarian-menstrual cycle, became the basis of the experimental group training program for young athletes involved in kettlebell lifting.

The experimental results were as follows.

Testing the level of special physical preparedness for athletes 12–13 years old, engaged in weight lifting, was carried out using special and special preparatory exercises: deadlift with 24 kg of weight; squats with 24 kg of weight; a jerk of a weight of 8 kg in 10 minutes and weight on the crossbar (Table 2).

An analysis of the manifestations of special physical preparedness in athletes 12–13 years old at the beginning of a one-year macrocycle showed that the differences in results were not significant: in a jerk of a weight of 8 kg (control – 15,4 times, experimental – 16,1 times; $P>0,05$); squats with 24 kg of weights (respectively – 12,5 times, 12,1 times; $P>0,05$) deadlift with 24 kg of weights (control – 35,2 times, experimental 34,8 times; $P>0,05$) hanging on the crossbar (36,4 s, 35,2 s, respectively; $P>0,05$) (Table 2).

During the study, at the end of the one-year macrocycle for 12–13-year-old female athletes involved in kettlebell lifting, the difference between the indicators was likely: in a jerk of a weight of 8 kg (control – 22,1 times, experimental – 30,2 times ($t=2,17$ $P<0,05$)) squats with 24 kg of weights (respectively – 18,7 times, 26,6 times ($t=2,37$; $p<0,05$); deadlift with 24 kg of weights (control – 41,2 times experimental 47,8 times ($t=2,24$; $p<0,05$)) hanging on the crossbar (38,2 s, respectively, 40,2 s ($t=2,31$; $p<0,05$)) (Table 3).

Conclusions / Discussion

An analysis of the scientific literature confirmed that research in the field of kettlebell lifting was mainly of a special nature. In recent years, scientists have conducted studies on the content and methodology of the training process of young female athletes 12–13 years old with various methods of improving motor skills and power qualities (Yu. V. Verkhoshansky [1]), planning the training process during the annual macro cycle of athletes 12–15 years (V. M. Platonov [8–9]) and the influence of the training process of young female 12–13-year-old weight-lifting athletes on manifestations of physical qualities (N. S. Ipolitov). However, the influence on the performance of young 12–13-year-old weight-lifting athletes was not studied at the first stage of training in many years of training, which prompted us to develop a training process for young 12–13-year-old weight-lifting weights during a one-year macrocycle taking into account ovarian-menstrual phases.

Today, there are a number of scientific studies that address the features of the construction of the training process of sports-women on the basis of taking into account working capacity at different periods (phases) of a specific biological cycle. Fundamental are the works of A. G. Radziewsky, Yu. T. Pokolenchuk, N. V. Svechnikov, B. P. Pangelov, T. A. Lozy, S. K. Fomina, A. Ya. Kvale, Yu. A. Karp, L. Ya.-G. Shakhlin, which determined the functional state of athletes during a specific biological cycle. To a lesser extent, the issues of building the training process of young athletes are studied, especially during the formation of a specific biological cycle.

The experimental training program, which was developed for 12–13-year-old weight-lifting athletes, taking into account the phases of the ovarian-menstrual cycle, provided for a dual structure of annual training, which included two macrocycles: the first, which should be preparatory (general construction preparatory, special preparatory stages) and competitive (competitive stage) periods; the second, with the presence of

Table 2

Average indicators of the results of special physical preparedness of young athletes of 12–13 years of age engaged in kettlebell lifting, taking into account the OMC phases at the beginning of the annual macrocycle ($n_1=n_2=15$)

| Indicators | CG | EG | T | P |
|--|----------------|-----------|------|-------|
| | $\bar{X}\pm m$ | | | |
| 8 kg kettlebell jerk for 10 minutes, times | 15,4±2,29 | 16,1±2,40 | 0,21 | >0,05 |
| Squats with 24 kg of weight, times | 12,5±2,57 | 12,1±2,57 | 0,11 | >0,05 |
| Deadlift with 24 kg of weight, times | 35,2±2,05 | 34,8±2,12 | 0,13 | >0,05 |
| Hanging on the bar, s | 36,4±0,96 | 35,2±0,85 | 0,94 | >0,05 |

Table 3

Average growth rates of the results of special physical fitness of young athletes 12–13 years old, engaged in kettlebell lifting, taking into account the CMC phases at the end of the annual macrocycle ($n_1=n_2=15$)

| Indicators | CG | EG | T | P |
|--|----------------|-----------|------|-------|
| | $\bar{X}\pm m$ | | | |
| 8 kg kettlebell jerk for 10 minutes, times | 22,1±2,36 | 30,2±2,89 | 2,17 | <0,05 |
| Squats with 24 kg of weight, times | 18,7±2,20 | 26,6±2,46 | 2,37 | <0,05 |
| Deadlift with 24 kg of weight, times | 41,2±2,25 | 47,8±1,90 | 2,24 | <0,05 |
| Hanging on the bar, s | 38,2±0,66 | 40,2±0,56 | 2,31 | <0,05 |

the preparatory (general construction preparatory and special preparatory stages) and competitive (competitive stage) and transitional (restoration phase) periods.

As means of training, competitive and competitive auxiliary exercises were used, which were used differentially depending on the phases of the ovarian-menstrual cycle according to the developed training program for a one-year macrocycle.

The introduction of the training methodology for young 12–19-year-old weight-lifting athletes during the annual macrocycle, taking into account the phases of the ovarian-menstrual cycle, contributed to a significant increase in the rates of competitive and competitive auxiliary exercises in the experimental group.

During the study, at the end of the one-year macrocycle for 12–13-year-old female athletes involved in kettlebell lifting,

the difference between the indicators was also probable: in a 8 kg kettlebell snatch ($t=2,17$; $p<0,05$); squats with 24 kg of weight ($t=2,37$; $p<0,05$); deadlift with 24 kg of weight ($t=2,24$; $p<0,05$); hanging on the crossbar ($t=2,31$; $p<0,05$).

The study confirmed the results of other authors [1; 2] about the need to take into account the impact of training on the physical performance of athletes 12–13 years old at the initial training stage. Domestic data were also expanded [4–5; 8; 9; 11] and foreign authors [16–22] on issues of increasing the level of the most significant indicators of physical qualities of athletes involved in kettlebell lifting.

The prospect of further research involves determining the construction of the training process for young 12–13-year-old weight-lifting athletes in separate mesocycles that take into account the OMC phases.

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.

References

- Verkhoshanskiy, Yu.V. (2013), *Osnovy spetsialnoy silovoy podgotovki v sporte* [Fundamentals of Special Strength Training in Sports], Sovetskiy sport, Moscow. (in Russ.)
- Dzhim, V.Yu. (2013), "Comparative analysis of jerking exercises in weightlifting and kettlebell lifting", *Pedagogika, psikhologiya ta mediko-biologichni problemi fizichnogo vikhovannya i sportu*, No. 11, pp. 10-16. (in Russ.)
- Iordanskaya, F.A. (2012), *Muzhchina i zhenshchina v sporte vysshikh dostizheniy: Problemy polovogo dimorfizma* [Man and woman in the sport of higher achievements: Problems of sexual dimorphism], Sov. sport, Moscow. (in Russ.)
- Mulik, V.V. (2001), *Sistema mnogoletnego sportivnogo sovershenstvovaniya v uslozhnennykh usloviyakh sopryazheniya osnovnykh storon podgotovlennosti sportsmenov (na materiale lyzhnogo sporta): avtoref. dis. na soiskanie uch. stepeni d-ra nauk po fiz. vosp. i sportu: spets. 24.00.01 "Olimpiyskiy i professionalnyy sport"* [The system of many years of sports improvement in complicated conditions of pairing the main aspects of athletes' fitness (based on skiing): DS thesis abstract], Kiiv. (in Russ.)
- Mulyk, V.V. (2016), "Modern Aspects of Building a Training Process for Female Athletes", *Slobozans'kij naukovno-sportivnij visnik*, No. 5(55), pp. 57-62. (in Ukr.)
- Novikov, V.P. (1990), "Characteristic of the development of strength in schoolchildren 7-10 years old", *Vozrastnye osobennosti fiziologicheskikh sistem detey i podrostkov*, Moscow, pp. 203-204. (in Russ.)
- Oleshko, V.H. (2011), *Pidhotovka sportsmeniv u sylovykh vydash sportu : navch. posib. dlia vuziv* [Training Athletes in Power Sports], DIA, Kyiv. (in Ukr.)
- Platonov, V.N. (2004), *Sistema podgotovki sportsmenov v olimpiyskom sporte. Obshchaya teoriya i ee prakticheskie prilozheniya* [The system of training athletes in Olympic sports. General theory and its practical applications], Olimp. lit., Kiev, Book 1. (in Russ.)
- Platonov, V.N. (2015), *Sistema podgotovki sportsmenov v olimpiyskom sporte. Obshchaya teoriya i ee prakticheskie prilozheniya* [The system of training athletes in Olympic sports. General theory and its practical applications], Olimp. lit., Kiev, Book 2. (in Russ.)
- Prudnikova, M.S. & Mulik, V.V. (2009), "The influence of physical activity on the functional state and personal qualities of young cyclists 12-15 years old during the formation of the CMC", *Slobozans'kij naukovno-sportivnij visnik*, No. 3, pp. 164-167. (in Russ.)
- Rovnyi, A.S. (2001), *Formuvannia systemy sensornoho kontroliu tochnykh rukhiv sportsmeniv: avtoref. dys. na zdobuttia nauk. stupenia d-ra nauk z fiz. vykhovannya i sportu: spets. 24.00.02. „Fizychna kultura, fizychnye vykhovannya riznykh hrup naseleennia"* [Formation of a system of sensory control of precise movements of athletes: DS thesis abstract], Kyiv, 40 p. (in Ukr.)
- Shakhlina, L.G. (1995), *Mediko-biologicheskie osnovy upravleniya protsessom sportivnoy trenirovki zhenshchin: Avtoref. dis. d-ra med. nauk* [Biomedical foundations of managing the process of women's sports training: DS thesis abstract], Kiev, 32 p. (in Russ.)
- Shakhlina, L.G. (1999), "Problems of Sexual Dimorphism in the Sport of Higher Achievements", *Teoriya i praktika fiz. kultury*, No. 6, pp. 51-55. (in Russ.)
- Shakhlina, L.G. (2000), "Women and Sport on the Frontier of the Third Millennium", *Nauka v olimpiyskom sporte*, No. 4, pp. 10-22. (in Russ.)
- Sheyko, B.I. (2008), "Planning Techniques for Beginner Powerlifters", *Mir sily*, No. 4, pp. 28-29. (in Russ.)
- Casazza, G.A., Jacobs, K.A., Suh, S. et al. (2004), "Menstrual cycle phase and oral contraceptive effects on triglyceride mobilization during exercise", *J. Appl. Physiol*, Vol. 97, pp. 302-309.
- Horton, T.J. Miller, E.K. & Bourret, K. (2006), "No effect of menstrual cycle phase on glycerol or palmitate kinetics during 90 min of moderate exercise", *J. Appl. Physiol*, Vol. 100, pp. 917-925.
- Jacobs, K.A., Cassaza, G.A., Suh, S. et al. (2005), "Fatty acid re-esterification but not oxidation is increased by oral contraceptive use in women", *J. Appl. Physiol*, Vol. 98, pp. 1720-1731.
- Janse de Jonge, X.A. (2003), "Effects of the menstrual cycle on exercise performance", *Sports Med*, Vol. 33, pp. 833-851.
- Kenney, L.W., Wilmore, J.H. & Costill, D.L. (2012), *Physiology of sport and exercise*, Human Kinetics, Champaign.
- Nimmo, M.A. (2009), "The female athletes", *Olympic text-book of science in sport*, Maughan, R.J. (ed.), Blackwell Sci. Publ., pp. 382-400.
- Wilmore, J.H. & Costill, D.L. (2005), *Physiology of sport and exercise*.

Received: 10.11.2019.

Published: 30.12.2019.

Information about the Authors

Liudmyla Kanunova: *Kharkiv State Academy of Physical Culture: st. Klochkivska, 99, Kharkov, 61058, Ukraine.*

ORCID.ORG/0000-0003-3545-5438

E-mail: lkanunova17@gmail.com

Viktor Dzhym: *PhD (Physical Education and Sport); Kharkiv State Academy of Physical Culture: st. Klochkivska, 99, Kharkov, 61058, Ukraine.*

ORCID.ORG/0000-0002-4869-4844

E-mail: djimvictor@gmail.com

Use of special exercises for the development of motor qualities and the formation of technical and tactical actions of defenders 13–14 years in the preparatory period

Yaroslav Kraynik
Vyacheslav Mulik
Daria Okun
Svyatoslav Koval

Kharkiv State Academy of Physical Culture, Kharkiv, Ukraine

Purpose: to develop the content of training programs for the wing-back and central defenders using special exercises in accordance with the game role and determine the effectiveness of their use in young football players 13–14 years old.

Material & Methods: the study involved young football players of 13–14 years old FC "Arsenal" in Kharkiv in the amount of 10 athletes during a one-year macrocycle (2018–2019). In the process of research, pedagogical observation and determination of quantitative and qualitative technical and tactical actions during the match, methods of mathematical statistics were used.

Results: the influence of the complexes of special running and jumping exercises, which were additionally used by the wing back and central defenders in accordance with the game role, on the quantitative and qualitative indicators of the game activity of young football players of 13–14 years is determined.

Conclusions: the results obtained experimentally confirmed the effectiveness of the use of specialized running and jumping exercises separately for the wing-back and central defenders, which increases the level of their performance of technical and tactical actions.

Keywords: wing back and central defenders, motor qualities, playing role, technical and tactical actions, morpho-functional indicators.

Introduction

Improving the training system for young athletes is impossible without the search for new approaches to the organization of the educational process, as well as the use of the latest achievements of sports science in the practical work of a trainer [8; 11; 13].

In existing studies [1; 3; 4; 8; 12] noted the need to improve the quality of training of young football players, to search for and put into practice the most effective training tools and methods, and therefore a special study and analysis of various aspects of this problem is necessary. One of the areas of research is the development of means of special physical training for young football players of 13–14 years of different game roles [5; 7; 14]. The feasibility of solving this issue determines that when conducting training sessions using special means of physical preparation requires taking into account the specific requirements for each player, depending on the game role [2; 6; 15].

In the papers [10; 16; 17] the issues of training features for field players of different game roles (defender, midfielder, forward) are considered, but it is obvious that the actions of the wing-back and central defenders and midfielders have a significant difference. Therefore, the determination of the features of the use of special motor exercises for wing-back and central defenders is relevant for research.

Purpose of the study: to develop the content of training programs for wing-back and central defenders using special exercises in accordance with the game role and determine the effectiveness of their use in young football players 13–14 years old.

Objectives of the study:

1. To develop sets of motor exercises and methods of their use for wing-back and central football players 13–14 years old, taking into account the game role.
2. To determine the effect of special running and jumping exercises, used during the preparatory period, on the quantitative and qualitative indicators of the technical and tactical actions of the wing-back and central defenders 13–14 years old.

Material and Methods of the research

The study involved young football players of 13–14 years old FC Arsenal in Kharkov in the amount of 10 athletes during a one-year macrocycle (2018–2019). In the process of research, pedagogical observation and determination of quantitative and qualitative technical and tactical actions during the match, methods of mathematical statistics were used.

Motor actions carried out by wing-back defenders are significantly different from the actions of central defenders and are associated with a large amount of work requiring manifesta-

tion of endurance, and, above all, anaerobic.

The preparatory period of the experimental program included a retractor, basic in general and basic with special physical training.

The retracting mesocycle is the same for all players in the team and provides for laying the base for general physical training, in connection with which running exercises in various modifications are used: uniform and variable running, fartlek. In addition, general physical exercises are used, which make up a circular training session, both at the stadium and in the gym. Particular attention was also paid to the use of athletics exercises, which are the basis of movements during jerks and accelerations, as well as various movements (back forward, step with a step, running with the lap of the lower leg and raising the thigh, etc.). Considerable attention was paid to jumping exercises (multi-hop, jumping up on one and two legs, etc.).

Conducted retracting mesocycle allowed to form a basic level of physical and technical-tactical preparedness of young football players 13–14 years old. In the end, quantitative and qualitative indicators of technical and tactical actions were determined during the game of the wing-back and central defenders.

Further basic mesocycle in general physical training provided for the use of additional exercises in wing-back defenders

with the use of running (uniform and variable intensity), jumping (over barriers, athletics), strength training on simulators, as well as with packed balls (as the wing-back defender has to throw the ball due to the sideline). Particular attention was paid to the technique of motor actions during their implementation.

In the basic mesocycle of special physical and technical training, exercises that corresponded to game actions were complicated.

So, for wing-back defenders, various types of running exercises were used in combination with overcoming obstacles, performing tackles, jumping, selecting the ball and further technical actions related to passing the ball. In addition, when performing exercises, special attention was paid to the technique of their implementation.

It should be noted that jerking was carried out due to the frequency of movements, and acceleration was mainly due to the length of steps.

Results of the research

The use of special running and jumping exercises allowed to significantly increase the quantity and quality of the implementation of the technical and tactical actions of the wing-back defenders of the studied group (Tables 1, 2). The number of game motor actions increased by 5,1% ($t=2,49$; $p<0,05$) due

Table 1
Quantitative indicators of the implementation of the technical and tactical actions of the wing-back defenders during the study, % (n=20)

| No. i/o | Motor actions | At the beginning of the study | At the end of the study | t | p |
|---------|---------------------------------|-------------------------------|-------------------------|------|-------|
| | | $\bar{X} \pm m$ | | | |
| 1. | Jerks 15–20 m | 16,1±0,45 | 18,2±0,47 | 2,31 | <0,05 |
| 2. | Acceleration 40–50 m | 16,7±0,46 | 19,5±0,51 | 4,06 | <0,01 |
| 3. | Running backwards | 5,0±0,24 | 4,9±0,23 | 0,18 | >0,05 |
| 4. | Jogging | 3,4±0,22 | 3,8±0,20 | 2,00 | >0,05 |
| 5. | Step run | 1,6±0,09 | 1,5±0,08 | 0,83 | >0,05 |
| 6. | Tackles | 19,1±1,31 | 22,5±1,27 | 1,87 | >0,05 |
| 7. | Head game | 4,8±0,34 | 5,2±0,36 | 0,80 | >0,05 |
| 8. | Throw in the ball | 5,6±0,17 | 5,7±0,18 | 0,41 | >0,05 |
| 9. | Number of run distance per game | 42,8±1,47 | 17,9±1,48 | 2,49 | <0,05 |
| 10. | Other motor actions | 27,7±1,52 | 19,7±1,50 | 3,74 | <0,01 |

Table 2
Performance indicators of the technical and tactical actions of the wing-back defenders during the study, % (n=20)

| No. i/o | Technical and tactical actions | At the beginning of the study | At the end of the study | t | p |
|---------|--------------------------------|-------------------------------|-------------------------|------|-------|
| | | $\bar{X} \pm m$ | | | |
| 1. | Short passes | 31,2±1,24 | 32,6±1,25 | 0,80 | >0,05 |
| 2. | Middle passes | 28,1±1,24 | 33,8±1,21 | 3,29 | <0,01 |
| 3. | Long passes | 9,6±0,42 | 11,7±0,46 | 3,39 | <0,01 |
| 4. | Dribbling | 14,0±0,58 | 15,8±0,58 | 2,20 | <0,05 |
| 5. | Keeping balls | 26,2±1,03 | 27,1±1,05 | 0,61 | >0,05 |
| 6. | Tackling | 30,0±1,58 | 35,7±1,54 | 2,59 | <0,05 |
| 7. | Ball stop | 24,2±1,08 | 27,8±1,4 | 2,32 | <0,05 |
| 8. | Kicks on goal | 25,0±1,08 | 26,1±1,09 | 0,71 | >0,05 |
| 9. | Head kicks | 20,3±1,05 | 21,1±1,07 | 0,53 | >0,05 |

to the number of jerks performed ($t=2,31$; $p<0,05$) and accelerations ($t=4,06$; $p<0,01$), while other motor actions, less significant for the wing-back defenders, decreased by 8,0% ($t=3,74$; $p<0,01$) (Table 3).

Along with this, the quality of the implementation of the technical and tactical actions of the wing-back defenders of the studied group significantly increased (Table 2). The number of medium ($t=3,29$; $p<0,01$) and long ($t=3,39$; $p<0,01$) passes, tackles ($t=2,59$; $p<0,05$) and ball stops ($t=2,32$; $p<0,05$), performed against a background of fatigue.

The construction of the training process of the central defenders in the retracting mesocycle has a general meaning for all team players and provides for a gradual increase in the load for further individualization of classes depending on the game role.

The basic mesocycle according to the GPP of the central defenders envisaged using running with variable intensity (running for 2000–2500 m; fartlek; shuttle running), jumping athletics based on aerobic endurance; power exercises; circular training, barbell exercises.

In the basic mesocycle for special physical training, the central defenders additionally used exercises taking into account the specifics of motor activity, namely: running exercises – fartlek, skipping, acceleration, jerking, types of running (right and left side, back forward, snake), paying attention to the frequency and the technique of the movements of their implementation; jumping exercises and their combinations with

running exercises and kicks to the ball.

The use of specialized exercises allowed in the competitive period (for 10 games) to carry out a greater number of game actions, mainly those that are characteristic of central defenders (Table 3).

Thus, the quantitative indicators of jerking performance ($t=5,54$; $p<0,001$), accelerations ($t=5,44$; $p<0,001$), back-to-back running ($t=3,43$; $p<0,01$) and a step step ($t=2,19$; $p<0,05$), as well as participation in tackles ($t=2,30$; $p<0,05$) and head games ($t=4,55$; $p<0,001$).

During the study, the number of running varieties per game significantly increased ($t=4,65$; $p<0,001$), which reduced the performance of other motor actions (walking, running in slow motion, etc.) ($t=4,40$; $p<0,001$), that is, the intensity of the game activity of the central defenders increased.

During the running and jumping exercises, special attention was paid to the technique of their implementation, which positively influenced the quality of the technical and tactical actions of the central defenders (Table 4).

In the process of implementing the experimental methodology using special exercises, the quality indicators of the technical and tactical actions of the central defenders increased: medium ($t=4,92$; $p<0,01$) and long ($t=5,54$; $p<0,001$) passes, ball stops ($t=2,72$; $p<0,05$), kicks of the ball ($t=2,13$; $p<0,05$) and head into the goal ($t=2,42$; $p<0,05$).

Table 3

Quantitative indicators of the implementation of the technical and tactical actions of the central defenders during the study, % (n=20)

| No. i/o | Motor actions | At the beginning of the study | At the end of the study | t | p |
|---------|---------------------------------|-------------------------------|-------------------------|------|--------|
| | | $\bar{X} \pm m$ | | | |
| 1. | Jerks 15–20 m | 14,0±0,49 | 18,1±0,56 | 5,54 | <0,001 |
| 2. | Acceleration 40–50 m | 12,5±0,47 | 13,2±0,49 | 5,44 | <0,001 |
| 3. | Running backwards | 5,6±0,25 | 6,8±0,24 | 3,43 | <0,01 |
| 4. | Jogging | 3,2±0,22 | 3,9±0,23 | 2,19 | <0,05 |
| 5. | Step run | 1,8±0,10 | 1,9±0,12 | 0,64 | >0,05 |
| 6. | Tuckles | 21,5±1,40 | 26,1±1,44 | 2,30 | <0,05 |
| 7. | Head game | 7,8±0,38 | 10,3±0,40 | 4,55 | <0,001 |
| 8. | Number of run distance per game | 37,1±1,46 | 46,9±1,52 | 4,65 | <0,001 |
| 9. | Other motor actions | 62,9±1,57 | 53,1±1,54 | 4,46 | <0,001 |

Table 4

Performance indicators of the technical and tactical actions of the central defenders during the study, % (n=20)

| No. i/o | Technical and tactical actions | At the beginning of the study | At the end of the study | t | p |
|---------|--------------------------------|-------------------------------|-------------------------|------|--------|
| | | $\bar{X} \pm m$ | | | |
| 1. | Short passes | 30,8±1,22 | 31,9±1,24 | 0,63 | >0,05 |
| 2. | Midle passes | 25,2±1,28 | 34,6±1,42 | 4,92 | <0,001 |
| 3. | Long passes | 10,1±0,44 | 16,3±1,03 | 5,54 | <0,001 |
| 4. | Dribbling | 15,1±0,59 | 17,2±1,02 | 1,78 | >0,05 |
| 5. | Keeping balls | 25,8±1,17 | 27,1±1,19 | 0,78 | >0,05 |
| 6. | Tackling | 16,0±1,26 | 17,1±1,28 | 0,65 | >0,05 |
| 7. | Ball stop | 26,2±1,18 | 30,8±1,21 | 2,72 | <0,05 |
| 8. | Kicks on goal | 25,0±1,08 | 28,3±1,4 | 2,13 | <0,05 |
| 9. | Head kicks | 20,8±1,07 | 24,5±1,09 | 2,42 | <0,05 |

Conclusions / Discussion

In previous studies [6; 9] it was established that the wing-back and central defenders in the game activity have a significant difference in terms of the quantity and quality of the performed technical and tactical actions.

So, for wing-back defenders, participation in tackles and the performance of motor actions of aerobic endurance is more inherent.

Central defenders, along with participation in tackles, it is more essential to perform jerks that condition anaerobic endurance. In this connection, it becomes necessary to differentiate the special motor activity of the wing-back and central defenders.

The results obtained in this study experimentally confirmed the assumption of the effectiveness of the use of specialized running and jumping exercises separately in the wing-back and central defenders. It has been proved that in wing-back defenders it is additionally advisable to use various types of

running exercises in training in combination with overcoming obstacles, performing tackles, jumping, taking the ball and further technical actions related to passing the ball. In addition, when performing exercises, special attention is paid to the technique of their implementation.

For central defenders, the use of exercises taking into account the specifics of motor activity is positive, namely: running exercises – fartlek, skipping, acceleration, jerking, types of running (right and left side, back forward, snake, paying attention to the frequency and technique of movements to perform them; jumping exercises and their combinations with running exercises and kicks and kicks to the ball.

So, it is determined that in the training process of the defenders it is advisable to use special exercises in accordance with the game role (wing-back and central defenders).

Prospect of further research is certain effects of using special motor exercises to form the factor structure of the preparedness of young football players of 13–14 years of different playing roles.

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.

References

1. Berdnikova, A.N. (2018), "Features of the technical, tactical and physical training of football players 13-14 years old", *Chelovek. Sport. Meditsina*, Vol. 18, No. 4, pp. 73-79. (in Russ.)
2. Daev, V.Ye. (2007), *Optimizatsiya sportivnogo otbora i orientatsii futbolistov po igrovym amplya na etape uglublennoy spetsializatsii: avtorefrat* [Optimization of sports selection and orientation of football players by playing roles at the stage of in-depth specialization: abstract], Malakhovka. (in Russ.)
3. Yermolenko, P. & Zaloilo, V. (2012), "Preparation of football players aged 11-15 years taking into account the game role", *Teoriia i metodyka fizychnoho vykhovannia i sportu*, No. 1, pp. 16-22. (in Ukr.)
4. Zhurid, S.N. (2007), "Model characteristics of the technical and tactical actions of young soccer players 15 and 17 years of various game roles", *Slobozhans'kij naukovno-sportivnij visnik*, No. 12, pp. 93-97. (in Russ.)
5. Zaychenko, A.S. & Popov, Yu.A. (2017), "Improving the speed qualities of physical training of football players of different game roles", *Fizicheska kultura: vospitanie, obrazovanie trenirovka*, No. 5, pp. 34-36. (in Russ.)
6. Koval, S.S. & Lebediev, S.I. (2014), "Comparative analysis of team quantitative indicators of technical and tactical actions of football players of 10-12 years during competitive activity", *Slobozhans'kij naukovno-sportivnij visnik*, No. 1(39), pp. 48-52. (in Ukr.)
7. Koval, S.S. (2010), "A study of the relationship of speed qualities and technical and tactical actions of young soccer players aged 8-12", *Slobozhans'kij naukovno-sportivnij visnik*, No. 1, pp. 99-102. (in Russ.)
8. Kostyukovich, V.M. (2006), *Upravlenie trenirovochnym protsessom futbolistov v godichnom tsikle podgotovki: monografiya* [Management of the training process of football players in the annual training cycle], Vinnitsa. (in Russ.)
9. Mulyk, V.V. & Krainyk, Ya.B. (2019), "Quantitative Characteristics of the Movement of Young Soccer Players During Competitive Activities during the Pre-Basic Training", *Sportyvni ihry*, No. 4(14), pp. 48-57, doi: 10.15391/si.2019-4.05. (in Ukr.)
10. Larin, O.S. & Ivanov, N.V. (2016), "Features of the special physical training of young football players taking into account the game role", *Uchenye zapiski universiteta imeni P.F. Lesgafta*, No. 1(131), pp. 123-125. (in Russ.)
11. Lisenchuk, G.A. (2003), *Upravlenie podgotovkoy futbolistov* [Training Management for Football Players], Kiev. (in Russ.)
12. Lisenchuk, H., Popov, O. & Khomenko, O. (2013), "Structure of physical fitness of football players", *Teoriia i metodyka fizychnoho vykhovannia i sportu*, No. 3, pp. 21-23. (in Ukr.)
13. Perevoznyk, V.I. & Pertsukhov, A.A. (2015), "Motor activity of football players of different roles in the conditions of competitive activity", *Sportyvni ihry*, No. 11, pp. 143-146. (in Ukr.)
14. Pertsukhov, A.A. (2009), "Assessment of reliability of performance of technical and tactical actions by football players of 17-19 years of different playing fields", *Slobozhans'kij naukovno-sportivnij visnik*, No. 3, pp. 123-126. (in Ukr.)
15. Pertsukhov, A.A. (2013), "Comparative characteristics of special preparedness indicators for central and wing-back defenders 17–19 years old", *Slobozhans'kij naukovno-sportivnij visnik*, No. 2, pp. 62-67. (in Russ.)
16. Sobko, S., Voropai, S., Sobko, N. & Havryshko, S. (2015), "Dynamics of indicators of general physical fitness of young players at the stage of basic training", *Fizychno vykhovannia, sport i kultura zdorov'ia u suchasnomu suspilstvi: zbirnyk naukovykh prats*, No. 2(30), pp. 160-164. (in Ukr.)
17. Shevchenko, A.Yu. & Boichenko, S.V. (2014), "Structure and content of the process of preparation of young football players at the stage of initial preparation", *Naukovyi chasopys NPU imeni M.P. Drahomanova*, Vypusk 6(49), pp. 147-155. (in Ukr.)

Received: 05.11.2019.

Published: 30.12.2019.

Information about the Authors

Yaroslav Krainyk: Kharkiv State Academy of Physical Culture: street Klochkivska 99, t. Kharkiv, 61058, Ukraine.

ORCID.ORG/0000-0003-1567-8570

E-mail: yaroslavkr2014@gmail.com

Vyacheslav Mulyk: *Doctor of Sciences (Physical Education and Sports), Professor; Kharkiv State Academy of Physical Culture: street Klochkivska 99, t. Kharkiv, 61058, Ukraine.*

ORCID.ORG/0000-0002-4441-1253

E-mail: mulyk.viacheslav@gmail.com

Daria Okun: *PhD (Physical Education and Sport), Lecturer in the Department of Olympic and Professional Sports; Kharkiv State Academy of Physical Culture, 61058, Kharkiv, st. Klochkivska, 99, Ukraine.*

ORCID.ORG/0000-0002-0639-5846

E-mail: dariaokun@gmail.com

Svyatoslav Koval: *PhD (physical education and sport), Associate Professor; Kharkiv State Academy of Physical Culture: Klochkivska str. 99, Kharkiv, 61058, Ukraine.*

ORCID.ORG/0000-0001-7140-6276

E-mail: Koval.S.S.79@gmail.ru

Differentiation of the content of classes on physical education, taking into account indicators of physical health and physical preparedness of students in grades 7–9

Margarita Mameshina

Kharkiv State Academy of Physical Culture, Kharkiv, Ukraine

Purpose: to study changes in the physical health indicators of students in grades 7–9 under the influence of a differentiation program for the content of physical education classes.

Material & Methods: analysis and generalization of scientific and methodological literature; study of documentary materials and systematization of information; pedagogical observation; biomedical methods; pedagogical testing; methods of mathematical statistics.

Results: according to the results of the initial study, the “average” level of physical health of schoolchildren of 7th grades was determined, “below the average” – for students of 8–9th grades and the “low” level of physical preparedness of the studied contingent.

Conclusions: the revealed and significant changes ($p < 0,05–0,001$) of indicators of physical health and physical preparedness of students in grades 7–9 of the main groups indicate the effectiveness of the proposed program for differentiating the content of physical education classes.

Keywords: differentiation, physical education, physical health, physical preparedness of schoolchildren 13–15 years old.

Introduction

The health status of the population, especially the younger generation, is one of the factors on which the economic and social progress of our state depends. At the same time, adverse social conditions of life, excessive mental and nervous stress; a decrease in interest in physical education and sports, and sometimes a negative attitude towards them; a sedentary lifestyle leads to a deterioration in the health of the younger generation [12; 24]. So, examining the level of physical health of school-age children (6–18 years old), a number of authors [5; 23] found that 56% of students have a “low” level of physical health, 36% have a “lower than average” level, and only 7,5% “tall”. There is no doubt that the fact that the level of physical fitness of children depends on the state of health is also significantly reduced. According to scientific studies, 36,4% of children and adolescents have a “low” level of physical fitness, 33,5% – “below average”, 22,6% – “average”, 6,7% – “above average” and only 0,8% – “high” [4; 14; 25].

According to leading experts, physical education plays a major role in shaping a healthy generation. However, a number of authors note that the physical education system in educational institutions mainly works ineffectively [16; 24]. Therefore, the issue of finding new, more effective approaches to the organization and content of the educational process in physical education, the introduction of atypical forms of classes in order to educate a healthy and comprehensively developed personality remains relevant.

Modern researchers indicate that this problem can be solved by updating the content of physical education with non-traditional types of motor actions, such as cheerleading [2]; snag golf [8]; health tourism [28] etc.

An analysis of scientific developments on the issue of a differentiated approach in physical education has revealed a significant number of works where the authors prove that defining criteria and distributing students to typological groups makes it possible to adapt the content of physical education in accordance with the individual capabilities of each child and make it more effective [1; 10; 12].

However, it should be noted that the problem of differentiating the content of classes on physical education of middle school students based on the results of monitoring physical health and the level of development of physical qualities is unexplored.

In connection with the above, a timely question is the development and implementation in the educational process of the primary school of a program for differentiating the content of physical education classes taking into account the individual characteristics of students and determining the effectiveness of the proposed innovations on the level of physical health and physical fitness of students in grades 7–9.

Purpose of the study: to investigate changes in indicators of physical health and physical preparedness of students in grades 7–9 under the influence of a program for differentiating the content of physical education classes.

Objectives of the study:

1. To establish the level of physical health and the development of physical qualities of students 13–15 years old.
2. To determine changes in indicators of physical health and physical preparedness of students in grades 7–9 in the process of applying the program for differentiating the content of

physical education classes.

Material and Methods of the research

In order to determine the level of physical health and physical fitness of students in grades 7–9, a stating experiment was conducted, during which the identity of the main and control groups was established ($p > 0,05$). The study involved 226 students in grades 7–9 of comprehensive school No. 150 in Kharkiv, of which 3 main groups (66 men, 79 women) and 3 control groups (41 and 40, respectively) were formed.

During the experiment, the educational process of students in grades 7–9 of the control groups was carried out in accordance with the state program for institutions of general secondary education “Physical Culture. 5–9 grades”, the content and its organization were standard.

Based on the analysis of the results of the initial study, a program was developed to differentiate the content of classes in physical education, taking into account indicators of physical health and physical preparedness of students in major groups. The program is built in accordance with the main provisions and includes: goals, objectives, basic methodological principles of training and the structure of the annual cycle of implementation of the program material of the variable component of the state program. The fundamental difference between the experimental program is the differentiation of the content of physical education lessons in accordance with the typological characteristics of students; improving pedagogical methods of organizing the educational process; development of multilevel tasks for each typological group. So, the content of the program material of physical education classes was divided into two levels: basic and variative. The main level contained an invariant component, which was divided into theoretical and methodological knowledge and general physical preparation and a variable component, which included modules: athletics, volleyball, basketball, football.

Based on the differentiation of educational material, taking into account the functional and motor preparedness of schoolchildren of the main groups, we developed the content of the *variable level* and divided it into two sublevels. The 1st sublevel contains exercises aimed at improving functional preparedness. Which included complexes of physical exercises and outdoor games aimed at: improving the regulation of the cardiovascular system and increasing the functional capabilities of the respiratory system. 2nd sublevel – exercises aimed at increasing the level of physical fitness. It includes complexes of physical exercises and outdoor games aimed at increasing the level of development of power and speed abilities and the level of development of coordination abilities and flexibility.

The practical implementation of the proposed program also had some innovations. So, in the *preparatory part*, the tasks of theoretical and general physical preparation were solved. Due to the rational organization of students, increasing the intensity and current performance of general developmental exercises, its duration was reduced to 10 minutes. In the *main part* of the lesson, the tasks of technical and technical-tactical preparation of the planned training variable modules were solved. To solve these problems 10–15 minutes were given. After solving the main problems, students of the main groups were divided into 4 subgroups (A – students with a “low” and

“below average” level of regulation of the cardiovascular system B – with a “low” and “below average” level of functionality of the respiratory system, C – with a “low” and “below average” level of strength development and speed abilities, G – students with a “low” and “below average” level of development of coordination abilities and flexibility), received individual task cards and performed specific motor actions specially selected for each formed typological subgroup. In pursuit of the proposed exercises, 10–15 minutes were allotted. In the *final part* of the lesson, the tasks of restoring the body were solved, the results were summed up and a differentiated homework was provided taking into account the individual characteristics of the students. The duration was 3–5 minutes. The implementation of the content of the variable level was carried out according to the periodization of the physical preparation of students [6]. The load changed gradually, in accordance with the age, gender and individual abilities of the students.

During the study, the following methods were used. Theoretical: analysis and synthesis of scientific and methodological literature, the study of documentary materials and the systematization of information. Empirical: pedagogical observation; biomedical methods (to determine the level of physical health of middle school students, the rapid assessment method proposed by S. D. Polyakov et al. was used) pedagogical testing; pedagogical experiment. Methods of mathematical statistics.

Results of the research

The level of physical health of students aged 13–15 was determined by indicators of the Quetelet 2, Robinson, Skibinsky, Shapovalova and Rufie indices. The data analysis revealed the “average” level of physical health in 13-year-old students of both study groups and 14-year-old boys in the control group. “Below the average” level was set in schoolchildren of 15 years of both studied groups, students of 14 years of basic groups and girls of 14 years of control groups.

The level of physical preparedness of students was determined by indicators of the development of basic physical qualities. For this, motor tests proposed by L. P. Sergienko were used [17; 18] and V. A. Romanenko [19]. Thus, the results of the initial study indicate a “low” level of physical preparedness for students in grades 7–9 (speed abilities – 2 points, coordination abilities, strength, flexibility and endurance – 1 point, respectively).

Analyzing the data obtained after the pedagogical experiment, it was determined that in indicators reflecting the level of physical health, both children and girls of the main groups experienced significant positive changes in all the studied parameters ($p < 0,05–0,001$). Thus, indicators of the body length of the children of the main groups varied from 1571,11 to 1748,95 cm, for women – from 1562,73 to 1661,30 cm; body weight in men ranged from 46,78 to 59,58 kg, in women from 45,73 to 50,61; blood pressure (BP) values in children ranged from 102,34/68,06 to 109,37/71,05 mmHg, for girls – from 101,55/66,42 to 106,30/70,13 mmHg; heart rate data (HR) in children ranged from 75,17 to 76,79 beats·min⁻¹, for girls – from 76,15 to 76,48 beats·min⁻¹; the results of vital lung capacity (VC) in children ranged from 2472,22 to 3278,95 ml, in girls – from 2300,00 to 2760,87 ml; indicators of breath holding time (Stange test) in children ranged from 41,21 to

44,32 s, in girls – from 39,97 to 44,04 s; the results of lifting the torso in the grades in children varied from 32,58 to 46,67 times, in girls – from 29,57 to 42,70 times; heart rates at rest (P_1) for children ranged from 16,33 to 19,47 beats, for girls – from 16,55 to 17,26 beats; Heart rate in the first 15 from the first minute of recovery (P_2) for children ranged from 29,94 to 33,76 beats, for girls – from 30,00 to 32,43 beats; heart rate data for the last 15 from the first minute of recovery (P_3) for children ranged from 18,28 to 21,74 strokes, for girls – from 18,79 to 19,61 strokes.

As a result of the above, the level of physical health in children of 7th grade increased from “middle” to “above average”, in students of 8–9th grade from “below average” to “average”. The exception is indicators of girls of 7th grades, where the increase in the total points in five indices from 14 to 17 points on the level scale was not reflected (Figure 1).

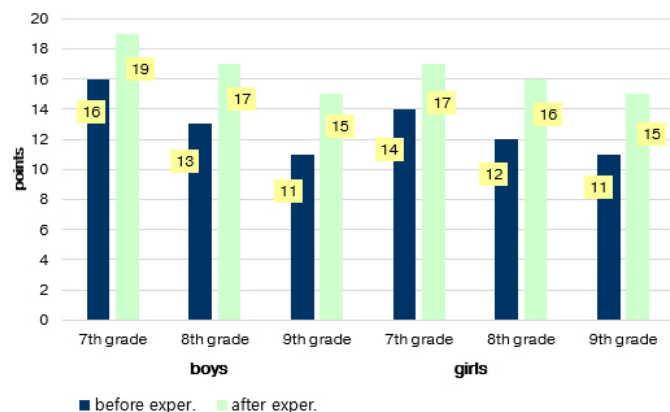


Fig. 1. Indicators of the general level of physical health of students of the main groups before and after the experiment

The most significantly improved indicators of the regulation of the cardiovascular system of students 13–15 years old (from “below average” to “average”) and the respiratory system of children 15 years old and girls 13–14 years old (from “low” to “average” level).

In schoolchildren of control groups after the experiment, significant changes were not determined. The exception is indicators of length and body weight, where the changes are significant ($p < 0.05-0.001$) of the specific intensity of the work performed by children of 9th grade, where the level increased from “low” to “below average”; regulation of the cardiovascular system of girls of 8th grade, where the level from “below average” increased to “middle” and guys of 9th grade, where, on the contrary, the level decreased from “average” to “below average”. However, these changes at the level of physical health of schoolchildren in control groups did not significantly affect and he remained at the primary “below average” level.

An analysis of the results of the development of physical qualities obtained after the implementation of the developed program indicates positive changes in all parameters that were studied ($p < 0,05-0,001$) (Table 1).

Thus, the growth rate of the development of speed abilities on average ranged from 2% to 17% in men and from 1% to 15% in girls; coordination abilities – from 3% to 118% and from 6% to 103%, respectively; strenght abilities – from 16,7% to 42,11% and from 16,52% to 28,95%, respectively; flexibility – from 2% to 26% and from 4% to 33%, respectively; endurance – from 16% to 59% in men and from 22% to 39% in girls.

The indicators of strength development of students aged 14–15 years improved more significantly (31,8% and 30,5%, respectively); flexibility and speed abilities – schoolchildren of

Table 1

Indicators of the level of development of physical qualities of schoolchildren of the main groups before and after the experiment, $\bar{X} \pm m$

| Grades | 7 grade | | 8 grade | | 9 grade | | |
|--|---------|------------|------------|------------|------------|------------|------------|
| | n | (n=18) | (n=33) | (n=29) | (n=23) | (n=19) | (n=23) |
| sex | | boys | girls | boys | girls | boys | girls |
| Speed abilities | | | | | | | |
| “Handover” test (cm) | | | | | | | |
| Before exper. | | 21,22±2,16 | 20,39±1,34 | 20,03±1,09 | 21,48±1,99 | 19,05±1,07 | 15,54±1,38 |
| After exper. | | 16,44±0,66 | 17,15±0,79 | 16,00±0,65 | 16,13±0,91 | 15,47±0,45 | 11,35±1,01 |
| t | | 2,68 | 4,10 | 7,31 | 4,08 | 5,00 | 4,35 |
| p | | <0,05 | <0,001 | <0,001 | <0,001 | <0,001 | <0,001 |
| Tapping test for 10 s (number of movements) | | | | | | | |
| Before exper. | | 35,83±1,58 | 31,58±0,83 | 36,69±1,50 | 35,65±1,24 | 31,26±1,27 | 29,48±0,93 |
| After exper. | | 40,22±1,64 | 36,36±0,88 | 40,28±1,28 | 38,96±1,13 | 38,32±1,19 | 33,65±0,96 |
| t | | 9,16 | 7,70 | 9,21 | 9,52 | 8,65 | 19,88 |
| p | | <0,001 | <0,001 | <0,001 | <0,001 | <0,001 | <0,001 |
| Running on 60 m (s) | | | | | | | |
| Before exper. | | 10,24±0,16 | 10,77±0,15 | 10,34±0,15 | 10,84±0,20 | 9,75±0,11 | 10,71±0,13 |
| After exper. | | 10,11±0,14 | 10,66±0,14 | 10,19±0,14 | 10,73±0,20 | 9,41±0,11 | 10,43±0,11 |
| t | | 5,66 | 6,19 | 10,09 | 8,65 | 10,45 | 7,74 |
| p | | <0,001 | <0,001 | <0,001 | <0,001 | <0,001 | <0,001 |
| Coordination abilities | | | | | | | |
| Rhythmic hand tapping (number of cycles) | | | | | | | |
| Before exper. | | 7,50±0,52 | 7,18±0,37 | 7,59±0,34 | 8,13±0,66 | 7,63±0,53 | 7,74±0,46 |
| After exper. | | 10,28±0,44 | 10,85±0,36 | 10,79±0,32 | 12,30±0,45 | 10,53±0,51 | 11,09±0,42 |

| | | | | | | |
|---|------------|------------|------------|------------|------------|------------|
| t | 9,42 | 10,90 | 15,50 | 9,61 | 27,50 | 21,18 |
| p | <0,001 | <0,001 | <0,001 | <0,001 | <0,001 | <0,001 |
| Ten "Eights" (Kopylov test) (s) | | | | | | |
| Before exper. | 14,69±0,97 | 14,15±0,43 | 15,55±0,49 | 14,39±0,30 | 13,58±0,61 | 12,74±0,73 |
| After exper. | 13,24±0,77 | 13,34±0,54 | 13,74±0,37 | 13,19±0,23 | 12,13±0,41 | 11,37±0,41 |
| t | 3,63 | 2,15 | 11,37 | 9,59 | 5,85 | 3,07 |
| p | <0,01 | <0,05 | <0,001 | <0,001 | <0,001 | <0,01 |
| Static equilibrium by the Bondarevsky method (s) | | | | | | |
| Before exper. | 44,78±3,22 | 43,33±1,71 | 48,31±1,73 | 48,09±1,80 | 43,05±1,36 | 48,87±3,00 |
| After exper. | 57,33±1,68 | 54,97±1,36 | 56,17±1,19 | 57,83±0,83 | 51,16±0,77 | 56,57±2,13 |
| t | 4,83 | 11,84 | 11,35 | 7,72 | 8,92 | 8,14 |
| p | <0,001 | <0,001 | <0,001 | <0,001 | <0,001 | <0,001 |
| Throws small ball in the goal (points) | | | | | | |
| Before exper. | 4,17±0,28 | 4,15±0,29 | 2,97±0,23 | 2,74±0,38 | 4,42±0,44 | 4,96±0,28 |
| After exper. | 7,00±0,36 | 6,52±0,25 | 5,83±0,16 | 6,26±0,25 | 6,05±0,42 | 7,09±0,26 |
| t | 10,63 | 10,68 | 19,52 | 10,08 | 4,52 | 12,02 |
| p | <0,001 | <0,001 | <0,001 | <0,001 | <0,001 | <0,001 |
| Throwing a small ball at a distance (m) | | | | | | |
| Before exper. | 15,77±0,09 | 8,51±0,06 | 18,90±0,33 | 8,78±0,08 | 23,83±0,23 | 9,41±0,06 |
| After exper. | 16,33±0,08 | 9,00±0,06 | 19,39±0,24 | 9,23±0,06 | 24,66±0,17 | 10,25±0,12 |
| t | 10,51 | 16,06 | 5,33 | 12,50 | 9,15 | 9,99 |
| p | <0,001 | <0,001 | <0,001 | <0,001 | <0,001 | <0,001 |
| Strength abilities | | | | | | |
| Bending and extending the arms in resting position (number of times) | | | | | | |
| Before exper. | 19,33±1,08 | 12,39±0,50 | 17,66±1,10 | 10,70±0,72 | 23,26±1,10 | 8,70±0,35 |
| After exper. | 24,06±0,54 | 14,00±0,41 | 24,52±0,46 | 13,26±0,52 | 26,42±0,99 | 12,09±0,29 |
| t | 5,62 | 9,54 | 7,29 | 8,35 | 10,93 | 19,82 |
| p | <0,001 | <0,001 | <0,001 | <0,001 | <0,001 | <0,001 |
| Three jumps on one foot with forward movement (m) | | | | | | |
| Before exper. | 4,39±0,12 | 3,78±0,07 | 3,94±0,14 | 3,68±0,15 | 3,89±0,16 | 3,71±0,08 |
| After exper. | 4,89±0,13 | 4,33±0,07 | 4,74±0,10 | 4,38±0,09 | 5,08±0,13 | 4,62±0,09 |
| t | 10,90 | 11,51 | 14,13 | 9,58 | 10,53 | 15,67 |
| p | <0,001 | <0,001 | <0,001 | <0,001 | <0,001 | <0,001 |
| Lifting the trunk in the saddle (number of times) | | | | | | |
| Before exper. | 44,56±0,63 | 41,33±0,57 | 36,86±1,76 | 34,57±0,66 | 28,16±1,22 | 25,91±0,81 |
| After exper. | 46,67±0,29 | 42,70±0,49 | 41,76±1,16 | 38,70±1,15 | 32,58±1,22 | 39,04±1,10 |
| t | 4,35 | 9,11 | 4,87 | 3,28 | 15,84 | 11,78 |
| p | <0,001 | <0,001 | <0,001 | <0,01 | <0,001 | <0,001 |
| Flexibility | | | | | | |
| Tilt forward torso from sitting position (cm) | | | | | | |
| Before exper. | 3,83±0,71 | 8,21±0,93 | 1,79±0,33 | 10,87±1,56 | 4,37±0,66 | 11,04±1,72 |
| After exper. | 4,33±0,74 | 9,48±0,78 | 2,62±0,30 | 11,61±1,47 | 5,79±0,64 | 12,39±1,63 |
| t | 2,62 | 5,14 | 8,26 | 4,71 | 10,20 | 7,94 |
| p | <0,05 | <0,001 | <0,001 | <0,001 | <0,001 | <0,001 |
| Straightening of straight arms back and forth (cm) | | | | | | |
| Before exper. | 80,44±3,55 | 83,67±2,38 | 96,41±0,81 | 75,78±4,19 | 96,89±2,28 | 83,26±3,86 |
| After exper. | 79,33±3,64 | 81,58±2,43 | 94,93±0,79 | 71,22±4,09 | 93,58±2,20 | 79,70±3,91 |
| t | 5,08 | 3,81 | 13,89 | 4,40 | 11,17 | 16,19 |
| p | <0,001 | <0,001 | <0,001 | <0,001 | <0,001 | <0,001 |
| Cross twine (cm) | | | | | | |
| Before exper. | 38,61±2,17 | 28,97±2,00 | 45,62±0,89 | 28,00±2,31 | 42,53±2,40 | 28,91±2,53 |
| After exper. | 35,83±2,25 | 27,30±2,02 | 44,28±0,88 | 25,91±2,37 | 40,37±2,36 | 26,39±2,48 |
| t | 3,13 | 11,21 | 11,79 | 4,65 | 8,40 | 5,09 |
| p | <0,01 | <0,001 | <0,001 | <0,001 | <0,001 | <0,001 |
| Endurance | | | | | | |
| Deflection bending (number of times) | | | | | | |
| Before exper. | 11,67±0,47 | 12,85±0,85 | 20,14±1,14 | 14,87±0,83 | 19,79±0,64 | 19,65±1,43 |
| After exper. | 18,06±1,15 | 17,30±0,98 | 22,90±1,04 | 17,83±0,74 | 24,79±0,80 | 23,48±1,25 |
| t | 5,42 | 6,24 | 10,20 | 12,80 | 15,41 | 12,28 |
| p | <0,001 | <0,001 | <0,001 | <0,001 | <0,001 | <0,001 |

15 years old (17,7% and 12,5%, respectively); stamina – students 13 years old (49,5%); coordination abilities – schoolchildren of 14 years old (50,0%).

As a result, the level of development of the physical qualities of students in the main groups increased on average by 1,4 points and began to meet the assessment of 2,4 points (Figure 2).

As a result, the level of physical preparedness of students in the main groups from “low” increased to “below average”.

The analysis of the data obtained by schoolchildren in control groups did not reveal significant changes in the indicators of manifestation of physical qualities and, as a result, their level of physical fitness did not change (“low” level).

From the noted it can be concluded that the introduction of an experimental program for differentiating the content of physical education classes has a positive effect on the level of physical health and physical fitness of students in grades 7–9 of the main groups.

Conclusions / Discussion

The analysis of the results of the study showed, basically, a significant increase in weight and height indicators of students of all studied groups ($p < 0.05-0.001$), which is consistent with the data of several authors [9; 22; 27], according to which adolescence is characterized by an intensive increase in body size, mainly due to lengthening of the legs, torso growth, and an increase in total muscle mass, which, in our opinion, confirms the purely natural nature of the changes in the anthropometric indices of schoolchildren aged 13–15.

The analysis of indicators reflecting the functional state of the cardiovascular and respiratory systems suggests that, after the introduction of exercises aimed at increasing functional preparedness, a tendency to a decrease in blood pressure and heart rate and an increase in lung capacity and time were revealed. breath holding in schoolchildren 13–15 years old of the main groups ($p < 0,01, 0,001$). The data obtained are confirmed by a number of studies, during which it was established an improvement in the functionality of the cardiorespiratory system under the influence of cheerleading [2; 20]; aerobics

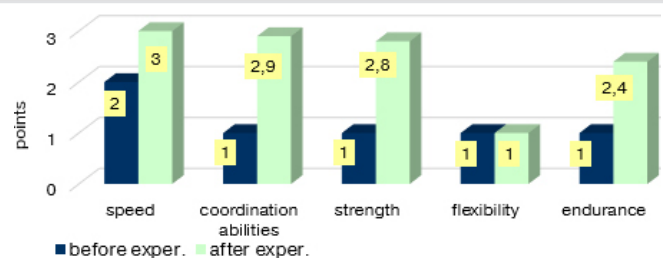


Fig. 2. Average estimates of the development of physical qualities of students in grades 7–9 of the main groups before and after the experiment

of power orientation [15]; rugby 5 [21]; sports tourism [28], a system of physical exercises for differentiated training [10].

An analysis of the results characterizing the level of physical preparedness obtained after the pedagogical experiment revealed a significant increase in indicators for both children and girls of the main groups, for all the studied parameters ($p < 0,05-0,001$). In our opinion, the positive changes are explained by the fact that the content of the variable level of the proposed experimental program was developed on the basis of differentiation of educational material taking into account the individual capabilities of students and supplemented with physical exercises and modified outdoor games aimed at developing physical qualities.

The results obtained are consistent with the data of several authors [3; 7] on the effectiveness of the impact of various types of motor activity on the physical preparedness of adolescent children; the effectiveness of differentiation of educational material, taking into account the level of individual motor abilities of students aged 13–15 [11; 13].

Thus, our studies indicate the positive impact of our proposed program to differentiate the content of physical education classes on the level of physical health and physical fitness of students in grades 7–9 of the primary school.

Prospects for further research in this direction include the introduction of a program for differentiating the content of training sessions in the process of physical education of another age group.

Conflict of interests. The author declares that no conflict of interest.

Financing sources. This article didn't get the financial support from the state, public or commercial organization.

References

1. Arefiev, V.H. (2017), “Pedagogical technologies for the implementation of differentiated physical education of primary school students”, *Naukovyi chasopys Natsionalnoho ped. universytetu imeni M. P. Drahomanova*, Iss. 3K(84), pp. 29-32. (in Ukr.)
2. Bala, T.M. & Masliak, I.P. (2011), “Changing the Physical Health Level of Grades 7-9 Students Under the Influence of Cheerleading Exercises”, *Sportyvnyi visnyk Prydniprov'ia*, No. 2, pp. 21-23. (in Ukr.)
3. Bala, T.M. (2012), “Dynamics of level of development of coordination abilities of pupils of grades 7–9 under the influence of cheerleading”, *Moloda sportyvna nauka Ukrainy*, Iss. 16, Vol. 2, pp. 20-26. (in Ukr.)
4. Bala, T.M., Svanadze, A.S. & Kuzmenko, I.O. (2017), “Physical fitness level of 10-11th grade students”, *Naukovyi chasopys Natsionalnoho ped. universytetu imeni M. P. Drahomanova*, Iss. 6(88), pp. 10-13. (in Ukr.)
5. Bodnar, I. (2014), *Intehratyvne fizychno vykhovannia shkoliariv riznykh medychnykh hrup* [Integrative Physical Education of Schoolchildren of Different Medical Groups], LSUPC, Lviv. (in Ukr.)
6. Krutsevych, T., Trachuk, S. & Napadii, A. (2016), “Planning the educational process for physical education of middle-school students in secondary schools”, *Teoriia i metodyka fizychnoho vykhovannia i sportu*, No. 1, pp. 36-42. (in Ukr.)
7. Kuzmenko, I.O. (2015), “The level of development of static and dynamic equilibrium of students in grades 5–9”, *Moloda sportyvna nauka Ukrainy*, Iss. 19, Vol. 2, pp. 137-140. (in Ukr.)
8. Kuzmenko, I.O. (2016), “Snag Golf in Physical Education of Schoolchildren”, *Fizychna kultura, sport ta zdorov'ia: stan i perspektyvy v*

- umovakh suchasnoho ukrainskoho derzhavotvorennya v konteksti 25-richchia Nezalezhnosti Ukrainy: materialy XVI Mizhnarodnoi naukovopraktychnoi konferentsii (Kharkiv, 8–9 hrudnia 2016 r.), pp. 41–44, available at: http://hdafk.kharkov.ua/docs/konferences/konf_8_12_2016.pdf. (in Ukr.)
9. Kuzmenko, I. (2017), "The level of physical development of students in grades 7–8", *Sportyvna nauka Ukrainy*, No. 1(77), pp. 34–37. (in Ukr.)
10. Mameshyna, M.A. & Masliak, I.P. (2017), "Physical health level of students in grades 7–8 under the influence of a multilevel system of differentiated physical exercises", *Visnyk Kam'ianets-Podilskoho natsionalnoho universytetu imeni Ivana Ohiiienka*, Iss. 10, pp. 312–322. (in Ukr.)
11. Mameshyna, M. & Masliak, I. (2017), "Dynamics of indicators of development of endurance of schoolboys of 13–15 years under the influence of multilevel system of differentiated learning", *Materialy XXIX Mizhnarodnoi naukovopraktychnoi internet-konferentsii "Tendentsii ta perspektivy rozvytku nauky i osvity v umovakh hlobalizatsii"*, Iss. 29, pp. 507–511. (in Ukr.)
12. Mameshyna, M.A. (2018), "Influence of the multilevel system of differentiated learning on the level of development of individual motor abilities of pupils of grades 7–9", *Materialy XXXVII Mizhnarodnoi naukovopraktychnoi internet-konferentsii "Tendentsii ta perspektivy rozvytku nauky i osvity v umovakh hlobalizatsii"*, Iss. 37, pp. 255–262. (in Ukr.)
13. Mameshyna, M.A. (2018), "Dynamics of indicators of development of coordination abilities of pupils of grades 7–9 under the influence of a multilevel system of differentiated learning", *Naukovyi chasopys NPU imeni M. P. Drahomanova*, Iss. 10(104)18, pp. 49–55. (in Ukr.)
14. Masliak, I.P., Vyshnia, V.O. & Hryda, D.S. (2016), "Physical preparedness of middle school students of regional general education schools", *Materialy II Vseukrainska naukovopraktychna konferentsiia*, pp. 118–127. (in Ukr.)
15. Masliak, I.P. (2017), "Effect of force aerobics on the condition of the cardiorespiratory system of high school students", *Naukovyi chasopys Natsionalnoho ped. universytetu imeni M. P. Drahomanova*, Iss. 1(82), pp. 35–38. (in Ukr.)
16. Moskalenko, N.V., Vlasiuk, O.O., Stepanova, I.V. & Shyian, O.V. (2011), *Innovatsiini tekhnologii u fizychnomu vykhovanni shkoliariv* [Innovative technologies in physical education of pupils], Dnipropetrovsk. (in Ukr.)
17. Serhiienko, L.P. (2001), *Testuvannia rukhovyykh zdibnostei shkoliariv* [Testing of pupils' motor abilities], Olimpiiska literatura, Kyiv. (in Ukr.)
18. Sergienko, L.P. (2015), "Determination of the development of strength and anaerobic abilities in jump tests: classification, measurement methodology and standards for assessing upward jumps from the spot", *Slobozans'kij naukovosportivnij visnyk*, No. 5(49), pp. 105–117. (in Russ.)
19. Romanenko, V.O. (2005), *Diagnostika dvigatelnykh sposobnostey* [Diagnostics of motor abilities], DonNU, Donetsk. (in Russ.)
20. Bala, T.M. (2012), "The influence of cheerleading exercises on the schoolchildren's physical health of 5–9th forms", *Pedagogics, psychology, medical-biological problems of physical training and sports*, No. 4, pp. 12–16.
21. Filenko, L.V., Filenko, I.U. & Martirosyan, A.A. (2013), "Research of indexes of physical development, physical preparedness and functional state of students aged 10–11 years under the influence of engagement in rugby-5", *Pedagogics, psychology, medicalbiological problems of physical training and sports*, No. 6, pp. 53–58, doi:10.6084/m9.figshare.714940.
22. Kuzmenko, I. (2017), "Investigation of the cardiovascular system of schoolchildren aged 13–14 years", *Slobozhanskyi herald of science and sport*, No. 6(62), pp. 51–53.
23. Mameshina, M. (2016), "Condition of physical health of pupils of the 7th–8th classes of the comprehensive school", *Slobozhanskyi herald of science and sport*, 5(55), pp. 47–52.
24. Masliak, I.P. (2015), "Quickness and endurance fitness of pedagogic college girl students under influence of cheer-leading", *Physical Education of Students*, No. 4, pp. 24–30, <http://dx.doi.org/10.15561/20755279.2015.0404>.
25. Maslyak, I.P., Shesterova, L.Ye., Kuzmenko, I.A., Bala, T.M., Mameshina, M.A., Krivoruchko, N.V. & Zhuk, V.O. (2016), "The Influence of the vestibular analyzer functional condition on the physical fitness of school-age children", *Sport science. International scientific journal of kinesiology*, Vol. 9(2), pp. 20–27.
26. Maslyak, I.P. & Krivoruchko, N.V. (2016), "Physical development of students of teacher training college as a result of exercises of cheer-leading", *Physical Education of Students*, Vol. 1, pp. 55–63, <http://dx.doi.org/10.15561/20755279.2016.0108>.
27. Masliak, I.P. & Mameshina, M.A. (2018), "Physical health of schoolchildren aged 14–15 years old under the influence of differentiated education", *Pedagogics, psychology, medical-biological problems of physical training and sports*, Vol. 22(2), pp. 92–98, <http://dx.doi.org/10.15561/18189172.2018.0205>.
28. Mulyk, K.V. & Grynova, T.I. (2015), "Influence of hiking trainings on 13 years old adolescents' health", *Pedagogics, psychology, medical-biological problems of physical training and sports*, No. 8, pp. 40–44, <http://dx.doi.org/10.15561/18189172.2015.0806>.
29. Natalia Krivoruchko, Irina Masliak, Tetiana Bala, Shesterova Ludmula, Mameshina Margarita, Irina Kuzmenko & Sergey Kotliar (2018), "Physical health assessment of 10–16 year old schoolgirls of the Kharkiv Region of Ukraine", *Research Journal of Pharmaceutical, Biological and Chemical Sciences (RJPBCS)*, No. 9(4), pp. 1498–1506.

Received: 03.11.2019.

Published: 30.12.2019.

Information about the Authors

Margarita Mameshina: *Kharkiv State Academy of Physical Culture: Klochkivska str. 99, Kharkiv, 61058, Ukraine.*

ORCID.ORG/0000-0001-7397-3805

E-mail: mameshina.rita@gmail.com

Modern methods of monitoring and evaluating the current functional state of athletes in various types of martial arts

Volodymyr Revenko¹
Yaroslavna Puhach¹
Valeriy Druz¹
Vadym Artemiev²

¹Kharkiv State Academy of Physical Culture, Kharkiv, Ukraine
²Municipal institute "Complex children's and youth sports school № 8 Kharkiv city council", Kharkiv, Ukraine

Purpose: development of a contactless real-time monitoring system of the athlete's current functional state.

Material & Methods: analysis of scientific and methodological literature on the problems of ongoing research; biomechanical analysis of the kinematic and dynamic characteristics of the athlete's motor actions when performing competitive exercises; methods of mathematical statistics; computer mathematical modeling.

Results: the existing methods for assessing the functional state of the body during the training and competitive activities of the athlete are reviewed and analyzed, on the basis of which the requirements for the construction of a method of contactless monitoring of the athlete's functional state are determined.

Conclusions: the functional state of martial arts athletes is currently monitored by modern equipment with a high degree of accuracy and speed of information processing, but only in contact mode, which excludes the possibility of operational monitoring of the athlete's current state during the fight. The study of the biomechanics of the motion of the kinematic links of the limbs and the static working pose based on the materials of the video recording of the athlete's movements made it possible to establish the dependence of the flow of dynamic forces that determine the speed of movement of the biokinematic pairs, which formed the basis of the developed non-contact method for assessing the measure of athlete fatigue directly during the fight. Modern techniques of video recording, computer support and established patterns of kinematic movements at various static stresses of the working pose allowed us to achieve our goal.

Keywords: athletes, martial arts athletes, contactless control, static stress, dynamic efforts.

Introduction

The development of a large number of various types of martial arts, representing various schools, involving in their classes an extensive and extremely diverse contingent of people of different age, sex, constitutional structure of somatotypes, requires deep theoretical studies that determine the acceptable norms of physical activity, the construction of optimal training process modes, assessment appropriate motor talent for practicing a specific type of martial arts aimed at achieving a high level of sports about mastery. This type of research suggests the need to solve quite serious and voluminous organizational tasks for monitoring the contingent of people who wish and are already engaged in the chosen sport.

In recent decades, this problem has become characteristic of many sports, but there are no sufficiently substantiated theoretical developments in this direction. One of the most important tasks, the solution of which is of paramount importance, is to determine the allowable loads based on the individual biological age, which reflects the ripening time of the morphological and functional systems of the body [14]. The essence of the problem is that the observed anatomical and morphological aspects of changes in the body under inadequate loads ultimately affect the reproductive function of the body, which entails the health problem of the next generation [2; 4].

The lack of fundamental systematic research in this area determines the relevance of the search for solutions to problems aimed at studying adaptation processes for both high achievement sports and practical healthcare.

Purpose of the study: to develop a non-contact system for monitoring the current functional state of athletes in situational sports.

Material and Methods of the research

Materials: data of video filming of fights by performances of athletes of various qualifications involved in martial arts.

Research methods: analysis and synthesis of scientific and methodological literature; biomechanical analysis of video materials of sports fights of athletes, a method of mathematical computer approximation of the kinematic movements of the centers of mass of individual parts of the body and the general center of mass of the body; graphical construction of research results in semantic attribute spaces with a single measure of comparable characteristics introduced into them; method of clinical anthropometry according to M. Ya. Breiتمان.

Results of the research

The organization of selection for the purpose of long-term

long-term planning involves mandatory certification of an individual's physical development, physical condition, true biological age, chronological age, individual structural features of the somatotype, prenosophical predisposition to the corresponding constitutional diseases, phylogenetic predisposition to certain forms of motor activity and the level of competitive reliability.

The compilation of such a passport of martial arts people became possible thanks to the methods developed at the Kharkov State Academy of Physical Culture and found their application in ongoing dissertation research [1; 5; 11].

Based on anthropometric data and their subsequent processing, special attention was paid to the weight of the individual referred to the population average statistical indicator for each specific age. In all types of martial arts, this task is greatly simplified due to the presence of weight categories in these sports, which made it possible to collect from 30 to 100 examined athletes from each weight category.

The availability of data on the weight of the athlete and his data on the biokinematic characteristics of the structure of the somatotype structure allows you to accurately determine the total center of mass of the body, the center of mass of each biokinematic link, which makes it possible to determine the energy costs of the athlete with modern computer technology, the necessary video processing programs and modern video recording technology. to perform motor activity immediately at the time of the fight. A characteristic feature of the kinematics of motion is that as fatigue increases, the inaccuracy of the technique of the techniques performed in terms of temporal, spatial and power characteristics is observed.

The rate of development of these changes depends on the initial state, which determines the potential abilities of the athlete, and the intensity of his physical activity. These characteristics are of a general nature of their course in all athletes, but have strictly individual isolation in each of them.

To build a method of remote contactless monitoring of the current state of a martial artist, it is necessary to establish regularities of the individual manifestations of the dynamics of the course of fatigue as a factor in temporarily reducing performance from the nature of its performance when it is certified for physical development and physical condition. Any motor act is associated with the mandatory presence of such constituent components as the physical stress of the static force that determines the working position, and dynamic forces that provide the kinematics of the performed locomotion.

Knowing the mass of the body and its location in the process of performing the movement of the body, the work performed on its movement is determined. Direct calculations show that the work performed is less than the actual expenditure of energy potential, which reflects the measure of the athlete's current loss of performance. This fact is explained by the fact that a significant amount of energy loss is spent on static voltage, which ensures the working pose of the performed locomotion. This expenditure of potential energy supply includes the cost of present emotional stress. Separate differentiation of these losses in the studies was not carried out. The main goal was to develop a method for assessing the athlete's contactless remote current state.

This fact is explained by the fact that in preserving the working posture a simultaneous balanced tension of the muscles, both their synergists and antagonists, is manifested. The kinematics in this balanced static stress is determined by the boundaries of its velocity pulsation and its duration. A processing program for this material was developed at the Kh-SAPC and was used in previously published works [6; 7; 10]. It is based on: the use of special semantic spaces with a single measure introduced in them, ensuring the construction of a scale of relations of the compared indicators, reflecting the dynamics of their course during the performance of a specific work. These regularities of the relationship between the current static stress depend on the angle of extension between the biokinematic links, which determine the structure of locomotion construction and the speed of their flow.

Any motor act is necessarily associated with the presence of static muscle tension of antagonists and synergists, providing a working pose for the exercise. The fulfillment of the motor act is possible provided that the voltage between the synergists and antagonists changes in a certain range, sufficient for the full implementation of its kinematic movement. In turn, the act of movement itself is characterized by the speed of movement of the biokinematic parts of the body. From what has been said, it follows that the structure for constructing the necessary semantic space with the unified measure of comparable characteristics introduced in it consists of equal static muscle tension of antagonists and synergists, from their minimum value to the maximum possible at the moment. The movement itself is carried out at a certain voltage range between synergists and antagonists. These characteristics can be represented in a Cartesian rectangular coordinate system, where the axes will reflect the voltage of "synergist antagonists". Naturally, this is a unit square, since the voltage varies from 0 to 1. Its diagonal reflects changes in equal forces of the "antagonist-synergist", the ratio of which is equal to 1 on the entire diagonal. The plot of moving the value on the coordinate axes relative to its projection onto the diagonal is $\sqrt{2}$ smaller than on the diagonal.

If we draw a perpendicular straight line with respect to the diagonal of the square, on which the "antagonist-synergist" voltage ripple zone will be reflected, then with the exception of the "time" parameter, the necessary phase semantic space will be constructed with a single measure for all the mentioned characteristics. Its peculiarity lies in the fact that the current value of the state is simultaneously on all four scales and is projected into a generalized section of two-unit squares, which are rotated at 45° relative to each other, which is shown in the figure.

By virtue of the distribution theorem of Archimedes, Cantor and the Dedekind randomness theorem in the generalized zone of the constructed semantic space, a measure of the normal distribution law in fractions of signal deviations is introduced, which is presented on all coordinate axes. In the generalized zone, a plot of the integral curve enclosed in the range $\pm\delta$ deviations from the zone of maximum density of the frequency of occurrence of interdependent observed deviations (Figure).

This task is reduced to determining the derivative of a complex function that describes the dependence of the change in the developed force on the regime of changing the angle of extension of the biokinematic pair, i.e. $\frac{dF}{dt}$, as a complex func-

tion $\frac{dF}{d\varphi} \cdot \frac{d\varphi}{dt}$ or $\frac{dF}{dt} = \frac{dF}{d\varphi} \cdot \frac{d\varphi}{dt}$, where $\frac{dF}{d\varphi}$ defines the boundary conditions, and $\frac{d\varphi}{dt}$ initial conditions of the movement.

The main task in forming the physical development passport and assessing the current functional readiness was to determine the individual nature of their manifestation. The establishment of the fact of the potential energy supply consumption in two components – on static voltage and dynamic forces – drew attention to the need to study the nature of the manifestation of static forces from the angle of extension of the biokinematic pair, which is defined as the first derivative $\frac{dF}{d\varphi}$.

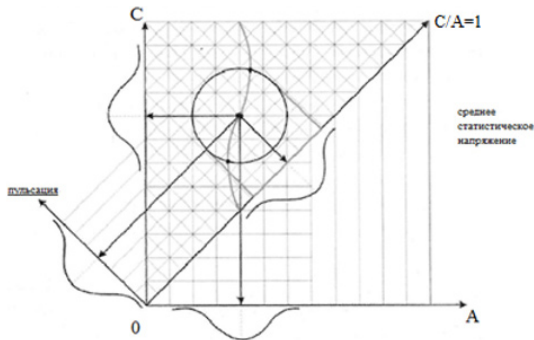


Fig. The regularity of the movement of the common point of the ripple indicator of the energy potential in its ordered representation in semantic space with its arbitrary manifestation in the naturally occurring process of a single combat combat:

C – reflects the magnitude of the synergistic efforts (*C*) in the relationship of potential opportunities with its antagonist *A* in ensuring equal statistical stress, which is represented by the *C/A* ratio, equal in all cases 1, as the coefficient of constant statistical stress ratios (*C/A*), which is the diagonal coordinate system, where the coordinates of the *C* axis; *A*. Orthogonal to the diagonal *C/A=1* ripple relative to the coefficient (*C/A=1*), which make up the space having a common beginning with the space *C*; *A* turned by an angle $\alpha=45^\circ$. The zone of joint intersection of these spaces is an area that reflects the behavior of a common point, combining the interaction of all 4 parameters that generate a logical analytical relationship of their interdependent relationships.

The essence of this regularity consists in recording the magnitude of the assessment of the dynamometric deadlift with different angular location of the biokinematic pair of “high-drumstick”. Presenting the results of such a measurement in the polar coordinate system, a relationship was obtained that relates the change in the angle of extension of the leg in the knee joint by the set value of degrees and the observed value of the deadlift. It was found that this dependence consists in the fact that with an increase in the angle of extension, which occurs according to the law of arithmetic progression, the corresponding developed static force flows along a geometric progression. In the polar coordinate system, this dependence is expressed by a logarithmic spiral in which the radius vector reflects the magnitude of the developed force in a given position of the biokinematic pair of “high-drumstick”.

A characteristic feature of this pattern is that, regardless of fatigue, the nature of its construction does not change. The curvature of the spiral remains unchanged, but the length of the radius vector, which reflects the magnitude of the developed static voltage, decreases. The duration of this effort is reduced. Both that and other value are reduced exponentially. Individual features of the manifestation of the described pat-

terns are that each individual has a characteristic curvature of the logarithmic spiral.

The presented analytical dependencies allow not only to reflect the current state, but also make it possible to predict its development and determine the available intensity of the work performed. The analytical apparatus and the corresponding algorithms for assessing the current state with sufficient completeness are described in previous works [2; 7]. With the full amount of passport data compiled for each individual, it is not difficult on the basis of modern computer processing systems and video recording equipment to provide current control of the athlete’s motor activity during the period of the fight.

The developed method is based on the restored physical research method, which was called the “collective photography”. The essence of the method is the multiple layering of proportionate photographs of the faces of men of the same age, as a result of which the most common features are drawn.

The method allows, without making any calculations, to obtain directly clearly expressed information about the structure of the structure of the most pronounced characteristic elements of the face.

The high cost of the method led Halton to the development of statistical research methods that successfully led to finding modal values of controlled parameters for finding their information indicators in the studied structure of the object structure. The physical research method itself has been forgotten for more than a century and a half. The presence of modern video-recording equipment and a theoretical justification for constructing semantic attribute spaces with a single measure introduced into them made it possible to restore the method of physical modeling. This method, in its modern presentation, has a high degree of solvability of complex problems inaccessible to classical research methods [12; 13].

The presence of the developed method allows us to perform the *inverse task*, which consists in determining the curvature of the logarithmic spiral based on the video data of any individual, which is of considerable interest in planning tactics for conducting a duel with an upcoming opponent. In addition, this control method allows you to isolate and analyze the most tedious and energy-intensive costs of various performed locomotion of athletes during the fight, which can be visualized in any convenient form for further analysis and construction of the training process. The objectivity of this kind of processing of the obtained data is significantly determined by the accuracy of the measurements performed in the used semantic spaces [8; 9; 14].

Thus, the established relationship between the characteristics of the kinematics of movement of body parts and the measure of fatigue made it possible to differentiate the consumption of potential energy reserves for dynamic effort and static muscle tension, aimed at maintaining the athlete’s working posture. As fatigue develops, the inaccuracy of the performed movements increases, and the rate of inertia suppression of the general center of mass of the body slows down. Angular movements between the lower leg and thigh increase. This effect is observed not only when performing dynamic efforts aimed at moving the body, but also during the athlete’s stand-up. With the same duration of static stress in the stand-up position and

the same time of active movement of the body, the resulting fatigue from “no movement” can be no less than in the active movement of the body. This is explained by the energy consumption for the reflex of readiness for the upcoming action and is characterized by tension of expectation. Changing the accuracy of the movement and the kinematics of damping the inertia of movement also allows us to estimate the energy costs of the performed techniques of both participants in the fight, which plays a significant role in the process of constructing tactics for subsequent actions. This technique of dynamic computer simulation was developed at KhSAPC on the basis of modern technology for video recording of movements and established patterns of separation of energy consumption into static tension of the working posture and dynamic forces, which provide the kinematics of angular movements between the biological links of the body.

Conclusions / Discussion

The availability of modern technical video recording tools that provide the necessary speed for recording a moving object, appropriate computer software and the necessary software made it possible to use the established patterns of the flow of biodynamic forces and static stress observed during the performance of competitive movements of martial arts, to develop a method for remote non-contact monitoring of the current state of athletes. This method opens up fundamentally new approaches to solving a number of problems that are inaccessible in their complexity when using classical methods of studying the motor activity of martial arts athletes.

Further development of this direction will be associated with its wider implementation in practical activities while ensuring the training of high-class athletes.

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.

References

1. Abdul Vakhid Dshlad Nikhad (2018), *Organizatsiyno-pedagogichni osnovi vidboru ditey dlya zanyat sportivnoyu gimnastikoyu v avtonomniy respublitsi Kurdistan: dis. na zdobuttya naukovogo stupenya k. fiz. vikh.* [Organizational-pedagogical foundations for children in order to occupy sports gymnastics in the autonomous republic of Kurdistan: PhD dis.], KhSAPC, Kharkiv, 201 p. (in Ukr.)
2. Azhippo, A.Yu., Pugach, Ya.I., Pyatisotskaya, S.S., Zhernovnikova, Ya.V. & Druz, V.A. (2015), *Ontologiya teorii postroeniya i otsenki urovnya fizicheskogo razvitiya i fizicheskogo sostoyaniya: monografiya* [Ontology of the theory of construction and assessment of the level of physical development and physical condition], Kharkiv. (in Russ.)
3. Anokhin, P.K. (1973), *Printsypialnye voprosy obshchey teorii funktsionalnykh sistem. Printsipy sistemnoy organizatsii funktsiy* [Fundamental questions of the general theory of functional systems. Principles of the systemic organization of functions], Nauka, Moscow. (in Russ.)
4. Bugaevskiy, K.A. (2018), “Anatomical and morphological features of the pelvis in young athletes involved in various types of martial arts”, *Yedinoborstva*, No. 2, pp. 30-41. (in Russ.)
5. Van Sin Na (2012), *Sovershenstvovanie tekhniki vypolneniya sorevnovatelnykh uprazhneniy kvalifikatsionnykh sportsmenov v pauerliffinge: dis. rabota na soiskanie uchenoy stepeni k. fiz. vosp.*, KhSAPC, Kharkov, 210 p. (in Russ.)
6. Halashko, M.M. (2016), Vykorystannia morfo funktsionalnykh pokaznykiv dlia prohozuvannia uspishnosti sportyvnoi diialnosti armrestleriv: avtoref. dys. na zdobuttya nauk. stupenia kand. nauk fiz. vykh., Kharkiv, 22 s. (in Ukr.)
7. Druz, V.A., Omelchenko, M.V. & Omelchenko, D.A. (2015), “Fundamentals of sprinting techniques”, *Slobozans'kij naukovy-sportivnij visnik*, No. 3(47), pp. 41-45, doi: 10.15391/snsv.2015-3.007. (in Russ.)
8. Zade, L. (1974), *Osnovy novogo podkhoda k analizu slozhnykh sistem protsessov prinyatiya resheniya* [Fundamentals of a new approach to the analysis of complex systems of decision-making processes], Znanie, Moscow.
9. Zade, L. (1976), *Ponyatie lingvisticheskoy peremennoy i ego primenenie k prinyatiyu resheniya* [The concept of a linguistic variable and its application to decision making], Moscow. (in Russ.)
10. Pugach, Ya.I. (2013), “Fundamentals of constructing a semantic space for an orderly presentation of research results”, Materials of the IX International Scientific and Practical Conference “On the Future of Surveys for Science”, Sofiya, P. 39, pp. 5-13. (in Russ.)
11. Pugach, Ya.I., Sokolova, T.Ye. & Yefremenko, A.N. (2017), “The use of modern technological advances to develop new methods for studying adaptation processes in order to improve the technology of training highly qualified athletes”, *Aktualnye nauchnye issledovaniya v sovremen-nom mire*, No. 12(32), P. 5, pp. 45-53. (in Russ.)
12. Samsonkin, V.N., Druz, V.A. & Fedorovich, Ye.S. (2010), *Modelirovanie v samoorganizuyushchikh sistemakh* [Modeling in self-organizing systems], Donetsk. (in Russ.)
13. Druz, V., Jermakow, S., Pugach, Ya., Shesterova, L., Zokow, W. & Cieslicka M. (2016), “Kinematic characteristics of a sprinting and morphofunctional structures of it's providing”, *Jornal of Education, Health and sport*, No. 6 (11), pp. 271-280.
14. Puhach, Ya., Druz, V., Yefremenko, A., Revenko, V., Galashko, M., Shutieiev, V., Nizhevskaya, T. & Miroshnichenko, V. (2019), “Modern methods of monitoring and assessing the current status of athletes – combatants in real time”, *Slobozans'kij naukovy-sportivnij visnik*, No. 3(71), pp. 54-60, doi: 10.15391/snsv.2019-3.009.

Received: 09.11.2019.

Published: 30.12.2019.

Відомості про авторів / Information about the Authors

Volodymyr Revenko: PhD (Pedagogical Science), docent; Kharkiv State Academy of Physical Culture: Klochkivska str. 99, Kharkiv, 61058, Ukraine.

ORCID.ORG/0000-0002-3003-3538

E-mail: revphd@gmail.com

Yaroslava Puhach: PhD (Physical Education and Sport); Kharkiv State Academy of Physical Culture: Klochkivska str. 99, Kharkiv, 61058, Ukraine.

ORCID.ORG/0000-0001-5460-772X

E-mail: sanadruz@gmail.com

Valeriy Druz: *Doctor of Science (Biology), Professor; Kharkiv State Academy of Physical Culture: Klochkivska 99, Kharkiv, 61058, Ukraine.*

ORCID.ORG/0000-0002-4628-6791

E-mail: valeriidruz@gmail.com

Vadym Artemiev: *PhD (Psychological Sciences), Municipal institute "Complex children's and youth sports school №8 Kharkiv city council", st. Volunteer, 4/6, 61093, Kharkiv, Ukraine.*

ORCID.ORG/0000-0002-1603-7401

E-mail: galina9767@gmail.com

Effect of different kinds of fitness based on the ovarian-menstrual cycle on the psychophysical state of young women

Olena Shyshkina¹
Ihor Beihul¹
Alla Mullagildina²

¹Dnipro State Technical University, Dnipro, Ukraine
²Kharkiv State Academy of Physical Culture, Kharkiv, Ukraine

Purpose: to determine the effect of different kinds of fitness, based on the ovarian-menstrual cycle on the psychophysical state of young women.

Material & Methods: the research involved young women aged 21–25 years ($n=84$), which are divided into two groups: control (CG, $n=36$) and experimental (EG, $n=48$). The control group was doing basic aerobics, pilates and stretching without taking into account the phases of the ovarian-menstrual cycle, experimental was doing different kinds of fitness according to the phases of the OMC. Exercises were conducted 3 times a week, the research lasted for 12 months. Functional capabilities were determined according to the following indicators: resting heart rate, blood pressure, recovery time after 20 squats in 30 s; physical fitness by the following indicators: “shuttle running 4x9 m”, with; “Long jump from place”, cm; “Lifting the torso into the saddle” in one minute, the number of times; “Leaning forward from sitting position”, cm Level of demonstration of psychological sphere according to the method of N. E. Vodopianova “Assessment of satisfaction with quality of life”.

Results: a comparative analysis of both groups showed that there was a significant ($p<0,05-0,01$) improvement in functional capacity in the EG. The greatest impact of the use of various fitness tools had on resting heart rate, bit·min⁻¹: from a rating of “fair” to “good”; recovery time after 20 squats in 30 s, from: ‘below average’ to ‘above average’. Physical fitness in the EG compared to CG also improved significantly ($p<0,05-0,01$). It was found that the biggest changes occurred in the indices of the endurance test of the abdominal muscles and flexibility: from the rating “unsatisfactory” to “excellent”. It was found that the personal assessment of the quality of life satisfaction with EG was significantly ($p<0,05-0,01$) different from CG. The former improved their attitude, self-control, self-esteem, health perception, support of friends and optimism while reducing tensions and expressing negative emotions.

Conclusions: the use of the wellness method of combining different kinds of fitness has a positive effect on the psychophysical state of young women. There is an opportunity to apply the developed methodology to the practice of wellness training.

Keywords: wellness fitness, psychophysical state, ovarian-menstrual cycle, young women, training load.

Introduction

In today's context, the social importance of health in terms of health is increasing in Ukraine. The health at this hour reveals a civilization that adheres to the socio-economic condition [3].

Due to the low birth rate, the problem of protection and preservation of reproductive function, health of the population of Ukraine is of particular importance. In recent years, a negative trend has been seen, which is associated with an increase abnormalities in the work of the most important systems of the body, a decrease in its resistance, an increase in the number of chronic diseases of young women [15]. The concept of physical culture proposes to maintain the optimum level of physical activity in order to maintain health [17; 21]. One of the leading tasks of wellness training is to improve the psychophysical condition of young women, which predetermines the level of health of the next generation [5; 23]. In this context urgent problem is the search for innovative ways to optimize physical education of youth.

Scientists [2; 22; 24] believe that fitness is a system of physi-

cal training that aims not only to stay in shape but also including intellectual, emotional, social and spiritual components. Today, it is this concept that fully shows the social (healthy lifestyle), biological (physical activity, physical training and physical fitness), psychological (motives, interests) and other characteristics of the use of physical education for health purposes.

The analysis of scientific and methodological literature shows that with the modern development of the fitness industry young women are given a wide choice of various fitness programs [12; 13; 18; 25]. At the same time, there is a small amount of books that have planning of the amount, intensity and focus of training loads, taking into account the ovarian-menstrual cycle in wellness fitness trainings. Some books are devoted to the study of the influence of health trainings on physical efficiency [4; 9; 19], on physical development [7; 10], on physical fitness [11; 20].

Health and fitness trainings are usually conducted in a group method without taking into account the physical, functional and biological capabilities of young women, which does not allow effective dosing of physical activity. With regard to the

psychological criterion, it should be noted that it is practically not used to analyze the impact of physical education on health of youth, although recommendations are found in some studies; In addition, the authors conclude that girls' psycho-emotional state is increased without using psychological tests in their studies.

To solve these problems, there is a need for an individual approach to load planning, as well as use not a particular type of fitness, but a combination of several types of fitness. In this case, the complex application of different types of fitness requires a more sophisticated planning system, where a rational combination of exercises of different orientation, taking into account the biorhythmics of the female body is possible.

Purpose of the study: to determine the effect of different kinds of fitness trainings, based on the ovarian-menstrual cycle on the psychophysical condition of young women.

Material and Methods of the research

The research involved young women aged 21–25 years ($n=84$). The research was conducted on the basis of the sports club of Dnipro State Technical University. The main research was conducted within 12 months. A survey was conducted to determine the individual characteristics of the biological cycles of young women. The results showed that the majority of women (67–81%) experience negative changes in body pain and depression of the emotional state in the menstrual, premenstrual and ovulatory phases of the cycle, which makes it impossible to fully engage fitness trainings in these phases. In connection with it, the participants of the research were voluntarily divided into control ($n=36$) and experimental ($n=48$) groups on the basis of individual wishes.

The control group (CG) was engaged in basic aerobics, pilates and stretching without taking into account the ovarian-menstrual cycle (OMC). Trainings were conducted three times a week for 65–80 minutes and were medium and high intensity. The structure of the lesson included preparatory, main and final parts. The heart rate in the main part ranged from 90 to 160 beats·min⁻¹, at the peak of load for 13–15 minutes the heart rate ranged from 140 to 160 beats·min⁻¹. Exercise during training has mainly aerobic orientation (35%), strength (25%) and dance (20%), stretching and figure correction ex-

ercises were used.

In the experimental group (EG), girls attended different types of fitness trainings according to the OMC phases. Classes were also conducted three times a week. In the post-menstrual and post-ovulatory phases they were engaged in basic aerobics (joined the control group), in the ovulatory one – they do pilates training. The duration of pilates training was 55–65 minutes, the training was conducted in the medium intensity. The heart rate in the main part of the class ranged from 90 to 130 beats·min⁻¹. Training is mainly corrective (45%), strength exercises (25%), stretching (25%), and aerobic exercises (5%) were proportionally used to restore muscle balance; the training ended with auto-training and muscle relaxation (5%). In the menstrual phase of the biological cycle, girls engaged in stretching. The duration of the training was 45–50 minutes, the training was low intensity. The heart rate in the main part of the session ranged from 90 to 120 beats·min⁻¹. The main focus of training is the development of flexibility (50%). Strength exercises (20%) performed in static and dynamic muscle contraction. A significant amount of training time (15%) was given to auto-training to get rid of negative psycho-emotional manifestations in the unfavorable phases of the cycle. During the pedagogical experiment, the operative control of girls' psychophysical condition was performed. If necessary, an individual correction of the training program was carried out.

To determine the functional state of the cardiovascular system, the following parameters were examined: heart rate (heart rate, beats·min⁻¹) was determined by palpation on the carotid or radial artery at rest; blood pressure was determined with a medical tonometer; recovery time after 20 squats in 30 s [1].

The following tests were used to examine the level of fitness: "4x9 m shuttle running", sec; "Long jump", cm; "Lifting the torso into the saddle" in one minute, the number of times; "Leaning forward from sitting position", cm [14].

To determine the level of the psychological sphere, the method of N. E. Vodopianova "Assessment of satisfaction with quality of life" [8] was used to characterize satisfaction with current activities, well-being and mental health of a person. Testing was performed at the beginning and end of the experiment.

Table 1
Functional indicators of control and experimental groups before and after the experiment

| Indicators | CG, n=36 EG, n=48 | Before the experiment $\bar{X} \pm m$ | Assess | After the experiment $\bar{X} \pm m$ | Assess | P |
|---|----------------------|--|----------------------|---|----------------------|-------|
| Heart rate at rest, beat·min ⁻¹ | CG | 80,01±2,22 | satisf. | 76,03±1,25 | satisf. | >0,05 |
| | EG | 77,25±1,24 | satisf. | 69,98±1,19 | satisf. | <0,01 |
| | P | >0,05 | | <0,01 | | – |
| BP syst, mm Hg | CG | 115,06±3,08 | optim. | 114,19±1,82 | optim. | >0,05 |
| | EG | 117,29±3,12 | optim. | 115,08±3,15 | optim. | <0,05 |
| | P | >0,05 | | <0,05 | | – |
| BP diast., mm Hg | CG | 72,30±0,86 | optim. | 71,10±0,72 | optim. | >0,05 |
| | EG | 75,30±1,22 | optim. | 74,15±1,33 | optim. | <0,05 |
| | P | >0,05 | | <0,05 | | – |
| Recovery time after 20 squats in 30 s, s | CG | 129,23±4,23 | Below the average | 112,63±4,50 | Below the average | >0,05 |
| | EG | 125,22±3,76 | Below the average | 89,93±2,24 | Below the average | <0,01 |
| | P | >0,05 | | <0,01 | | – |

Table 2

Indicators of physical fitness of the control and experimental groups before and after the experiment

| Test exercise | CG, n=36 EG, n=48 | Before the experiment X±m | Assess | After the experiment X±m | Assess | P |
|---|----------------------|------------------------------|-----------|-----------------------------|-----------|-------|
| Shuttle running 4x9 m, s | CG | 11,75±0,13 | poor | 11,36±0,08 | unsatisf. | >0,05 |
| | EG | 11,71±0,14 | poor | 11,18±0,06 | satisf. | <0,01 |
| | P | >0,05 | | <0,05 | | - |
| Long jump, cm | CG | 159,75±2,63 | poor | 169,51±2,87 | unsatisf. | >0,05 |
| | EG | 162,74±2,62 | poor | 179,12±3,15 | satisf. | <0,05 |
| | P | >0,05 | | <0,01 | | - |
| Lifting the torso into the saddle from the supine position, the number of times | CG | 26,05±2,22 | unsatisf. | 37,24±1,88 | satisf. | >0,05 |
| | EG | 27,55±1,85 | unsatisf. | 46,15±2,20 | excellent | <0,05 |
| | P | >0,05 | | <0,001 | | - |
| Lean forward from sitting position, cm | CG | 12,05±1,14 | unsatisf. | 16,52±0,63 | good | >0,05 |
| | EG | 12,45±1,05 | unsatisf. | 19,65±0,90 | excellent | <0,01 |
| | P | >0,05 | | <0,01 | | - |

Results of the research

A research of the functional status of young women at the beginning of the pedagogical experiment showed that no significant changes were found between the control and experimental groups (p>0,05).

In the tabl. 1 presents changes in both groups. Comparative

analysis of the functional status of young women in the control and experimental groups showed that, according to generally accepted norms for this age, during the experiment period, significant changes (p<0,05–0,01) occurred in the following parameters: systolic blood pressure, diastolic blood pressure mm Hg; Heart rate at rest, beats · min⁻¹; recovery time after 20 squats in 30 s. In CG, there were slight changes in all indicators (p>0,05). The greatest impact of the use of various

Table 3

Indicators of the “Assessment of satisfaction with quality of life” level of the control and experimental groups before and after the experiment

| Indicators | CG, n=36 EG, n=48 | Before the experiment X±m | After the experiment X±m | P |
|---------------------------------------|----------------------|------------------------------|-----------------------------|-------|
| Work, career | CG | 22,02±1,19 | 25,80±1,50 | >0,05 |
| | EG | 22,40±1,17 | 29,31±1,44 | <0,05 |
| | P | >0,05 | <0,01 | - |
| Personal achievements and aspirations | CG | 23,45±1,28 | 26,72±1,36 | >0,05 |
| | EG | 22,48±1,17 | 30,12±1,72 | <0,01 |
| | P | >0,05 | <0,01 | - |
| Health | CG | 21,35±1,26 | 29,45, ±1,74 | <0,05 |
| | EG | 21,11±0,99 | 35,65±0,75 | <0,01 |
| | P | <0,05 | <0,001 | - |
| Communication with friends (family) | CG | 28,20±1,73 | 32,05±0,88 | >0,05 |
| | EG | 28,32±1,49 | 35,75±0,73 | <0,01 |
| | P | >0,05 | <0,01 | - |
| Support | CG | 27,09±1,29 | 29,05±0,84 | >0,05 |
| | EG | 26,55±1,37 | 31,45±1,12 | <0,01 |
| | P | >0,05 | <0,01 | - |
| Optimism | CG | 24,04±1,32 | 29,45±0,95 | <0,05 |
| | EG | 25,25±1,53 | 34,15±1,05 | <0,01 |
| | P | <0,05 | <0,001 | - |
| Tension | CG | 24,90±1,40 | 28,55±1,21 | >0,05 |
| | EG | 26,05±1,56 | 34,71±1,03 | <0,05 |
| | P | >0,05 | <0,01 | - |
| Self-control | CG | 21,32±1,37 | 25,07±1,30 | >0,05 |
| | EG | 22,45±1,58 | 28,51±1,46 | <0,01 |
| | P | >0,05 | <0,01 | - |
| Negative emotions | CG | 23,52±1,43 | 26,29±1,22 | >0,05 |
| | EG | 24,91±1,33 | 28,57±1,26 | >0,05 |
| | P | >0,05 | >0,05 | - |
| Quality of Life Index | CG | 23,97±1,28 | 28,03±1,39 | >0,05 |
| | EG | 24,43±1,54 | 31,94±1,48 | <0,05 |
| | P | >0,05 | <0,01 | - |

fitness tools had on resting heart rate, beats · min⁻¹: from a rating of “fair” to “good”; recovery time after 20 squats in 30 s., from: ‘below average’ to ‘above average’.

Analysis of the physical fitness of young women showed that no significant changes were found between the control and experimental groups at the beginning of the pedagogical experiment ($p > 0,05$).

In the tabl. 2 presents the changes in physical fitness of both groups. During the research, significant changes ($p < 0,05 - 0,01$) of the following indicators occurred in the experimental group: “shuttle running 4x9 m”, s; “Long jump”, cm; “Lifting the torso into the saddle” in one minute, the number of times; “Leaning forward from a sitting position”, cm. Analysis of the results of the control group showed that they also improved but not enough ($p > 0,05$). After summarizing, it is found that the largest changes occurred in the test of the strength of the abdominal muscles and flexibility, from the rating “unsatisfactory” to the “excellent”.

An analysis of the indicators of the level of “Assessment of satisfaction with quality of life” revealed that no significant changes were found between the control and experimental groups at the beginning of the experiment ($p > 0,05$).

In the table 3 presents changes in the level of “Assessment of satisfaction with quality of life” of women in the control and experimental groups. According to the table, during the pedagogical experiment there were positive changes in both groups. However, it should be noted that the control group experienced non-significant changes ($p > 0,05$), with the exception of the Health and Optimistic scales ($p < 0,05$). In the experimental group, all the indicators that were studied significantly changed ($p < 0,05 - 0,01$), except for the indicator “Negative emotions” ($p > 0,05$): improved attitude to their activity, self-control, self-esteem, perception of health, support from friends, optimism while reducing tension and the degree of negative emotions. As a result of the study, it was found

that personal assessment of satisfaction with quality of life with EG girls was significantly ($p < 0,05$) different from CG girls ($p > 0,05$).

Therefore, the developed method of combining different types of fitness with taking into account the ovarian-menstrual cycle is an effective means of improving the indicators of physical performance, physical fitness and mental health of young women.

Conclusions / Discussion

The results of the research made it possible to confirm and supplement known scientific developments, as well as to obtain new data in the aspect of the problem under study. The research confirms scientific data [4; 12; 19; 20] that trainings enhances fitness and efficiency, supplemented and expanded data [10] on the individual and psychological capabilities of young women in health fitness trainings.

Summarizing the results of the research, we can state that the study has further developed scientific data on the need to take into account the biological cyclic functions of the female body when planning physical activities, selection of exercises of different orientation in the physical and health education [6; 16].

The use of the author’s method of combining different kinds of fitness trainings (basic aerobics, pilates and stretching), which is based on the selection of optimal parameters of physical activity in different phases of OMC, helps to improve the psychophysical condition of young women. The results of the research complement the theory and methods of physical education with new ideas about the possibility of modernization of physical and health education.

The prospects for further research are defined by indicators of the level of anxiety of young women engaged in health fitness in different phases of the ovarian-menstrual cycle.

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.

References

1. Apanasenko, G.L. (1992), *Evolyutsiya bioenergetiki i zdorove cheloveka* [The evolution of bioenergy and human health], St. Petersburg. (in Russ.)
2. Belyak, Y., Gribovskaya, I., Music, F., Ivanochko, V. & Chekhovska, L. (2018), *Teoretyko-metodychni osnovy ozdorovchoho fitnesu* [Theoretical and methodological foundations of wellness fitness], Lviv. (in Ukr.)
3. Dutchak, M.V. (2015), “The paradigm of wellness motor activity: theoretical grounding and practical application”, *Teoriia i metodyka fizychnoho vykhovannia i sportu*, No. 2, pp. 44-52. (in Ukr.)
4. Ivanochko, V.V. & Malanchuk, G.G. (2018), “The Impact of Wellness Aerobics on the Physical Performance of Women in the First Mature Age”, *Aktualni pytannia vdoskonalennia systemy fizychnoho vykhovannia i sportyvnoi roboty u vyshchii shkoli*, Collection of scientific papers on the materials of the First Scientific Conference with International Participation, Uzhgorod, pp. 16-18. (in Ukr.)
5. Kashuba, V., Goncharova, N., Dudko, M. & Martyniuk, O. (2016), “On the Issue of Improving the Efficiency of Physical Culture and Health Activities of Different Populations”, *Molodizh. nauk. visn. Skhidnoievrop. nats. un-tu im. Lesi Ukrainky*, Iss. 24, pp. 9-14. (in Ukr.)
6. Lukovskaya, O. & Sologubova, S. (2015), “Combination of different types of fitness in fitness classes with women of the first mature age”, *Sportyvnyi visnyk Prydniprov’ia*, No. 2, pp. 103-108. (in Ukr.)
7. Martyniuk, O. (2016), “Indicators of the physical condition of women engaged in health aerobics”, *Slobozans’kij naukovо-sportyvnyj visnyk*, No. 4 (54), pp. 73-78. (in Russ.)
8. Nikiforov, G.S. (2006), *Psikhologiya zdorovya: uchebnyk dlya vuzov* [Health Psychology: a textbook for universities], St. Petersburg. (in Russ.)
9. Pirogov, K. & Mykytchuk, O. (2019), “Physical state of aqua fitness women of the first adult age”, *Sportyvnyi visnyk Prydniprov’ia*, No. 3, pp. 149-157. (in Ukr.)
10. Pyastolova, N.B. (2019), “Fitness training: the physical and psycho-emotional state of women”, *Fizicheskaya kultura. Sport. Turizm. Dvigatel'naya rekreatsiya*, No. 4, pp. 138-143. (in Russ.)
11. Romanenko, N.I. (2018), “Methods of the integrated use of basic and power aerobics in the physical preparation of women 25–35 years

- old", *Fizicheskaya kultura, sport – nauka i praktika*, No. 1, pp. 52-56. (in Russ.)
12. Romanyuk, V. (2015), "The Impact of Fitness Programs on the Functionality of the Cardiovascular System of Female Students", *Molodizhnyi naukovyi visnyk Skhidnoievropeiskoho natsionalnoho universytetu imeni Lesi Ukrainky. Fizychno vykhovannia i sport*, Issue 17, pp. 61-66. (in Ukr.)
13. Saykina, E.G. (2016), "Fitness technologies: concept, development and specific features", *Vestnik sportivnoy nauki*, No. 1, pp. 50-53. (in Russ.)
14. Sergienko, L.P. (2001), *Kompleksne testuvannia rukhovnykh zdibnostei liudyny* [Comprehensive testing of human motor abilities], Mykolaiv. (in Ukr.)
15. Sivak, O., Prokopenko, O., Tsykalyuk, O. & Polycarchuk, I. (2019), *Zdorov'ia zhinok v Ukraini: prava, mozhyvosti ta rekomendatsii* [Women's Health in Ukraine: Rights, Opportunities and Recommendations], Kiev. (in Ukr.)
16. Sologubova, S. (2016), "An algorithm for constructing individual programs in women's conditioning training", *Sportyvnyi visnyk Prydniprov'ia*, No. 1, pp. 121-125. (in Ukr.)
17. Sutula, V., Lutsenko, L., Zhadan, A., Sutula, A. (2018), "Physical fitness as the historical development of physical culture", *Slobozans'kij naukovy-sportyvnyj visnyk*, No. 4 (65), pp. 63-66. (in Ukr.)
18. Usachev, Yu.A. (2015), *Fizkulturno-ozdorovitelnye tekhnologii formirovaniya fitnes-kultury studentov* [Fitness and fitness technologies for the formation of students' fitness culture], Kiev. (in Russ.)
19. Shishkina, O.M. & Beygul, I.O. (2014), "The Impact of Fitness Aerobics on the Functional Indicators of Women", *Fizychna kultura, sport ta zdorov'ia natsii*, Issue 17, pp. 343-347. (in Ukr.)
20. Shishkina, O.M. & Mulagildina, A.Ya. (2015), "Changes in the fitness level of women engaged in fitness aerobics", *Naukovyi Chasopys Natsionalnoho pedahohichnoho universytetu imeni M. P. Drahomanova. Seriya №15. "Naukovo-pedahohichni problemy fizychnoi kultury (Fizychna kultura i sport)"*, No. ZK1(56)15, pp. 393-395. (in Ukr.)
21. Armstrong, T. (2011), "Physical activity and health benefits", *14th World Conference Sport for All 20–23.09.2011: Abstracts Book*, Beijing, pp. 46-49.
22. Crossley, J. (2012), *Personal training: Theory and Practice* Routledge.
23. Stewart, A. & Sutton, L. (2012), *Body composition in sport, exercise and health*, Routledge, London.
24. Synytsya, T.O., Shesterova, L.E. & Synytsya, S.V. (2014), "The popular activities of health aerobics among women of Ukraine", *Stiinta culturii fizice: Pregatire profesional antrenament sportive educatie fizica recuperare recreatie*, Chişinău, No. 19(3), pp. 101-107.
25. Yarmak, O., Galan, Y., Hakman, A., Dotsyuk, L. & Teslitskyi, Y. (2017), "The use of modern means of health improving fitness during the process of physical education of student youth", *Journal of Physical Education and Sport*, No. 17(3), pp. 1935-1940.

Received: 08.11.2019.

Published: 30.12.2019.

Information about the Authors

Olena Shishkina: senior lecturer; Dnipro State Technical University, Dneprostroyevskaya str. 2, Kamenskoye, 51900, Ukraine.

ORCID.ORG/0000-0002-6755-138X

E-mail: olefirshishkina@gmail.com

Igor Beihul: PhD (Physical Education and Sport); Dnipro State Technical University, Dneprostroyevskaya str. 2, Kamenskoye, 51900, Ukraine.

ORCID.ORG/0000-0002-3892-6023

E-mail: bejippon@gmail.com

Alla Mullagildina: PhD (Pedagogical), Associate Professor; Kharkiv State Academy of Physical Culture, Klochkivska 99, Kharkiv, 61058, Ukraine.

ORCID.ORG/0000-0002-9232-6387

E-mail: mullagildinaalla@gmail.com

Features of the activities of the first Gymnastic Society in the Kharkov province at the end of the XIX and beginning of the XX century

Larysa Taran

Kharkiv State Academy of Physical Culture, Kharkiv, Ukraine

Purpose: to establish the features and areas of activity for the development of physical culture and sports in the territory of the Kharkov province of the 1st Gymnastic Society.

Material & Methods: the research material was preserved in rare editions – reports on the activities of the Kharkov Gymnastic Society for 1895, 1896, 1900, 1909. Research methods: analysis and synthesis of scientific literature data, problem-search, historical-systemic and logical methods.

Results: revealed that at the end of the 19th and the beginning of the 20th centuries, sports spread in large cities, and educational institutions and sports societies became the basis for the development of physical culture and sports. Kharkov 1st Gymnastic Society began to work one of the first in the Kharkov region. The use of various forms of organization of classes made it possible to carry out extensive campaigning among the population of Kharkov to attract physical education and sports, including women and children; contribute to the development of sports that the Society has cultivated.

Conclusions: as a result of the study, the year of foundation and founders of the 1st Gymnastic Society was established. The results of previous scientific studies on the functioning of societies at the end of the 19th and beginning of the 20th centuries were expanded in the following areas: organizational structure and composition, functions of a teacher (trainer), attracting women and children to physical education, sources of income and expense items, timetable and forms of organization of classes, activities for the development of physical education and individual sports in the territory of Kharkov province, the 1st Gymnastic Society.

Keywords: Gymnastic Society, sports movement, physical education, sport, Kharkov province.

Introduction

Studying and analyzing the surviving rare publications allows us to highlight the features of the development and formation of physical culture and sports in different regions of Ukraine at a time when it was a part of the Russian Empire. The research results enrich the historical heritage of the region, the study of which is a prerequisite for the development of Ukrainian society, its national identity and self-identification in the context of integration into the European Union.

The work of many scientists is devoted to the study of the development of sports movement in different regions of Ukraine in the late XIX and early XX centuries.

The monograph by A. Waceba (1997) established that the first Ukrainian sports societies appeared in Galicia at the beginning of the XX century. A characteristic sign of their development was that most of them worked within the framework of purely national structures. Other sports clubs have joined the official structures of Polish sports. Among the most common sports of the time – football, athletics, gymnastics, skiing, boxing, sports.

The legal foundations of physical culture and sports, and in particular, sports organizations of the late XIX – early XX centuries, were considered in the works of L. Vostroknutov (2001), I. Gasyuk (2009). According to information covered by L. Vostroknutov (2001), one can come to the following conclusions – the spread of sports and the creation of societies

were facilitated by: a high percentage of the urban population in Ukraine; the availability of educational institutions (universities, gymnasiums, schools); active position of the advanced public – the organizers were representatives of the intelligentsia, the growth of the international sports movement and its influence.

The monograph of M. Oleinik and Yu. Grot (2002) is devoted to the study of the development of individual sports, the creation of sports societies in the Kharkov region, starting in the second half of the XIX century.

In the scientific work of A. Lyakh-Porodka (2009), the formation of the Sokolsky movement on the territory of Ukrainian lands that were part of the Russian Empire at the beginning of the XX century is disclosed.

The publication by A. Bondar (2012) highlights that the creation of sports societies, clubs, and circles in Slobozhanshchina at the indicated time contributed to the emergence of a number of popular sports in the present – gymnastics, weightlifting, wrestling, boxing, football, cycling.

T. Ustinova (2012) investigated the development of the gymnastic movement in the context of physical education in Europe (the second half of the XIX century – the 30s of the XX century). It is established that the development of the gymnastic movement is determined by the main directions of physical education – gymnastics, sports and games, and military-physical.

The peculiarities of the origin and formation of the physical culture and sports movement in the Ekaterinoslav region (now Dnepropetrovsk) in the pre-revolutionary period (late XIX century – 1917) are studied. The work of the authors I. Baldzhi, G. Salenko (2016) is devoted. Among the first sports organizations, the Yekaterinoslav Society of Cyclists (1894), Yekaterinoslavsky (1897) and Kamenskaya (1898) Yacht Clubs were created.

The scientific work of G. Griban (2018) is devoted to the history of the activities of sports societies in the Zhytomyr region in 1893–1922. According to the established data, educational institutions made a great contribution to the development of physical culture in the Zhytomyr region. One of the first sports societies was opened Zhytomyr society of amateur cyclists (1893).

So, the question of the development of the sports movement and the creation of sports societies at the end of the 19th century in Ukraine is of interest to scientists in order to disseminate little-known historical facts. The activities of the 1st gymnastic society need to be clarified regarding the year of its creation and the founders; they require a comprehensive study of the features of its functioning as one of the leading sports centers of that time.

Purpose of the study: to establish the features and areas of activity for the development of physical culture and sports in the territory of the Kharkov province of the 1st gymnastic society.

Material and Methods of the research

The research material was preserved rare editions – “reports on the activities of the Kharkiv Gymnastic Society for 1895, 1896, 1900, 1909”. Research methods: analysis and synthesis of scientific literature data, problem-search, historical-systemic and logical methods.

Results of the research

At the end of the 19th century, sport began to develop rapidly in many countries, which was facilitated by certain conditions. The sports movement takes shape organizationally – the international federations of gymnastics (1881), rugby (1886), rowing (1892) and the international skating union (1892) were created. Gradually, certain sports are gaining popularity in the Russian Empire, which included the Kharkov province.

As S. Fily [13] notes, the gymnastic movement in the country in the second half of the 19th century develops along the lines of Western states, that is, mainly for wealthy and close citizens. The main sign is that sport is spreading in large cities. As a rule, sports clubs (most often as honorary ones) were led by powerful bankers, factory owners, and the like.

Contributed to the formation and development of sports in many cases, foreign experts, namely representatives of Germany, the Czech Republic and other European countries. This is due to the lack of special institutions in the country for the training of specialists of the corresponding profile. Educational institutions and sports societies became the basis for the development of physical culture and sports in those days.

The Kharkov Society of Amateur Cyclists (1887), the Kharkov 1st Gymnastic Society (1894), the Kharkov Gymnastic Society Sokol (1907) and others were among the first to operate in the Kharkov region.

On November 17, 1893, the Ministry of the Interior of the Russian Empire approved the *Charter of the Gymnastics Society* at number 514, which was founded in 1894 with the goal of promoting “... the goals of the physical development of our youth and maintaining health among the population of Kharkov” [9].

The calendar year began on February 1. Annual activity reports were submitted to the Governor, under whose supervision it was, and to the Medical Department.

From the *history of the creation of the gymnastic society* “Many of you remember very well how our Society was born. Having originally appeared, according to the thought of five people, in a private house, on one of the remote udivs of Kharkov, where few admirers and connoisseurs of physical development visited, it existed for only one year, as it became immediately obvious that the framework in which business initiators thought to conclude their task and activities, they are getting close. Following this, recognizing the urgent need to develop and strengthen our thoughts on a wider and more correct basis, several individuals from the original gymnastics club, among whom G. Gelferikh, Toffer, Meyer, Grozber, Goltsgjut’yr, Benjamin, took part, Pilstrem, Cherevko, Wilgalm, Kurze and others, decided to establish a Gymnastic Society in Kharkov, similar to those that already existed abroad and in Russia, such as Petersburg, Moscow and Odessa” [9]. This fact from the report on the activities of the Company for 1895 allows us to name its founders and testifies that it was created from a circle of gymnastics lovers.

Also, according to M. Oleinik, Yu. Grot [8], involved in the organization of the gymnastic society is mentioned Karl Augustovich bashing, who was engaged in successful entrepreneurial and charitable activities in the city.

From 1895 to 1901, as noted in the financial report of the created organization, it rented a room for classes in the Roman Catholic Church on Kokoshkinsky Street No. 4 (modern address is Gogol Street, 4) for an annual fee of 600 rubles. Subsequently, the premises of the Real School were rented along Staromoskovskoye Street (modern address is Moskovsky Prospekt), while the fee was 200 rubles in 1909–1911.

The *gymnastics society* included: chairman, secretary, cashier, members of the council or board, teachers, doctors, honorary guardian of the society (governor), honorary members and full members. Doctor of Medicine Alexander Mikhailovich Cherevko is noted as the Chairman of the Society in the surviving reports of 1895-1901, and Pavel Karlovich bashing in the report for 1909.

The main *teacher*, or gymnasium of the Society (in the modern sense of the trainer), was Nikolai Fedorovich Wilgalm (a native of Kharkov, graduated from the Berlin Gymnastics Society. In 1913, at the All-Russian take-off of gymnasts for the successful performance of athletes of the Kharkov school district, Emperor Nicholas II awarded M. F. Vilgalm the title “Grammar School of All Russia”). Its functions included observing gymnastic exercises, placing visitors in departments, assigning

a sequence of various gymnastic exercises and monitoring their exact performance, setting a rest time, avoiding excessive cooling of the body, etc.

Among the teachers who helped M. F. Vilgalm, the names were B. Kraevsky (fencing teacher, 1895), Gasselbrring, Gutiar, Rings (heads of departments, 1896), Ms. M. E. Krushel (head of women's gymnastics since 1896)

The Society included doctors – Dr. A. M. Cherevko, Yu. G. Pensky, M. E. Krushel, thanks to which visitors were under control and could use the necessary advice from them.

As indicated in the extract to the charter of the Company, it consisted, in addition to honorary and full members, of visitors. There were certain age restrictions for full members and visitors. Full members could be at least 21 years old, and the age of visitors should have been 8 years or older. The number of full members of the Company, according to reports on its activities [9; 10, 11; 14] is gradually growing (Fig. 1). Since September 1896, women have been included in the full membership due to the fact that the society has opened gymnastics courses for women.

The Gymnastic Society existed on a voluntary basis, as indicated by the following quote: "... free service to all members of our Society in such a good intention ..." [9]. The only one who received a salary was gymnastics instructor M. F. Wilgalm.

The *main sources of income of the Society* include the following: contributions of full members, visitors, organization of public evenings, donations to the Society.

Gymnastics classes in the Society were organized on a paid basis. So, for full members it cost 10 rubles a year and 3 rubles once, subject to a payment for six months. For visitors, the payment was 1 ruble per month or 10 rubles per year, subject to a semi-annual contribution.

The largest donations came from an honorary member of the Society, Maximilian Khristianovich Gelferikh. Among those who helped the Society financially or with sports equipment, the names of G. A. Pilstrem, B. A. Kraevsky, P. A. Noskov, N. I. Kudryachevsky, M. S. Navratil, R. K. Meyer, V. I. Pidde.

The *expenses of the Society* were related to renting a room, paying a salary to a teacher and a minister, purchasing and repairing sports equipment, holding public evenings, prizes for competitions, subscribing to magazines and so on.

The report of the Society for 1909 [14] provides a timetable or lesson plan for the various groups included in its composition (Table 1). According to the schedule, only full members could practice daily (except Saturday and Sunday) at 2:00. For oth-

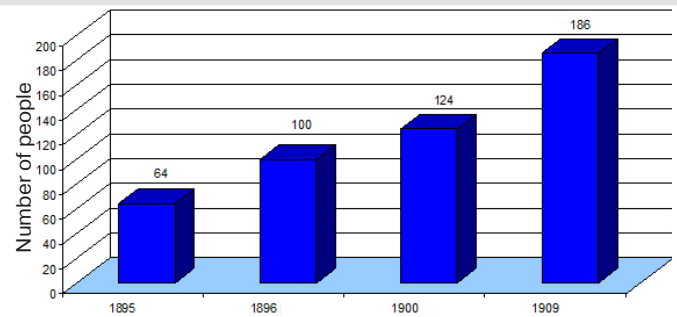


Fig. 1. Number of full members of the first gymnastic society in 1895, 1896, 1900, 1909

er groups of visitors, two classes of different durations were planned per week: adult visitors (men) studied for two hours, ladies and girls had one and a half hours, and children of both sexes had one hour.

At the same time, there were "Rules for members and visitors of the Kharkov Gymnastic Society", which noted that "... for more experienced people, floor exercises do not last more than half an hour, after which no one should do more gymnastics".

Certain requirements existed before the sportswear of people who were engaged in gymnastics: "... were whenever possible in uniform gymnastic clean suits, that is, in blue trousers and a white sweatshirt. Gymnastic sweatshirt and shoes (or shoes) are mandatory, because without them, no one is allowed to exercise" [14].

Along with gymnastics, the Society developed sports such as fencing, weightlifting, and wrestling [8].

The forms of organization of classes that were used in the Society were quite diverse: gymnastic evenings (training sessions), gymnastic evenings "to test the results of the busy", public and family evenings, children's games, a tree for children, theater performances, country walks, public summer competitions, competitions in the Missouri circus, performances with charity, performances at the gymnastic saints, competitions for prizes "for gymnastics", "for athletics", "for wrestling". The application of such forms of work by the Society made it possible to carry out wide propaganda work among the population of Kharkov to attract physical education and sports, including women and children; contribute to the development of sports that the Society has cultivated.

Analyzing the performance of visiting the hall, it should be noted that the work carried out had a positive impact (Table 2). Thus, the number of visits by adults over the study period is gradually growing, with the exception of 1900. The decrease in indicators in 1900 was due to the inconvenient classroom,

Table 1
Lesson plan for groups of the Kharkov 1st Gymnastics Society (1909–1910)

| Group Society | Days of the week and time for classes | | | | |
|----------------------------|---------------------------------------|-------------|-------------|-------------|-------------|
| | Monday | Thursday | Wednesday | Thursday | Friday |
| Full members | 20:30–22:30 | 20:30–22:30 | 20:30–22:30 | 20:30–22:30 | 20:30–22:30 |
| Adult visitors of group I | | 20:30–22:30 | | 20:30–22:30 | |
| Adult visitors of group II | | | 20:30–22:30 | | 20:30–22:30 |
| Ladies and damsels | 18:30–20:00 | | | 18:30–20:00 | |
| Children of both sexes | | 18:30–19:30 | | | 18:30–19:30 |

Table 2

Indices of the visit to the hall, held gymnastic evenings and competitions of the Kharkov 1st gymnastic society (1894–1896, 1900, 1909)

| Indicators | Years | | | | |
|-----------------------------------|-------|------|------|------|-------|
| | 1894 | 1895 | 1896 | 1900 | 1909 |
| hall visit | | | | | |
| (Number of times): | 1872 | 3526 | 6279 | 5416 | |
| – full members | | 566 | 1092 | 796 | |
| – adult visitors | 1872 | 2960 | 4585 | 3835 | 15336 |
| – ladies and damsels | | | 602 | 330 | |
| – children (for children’s games) | | | | 455 | |
| Gymnastic evenings (number) | 106 | 118 | 158 | 150 | 187 |
| Competitions for prizes (number) | | | | 1 | 13 |

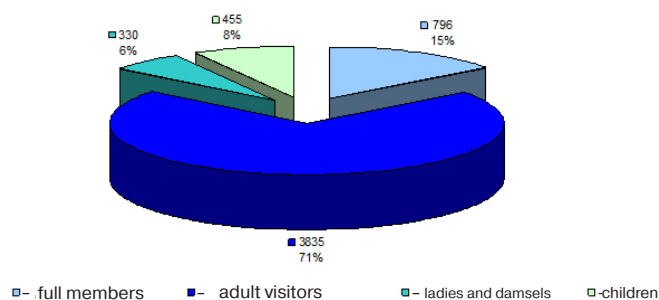


Fig. 2. Ratio of different categories of visitors by the number of times visiting the halls of the gymnastic society in 1900

because the Roman Catholic Church, in which it is rented, reduced the area of use for the Society.

Over the 15 years of the existence of the sports organization, the indicators of the number of visits to the hall by adult visitors have increased more than 8 times, and the number of gymnastic evenings – 1,7 times.

Among the various segments of the population who attended the Society’s hall in 1896, the largest number of visits among adults was 73% (4,585 times), a member was 17% (1,092 times) and women were 10% (602 times). In 1900, the Society organized children’s games [11]. Accordingly, the number of visits to the hall by children amounted to 8% of the total number (Figure 2).

The methodological basis for the work of the teaching staff was “... two magazines devoted to gymnastics and sports: Turner-Zeitung and Athleten-Zeitung”, which were received by the society. Various gymnastic exercises were visually

presented in the form of “19 table of figures” [9]. Also at that time, translation works on physical education were published, bibliographic reviews of books on physical education published in Russia were published in magazines [4].

Conclusions / Discussion

As a result of the study, it was established that the Gymnastics Society was founded with a circle of gymnastics enthusiasts in 1894 with the participation of the honorary member of the Society Maximilian Khristianovich Gelferikh, a well-known entrepreneur in the city, philanthropist (who made the largest amount of donations) and other persons, complements the data of L. Vostroknutov and clarifies information M. Oleinik and Yu. Grot. The scientific search of A. Bondar, A. Waceba, G. Griban, A. Lyakh-Porodka, T. Ustinova, S. Fil and others from the history of the development of the sports movement in different regions of Ukraine at the end of the 19th and beginning of the 20th centuries was extended. The data of I. Baldzhi, G. Salenko on financing the first sports organizations was confirmed. The results of previous scientific studies on the functioning of societies were expanded in the following areas: organizational structure and composition, functions of a teacher (trainer), attracting women and children to physical education, sources of income and expense items, timetable and forms of organization of classes, activities for the development of physical education and individual sports (gymnastics, fencing, wrestling, weightlifting) in the territory of the Kharkov province of the 1st gymnastic society.

Prospects for further research are related to the generalization of reports on the activities of societies in other sports, which were founded since then in the Kharkov province.

Conflict of interests. The author declares that no conflict of interest.

Financing sources. This article didn’t get the financial support from the state, public or commercial organization.

References

- Baldzhi, I. & Salenko, G. (2016), “Physical Culture and Sports Movement in the Yekaterinoslav Province in the Pre-Revolutionary Period (End of the 19th Century – 1917)”, *Sportivniy visnik Pridniprov’ya*, No. 1, pp. 152-157. (in Russ.)
- Bondar, A.S. (2012), “The History of the Development and Traditions of Sports in the Slobozhanshchina”, *Slobozans’kij naukovno-sportivnij visnik*, No. 5, pp. 156-159. (in Russ.)
- Vatseba, O. (1997), *Narys z istorii zakhidnoukrainskoho sportyvnoho rukhu* [Essays on the History of Western Ukrainian Sports Movement], Ivano-Frankivsk. (in Ukr.)
- Vostroknutov, L.D. (2001), “The Legal Basis of Activity of Sports Organizations in Ukraine (End of XIX – Beginning of XX Century)”, *Visnyk Kharkivskoho natsionalnoho universytetu vnutrishnikh sprav*, Vypusk 15, pp. 151-155. (in Ukr.)
- Hasiuk, I.L. (2009), “The evolution of the organizational and legal foundations of public management of physical culture and sports in the Ukrainian lands at the end of the 19th century and in the Soviet period”, *Universytetski naukovy zapysky*, No. 4 (32), pp. 261-272. (in Ukr.)

6. Hryban, H.P. (2018), "The History of Activity of Sports Societies in Zhytomyr Region in 1893–1922", *Fizychna kultura, sport ta zdorovia natsii*, No. 5, pp. 446-453. (in Ukr.)
7. Liakh-Porodko, O.O. (2009), "Peculiarities of Formation of the Falcon Movement in the Ukrainian Lands of the Russian Empire at the Beginning of the XX Century", *Teoriia i metodyka fizychnoho vykhovannia i sportu*, No 1, pp. 86-99. (in Ukr.)
8. Oleynik, N.A. & Grot, Yu.I. (2002), *Istoriya fizicheskoy kultury i sporta na Kharkovshchine* [The history of physical culture and sports in the Kharkov region], Vol. 1, pp. 5-11. (in Russ.)
9. *Report on the activities of the Kharkov Gymnastic Society for 1895* (1896), Kharkiv, 19 p. (in Russ.)
10. *Report on the activities of the Kharkov Gymnastic Society for 1896* (1897), Kharkiv, 15 p. (in Russ.)
11. *Report on the activities of the Kharkov Gymnastic Society from February 1, 1900 to February 1, 1901* (1901), Kharkiv, 13 p. (in Russ.)
12. Ustinova, T. (2012), "The Development of Gymnastic Movement in the Context of Physical Education in Europe (Second Half of the 19th Century – 30s of the 20th Century)", *Teoriia i metodyka fizychnoho vykhovannia i sportu*, No. 3, pp. 134-138. (in Ukr.)
13. Fil, S.M., Khudolii, O.M. & Malka, H.V. (2003), *Istoriia fizychnoi kultury* [History of Physical Culture], pp. 99-101. (in Ukr.)
14. *Kharkov 1st Gymnastic Society. Annual report from February 1, 1909 to February 1, 1910* (1910), Kharkov, 15 p. (in Russ.)

Received: 25.10.2019.

Published: 30.12.2019.

Information about the Authors

Larysa Taran: PhD (Physical Education and Sport); Kharkiv State Academy of Physical Culture: Klochkivska str. 99, Kharkiv, 61058, Ukraine.

ORCID.ORG/0000-0001-8141-443X

E-mail: taranlarisa11@gmail.com

Gender identification of athletes of different qualifications regarding classification groups of sports

Olena Tarasevich
Oleg Kamaev
Daria Okun

Kharkiv State Academy of Physical Culture, Kharkiv, Ukraine

Purpose: identify (determine) gender types of athletes of different qualifications depending on the classification groups of sports.

Material & Methods: the study involved 859 students from 17 to 28 years old, who study at the Kharkiv State Academy of Physical Culture, the National University of Physical Education and Sports of Ukraine and the Sumy State Pedagogical University named after A. S. Makarenko, specializing in Olympic and non-Olympic sports and with various sports qualifications. Of these, 428 male athletes and 431 female athletes. Such research methods were used as: analysis and generalization of literary sources and Internet resources on the investigated problem; questioning; conversation; psychological methods: S. Bem's technique "Masculinity / femininity"; methods of mathematical statistics.

Results: the percentage correlation of masculine, feminine and androgynous types of personality was revealed among 859 male and female athletes studied, who specialize in sports games and martial arts, in cyclic, speed-strength and complex coordination sports. With a masculine personality type, 238 young men were identified, which is 55% of the total number of athletes and 238 girls (56% of their total number). Athletes of the androgynous type identified 193 people (45%), and athletes – 190 (44%). Feminine-type personalities were not found among either boys or girls. The percentage ratio of masculine and androgynous male and female athletes in different classification groups of sports and sports disciplines relative to their biological gender and sports qualification is also determined.

Conclusions: regarding such a concept as "gender", men and women belong to one of three sociocultural sexes: masculine, feminine, and androgenic. The idea of masculinity and femininity is associated not with the biological sex of a person, but with the type of culture to which he belongs. Sport, as an institute of socialization, actively contributes to the formation of gender qualities of an individual. As a result of the study, it was proved that the ratio of gender types in both men and women varies depending on the type of sports activity that they are engaged in. High qualification of athletes and athletes contributes to the formation of masculinity in them.

Keywords: gender, men, women, masculinity, femininity, androgyny, gender identity.

Introduction

Under the concept of "gender", which was introduced into science by the American psychoanalyst Robert Stoller in 1958, we understand the social gender that determines the behavior of a person in society and how this behavior is perceived [7; 8; 14]. G. Stoller's proposal on breeding the biological and cultural component in the study of gender-related issues gave impetus to the formation of a special direction in modern humanitarian knowledge – gender studies, which began to be actively carried out from the 60–70s of the XX century.

The concept of masculinity and femininity is manifested by normative ideas and attitudes, which should be, and therefore what men and women should do in this society at present. Masculinity and femininity are social, not biological, categories. They define our gender identity and are directly related to our perceptions of ourselves and others. Gender identity is the recognition of one's belonging to a certain gender and the willingness to abide by relevant social gender norms [9; 10].

Representations of masculinity and femininity are associated not only with the biological sex of a person, but also with the socio-psychological article of the individual. Understanding the similarities and differences between the biological and

socio-psychological sex helps a person to determine his life, in professional activity, including in sports activities [1; 2].

The problem of the formation of masculinity or femininity causes a lot of controversy and divergence of views, in particular, on the question of whether these components of the personality are innate or those that were acquired during the development of personality.

Gender differences were addressed by authors such as E. E. Maccoby, C. N. Jacklin (1974), S. L. Bem (1979; 1983; 1993; 2004), K. Deaux, B. Major (1987), D. A. Gentile (1993), R. K. Under, M. Crawford (1993), A. Feingold (1994), J. Homsby (1995), I. S. Kletsina (1998; 2003; 2009), S. Berne (2001), N. G. Tsykunov (2003), and I. Taran (2004), T. V. Bendas (2006), E. P. Ilyin (2003; 2010), A. Weininger (2012), D. B. Ver-shinin (2017), A. V. Voronova (2014, 2015, 2018), N. A. Skomorokhova (2018) and others. But most of their work dealt with gender psychology.

The activity that this or that individual is engaged in, his character, cannot but affect the change in the structure of the personality. Sport is one of the highly specific areas of human activity, and, as an institution of socialization, actively contributes to the formation of gender personality traits [11; 12].

Each person, despite the biological sex, has a combination of both courage and femininity. The combination of these components forms a series of transitional forms with a pre-dominance of either masculinity or femininity. In a fairly large number of cases, the equal contribution of both undertakings to the general essence of a person is observed. The combination of masculine and feminine signs of behavior, that is, a phenomenon in which a person shows both male and female qualities, forms the androgynous type of personality. Masculinity, femininity and androgyny are not biological, but social categories that reflect stereotypical ideas about personal characteristics, appearance, behavior, interests, interpersonal relationships of men and women and their professional occupations [3; 8].

Gender roles are always associated with the specifics of the regulatory system, which is recognized in a particular socio-cultural environment, which the person assimilates and projects on his behavior [4; 6]. But how deep, pivotal or not these personality changes, the difference in this issue between men and women, encourages them to engage in certain types of sports activities, how and to what extent does this affect the change in personality structure? These issues, as well as the relationship between biological and socio-psychological sex, have been particularly acute in recent years in connection with the spread of sports and sports disciplines that women began to engage in. Currently, girls compete in those sports that until recently were traditionally considered men's. In them, athletes exhibit behavioral features atypical within society, and often from a biological point of view [5; 15].

Currently, the majority of scientific studies of such authors as N. G. Tsykunov (2003), A. L. Vorozhbitova (2007), T. V. Artamonova; T. A. Shevchenko (2009), Sh. K. Shakhov, A. S. Damadaev (2011), T. Yu. Maskae, G. M. Germanov (2014), D. I. Dzhrumiy (2015), K. A. Bugaevsky (2016; 2017; 2018) and others are aimed at the formation of gender types of athletes in various sports. But the question is, what kinds of sports are more conducive to the formation of certain gender characteristics have not been studied enough. In this regard, this work is devoted to determining the characteristics of the formation of gender types of athletes, depending on their sports qualifications and classification groups of sports, acquires timeliness and relevance.

Purpose of the study: to determine the gender types of athletes of various qualifications, taking into account gender and depending on the classification groups of sports.

Material and Methods of the research

Research Methods. Such research methods were used as: analysis and generalization of literary sources and Internet resources on the studied problem; questioning; poll; psychological methods: S. Būhm's technique "Masculinity / femininity", which diagnoses the psychological gender and reveals the degree of androgyny, masculinity and femininity of a person [16]; methods of mathematical statistics.

Study material. The study involved 859 students from the age of 17–28 who study at the Kharkov State Academy of Physical Culture, the National University of Physical Education and Sports of Ukraine and the Sumy State Pedagogical University named after A. S. Makarenko, involved in Olympic and non-Olympic sports and have various sports qualifications (from

mass athletes to those with the title of Honored Master of Sport). Of these, 428 athletes and 431 athletes specializing in sports and disciplines such as judo, sambo, boxing, kick-boxing, karate, taekwondo, freestyle wrestling, Greco-Roman wrestling, mixed martial arts, Thai boxing, hand-to-hand fighting, capoeira, grappling, athletics, skiing, swimming, short track, rowing, orienteering, cycling, sports tourism, triathlon, biathlon, horse riding, sailing, parachuting, rowing slalom, fitness, modern dance, figure skating, jumping into the water, sync swimming, rhythmic gymnastics, aesthetic gymnastics, sports gymnastics, workout, tumbling, acrobatics, acrobatic rock and roll, aerobics, cheerleading, ballroom dancing, archery, motorsport, motor sports, mountaineering, volleyball, badminton, tennis, hockey, water polo, handball, basketball, table tennis, baseball, bowling, petanque, chess, football, rugby, weightlifting, powerlifting, weight-lifting, arm sport, bodybuilding.

The types of sports and sports disciplines that the subjects are engaged in were divided into groups relative to the most common classification, reflecting the specifics of movements, as well as the structure of competitive and training activities (according to V. N. Platonov).

Results of the research

In various sports, different requirements are made to the personality of athletes. In some forms, they are required to manifest a higher level of aggressiveness, courage, determination, assertiveness, strength; secondly, increased artistry, sensuality, expressiveness, emotionality, grace; thirdly, the manifestations of logical thinking, the ability to quickly navigate and make decisions in non-standard situations, good memory, etc. Thus, this or that type of sports activity affects the formation of the gender type of athletes [13].

During the study, the percentage of masculine, feminine and androgynous types of personality was found in all athletes and female athletes, both qualified and discharged. With a masculine personality type, 238 athletes were identified, accounting for 55% of their total number, and with androgynous – 193 people, respectively – 45%. Young men who have a feminine personality type were not identified during the study.

We observe a similar situation in girls. Athletes of the feminine type of personality were not found. In total, 428 athletes took part in the study, 238 of which were masculine-type girls, that is 56%, and 190 androgynous – this is 44%.

We see that in relation to the total number of people studied, the percentage of boys and girls involved in various sports is almost identical.

The absence of male athletes and female athletes with a feminine gender status indicates that sports activity imposes certain requirements on a person's personality and affects people involved in sports in a certain way.

We see that in relation to the total number of people studied, the percentage of boys and girls involved in various sports is almost identical.

The absence of male athletes and female athletes with a feminine gender status indicates that sports activity imposes certain requirements on a person's personality and affects

people involved in sports in a certain way.

For androgyny, a combination of the characteristics of masculinity and femininity is inherent, that is, the merging into a single whole of the dominant male principle and the emotionally expressive female principle. (T. V. Artamonova, T. A. Shevchenko).

Concerning the classification groups of sports and gender, the sociocultural gender of the studied and the percentage of representatives of various gender personality types among male athletes and female athletes specializing in complex coordination, speed-strength, cyclic sports, sports games and martial arts were found. Young men and women who are engaged in all-around and combined sports are not enough to conduct an analysis (6 male athletes and 8 female athletes). Therefore, this group was not considered in our study.

In speed-strength sports, athletes with androgynous personality type during the study revealed more than athletes with the same type (45% of boys and 27% of girls). And masculine type athletes are fewer than athletes of this type (55% of boys and 73% of girls).

However, among male athletes and female athletes involved in weightlifting, powerlifting, weight lifting, arm wrestling, bodybuilding, masculine-type boys and girls predominate, but the difference between masculine and androgynous athletes is not significant, and this difference is quite large among athletes.

If we compare male athletes and female athletes in cyclic sports with respect to belonging to a particular sociocultural gender, then among girls there are more masculine persons (54%), and among boys – androgynous (52%).

In complex coordination sports, 45% of boys are masculine, and 55% are androgynous. In women, this indicator: 53% – masculine athletes and 47% – androgynous. Thus, in boys, faces of the androgynous type predominate, and in girls, the masculine type.

In sports games, the advantages of both masculine male athletes and masculine female athletes over androgynous were found (in boys, the ratio of 60% is masculine and 40% is androgynous, in girls – 59% – masculine and 41% – androgynous).

When comparing boys and girls with respect to their gender type, we see that masculine type athletes are not much more than female athletes of the same type (60% male and 59% female), and among respondents with an androgenic type there is a slight advantage on the part of female athletes (41% are girls and 40% are boys). Thus, we can conclude that as a

result of research in sports games, almost the same number of athletes and female athletes of the masculine and androgynous sexes were found.

In martial arts there is a picture similar to sports games. Both male athletes and female athletes found a greater number of masculine-type individuals (56% – girls and 58% – boys).

As for the comparison of the ratio of masculine wrestlers and athletes involved in judo, sambo, karate, taekwondo, freestyle wrestling, boxing, etc., a greater number of masculine young men were found (58%) than girls (56%). But there are more athletes with an androgynous personality type (42%) than athletes (44%). But this advantage is negligible for both masculine and androgynous personality types.

There is a predominance of masculine girls in all classification groups of sports. Among young men, a greater number of masculine athletes were found in martial arts, sports games and speed-strength sports.

At the next stage of the study, the percentage ratio of gender personality types among male athletes and female athletes specializing in sports was identified, belong to different classification groups regarding their sports qualifications.

All subjects with respect to their biological gender were divided into two groups. The first group is qualified athletes and sportswomen. These include those who have the title of HMS, MSIG, MS and CMS. The second group is ranked athletes (1 and 2 sports categories).

When comparing all the studied boys and girls with respect to their gender type and their qualifications, they found that highly skilled masculine male athletes are more than highly skilled masculine female athletes. Among highly skilled androgenic people, more male athletes than female athletes were identified.

Among ranked athletes there are more boys of masculine type than masculine girls. Among androgynous individuals with 1 and 2 sports categories there is a slight advantage in favor of female athletes (Table).

When comparing male athletes and female athletes with high athletic achievements with respect to their gender, it was found that among qualified athletes and sportswomen there are more masculine types, and among athletes and sportswomen with sports categories, we observe the ratio of masculine and androgynous men 48:52%, and girls – athletes of the androgynous type more than with masculine.

From the foregoing, we can conclude that the high qualification of athletes and athletes contributes to the formation of

Ratio of highly qualified male athletes and female athletes to those with mass categories, relative to the gender type of person, %

| Gender personality type | Biological sex | | | |
|-------------------------|----------------|-----------------|----------------|-----------------|
| | Boys (n=431) | | Girls (n=428) | |
| | Highly skilled | Ranked athletes | Highly skilled | Ranked athletes |
| masculine | 58 | 48 | 63 | 37 |
| androgenic | 42 | 52 | 45 | 55 |
| feminine | 0 | 0 | 0 | 0 |

masculinity in them. In order to achieve high sports results, you need to train a lot and fruitfully, set goals and achieve them, be mentally and physically ready for heavy loads, be able to mobilize all the reserves of your body at the right time, and much more. To realize all this, you need to have a set of qualities that are characterized as masculine in society.

When detecting and comparing the percentage of gender types of athletes and athletes relative to their sports qualifications in various classification groups of sports, it was found that the largest number of qualified masculine female athletes (90%) and qualified masculine male athletes (71%) are in martial arts. Highly skilled androgynous girls are in complex coordination sports (63%), and androgynous boys are in martial arts (60%) and cyclic sports (59%).

Among female athletes, female masculine girls are more involved in high-speed strength sports (50%), and masculine athletes of low sports qualifications are in sports games (74%). Androgynous girls with 1 and 2 sports categories in cyclic sports (68%), and boys of this gender type – in sports games (69%) and speed and power sports (67%).

Conclusions / Discussion

Regarding such a concept as “gender”, men and women belong to one of three sociocultural articles: masculine, feminine, and androgenic. The ideas of masculinity and femininity are not associated with the biological sex of a person, but rather with the type of culture to which it belongs.

Sport, as an institution of socialization, actively contributes to the formation of gender personality traits. As a result of the study, it was proved that the ratio of gender personality types in both men and women varies depending on the type

of sports activity that they engage in.

As a result of the study, among 859 athletes and sportswomen, no persons having a feminine personality type were found. This indicates that sports activity makes certain demands on the person's personality and transforms it. It was revealed that the percentage ratio of masculine boys (55%) and girls (56%) and androgynous boys (45%) and girls (44%) involved in various sports is almost the same.

High qualification of athletes and athletes contributes to the formation of masculinity in them. This can be explained by the fact that in the muscles during exercise there is a metabolism of androgens – male sex hormones. In athletes, muscle tissue is well developed and therefore masculinization of both men and women involved in sports.

When detecting and comparing the percentage of gender types of athletes and athletes relative to their sports qualifications in various classification groups of sports, it was found that the largest number of qualified masculine female athletes and male athletes are in martial arts (90% and 71%, respectively). Skilled androgynous girls are in complex coordination sports (63%), and boys are in martial arts (60%) and cyclic sports (59%).

Prospect of further research in this direction. On this topic, further research is planned to be carried out in the direction of determining personality indicators (according to the Kettell questionnaire) among female athletes and male athletes specializing in various sports regarding their biological sex, gender type and sports qualifications, as well as to clarify the similarities and differences in gender stereotypes and attitudes, motives and goals of sports.

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.

References

1. Artamonova, T.V. (2008), *Gendernye proyavleniya lichnosti v sporte* [Gender manifestations of personality in sports], Volgograd. (in Russ.)
2. Artamonova, T.V. & Shevchenko, T.A. (2009), *Gendernaya identifikatsiya v sporte* [Gender Identification in Sports], Volgograd. (in Russ.)
3. Bendas, T.V. (2006), *Gendernaya psikhologiya. Uchebnoe posobie* [Gender Psychology], St. Petersburg. (in Russ.)
4. Bugaevskiy, K.A. (2017), “The Study of Gender Identification Indicators in Female Athletes”, *Aktualnye nauchnye issledovaniya v sovremennoy mire*, No. 29, pp. 144-153. (in Russ.)
5. Vorozhitova, A.L. (2007), “The Gender Theory of Physical Culture as the Basis for the Formation of the Gender Consciousness of Athletes”, *Vestnik Stavropolskogo gosudarstvennogo universiteta*, No. 49, pp. 27-31. (in Russ.)
6. Dzhurmiy, D.I. (2015), “Features of Gender Identification in Sports Activities”, *Problemy sovershenstvovaniya fizicheskoy kultury, sporta i olimpiada*, pp. 169-174. (in Russ.)
7. Ilin, Ye.P. (2003), *Differentsialnaya psikhologiya muzhchiny i zhenshchiny* [Differential Psychology of Men and Women], St. Petersburg. (in Russ.)
8. Ilin Ye.P. (2010), *Pol i gender* [Sex and gender], St. Petersburg. (in Russ.)
9. Kovaleva, V.V. & Kodatskiy, I.Yu. (2017), “Features of the gender stereotypes of student youth”, *Territoriya nauki*, No. 2, pp. 31-35. (in Russ.)
10. *Osnovy teorii genderu: navchalnyy posibnik* [Fundamentals of Gender Theory] (2004), Kyiv. (in Ukr.)
11. Tarasevich, Ye.A. (2016), “Gender differences of athletes in various classification groups of sports and sports disciplines”, *Slobozans'kij naukovno-sportivnij visnik*, No. 2 (52), pp. 117-120. (in Russ.)
12. Tarasevich, Ye.A. & Kamaev, O.I. (2018), “Gender differences in assessing the role of playing sports as one of the indicators of the quality of life of athletes”, *Fizichna aktivnist i yakist zhittya lyudini. Zbirnik tez dopovidey II mizhnarodnoi naukovno-praktichnoi konferentsii*, Eastern Europe. nat. Lesya Ukrainka University, Lutsk, p. 71. (in Russ.)
13. Tarasevich, O.A. & Kamaev, O.I. (2019), “Peculiarities of Gender Differences in Martial Arts Athletes”, *Yedinoborstva*, No. 4 (14), pp. 117-26. (in Ukr.)
14. Tsikunova, N.G. (2003), *Gendernye kharakteristiki lichnosti sportsmenov v maskulinnykh i femininnykh vidakh sporta. Dis. kand. ped. nauk* [Gender characteristics of the personality of athletes in masculine and feminine sports: PhD Dis.], St. Petersburg, 181 p. (in Russ.)
15. Shakhov, Sh.K. & Damadaeva, A.S. (2011), “Sport as a factor in the formation of the psychological gender of a person”, *Teoriya i metodika sporta visshikh dostrizheniy*, pp. 16-18. (in Russ.)
16. Bem, S.L. (1979), “Theory and measurement of androgyny”, *Journal of Personal and Social Psychology*, Vol. 37, pp. 1047-1054.

17. Bem, S.L. (1983), "Gender schema theory and its implications for child development: Raising gender-schematic children in a gender-schematic society", *Journal of women in culture and society*, Vol. 8, No. 4, pp. 65-78.
18. Colker, R. (1980), "Correlates of female athletic: masculinity, femininity, selfesteem and attitudes toward women", *Sex Roles*, Vol. 6, pp. 47-58.
19. Matteo, S. (1986), "The effect of sex and gender-schematic processing on sport participation. *Sex Roles*", Vol. 15, pp. 356-371.
20. *Social groups and identities: developing the legacy of Henri Tajfel* (1996), W. Peter Robinson (Ed.), Butterworth-Heinemann, Oxford.
21. Volpato, Ch. & Contarello, A. (1999), "Towards a social psychology of extreme situations: Primo Levi's If This is a Man and social identity theory", *European Journal of Social Psychology*, Vol. 29, pp. 239-258.

Received: 27.10.2019.

Published: 30.12.2019.

Information about the Authors

Olena Tarasevich: Senior Lecturer of the Department of Olympic and Professional Sports; Kharkiv State Academy of Physical Culture: Klochkovskaya st., 99, Kharkov, 61058, Ukraine.

ORCID.ORG/0000-0002-6016-3608

E-mail: tarasevichelena13@gmail.com

Oleg Kamaev: Doctor of Science (Physical Education and Sport), Professor; Kharkiv State Academy of Physical Culture: Klochkivska 99, Kharkiv, 61058, Ukraine.

ORCID.ORG/0000-0003-4358-888X

E-mail: oips.hdafk@gmail.com

Daria Okun: Phd (Physical Education and Sport), Lecturer in the Department of Olympic and Professional Sports, Kharkov State Academy of Physical Culture, 61058, Kharkiv, st. Klochkovskaya, 99.

ORCID.ORG/0000-0002-0639-5846

E-mail: dariaokun@gmail.com

Self-management strategy in training programs for patients with chronic obstructive pulmonary disease

Kateryna Tymruk-Skoropad¹
Iuliia Pavlova¹
Nadiya Sydoryk²

¹Lviv State University of Physical Culture, Lviv, Ukraine

²Non-profit municipal enterprise «5 City Clinical Hospital», Lviv, Ukraine

The aim of modern therapy for chronic obstructive pulmonary disease (COPD) is to reduce the severity of symptoms and prevent the development of relapse exacerbations, maintain pulmonary function at an optimal level and improve the quality of life of patients. The solution to these problems is pulmonary rehabilitation. Search for effective ways of providing an educational component, assessing the impact of various training programs and implementing a self-management strategy continues.

Purpose: to analyze modern approaches, advantages and disadvantages of educational programs on self-management of people with COPD and establish the role of a physical therapy specialist in providing them.

Material & Methods: the search was conducted on the resource of the US National Center for Biotechnological Information PubMed and in the database of scientific evidence on physical therapy PEDro. According to the results of the search in the databases, 329 links were obtained, of which, after excluding those that did NOT meet the necessary criteria, 14 publications were selected for subsequent analysis.

Results: 29 educational topics related to self-management education were identified, which in different combinations are recommended for study in educational programs for patients with COPD. Training topics were grouped into four training modules that took into account the goals and objectives of the self-management strategy and ensure their solution. The most often competent in implementing educational programs for patients with COPD are a pulmonologist, physical therapist, nurse, pharmacist, occupational therapist, and social worker. The content, results, advantages and limitations of various self-management training programs are analyzed.

Conclusions: today there are not enough practical recommendations and clear criteria that training programs on self-management for patients with COPD should meet. The analysis of modern clinical studies on the introduction of self-management training is the basis for the development of Ukrainian-language training programs.

Keywords: physical therapist, physical therapy, pulmonary rehabilitation, education, COPD, self-control.

Introduction

It is important for the patient to understand the characteristics of his disease, the available options for its treatment and control. In the case of a chronic disease requiring constant treatment and rehabilitation, significant efforts, and constant measures to prevent deterioration, such knowledge is vital. The implementation of an integrated approach to pulmonary rehabilitation of patients with chronic obstructive pulmonary disease (COPD) provides for the implementation of the educational component; it is within its framework that the patient is helped to form and develop skills that are the basis for effective self-management [36].

The first publication, which was published in 1986, was close to self-management issues and focused on self-monitoring and stress management in patients with chronic diseases, in particular, with COPD [1]. Today, the attention of scientists and specialists in pulmonary rehabilitation is much more often focused on the problems of self-management of patients, assessment of its advantages and effectiveness, in particular, in combination with other components of pulmonary rehabilitation programs.

Intervention for the implementation of self-management for people with COPD has a certain structure, is personalized,

and often multi-component. They aim to motivate, attract and support patients in the process of adapting behavior and developing skills to manage the disease better [14].

The self-management concept contains self-control, management of symptoms, emotional, psychosocial, and functional consequences of the disease, provides for cooperation with family, society, and medical workers [32].

The self-management strategy, which has separated from the educational component, is more comprehensive today, covers a wide range of tasks, aims to increase the level of self-efficacy and disease control, relying on a high level of patient knowledge, well-formed skills, well-established cooperation with health professionals [35].

Approaches aimed at developing self-management are primarily based on providing patients with the necessary information, as well as formulating an individual goal and strategy, focusing on supporting motivation, achievements and a high level of mental health [8].

In Ukraine, the education of patients with COPD and informing them about the disease, changing the way necessary daily actions are undoubtedly present in the process of treatment and rehabilitation. However, such enlightenment is not sys-

temic; there is no didactic and methodological support. Usually, the recommendations of leading professional societies and clinical guidelines are not taken into account; they do not attract specialists of various specialties in a team and interconnected work. However, thoughtless copying of the world's leading approaches for the rehabilitation and education of patients with COPD in Ukraine is not possible and appropriate. It should take into account the peculiarities of the Ukrainian health care system, material and technical and staffing, the willingness of patients to spend additional resources on the measures provided during treatment and rehabilitation. An essential step in introducing the educational component of pulmonary rehabilitation and self-management, in particular, with the involvement of physical therapy specialists, is the analysis of modern approaches, advantages and disadvantages of existing educational programs.

Purpose of the study was to analyze modern approaches, advantages and disadvantages of educational programs on self-management of people with COPD and establish the role of a physical therapy specialist in providing them.

Material and Methods of the research

The search was conducted on the resource of the National Center for Biotechnology Information of the USA PubMed and in the database of scientific evidence on physical therapy PEDro. The database was searched for a number of keywords (for PubMed – “COPD”, “Chronic Obstructive Pulmonary Disease,” “Physical Therapy,” “Physical Therapy,” “Physiotherapy,” “Self-management,” “Self management,” for PEDro – “Chronic Obstructive Pulmonary Disease,” “Self-management”) using the Boolean logical operators “AND” and “OR”.

The inclusion criteria for the analysis were as follows:

- 1) publication addresses self-management issues in individuals with COPD;
- 2) scientific work concerns the meaning, ways of implementing the self-management strategy, its effectiveness and content as a separate activity, or part of pulmonary rehabilitation programs or physical therapy
- 3) published during June 2014 – June 2019.

The following exclusion criteria were used:

- 1) do not match the selected search period June 2014 – June 2019;
- 2) protocols of incomplete clinical trials, pilot studies, methodological substantiation of future clinical studies;
- 3) publications regarding other diseases of the respiratory system, or if the patient simultaneously had COPD and another disease / other diseases;
- 4) studies are devoted to the use of self-management in pharmacotherapy or to control the emotional state;
- 5) there is no access to a full-text article;
- 6) language of publication is not English.

Search conducted in June 2019.

Based on the search results, 329 links were received in the databases (Fig. 1), in particular, 232 from the PubMed database and 97 from the PEDro database. At the screening stage, duplication of links (n=19) was detected and articles meeting the exclusion criteria (n=249) was removed. At the

stage of analysis and selection of full-text articles, 47 publications were additionally withdrawn that met the exclusion criteria. Subsequently, the work analyzed the content of 14 publications that met all the search requirements.

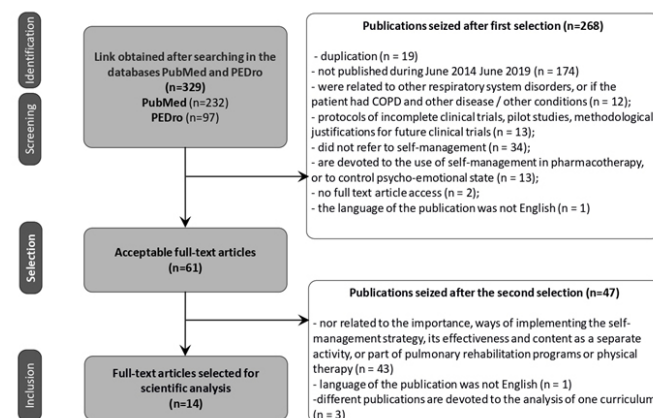


Fig. 1. PRISMA flowchart for selecting publications for analysis

Results of the research

According to the analysis of 14 scientific works, 29 educational topics were identified related to education on self-management issues and in different combinations are recommended for study in training programs (Table 1).

The training modules that take into account the goals and objectives of the self-management strategy and provide their solutions are:

- management of symptoms;
- self-control;
- management of the consequences of the disease (emotional, psychosocial, functional);
- cooperation with family, society, and healthcare professionals.

To implement the proposed training topics attract specialists of various specialties. In particular, the most often competent in the implementation of educational programs for patients with COPD are a pulmonologist, physical therapist, nurse, pharmacist, occupational therapist, and social worker. Educational topics, to the presentation of which it was recommended to involve physical therapists, are also indicated in the Table 1.

Despite the similarities between the components of patient education and self-management education, they have a number of important differences [7], namely, self-management education is based on the patient's commitment to the proposed curriculum and its active participation; problems, goals and objectives are formulated by the patient, not a health professional; the information provided and the formation of skills is problem-oriented rather than nosological in nature; behavioral changes occur due to the patient's confidence in the opportunity to participate in self-management, and not only due to an increase in the level of knowledge. In general, self-management education aims to encourage the patient to control the disease and its consequences [20]. The component “patient education” in pulmonary rehabilitation programs is not effective enough since it does not change the patient's behavior to a sufficient extent and does not allow the forma-

Table 1
Content of educational programs on self-management

| Module | Topics | Scientific work | | | | | | | | | | | | | |
|---|--|-----------------|---|---|----|----|----|----|----|---|----|----|----|----|----|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| Symptom management | Diseases of the lungs and treatment of COPD | + | + | + | +P | +P | NS | + | + | - | - | NS | - | + | + |
| | Medicines | + | + | + | + | +P | + | - | + | + | + | + | - | + | - |
| | Oxygen therapy | + | + | - | - | - | NS | - | NS | - | - | - | - | - | - |
| | Disease control (in particular, symptoms and exacerbations) | + | + | ± | +P | +P | + | + | + | - | + | + | - | + | + |
| | Shortness of breath control | +P | + | ± | +P | +P | + | + | + | + | + | + | - | + | + |
| | Airway cleansing | +P | + | + | ±P | NS | NS | NS | + | + | - | + | - | NS | + |
| Self-control | Respiratory Function Tests | + | + | - | - | - | NS | - | - | + | + | - | - | - | - |
| | Economical use of own forces | + | + | - | - | - | NS | + | + | - | - | + | - | - | - |
| | Nutrition | + | + | + | + | +P | NS | + | + | - | - | - | - | - | - |
| | Defining your own goal, tasks, action plan | - | + | - | + | - | NS | - | + | - | + | + | + | - | - |
| | Lifestyle (habits) | - | - | - | - | +P | + | + | + | - | + | + | + | - | + |
| | Practical skills for using inhalers | - | - | - | - | - | - | - | - | + | + | - | - | - | - |
| | Limitations and COPD | +P | + | ± | - | - | - | - | - | - | - | - | + | NS | + |
| | Travels | - | + | - | - | - | - | - | - | - | - | - | - | - | - |
| | Free time and hobbies | - | + | - | - | +P | - | - | - | - | - | + | - | - | - |
| | Determination of walking speed | - | + | - | - | - | - | - | - | - | - | - | - | - | - |
| Management of the consequences of the disease (emotional, psychosocial, functional) | Exercise and activity | +P | + | + | +P | +P | + | + | + | + | + | + | + | + | + |
| | Stress and anxiety | + | + | - | + | +P | + | + | + | - | - | + | - | + | + |
| | Cognitive function management | - | - | - | + | - | NS | - | - | - | - | - | - | - | - |
| | Sleep | - | - | - | - | +P | - | NS | - | - | - | - | - | - | - |
| | Relaxation | - | - | - | - | - | - | - | - | - | - | - | - | - | + |
| | Swallowing and COPD | + | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | Swallowing screening | + | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Family life, cooperation with society, healthcare professionals | Resources provided by society | + | - | - | + | - | + | - | - | - | - | - | - | - | - |
| | Help for guardians | - | + | - | - | - | - | - | - | - | - | - | - | - | - |
| | Relations | - | + | - | - | - | - | - | - | - | - | - | - | - | - |
| | Sexuality and intimacy | + | + | - | - | +P | NS | - | - | - | - | - | - | - | - |
| | Communication | - | - | - | + | - | NS | - | - | - | - | - | - | - | - |
| | Influence of partner, family, friends and colleagues on behavior | - | - | - | - | - | - | - | - | - | - | - | + | + | - |

Remark: 1 – Blackstock, F. C. [4]; 2 – Chaplin, E. [1; 11]; 3 – Blázquez Moreno, C. et al. [5]; 4 – Cameron-Tucker, H. L. [9]; 5 – Carron, T. [10]; 6 – Chen, K. H. et al. [12]; 7 – Lopez-Lopez, L. et al. [23]; 8 – Nyberg, A. et al. [30]; 9 – Bhattacharyya, P. et al. [3]; 10 – Jolly, K. et al. [18]; 11 – Marquis, N. et al. [25]; 12 – Voncken-Brewster, V. [37]; 13 – Jonsdottir, H. [19]; 14 – Howard, C. [16]; P – training topics that are supposed to be conducted by a physical therapist, NS – not specified; ± – topic partially disclosed.

tion of the necessary self-help skills at a high level [31]. According to Sohanpal, R. et al. [34], patient education should be considered as part of the self-management education component.

Self-management education is aimed at solving two main tasks: 1) adjust patient behavior to further support health; 2) teach patients how to influence and manage diseases.

Changing the patient's behavior to maintain his health involves increasing the level of physical activity, performing physical

exercises, quitting smoking, and is also aimed at increasing the patient's adherence to drug treatment, mastering the correct inhalation technique.

The impact and management of diseases includes the following:

- avoidance of factors worsening the patient's condition (smoking, dust);
- management of dyspnea (taking medication, mastering the breathing technique through compressed lips);

- the use of methods of economical use of own forces (for example, the choice of pace of walking);
- concluding an exacerbation management strategy (an action plan containing key components to facilitate exacerbation management);
- use of stress management techniques (exercises for relaxation).

Self-management education for people with COPD aims to master these skill groups [13]:

- prevention, control and management of the consequences of COPD and respiratory symptoms;
- control and management of daily activity;
- overcoming sleep problems;
- control of exacerbations and their management;
- management of mental state and overcoming emotional discomfort;
- management of social spheres of life;
- collaboration with healthcare institutions;
- self-care.

The most common options for implementing a self-management program for patients with COPD are face-to-face sessions, web resources, and printed materials.

Kruijssen, V. et al. [22] recommends using an online diary to effectively implement self-management education, mastering self-control skills, and establishing feedback with health professionals. Patients with COPD who used such an instrument felt more confident, noted that they better control the disease itself; obstacles to the introduction of this technique into regular practice is the low level of patient commitment and poor Internet skills in this particular category of patients. The proposed approaches may have a number of obstacles when implemented in Ukraine – it can be difficult to implement due to the age-related characteristics of patients with COPD, their level of Internet literacy, inability to use mobile and web applications, problems with access to the Internet. Also, a limited number of Ukrainian-language Internet resources dedicated to supporting people with COPD, primarily aimed at the patient, should be considered a problem for the Ukrainian patient. This limits the use of some training material options.

Conclusions / Discussion

Self-management education provides a number of benefits for people with COPD – it improves the functional level and overall health status [27], helps reduce hospitalization, helps build and further develop skills that help control diseases [29].

According to patients with COPD, self-management is a complex and variable process, the main components of which should be self-regulation and the choice of appropriate health-saving behavior [12]. It is affected by the duration of the disease and the experience of the disease, mental state, and social support. Accordingly, training programs on self-management should be developed taking into account the characteristics, experience, and condition of the patient. Interviewing patients revealed four main, significant topics in which patients were interested: relationships with medical workers, patient awareness, support and access to the healthcare system [2].

To date, there is no single assessment of the effectiveness of

educational programs on self-management. So, the evaluation of such programs revealed their positive impact on such areas of self-management as “Constructive attitudes and approaches,” “Acquisition of skills and techniques,” “Self-control and understanding” [8], and the improvement of the quality of life [17; 28], an increase in the level of knowledge about diseases [26], a decrease in hospitalization, and the frequency of visits to a doctor [33; 38], an increase in time to the first exacerbation [17]. In a cohort study, Khan, A. et al. [21] patients who had developed a self-management plan were more likely to attend a training course or consult on physical activity, had a higher level of knowledge of COPD, and better adherence to treatment. However, in Harrison, S. L. [15], self-management training programs did not affect the quality of life, physical performance, or psycho-emotional state. Blackstock, F. C. [4] proposed an 8-week program that included sixteen classes lasting 45 minutes and consisted of physical exercises and training modules on self-management issues; this program was not more effective for improving the quality of life and the results of the 6-minute walk test compared to a program consisting solely of exercise. Participants who attended additional training sessions had a higher level of knowledge about the disease than patients who only performed physical exercises, but did not observe a statistically significant decrease in the number of visits to a doctor or medication. This study revealed certain limitations associated with the organization of a multidisciplinary approach to the implementation of the experimental program, in particular, the low patient commitment to the program – only 60% of the participants took part in it and attended 70% of the planned classes. The self-management strategy and the corresponding educational component can be implemented, implemented and supervised by various specialists, within their competence, they are responsible for their part of the curriculum and further patient support. In the case of the Blackstock program [4], the need to attract specialists from ten specialties can be attributed to the shortcomings of the program. Similar results were obtained when studying the impact of the educational web application on self-management, the main goals of the program remained unattained – increasing physical activity and quitting smoking/ limiting the number of cigarettes smoked [37].

Blónquez Moreno, C. et al. [5] proposed a short and smaller curriculum. This allowed an increase in the number of patients completing their studies (78,2%). It was possible to reduce the duration of the educational program by reducing the training topics that were discussed in the classroom. In addition, a nurse was involved in the training. Such decisions contributed to a statistically significant improvement in the quality of life, the results of a 6-minute walk test, and a decrease in shortness of breath. Thus, if there are restrictions on staffing, it is difficult for the patient to attend more classes or sessions of long duration, it is advisable to use just such a variant of the curriculum, even though the minimum number of program sessions does not comply with the recommendations of the British Thoracic Society [6].

It is the search for the optimal curriculum that is the reason for the testing of programs of various durations, volumes, number of sessions, and semantic content. One of the options for implementing the program was to conduct training in the camps, which consisted of four intensive days with a 6-week break. Such an approach, which had proven effectiveness, made it possible to organize a full-fledged assessment at each

meeting, to repeat what was learned, to absorb the necessary material deeper [3]. Another option for the implementation of self-management training programs was specially organized telephone conversations that were previously agreed with the patient [18]. Despite the fact that this approach did not improve the quality of life and physical performance of the patient compared to traditional pulmonary rehabilitation programs, positive changes in behavior were noted. For example, the number of patients who had life-saving first-aid kits increased, the number of requests to doctors increased to check the technique of using the inhaler and to agree on an action plan for exacerbation.

The use of printed materials is sufficient. Howard, C. used a brochure that consisted of six sections. This approach demonstrated clinical and economic efficiency, and was acceptable for participants; it can be applied both at the primary and secondary levels of treatment [16]. Also, printed materials remain the most accessible for use in Ukraine, where older adults have limited access to modern Internet and computer technologies and a low level of knowledge to use them.

Today, programs on online platforms are considered as an addition to the main curriculum or an alternative to it. Chaplin, E. et al. [11] showed high patient adherence to the SPACE for COPD web-based training program but did not find significant differences in the results of physical performance and quality of life compared with the classical pulmonary rehabilitation program and the educational component. Similar results were had by the self-management training program hosted on a web platform [30]. The adherence of people with COPD to this program and the attendance of the developed site was 77% of the patients in the experimental group; this result is compa-

table to the level of patient commitment to type training.

Most self-management training programs are part of pulmonary rehabilitation, which is recommended to begin within the first month after hospitalization. However, according to some data [23], the inclusion of self-management sessions for patients with COPD hospitalized due to an exacerbation has a positive effect on the quality of life and functionality, in particular, the effectiveness of the exposure is better compared to physical therapy alone.

The study and practical development of self-management as part of the educational component of pulmonary rehabilitation programs is vital for managing the disease and reducing its impact on life, and, accordingly, improving the quality of life of patients with COPD.

Search for optimal options for the implementation of self-management training programs, their meaningful content and duration requires careful analysis and testing. Today, there are not enough practical recommendations and clear criteria for what criteria self-management training programs should meet. Physical therapy specialists are active developers of training programs and are involved in their implementation.

Based on the analysis of modern scientific data on the management of patients with COPD, 29 separate educational topics were identified, which are grouped into four substantive modules (symptom management; self-control, management of the consequences of the disease, family life, cooperation with society, healthcare specialists) and three main options were identified their implementation (full-time classes, web resources, and printed materials).

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.

References

1. Apps, L.D. et al. (2013), "The development and pilot testing of the Self-management Programme of Activity, Coping and Education for Chronic Obstructive Pulmonary Disease (SPACE for COPD)", *International Journal of COPD*, (8), pp. 317-327, <https://doi.org/10.2147/COPD.S40414>.
2. Benzo, R.P. et al. (2017), "Health Coaching in Severe COPD After a Hospitalization: A Qualitative Analysis of a Large Randomized Study", *Respiratory care. United States*, 62(11), pp. 1403-1411, <https://doi.org/10.4187/respcare.05574>.
3. Bhattacharyya, P. et al. (2018), "The impact on health status in short- and long-terms of a novel and non-orthodox real-world COPD rehabilitation effort in rural India: an appraisal", *International journal of chronic obstructive pulmonary disease*. Dove Press, (13), pp. 3313-3319, <https://doi.org/10.2147/COPD.S160665>.
4. Blackstock, F.C. et al. (2014), "Comparable improvements achieved in chronic obstructive pulmonary disease through pulmonary rehabilitation with and without a structured educational intervention: A randomized controlled trial", *Respirology*. John Wiley & Sons, Ltd (10.1111), 19(2), pp. 193-202, <https://doi.org/10.1111/resp.12203>.
5. Bl6nquez Moreno, C. et al. (2018), "Effectiveness of an educational program for respiratory rehabilitation of Chronic Obstructive Pulmonary Disease patients in Primary Care in improving the quality of life, symptoms, and clinical risk", *Atencion Primaria*, 50(9), pp. 539-546, <https://doi.org/10.1016/j.aprim.2017.03.019>.
6. Bolton, C.E. et al. (2013) "BTS Guideline on Pulmonary Rehabilitation in Adults British", *Thorax*. Edited by B. T. S. P. R. G. Group, (68), pp. ii1-ii30, <https://doi.org/10.1136/thoraxjnl-2013-203808>.
7. Bourbeau, J., Lavoie, K.L. and Sedeno, M. (2015), "Comprehensive Self-Management Strategies", *Seminars in Respiratory and Critical Care Medicine*, Thieme Medical Publishers, Inc., 36(4), pp. 630-638. <https://doi.org/10.1055/s-0035-1556059>.
8. Bringsvor, H.B. et al. (2018), "Effects of a COPD self-management support intervention: a randomized controlled trial", *International journal of chronic obstructive pulmonary disease*, (13), pp. 3677-3688, <https://doi.org/10.2147/COPD.S181005>.
9. Cameron-Tucker, H.L. et al. (2014), "Chronic disease self-management and exercise in COPD as pulmonary rehabilitation: a randomized controlled trial", *International journal of chronic obstructive pulmonary disease*, (9), pp. 513-23, <https://doi.org/10.2147/COPD.S58478>.
10. Carron, T. et al. (2017), "Feasibility, acceptability and effectiveness of integrated care for COPD patients: a mixed methods evaluation of a pilot community-based programme", *Swiss Medical Weekly*, EMH Media, 147(w4950), <https://doi.org/10.4414/sm.w.2017.14567>.
11. Chaplin, E. et al. (2017), "Interactive web-based pulmonary rehabilitation programme: a randomised controlled feasibility trial", *BMJ open*, BMJ Publishing Group, 7(3), p. e013682, <https://doi.org/10.1136/bmjopen-2016-013682>.
12. Chen, K.-H. et al. (2016), "Living With Chronic Obstructive Pulmonary Disease: The Process of Self-Managing Chronic Obstructive Pulmonary Disease", *The journal of nursing research*, JNR, China, 24(3), pp. 262-271, <https://doi.org/10.1097/jnr.000000000000152>.
13. Clari, M. et al. (2017), "Self-Care of People with Chronic Obstructive Pulmonary Disease: A Meta-Synthesis", *The Patient – Patient-Cen-*

tered Outcomes Research, Springer International Publishing, 10(4), pp. 407-427.

14. *Global Initiative for Chronic Obstructive Lung Disease – Global Initiative for Chronic Obstructive Lung Disease – GOLD* (2017), available at: <https://goldcopd.org/> (Accessed: 21 June 2019).
15. Harrison, S.L. et al. (2015), "Self-management following an acute exacerbation of COPD: A systematic review", *Chest*, 147(3), pp. 646-61, <https://doi.org/10.1378/chest.14-1658>
16. Howard, C. & Dupont, S. (2014), "The COPD breathlessness manual": a randomised controlled trial to test a cognitive-behavioural manual versus information booklets on health service use, mood and health status, in patients with chronic obstructive pulmonary disease", *NPJ Primary Care Respir Med.*, (24), p. 14076, <https://doi.org/10.1038/npjpcrm.2014.76>.
17. Johnson-Warrington, V. et al. (2016), "Can a supported self-management program for COPD upon hospital discharge reduce re-admissions? A randomized controlled trial", *International journal of chronic obstructive pulmonary disease*, (11), pp. 1161-9, <https://doi.org/10.2147/COPD.S91253>.
18. Jolly, K. et al. (2018), "Self management of patients with mild COPD in primary care: Randomised controlled trial", *BMJ* (Online), BMJ Publishing Group, (361), <https://doi.org/10.1136/bmj.k2241>.
19. Jonsdottir, H. et al. (2015), "Effectiveness of a partnership-based self-management programme for patients with mild and moderate chronic obstructive pulmonary disease: a pragmatic randomized controlled trial", *Journal of advanced nursing*. England, 71(11), pp. 2634-2649, <https://doi.org/10.1111/jan.12728>.
20. Kaptein, A., Fischer, M. & Scharloo, M. (2014), "Self-management in patients with COPD: theoretical context, content, outcomes, and integration into clinical care", *International Journal of Chronic Obstructive Pulmonary Disease*, 9(1), p. 907, <https://doi.org/10.2147/COPD.S49622>.
21. Khan, A. et al. (2017), "Self-management behaviour and support among primary care COPD patients: cross-sectional analysis of data from the Birmingham Chronic Obstructive Pulmonary Disease Cohort", *NPJ Primary Care Respiratory Medicine*. Nature Publishing Group, 27(1), p. 46, <https://doi.org/10.1038/s41533-017-0046-6>.
22. Lopez-Lopez, L. et al. (2019), "Results on health-related quality of life and functionality of a patient-centered self-management program in hospitalized COPD: a randomized control trial", *Disability and rehabilitation*, England, pp. 1-9, <https://doi.org/10.1080/09638288.2019.1609099>.
23. Mandel, A.R. & Keller, S.M. (1986), "Stress management in rehabilitation", *Archives of physical medicine and rehabilitation*, 67(6), pp. 375-9.
24. Marquis, N. et al. (2014), "Are improvements maintained after in-home pulmonary telerehabilitation for patients with chronic obstructive pulmonary disease?", *International journal of telerehabilitation. University Library Systems*, University of Pittsburgh, 6(2), pp. 21-30. <https://doi.org/10.5195/ijt.2014.6156>.
25. Mitchell, K.E. et al. (2014), "A self-management programme for COPD: a randomised controlled trial", *The European respiratory journal*, European Respiratory Society, 44(6), pp. 1538-47, <https://doi.org/10.1183/09031936.00047814>.
26. Murphy, L.A. et al. (2017), "Clinical-effectiveness of self-management interventions in chronic obstructive pulmonary disease: An overview of reviews", *Chronic Respiratory Disease*. SAGE Publications Sage UK: London, England, 14(3), pp. 276-288, <https://doi.org/10.1177/1479972316687208>.
27. Newham, J.J. et al. (2017), "Features of self-management interventions for people with COPD associated with improved health-related quality of life and reduced emergency department visits: a systematic review and meta-analysis", *International journal of chronic obstructive pulmonary disease*, New Zealand, (12), pp. 1705-1720, <https://doi.org/10.2147/COPD.S133317>.
28. Ng, W.I. and Smith, G.D. (2017), "Effects of a self-management education program on self-efficacy in patients with COPD: a mixed-methods sequential explanatory designed study", *International journal of chronic obstructive pulmonary disease*, (12), pp. 2129-2139, <https://doi.org/10.2147/COPD.S136216>.
29. Nyberg, A., Tistad, M. and Wadell, K. (2019), "Can the COPD web be used to promote self-management in patients with COPD in swedish primary care: a controlled pragmatic pilot trial with 3 month- and 12 month follow-up", *Scandinavian Journal of Primary Health Care*, Taylor and Francis Ltd, 37(1), pp. 69-82, <https://doi.org/10.1080/02813432.2019.1569415>.
30. Rice, K. et al. (2014), "Collaborative Self-Management and Behavioral Change", *Clinics in Chest Medicine*. Elsevier, 35(2), pp. 337-351, <https://doi.org/10.1016/J.CCM.2014.02.004>.
31. Richard, A.A. and Shea, K. (2011), "Delineation of Self-Care and Associated Concepts", *Journal of Nursing Scholarship*, John Wiley & Sons, Ltd (10.1111), 43(3), <https://doi.org/10.1111/j.1547-5069.2011.01404.x>.
32. Sanchez-Nieto, J.M. et al. (2016), "Efficacy of a self-management plan in exacerbations for patients with advanced COPD", *International journal of chronic obstructive pulmonary disease*, New Zealand, (11), pp. 1939-1947, <https://doi.org/10.2147/COPD.S104728>.
33. Sohanpal, R., Epiphaniou, E. and Taylor, S. (2014), "Self-management for COPD?: why does it generate negative connotations?", *The British journal of general practice : the journal of the Royal College of General Practitioners. British Journal of General Practice*, 64(625), pp. e522-4, <https://doi.org/10.3399/bjgp14X681157>.
34. Spruit, M.A. et al. (2013), "An Official American Thoracic Society/European Respiratory Society Statement: Key Concepts and Advances in Pulmonary Rehabilitation", *American Journal of Respiratory and Critical Care Medicine*, 43(5), pp. 1326-37, <https://doi.org/10.1183/09031936.00145613>.
35. Tymruk-Skoropad, K. et al. (2019), "Educational component in rehabilitation programs for persons with chronic obstructive pulmonary disease: a systematic review". *Advances in Rehabilitation*, (4).
36. van Kruijssen, V. et al. (2015), "Use of Online Self-Management Diaries in Asthma and COPD: A Qualitative Study of Subjects' and Professionals' Perceptions and Behaviors", *Respiratory care. Respiratory Care*, 60(8), pp. 1146-56, <https://doi.org/10.4187/respcare.03795>.
37. Voncken-Brewster, V. et al. (2015), "A randomized controlled trial evaluating the effectiveness of a web-based, computer-tailored self-management intervention for people with or at risk for COPD", *International journal of chronic obstructive pulmonary disease*, New Zealand, (10), pp. 1061-1073, <https://doi.org/10.2147/COPD.S81295>.
38. Wang, T. et al. (2017), "Effectiveness of disease-specific self-management education on health outcomes in patients with chronic obstructive pulmonary disease: an updated systematic review and meta-analysis [with consumer summary]", *Patient Education and Counseling*, 100(8), pp. 1432-1446, <https://doi.org/10.1016/J.PEC.2017.02.026>.

Received: 01.11.2019.

Published: 30.12.2019.

Information about the Authors

Kateryna Tymruk-Skoropad: Doctor of Philosophy, Associate professor of physiotherapy and occupational therapy department, Lviv State University of Physical Culture: Kostushko Str., 11, Lviv, 79007, Ukraine.

ORCID.ORG/0000-0001-8152-0435

E-mail: tymruk_k@ukr.net

Iuliia Pavlova: Doctor of Science (Physical Education and Sport), Senior Researcher, Professor of Theory and Methods of Physical Culture Department; Lviv State University of Physical Culture: Kostushko Str., 11, Lviv, 79007, Ukraine.

ORCID.ORG/0000-0002-8111-4469

E-mail: pavlova.j.o@gmail.com

Nadiya Sydoryk: *Pulmonologist of the highest category, Non-profit municipal enterprise "5 City Clinical Hospital", str. Konovalets, Lviv, Ukraine, 79013; medical center "Medicare".*

ORCID.ORG/0000-0002-2469-1243

E-mail: n.sydneyk.79@ukr.net

**SLOBOZHANSKIY
HERALD OF SCIENCE AND SPORT**

The reliability of the presented results correspond to authors

Publication of Kharkiv State Academy of Physical Culture
Kharkiv State Academy of Physical Culture
Klochivska Str. 99, Kharkiv, 61058, Ukraine
+38 (0572) 705-21-02
hdafk.edu@gmail.com