

## Fitness technologies in the system of physical qualities development by young students

VALERY ZHAMARDIY<sup>1</sup>, OLENA SHKOLA<sup>2</sup>, HANNA TOLCHIEVA<sup>3</sup>, VOLODYMYR SAIENKO<sup>4</sup>

<sup>1</sup> Department of Physical Education and Health, Physical Rehabilitation, Sports Medicine, Ukrainian Medical Stomatological Academy, UKRAINE

<sup>2</sup> Department of Physical Education, Municipal Establishment «Kharkiv Humanitarian Pedagogical Academy» of Kharkiv Regional Council, UKRAINE

<sup>3</sup> Department of Olympic and professional sports, Luhansk Taras Shevchenko National University, UKRAINE

<sup>4</sup> Faculty of economics and pedagogical, The Academy of Management and Administration, POLAND

Published online: January 31, 2020

(Accepted for publication: January 08, 2020 )

DOI:10.7752/jpes.2020.01019

### Abstract:

The article present in Ukraine and in recent years, there has been a decrease in the level of general physical preparedness of students, which is essentially due to the low initial level of physical preparedness of university entrants and the reduction of study hours for physical education. All students by the method of equal group distribution. The students took classes according to the traditional system, which concentrates on the development of only those physical qualities that are necessary for the successful assimilation of motor activity techniques. Students were engaged in the methodical system. The analysis of indicators dynamics of physical qualities development by students who participated in pedagogical experiment showed low initial level in all experimental groups. Students of control groups who were engaged in the traditional physical education system improved the test performance during the entire period of study, however among men four tests were rated "unsatisfactory", women received six "unsatisfactory" grades. Students from experimental groups, where a methodical system was introduced, were able to show significantly better test performance indicators. In general, the results of the conducted pedagogical molding experiment allow us to state that the introduction of methodical system promotes activation of educational activity, increases motor activity, physical fitness, physical development, formation of motivation to systematic training by means of modern innovative fitness technologies and to adhere to a healthy lifestyle. In general, the results of the conducted pedagogical molding experiment allow us to state that the introduction of methodical system promotes activation of educational activity, increases motor activity, physical fitness, formation of motivation to systematic training by modern innovative fitness technologies and to adherence to a healthy lifestyle.

**Key words:** pedagogical experiment, students, physical development, physical qualities, fitness technologies.

### Introduction

Diversity and multidimensionality of different forms of educational and recreational activities place particular demands to assessment of its effectiveness in general and to the relevance of scientific research. Scientifically based physical activity programs, as well as methodical guidelines for different age groups, are widely used: school children (Butenko et al., 2017; Sukarmin, Y., & Sudardiyono, 2017), students (Ivanchykova et al., 2018; Savchuk et al., 2002; Yarmak et al., 2017); young people (Chernozub et al., 2018; Halaidiuk et al., 2018; Kozina et al., 2018). In its turn, the evaluation of introduced methodical system application effectiveness into physical education process is of paramount importance for improving the quality of future specialists training. Among the scientific researches of recent years in the field, we note the methodical and monographic editions (Dobrodub, 2011; Gurvich, 2007; Krutsevych, 2008; Saikina, 2009; Zinchenko, 2011). Positive results of various types of fitness usage in practice is also known in recent years in the studies (Beliak, 2014). Despite numerous scientific studies, the problem of finding effective programs, techniques and fitness technologies for improvement of students' motor activity, which would contribute to the development of positive motivation and form the basis of independent health-improving activity.

The process of efficiently studying is complicated by the fact that it is necessary to determine not only the effectiveness of scientific research conducted in an educational institution, but also the effectiveness of its influence on the educational process of students, improvement of preparation quality and increase in skill requirements for scientific and pedagogical staff. In assessment of fitness technology methodical application effectiveness, the whole complex of psychological and pedagogical measures, related to conducting scientific researches were taken into account. The detection of methodological system effectiveness was determined by such criteria as indications that confirm qualitative and quantitative effectiveness of educational work and, in

particular, the assessment of applied fitness technologies in student youth training process. The purpose of this work is to determine physical qualities development dynamics of students by means of fitness technologies. In general, methodical system effectiveness was evaluated according to specific indicators.

### Material & methods

Pedagogical experiment usage of theoretical and empirical methods. Theoretical methods consisted of: study and analysis of pedagogical, psychological, methodical literature, curriculum and normative documents; synthesis; generalization. Empirical methods included: observation, interviews, who conduct physical education sessions by the curriculum and fitness technology sessions in their free time. To solve the tasks of the study, a basic pedagogical experiment was conducted, in which 232 students took part, among them 88 were boys and 144 girls. The control and experimental groups were formed. The control group was engaged in the traditional system of education. Students of the experimental group were engaged in the methodical application of fitness technologies. Pedagogical molding experiment was aimed at revealing the advantages of the experimental methodical system in physical education process of students. In the pedagogical experiment, in addition to the student's personality formation and upbringing through usage of fitness technologies, a comparative analysis was conducted to identify differences between performance indicators of physical education of students, as well as the significance of the studied indicators.

### Results

In recent and present years in Ukraine, there has been a decrease in the level of general physical preparedness of students, which is essentially due to the low initial level of physical preparedness of university entrants and the reduction of study hours for physical education. A similar negative dynamics is observed in our studies. The study of physical qualities development dynamics shows significant differences between parameters of students of both sexes. In particular, the assessment of physical quality showed low initial level in all experimental groups, which was unsatisfactory (men – 2.8-2.9 points, and women – 1.1 points). Implementation of methodical system significantly changed the indicators in experimental groups (fig. 1).

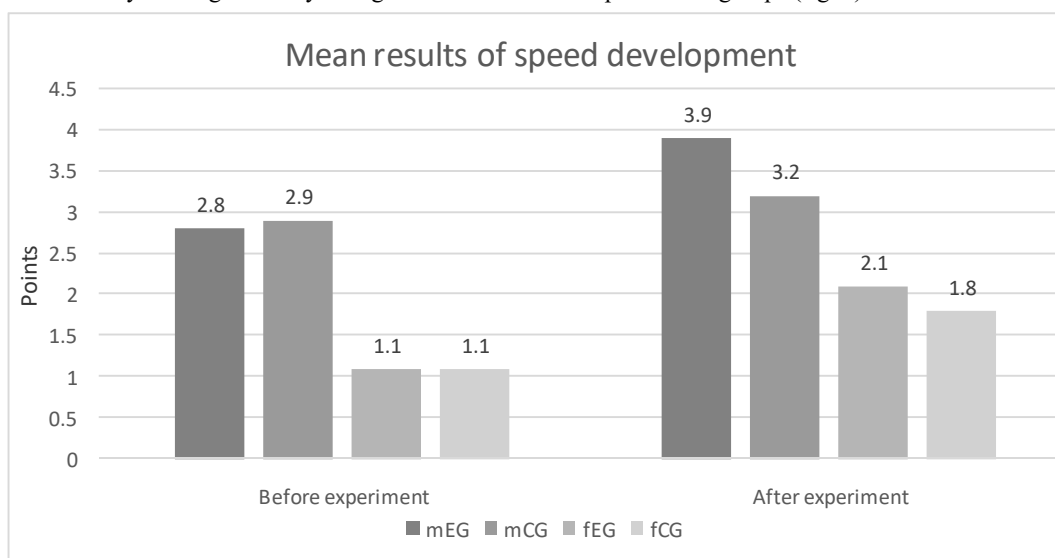


Fig. 1. Dynamics of speed development among students of experimental groups during the period of pedagogical experiment (explanation in text)

The speed was estimated after completion of the 100 m race test. The final results confirmed a satisfactory rate of increase in men's group only (EG – 3.9 points; CG – 3.2) in women's groups, none of participants from pedagogical experiment reached a satisfactory rate of increase in the development, the means of indicators were following: EG – 2.1 points; CG – 1.8 points, which corresponds to "poor" evaluation of this test. During pedagogical experiment women showed improvement in results of overcoming the distance of 100 m, but they were not significant and generally remained unsatisfactory throughout the period of study at the university.

The development of endurance in both male and female students had better improvement than speed. To assess endurance we used following tests: for men we used running 3000 m, and for women we used running 2000 m, we used swimming 100 m for both sexes. Male students from experimental group (mEG) before the experiment had 2.9 points in running test, and a 3.9 point in swimming, which overall had a total score of 3.4 points. For male students from control group (mCG), the initial level of endurance development was equal to 2.8 points in running and 3.9 points in swimming, the average endurance development rate was 3.4, which is a very positive indicator for this contingent of students. Female students from experimental group (fEG) before the

experiment had 2,4 points in running and 3,4 points in swimming, which overall had a total score of 2,81 = 2,9 points. Female students from control group (fCG), the initial level of mean endurance development was 3.1 points, which is a rather good for indicator of the initial level of endurance. After implementation of the methodical system there was a significant improvement in indicators of endurance development among students of these groups, namely: mEG showed 4.5 points in mean level of endurance development, fEG showed 3.9 points. Students of control groups showed a slightly lower growth of endurance, namely: mCG had 3.7 points, fCG had 3.3 points (fig. 2).

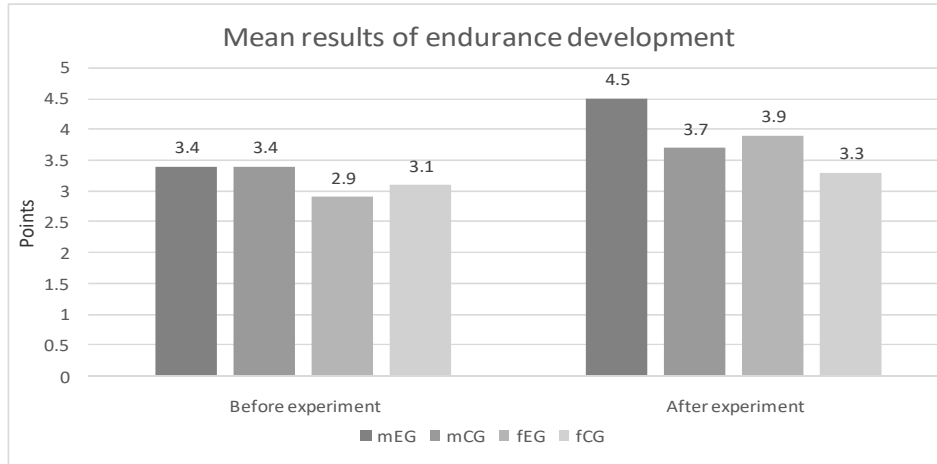


Fig. 2. Dynamics of development of endurance among students of experimental groups for the period of pedagogical experiment (explanation in text)

In general, usage of fitness technologies contributes of endurance of students. It should be noted that endurance development indicators during the pedagogical experiment exceeded the assessment "satisfactorily". It should also be noted that usage of swimming fitness techniques during physical education classes had rather positive effect on the development of students' motivation.

Students value power qualities since for them they take one of the priority places in their livelihood. In the study (Griban, 2009, p. 123) defines force as one of the components of human physical qualities structure on which the revelation of all other physical qualities depends. The manifestation of muscle strength depends on the activity of the central nervous system, the physiological state of the muscles, their elasticity and the biochemical processes that occur in the muscles, changes in muscle excitability and other factors.

The assessment of strength qualities in experimental groups was carried out according to the following tests: tightening on the crossbar (male), bending on the folded arms (female), bending and extension of arms in the emphasis, lying in length from the place, lifting the trunk in the seat for 1 min. The initial level of strength training of students turned out to be rather low, in particular, male students of EG and CG received 1.6 points both, female students, respectively, 1.1 and 1.2 points, which is lower indicator of the assessment of "bad" result. The pedagogical molding experiment confirmed that the purposeful work with usage of physical fitness and fitness technologies, which improve the development of power qualities, significantly contributed to the enhancement of results in experimental groups, where the assessment of power qualities was 3.9 points in mEG and 3.2 points in fEG wich corresponded better than "satisfactorily" mark. At the same time, in control groups, where the methodical system was not implemented, the increase in strength qualities was unsatisfactory and was 2.5 in mCG and 2.4 in fCG (fig. 3).

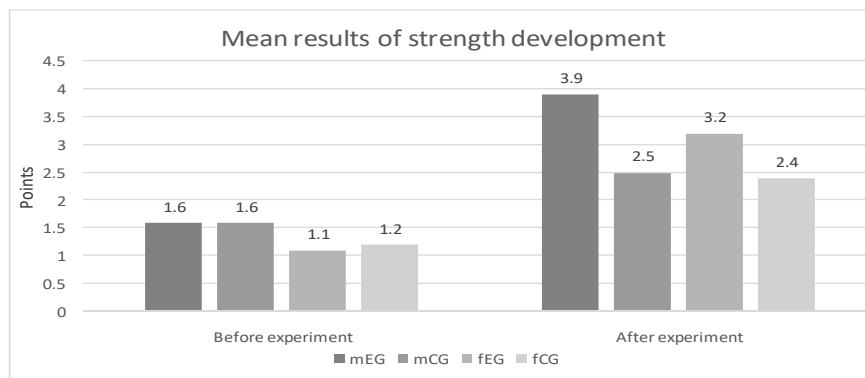
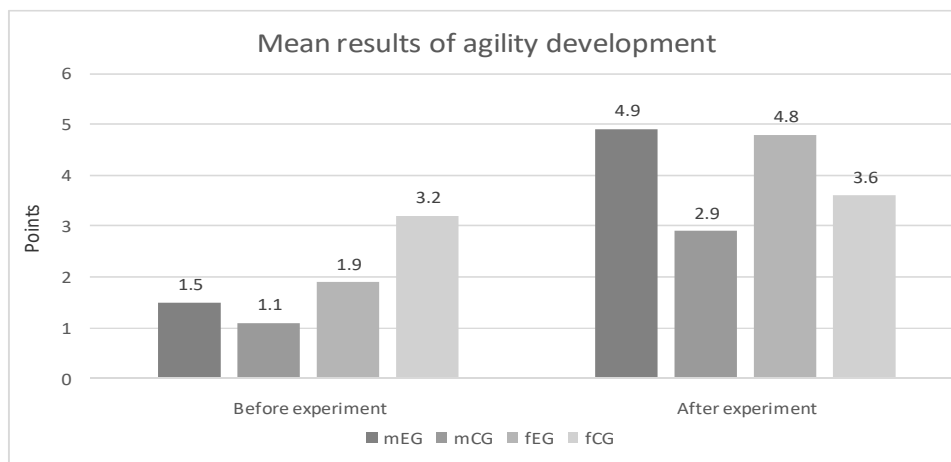


Fig. 3. Dynamics of strength development in experimental groups during the period of pedagogical experiment (explanation in text).

For the rational restructuring of motor activity in accordance with changes in the environment in which it passes, dexterity is required, and coordination is needed to maintain the rational position of the body. The term "coordination" in the study (Krutsevych, 2008) means consistency, association, ordering. The notion of coordination and agility as motor qualities are similar in nature, but not identical, they are united by the commonality of the requirements imposed on human motor sphere, but there are distinguishes between them. Agility is characterized by the rationality and efficiency of movements in a situation that arises, as for the coordination, in the study (Ter-Ovanesyan& Ter-Ovanesyan, 1986) means speed and accuracy of the reproduction of movements are its main traits. Therefore, we can describe coordination as the ability of students to solve motor tasks rationally, economically and intelligently in instantaneous situations. According to studies (Dubovoi & Saienko, 2013; Prikhodko et al., 2006) in curricula for higher education institutions these qualities are considered as identical. Therefore, for the development of agility and coordination skills of students, special exercises should be used, specialized for the development of these qualities.

Assessment of dexterity was carried out by performing a shuttle running test 4x9 m. The development of dexterity and coordination skills among students mEG during the pedagogical molding experiment maintained the tendency for high growth (the initial level was "bad" – 1.5 points, and the final indicators are rather high – 4.9 points), indicating that in the educational process, fitness techniques, which were aimed at the development of agility and coordination skills, were applied effectively. Students from mCG failed to reach a satisfactory score (the initial level was 1.1 points, and the final score was 2.9 points). Similarly, students from fEG showed a high gain of dexterity and correlation of movements, reaching the final result of 4.1 points, which corresponds to the assessment of physical education "good". Students from fCG did not significantly increase the indicators, but they can satisfy the quality of development of these qualities (initial level was 2,4 points, and the final was 3,0 points), which corresponds to the assessment "satisfactory". Students from fCG had, in comparison with men, higher initial rates of development of dexterity and therefore managed to show, respectively, a good and satisfactory level of performance in this test (fig. 4).

The development of flexibility is important for human life, but different types of motor activity and professional activity impose certain requirements that are determined by the biomechanical structure of professional activity. In the study (Oleshko, 1999) the term "flexibility" to evaluate the total mobility of joints throughout the body, and the term "mobility" is used for the characteristics of the amplitude of motion of the individual joint. Flexibility is the ability of a person to perform movements with a high amplitude of joints movement. It depends mainly on the state of a certain group of muscles and their antagonists, as well as on the anatomical features of the joints, the shape and construction of articular bags. In the study (Platonov, 2013), it is stated that sometimes excessive development of a certain group of muscles is the reason at the lack of flexibility in corresponding parts of the body.



**Fig. 4. Dynamics of agility development among students of experimental groups during the period of pedagogical experiment (explanation in text)**

In our studies, flexibility was assessed by tilting the body forward from the sitting position. Indicators of flexibility in the pedagogical molding experiment for both EG and CG students of both genders were unsatisfactory and fairly low: mEG – 1.3 points, mCG – 1.7 points, which is equal to the assessment "very bad"; fEG – 2.5 points, fCG – 2.4 points, which corresponds to the assessment of "bad". After completing the pedagogical molding experiment, all the training groups achieved a positive assessment after completing the flexibility test (fig. 5).

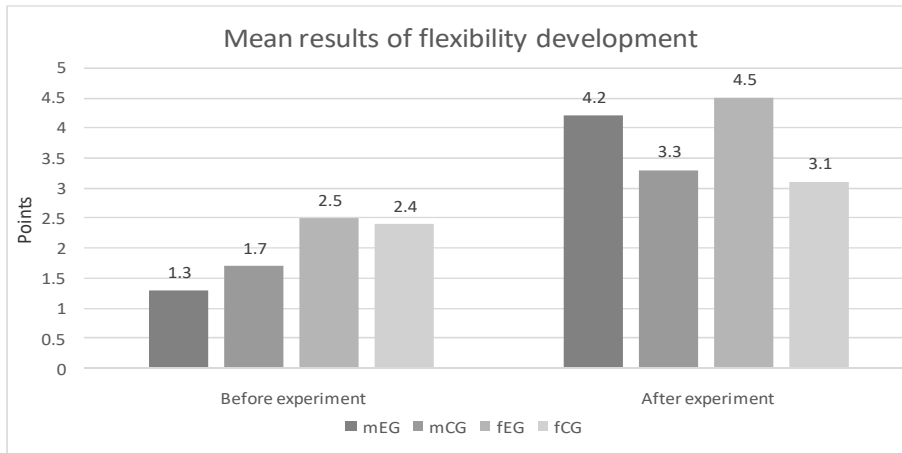


Fig. 5. Dynamics of development of flexibility in students of experimental groups during the period of pedagogical experiment (explanation in text).

Students of experimental groups, where methodical system was introduced, showed following results: women (4.5 points) and men (4.2 points), these results were rated "good". In control groups, the assessment revealed "satisfactory" results, in particular, men received 3.3 points, women – 3.0 points. This shows that targeted development of flexibility contributes to improvement of its performance. Dynamics physical qualities development analysis of students, who participated in pedagogical experiment, showed low initial level for students from all experimental groups. The students from control groups demonstrated further improvement in the performance in tests during the entire period of study, but four tests from male group were rated "unsatisfactory", and women received unsatisfactory assessment from six tests. Students from experimental groups managed to show a significantly better performance in tests for assessing physical qualities development, in particular, men have shown "good" results in five tests and "satisfactory" results in four tests, "unsatisfactory" ratings were not obtained in any tests. Women in experimental groups showed "good" results in three tests, "satisfactory" in four tests, and only in running for 100 m and in length jumps from the place tests received unsatisfactory ratings. In general, we can argue, that the introduction of fitness methodical system in institutions of higher pedagogical education contributes to a significant improvement in physical qualities development.

Analysis of physical fitness indicators of students showed that the structure of physical preparedness is not identical in all groups that participated in the experiment (fig. 6).

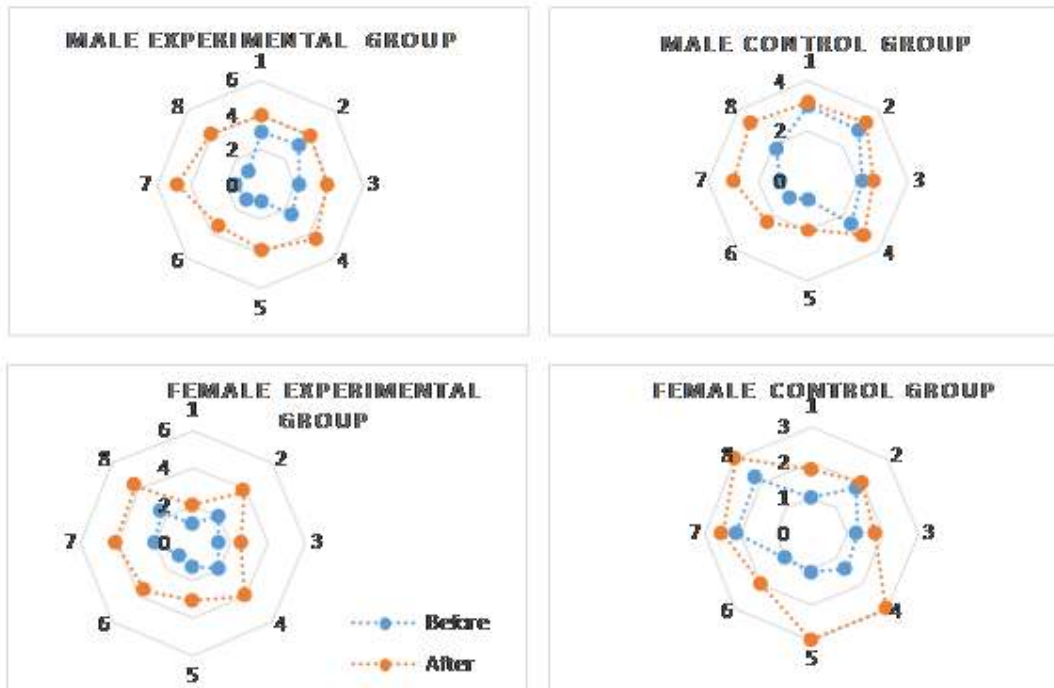


Fig. 6. "Profile" of physical fitness of students before and after the formation of a pedagogical experiment (in points): 1 – 100 m running; 2 – 3000 m running (male), 2000 m running (female); 3 – jump from place; 4 – extension of the hands in the emphasis laying; 5 – tightening on the crossbar (male), hanging on bent hands female); 6 – lifting the trunk from the position lying on the back; 7 – shuttle running 4 x 9 m; 8 – tilt of the trunk forward from sitting position.

Students from male experimental groups showed the highest growth of indicators when performing physical training tests: shuttle run – 3.4 points; in pulling on the crossbar – 3.0 points; when performing the body tilt forward – 2.9 points; bending and unbuttoning of hands in an emphasis – 2,2 points. Instead, female students from experimental groups have a slightly lower growth rate: lifting the trunk in the seat – 2.6 points; shuttle running – 2.2 points; bending and extending the arms in the emphasis and tilt forward – 2.0 points, etc.

Students from male control groups, where the methodical system has not been introduced, have significantly lower growth rates. In particular, the best results were shown by men with shuttle running – 1.8 points; in the torso of the trunk forward – 1.6 points; Tightening on the crossbar – 1.1 points. Similarly, women in control groups showed similar results: 1.7 points on folded hands; bending and extension of hands in an emphasis – 1.5 points; lifting the trunk in the bench – 1.0 points. The "profile" of women physical fitness in control groups is lower and somewhat different in its stability and dynamism from experimental groups. Analysis of the results of experimental work showed that the methodical system contributes to the formation of a positive attitude of students to physical culture and sports and improves motor and physical activity of students. In the study (Griban, 2009) states the it improves efficiency, health, functioning of the cardiovascular, respiratory, hormonal and other systems of the body, provides versatile harmonious development, activates the neuromuscular apparatus and mechanisms for the transfer of reflexes from the muscles to the internal organs. Physical activity always acts as one of the most effective prerequisites for a healthy lifestyle and physical qualities formation. Therefore, the "physical activity" of man is aimed only at changing the state of his body, to acquire a new level of physical qualities and abilities. In the study (Balsevich & Zaporozhanov, 1987) concludes that it cannot be achieved by any other means except for training.

The obtained data confirms the studies (Ivanova, 2000; Savchuk, 2002), contradicts the research (Bazylchuk, 2004), is partly confirmed (Griban, 2012; Kotov, 2003). Markings may also be due to the fact that these studies were conducted in different years, which gave us suggestion that the system of physical education of student youth in Ukraine in recent years had deteriorated, but it is known that since 1994 the physical education system destruction had begun to occur in Ukraine, which indicates the poor quality of the methodological supplementation of physical education process and the lack of fitness technologies usage in institutions of higher education in Ukraine.

## Discussion

An important condition for the introduction of a methodical system is increase in general level of physical development of students, which is important for daily activity and productivity in future professional activities. Implementation of the methodological system consisted from provision of theoretical and methodological information, theoretical knowledge, methods and means of applying fitness technologies both during regular and independent classes. By selecting general training exercises, methods and techniques of their assimilation, it was taken into account that the general physical training should ensure both harmonious body strengthening and spiritual development of the student's personality. The content of general physical training reflects the features of the selected types of fitness technology. At the initial stage of training students developed special skills of fitness technologies that best met students' inquiries. At the same time, at the initial level of education, students became familiar with the basic, most affordable fitness technologies, received some knowledge about the content and ієфпгг of the performed motor actions. Subsequently, the student had to independently perform certain motor actions and master their execution algorithm.

The level of special skills and abilities formation has shown that fitness technology usage, will provide a high level of autonomy, error-free execution of motor activities. Formation of fitness technologies special skills and abilities of students was a prerequisite for a practical section of experimental work. We selected correct methods, forms and means of training by taking into account: motivation to take on fitness techniques, sex, age, level of health of students, etc. In accordance with these factors, the planning of methodology components was carried out: the total number of exercises at each stage of the training, the duration of exercises, the intervals of rest between exercises, the types and nature of rest, the number of approaches and repetitions of each exercise, the intensity of exercises, etc.

## Conclusions

In general, the level of development of physical qualities of students of experimental groups who studied by the methodical system during experimental training is significantly. During the formative pedagogical experiment students identified a number of shortcomings that were taken into account and eliminated in the educational process. The methodical system application has been constantly improved during experimental work, the differentiated and individual approaches to physical preparedness of students were applied accordingly.

In general, the results of the conducted pedagogical molding experiment allow us to state that the introduction of methodical system promotes activation of educational activity, increases motor activity, formation of motivation to systematic training by modern innovative fitness technologies and to adherence to a healthy lifestyle. The results of experimental sections, which confirmed the overall effectiveness of the developed methodical system, were presented and interpreted.

**Conflicts of interest**

The authors state that there's no conflict of interest.

**References:**

- Balsevich, V. K., & Zaporozhanov, V. A. (1987). *Fyzycheskaya aktivnost' cheloveka* [Human physical activity]. Kyiv, Zdorov'ya. [in Russian].
- Bazylchuk, V. B. (2004). *Orhanizatsiyni zasady aktyvizatsiyi sportyvno-ozdorovchoyi diyal'nosti studentiv v umovakh vyshchoho navchal'noho zakladu* [Organizational fundamentals of activation of sports and recreation activity of students in the conditions of a higher educational institution]: dissertation. L'viv, LDIFK. [in Ukraine].
- Beliak, Y. I. (2014). Classification and methodical features of fitness and wellness facilities. *Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports*, 14(11), pp. 3-8. doi: 10.15561/18189172.2014.1101
- Butenko, H., Goncharova, N., Saienko, V., & Tolchieva, H. (2017). Use of health tourism as a basis for improving physical condition of primary school age children. *Journal of Physical Education and Sport*, 17(1), Art. 6, pp. 34-39. DOI:10.7752/jpes.2017.s1006.
- Chernozub, A., Imas, Y., Korobeynikov, G., Korobeynikova, L., Potop, V., Lytvynenko, Y., Bodnar, A., Titova, A., & Dubachinskiy, O. (2018). The influence of dance and power fitness loads on the body morphometric parameters and peculiarities of adaptive-compensatory reactions of organism of young women. *Journal of Physical Education and Sport*, 18(2), Art. 141, pp. 955-960. DOI:10.7752/jpes.2018.02129
- Dobrodub, Y. E. (2011). *Teoriya ta metodyka ozdorovchoho fitnesu* [Theory and methods of health fitness]. Zaporizhzhya, KPU. [in Ukraine].
- Dubovoi, A. V., & Saienko, V. G. (2013). *Primenenie programm fizicheskoy kultury i sporta v regional'nykh uchebnykh zavedeniyah* [The use of programs of physical culture and sports in the regional educational institutions]. Proceedings of the IX International Conference «Days of Science – 2013». Praha, Publishing House «Education and Science» s.r.o., 36, pp. 75-79. [in Russian].
- Griban, G. P. (2009). *Zhyttyediyal'nist' ta rukhova aktyvnist' studentiv* [Life activity and physical activity students]. Zhytomyr: Ruta. [in Ukraine].
- Griban, G. P. (2012). *Fyzichne vykhovannya studentiv ahrarnykh vyshchykh navchal'nykh zakladiv* [Physical education of students of agrarian higher educational establishments]. Zhytomyr: Ruta; 2012. [in Ukraine].
- Gurvich, A. V. (2007). *Prymenenye ynovatsyonnykh fytnes-tekhnologiy v voenno-obrazovatel'nykh uchrezhdeniyakh y sportyvnykh klubakh dlya podderzhannya zdorovoho obraza zhyzny* [The use of innovative fitness technologies in military educational institutions and sports clubs to maintain a healthy lifestyle], dissertation. St. Petersburg, Military Institute of Physical Education. [in Russian].
- Halaidiuk, M., Maksymchuk, B., Khurtenko, O., Zuma, I., Korytko, Z., Andrieieva, R., Strykalenko, Ye, Zhosan, I., Syvokhop, Ya., Shkola, O., Fomenko, O., & Maksymchuk, I. (2018). Teaching approaches to extracurricular physical activities for pupils aged between 12 and 14 under environmentally unfavourable conditions. *Journal of Physical Education and Sport* 18(4), Art. 344, 2018. pp. 2284-2291.. doi:10.7752/jpes.2018.04344
- Ivanchykova, S., Saienko, V., Goncharova, N., Tolchieva, H., & Poluliashchenko, I. (2018). Comparative analysis of changes in the body composition of female students under the influence of the various kinds of fitness training load. *Journal of Physical Education and Sport* 18(2), Art. 142, pp. 961-65. doi:10.7752/jpes.2018.02142
- Ivanova, G. Y. (2000). *Optyimizatsiya fizkul'turno-ozdorovchoyi roboty v tekhnichnykh vyshchykh navchal'nykh zakladakh shlyakhom valeolohichnoyi osvity studentiv* [Optimization of physical culture and health work in technical higher educational institutions through valeological education of students], thesis abstract dissertation. Luts'k, Volins'kij nacional'nij universitet imeni Lesi Ukraïni. [in Ukraine].
- Kotov, Y. O. (2003). *Pidhotovka studentiv vyshchykh zakladiv osvity do samostiynykh zanyat' fizychnymy vpravamy* [Preparation of students of higher education institutions for self-employment with physical exercises]: dissertation. Luts'k: Volins'kij nacional'nij universitet imeni Lesi Ukraïni. [in Ukraine].
- Kozina, Z., Nikolaeva, V., Safronov, D., Goncharenko, M., Razumenko, I., & Tishchenko, T. (2018). The relationship of recovery performance indicators after exercise with indicators of body weight and length of fitness sessions for 24-28-year-old women. *Journal of Physical Education and Sport*, 18(4), Art. 374, pp.2497-2503. DOI:10.7752/jpes.2018.04374
- Krutsevych, T. Y. (2008). *Teoriya i metodyka fizychnoho vykhovannya* [Theory and methods of physical education]. In 2 vol.; vol. 1 *Zahal'ni osnovy teorii i metodyky fizychnoho vykhovannya* [General principles of the theory and method of physical education]. Kyiv, Olimpiys'ka literatura. [in Ukraine].
- Oleshko, V. H. (1999). *Sylovi vydy sportu* [Power sports]. Kyiv, Olimpiys'ka literatura. [in Ukraine].
- Platonov, V. N. (2013). *Periodizacija sportivnoj trenirovki. Obshhaja teoriya i ee prakticheskoe primenenie* [Periodization of sports training. General theory and its practical application]. Kyiv, Olympyyskaya lyteratura. [in Russian].

- Prikhodko, V., Ivashchenko, N., Zhvanova, V. et al. (2006). Metodolohyya razrabotky rehyonal'nykh prohram dvyhatel'noy podhotovky studentov [Methodology for the development of regional motor training programs for students]. *Sports Bulletin of the Dnieper*, 2, 147-148. [in Russian]
- Saikina, E. G. (2009). Fytnes v systeme doshkol'noho y shkol'noho fyzkul'turnoho obrazovannya [Fitness in the system of preschool and school physical education], dissertation. St. Petersburg, Rossijskij gosudarstvennyj pedagogicheskij universitet im. A. I. Gercena. [in Russian].
- Savchuk, S. A. (2002). Korektsiya fizychnoho stanu studentiv tekhnichnykh spetsial'nostey v protsesi fizychnoho vykhovannya [Correction of physical condition of students of technical specialties in the process of physical education], thesis abstract dissertation. Rivne, Luc'kij nacional'nij tehnicnij universitet. [in Ukraine].
- Sukarmin, Y., & Sudardiyono (2017). Physical fitness profiles of lower-level students in elementary schools based on observation guidelines. *Journal of Physical Education and Sport*, 17 Supplement issue 1, Art. 13, pp. 84-91. DOI:10.7752/jpes.2017.s1013
- Ter-Ovanesyan, A. A., & Ter-Ovanesyan, Y. A. (1986). Pedahohyka sporta [Sport pedagogy]. Kyiv: Zdorov'ya. [in Russian].
- Yarmak, O., Galan, Y., Hakman, A., Dotsyuk, L. Blagii, O., & 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*, 17(3), Art. 189, pp. 1935-1940. DOI:10.7752/jpes.2017.03189
- Zinchenko, V. B. (2011). Fytnes-tekhnohyy v fyzycheskom vospytanny [Fitness technology in physical education]. Kyiv, NAU. [in Russian].