

Improving the physical health of female students using boxing specialization in physical education

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Abstract:

The study of the issues of sports-oriented physical education of student youth continues to be an urgent problem, despite the available literary sources on this topic. **Purpose.** Develop and test a new training program using elements of boxing training, and thereby increase the motivation for physical activity of young students, in particular female students. **Materials and methods.** The pedagogical experiment was carried out on the basis of one of the Russian universities. Two representative groups of female students took part in the pedagogical experiment, during the academic year they studied for 2 hours 2 times a week in physical education classes. The experimental group (EG, n=106) was engaged in a sports program with boxing training. The control group (CG, n=106) studied according to the standard general education program. Female students of both groups were observed through the initial and final testing of the main anthropometric characteristics of the body: the indicators of the cardiovascular system, respiratory system, muscular and nervous systems were determined. We did the calculation of the indices of the functional systems of the body. At the beginning and at the end of the pedagogical experiment, we used motor tests and assessed the level of development of the main indicators of girls' physical fitness. During the initial and final testing, measurements were made of the main anthropometric characteristics of the body of female students: indicators of the cardiovascular system, respiratory system, muscular and nervous systems were recorded. We made analytical calculations of indicators of the functional systems of the body. At the beginning and at the end of the pedagogical experiment, we used motor tests and assessed the level of development of the main indicators of physical fitness of female students. **Results.** It was found that at the beginning of the pedagogical experiment, the values of all the studied indicators in girls in both observation groups practically did not differ, $p > 0.05$. After the completion of the pedagogical experiment, an increase in the values of indicators in functional and motor tests was registered among the girls of the control and experimental groups. A significantly greater increase in the values of functional tests of the cardiorespiratory, muscular and central nervous system, as well as motor tests was noted in EG girls, where the pedagogical technology of sportization was used in physical education classes, in comparison with CG, in which classes were conducted according to the traditional curriculum. **Conclusions.** The use of the pedagogical technology of sportization with elements of boxing in the curriculum of physical education of female students showed a fairly high efficiency compared to the traditional general developmental physical education program. The proposed technology can be used in other educational institutions.

Key Words: sports training, physical education, sportization, boxing

Introduction

The improvement of pedagogical technologies for planning and organizing physical culture to preserve and improve the health of students is considered by many researchers as an urgent task facing teachers of educational institutions (Miroshnichenko et al., 2019; Nesterchuk et al., 2020; Andrieieva et al., 2020).

Motivation remains low for physical education classes within traditional curricula (Galan et al., 2021), which leads to a deterioration in the physical and functional fitness of young people and the formation of disharmonious physical development (Mazin et al., 2021; Christiani et al., 2021) and lower health levels (Martin

and Naziruddin, 2020; Soleh Solahuddin et al., 2021). The analysis of scientific literary sources indicates many reasons for the decrease in interest and motivation for physical education lessons. The main reason is the ignorance of the use of innovative means and methods of youth sports physical training by teachers (Tuan, 2019). The lack of an opportunity to choose an interesting form of physical activity plays an important role (Kuśnierz et al., 2020).

In the field of physical culture, there is a constant search for new means, methods and technological approaches to optimize the educational and training process to preserve and strengthen the health of young people. This improves the physical, somatic and mental health of students. However, in general, the level of health of young people continues to be low, as evidenced by the research materials of many authors (Tortella et al., 2021; Tomás Reyes-Amigo, 2021).

The decline in health status begins at school age and continues to decline towards the senior year (Krasnozhon et al., 2017). After entering a vocational educational institution, yesterday's students are included in the intensive educational process of higher education, which automatically delegates them to a group of increased health risk (Kovalev, Bulgakova, 2023). It is also necessary to take into account that the period designated as "student youth" in most cases becomes the final one for the individual in the formation of his constant need to comply with the basics of a healthy lifestyle and the recommended amount of regular physical activity.

It is possible to interest young people in physical training if sports technologies of popular sports are introduced into the educational process of physical education (Balsevich, Lubysheva, 2003). The innovative technology proposed by the authors is designated as the sportization of physical culture. It makes it possible to expand the forms and means of physical culture and significantly increase the motivational component of training sessions (Lubysheva et al., 2017; Golovin, Romanova, 2017) through the use of a competitive component in the educational process. Sports technology has become a mandatory form of physical education curriculum in many countries around the world (Harvey et al., 2018; Barba-Martín et al., 2020). Most often, the most popular sports are used for these purposes (Baidiuk et al., 2019; Viktorov et al., 2020). These include sports of a gaming orientation (Montesano, 2018) and martial arts (Gianpiero Greco et al., 2019).

Currently, women have begun to perform in various sports that were traditionally male. Boxing, which is a popular martial art, was no exception. This sport develops vital motor indicators: endurance, speed-strength qualities, coordination of movements and agility. Boxing is an effective means of improving health, it forms the harmonious physical development of athletes, develops moral and volitional qualities and the ability to anticipate the opponent's actions, and instills healthy lifestyle skills (Rakovetsky et al., 2020).

Since 2009, women's boxing has become an Olympic sport and is currently being actively developed in many countries around the world. Means and methods of sportization began to be used in the curriculum of the discipline "Applied physical culture and sports". Currently, in the educational specialization "boxing" of the Siberian Federal University (Krasnoyarsk, Russia), out of more than 1000 students involved in this sport, 25% are girls (Kovalev, Bulgakova, 2023). The specificity of the sport "boxing" lies not only in aggressive contact, but also in the special requirements for the psychophysical qualities of those involved, which, of course, is reflected in the organization of the "boxing" academic discipline. The use of the technology of sportization of boxing orientation in the educational and training process of physical education of girl students causes the need for an in-depth scientific study of this issue and comparison of the results obtained with the data obtained during the implementation of traditional training programs. This issue has not been adequately addressed in the scientific literature. We believe that the study of this problem will make it possible to determine the degree of implementation of sportization technology in the physical education of young people and increase the effectiveness of physical education and motivation for regular physical activity.

Purpose. Develop and test a new training program using elements of boxing training, and thereby increase the motivation for physical activity of young students, in particular female university students.

Material & methods

The pedagogical experiment was carried out in the 2022-2023 academic year at the Department of Physical Education of the Siberian University (Krasnoyarsk, Russia). The project involved 106 female students aged 18-20 years (18.3 ± 1.2) who made up the experimental group (EG): 1st and 2nd year students at the university, attending compulsory physical education classes specifically in the sports specialization "boxing". These girls had no medical contraindications for playing sports; the selection for this group was carried out with the voluntary consent of the girls. In the control group (CG), the same number of female students ($n=106$) were randomly selected, who attended physical education classes according to the traditional curriculum for universities and were practically healthy. The educational process of physical education of female students in CG and EG was carried out on 1-3 courses of study, twice a week (180 minutes).

The basis of the methodology of sports-oriented training for EG girls was the state standard of physical training for the sport Boxing (2022). Due to the lack of sports training skills in boxing, all EG girls were assigned by us to the group of initial training.

The structure of the training process included two macrocycles of physical education for EG students, which correspond to 2 semesters of study at the university. Each macrocycle included working stages lasting from two to nine weeks. According to the federal standard, training sessions included sections of general physical and special training, the girls mastered technical, tactical, psychological training. Participation at least once a year in various university-level competitions was a prerequisite for sports-oriented classes.

For the assessment of physical fitness indicators of CG and EG students, we used generally accepted motor tests to determine the main morphological and functional motor qualities: we determined the body length, body weight with the calculation of the body mass index (BMI), kg/m², which characterize the state of metabolic, metabolic, hormonal and other vital processes in the body.

For an objective assessment of the indicators of physical fitness of students from the CG and the EG, generally accepted motor tests were used to determine the fundamental morphological functional motor qualities: body length, body weight was determined with the calculation of body mass index (BMI), kg/m², characterizing the state of respiratory, metabolic, hormonal and other vital processes in the body. The functional study of female students included the following measurements: minimum and maximum blood pressure, mm. rt. column, heart rate at rest (beats per minute), the calculation was made according to the Robinson index (IR), arb. units. We studied the reaction of the cardiovascular system to physical activity by taking functional tests with 20 squats in 30 seconds, beats in 10 seconds (beats / 10s x beats / 60 s.). Strength characteristics were studied using a hand dynamometer, kg/s, calculating the strength index (SI) of the hands of both hands, %.

We conducted a study of the respiratory system with the determination of the vital capacity of the lungs, ml and the calculation of the vital index (VI), ml/kg. The hypoxic resistance of the girls' organism was determined using the Genchi test, p. The static equilibrium of the body was determined by a simple Romberg test, p.

The completed pedagogical experiment does not violate the principles for biomedical research, which are set out in the 2008 Declaration of Helsinki.

When we received the results, we processed them using the methods of parametric statistics with the calculation of the arithmetic mean and its error. By the value of Student's t-test, we determined the significance of the difference in indicators (at $p < 0.05$). The study used the application software package STATISTICA 10.0, MS Excel 2010.

Results

The results of a milestone study of the morphofunctional characteristics of girls in both observation groups are presented in Table 1.

Table 1. Values of morphofunctional indicators of female students CG and EG, M±m

Indicators	CG (n=106)		EG (n=106)	
	At the beginning of the project	At the end of the project	At the beginning of the project	At the end of the project
Anthropometric				
Body length, cm	165.6±1.3	165.9±1.4	166.2±1.3	166.6±1.5
Body weight, kg	58.8±0.6	59.5±0.7	57.7±0.6	55.4±0.5*
Body mass index (BMI), kg/m ²	21.4±0.3	21.6±0.3	20.9±0.2	20.0±0.2*
Cardiovascular system				
Pulse rate, beats/min	At rest	78.3±3.4	76.4±3.1	79.5±3.4
	After 20 sit-ups in 30 seconds	122.7±5.3	120.2±5.2	120.7±5.1
Pulse recovery time after 20 squats, s	69.7±3.6	63.6±2.5*	70.2±3.4	59.2±2.8*
Blood pressure, mm. rt. pillar	Systolic	125.1±4.6	124.2±4.9	124.7±4.8
	Diastolic	75.2±3.9	66.9±2.9	69.5±3.9
Robinson index, conventional units	98.0±3.3	95.6±3.1	99.1±4.2	78.8±3.4*
Respiratory system				
Vital capacity of the lungs, ml	2432.3±33.4	2615.1±35.6	2360.6±32.6	2850.2±42.4*
Life index, ml/kg	41.3±1.7	43.9±1.9	40.9±1.6	51.4±2.3*
Genchi test, s	24.0±0.6	28.2±0.8	25.2±0.5	34.4±1.1*
Muscular system				
Muscle strength, kg	Left hand brushes	22.4±0.9	23.5±0.9	22.1±0.8
	Right hand brushes	24.5±1.3	26.2±0.9	23.2±1.2
Power index, %	Left hand	38.1±1.4	39.5±1.5	38.3±1.8
	Right hand	41.7±1.7	44.0±2.2	40.2±2.6
Central nervous system				
Romberg test, s	28.0±1.5	32.4±2.1*	25.5±1.4	38.6±2.6*

Note. *significant difference in the values of indicators, $p < 0.05$

More pronounced changes at the end of the experiment were noted in the cardiovascular and respiratory systems of female students. Data were recorded: heart rate at rest became less frequent, a decrease in their recovery time after 20 squats in 30 seconds and the Robinson index in female students of both observation groups. In the system of external respiration in female students of both groups, the vital capacity of the lungs, the vital index increased, the time of holding the breath in the Genchi test increased. These results of the study indicate an increase in the tolerance of the cardiovascular and respiratory systems in female students from the CG and the EG to physical activity. The increase in the values of functional indicators of the cardiorespiratory system, dynamometry, strength index of the hands of both hands, time of holding the position in the Romberg test and BMI was greater in girls from the EG compared with the CG, $p < 0.05$, Fig.1.

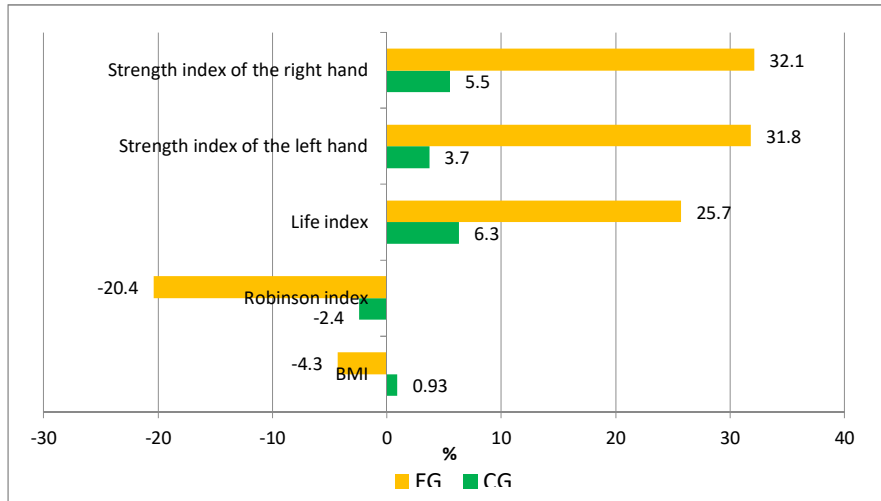


Fig. 1. Dynamics of the values of functional indices and BMI in girls at the end of the experiment

It is of scientific and practical interest to study the issue of the comparative effectiveness of the development of physical fitness among female students when using different curricula in the process of physical education, table 2.

Table 2. The value of indicators of physical fitness of girls CG and EG, M±m

No p/p	Test	Observation group	At the beginning of the project	At the end of the project	p
1	Running: 30 m	EG	5.26±0.05	5.17±0.03	< 0.05
		CG	5.24±0.01	5.23±0.01	> 0.05
2	Running: 1000 m, m/ s	EG	6.47±0.30	5.57±0.22	< 0.05
		CG	6.44±0.19	6.42±0.13	> 0.05
3	Lifting the body in 30 s, the number of times	EG	20.55±1.13	38.40±1.75	< 0.05
		CG	21.52±1.11	24.52±1.59	> 0.05
4	Push-ups from a prone position, the number of times	EG	22.12±1.45	34.5±2.62	< 0.05
		CG	23.52±1.76	27.2±2.87	> 0.05
5	From a sitting position, tilt forward, cm	EG	11.3±1.25	16.5±2.52	< 0.05
		CG	11.8±1.57	13.6±1.78	> 0.05
6	Standing long jump, cm	EG	161.28±4.12	173.6±7.28	< 0.05
		CG	162.12±4.53	168.5±6.44	> 0.05

At the beginning of the pedagogical experiment, the physical fitness of CG and EG students did not differ significantly, $p > 0.05$. At the end of the experimental study, an increase in the values of indicators of physical fitness in female students of both groups was established.

However, a significant increase in the values of motor qualities testing indicators, in comparison with the beginning of the study, was registered only in EG students, where the pedagogical technology of sportization of physical education using boxing was used. By the end of the observation, the female students of the experimental group had a significantly higher increase in the values of indicators in motor tests than female students of the control group, Fig.2

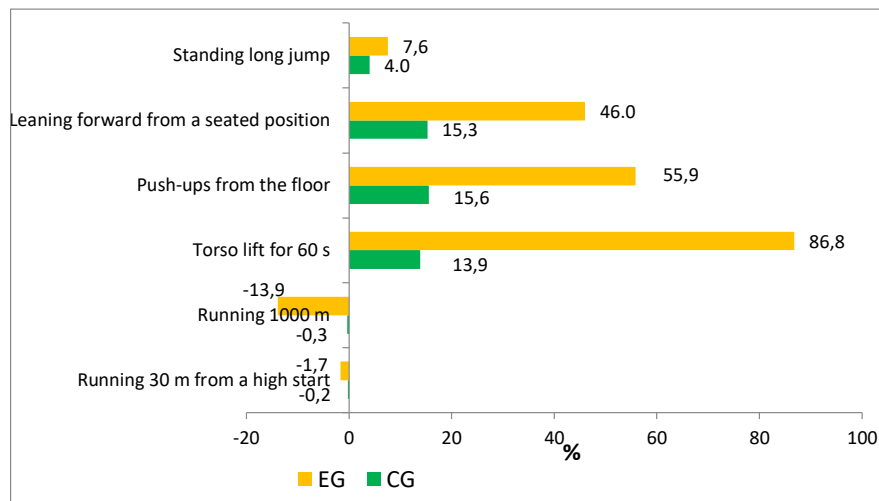


Fig. 2. Dynamics of the values of indicators in motor tests of female students at the end of the experiment

At the end of the scientific pedagogical experiment, the strength qualities of the EG girls increased the most. This established fact is demonstrated by the “torso lifting” test - the increase was 86.8%, the “push-ups from the floor” test - 55.9%, which is 6.2 and 3.4 times more than in the girls of the control group, respectively. Active flexibility of the spine and hip joints was 3.0 times greater in EG female students than in the control group. In girls of the experimental group, the increase in speed characteristics (test running 30 meters) and overall endurance (test running 1000 meters) was significantly greater, $p < 0.05$, than in female students CG, Figure 2.

Significantly high morphological and functional indicators and motor qualities in girls, where the technology of sportization with the inclusion of boxing was used, indicate a more pronounced effectiveness of this physical education program, compared with the established traditional educational general developmental physical education classes.

Dicussion

Significant results have been obtained in the development and improvement of pedagogical means and methods of physical education of students, which are aimed at introducing elements of different sports into the educational process of the discipline. However, the methods of using sports technologies in organizing and conducting physical education classes among students continue to be an urgent problem (Miroshnichenko et al., 2019; Nesterchuk et al., 2020; Andrieieva et al., 2020) and increasing their motivation for physical activity (Tuan, 2019; Kuśnierz et al., 2020).

The recommendations of specialists and scientists in the field of physical culture on the use of sports-oriented activities for students were found to be effective in improving health, physical development and increasing the motivation of those involved (Balsevich, & Lubysheva, 2003; Lubysheva et al., 2017; Golovin, & Romanova, 2017). The introduction of sports training into the educational process of physical culture finds supporters in many countries (Harvey et al., 2018; Barba-Martín et al., 2020). Therefore, a comprehensive study of the issue of increasing the effectiveness of the use of various sports in the physical education of young people seems to be a timely and important direction, and the topic of this study is relevant in the field of physical culture and sports.

The pedagogical experiment conducted by us during one academic year, which was based on the use of boxing in the physical education of female students of the university, showed a rather high efficiency of the proposed pedagogical technology in comparison with the classes of female students according to the traditional curriculum. These data do not contradict the results of the study of other authors who used some sports in physical education and received a high positive result (Montesano, 2018; Biino et al., 2020; Silva et al., 2021).

Approbation by us of the sports-oriented technology of using boxing in the pedagogical process of physical education of female students showed a significantly greater efficiency in improving the adaptive qualities of the cardiovascular and respiratory systems to perform physical activity compared to the control group, where the traditional program of physical education was used. Also, the increase in functional characteristics in the muscular, nervous systems of the body and in the main motor qualities was significantly more established.

Our data are consistent with the results of a study of functional systems in individuals performing intense physical activity compared to individuals with reduced physical activity (Nuuttila et al., 2017). The

strategy for monitoring the dynamics of morphological and functional indicators and the characteristics of the physical fitness of female students, in our opinion, are timely, both for the effective implementation of the educational process of the discipline (including possible corrective actions), and for the health-saving of girls, which in the end can have a positive impact, both on motivation and physical health of female students.

Our data are consistent with the results of a study of functional systems in individuals performing intense physical activity compared with individuals with reduced physical activity (Nuuttila et al., 2017). Our study is important, our strategy of monitoring the dynamics of morphological and functional indicators and physical fitness characteristics of female students is timely, as it demonstrates the effectiveness of the educational process of the discipline, including possible corrective actions to introduce sports training methods. This technique can reliably positively affect both the motivation and the physical health of young students. A more significant result of the increase in motor qualities in the girls of the experimental group, where we used the technology of sportization compared to the general developmental physical education program of physical education classes, is consistent with the data obtained by Tuan Tran Minh, Cuong Tran Ngoc (2022). The authors noted positive changes and concrete results in the physical fitness of students when using basketball, compared with physical fitness when using the generally accepted physical education curriculum.

The data obtained by us in the course of the experiment and the results of studies by other scientists indicate that the sportization of physical education of students is the most effective in physical training and an effective form of improving the physical health of young people.

Conclusions

To increase the effectiveness of physical education of female university students, a pedagogical technology of sports-oriented training sessions using boxing training has been developed and tested. Training sessions in the experimental group were carried out using the principle of organizing sports training, which are held 2 times a week for 90 minutes each during the academic year. The control group of female students studied using the traditional curriculum.

According to the results of the scientific and pedagogical study, it was found that the increase in the values of indicators in functional tests, as well as in all motor tests, was significantly greater in female students of the experimental group compared to the results of female students in the control group. The obtained positive results of evaluation of the effectiveness of the pedagogical technology of sports-oriented physical education of female students with the use of boxing allow us to recommend it for use in the educational process of educational institutions.

Conflicts of interest. The authors declare no conflict of interest.

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