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Optimising the physical condition of senior school-age girls using new types of motor activity (on the example of "Rugby-7")

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Abstract. The process of physical education of high school students includes model training programmes that include both traditional and innovative types of motor activity. In particular, the variable programme "Rugby-7" is presented, but the content and direction of sectional classes differs from physical education lessons, which necessitated the purpose of the work: to justify and develop the organisational and methodological principles of classes with the priority use of "Rugby-7" in the process of extracurricular (sectional) work and to determine their impact on the morphofunctional state and physical fitness of girls of high school (16-17) age. The anthropometric method was used to assess the physical development. The harmony of the physique was determined using the index method. The functional state of the cardiorespiratory system was determined by pulsometry, tonometry, spirometry. The aerobic capacity was studied using the Robinson index. Assessment of physical fitness took place in the pedagogical testing process. The programme "Rugby-7" for sectional classes with girls of high school age has been developed. Organisational and methodological features of sectional classes with priority use of "Rugby-7" were highlighted in the developed programme, which include: purpose, tasks, principles and implementation (complexity, continuity, variability), content, control standards. The effectiveness of the proposed programme was tested in the process of a formative experiment. At the end of its implementation, a re-examination was carried out to determine the indicators of girls morphofunctional state and physical fitness. A comparative analysis of physical development indicators and functional state of girls before and after the experiment showed their positive dynamics. A comparison of the results of physical fitness allowed to claim a general improvement in indicators. The greatest rates of growth were recorded in the manifestation of speed and strength, coordination abilities, and speed. The obtained data proved the effectiveness of the developed programme of extracurricular activities and can be applied by physical education teachers in extracurricular work

Keywords: 16-17-year-old schoolgirls; programme of extracurricular activities; sport games; motor qualities; morphofunctional state

Introduction

Taking into account the challenges of the last three years (2020-2023: COVID-19 pandemic, the full-scale invasion of Ukraine), the issue of maintaining and improving the physical and mental health of children, adolescents and

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young people is an urgent one. In the system of physical education, a special place belongs to mobile and sports games. Among the modern sports that appeared in the last decade (the so-called "non-Olympic sports"), women's rugby stands out, which has been intensively developing recently: not only "big" rugby, but also its 7×7 variants, beach rugby, etc. Taking into account the fact that there has been a tendency for women to engage in strictly "masculine" and extreme sports, the active introduction of the game of rugby into the practice of physical education of girls of high school age allows to count on mass interest in this game.

Data from the World Health Organization (2021) indicates that insufficient level of physical activity is one of the main factors that limits the quality and length of human life. The confirmation of the presence of significant problems and the objective need for significant changes in the system of school physical education is the low level of physical fitness and the deterioration of the health of a large part of the students. According to Ya. Sorokata (2021), effective implementation of physical education programmes for secondary school students requires the implementation of appropriate scientific and methodological developments in practice. N. Belikova & I. Shnyt (2019), O. Rymar *et al.* (2020) and O. Nesen (2023) emphasised that one of the problems of the school physical education system is the imperfection of physical education. Work on physical education at school is characterised by a wide variety of forms, both in-class and extra-curricular.

As O. Rymar *et al.* (2020) emphasised, extracurricular forms of physical education and sports are aimed at improving motor skills and abilities, increasing the level of physical fitness, as well as sports achievements of students. It is noted in the O. Nesen (2023) researching, that within the framework of the New Ukrainian School reform, approaches to the teaching of physical culture disciplines in general secondary education institutions were changed (introduction of competence-oriented physical education, formative assessment, new types of motor activity, etc). The data of N. Belikova & I. Shnyt (2019) and A. Petrova (2021) testified creation of programmes which include both traditional and modern types of physical activity (crossfit, squash, korfball, pétanque, etc.) for students of basic and specialised schools. The authors of these programmes, A. Boliak *et al.* (2022) and O. Pedan *et al.* (2022) highlighted that, for the most part, these programmes are intended to be introduced into the content part of physical education lessons.

According to T. Krutsevich *et al.* (2023), physical education lessons compensate for only 15-20% of the amount of motor activity necessary for the child's body. Approximately 50% of students have no sustained interest in physical education lessons. In this regard, there is a need to improve the educational process by including new types of motor activity. The effective use of rugby tools in the process of sports and mass work at school is hindered by the lack of a well-founded and developed content for organising and conducting extracurricular sectional classes. Therefore, the purpose of the study was to substantiate and develop the organisational and methodological principles of classes with the priority use of "Rugby-7" in the process of extracurricular (sectional) work and to determine their impact on the physical fitness of girls aged 16-17.

Materials and Methods

The following research methods were used to achieve the research goal: theoretical analysis and generalisation of data from scientific and methodological literature, pedagogical methods (experiments, testing), medical and biological methods (anthropometry, pulsometry, tonometry, spirometry, index method) and methods of mathematical statistics. The analysis of scientific and methodological literature made it possible to develop the programme "Rugby-7" for sectional classes with girls of high school age. The anthropometric method was used to assess the physical development of the studied contingent, and the harmony of the physique was determined using the index method (deviation of the actual body weight from the appropriate one), namely the Quetelet index was used. The functional state of the cardiorespiratory system of girls aged 16-17 was determined by medical and biological methods (pulsometry, tonometry, spirometry). The Robinson index was used to study the body's aerobic capacity, which determines the functioning state of the cardiovascular system. To determine the level of endurance 12 minutes Cooper test was applied. Assessment of physical fitness took place in the process of pedagogical testing in the conditions of pedagogical experiments (declarative, formative). The interpretation of the actual research material was carried out by statistical methods on a personal computer using the STATISTICA 6.0 package of applied statistics of automated data processing systems, as well as the EXCEL spreadsheet editor for MAC-2015.

19 girls ($N = 19$), aged 16-17, who attended sectional "Rugby-7" classes at the Pereiaslav secondary school of grades I-III No. 3 participated in the study. Testing of the subjects took place with the written consent of the parents. The research was conducted in accordance with the rules of the Declaration of Helsinki (2013), and all research participants were informed of the purpose of this interaction and how the data obtained would be used. The pedagogical experiment lasted for one academic year (September 2022-May 2023) in the working conditions of the "Rugby-7" school section of Pereiaslav Secondary School No. 3 (Kyiv Region, Ukraine). The research, which was aimed at solving the established tasks, was conditionally divided into three stages. The first stage was conducting an ascertaining experiment, determining the initial level of the morpho-functional state and physical fitness of the studied contingent (September-October, 2022). The second stage has been a development of the "Rugby-7" programme sectional classes, conducting a formative experiment, control testing (October 2022-April 2023). The third stage was a mathematical processing of the obtained results, their interpretation, formulation of conclusions (April-May, 2023).

Results and Discussion

Content, organisation and methodical basis of the "Rugby-7" extracurricular classes programme

There has been an increase in the interest of women in purely "male" sports, which caused the active introduction of the game of rugby into the system of extracurricular work with girls of high school age. That is due the fact that rugby can be used as a physical training tool, as from the technics of the "Rugby-7" is not difficult. No special ammunition, inventory, etc. is required. It can be done without a goal and played with any ball. The game of

rugby is gaining more and more popularity in the world as a means not only of sports, but also of recreational activity (Mandiuk, 2021). In some countries, rugby is part of the physical education programmes for students. N. Kholidari (2017), revealing the content of physical education in elite schools in Great Britain, noted that such sports as athletics, rowing, football, golf, cricket and rugby are very widely used, and the predominant method of organising classes is sports and games. Game sports, particularly rugby, are especially popular. Perhaps this is due to the fact that it was in the college of the English town of Rugby that this game was started more than 100 years ago. According to many scientists, playing rugby is an effective means of physical education, which has a complex effect on the personality of students.

According to Z. Kozina & Y. Zaichenko (2022), in the process of game activity there is a need to implement a large number of technical methods and tactical elements. All this happens in conditions of rapid change of game situations against the background of great emotionality. In addition, it is necessary to perceive and analyse information quickly, make the right decisions, that is, to show cognitive abilities. The authors emphasised that sports games are one of the main content components of the school physical education programme. The "Rugby-7" lesson is introduced into the practice of physical education lessons in grades 10-11 as a variable module (Boliak *et al*., 2022). However, the presented module "Rugby, Rugby-7" in the physical education programme for a specialised school does not fully correspond to the specifics of sectional classes, which prompted authors to develop the organisational and methodological principles of "Rugby-7" classes with girls 16-17 years old outside of school.

The purpose of the "Rugby-7" programme is the formation of a versatile, harmoniously developed personality, ready for active creative self-realisation in the space of universal culture. The use of rugby equipment is appropriate for strengthening and preserving one's own health, fostering responsibility and professional self-determination in accordance with individual abilities in the organisation of a healthy lifestyle. ***The goal*** of the programme achieved through solving the following tasks:

1. Formation of a healthy lifestyle by means of rugby.
2. Development of basic physical qualities, formation of vital motor abilities and skills.
3. Strengthening and preservation of health, improvement of physique and education of a harmoniously developed personality, aimed at long-term preservation of a high level of general working capacity.
4. Education of positive personality qualities, collective interaction and cooperation in educational and competitive activities.

Principles of programme implementation. The principle of complexity implied a close relationship between all aspects of the educational process (physical, technical-tactical, integral, psychological and theoretical training, educational work, pedagogical control). The principle of continuity determined the sequence of presentation of the programme material by stages of training to ensure the continuity of tasks, means and methods of training, volumes of training and competitive loads, growth of indicators of physical and technical-tactical readiness in the multi-year educational process. The principle of variability provided for the variability of programme material for practical classes, which is characterised by a variety of educational and training tools and workloads aimed at solving pedagogical tasks, depending on the stage of multi-year training and individual characteristics of students. Rugby tools allowed to successfully solve the entire set of tasks listed above, created prerequisites for the formation of survival skills in extreme situations, which emphasises their applied value (especially in the conditions of martial law in Ukraine). Thematic planning of the "Rugby-7" programme for girls aged 16-17 is described below.

Rugby based physical education knowledge. Theoretical training. Individual plan of educational and training classes. Studying the experience of teams of the game in rugby. The theory of rugby. Game strategy. *Main content lines*. Drawing up an individual lesson plan taking into account the characteristics of those who work. Referee gestures, rules of the game. Orientate yourself on the court, perform the functions of players from standard positions and in open play in defence. Build game tactics depending on game conditions. Adhere to the optimal alternation of workload and rest. Analyse indicators of physical condition. Regulate physical load during physical exercises. Tell about the rules of the game in "Rugby-7". Name and distinguish gestures of judges. Tell and understand the location of players from standard positions and in open play in defence.

Ways of motor activity. Perform individual technical actions: improvement of skills and abilities in possession of the ball and other technical techniques of rugby. Perform group tactical interactions: improve previously learned options for group interaction, depending on the conditions on the sports field. Perform team tactical actions in defence and in attack: improve the execution of previously learned team interactions, both in open play and depending on standard provisions. *Main content lines*. Improving the skills and abilities of performing individual technical actions with the ball, coordinated combinations of hand movements with the execution of basic steps (elements). Improvement of abilities and skills of performing group tactical interactions in attack and defence. Improvement of abilities and skills of performing team tactical actions in attack and defence. Describe the individual technique of performing various kicks on the ball, catching and passing the ball, movement without the ball. Master the technique of the studied exercises. Identify mistakes while performing an exercise, be able to analyse and correct them. Perform coordinated combinations of hand movements with the execution of basic steps (elements). Master the technique of studied tactical actions. Demonstrate the technique of performing learned tactical actions in defence and attack.

Physical improvement. Sports and health activities with general development orientation: "Rugby-7" game. Security requirements. Have the skills to play "Rugby-7". Exercises of general development and special focus: safety requirements. Athletics exercises. Sports games using a rugby ball (handball, basketball, soccer). *Main content lines*. Compliance with safety rules during "Rugby-7" classes. To perform exercises for the development of physical qualities, to navigate in space, to perform technical and tactical interactions in game activities. Compliance with safety rules during athletics classes. Performing athletics exercises:

walking with a change in speed and stride length; different types of walking – on toes, rolling from heel to toe, springy step, with jumps, alternating walking and running; running with a change in speed and direction of movement, also precisely at the teacher's signal; back forward, step by step, "shuttle" run 3×10 m; running at 60 m, 100 m, at medium distances of 400-800 m in the mode of repeated – interval method; a steady 6-minute run. Compliance with safety rules during sports games. Application of sports games for the development of speed, coordination, strength, orientation in space: stance and movement; moving to the right, to the left side in incremental steps, with the back forward; with a change of direction at the teacher's signal; with jumps and turns at the teacher's signal; passing the ball in pairs (from the side, from below) while standing still and in motion; transfers in columns with movements; two-way games using a rugby ball.

Observe safety rules during "Rugby-7" classes. Perform technical exercises from the sports game of "Rugby-7". Interact in pairs, threes, groups when performing exercises and game actions. Take an active part in games. Model the technique of game actions and techniques, depending on the game situation and the conditions that arise in the process of game activity. Follow the rules of the game. Communicate and interact with peers during the game. Show benevolence, mutual understanding, to treat one's emotions objectively. Use rugby game actions to develop physical qualities and as a means of active recreation. Perform exercises to develop endurance, coordination, strength and speed. Identify possible lags in indicators of physical development and physical fitness. Follow the standards of physical training. Follow the rules of breathing when performing exercises. Control the load according to the heart rate. Organise and conduct independent classes, compile their content and plan in the system of physical education classes. Actively participate in games and referee. Model the technique of game actions and techniques, depending on the game situation and the conditions that arise in the process of game activity. Follow the rules of fair play. Communicate and interact with peers during the game. Respect your opponent, control your emotions. Use game actions of sports games for the development of physical qualities, and as a means of active recreation.

Control exercises on rugby technique for students (16-17 years old). Passing the ball on the spot – 7-8 times. Passing the ball in motion – 7-8 times. Catching the ball after kicking – 7-8 times. Kick the ball with your hands for accuracy – 6-7 times. "Slalom" – 18-21 times. *Means of dexterity development*: performing movements of different intensity, changing the direction of movement by 90° according to a sound or visual signal (repeatedly); receiving and passing the ball in different ways. Moving along the sports field with low, moderate, high intensity, in groups of three "fan", in "extreme". Pass from the right "extreme" to the "central", receiving the "central" and passing the ball to the left "extreme" and back; moving along the field, in groups of three "fan", the distance between athletes is from 2 to 7 m; passing the ball and "running" for a partner, receiving the ball; in pairs, passing the ball in different ways, from different positions, changing places. The first student performs a pass on the spot and moves to the place of the receiver, the second student performs the reception of the ball and moves to the place of another, etc. Pupils perform ten receptions and passes of the ball. The exercise is performed in series; multiple execution of a technical element; execution of several technical elements in a row; mobile games: "Third extra", "Sparrows and crows", "Running with proceeds", "Two camps", "Shoot the ball", "Running in teams", "Squads" along the lines with and without the ball" and others; sports games using a rugby ball (handball, basketball, soccer).

Means of endurance development: fartlek. Alternating running segments with maximum, high, moderate and low intensity; receiving and passing the ball in groups, repeatedly in motion. Different formations are used: in rows, opposite columns, shaped formations (triangle, square, star, circle); 6-minute run; execution of several team technical-tactical actions with increased intensity in a row; educational and training games with a longer duration; moving games: "Race with elimination", "Onslaught", "Be able to catch up"; sports games using a rugby ball (handball, basketball, football).

Means of strength development: performance of strength exercises by the circular training method; execution of passes of the stuffed ball in different ways; performance of strength exercises with a partner, in pairs; mobile games: "Rugby on your knees", "One by one", "Gladiators" and others; sports games using a weighted ball for rugby (handball, basketball). *Means of speed development*: running 10-30 m; running at maximum intensity with running around landmarks; low-intensity running, with a further start of 10 m (left, right) at the signal; repeated running of distances from 10 to 60 m with feints; educational and training games with a reduced composition and reduced time; mobile games: "Falling stick", "Onslaught", "Run with proceeds", "Call the number" and others; sports games using a rugby ball (handball, basketball, football).

The influence of the "Rugby-7" programme on the physical condition of girls aged 16-17 years

The effectiveness of the proposed "Rugby-7" programme was tested in the process of conducting a formative experiment. At the end of its implementation, a repeat examination was conducted to determine the morphofunctional state and indicators of physical fitness. The physical development assessment was based on the parameters of length, body weight, the proportions of the development of individual parts of the body, as well as the degree of development of the functional capacities of the body, first of all cardiovascular and respiratory systems. As G. Giorgi *et al.* (2020) and T. Liu (2022) noted, these systems depend on the differentiation and maturity of the cellular elements of organs and tissues, functional capabilities of the nervous system and endocrine apparatus. Historically, physical development has been assessed mainly by external morphological characteristics (Table 1).

Table 1. Average statistical values of indicators of physical development of girls aged 16-17

Quantity	Body length, cm	Body weight, kg	Quetelet index, g/cm
N = 19	169.39 ± 1.88	59.79 ± 2.11	310 ± 1.51

Source: created by the authors

Analysing parameters of physical development, it was found that 58% of girls had an average level of physical development, their body weight was normal; 37% of girls had an index below the average level of physical development, they had a body weight deficit; the remaining 5% had a higher-than-average level of physical development, their proper body weight exceeded the actual one. Obtained data confirms the results of investigation by M.C. Pascoe *et al.* (2020) and Y. Geng *et al.* (2023). This proves about availability of common tendencies in physical development of girls 16-17 years old in European region. The data received are somewhat inconsistent with the results obtained by Y. Geng *et al.* (2023). According to their data, the arithmetic mean of body length is 164.51 ± 1.75 cm, body weight is 55.63 ± 2.35 kg, the Quetelet index is 317 ± 2.15 g/cm.

One of the components of physical development is the functional capabilities of the body, which are determined by the activity of the cardiovascular and respiratory systems. Heart rate, systolic and diastolic arterial blood pressure and vital lung capacity were measured to evaluate the activity of the cardiorespiratory system. The rate of heart rate in an untrained person is in the range of 70-85 beats per minute (bpm). Analysing the obtained results of the rate of heart rate, it was evident that this rate was within the normal range for most girls (Table 2).

Table 2. Average statistical values of functional indicators of the cardiovascular system of the studied girls

Age	*N*	Heart rate at rest, bpm^{-1}		Systolic blood pressure, mm Hg		Diastolic blood pressure, mm Hg	
		$\bar{X}$	*S*	$\bar{X}$	*S*	$\bar{X}$	*S*
16-17	19	78.28	2.58	113.11	1.66	73.06	1.66

Note: $\bar{X}$ – arithmetic mean; *S* – mean square deviation
Source: created by the authors

There were some statistical differences with the data obtained by T. Krutsevich *et al.* (2019) and C.A. Webster *et al.* (2021). Data obtained by T. Krutsevich *et al.* (2019) show that resting heart rate in high school age girls is 83.22 ± 3.21 bpm, systolic blood pressure is 118.21 ± 3.71 mm Hg, diastolic arterial pressure – 76.51 ± 2.83 mm Hg. The author noted that the functional state of the cardiovascular system of teenagers and young people is not only the main indicator of health, it is of exceptional importance in the body's adaptation to physical exertion and is one of the main indicators of the body's functional capabilities. At the same level of exercise, the heart rate of women is higher than that of men. The scientist emphasised that this is due to a lower concentration of haemoglobin in the blood of women who have reached sexual maturity. The degree of relative tachycardia of women ranges from 10 to 20 bpm. C.A. Webster *et al.* (2021) conducted research on the functional state of schoolchildren who, due to quarantine restrictions during the COVID-19 pandemic, were on distance learning (physical education lessons were conducted online). The obtained results indicate deterioration of indicators of the functional state of the cardiovascular system of girls aged 15-17. An 8-12% increase in heart rate during absolute and relative rest was observed. As for the blood pressure indicators, they had minor fluctuations from the norm. The analysis of the obtained data showed that blood pressure is within the physiological norm, which should be 110-120/60-85 mm Hg. The vital capacity of the lungs of the observed girls was in the range of 2,500-2,700 mm, which corresponded to the average values of this age group of girls (Table 3). Obtained data as for functional condition of cardiorespiratory system of pupils of high school age confirm the results of research by W. Thompson (2018) and M. Grasdalsmoen *et al.* (2020).

Table 3. Average statistical values of the functional indicators of the respiratory system of the subjects

Age	*N*	The vital capacity of the lungs, ml		Robinson's index, conventional units	
		$\bar{X}$	*S*	$\bar{X}$	*S*
16-17	19	2,492.22	144.41	88.48	3.61

Source: created by the authors

Using the Robinson index, as a characteristic of a person's aerobic capabilities, it was determined that 16% of schoolgirls had a high level, 31% had an average level, and 53% of girls had an above-average level. No deviations in the regulation of the cardiovascular system were detected (Fig. 1).

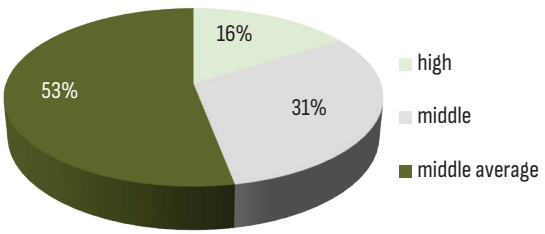

Figure 1. Indicators of the Robinson index level of girls aged 16-17
Source: created by the authors

A comparative analysis of the values of the results of the manifestation of individual motor abilities according to the results of the pedagogical testing of schoolgirls (Table 4) allows to state that in schoolgirls who are engaged in "Rugby-7" in extracurricular time, there is a positive dynamic of the results in the manifestation of motor abilities in the age aspect (compared to the beginning of the course occupations). The assessment of general endurance according to Cooper test showed that none of the girls has a low level of physical fitness. However, 31.25% of girls have a lower-than-average level, average – 50%, higher-than-average – 12.5% and high – 6.25% of the subjects.

Table 4. Average statistical indicators of pedagogical tests at the beginning and at the end of the observation course for girls aged 16-17

Test	Results	
	At the beginning	At the end
Running 30 m, s	6.59 ± 0.33	6.32 ± 0.20
Running 1,500 m, min	9.65 ± 1.83	9.53 ± 1.64
Long jump from a standing position, cm	187.22 ± 10.07	198.00 ± 10.90
"Shuttle" run 3×10 m, s	10.38 ± 0.26	10.07 ± 0.23
Flexion and extension of the arms in a supine position, repetitions	10.70 ± 3.40	13.00 ± 2.29
Cooper test, m	1,900 ± 250	2,100 ± 303
Leaning forward from a sitting position on the floor, cm	15.13 ± 2.01	17.34 ± 2.45

Source: created by the authors

Authors of the study considered it expedient to compare the data obtained regarding the physical fitness of 16-17-year-old girls with the results of other authors' research. M. Perehinets (2018), researching the physical condition of girls of high school age in various types of educational institutions, noted that the lack of physical activity affects physical fitness indicators. Only 36.7% of girls have a high level of competence, and 30.4% have an average level of competence. The results of indicators of development of speed, coordination and speed-power abilities were lower in comparison with authors' data. The exception is the "running 1,500 m" test, which was significantly higher (8 min 6 s ± 0.51) than in the group of girls studied by the authors of the study (9 min 53 s ± 1.64).

The obtained data confirm the results of research by T. Krutsevich *et al.* (2023), which noted that the analysis of indicators of physical fitness of high school students does not meet the requirements of modern society. According to the Ministry of Education and Science of Ukraine, 65.01% of students in the 2018-2019 academic year had an insufficient level of physical fitness, namely: 15.2% had a high level, 19.7% – sufficient, 12.3% – average and 52.8% – low. The authors noted that the modular programme for grades 10-11 contains 37 modules that can be used both in academic and extracurricular (sectional) classes. This is an innovative approach that will contribute to increasing the motivation of high school students to engage in physical culture and sports, which, in turn, will optimise their level of physical fitness. N. Moskalenko *et al.* (2020), analysing the methods of implementation of each key competence in the process of physical education of schoolchildren within the framework of the New Ukrainian School reform, also noted that the level of physical fitness of modern students does not correspond to the appropriate indicators. The authors believe that an integrative approach to the formation of key competencies in the process of physical education will allow to comprehensively solve the problem of increasing the level of development of physical abilities of students.

The received data to some extent confirm the results of the study by V. Vakhniak (2022) regarding the inadequate level of physical fitness of girls of high school age. The researcher noted that the cancellation of the assessment for the dynamics of the development of physical qualities and indicative educational standards had a negative impact on motor activity, physical fitness and, as a result, significantly reduced the level of physical health of students. The authors emphasise that the model curriculum "Physical culture 10-11 grades" has a significant number of modules, but the programmes for most of them need significant revision. The distribution of the obtained results of physical fitness according to the rating tables in percentages is given in Table 5.

Table 5. Distribution of the obtained indicators of physical fitness of girls aged 16-17 at the beginning of the experiment according to evaluation tables, %

Test / Level	High	Sufficient	Average	Low
Running 30 m	46.68%	16.66%	36.66%	–
Running 1,500 m	45.01%	20.00%	34.99%	–
Standing long jump	16.65%	58.35%	15.61%	9.39%
"Shuttle" run 3×10 m	8.33%	16.65%	58.35%	16.67%
Leaning forward from a sitting position	9.41%	18.32%	38.34%	33.93%

Source: created by the authors

At the end of the study, pedagogical testing was conducted again in order to compare with the results obtained at the beginning of the study and to determine whether there was an improvement in the level of physical fitness of high school girls. The average statistical values of the results of pedagogical testing of schoolgirls who played "Rugby-7" have improved and have reliable differences in such motor tests as "running 30 m", "shuttle run 3×10 m" and "long jump from a standing position" ($p < 0.05$). In particular, a significant improvement of the results by 8.7% was recorded in the indicators of speed abilities (running 30 m). Indicators of such a component of coordination abilities as the ability to estimate space-time parameters of movement also had positive dynamics, the rate of growth was 7.6%. Indicators of speed-power abilities improved by 5.8%. Table 6 shows the results of pedagogical testing at the end of the experiment.

Table 6. Distribution of the obtained indicators of physical fitness of girls aged 16-17 years after the experiment, %

Test / Level	High	Sufficient	Average	Low
Running 30 m	76.66%	16.66%	6.68%	–
Running 1,500 m	75.01%	16.66%	8.33%	–
Standing long jump	39.98%	47.69%	12.33%	–
"Shuttle" run 3×10 m	26.61%	58.31%	10.31%	4.77%
Leaning forward from a sitting position	16.51%	66.68%	9.36%	7.45%

Source: created by the authors

It can be stated that there have been positive changes in the distribution of the obtained indicators according to the levels of physical fitness of the studied contingent. At the beginning of the experiment, according to the evaluation tables, a high level of manifestation of speed abilities was recorded in 46.68% of the subjects, sufficient – 16.66%, average – 36.64%. At the end of the experiment, a high level of speed development was already recorded in 76.66%, sufficient in 16.64%, and average only in 6.68% of the contingent. Similar trends were recorded in dynamic endurance indicators: at the beginning of the experiment, a high level was observed in 45.01% of girls, a sufficient level in 20.00%, and an average level in 34.99%. At the end of the experiment, 75.01% of female students achieved a high level, a sufficient level was observed in 16.66%, and an average level of endurance was recorded in 8.33% of girls.

A high level of development of speed and strength abilities at the beginning of the experiment was recorded in 16.65% of girls, a sufficient level in 58.35%, an average level in 15.61% and a low level in 9.39% of the researched ones. After the end of the experiment, there was an improvement in the level of manifestation of this ability (high level 39.98%, sufficient 47.69%, average 12.33, low level was not detected. The distribution of indicators by the level of development of coordination abilities at the beginning of the experiment was as follows: high level – 8.33%, sufficient – 16.65%, average – 58.35%, low – 16.67%. After the end of the experiment, positive dynamics in the development of dexterity were also observed (high level 26.61%, sufficient 58.31%, average 10.31%, low 4.77%). There were also positive changes in the indicators of the development of spinal flexibility (leaning forward from a sitting position). At the beginning of the experiment, the following data were obtained: high level of development – 9.41%, sufficient – 18.32%, average – 38.34%, low – 33.93%. After the end of the experiment, the level of flexibility improved significantly (a high level of manifestation was recorded in 16.51% of girls, sufficient in 66.68%, average in 9.36%, low in 7.45%). Therefore, a comparison of the results of the motor tests of high school girls playing "Rugby-7" at the beginning and at the end of the experiment allows to claim a general improvement in the indicators, but the greatest growth rates were recorded in the manifestation of dexterity, speed and speed-power abilities.

Conclusions

The analysis of special literature devoted to the problem of the effectiveness of using "Rugby-7" classes with girls of high school age shows that these classes are a new and effective type of physical exercise, which is gaining more and more popularity both abroad and in Ukraine. However, despite this, in the special literature there are only episodic data on the organisation and methods of conducting health-oriented classes using rugby equipment, which necessitated the development of the "Rugby-7" programme for sectional classes, which included: the goal, tasks, principles of programme implementation, its thematic planning, expected results, control standards. The developed programme was implemented into extracurricular work of physical education with girls 16-17 years old.

During the research of the parameters of the physical condition of girls aged 16-17 under the influence of the "Rugby-7" course, the positive dynamics of some indicators were found. Thus, the indicators of the harmony of the physique indicate that 12.5% of the girls had normalised their body weight, which significantly reduced the number of subjects who were overweight. The condition of the body's functional systems also improved, especially the cardiovascular system (heart rate at rest). If at the beginning of the experiment the average arithmetic value of this indicator was 78.3 bpm^{-1}, then after the experiment this indicator decreased to 76.7 bpm. Repeated assessment of dynamic endurance according to Cooper test showed that 31.3% of the studied girls showed an improvement in indicators.

Conducting extracurricular "Rugby-7" classes contributed to a statistically significant increase in indicators of the morphofunctional state and physical fitness of high school-aged girls. A low level of physical fitness was not recorded, 7.6% of girls had a lower-than-average level, an average

level was recorded in 22.0%, an above average level in 26.6% of schoolgirls, and a high level was found in 43.7% of the subjects. Prospects for further research will be to determine the impact of the "Rugby-7" physical culture and health programme on the level of physical health of high school girls.

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Conflict of Interest

None.

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Оптимізація фізичного стану дівчат старшого шкільного віку засобами нових видів рухової активності (на прикладі «Регбі-7»)

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Анотація. У процес фізичного виховання старшокласників впровадженні модельні навчальні програми, які включають як традиційні, так й інноваційні види рухової активності. Зокрема представлена варіативна програма «Регбі-7», але зміст і спрямованість секційних занять відрізняється від уроків фізичної культури, що обумовило мету роботи: обґрунтувати й розробити організаційно-методичні засади занять із пріоритетним використанням «Регбі-7» у процесі позакласної (секційної) роботи та визначити їх вплив на морфофункціональний стан і фізичну підготовленість дівчат старшого шкільного віку (16-17 років). Для оцінки фізичного розвитку використано метод антропометрії. Гармонійність тілобудови визначалася за допомогою методу індексів. Функціональний стан кардіореспіраторної системи визначався пульсометрією, тонометрією, спірометрією. Аеробні можливості досліджені за допомогою індексу Робінсона. Оцінка фізичної підготовленості відбувалась у процесі педагогічного тестування. Розроблено програму «Регбі-7» для секційних занять із дівчатами старшого шкільного віку. Організаційно-методичні особливості секційних занять із пріоритетним використанням «Регбі-7» були висвітлені в розробленій програмі, яка включає: мету, завдання, принципи її реалізації (комплексності, наступності, варіативності), зміст, контрольні нормативи. Ефективність запропонованої програми перевірена в процесі формувального експерименту. У кінці його проведення було здійснено повторне обстеження для визначення показників морфофункціонального стану і фізичної підготовленості дівчат. Порівняльний аналіз показників фізичного розвитку й функціонального стану дівчат до та після експерименту свідчить про їх позитивну динаміку. Порівняння результатів фізичної підготовленості дозволило стверджувати про загальне покращення показників. Найбільші темпи приросту зафіксовано в прояві швидкісно-силових, координаційних здібностей та швидкості. Отримані дані засвідчили ефективність розробленої програми позаурочних занять і можуть бути застосовані вчителями фізичної культури в позаурочній роботі

Ключові слова: учениці 16-17 років; програма позаурочних занять; спортивні ігри; рухові якості; морфофункціональний стан