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Університет Григорія Сковороди в Переяславі
08401, вул. Сухомлинського, 30, м. Переяслав, Україна
Тел.: +380 (44) 293-11-10
E-mail: info@tppcs.com.ua
https://tppcs.com.ua/

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Editors office address:
Hryhorii Skovoroda University in Pereiaslav
08401, 30 Sukhomlynskyi Str., Pereiaslav, Ukraine
Tel.: +380 (44) 293-11-10
E-mail: info@tppcs.com.ua
https://tppcs.com.ua/

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Improving the technique of performing elements of sports dance for dancers aged 15-16 at the stage of specialised basic training

Nataliia Moskalenko*

Doctor of Physical Education and Sport, Professor
Prydniprovsk State Academy of Physical Culture and Sport
49094, 10 Naberezhna Peremohy Str., Dnipro, Ukraine
https://orcid.org/0000-0001-9162-5206

Oksana Demidova

PhD in Physical Education and Sport, Associate Professor
Prydniprovsk State Academy of Physical Culture and Sport
49094, 10 Naberezhna Peremohy Str., Dnipro, Ukraine
https://orcid.org/0000-0002-8524-5095

Olena Kosheleva

PhD in Physical Education and Sport, Associate Professor
Prydniprovsk State Academy of Physical Culture and Sport
49094, 10 Naberezhna Peremohy Str., Dnipro, Ukraine
https://orcid.org/0000-0002-9085-6800

Tetiana Sydorchuk

PhD in Physical Education and Sport, Associate Professor
Prydniprovsk State Academy of Physical Culture and Sport
49094, 10 Naberezhna Peremohy Str., Dnipro, Ukraine
https://orcid.org/0000-0001-7129-1616

Iryna Stepanova

PhD in Physical Education and Sport, Associate Professor
Prydniprovsk State Academy of Physical Culture and Sport
49094, 10 Naberezhna Peremohy Str., Dnipro, Ukraine
https://orcid.org/0000-0002-5431-8052

Abstract. The specificity of modern competitive dances requires a high level of preparedness, the ability to maintain maximum concentration, precise execution of dynamic movements and their biomechanical optimisation. A special role in the construction of the training process is attributed to the technical execution of elements within the European dance programme. Therefore, the purpose of the study was to scientifically substantiate the improvement of the technique of the dance elements of the European programme and to create corresponding training methods for dancers aged 15-16 at the stage of specialised basic training. The research involved 40 athletes aged 15-16 of category C according to the regulations of the International Dance Sport Association. The level of specialised training was determined through expert evaluation of the components of five types of competitive activities. Training session models were developed with the aim of improving motor skills and improve technical mastery the performance of dance elements of the European dance programme. According to the developed model, each session involved the combined use of physical and technical training methods by selecting comprehensive "blocks" of exercises that addressed additional physical conditioning tasks, and "blocks" of selected foundational exercises and individual figures from the European dance programme aimed at

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*Corresponding author

refining the technical preparedness. It was found that it is advisable to apply various foundational exercises, elements of dance figures at different tempos with fixation of points in the respective positions, swing movements and steps in balance and semi-balance with movement in different directions, to refine sways and shapes, and to use various jumps and running step variations: a run corresponding to the conditions of competitive dance execution and a run during which an additional dance is performed between each dance, depending on the focus of the session. The research findings can assist experts in sports dancing in improving the training process for dancers

Keywords: models of training classes; the European programme; couples; swing; balance; semi-balance

Introduction

Sport dance is continuously gaining popularity among different groups of the population. It represents a special kind of creative activity that tightly combines sport and art. In 2023, sports dancing is not just an art; it is a highly popular sport that captivates with its beauty and complexity and continues to evolve. Such performances require from dancers a sufficiently high level of different types of preparedness. As experts point out, different types of preparedness in the process of sports training in a competitive activity are not implemented in isolation. The improvement of physical preparedness contributes to increasing the level of technical skill, and together they contribute to high tactical and psychological preparedness. This is expressed in effective competitive activity. Many experts in their studies depict the development of sports dancing, looking for opportunities to enhance dancers' skills.

Y. Husak & V. Vorona (2021) in their research have identified that after the recognition of sports dancing as a type of sport, several directions have emerged regarding their use in the field of physical culture and sports. For educational institutions of various types, scientists have developed programmes and methodologies for the implementation of sports dancing elements in the physical education of preschool and school-age children. Elements of sports dancing are applied in the training of athletes in certain complex coordination sports. O. Lavrentiev *et al.* (2023) considered the issues of specialised physical training for dancer-athletes. The research determined that in order to improve dancers' skills and ensure successful performances in competitions, it is necessary not only to enhance but also to maintain their physical fitness. For this purpose, when structuring the training process, attention should be paid to both sets of general physical exercises and sets of specific exercises. In the research conducted by S. Veselkina & I. Soronovich (2018), issues related to the formation of blocks (modules) of training exercises with the most effective elements of fitness technologies are revealed. Each of the modules solves certain tasks of physical training and creates prerequisites for successful sports activities for the dancer. Based on the modules, the structure of the training session has been developed, suggesting the integration of these modules into a system of training sessions. T. Osadtsiv *et al.* (2022) presented the results of the study on the specifics of sports activities in ballroom dancing and considered the issue of monitoring the technical preparedness of dance couples. The study examined issues related to improving the system for monitoring the technical preparedness of athlete-dancers aged 12-13 years.

T. Rebrikova (2023) explored the impact of ballroom dancing sessions on an individual's physical health. The research results indicated that ballroom dancing has a beneficial effect on several aspects of health. The elements of sports ballroom dancing, which engage a large number of muscle groups and cognitive functions, can become more effective compared to traditional physical education lessons. I. Grygus *et al.* (2023) used factor analysis to calculate the correlation of measures to be implemented in the process of dancing for the prevention and correction of posture disorders. D. Zhao (2023) recommended implementing exercises during training to reduce injuries. M.G. Vaccaro *et al.* (2019) conducted research where they studied the effect of dance classes on the physical condition of elderly people. The participants involved in the study attended dance classes 4 times a week for a period of 6 months. Based on the research findings, it was determined that social dance sessions can slow down the ageing process and enhance the socialisation of elderly people. L. Teixeira-Machado *et al.* (2019) demonstrated in their research that individuals engaged in sports dancing have shown improvements in memory, attention, body balance, and psychosocial parameters. The study determined which dances are able to change brain volumes and structures, brain functions, psychomotor adaptation, and levels of neurotrophic factors.

The analysis of literary sources indicated that experts in their studies offered methods to enhance dancers' technical preparation or focused on determining the impact of sports dancing on the human body. However, the studies insufficiently addressed the issues concerning the methods that would help dancers improve the technique of performing dance elements at different stages of training. This led to research in order to find new possible ways to optimise the process of physical and technical training of dancers at the stage of specialised basic training. One possible solution to this issue could be to improve the technical elements of dances of the European programme. The purpose of the study was to scientifically substantiate the methodology of training dancers aged 15-16 aimed at improving the technique of performing dance elements of the European programme at the stage of specialised basic training.

Materials and Methods

Forty dancers, ages 15 to 16, took part in the study. According to the competition guidelines of the International Sports Dance Association, all dancers had class C. The control group (CG) comprised 10 boys and 10 girls, and the basic group (BG) had an identical number of participants. An equal number of boys and girls represented the sample because the research was conducted among dance couples. The study was conducted in Dnipro (Ukraine) based on the sports dance clubs "Elita", "Astra" during 2021-2022. In the BG, the classes were conducted according to the models of training classes developed for it. Models of training sessions

were aimed at developing motor qualities and improving the technical skills of dancers performing elements of the European dance programme. The training models were applied during the preparation period of the basic mesocycle at the stage of specialised basic training. The CG studied according to the curriculum of sports dance clubs. The peculiarity of the training lessons for the BG was the combined use of dancers' physical and technical training means. The dancers' parents gave informed consent to participate in the testing. To protect the health of research participants before and during testing, safety requirements regarding material and technical conditions and the suitability of premises for testing were observed. The study was conducted according to the ethical norms of the Declaration of Helsinki (2013).

The level of dancers' physical preparedness was determined by tests: "Standing long jump, cm", "Push-ups, repetitions", "10-seconds squats, repetitions", "Pump-ups, repetitions", "Gymnastic bridge, cm", "Gymnastic twine, cm", "Foot extension, sitting, cm", "Twist of the gymnastic stick, cm", "15 m run, forward and backwards, s", "Romberg test, s", "Turning 360º on a gymnastic bench in 20 s, repetitions". The determination of special preparedness level was based on an expert assessment of the components of the five types of competitive activities, which were carried out in compliance with the regulations of sports dance competitions. Dance compositions from the basic figures of the European programme were used as special exercises. The work was evaluated by 15 experts – three experts for each component of the dance. The evaluation was conducted on a 5-point scale. The highest score was 5 points, the lowest one was 1 point.

Five components were assessed. Tempo: the degree of steps speed and body movement for a deeper musical filling typical for this dance. The basic rhythm: the performance of dance steps and body movements in accordance with the rhythmic structure of the main figures and elements that are typical for this dance. Body lines: the couple's correct and elegant lines, which correspond to the choreography of ballroom sports dancing. Movement: balance, leading, amplitude and volume of the movement in accordance with the basic rhythmic structure of figures, elements, technical actions and the nature of ballroom dancing. Rhythmic interpretation: clear expressiveness in the middle of a beat, artistry. Footwork: feet positions; weight distribution on the supporting foot; the direction of legs movement in relation to the body in accordance with the drawing of the figure or element that is being performed; contrary body movement; control of the swing leg movement; placing the feet on a toe, of the foot pad, on the heel, flat – in accordance with the description of figures, elements and technical actions; leg work for lift the body, which is done with raising the foot or without raising the foot; a condition of a swinging and basic leg (straight, bent); the state of the feet in the process of movement according to the dance technique that is performed. The dance classes were held 3 times per week, each class lasted for 90 minutes.

The study results were analysed using statistics on a personal computer using the application statistics package of automated data processing systems STATISTICA 6.0, as well as the spreadsheet editor Excel for Mac-2015. The probability of differences was assessed by the Mann-Whitney U test. The relationships and informativeness of physical preparedness indicators were determined by Spearman rank correlation analysis. The agreement of experts in the assessment of special preparedness was established by the Kendall's coefficient of concordance.

Results

Models of training sessions were proposed in the BG to improve the technical elements of dances of the European programme. The models of training sessions were aimed at the development of motor qualities of dancers and at increasing the technique of dance elements. The peculiarity of the developed models was combined use of physical and technical training means. It allowed to improve the technique of performing separate dance elements; to increase the dancers' special physical preparedness; vary physical loads; reduce fatigue of the higher neuro-motor functions of movement control, which had a positive effect on the technical performance of dance elements. Data analysis of the ascertaining research showed that the dancers of the CG and BG had no differences in physical and special preparedness. The results are shown in Table 1.

Table 1. Assessment of the special preparedness of dancers aged 15-16 when performing the dances of the European programme

Dance name	CG (*N* = 10)		BG (*N* = 10)	
	BR	FR	BR	FR
	M ± *SD*	*M* ± *SD*	*M* ± *SD*	*M* ± *SD*
W	44.60 ± 1.09	50.40 ± 0.58	45.90 ± 0.48	53.90 ± 0.90
T	43.80 ± 0.49	47.60 ± 0.68	46.00 ± 0.42	50.60 ± 0.92
V	45.80 ± 0.98	45.60 ± 0.68	45.70 ± 0.65	52.90 ± 1.01
F	47.70 ± 0.52	49.00 ± 0.69	45.20 ± 0.47	50.50 ± 0.87
Q	47.10 ± 0.40	50.20 ± 0.63	47.10 ± 0.29	54.10 ± 0.53
Overall score	229.70 ± 2.86	232.80 ± 2.60	229.70 ± 1.95	262.00 ± 2.96*

Note: *N* – number of dancing couples; BR – beginning of the research; FR – finish of the research; W – slow waltz; T – tango; V – Viennese waltz; F – slow foxtrot; Q – quickstep; * – *p* value, $p < 0.05$

Source: calculated by the authors

The correlation of different levels of significance between the indicators of their separate physical qualities and the forms of their manifestation was determined with the aim of rational selection of means and methods of technical and physical training of dancers. Correlation analysis showed that a large number of statistically significant relationships ($p < 0.05$) belonged to the explosive force, which correlated with strength endurance, speed-strength

and coordination abilities, and mobility of the hip joints (r from −0.523 to 0.906) in boys aged 15-16. Probable positive relationships ($p < 0.05$) were observed among flexibility indicators. Specifically, between the mobility of the ankle joints and mobility in the hip joints (r from 0.801 to 0.948). Hip mobility had inverse relationships ($p < 0.05$) of varying significance with the strength endurance of different muscle groups (r from −0.523 to −0.523). Probable inverse relationships ($r < 0.05$) of different significance were determined between the ability to orient in space with power endurance, explosive power, speed and power abilities, static and dynamic balance (r from −0.530 to −0.886). Speed and power abilities had close probable ($p < 0.05$) relationships with strength endurance, and explosive power (r from 0.544 to 0.849).

A large number of statistically significant relationships ($p < 0.05$) belonged to the indicators of explosive power and strength endurance, speed-strength, and coordination abilities (r from −0.554 to 0.762) in girls aged 15-16. Speed-power abilities had close probable ($p < 0.05$) interrelations with force endurance and explosive force (r from −0.551 to 0.623). Probably positive and inverse relationships ($p < 0.05$) are observed between flexibility and the mobility of the ankle joints and various physical qualities and abilities in girls as well as in boys. These were: explosive force, speed-power abilities, and mobility in the hip joints (r from −0.558 to 0.633). Mobility in the hip joints had positive relationships ($p < 0.05$) of varying significance with strength endurance of different muscle groups (r from 0.519 to 0.645). Also in girls, as well as in boys, there were positive and inverse relationships ($p < 0.05$) of different significance between the ability to navigate in space with strength endurance, explosive power, speed and power abilities, static and dynamic balance (r from −0.515 to −0.863). There were almost no relationships between mobility in the ankle and spine joints, hip and shoulder joints, both in girls and boys.

Correlation analysis showed the significant importance of speed-power abilities in young men who go in for sports dances. Using exercises that are aimed at developing speed-strength, coordination abilities, and flexibility was advisable during one training class for young men. A significant importance has been defined in the level of explosive strength in girls aged 15-16 who participate in the sports dancing. Using exercises that are aimed at developing strength endurance and coordination abilities was recommended during one training class for girls. In addition, it is necessary for both boys and girls to develop mobility in all joints during the training session.

The data obtained during the correlation analysis and determining the level of dancers' preparedness allowed to develop models of training sessions. These models were aimed at developing motor skills and improving the technical skills of performing dance elements of the European dance programme. They formed the basis for the construction of the training process among dancers aged 15-16 in the preparatory period of the basic mesocycle at the stage of specialised basic training. According to the developed models, there was a combined use of means of physical and technical training at each lesson. Various comprehensive "blocks" of the physical load were selected for the dancers. Additional tasks of physical training were solved in some "blocks" of the physical load. Leading exercises and separate figures of the dances of the European programme were selected in other "blocks" of the physical load. This helped to improve the dancers' technical proficiency. Classes were aimed at studying and improving the technique of complex coordination motor actions in the European dance programme. The tasks of increasing the level of strength, special endurance, coordination, flexibility, and expanding the adaptive capabilities of the aerobic energy resources of the dancers' organisms were solved at the lessons. Increasing the aerobic productivity of the dancers aged 15-16 during training was provided by a constant change in the direction of the physical load.

The training class for the European dance programme consisted of preparatory, main, and final parts. The preparatory part lasted 20 minutes. During the preparatory part, choreography exercises were performed. The heart rate during the exercises was in the range of 100-130 beats per minute (bpm). The main part of the lesson consisted of three blocks. In the first block, elements of one of the dances of the European programme (W, T, V, F, Q) were performed to improve the technical elements, depending on the objectives of the lesson. The first block lasted 25 minutes. Leading exercises to improve technical elements were selected. Elements of the figures were performed at different tempos, with a fixation of points and an accent of attention. Attention was focused when holding the lines of the body, when performing a swing movement, when working out the swing and shape, when Man and Lady were standing in the correct position in the couple, and when working with the foot. When mastering and practicing dance elements, the technique of performing exercises in whole and in part was used.

Almost all dances in the European programme except tango dance are sometimes called "swing dances". Swing in dance, often called pendulum motion, is important for elegant dance with good balance. Studies by T. Shioya (2018) have shown that swing does not depend on the length and weight of the dancer. To perform the swing movement correctly, it is necessary to use the muscles and correct feet work. H. Smith-Hampshire (1996) noted that when performing dances such as slow waltz, Viennese waltz, foxtrot and quickstep, it is necessary to make sure that the feet are elastic and in a good muscle tone. The feet should keep parallel lines. It is necessary to define clearly the trajectory of movement and the rhythmic performance of the movement in music. The position in the couple and the smoothness of the movement are important as well as the creation of the movement impulse using the body swing method.

To improve the technique of performing figures in addition to figures of competitive variations, dancers practiced basic dance figures in the first block of the training model: slow waltz (natural turn, reverse turn, natural spin turn, double back spin); Viennese waltz (natural turn, reverse turn); quickstep (natural pivot turn, lockstep forward, lockstep back, running turn); foxtrot (feather step, three steps, natural rotation, reverse rotation). The basic figures were performed both separately and combined in educational variations. H. Smith-Hampshire (1996) indicated the body swing method of movement depends on the correct balance of the body to leverage the effect of gravity as an auxiliary element for movement during the execution of

steps by controlling the conscious synchronous use of the propulsive power of the supporting leg and foot.

For the correct work of the foot in the first block, soft ascents and descents were practiced both in couples and individually. When performing dance steps, attention was concentrated on the work of the dancer's foot: the foot should pass by the other foot with the "brush"; when moving from one position to another, the feet should remain parallel from one to another and not deviate outward. To increase the tone of the leg muscles, strengthen the foot muscles, and develop lightness and jumping, the dancers were asked to perform a variety of jumps with a skipping rope and force weights, as well as options for syncopated jumps from the quickstep dance.

Due to the movement in standard dances having a specific orientation in the hall for each figure, the execution of both separate figures and the connection of the figures with the observation of the necessary body and foot turns while moving along an oriented trajectory were practiced before performing one or another variation in the first block. Attention was paid to maintain perfect balance. To develop a sense of balance, the dancers were recommended to perform rolls from toe to heel across the entire foot, while it was necessary to maintain the correct position of the body, which is typical for the Man and for the Lady. The dancers performed steps in balance and in semi-balance with movement in front and back. In performing these steps, much attention was paid to the work of the foot and knees. The exercise was performed both individually and in couple. To maintain and improve balance, the dancers kept a book or similar object on their heads while dancing basic figures in one or more dances.

For the correct placement in the dance couple of one partner in relation to the other, exercises that are aimed at maintaining contact and keeping a balanced position in the dance couple were performed. Furthermore, for the correct acceptance of the position in the couple, the dancers repeatedly stood in the correct individual position before the practice of variations of a particular dance began. For perfect technical performance of figures in swing dances, the Man must achieve the correct feeling in the knees, namely the feeling of vertical "stretching" and increased muscle tone, but there should be no tension or stiffness at any point of maximum rise. In order to achieve this feeling, as an exercise, the dancers were asked to bring their knees back as much as possible, then relax their knees and bring them forward slightly. The exercise was performed both individually and as a couple.

An important factor in achieving the body's natural response to the centrifugal force of the figures where rotations are used is the flexibility of the Lady's back. Therefore, in the first block of the final part of the training class, exercises were performed to develop flexibility. In addition, in the first block of the main part, such exercises as sway (lateral deviation of the dancers' bodies, when the Man and the Lady not only keep their balance but also create a spectacular appearance) and oversway (movement created on the basis of the dance element of the sway) were used (Pavliuk, 2018). Attention was paid to how the Man was able to demonstrate the line of the Lady. The exercises aimed at the ability of a dance couple to maintain volume (working out the shape) were selected.

An important aspect of improving the technique of performing elements of the European programme dances was the achievement of smoothness in the performance of these elements by the dancers. H. Smith-Hampshire (1996) indicated that smoothness of movement should be achieved when the dancer is moving over the floor from one leg to the other. It is necessary for the dancer to achieve smoothness of rotational movement (turns and spins), smoothness of body rise and fall, and smoothness of body vertical axis deviation from the perpendicular. In the BG, during training, each type of smoothness was practiced both independently, with the help of leading exercises and the performance of individual poses and dance elements, and during the performance of educational and competitive variations.

The level of dancers' technical skills depends on their physical preparedness and functional reserves of the body. Therefore, the second block was aimed at the development of physical qualities and the expansion of the adaptive and functional capabilities of the body. The duration of the second block was 20 minutes. The content of the second block depended on the tasks of the training class and on the content of the first block. This allowed to pay attention to the improvement of the technique of some dance elements. During the second block, there were two "training laps" of the European programme. The first "training lap" consisted of five dances: slow waltz, tango, Viennese waltz, foxtrot, and quickstep. Each dance was performed for 90 seconds. There was a 30-second break between the dances. After the first dance, the dancers did flexibility exercises for five minutes, which promoted partial recovery and improved muscle elasticity. During the second "training lap", the dancers performed the European programme dances, but the choice of the dance depended on the physical qualities the dancers needed to develop during a particular training session. The break between the dances was 30 seconds. During these 30 seconds, the dancers performed walking and breathing exercises.

During the second "training lap", a Viennese waltz was performed for 60 seconds to improve the dancers' coordination abilities and their vestibular apparatus. Quickstep was performed for 90 seconds after each dance to improve the dancers' speed skills. A slow foxtrot or tango was performed for 90 seconds after each dance to develop the dancers' sense of spatial orientation and rhythmic interpretation. A slow waltz was performed for 90 seconds after each dance to improve the dancers' body line and footwork. In the second block, in addition to improving the technique of performing the elements of a particular dance in a variation, the issues of revealing the aerobic mechanisms of the dancers were addressed. This allowed them to increase the level of their endurance. To develop special endurance in the second block during the second "training lap", a force weights in separate training sessions were used.

The third block of the main part (lasting 10 minutes) was aimed at developing dynamic balance. Dancers performed translational, rotational movements, pivots, both in a couple and individually. The final part of the lesson consisted of two blocks. The first block lasted seven minutes. During the first block, the dancers performed exercises to develop flexibility. The heart rate of the dancers was 100-130 bpm. In the second block, breathing exercises and relaxation exercises were selected. This helped to restore the dancers and relieve tension after intense training.

The heart rate of the dancers during the second block of the final part was 80-100 bpm. To substantiate the improvement of the technique of performing elements of the European programme dances, a comparative analysis of the physical and technical preparedness of dancers aged 15-16 in CG and BG before and after the research was conducted. The results of the formative research showed that there are differences among a number of indicators of the physical preparedness of boys and girls 15-16 years old in CG and BG (Table 2).

Table 2. Indicators of physical preparedness of dancers aged 15-16 in the BG and CG before and after the research

Test event	Boys						Girls					
	CG (*N* = 10)			BG (*N* = 10)			CG (*N* = 10)			BG (*N* = 10)		
	BR	FR	*p*	BR	FR	*p*	BR	FR	*p*	BR	FR	*p*
	M±SD	*M±SD*		*M±SD*	*M±SD*		*M±SD*	*M±SD*		*M±SD*	*M±SD*	
Standing long jump, cm	198.00±6.86	206.02±5.75	<0.05	199.30±3.88	224.50±3.28	<0.05	162.75±1.69	165.90±3.15	<0.05	162.10±1.76	173.80±1.96	<0.05
Push-ups, repetitions	29.60±4.69	30.80±1.69	*ns*	30.50±1.48	36.10±2.21	<0.05	8.80±0.58	9.00±0.50	*ns*	9.50±0.70	10.60±0.55	<0.05
Pump-ups, repetitions	41.90±1.43	44.50±3.91	<0.05	42.10±4.19	52.90±4.86	<0.05	37.40±2.37	40.10±2.67	<0.05	37.40±2.39	40.40±3.14	<0.05
10-seconds squats, repetitions	10.50±0.39	11.60±0.32	*ns*	11.80±0.60	14.40±0.32	<0.01	9.40±0.23	9.90±0.26	*ns*	9.30±0.32	12.40±0.23	<0.01
Gymnastic bridge, cm	53.70±1.91	52.60±1.84	*ns*	53.10±2.35	46.10±2.06	<0.05	35.84±2.54	34.50±2.42	*ns*	33.90±2.10	31.00±1.83	<0.05
Gymnastic twine, cm	30.30±1.91	29.0±2.37	*ns*	29.60±2.02	25.55±2.95	<0.05	10.70±1.08	9.90±0.91	*ns*	9.60±0.74	7.20±0.73	<0.01
Foot extension, sitting, cm	9.20±0.34	8.70±0.27	*ns*	9.05±0.74	7.20±0.66	<0.01	6.45±0.49	6.20±0.47	*ns*	6.40±0.32	4.85±0.31	<0.01
Twist of the gymnastic stick, cm	75.44±1.35	73.58±5.92	*ns*	74.30±3.98	67.90±4.96	<0.05	51.05±0.93	50.17±1.63	*ns*	52.10±1.20	47.50±1.17	<0.05
Romberg test, s	20.00±1.68	21.20±2.08	*ns*	21.30±1.85	28.10±1.79	<0.01	21.30±1.60	20.70±1.85	*ns*	22.70±1.55	26.60±1.31	<0.05
15 m run, forward and backwards, s	1.24±0.07	1.20±0.06	*ns*	1.21±0.05	0.99±0.05	<0.01	1.12±0.10	1.10±0.09	*ns*	1.15±0.05	1.04±0.06	<0.05
Turning 360º on a gymnastic bench in 20 s, repetitions	4.10±0.17	4.65±0.16	*ns*	4.45±0.21	5.25±0.28	<0.05	4.75±0.32	4.95±0.27	*ns*	5.10±0.32	5.90±0.28	<0.05

Note: BR – beginning of the research; FR – finish of the research; *ns* – not significant; *N* – number of persons
Source: calculated by the authors

Analysis of the results showed that by the end of the research the dancers in the BG had statistically significant changes in the following tests: "Standing long jump" – for girls by 7.22% ($p < 0.05$), for boys by 12.64% ($p < 0.05$); "Pump-ups" – for boys by 20.41% ($p < 0.05$); "10-seconds squats" – for girls by 25.00% ($p < 0.01$), for boys by 18.05% ($p < 0.01$); "Gymnastic bridge" – for boys by 15.18% ($p < 0.05$), "Gymnastic twine" – for girls by 33.33% ($p < 0.01$), for boys by 15.86% ($p < 0.05$); "Foot extension, sitting" – in girls by 31.96% ($p < 0.01$), in boys by 25.69% ($p < 0.01$); "Romberg test" – in boys by 24.20% ($p < 0.01$); "15 m run, forward and backwards" – in girls by 10.58% ($p < 0.05$), boys by 22.22% ($p < 0.01$); "Turning 360º on a gymnastic bench in 20 s" – for girls by 13.56% ($p < 0.05$), boys by 15.23% ($p < 0.05$). The dancers in the CG had statistically significant changes in tests: "Standing long jump" – in boys by 4.05% ($p < 0.05$), "Pump-ups" – in girls by 7.21% ($p < 0.05$), in boys by 6.21% ($p < 0.05$), which is a predicTable result because at the age of 15-16, favourable conditions for the development of strength and speed-power abilities continue.

By the end of the study, dancers aged 15-16 showed statistically significant differences in scores, both among individual dances and in the total amount. Data analysis in the beginning and at the end of the research showed that the dancers of the BG had a statistically significant increase in indicators of special preparedness. The overall score for five dances of the European programme in the BG increased by 32.3 points, which is 12.25% ($p < 0.05$), and in the CG – by 13.10 points, which is 5.39% (Table 1). A significant improvement in the BG was observed in the performance of the dances: slow waltz, Viennese waltz, foxtrot. The agreement among experts in the assessment of special preparedness was established by the Kendall's coefficient of concordance. Both at the beginning of the research and at the end of the research, the degree of agreement of experts was defined as high. At the beginning of the research, the coefficient was 0.756 ($p < 0.05$), and at the end of the research, it was equal to 0.745 ($p < 0.05$). Comparative analysis and study of the dynamics of physical and special preparedness of dancers aged 15-16 at a stage of specialised basic training testified to the high efficiency of the application of the developed models of training classes with the combined use of means of physical and technical training for the improvement of the technique of elements of the European programme dances.

Discussion

During the study, models of training classes for dancers aged 15-16 were developed. These models were aimed at the development of dancers' motor abilities and to increase the technical skill of dance element execution. In these models, the combined use of means of physical and technical training was applied. According to the developed models in the training classes, there was an alternation of exercises for the development of physical abilities and exercises to improve the technique of the execution of separate dance elements. This alternation of exercises made it possible to vary the load to different intensities. This allowed to reduce fatigue of higher neuro-motor functions of movement control, which had a positive effect on the technical performance of dance elements, and to solve the problem of increasing the level of strength and special endurance, coordination and flexibility. These results confirmed the data from H. Ji (2022). The author noted that the technicality of each dance movement was the foundation of the dance itself. During the execution of dance elements, dancers constantly adjust their muscle groups. This is associated with corresponding functional processes in the human body. Therefore, for dancers, it was advisable to employ functional training, the main components of which included: strength training; endurance to assist dancers in executing dance movements from start to finish; coordination abilities; technical skills aiding in figure execution; and proper partner sensing and pairing.

In the study, the combined use of physical and technical training during training classes has been proposed. For this purpose, various complex "blocks" of the physical load were selected. In some "blocks" of the physical load, additional physical training tasks were solved. In other "blocks" of the physical load, the leading exercises and separate figures of the European programme dances to improve the dancers' technical proficiency were selected. The proposed combined use of physical and technical training was consistent with the research of other specialists. J.P. Ambegaonkar *et al.* (2021) argued that it is necessary to incorporate several exercises into training aimed at developing physical and technical abilities to enable a dancer to fully realise their potential in performing dance composition.

The study determined the level of physical and specialised preparedness of dancers, as well as the correlation of varying degrees of significance between indicators of individual physical and functional abilities. The obtained results were used in the construction of the training process of dancers aged 15-16 in the preparatory period of the basic mesocycle at the stage of specialised basic training. Data from M.F. Grigore *et al.* (2019) was supported by the received results. They demonstrated in their research that sports training is a systematic process that requires planning and consideration of not only preparation periods and competition calendars but also real-time information regarding the level of physical and functional indicators of dancers.

To improve the technical elements, lead-up exercises were selected in the study. Elements of the figures were performed at different tempos, with a fixation of points and an accent of attention. Attention was focused when holding the body lines, when performing a swing movement, when working out the swing and shape, when taking the correct position in a couple, and when working with the foot. In addition to the figures of competitive variations, the dancers practiced the basic figures of dances: slow waltz, Viennese waltz, quickstep, foxtrot, as individually as well as conjunctional educational variations. The dancers performed: steps in balance and half-balance with forward and backward movement – while performing these steps to improve balance, the dancers held a book or similar object on the head; dancing steps with an emphasis on footwork and on gentle rise and fall. This is confirmed by the opinion of G. Sun (2022), who identified the necessity of constantly improving the specific technical and physical preparation of dancers. And proposes implementing innovative methodologies that will enrich the theoretical knowledge of dancers for their understanding and mastery of the technical characteristics of various dances.

Depending on the tasks of the training class to develop physical abilities and expand the adaptive and functional capabilities of the body, the dancers performed two "training laps" of the European programme dances. The first "training lap" corresponded to the conditions of competitive dance performance. During the second "training lap", five dances from the European programme were performed. Between dances, depending on the objectives of the training class, one of the dances of the European programme was performed additionally. In order to develop special endurance in the performance of dances during the second "training lap", the dancers used force weights in separate training classes. The same methodological approach has also been identified in the studies of other experts. M.F. Grigore *et al.* (2022) provided in their research a set of specialised exercises to enhance competitive choreography for dancers. The proposed module consisted of 10 exercises performed under various conditions, utilising additional equipment and variations in musical accompaniment. In the study, the level of dancers' specialised preparedness was also identified, but it was not taken into account their previous level of physical preparedness.

In the BG, the training session consisted of preparatory, main, and final parts. In the preparatory part of the training session, choreography exercises were performed. The main part of the training session included three "blocks" of different orientations. In the first "block" the task of raising the level of dancers' technical readiness was solved. In the second "block" the tasks of improving dancers' physical preparedness were settled. Elements of the European programme dances and physical exercises were used for this purpose. In the third "block", the emphasis was on the development of dynamic balance. The final part of the lesson consisted of two "blocks" and was aimed at restoring the dancers and relieving tension after intense training. In the BG, individual dance elements and exercises for the development of coordination abilities and flexibility were used during the training class in the breaks between high-intensity workouts. The results of the study indicated that this training class improved the level of physical and technical preparedness of the BG dancers. This confirmed the data of O. Kaluzhna *et al.* (2022), who suggested allocating various types of physical training tools based on the dancer's level of physical preparedness. This made it possible to effectively solve tasks related to both the development of physical abilities and the improvement of technical mastery.

At the end of the study, dancers showed improvements in strength, endurance, flexibility, and coordination. This is supported by the findings of A.M. Clifford *et al.* (2023), who demonstrated in their study that dance sessions positively influence physical abilities such as flexibility, strength, and endurance. S. Douka *et al.* (2019) also indicated that dance lessons improved coordination abilities, flexibility, and strength. The stage of specialised basic training needs special attention. At this stage, a sufficiently high level of sportsmanship was provided, and comprehensive prerequisites for intensive specialised training at the next stage were formed. The goal of the next stage is to achieve the highest results. The growing popularity of sport dances requires the development and scientific and methodological substantiation of specific methods of various types of training for dancers.

Conclusions

The data obtained during the correlation analysis between indicators of dancers' individual physical abilities allowed for the development of training models aimed at enhancing athletes' technical skills. The application of training models combined with the use of physical and technical preparation tools to improve the technique of performing elements of the European dance programme contributed to the improvement of the physical and specialised preparedness indicators of dancers aged 15-16 during the stage of specialised basic training.

The use of the developed training models had its own peculiarities and advantages. Performing exercises to enhance active and passive flexibility during intervals between each "training lap" contributed to improving joint mobility and created optimal conditions to maintain the necessary range of motion when performing specific exercises. Performing small sets of strength exercises at the beginning of the class, speed development exercises, and flexibility exercises created favourable conditions for the development of specific abilities. The physical exercises used in the specialised warm-up, sharing similar dynamics and kinematic structure with the primary technical actions of the dancer, contributed to the improvement of the dancer's technical proficiency. Using exercises at the end of the training session aimed at restoring the overall specific endurance of dancers allowed for the successful achievement of enhancing their efficiency, which also positively affected the improvement of the dancers' technical proficiency.

Additional performance of basic elements of the European dance programme, executing dance compositions at different tempos, and varying dance elements when performing compositions contributed to the improvement of the technical and physical readiness of dancers and allowed for an increase in their endurance level. The practice of dancers in the role of supporting exercises, steps moving forward and backward in balance and semi-balance with an emphasis on footwork, knee work, and maintaining posture, made it possible to improve technical performance in executing elements of the slow waltz and foxtrot dances. Prospects for further research could include improving the technique of performing dance elements of the Latin programme for dancers aged 15-16 at the stage of specialised basic training.

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Conflict of Interest

None.

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Удосконалення техніки виконання елементів спортивного танцю танцюристів 15-16 років на етапі спеціалізованої базової підготовки

Наталія Москаленко

Доктор наук з фізичного виховання і спорту, професор
Придніпровська державна академія фізичної культури і спорту
49094, вул. Набережна Перемоги, 10, м. Дніпро, Україна
https://orcid.org/0000-0001-9162-5206

Оксана Демідова

Кандидат наук з фізичного виховання і спорту, доцент
Придніпровська державна академія фізичної культури і спорту
49094, вул. Набережна Перемоги, 10, м. Дніпро, Україна
https://orcid.org/0000-0002-8524-5095

Олена Кошелева

Кандидат наук з фізичного виховання і спорту, доцент
Придніпровська державна академія фізичної культури і спорту
49094, вул. Набережна Перемоги, 10, м. Дніпро, Україна
https://orcid.org/0000-0002-9085-6800

Тетяна Сидорчук

Кандидат наук з фізичного виховання і спорту, доцент
Придніпровська державна академія фізичної культури і спорту
49094, вул. Набережна Перемоги, 10, м. Дніпро, Україна
https://orcid.org/0000-0001-7129-1616

Ірина Степанова

Кандидат наук з фізичного виховання і спорту, доцент
Придніпровська державна академія фізичної культури і спорту
49094, вул. Набережна Перемоги, 10, м. Дніпро, Україна
https://orcid.org/0000-0002-5431-8052

Анотація. Специфіка сучасних спортивних танців вимагає високого рівня підготовленості, здатності до максимальної концентрації, чіткого виконання динамічних рухів та їх біомеханічної оптимізації. Особлива роль при побудові тренувального процесу відводиться технічному виконанню елементів танців європейської програми. Тому метою дослідження було наукове обґрунтування вдосконалення техніки виконання елементів танців європейської програми та створення відповідних методик занять для танцюристів 15-16 років на етапі спеціалізованої базової підготовки. У дослідженні брали участь 40 спортсменів віком 15-16 років категорії «С» згідно з правилами змагань Міжнародної асоціації спортивного танцю. Рівень спеціальної підготовленості визначався шляхом експертної оцінки компонентів п'яти видів змагальної діяльності. Розроблено моделі тренувальних занять, які спрямовані на розвиток рухових якостей і підвищення технічної майстерності виконання танцювальних елементів європейської програми танців. Відповідно до розробленої моделі, на кожному занятті відбувалося сполучене використання засобів фізичної й технічної підготовки за рахунок підбору комплексних «блоків» навантаження, в яких вирішувалися додаткові задачі фізичної підготовки, та «блоків», у яких підбиралися підвідні вправи й окремі фігури танців європейської програми для вдосконалення технічної підготовленості. Встановлено, що доцільно застосовувати різноманітні підвідні вправи, виконувати елементи танцювальних фігур у різному темпі й із фіксацією точок у відповідному положенні, свінгові рухи та кроки в балансі та в півбалансі з рухом у різних напрямках, відпрацьовувати свеї та шейпи, застосовувати різноманітні стрибки й варіанти прогонок: прогонку, яка відповідає умовам конкурсного виконання танців, і прогонку, впродовж якої між кожним танцем виконується додатковий танець у залежності від спрямованості заняття. Результати дослідження можуть допомогти фахівцям зі спортивних танців покращити тренувальний процес танцюристів

Ключові слова: моделі тренувальних занять; європейська програма; пари; свінг; баланс; півбаланс

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Features of technical improvement of wrestlers at the initial training stage

Svitlana Karaulova*

Doctor of Physical Education and Sport, Professor
Zaporizhzhia National University
69600, 66 Zhukovskyi Str., Zaporizhzhia, Ukraine
https://orcid.org/0000-0003-1582-2368

Kristina Alieksandrova

Master
Zaporizhzhia National University
69600, 66 Zhukovskyi Str., Zaporizhzhia, Ukraine
https://orcid.org/0009-0001-2916-1073

Abstract. The level of modern judo development puts forward increased requirements for the general preparation of athletes and its individual components at all stages of long-term training. Special attention is paid to the improvement of the training process at the stage of initial training, which makes it possible to identify promising directions that determine the effectiveness of training wrestlers in techniques. The purpose of the study is to determine the effectiveness of the application of the game method of training in the process of technical improvement of judokas at the stage of initial training. The dynamics of indicators were studied, which ranged from 10% to 66.6% for general physical fitness, from 12.6% to 27.8% for special physical fitness, 12.9-37.5% for technical training, and 13.3% for general physical fitness, for which a pedagogical experiment was used, testing indicators of general and special physical and technical fitness as well as assessment of the level of general physical fitness. Thirty judokas, aged 10-12, took part in the study. Of them, 15 were part of the experimental group, and 15 were part of the control group. An experimental training programme with the use of special educational games was proposed, which contributed to the development of the necessary specialised qualities and the mastery of the basic techniques of judo. The games were divided into several groups depending on the task (games with "touching the opponent", "blocking grip", and "attacking grip"). The positive influence of game exercise complexes in studying and improving the technique of judo techniques was revealed, which contributed to the significant optimisation of general and special physical fitness and the general physical performance of athletes' bodies. A comparative analysis of the dynamics of the studied indicators allowed to state that the athletes of the experimental group, who used an experimental training programme using special educational games, had better results compared to the control group. The practical value of the research lies in the recommendation of the introduction of experimental game methods for improving technical training in judo in the system of multi-year sports improvement, namely, at the stage of initial training

Keywords: judo; training process; physical preparation; motor qualities; working capacity

Introduction

The expediency of improving the educational and training process in many types of wrestling, in particular judo, is determined by the need for further modernisation of the training of the sports reserve, the development of judo on the international sports arena, changes in the requirements for the preparation and proper level of health of judoka wrestlers, and changes in the material and economic working conditions. One of the most important factors determining the success of athletes is a high-quality training method at all stages of the multi-year sports process. Often,

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*Corresponding author

some components of training and competitive activities, most often significant at the level of the highest sportsmanship, are not given sufficient attention at the stages of initial, preliminary basic, specialised basic training, and the stage of preparation for higher achievements. Therefore, when building a training system and creating an appropriate functional foundation at these stages, it is necessary to focus on those components that ensure success at the level of the highest sports achievements.

The systematic process of developing technical mastery in sports wrestling from the beginning of sports to reaching the level of higher achievements should be based on the basic principles of general didactics adapted to judo as well as on a number of special principles of sports training (Principles of judo, n.d.). According to the researcher V. Manolaki (2020), it is reliance on these principles that determines the effectiveness of the process of multi-year improvement of athletes in relation to both the process of developing sportsmanship as a whole as well as to individual aspects of preparedness (technical, physical, psychological, tactical) or individual movement qualities of athletes in sports wrestling. Since 2010, ideas about the peculiarities of sports training in wrestling have changed significantly. This is connected with the successful performances of Ukrainian wrestlers at international competitions, changes in the Olympic selection systems, and the rapid development of scientific research in modern sports, as O.R. Zadorozhna *et al.* (2023) noted in their article. The active developments of specialists such as M. Chobotko (2018) in the field of sports training indicate that in the system of multi-year improvement, the systematic preparation of sports reserves at the stage of initial training at the level of modern requirements is an essential reserve for increasing its effectiveness. From the point of view of a systemic approach, the training process is multifaceted and long-lasting and is also characterised by modern high sports and technical requirements, so an athlete needs years of persistent, purposeful training to achieve high results at the further stages of multi-year sports training.

Some authors note that when forming a school of judo techniques, not only traditional teaching methods but also innovative methods are important in the learning process. V. Melnyk & A. Dyachenko (2018) suggest using exercise ball exercises when learning throws. It is shown that the developed set of exercises with an exercise ball contributed to the effective and correct execution of a set of techniques, in particular sparring for off-balance, throwing and landing the opponent, interaction during the work of body parts of athletes, etc. As M. Chobotko (2018) notes in his research, at the initial stage of learning techniques, one of the leading physical qualities is dexterity, which is effectively developed through games. It is this game technique that allows you to develop spatial orientation, coordination of movements, and interaction with objects and other athletes during games. In the article by scientists O. Bekas *et al.* (2019), they examine the issue of changes in the training process of 10-12-year-old judokas in the context of a differentiated approach that is based on the constitutional characteristics of athletes, taking into account the sensitive periods of development of individual movement qualities. The peculiarities of the body structure of young athletes and specific somatotypes were studied, which formed the basis of the distribution of young judokas by somatotypes in order to create differentiated training programs. This made it possible to differentiate the level of development of general and special physical qualities and manage the training process of young judokas. In this regard, it is relevant to solve a scientific and practical task related to the further improvement of the content of technical training for athletes in the second year of training at the initial training stage in judo using the game method, which was the goal of this study.

Materials and Methods

Thirty young judokas, in their second year of training at the stage of initial training, were involved in the study; 15 of them were part of the experimental group and 15 were part of the control group. All of them are pupils of the Municipal Institution "Regional Specialised Children's and Youth Sports School of the Olympic Reserve in Freestyle Wrestling and Judo" of Zaporizhzhia Regional Council, Zaporizhzhia, Ukraine. The age of athletes at the time of the beginning of the study was 10-12 years. The athletes had no contraindications to judo classes and had an appropriate state of health. All participants and their parents gave written consent to conduct the study and were informed about the purpose and methodology of the study, as well as the possibility of withdrawing consent at any time for any reason. The requirements of the Declaration of Helsinki (2013) were followed. During September 2021 to February 2022, an experimental training programme using special educational games was introduced into the educational and training process of judokas in their second year of training at the stage of initial training.

The experimental programme contained game-oriented training tasks that contributed to the development of the necessary specialised qualities and the mastery of the basic techniques of judo. The games were divided into several groups depending on the tasks. The first group included games involving "touching the opponent". These game exercises provide an opportunity to play various options for manoeuvring on a minimal area and the trajectory of entrances into attacking tackles. The second group included games with a "blocking grip", which involve playing a release from blocking grips and stops, which is one of the main obstacles to making a reception. The third group includes games with "attacking grip", in which practical skills and skills in the technique of different types of grips are formed. It is the capture that is the most important tactical and strategic part of the match, where judokas show significant muscle tension, especially the muscles of the hands. Therefore, the exercises that were included in the games were used as training tools for speed and strength. The difference in the application of the programme for both groups of athletes was the use of the above-mentioned games during the entire training session in the experimental group and in the control group only in the preparatory part of the training. Classes in both groups were held 3 times per week with a duration of 90 minutes. The effectiveness of the application of the game method of training in the process of technical training of judokas of the second year of training at the stage of initial training was determined by the results of tests for determining the level of general and special physical and technical readiness recommended by

the curriculum of the Children's and Youth Sports School (Aleksieiev *et al.*, 2019) and wrestling specialists (Kamaiev *et al.*, 2019; Gheorghiu, 2023).

The speed and strength qualities of the athletes were determined using the "long jump from a standing position" and "dynamometry of the right and left hands". To assess the strength and endurance of the muscles of the arms and shoulder girdle, the tests "pull-ups", "flexion and extension of the arms in the supine position", and "rope climbing" were used. In the course of the study, the dynamics of the development of coordination abilities were also analysed, which were measured using the test "forward somersault in a group from acceleration", which was evaluated in points. The assessment of the level of general physical capacity was determined by the index of the Harvard step test (*IHST*). The test consisted of climbing a step 35 cm high with a frequency of 30 times per minute (each climb was performed for 4 counts). The duration of the test (t) is 3 min. After exercising in a sitting position, the subject's heart rate was measured after an interval of 1 min-1 min 30 s (P_1), 2 min-2 min 30 s (P_2), and 3 min-3 min 30 s (P_3) during the recovery period. The *IHST* was calculated according to the formula:

$$IHST = (t \times 100) / (P_1 + P_2 + P_3) \times 2. \quad (1)$$

The value of the index was evaluated according to the following functional classes: low (less than 55); below average (56-64); average (65-79); above average (80-89); excellent (more than 90) (Krutsevych *et al.*, 2011). To measure the dynamics of indicators of special physical qualities of wrestlers in the control and experimental groups, the following exercises were used: "Getting up in the 'bridge' from a standing position for 30 s", "Sharp lifting of the legs in 15 s", "Running with legs around the head to the left and right in 15 s". To analyse the level of technical preparation of wrestlers in the training process, the following indicators were evaluated: fighting activity; turns on an unresisting opponent; turns on rubber; throwing a training dummy with deflection; performing techniques on an opponent who does not resist; effectiveness of techniques.

Results

To determine the effectiveness of the experimental training programme with the use of special educational games, the dynamics of indicators of general, special physical, and technical preparedness, as well as the general physical work capacity of judokas during the study period, were determined. At the beginning of the study, there was no probable difference between the indicators of the general physical fitness of the wrestlers in the experimental and control groups (Fig. 1).

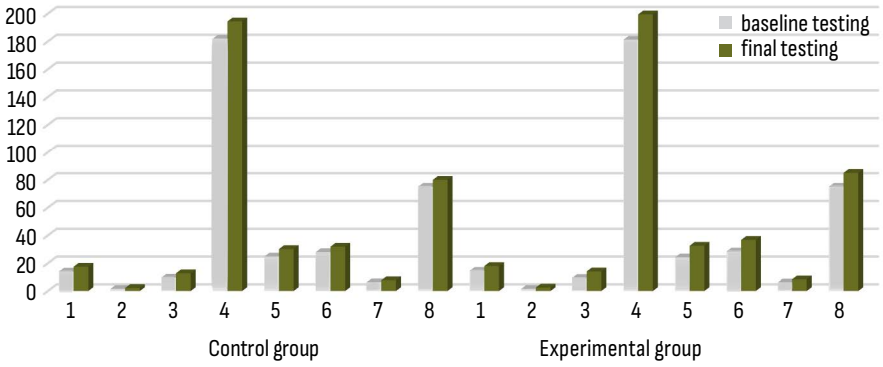

Figure 1. Dynamics of indicators of general physical training and physical capacity of wrestlers

Note: 1 – flexion and extension of the arms in the supine position, number of times; 2 – rope climbing, number of times; 3 – pull-ups, number of times; 4 – long jump from a standing position, cm; 5 – dynamometry of the right hand, kg; 6 – dynamometry of the left hand, kg; 7 – forward somersault in a group from acceleration, points; 8 – *IHST*

Source: made by the authors

However, at the end of the experiment, the level of physical qualities in both groups increased, but significantly more in the experimental group. The level of speed and strength qualities improved in the experimental group by 10% and in the control group by 7.2%. The level of muscle strength development (dynamometry of the right and left hands) also increased and amounted to 34.7% and 29.5% in the experimental group, and 21.1% and 13.9% in the control group. According to the assessment of the strength and endurance of the muscles of the arms and shoulder girdle, it was established that positive changes occurred in both groups, but the best result was in the experimental group: the result in the pull-ups in the experimental group improved by 50%; flexion and extension of the arms in the supine position improved by 24.14%; rope climbing improved by 66.67%; and in the control group by 33.3%, 25%, and 46.67%. It was established that the performance quality of the forward somersault in a group from acceleration to assess the dynamics of the development of coordination abilities increased, but in the experimental group it was significantly higher – by 35.5% – and in the control group by only 23.8%. When analysing the results of the testing of general physical working capacity (*IHST*), it was found that this indicator is higher in the experimental group than in the control group. Although the *IHST* indicators in both groups at the beginning of the experiment were the same, at the end of the study, the level of general physical performance in the experimental group improved by 13.33% and in the control group by only 6.67%.

To increase the level of technical preparation, specific exercises were used in the training process of wrestlers, which were included as elements of educational games, with the help of which it is possible to effectively influence the improvement of the functioning of the athlete's body systems in relation to the requirements of the chosen sport. Analysis of the dynamics of indicators of special physical fitness revealed that at the end of the study, the judokas observed an improvement in these indicators according to the results of all the proposed tests (Table 1).

Table 1. Dynamics of indicators of special physical qualities of wrestlers in the control and experimental groups at the beginning and end of the experiment

Special exercises	Group	Start of the experiment	End of the experiment	%
Getting up in the "bridge" from a standing position for 30 s, number of times	E	6.1 ± 0.12	7.8 ± 0.25*	27.8
	C	6.5 ± 0.41	7.5 ± 0.38	15.4
Sharp lifting of the legs in 15 s, number of times	E	12.1 ± 0.56	15.4 ± 1.23*	27.3
	C	12 ± 0.54	14.8 ± 1.57*	23.3
Running with legs around the head to the left in 15 s, number of times	E	5.2 ± 0.71	6.4 ± 0.74	23.1
	C	5.2 ± 0.71	6.2 ± 0.88	19.2
Running with legs around the head to the right in 15 s, number of times	E	5.15 ± 0.62	5.8 ± 1.02	12.6
	C	5.1 ± 0.60	5.7 ± 0.98	11.8

Notes: E – experimental group; C – control group; * – the difference between indicators is probable at $p < 0.05$
Source: made by the author

In the experimental group, the indicators that characterise the specific qualities of wrestlers improved by 12.6-27.8%, and in the control group, they were somewhat lower, from 11.8% to 23.3%. Technical preparation is the basis of the skill of wrestlers, determining in many ways their ability to achieve victory over their opponents. With the correct organisation of the training process for wrestlers, not only their physical fitness but, to an even greater extent, their technical skill should steadily increase. It should be noted that when the level of development of general and special physical fitness of young wrestlers in the experimental and control groups improved, the level of technical fitness also increased, but a higher level was observed, again, in the experimental group (Table 2).

Table 2. Dynamics of indicators of technical readiness of wrestlers in the control and experimental groups at the beginning and at the end of the study

Indicators of technical readiness	Group	Start of the experiment	End of the experiment	%
Fighting activity	E	12.7 ± 1.55	15 ± 1.60	18.1
	C	12.8 ± 1.31	13.7 ± 1.44	7.0
Turns on an unresisting opponent, 30 s	E	11 ± 0.95	13.5 ± 1.23	22.7
	C	12 ± 0.89	13.2 ± 0.87	10.0
Turns on rubber, 30 s	E	10 ± 1.02	11.5 ± 1.11	15.0
	C	10 ± 0.63	10.8 ± 0.65	8.0
Throwing a training dummy with deflection, 30 s	E	8 ± 0.51	11 ± 0.86*	37.5
	C	9 ± 0.67	10.8 ± 0.85	20.0
Performing techniques on an opponent who does not resist, 30 s	E	9 ± 0.65	11.5 ± 1.02*	27.8
	C	9 ± 0.72	10.8 ± 0.79	20.0
Effectiveness of techniques, points	E	3.1 ± 0.21	4.5 ± 0.36*	12.9
	C	3.15 ± 0.32	3.4 ± 0.51	7.9

Notes: E – experimental group; C – control group; * – the difference between indicators is probable at $p < 0.05$
Source: made by the authors

In the test "performing techniques on an opponent who does not resist" in the experimental group, the indicators increased by 27.8% and in the control group by 20%. In the test of "throwing a training dummy with deflection", the indicator increased by 37.5% in the experimental group and by 20% in the control group. In the "effectiveness of techniques" test, the indicator in the experimental group increased by 12.9% and in the control group by 7.9%. In the "fighting activity" test, the indicator in the experimental group increased by 18.1% and in the control group by 7%. Summarising the results of the study, it should be noted that the use of special educational games in the training process contributed to the pronounced optimisation of the levels of general and special physical and technical preparedness of judokas at the stage of initial training. When managing the training process, the principle of multiple repetition in special training games and the use of constant control and correction of the quality of the performance of these exercises are the basis of training and improving the techniques of young wrestlers. The effectiveness of the proposed programme for improving the techniques of wrestlers is evidenced by the fact that the level of indicators of physical

fitness, general physical working capacity, and technical fitness in the experimental group is significantly higher than in the control group of athletes.

Discussion

The conducted research was based on the fundamental principles of the theory of sport, where technical training in judo should be considered as a whole system in the aspect of long-term training, and at each stage relevant tasks should be solved (Principles of judo, n.d.). From the point of view of a systemic approach, the training process is multifaceted and long-lasting, since modern sports and technical requirements are so great that an athlete needs years of persistent, purposeful training to achieve high results (Izzo *et al.*, 2022). According to the results of the analysis of the problem of improving the level of technical preparation of judokas, it was shown the need for further improvement of the training process at the stage of initial preparation in connection with the complication of the leading technical elements in competitive practice, the introduction of modern methods of training athletes, which are aimed at improving the level of integral preparation and contribute to increasing a qualitatively higher level of technical and tactical skill of athletes in the later stages of long-term training, which coincides with the data of research by scientists Yu. Tropin & J. Kovalenko (2018) and E. Franchini *et al.* (2019). The opinion of the authors V. Nikolaev & P. Chizhaev (2019) was confirmed: the use of complexes of physical exercises of various orientations, as well as specialised mobile games, has a positive effect on technical readiness in the educational and training process. In particular, they increase the effectiveness of the formation of motor skills during the study of technical actions in judo at the stage of initial training.

Researcher I. Gheorghiu (2023) determines that the basis for achieving a high level of performance indicators among wrestlers, in particular in judo, is the development of technical and tactical skills with the simultaneous improvement of special psychomotor training. It is shown that the use of compatible means taken from all styles of wrestling and aimed at optimising motor qualities stimulates the development of technical training necessary for judo fighters. A number of authors, like R. Walaszek *et al.* (2017) and J. Jaworski *et al.* (2023), determine the positive impact of the developed sets of exercises aimed at developing the ability to maintain body balance on the components of the technical preparedness of athletes practicing judo. Maintaining the postural stability of an athlete's body during competitive matches is considered an important factor in achieving success. It was found that purposeful training of athletes' body balance effectively affects the speed at which judokas perform complex coordination throws. Scientists S.I. Karaulova *et al.* (2022), in their work, investigated the effectiveness of judo classes on the development of strength abilities. It was determined that the means of developing the strength of judokas are physical exercises, the performance of which requires more muscle tension than under normal conditions of their functioning: exercises with weights – the weight of one's own body, the resistance of a partner. Particularly effective means of combating on the ground floor include maintaining balance, opponents' coups, etc. Based on the results of previous research by modern authors, which was given, this article used most of the exercises that became the basis of the experimental game methodology.

According to a number of experts, in particular N. Boychenko & M. Chobotko (2019) and M.P.V.C. Pereira *et al.* (2021), using the game method promotes an increase in the emotional state and expands the range of ideas, observation, and intelligence of young wrestlers. In the course of the game, many situational tasks arise, during which judokas must use a significant number of various techniques and variably perform techniques in interaction with a partner, which are combined into technical and tactical elements of struggle. The article experimentally proves the opinion of the mentioned scientists: by introducing game methods into the educational process of young judokas, their level of technical preparation and skill has increased significantly, in particular among the wrestlers of the experimental group. However, the use of the game method even only during the preparatory part of the lesson in the control group was able to demonstrate positive dynamics.

Among the total number of studies, a problematic circle of questions related to teaching judo techniques, taking into account the level of development of physical qualities, coordination abilities, functional capabilities of the wrestlers' bodies, and means and methods of the training process, stands out. Scientists B. Adel *et al.* (2019) studied the impact of competitive judo activity in youth athletes on changes in blood parameters. It was determined that under the influence of the competition, the number of blood cells effectively increases, and these changes are due to the adaptation of athletes to the efforts associated with the competitive activity of judokas. In the article by R.L. Kons & D. Detanico (2022), the authors investigated the effect of the use of maximum intensity training tools on the functional state of the physiological, perceptual, and functional reactions of the body of highly qualified athletes specialising in judo. The obtained experimental data confirmed the performance of the athletes' bodies during high-intensity exercises. The obtained experimental data also complement the information of O. Bekas *et al.* (2019) and E. Franchini *et al.* (2019) that in order to improve the level of technical preparation in judo, it is necessary to use a comprehensive approach based on the introduction into the training process of combined exercises of different orientations, taking into account the sensitive periods of the development of individual movement qualities. The data obtained in this article can become the basis for drawing up an optimal training programme at various stages of the annual training cycle.

Thus, in their works, the scientists came to the conclusion that, thanks to the combination of the development of technical and physical training, individual techniques are improved and the level of physical fitness increases in accordance with the individual characteristics of athletes. This conceptual position was confirmed by the conducted research, which made it possible to justify the need to further search for ways to improve the technical skills of wrestlers at the stage of initial training. It is shown that the use of an experimental training programme with the use of special educational games contributed to an increase in the level of special physical fitness of the judokas who participated in the study.

Conclusions

One of the factors in increasing the efficiency of the training process is the use of measures aimed at studying the peculiarities of the technical training of young wrestlers. It is the level of technical preparation in relation to the physical, tactical, and psychological capabilities of athletes that makes it possible to increase the number and variety of motor skills and to achieve high stability and rational variability of technical and tactical techniques in the process of competitive fighting. At the stage of initial training in judo sports, the game method of training is one of the leading ones; it takes on the character of a universal method of sports improvement for athletes aged 10-12 years. The game method is characterised by the complex nature of the activity, as its basis is a variety of moving actions, a constantly changing environment, and a high emotional factor of a competitive nature. In the practice of sports training for judokas, the game method was used when solving tasks of general, special physical, and technical training, which positively contributed to the development of the necessary specialised qualities and the mastery of the basic techniques of judo.

The use of an experimental training programme in the training process of wrestlers, the basis of which was special educational games, contributed to the significant optimisation of the physical fitness, general physical work capacity, and technical fitness of young judokas. The level of development of the basic physical qualities of young wrestlers in the experimental group improved by 10-66.6%, while in the control group it improved by only 7.3-46.7%. The level of general physical working capacity in the experimental group improved by 13.3%, and in the control group by only 6.7%. Indicators characterising the special physical fitness of wrestlers in the experimental group improved by 12.6-27.8%, while in the control group they were slightly lower (11.8-23.3%). A comparative analysis of indicators of technical readiness states that the increase in the experimental group was from 12.9% to 37.5%, and in the control group only from 7% to 20%. Thus, in the athletes of the experimental group who used a training programme using special educational games, significantly higher values of the studied indicators were registered than in the representatives of the control group, in whom positive dynamics of results were also registered, but they were lower than in the experimental group of judokas. The test results obtained during the research give reason to recommend the use of the game method in the process of teaching judo techniques at the initial training stage. Prospects for further research are in the programming of educational and training sessions using the game method of learning.

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Conflict of Interest

None.

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Особливості технічного вдосконалення борців на етапі початкової підготовки

Світлана Караулова

Доктор наук з фізичного виховання і спорту, професор
Запорізький національний університет
69600, вул. Жуковського, 66, м. Запоріжжя, Україна
https://orcid.org/0000-0003-1582-2368

Крістіна Алєксандрова

Магістр
Запорізький національний університет
69600, вул. Жуковського, 66, м. Запоріжжя, Україна
https://orcid.org/0009-0001-2916-1073

Анотація. Рівень сучасного розвитку дзюдо висуває підвищенні вимоги до загальної підготовленості спортсменів та її окремих компонентів на всіх етапах багаторічної підготовки. Особлива увага приділяється вдосконаленню тренувального процесу на етапі початкової підготовки, що дозволяє визначити перспективні напрямки, які обумовлюють ефективність навчання борців технічним прийомам. Мета дослідження – визначити ефективність застосування ігрового методу навчання у процесі технічного вдосконалення дзюдоїстів на етапі початкової підготовки. Вивчено динаміку показників, що склала від 10 % до 66,6 % загальної фізичної підготовленості, від 12,6 % до 27,8 % спеціальної фізичної підготовленості, від 12,9 % до 37,5 % технічної підготовки, 13,3 % – загальної фізичної працездатності, для чого було застосовано педагогічний експеримент, тестування показників загальної і спеціальної фізичної та технічної підготовленості, а також оцінка рівня загальної фізичної працездатності. У дослідженні брали участь 30 дзюдоїстів 10-12 років. З них 15 входили до складу експериментальної та 15 – контрольної груп. Запропоновано експериментальну тренувальну програму з використанням спеціально-навчальних ігор, що сприяли розвитку необхідних спеціалізованих якостей та оволодінню базовими технічними прийомами дзюдо. Ігри було розділено на декілька груп у залежності від завдання (ігри з «торканням суперника», «блокувальним захватом», «атакувальним захватом»). Виявлено позитивний вплив комплексів ігрових вправ під час вивчення та вдосконалення техніки прийомів дзюдо, що сприяло істотній оптимізації загальної та спеціальної фізичної підготовленості, загальної фізичної працездатності організмів спортсменів. Порівняльний аналіз динаміки досліджуваних показників дозволив констатувати, що спортсмени експериментальної групи, які застосовували експериментальну тренувальну програму з використанням спеціально-навчальних ігор, мали кращі результати в порівнянні з контрольною групою. Практична цінність дослідження полягає в рекомендації впровадження експериментальної ігрової методики вдосконалення технічної підготовки в дзюдо в системі багаторічного спортивного вдосконалення, на етапі початкової підготовки зокрема

Ключові слова: дзюдо; тренувальний процес; фізична підготовленість; рухові якості; працездатність

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Features of the needs and motivational sphere of the personality of future specialists in physical culture and sports

Oksana Marchenko*

Doctor of Physical Education and Sport, Professor
National University of Ukraine on Physical Education and Sport
03150, 1 Fizkultura Str., Kyiv, Ukraine
https://orcid.org/0000-0002-2902-5960

Oleksandr Moskalenko

Postgraduate Student
National University of Ukraine on Physical Education and Sport
03150, 1 Fizkultura Str., Kyiv, Ukraine

Director
Ivan Piddubnyi Professional Olympic College
of National University of Ukraine on Physical Education and Sport
02156, 4 Mykola Mateiuk Str., Kyiv, Ukraine
https://orcid.org/0009-0008-3020-8909

Abstract. Analysing and understanding the motivation that encourages students to choose physical culture and sports as their main field of activity is a topical issue that plays an important role in developing effective strategies to support students focused on their personal and professional needs and ambitions. The aim of the study was to investigate the peculiarities of the needs and motivational sphere of students of a professional college who intend to become specialists in the field of physical culture and sports. The sociological method of surveying was used to study students' motivations. The results of the questionnaire indicate the predominance of intrinsic motivation among students, which can be a key factor in achieving high performance. The desire "to surpass oneself" was identified as one of the main components of this motivation, indicating the internal dynamics and self-growth of students in their sporting efforts. It has been found that the influence and personal example of parents, coaches' invitations, the prestige of sports, and attending sports events are the main factors influencing students' decisions to engage in sports. Studying the needs and motivational sphere of future specialists in the field of physical culture and sports, the goal that motivates students to engage in sports was determined: the dominant motive is to achieve success in the chosen sport. The most significant motivations for students are the motive to become champions of Ukraine, Europe, the world, a desire to obtain the title of master of sports, and a desire to participate in sports competitions. Students of the sports college consider the main priorities to be securing their future, achieving recognition and respect, and having the desire to have a job they like. The survey results also showed a low level of awareness of a healthy lifestyle among the respondents, which highlights the need for additional measures to raise their awareness. For athletes, this concept mainly includes various aspects of physical fitness. Applying the findings in practice can significantly improve interaction with students, which will contribute to their active development and achievement of personal and professional goals

Keywords: students; physical activity; training; health; objectives; recognition; self-improvement

Introduction

In the context of modern challenges, such as socio-political, socio-cultural, pandemic, and others, one of the key trends of the educational paradigm is the training of specialists of the new generation. Such specialists must have sufficient intellectual resources and knowledge to successfully navigate any situation during the entire active period of their

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*Corresponding author

lives. This is due to the social demand to find effective ways and means of solving the problem of preserving the health of children and youth. Thanks to the development of the latest technologies and changes in methods and approaches to work, the requirements for specialists are becoming more diverse and complex. Among the main challenges that have a direct impact on the quality of training of specialists in the field of physical culture and sports, it is possible to identify a contradiction between the knowledge, abilities, and skills of students in sports activities and the need for personal development of their needs and motivational sphere in order to form their motivation for future professional activities.

The problem of a low level of motivation among students to study and further professional activity in the field of physical culture and sports can affect the quality of training for future specialists. To overcome this problem, a balanced combination of theoretical and practical aspects is necessary, as is the development of personal qualities in students, which will significantly increase the level of motivation and readiness of graduates for professional activities in the field of physical culture and sports, as written by A. Hakman *et al.* (2021). The problem of motivation, including educational and professional, has attracted the attention of researchers for a long time, both in Ukraine and in other countries. Investigating the structural features of the formation of motivation for sports among students, O. Khurtenko & B. Bortun (2019) determined that students with a high level of success in sports show specific motivational features, such as achieving success in sports, achieving high results, and team integration, which is determined by the formation of character and strengthens both physical and moral endurance during constant training. Among the main motives of students are the motive of increasing prestige in sports, the social and moral motive, and the motive of communication. The theoretical analysis of the basic concepts of research on the professional training of future specialists in physical culture allows us to come to the conclusion that a specialist in this field must be a person capable of performing pedagogical, psychological, legal, research, and medical activities. Professional training should be a complete system of activities, methods, and techniques; be built taking into account the personal qualities of a specialist; and have a clearly defined structure and specificity.

Scientists, psychologists, and philosophers have different views on the nature of human motivation. Some sources highlight motivation as an internal psychological state that drives a person to certain actions or achievements. According to O. Marchenko (2018), external and internal factors play one of the determining roles in the formation of motivation for motor activity. Intrinsic motives can be related to personal goals, values, and needs. Other sources see motivation as an external force that affects a person from the outside and causes a reaction in the form of actions. O. Khurtenko & B. Bortun (2019) indicate that extrinsic motives can be related to rewards, punishments, social norms, or the expectations of other people. N. Moskalenko *et al.* (2018) indicate the need to create a system of physical culture and health work to solve the problem of increasing the volume of motor activity. This system involves interaction between the family and the educational institution, ensuring the effective cooperation of participants in the educational process, including distance education. N. Huretska (2023) also notes that distance learning, together with forms of motivation that are interesting for students, can be effective. Various factors, such as the perceived needs and interests of a person, attitudes and ideals, beliefs and outlook, as well as feelings and thoughts, act as motives for achieving this goal. In this regard, it is important to take into account not only the main aspirations in human behaviour and activity but also to apply the characteristics of the individual, which shape their position in life and determine their attitude towards various aspects of reality. This approach allows for a more comprehensive consideration of motivation and influencing it, ensuring the effective implementation of programmes of physical culture and health work in various conditions, including distance learning.

Various motivations act as motives: perceived needs and interests of a person; attitudes and ideals; beliefs and outlook; feelings and thoughts. Therefore, in behaviour and activity, one should determine not only the main aspirations but also apply those features of the individual that determine their position in life and an attitude to various aspects of reality. However, modern specialists, as noted by O. Gretskyi (2019), adhere to a combined view of motivation, according to which motivation is not the result of only such individual characteristics as personality characteristics and needs or goals, or only such situational factors as the style of the trainer or the teacher. V. Oliynyk (2018) claims that despite the fact that internal motives are based on satisfaction with the process and immediate results of activity, external motives, which include the professional motive (the desire to perfectly master the future profession, to become a high-class specialist), also play an important stimulating role.

In modern conditions, it is possible to identify a problem related to the need in Ukraine for highly qualified specialists in the field of physical culture and sports who are able to compete in the market for educational services. The target direction for solving this problem is the formation of personnel who will show a desire to actively update and improve the content of their professional activities through constant self-improvement and self-development. However, there is no scientific research that studies the specific needs and motivational sphere of future physical culture and sports specialists. The purpose of the study was to study the specific needs and motivations of students at a professional college who are preparing to become specialists in the field of physical culture and sports.

Materials and Methods

The following scientific methods were used during the research: theoretical, sociological, psychological, and mathematical statistical methods. In order to study the internal and external factors that influence the formation of the needs and motivational sphere of future physical culture and sports specialists, a sociological and psychological survey method was used, namely, its variant: conducting a written questionnaire. The results of the study are based on the materials of this questionnaire and the testing of education seekers in the separate structural subdivision Ivan Piddubnyi Olympic Professional College of the National

University on Physical Education and Sports of Ukraine with a total of 68 young men ($N = 68$). All respondents systematically play the following sports: athletics, volleyball, wrestling, athletic gymnastics, cycling, synchronised swimming, fencing, and judo. Scientific research was carried out in accordance with the ethical standards approved by the responsible human rights committee (Declaration of Helsinki, 2013). Consent to participate in the study was obtained from all respondents, and they were provided with information about the purpose of the study and the use of their personal data.

The survey was conducted using a Google Forms. The original version of the questionnaire consists of 16 questions. The questions related to determining the interests and motivations of student youth in the field of physical culture and sports and also explored their ideas about a healthy lifestyle. Among the most important ones, on which the most significant results were obtained and which are presented in more detail later in the study, are questions such as: "Why did you decide to do sports?"; "Do you have a desire to change the sport?"; and "Define the concept of a healthy lifestyle". When answering questions in the questionnaire, respondents had the opportunity to choose several options for answering the question. Students' goals were studied using the "diagnostics of the degree of satisfaction of basic needs" method. Respondents were offered 15 statements that they should evaluate, comparing them in pairs. By counting the number of points scored for each statement, the five statements that received the highest number of points are selected. The answers were presented in points.

The statistical processing of the data was carried out with the help of the Statistica 10.0 mathematical statistics software package and Excel 2010. Analysis, synthesis, and comparison were used among the theoretical methods. The analysis was used for the analysis of literary sources, which was carried out in order to study the problem and determine the purpose of the research. For this, professional material was used, such as articles, methodical guides, etc., which were available on the Google Scholar platform. The synthesis was used to combine the received information, which is particularly important for the further formation of the correct questionnaire questions. The comparison method was used to compare the answers received from the respondents as well as in the process of writing a discussion of the research results. The graphical method was used to visually present the most significant results. The scope of the work corresponds to the plan for the preparation of children, adolescents, and young people for the Research Plan of the National University of Ukraine on Physical Education and Sport on topic 3.1 "Improving the system of pedagogical control of physical education in educational institutions" for 2021-2025.

Results

The motivational sphere of the individual is a complex of motives that determines and regulates the behaviour and activity of the individual. It moves a person to achieve their goals and satisfy their needs. Various motives arise and function in the motivational sphere of the individual, such as needs, goals, values, interests, desires, incentives, etc. They influence the choice of activity, instructions for its implementation, and its effectiveness. The motivational sphere of an individual can be positive or negative, it can stimulate the development and increase self-esteem, and it can also suppress and hinder the achievement of success. In the process of formation of the motivational sphere, an important role belongs to internal and external motives. Intrinsic motives are based on the needs, values, interests of the individual. Extrinsic motives are related to the environment, rewards, recognition (Oliynyk, 2018). In order to study the internal and external factors that have an impact on the specifics of the formation of the needs and motivational sphere of future physical culture and sports specialists, the following question was asked in the questionnaire: "Why did you decide to do sports?" (Table 1).

Table 1. The influence of factors on the formation of motivation for sports, $N = 68$

Answer option	Number of responses	%
An example of friends	4	5.9
Motivational videos from social networks	3	4.4
The prestige of sports	10	14.7
Attending sports events	10	14.7
Parents' request	6	8.8
An example of parents	18	26.5
Coach's invitation	16	23.5
Advice from a physical education teacher	1	1.5

Source: made by the authors

Based on the results of the survey, it was determined that both external and internal factors influence the respondents' decision to start playing sports. The example of parents (26.5%) has the greatest influence on the decision to play sports. For 23.5% of respondents, the personality of the coach and his invitation to training were also significant factors that influenced the decision to engage in sports activities. Attending sports events, the atmosphere of competitions, the desire to belong to the sports community, and the prestige of playing sports contributed to the formation of motives for playing sports for 14.7% of respondents. Studying the needs and motivations of future specialists in the field of physical culture and sports, a goal was determined that motivates respondents to engage in sports (Fig. 1).

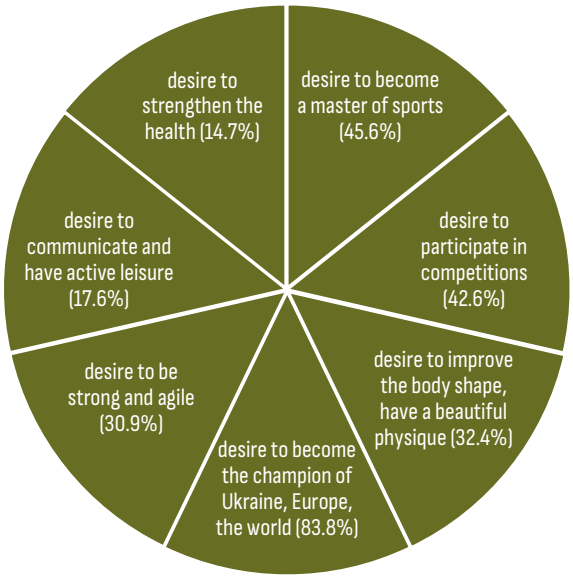

Figure 1. The purpose of sports, $N = 68$
Source: made by the authors

The motives chosen by the students are a necessary prerequisite for the self-affirmation of the athlete's personality and the achievement of the goal. According to the results, it was determined that the motive for achieving success in the chosen sport is dominant among the majority of respondents. For them, the following motives are most significant: "desire to become the champion of Ukraine, Europe, the world" (83.8%), "desire to become a master of sports" (45.6%), and "desire to participate in competitions" (42.6%). The motive to improve the physique (32.4%) and the motive to become strong and agile (30.9%) are still important for future specialists in the field of physical culture and sports. The social motive of communication does not have value for respondents (17.6%), which indicates a lack of desire to use training to communicate with friends. For communication and active leisure time, students choose free time from training and classes at the college. The motive of improving health turned out to be less significant for the respondents (14.7%). Investigating the motives of athletes regarding the choice of a sport, it was established that young men had a desire to engage in the particular sport since childhood (83.8%), which became a determining factor in the duration of sports activities. Other answers have a much lower percentage. To the question, "Do you have a desire to change your sport?" the vast majority of students (81%) answered negatively. This indicates a high level of motivation for playing sports among the students studied. Among the athletes, there were also those who had a desire to try themselves in another sport (16.2%).

Physical culture and sports are not just physical activities but also socio-cultural phenomena that contribute to the formation of personality. The formation of the subject of professional activity involves the development of such qualities as independence, critical thinking, and analytical skills in future specialists. This is necessary because the organisation of physical activity is a complex process that requires competence and skills to take into account the needs and specifics of different groups of people. A high level of formation of the value of "health" is necessary in the context of the professional activity of a specialist in physical culture and sports. A future specialist should be an example for others, encourage a healthy lifestyle, independently engage in physical activity, strive to increase his physical and moral potential, and engage in another type of sports activity. With the growing focus on healthy lifestyles and physical health, it is possible that students prefer occupations related to physical activity and sports. A change in awareness about the importance of health can be a significant factor in choosing this field. In this regard, respondents' perceptions of a healthy lifestyle were investigated.

According to the results of the study, it was determined that 47% of respondents believe that a list of certain measures aimed at preserving health is a healthy way of life for a person. The second most important answer concerns the individual system of human behaviour aimed at preserving and strengthening health (33.8%). That is, regardless of the fact that students are engaged in sports for a long time and, after graduating from college, will receive a specialty in the field of physical culture and sports, only 33.8% gave an adequate definition of a healthy lifestyle of a person and physical and moral potential of themselves in another type of sports activity. Athletes believe that a healthy lifestyle comes down mostly to physical development and maintaining fitness. They often focus on training, using a special diet, and following a sleep and rest schedule to maintain their fitness. Forming a healthy lifestyle requires a conscious approach and an understanding of all its aspects. Athletes should be aware of the importance of not only physical training but also a balanced diet, good emotional stability, establishing healthy relationships with people around them, and paying due attention to their psychological state. It is important that athletes learn and understand that health is more than just physical development and physical perfection. This means that they must be aware of and practice various aspects of a healthy lifestyle and their physical and moral potential in another type of sports activity (EU youth strategy, n.d.).

Motivation for sports and professional activities can be different for each person. It is usually based on a combination of biological, social, and personal factors. Biological factors include physical abilities and natural predispositions to an active lifestyle. For example, some people may be more prone to athletic achievements because of their physical constitution or genetic characteristics. Social factors include the social context in which a person lives. For example, the influence of parents, coaches, peers, and other people can be important for the formation of motivation for sports and physical activity. Personal factors include a person's internal motives and needs. For example, some individuals may be highly motivated to achieve great athletic achievements, improve their physical health, or find personal satisfaction in athletic activities. The basis of the motivational sphere of the individual is formed by needs – dynamic and active states of the individual that express his dependence on specific conditions of existence and generate activities aimed at removing this dependence (Krutsevych, 2012). For a better understanding of the needs and motivational sphere of students of a professional college, it is important to investigate their needs and target attitudes towards themselves in another type of sports activity (Table 2).

Table 2. Rating of general needs of students, $N = 68$

No.	Needs	Sum of points	Rating
1	To achieve recognition and respect among people	107	2
2	To have good relations with others	63	6
3	To be financially independent	125	1
4	To be able to provide for yourself in the future	43	9
5	To be able to share your thoughts and feelings with others	41	10
6	To establish the position	70	5
7	To achieve success and self-realisation	58	7
8	To have sufficient resources, goods, and opportunities	56	8
9	To engage in self-improvement and acquire new knowledge and skills	71	4
10	To learn how to resolve conflicts effectively	27	11
11	To go to the new and unknown	21	13
12	To secure a financial future	26	12
13	To be able to dress beautifully and stylishly	9	14
14	To have a favourite job	74	3
15	To be effective in communication and reduce the risk of misunderstandings	10	15

Source: created by the authors

The analysis of the rating of the general needs of sports college students allows to put the need to be financially independent (125 points), in second place is the need to achieve recognition and respect among people (107 points), and in third place is the need to have a favourite job (74 points). The need to engage in self-improvement and acquire new knowledge and skills (71 points) and the need to establish the position (70 points) also turned out to be significant for students. Such a choice may be related to the desire to achieve success in sports. Next in the rating are the needs for good relationships and friendly relations (63 points) and the needs for the development of one's abilities (58 points), which indicates the desire to increase the level of mastery and competence by doing work that requires full dedication. On the other hand, the need to provide material comfort is not a priority for students; that is, it is no longer about earning a living, because for them it turned out to be irrelevant, but it is about higher material support, which is highlighted in the priority need to "provide for one's future".

Considering that success in the field of physical culture and sports is determined not only by physical abilities but also by internal beliefs and values, it can be concluded that the formation of motivation for sports is a complex and multifaceted process. A valuable attitude towards sports activities not only stimulates the achievement of results but also forms internal motivation, which is an important factor for professional mobility. It should be noted that values and motivation are not limited to the field of sports. They are transferable to other areas of life, being used in professional activities and personal development.

Discussion

As a result of the study of the needs and motivational sphere of future specialists in physical culture and sports, it was determined that their needs, motives, and interests are more aimed at achieving high sports results, cooperation with coaches and the team, improving fitness, and developing sports skills and abilities than to maintain and improve health and mental and emotional well-being. The topic of the scientific research conducted by the authors has already attracted the attention of other scientists, and its results testify to the diversity of conclusions on this issue. In the work of professors V. Voronova & I. Smoliar (2020), regarding the structure of the motivational sphere of young basketball players, it was found that the motivational priorities of athletes are significantly determined by various factors. Particularly important are the athlete's success in activities, the degree of satisfaction with the educational and training process, and the psychological climate on the team.

Studying the issue of training specialists in the field of physical culture and sports, scientists emphasise the importance of practical experience, its interaction with theoretical knowledge, and taking into account the individual characteristics of future specialists in the field of education. The topic of motivation, which plays a key role in the formation of high-quality educational training and professional development in the field of physical culture and sports, is also actively studied; this issue was addressed by L. Borisevich & I. Zhukova (2020). The results of the experiment coincide with the scientific conclusions of I. Samokhvalova *et al.* (2020), who in their survey investigated the attitude of female university students towards physical culture and sports, as well as their health values. According to the results of the study, young people take into account their sports achievements, which determine their motivation, and sports can be an important indicator for maintaining interest in sports and future professional activities in the field of physical culture and sports.

The study of adolescent motivation in sports activities should include the analysis of various aspects, such as personal goals, perceptions of success and failure, team atmosphere, and interactions with coaches and other participants. This will help create more effective strategies for the formation of motivation in the sports environment, promoting further involvement in professional activities in the field of physical culture and sports. It also indicates the need to integrate psychological and social aspects into training and development programmes for teenagers in sports. Ensuring a positive psychological climate, supporting

personal growth, and taking into account individual characteristics can become key elements of successful work with young people in the sports field (Anshel *et al*., 2019).

Ukrainian scientist N. Denisenko (2021) dealt with the problem of forming the professional mobility of future physical education teachers. It determined the level of professional mobility of future specialists in the field of physical culture and sports. The main indicators of the motivational criterion in the research were the level of formation of a valuable attitude towards pedagogical activity and the need to achieve success. This aspect is also an essential element of this study. Items such as "to achieve recognition and respect among people" and "to have good relations with others", which took second and sixth place in the ranking of general needs of students, are correlated with the results of R.L. White *et al.* (2021), who in their study came to the conclusion that good relations with others, in particular peers, and authority among people are significant motivating factors for students of physical education.

O. Soltyk (2019) conducted an analysis of the structure of professional reliability for future physical education teachers, focusing on personal motivational and activity components. This aspect, as noted in his research, also becomes a key element of the presented research. The identified main motives, such as improving health, developing physical qualities, improving body shape, and achieving high sports results, emphasise the importance of this information in the context of the author's scientific efforts. The authors of the conducted research believe that this is important for future specialists in the field of physical culture and sports, as it is related to their professional orientation. According to the results of research by M. Shepelova (2022), a hierarchy of system-forming factors for students' needs was built. These needs are actualised when students find themselves in conditions of uncertainty. It was found that young people with a pronounced need for achievement demonstrate significant success in both the academic and creative spheres. This finding underscores the importance of considering motivational priorities, particularly the need for achievement, when studying young people's motivation for professional activity and achievement in various areas of their lives. At the same time, there is the opinion of O. Marchenko (2019) that the way of life of a person is based on a deeply individualised relationship between the objective position of the individual in society and his inner world.

R.M. Ryan & E.L. Deci (2018; 2020) worked on self-determination theory and research on the role of motivation in sport. Their research focuses on the concept of "need for achievement" and other aspects of motivation in a sports context. Scientists recognise the importance of internal motivation, which is based on self-determination and personal internal recognition of values and goals. This study also notes the importance of autonomous motivation, where a person feels in control and internally recognises their goals. The authors of the current study agree with the authors of the self-determination theory that intrinsic motivation and autonomous extrinsic motivation are associated with positive results in studies and sports. Research findings also point to the importance of supporting basic psychological needs such as autonomy, competence, and relatedness. Instead, the theory of R.M. Ryan & E.L. Deci (2018; 2020) applies more generally to various aspects of life, including work, education, sports, etc. The same study specifically focuses only on the motivation of teenagers in sports and its influence on the formation of needs and motivational sphere.

M.D. Fry & E.W.G. Moore (2019) research uses achievement goal theory, the concept of caring, and self-determination theory, particularly in the context of the motivational climate created by coaches, athletes, and parents. Scientists indicate the need for the development of science-based training programmes for coaches in order to optimise the emotional and performance experiences of athletes. Instead, the results of the author's research highlight the importance of the triad of coaches, parents, and athletes and emphasise the need for training for all parties to maximise athletic and personal growth. The authors of the study believe that it is important to take into account the integration of psychological and social aspects in training programmes and the development of adolescents in sports. Research results indicate the need for a positive psychological climate, support for personal growth, and consideration of individual characteristics for successful work with young people in the sports field. Research by scientists also indicates the importance of a valuable attitude towards pedagogical activity and the need to achieve success as key components of the professional mobility of participants in the field of physical culture and sports. Such conclusions help to improve specialist training programmes and a pedagogical approach to the formation of motivation in a sports environment.

Thus, the need for achievements manifests itself as a tendency to improve results and achieve success in professional activities, not limited exclusively to the sports field. The formation of motives for sports is inextricably linked to the establishment of a specific sports achievement, and the very process of achieving a result becomes for the athlete an increase in self-esteem, a confirmation of the implementation of the task, and at the same time a source of motivation for further success. Therefore, in the future, it is important to continue to develop and improve training programmes for specialists in the field of physical culture and sports in order to provide future specialists not only with technical skills, but also with value orientations that will contribute to their success and higher achievements in professional activity and personal life.

Conclusions

The results of the study made it possible to determine that the motivation of teenagers in sports is the result of the interaction of numerous factors, such as individual achievements, satisfaction with the learning process, and the social context. It was determined that the formation of the needs and motivational sphere of future physical culture and sports specialists is influenced by external conditions created by the professional environment of students and internal conditions determined by their potential. Living conditions, learning conditions in an educational institution, mode and type of physical activity, sports, which affect the formation of needs, motives, interests, orientation, level of achievements, goals, etc. A high level of sports motivation indicates the direction of the athlete's personality and is a component of the process of personal and professional growth, which plays an important role in achieving sports

results. The main factors that influence the decision to play sports are the authority and personal example of parents, the invitation of a coach, the prestige of playing sports, and attending sports events.

Studies have shown that for athletes, a healthy lifestyle reflects their overall health, which includes physical strength, endurance, speed, flexibility, and other aspects of physical fitness. Not all respondents understand the concept of a "healthy lifestyle". Only a few of them correctly understand this concept and show their concern for health by using different methods. For athletes, ideal physical condition and a high level of physical training are important factors in achieving success in sports. Therefore, they care about their health and work to maintain and improve it through exercise, proper nutrition, rest, and other healthy habits. The analysis of the rating of the general needs of sports college students identified the following priority needs: the need to secure one's future, the need to achieve recognition and respect, and the need to engage in work that requires dedication. Further research will be directed in the direction of studying the self-assessment of the physical development of students at a professional college.

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Conflict of Interest

None.

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Особливості потребо-мотиваційної сфери особистості майбутніх фахівців фізичної культури і спорту

Оксана Марченко

Доктор наук з фізичного виховання і спорту, професор
Національний університет фізичного виховання і спорту України
03150, вул. Фізкультури, 1, м. Київ, Україна
https://orcid.org/0000-0002-2902-5960

Олександр Москаленко

Аспірант
Національний університет фізичного виховання і спорту України
03150, вул. Фізкультури, 1, м. Київ, Україна

Директор
Олімпійський фаховий коледж імені Івана Піддубного
Національного університету фізичного виховання і спорту України
02156, вул. Миколи Матеюка, 4, м. Київ, Україна
https://orcid.org/0009-0008-3020-8909

Анотація. Аналіз та розуміння мотивації, яка спонукає студентів обирати фізичну культуру й спорт як основну сферу діяльності, є актуальним питанням, що відіграє важливу роль у розробці ефективних стратегій підтримки студентів, орієнтованих на їхні особисті та професійні потреби та амбіції. Метою було дослідження особливостей потребо-мотиваційної сфери студентів профільного коледжу, які мають намір стати фахівцями у сфері фізичної культури і спорту. Застосовано соціологічний метод анкетування для дослідження мотивації студентів. Результати анкетування свідчать про перевагу внутрішньої мотивації серед студентів, яка може бути ключовим фактором досягнення високих результатів. Бажання «перемогти себе» виявлено як одну з основних складових цієї мотивації, що вказує на внутрішню динаміку та самозростання студентів у їхніх спортивних зусиллях. Встановлено, що авторитет та особистий приклад батьків, запрошення тренера, престижність занять спортом та відвідування спортивних заходів є основними факторами, що впливають на рішення студентів займатися спортом. Вивчаючи потребо-мотиваційну сферу майбутніх фахівців сфери фізичної культури і спорту, визначено мету, яка спонукає студентів до занять спортом: домінантним є мотив досягнення успіху в обраному виді спорту. Найбільш значущими мотивами для студентів є мотив стати чемпіоном України, Європи, світу, прагнення отримати звання майстра спорту та бажання брати участь у спортивних змаганнях. Студенти спортивного коледжу вважають основними пріоритетами забезпечення свого майбутнього, досягнення визнання та поваги, а також бажання мати улюблену роботу. Результати дослідження також показали низький рівень освіченості респондентів стосовно здорового способу життя, що висвітлює необхідність додаткових заходів для підвищення рівня освіченості. Для спортсменів це поняття включає здебільшого різні аспекти фізичної підготовки. Застосування отриманих результатів на практиці може значно покращити взаємодію зі студентами, що сприятиме їхньому активному розвитку та досягненню особистих і професійних цілей

Ключові слова: студенти; фізична активність; тренування; здоров'я; цілі; визнання; самовдосконалення

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Physical condition of first-level higher education students studying pedagogical specialties

Yelyzaveta Matsukhova*

Postgraduate Student
Prydniprovsk State Academy of Physical Culture and Sport
49094, 10 Naberezhna Peremohy Str., Dnipro, Ukraine
https://orcid.org/0000-0002-2534-9319

Olha Mykytchyk

PhD in Physical Education and Sport, Associate Professor
Prydniprovsk State Academy of Physical Culture and Sport
49094, 10 Naberezhna Peremohy Str., Dnipro, Ukraine
https://orcid.org/0000-0002-8656-0943

Abstract. A rapid decrease in the level of daily motor activity of student youth as a result of the transition to distance learning, which is characterised by a high amount of mental and psycho-emotional load, has led to an increase in morbidity and deterioration of the physical condition of students in general, which is an urgent problem. The purpose of the study was to determine the level of physical condition of first-level higher education graduates who are studying pedagogical specialties at Berdyansk State Pedagogical University. In the course of the experiment, a medical-biological research method was used, namely an anthropometric method for measuring body weight and length, body mass index, Erisman index, and chest circumference, to further determine the level of students' physical condition. In order to process the received data, the methods of mathematical statistics were used. It has been established that the anthropometric indicators of first-level higher education graduates studying pedagogical specialties at Berdyansk State Pedagogical University are within age norms. Some students are overweight. Indicators of the frequency of heart contractions in a state of relative rest are within age norms. In blood pressure indicators, there was a predominance of cases of hypertension in representatives of both sexes. The indicators of the functional state of the students' respiratory system, according to the Stange test, are within the physiological age norm. The level of physical condition of female students according to the method of O. Pirohova is defined as average; for boys, it is below average. The studies conducted proved that the majority of students have reduced indicators of their physical condition. The results obtained in practice can be taken into account by teachers during the organisation of physical education classes in distance learning conditions

Keywords: students; distance learning; functional state; the method of Pirohova; anthropometric indicators

Introduction

The assimilation of new knowledge mostly occurs by mastering various computer technologies, thanks to the development of artificial intelligence. The rapid implementation of the latest technologies was not left aside by institutions of higher education, for which, in the conditions of quarantine restrictions and during martial law, the issue of introducing distance education became especially urgent. However, the transition to distance learning led to a significant deterioration in the physical condition of students in higher education institutions in Ukraine.

C. Hodges *et al.* (2020) argue that the shift to online learning can provide the flexibility of teaching and learning anywhere and anytime, which is what happened in 2020. However, in their work, scientists L. Anikeyenko & N. Dhakal (2019) came to the conclusion that, despite the positive features of distance education, acquiring knowledge without visiting special educational institutions and without personal contact with a teacher has certain disadvantages. This is a decrease in the level of daily physical activity among students and their healthy lifestyle skills. In

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*Corresponding author

this regard, V. Bondarenko *et al.* (2022) emphasised that the physical condition of student youth is rapidly deteriorating. This leads to an increase in morbidity and a decrease in the level of physical activity. The requirements of modern higher education and, subsequently, the acquisition of certain professional skills require students to have a high level of indicators of physical condition and, in particular, physical fitness. In the process of physical education, many functional changes occur in the muscles, bones, cardiovascular system and other systems, which ensures adaptation of the body to further training loads in the future.

H. Boyko *et al.* (2022) emphasise that in the conditions of distance learning, the observance of recommended types of motor activity by students of higher education corresponds to the need for physical activity as an integral component of a healthy lifestyle, and only if they are aware of their attitude towards their own health as the highest value. In addition to long-term restrictions on physical activity and being constantly under the negative influence of information about new diseases, the tragic consequences of war also negatively affect the psycho-emotional state of students. The opinion of O. Mkrtichyan (2023) is valid because insufficient efforts are being made to solve the health problems of student youth, especially during the period of forced distance learning due to martial law. The scientist focuses on the expediency of higher education students acquiring the competence for self-diagnosis of the functional state.

An analysis of research by R. Slukhenska *et al.* (2020) on the issue of the health status of applicants proved that 90% of them show deviations in their health status, and approximately 50% have an unsatisfactory level of physical fitness. Diseases of the musculoskeletal system, organs of vision, cardiovascular system, etc. are the most common and progressive among them. L. Zhao *et al.* (2021) noted that, due to the extraordinary transition to online teaching and learning, teachers and students are forced to work with new systems and face increased workloads. Taking this into account, scientists draw a conclusion regarding the peculiarities of the organisation of distance learning, which requires teachers to develop new forms and methods of working with students. Therefore, it will be relevant to create a fundamentally new model of the process of physical education in the context of distance learning with the help of information technologies. Yu. Nenko & O. Ivashchenko (2023) note that the most common tools of the educational process management system are Moodle, Blackboard, Canvas, Edmodo, Google Classroom, and Microsoft Teams.

That is why the question of researching the existing level of physical condition and level of physical fitness of students is currently being updated. In the conditions of distance learning, taking into account these indicators is important because increasing the indicators of physical condition and the level of physical preparedness of students is a guarantee of effective development of personal and professional qualities in the future and an important task of physical education classes in a higher education institution. The system of physical education for graduates, which has developed in the state as of 2023, is inefficient, does not provide psychological and professional preparation for productive activities and the further lives of graduates, and needs constant improvement. The above determined the chosen goal of the study: to investigate the level of physical condition of the first-level higher education graduates on the example of students of pedagogical specialties at the Berdyansk State Pedagogical University.

Materials and Methods

A combination of empirical and theoretical methods was used for the purpose of practical implementation of the research goal. Research was conducted on the basis of Berdyansk State Pedagogical University (temporarily relocated to Zaporizhzhia, Ukraine). Before starting the study, the students were introduced to the research methodology and indicators reflecting the level of physical condition; a description of the testing methodology, their assessment criteria, and formulas were provided. The research was conducted in compliance with ethical standards, all survey participants were informed about what their data would be used for, about anonymity, and the risks that exist (Ethical expertise of scientific research, 2020). The experiment was conducted from September 2022 to August 2023. The indicators of the functional state of the cardiovascular and respiratory systems of students and anthropometric data were determined. For this, students were provided with electronic cards in September 2022, which describe the specifics of the measurements. After filling them out, the cards were sent to messengers or e-mail, with further processing of the results. Forty students ($N = 40$) of the first level of higher education, including 14 girls ($n = 14$) and 26 boys ($n = 26$), who are getting an education in specialty 014 "Secondary Education" (subject majors), took part in the research.

Anthropometric measurements were carried out in order to assess the level of physical development of first-level higher education graduates. Such indicators as body length and weight, body mass index, and chest circumference according to the Erisman index were studied. In order to assess the resistance of the students' bodies to mixed hypercapnia and hypoxia and to assess the general state of the body's oxygen supply systems during breath hold against the background of deep inhalation, the Stange test was used. The assessment of physical condition was carried out according to the method of O. Pirohova (Determination of the level..., n.d.). Mathematical statistics methods were used to process the obtained results. The arithmetic mean was calculated according to the formula:

$$\overline{X} = \frac{1}{n}\sum_{i-1}^{n} X_i = \frac{1}{n} = (X_1 + \cdots X_n), \quad (1)$$

where $\bar{X}$ is the arithmetic mean; n is a sample size; X_i is a sample variable. The standard deviation was calculated using the formula:

$$S = \sqrt{\frac{\sum_1^n (X_i - \bar{X})^2}{n}}, \quad (2)$$

where S is the standard deviation. The error of the arithmetic mean was calculated according to the formula:

$$m = \frac{S}{\sqrt{n}}, \quad (3)$$

where m is the error of the arithmetic mean. The coefficient of variation was calculated according to the formula:

$$V = \frac{S}{\bar{X}}, \quad (4)$$

where V is the sampling variation. X_{min} – the minimum sample rate, and X_{max} – the maximum sample rate, are the indicators given later in the paper. Among the theoretical methods used are the following. The analysis of scientific and methodical literature was used to study the relevance of the given problem, namely, the determination of the level of physical condition of higher education students during distance learning. Graphical methods were used in order to provide a general picture of the subject of research and, at the same time, a visual representation of its components, cause-and-effect relationships, and the power of the distribution of components in a given volume. To compare the level of physical condition and compliance of the obtained indicators with the age norms of physical development, the method of comparison was applied. When forming conclusions, the method of abstraction was applied.

Results

The morphological characteristics of the students were determined and analysed. It was found that in representatives of both sexes, the coefficient of variation (V) ranges from 2.09 to 4.81% in terms of body length and Erisman index; in girls, chest circumference indicators (V = 8.43%). The average variability of the sample was found in the indicators of body weight in boys (V = 16.20%), body mass index in representatives of both sexes (where V ranged from 10.79% to 15.66%), and chest circumference in boys (V = 14.48%). Significant variability in the sample was recorded in girls in body weight indicators (V = 21.68%). It was found that the selected population of students at the higher education institution is not homogeneous in terms of anthropometric indicators. The obtained results are shown in Table 1.

Table 1. Anthropometric indicators of students in the I-II courses of pedagogical specialties, N = 40

Indexes	Sex	$\bar{X}$	S	m	V, %	X_{min}	X_{max}
Body length, cm	girls (n = 14)	165.93	7.63	1.11	4.60	155	180
	boys (n = 26)	179.46	8.63	1.69	4.81	167	192
Body weight, kg	girls (n = 14)	58.07	12.59	2.04	21.68	45	85
	boys (n = 26)	79.5	12.88	2.53	16.20	56	105
Body mass index, kg×m^{-1}	girls (n = 14)	20.92	3.28	0.88	15.66	17.76	27.8
	boys (n = 26)	24.57	2.65	0.52	10.79	18.3	30.7
Erisman index, units	girls (n = 14)	−0.89	3.40	0.91	−3.82	−7.5	4.5
	boys (n = 26)	5.02	10.52	2.06	2.09	−13.5	27
Circumference of the chest, cm	girls (n = 14)	82.07	6.92	1.85	8.43	70	92
	boys (n = 26)	94.73	13.72	2.69	14.48	74	121

Source: created by the authors

It was found that the height and body weight indicators of higher education graduates are mostly within the age norms. Body length indicators in girls were 165.93 ± 7.63 cm, which corresponds to the average level of physical development. For boys, the measured indicators corresponded to a sufficient level of physical development, as they were 179.46 ± 8.63 cm. The body weight indicators of female students at the pedagogical university were 58.07 ± 12.59 kg, and for boys, 79.5 ± 12.88 kg. Despite the fact that the anthropometric indicators of the general group sample were generally within the age norms, cases of excess body weight were observed in some students. The obtained data on body length and weight made it possible to calculate the body mass index. It was established that the body mass index in girls was 20.92 ± 3.28 kg×m^{-1}, in boys it was 24.57 ± 2.65 kg×m^{-1}. This confirmed the previous conclusion that the majority of students have body mass indicators within the age norm.

Chest proportionality was assessed by calculating the Erisman index. The following average values have been established: for girls, −0.89 ± 3.40 units. This indicates that the majority of female students belong to the asthenic body type. In boys, the value of this index was equal to 5.02 ± 10.52 units, which indicates the predominance of representatives of the hypersthenic body type. Indicators of the functional state of the cardiovascular and respiratory systems of higher education graduates were used to characterise the state of the main life support systems of the body. The results are shown in Table 2.

Table 2. Indicators of the functional state of the cardiovascular and respiratory systems of students in the I-II courses of pedagogical specialties, N = 40

Indexes	Sex	$\bar{X}$	S	m	V, %	X_{min}	X_{max}
Heart rate, bpm^{-1}	girls (n = 14)	89.21	4.46	1.19	5.01	80	95
	boys (n = 26)	81.15	7.60	1.49	9.37	60	95
Systolic blood pressure, mm Hg	girls (n = 14)	133.64	6.64	1.77	4.97	120	146
	boys (n = 26)	128.27	7.26	1.42	5.66	110	145
Diastolic blood pressure, mm Hg	girls (n = 14)	91.14	7.44	1.99	8.16	78	105
	boys (n = 26)	85.31	5.50	1.08	6.44	70	95
Average arterial pressure, mm Hg	girls (n = 14)	105.36	6.96	1.86	0.07	92	119
	boys (n = 26)	99.65	5.02	0.98	0.05	87	110
Stange test, s	girls (n = 14)	31.21	4.15	1.11	13.31	27	40
	boys (n = 26)	45.46	9.03	1.77	19.85	30	62

Source: created by the authors

Analysing the obtained data, it should be noted that in representatives of both sexes, weak variability of the sample was found in all indicators of the functional state of the cardiovascular system (V ranges from 0.05 to 9.37%), which indicates a significant homogeneity of the sample in terms of these indicators. Average group indicators of the heart rate in a state of relative rest in girls were within 89.21 ± 4.46 bpm^{-1} and 81.15 ± 7.60 bpm^{-1} in boys. The obtained data corresponded to the age norm. The prevalence of arterial hypertension was observed in representatives of both sexes: blood pressure indicators in girls were 133.64/91.14 ± 6.64/7.44 mm Hg, in boys, 128.27/85.31 ± 7.26/5.50 mm Hg. The obtained data are consistent with the conclusions of other scientists, such as S. Hossain *et al.* (2020) and G. Perez & V. Delgado Martinez (2023), who link it to anxiety and stress. According to the Stange test, the average variability of the sample was revealed (V ranged from 13.31 to 19.85%). A detailed analysis of the results of this test established that 50% of the girls had an unsatisfactory functional state of the respiratory system; 43% of girls and 42% of boys had a satisfactory condition; and 7% of girls and 58% of boys are in good condition (Fig. 1). Thus, it was found that the functional indicators of the cardiovascular and respiratory systems in students in higher education institutions are mostly within the physiological age norm. The assessment of the level of physical condition was carried out according to the O. Pirohova method. The data are shown in Table 3 and Figure 2. It was established that, in terms of physical condition indicators, there was a significant variability of indicators in girls (V = 20.10%), and in boys it was average (V = 18.61%). This indicates the heterogeneity of the sample.

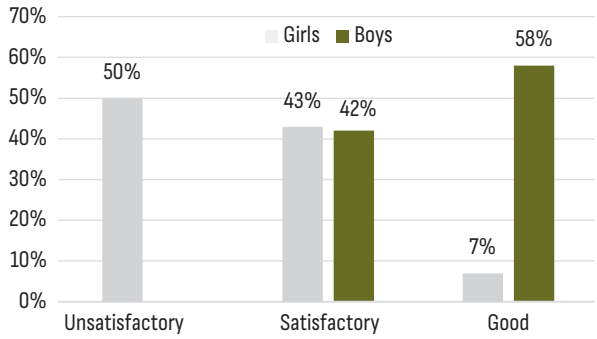

Figure 1. Assessment of the functional state of the respiratory system according to the Stange test, N = 40
Source: created by the authors

Table 3. Indicators of the physical condition of students in the I-II courses of pedagogical specialties according to the method of O. Pirohova, N = 40

Indexes	Sex	$\bar{X}$	S	m	V, %	X_{min}	X_{max}
Level of physical condition, units	girls (n = 14)	0.375	0.08	0.02	20.10	0.248	0.474
	boys (n = 26)	0.508	0.09	0.02	18.61	0.362	0.727

Source: created by the authors

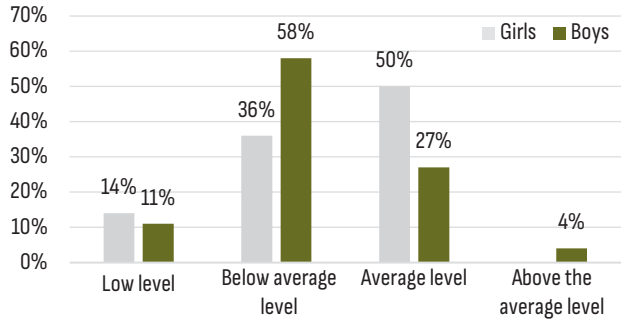

Figure 2. Assessment of the level of physical condition, N = 40
Source: created by the authors

A detailed analysis of the obtained data proved that the level of physical condition, according to the method of O. Pirohova, was defined as average in the vast majority of girls and below average in boys. 50% of female students and 27% of male students had an average level of physical condition; 36% of girls and 58% of boys had a level below average; 14% of girls and 11% of boys had a low level. A higher-than-average level of physical condition was found in 4% of students. The studies conducted proved that the majority of students have a low or below-average level of physical condition. The authors did not find a single student who had a high level of physical condition. It is advised to implement independent programmes with exercise components utilising remote technologies in order to raise the physical condition and daily motor activity.

Discussion

Analysing and contrasting the data gathered throughout the study process with that of other researchers is suitable. The obtained data confirm the results of previous studies by R. Mahruk *et al.* (2023), which revealed the predominance of those with higher education with only satisfactory skills in leading a healthy lifestyle, and I. Vovchenko *et al.* (2022), which established the presence of 50% of higher education graduates with average and above-average levels of physical condition. At the same time, the scientist established that a significant part of students (37.5%) is characterised by a low or below-average physical condition, while only a small percentage of students (12.5%) is characterised by a high level of physical fitness.

Considering that regular physical activity improves mental health, which is also confirmed by the results of A. Mahindru *et al.* (2023), the process of physical education at the university should be aimed at raising the level of physical condition of students and its further preservation for a long period of time. The presented data should motivate teachers to timely assess the physical condition of students and make the necessary corrections. The results of this study were confirmed in comparison with the opinion of O. Mozolev *et al.* (2020) that there is currently a deterioration in the indicators of the physical condition of students in higher education institutions. Specialists

such as O. Plyeshakova (2020) associate this with the high intensity of academic work during mental work at the computer and, as a result, a low level of motor activity. The obtained data are consistent with the conclusions of other scientists, I. Zenina *et al.* (2022), which proved that the number of students entering preparatory and special medical groups increased from 5.36% in the first year to 14.46% in the fourth year during their studies in higher educational institutions. Thus, almost 90% of this contingent have identified abnormalities in their state of health. This was significantly updated during the period of the mass introduction of computer technology. The most common symptoms of the deterioration of the physical condition of the acquirers are: headaches; blurred vision; memory impairment; increased fatigue; discomfort in the eyes (pain, dryness, lacrimation); increased irritability, and much more.

V. Zahorodniy & L. Yaroslavska (2021) confirm the opinion of the authors of this article that body length as an integral indicator of physical development in young men during the entire period of study does not change significantly and ranges from 178.64 ± 0.93 to 178.47 ± 0.89 cm. The body weight indicators of young men at the beginning of their studies at the university increase from 67.28 ± 1.43 kg to 69.31 ± 1.52 kg. In girls, body weight during the entire period of study decreases from 59.32 ± 3.44 kg in the first year to 55.93 ± 1.42 kg in the third year. The research of S. Kybalnyk & O. Ptashenchuk (2019) proved that the average indicator of the actual vital capacity of the lungs of the winners is 2.843 ± 0.77 l, in particular in girls – 2.581 ± 0.54 l, and in boys – 3.774 ± 0.73 l, which mostly corresponds to age norms.

The idea of a disappointing situation in the indicators of physical fitness related to the morpho-functional state of higher education students was further developed. The reasons for low physical fitness are genetics, condition, lifestyle, environmental conditions, as well as medical care, low motivation, a lack of an individual approach to the organisation of physical education classes, etc. Therefore, when doing physical exercises, as well as when testing students' motor readiness (current or final), it is necessary to take into account their individual physical condition. The results obtained by the authors confirm the conclusions of other scientists that the level of physical condition in most girls is defined as average and in boys as lower than average. This, in the authors' opinion, may indicate that the problem of poor physical condition among students can be caused by many factors, such as insufficient physical activity, irrational nutrition, the low-stress nature of modern life, environmental pollution, etc. The general deterioration of the physical condition is also caused by negative changes in the health of student youth, as noted by K.A. Almhdawi *et al.* (2021). These problems, according to M. Korchagin & Ye. Kurishko (2023), are aggravated by the influence of factors caused by the active phase of the war, which began in February 2022.

According to O. Palienko & O. Ivanenko (2022), the variety of functional deviations in physical condition, as well as differences in the initial level of students' motor abilities, require a differentiated approach both to the use of physical education tools and to regulatory requirements for evaluating the results of motor tests while taking into account the individual level of physical health of the applicants. The use of a scientifically based system for assessing the level of physical fitness of students based on objective quantitative characteristics of their state of health allows to personalise the process of physical education and increase its effectiveness. That is why it is necessary to significantly change the attitude of authorities and educational institutions regarding the formation of students' appropriate attitudes towards physical activity, leading a healthy lifestyle, preventing bad habits, and reducing hypodynamism as an important reserve for strengthening health. This is emphasised by P. Długosz *et al.* (2022), who indicate that there is a direct relationship between students' addiction to the Internet and their health problems. Taking into account the results of previous studies by Y. Matsukhova & O. Mykytchyk (2023), a survey of pedagogical students showed that most of them expressed a desire to engage in physical education using the latest fitness technologies.

Therefore, in order to increase the level of physical condition and the volume of daily motor activity, it is recommended to introduce independent classes with elements of fitness using remote technologies. Factors that directly affect the activity of students are the implementation of programmes of physical culture and health education, which provide stimulating elements for the motivation of systematic physical exercises, the use of innovative technologies, and consideration of the motivational priorities of students of higher education.

Conclusions

The article presented the results of research on the level of physical condition of students of pedagogical specialties in the conditions of distance learning. Having considered the available number of sources of scientific and scientific-methodical literature, it can be stated that there is a tendency to decrease the daily motor activity of students in the process of studying in institutions of higher education as a result of their physical condition. Girls' physical development is at an average level: body length 165.93 ± 7.63 cm; body mass index 20.92 ± 3.28 kg×m^{-1}; chest proportionality index –0.89 ± 3.40 units (the asthenic type prevails). The boys had a sufficient level of physical development: body length 179.46 ± 8.63 cm; body mass index 24.57 ± 2.65 kg×m^{-1}; chest proportionality index 5.02 ± 10.52 units, i.e., representatives of the hypersthenic type prevail. According to the results of the assessment of the functional state of the cardiovascular system, it was determined that among girls and boys, the heart rate indicators are within the age norms (89.21 ± 4.46 bpm^{-1} and 81.15 ± 7.60 bpm^{-1}). However, blood pressure indicators indicate the presence of hypertension: in girls, 133.64/91.14 ± 6.64/7.44 mm Hg; in boys, 128.27/85.31 ± 7.26/5.50 mm Hg.

The indicators of the Stange test indicate the predominance of an unsatisfactory level of the functional state of the respiratory system among 50% of girls. At the same time, 43% of female students and 42% of male students demonstrated a satisfactory condition; 7% of girls and 58% of boys had a good functional condition of the respiratory system. The level of physical condition according to the method of O. Pirohova among students of Berdyansk State Pedagogical University, among girls it

was at an average level, among boys it was at a level below average. There is a need to improve physical education programmes to improve the state of health and the level of physical fitness. In further research, there may be a scientific justification for the introduction of innovative forms of work for first-level higher education graduates studying pedagogical specialties with the aim of improving their physical condition.

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Conflict of Interest

None.

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Фізичний стан здобувачів першого рівня вищої освіти, які навчаються за педагогічними спеціальностями

Єлизавета Мацухова

Аспірант
Придніпровська державна академія фізичної культури і спорту
49094, вул. Набережна Перемоги, 10, м. Дніпро, Україна
https://orcid.org/0000-0002-2534-9319

Ольга Микитчик

Кандидат наук з фізичного виховання і спорту, доцент
Придніпровська державна академія фізичної культури і спорту
49094, вул. Набережна Перемоги, 10, м. Дніпро, Україна
https://orcid.org/0000-0002-8656-0943

Анотація. Стрімке зниження рівня добової рухової активності студентської молоді внаслідок переходу на дистанційне навчання, яке характеризується високим обсягом розумового та психоемоційного навантаження, призвело до підвищення захворюваності та погіршення фізичного стану студентів загалом, що є актуальною проблемою. Метою дослідження було визначити рівень фізичного стану здобувачів першого рівня вищої освіти, які навчаються за педагогічними спеціальностями в Бердянському державному педагогічному університеті. Під час експерименту використано медико-біологічні методи дослідження, а саме антропометричний для вимірювання маси та довжини тіла, індексу маси тіла, індексу пропорційності Ерісмана, окружності грудної клітки для подальшого визначення рівня фізичного стану студентів. З метою обробки отриманих даних використано методи математичної статистики. Встановлено, що в здобувачів першого рівня вищої освіти, які навчаються за педагогічними спеціальностями у Бердянському державному педагогічному університеті, антропометричні показники знаходяться у межах вікових норм. У деяких студентів спостерігається наявність надлишкової маси тіла. Показники частоти серцевих скорочень у стані відносного спокою знаходяться у межах вікових норм. У показниках артеріального тиску в представників обох статей спостерігалося переважання випадків гіпертензії. Показники функціонального стану дихальної системи студентів за пробою Штанге знаходяться у межах фізіологічної вікової норми. У студенток рівень фізичного стану за методикою О. Пирогової визначається як середній, у хлопців – нижчий за середній. Проведені дослідження довели, що більшість студентів мають знижені показники рівня фізичного стану. Отримані результати на практиці можуть бути враховані викладачами під час організації занять із фізичного виховання в умовах дистанційного навчання

Ключові слова: студенти; дистанційне навчання; функціональний стан; методика Пирогової; антропометричні показники

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Expediency of using physical education means in the educational process of preschool-aged children with speech disorders

Nadiia Huliuk*

Postgraduate Student
National University of Ukraine on Physical Education and Sport
03150, 1 Fizkultura Str., Kyiv, Ukraine
https://orcid.org/0009-0006-9067-3330

Liubomyr Pasichniak

PhD in Physical Education and Sport, Associate Professor
National University of Ukraine on Physical Education and Sport
03150, 1 Fizkultura Str., Kyiv, Ukraine
https://orcid.org/0000-0001-7296-8510

Mariia Palchuk

PhD in Physical Education and Sport, Associate Professor
National University of Ukraine on Physical Education and Sport
03150, 1 Fizkultura Str., Kyiv, Ukraine
https://orcid.org/0000-0003-2774-1960

Abstract. Speech disorder in preschool children is among the most common nosologies. The relevance of studying the feasibility of using physical education means in work with children with speech development disorders is due to the data of scientific research, which emphasises the connection between the speech and motor skills of preschool children. The purpose of the study was to investigate the peculiarities of communication abilities and motor development of 5-6-year-old children with speech disorders and to determine, based on the analysis of scientific literature, the most appropriate means of physical education used in the work with children of this nosology. The research was conducted on the basis of preschool educational institutions No. 779 and No. 652 of combined type in Kyiv. The study involved 40 children aged 5-6 years with speech development disorders. During the ascertaining experiment, the children's communication abilities and the level of their motor development were assessed. It has been established that 50% of preschool children with speech development disorders have not undergone the operations of successive analysis and synthesis at the nonverbal level, which were assessed on the basis of the "Turtle" method. It was found that most preschoolers have not developed the nominative function of speech for communication with others – the ability to convey their thoughts through words, gestures, and signs – as evidenced by the results of the assessment of expressive and imprecatory speech. Children with speech development disorders have a delay in motor development, as evidenced by the results of motor tests. The obtained results should serve as a basis for the choice of physical education means in the educational process with preschool children with speech disorders and in the development of comprehensive programmes aimed at their correction

Keywords: preschoolers; general underdevelopment of speech; motor development; educational process; exercises; games

Introduction

The development of the motor skills plays an important role in the formation of the child's psyche and also affects its speech development, which is one of the most important components of the formation of a child's personality.

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*Corresponding author

Taking into account the interrelationship of children's general speech and motor skills, it is appropriate to study the peculiarities of speech and motor development in older preschool children and to analyse approaches to the use of physical education tools for the purpose of their correction and development. Statistical data on the number of children with speech disorders in preschool education institutions in Ukraine for 2018-2022 indicate that this disorder is the most common among preschoolers. According to the State Statistics Service of Ukraine, in 2018, 3,638 children with the specified nosology were recorded; in 2020, 3,328; in 2021, 3,324; and in 2022, 2,755 children (Preschool education in Ukraine, 2023).

The work of Ukrainian researchers such as O. Kozynets & L. Tsybulska (2023) is devoted to the study of the speech development of preschool children. The authors analysed modern approaches to corrective and developmental work with children with general underdevelopment of speech and also determined the most effective forms and means of the speech therapists' work, which include speech exercises and special game tasks. Researchers K.V. Eremenko & O.P. Taran (2022) developed a system for diagnosing the syllabic-rhythmic structure of speech and psychomotor skills of children with general underdevelopment of speech. The authors came to the conclusion that most preschool children with general underdevelopment of speech have an insufficiently formed syllabic-rhythmic structure of speech and psychomotor skills. It was established that the formation of skills of spatial organisation of movements and the ability to carry out spatially organised activities have a direct impact on the pronunciation of complex words, the perception of word combinations that denote objects, phenomena, signs, and the definition of accented components in a syllable series. The researchers discovered a relationship between the general underdevelopment of children's speech and the formation of their motor skills, which became the basis for the development of a diagnostic system that includes two aspects: psychomotor and the syllable-rhythmic structure of speech.

A. Tinazova (2022) emphasises the need to develop spatial concepts in children with a general underdevelopment of speech. The researchers presented an algorithm of actions for the correction of features of spatial functions in older preschoolers with general underdevelopment of language, which includes planning the directions of corrective work with children in accordance with innovative forms of work during corrective and developmental classes, in particular in the form of games. Carried out by B. Bukhovets *et al.* (2021), analysis shows the absence of modern developed programmes for the organisation of the process of physical education of older preschool children with impaired speech development, the prerequisite for the development of which should be the study of the motor development of the specified contingent. The authors share the opinion of I. Omelianenko (2018) that the implementation of an effective corrective and health-improving effect on the body of children with speech disorders by means of physical education should be based on the study of their motor function. As the author notes, the study of the peculiarities of the psychophysical development of children and the assessment of their cognitive and motor capabilities and abilities should be the basis for the meaningful filling of classes, the formation of methods, the choice of forms of organisation of classes, and the conditions of their conduct. Despite the interest of scientists in the study of issues related to the correction of speech disorders in older preschool children, the study of their motor development, communicative abilities, and approaches to the use of physical education tools in the educational process of special education needs further study. The purpose was to investigate the peculiarities of communicative abilities and motor development in 5-6-year-old children with speech disorders and to determine the means of physical education for working with such children.

Materials and Methods

In order to study the relevance of the researched problem and determine the purpose of the research, the method of analysis and generalisation of scientific literature data was used. In order to comprehensively analyse the data of the scientific literature, a systematic information search was carried out with the help of Ukrainian and international resources. The research was conducted during September-October 2023 on the basis of preschool education institutions No. 779 and No. 652 of the combined type in Kyiv, Ukraine. Forty children ($N = 40$) aged 5-6 with delayed speech development took part in the study. The specified contingent of participants was involved in the study voluntarily. The participation of children in all stages of the pedagogical experiment, the analysis of the data obtained in the process of the research, and the publication of the research results were carried out based on the written consent of the parents. Parents were warned about the anonymity of their children's participation in the study. The study was conducted in compliance with the ethical principles for medical research involving human subjects (Declaration of Helsinki, 2013). The data obtained in the research process was processed by the method of determining the relative share indicators using Microsoft Excel 2010 spreadsheets.

In the course of the ascertaining pedagogical experiment, an assessment of the communicative and motor development of children aged 5-6 years was carried out. In order to evaluate the motor skills of children 5-6 years old, the following tests were used: standing on tiptoes with open eyes for 10 s; jumping with open eyes alternately on the right and left leg for 5 m; throwing a ball at a target at a distance of 1.5 m; jumping over a rope stretched 20 cm from the floor; walking 2 m along the rope, putting the toe of one foot to the heel of the other. The result was considered positive if the exercise was performed from start to finish. In order to study the formation of operations of successive (sequential, by parts) analysis and synthesis at the non-verbal level, the "Turtle" method was used, which involved the reproduction of a digital series using visual material. The child was offered a card with the image of a turtle, on the shell of which the numbers from 1 to 9 are randomly placed, which must be shown and named in order, that is, independently reproduce a linear series (Andrusyshyna, 2012).

The study of expressive speech included an assessment of the nominative function, which reflects the child's ability to express thoughts and exchange information. The

assessment of the nominative function of speech was carried out on the basis of tasks related to the child's naming of objects (in one word) by pictures. The assessment of the performance of the task was carried out on a 5-point scale: 5 – exact name; 4 – search for the correct name; 3 – incorrect grammatical form of the word; 2 – distortion of the sound-syllabic structure of the word; 1 – distant verbal change. The study of impressive speech included an assessment of understanding of the names of objects distant in sound and meaning, understanding of words close in sound, and understanding of names of actions distant in meaning and sound, which allowed the children to assess their understanding of the speech addressed to them. The result was evaluated on a 5-point scale: 5 – correct execution; 4 – 2-3 mistakes; 3 – questioning; 2 – changing the order of words; 1 – skipping or changing words.

Results and Discussion

The results of the evaluation of expressive speech – the ability to convey one's thoughts and feelings using words, gestures, signs, and symbols – indicate that 37.5% ($n = 15$) of children have a distant verbal change; 15% ($n = 6$) distort the sound-syllable structure of the word; 25% ($n = 10$) of preschoolers build the grammatical form of the word incorrectly; 20% ($n = 8$) search for and find the correct name; and only 2.5% ($n = 1$) could not complete the task. This indicates that the majority of preschoolers do not have a nominative speech function for communicating with others. The results obtained during the evaluation of expressive speech, that is, the understanding of information presented in different ways, for example, sounds and words, movements and gestures, signs and symbols, indicate that 45% of children ($n = 18$) changed the order of words in a sentence; 30% ($n = 12$) of older preschoolers skipped or changed words; and 25% ($n = 10$) questioned, which indicates a lack of understanding of the task. It is worth noting that among the children who were involved in the study, there were none who were able to complete the task with minor errors (2-3) or to complete it correctly.

The results of the study of the state of formation of operations of successive analysis and synthesis at the non-verbal level indicate that 50% ($n = 20$) of preschoolers have transfer difficulties: the child cannot reproduce a number series or distorts its linear structure (rearranges and/or omits numbers); 27.5% ($n = 11$) of children, together with an adult, determine the linear principle of relations between elements and later independently reproduce them in the process of forming a numerical series; 12.5% ($n = 5$) of children, based on the fragment of a linear construction demonstrated by the teacher, independently determine and reproduce the given type of relationship between the elements of the numerical series; and only 10% ($n = 4$) correctly and independently perform the task after providing stimulating or organising assistance. Among the children who participated in the study, no one was found who could independently reproduce the linear relationships between the elements of the numerical series, abstracting from the visually dominant secondary features. After receiving the results of the speech evaluation, the motor skills of preschoolers were evaluated based on a number of tests. Their results are presented in Figure 1.

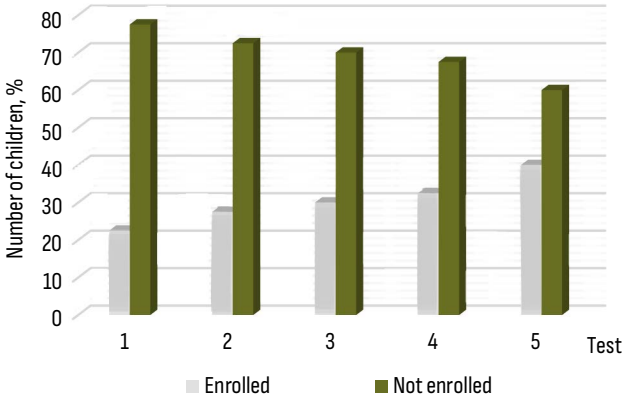

Figure 1. The results of motor tests performed by preschoolers aged 5-6 years

Note: 1 – standing on tiptoes with open eyes for 10 s; 2 – jumping with open eyes alternately on the right and left leg for 5 m; 3 – throwing a ball at a target at a distance of 1.5 m; 4 – jumping over a rope stretched 20 cm from the floor; 5 – walking 2 m along the rope, putting the toe of one foot to the heel of the other

Source: created by the authors

During the research, it was established that only 22.5% ($n = 9$) of preschoolers are able to perform a stand on their toes with their eyes open for 10 s without errors, and the majority, 77.5% ($n = 31$) could not cope with the task. When performing jumps over a rope stretched at a height of 20 cm, the main task was to perform a jump with two legs. 32.5% ($n = 13$) of children coped with the task. 67.5% ($n = 27$) of preschoolers failed the test. It should be noted that most children performed jumps alternately with the right and left leg; that is, they could not reproduce the movements that the instructor demonstrated before the task. Despite the fact that children made minor mistakes when throwing the ball at a target at a distance of 1.5 m, the result was considered positive when hitting the target. At the same time, only 30% ($n = 12$) of older preschoolers completed the specified exercise. Among the children who took part in the study, the largest number, namely 40% ($n = 16$), coped with the task of walking 2 m along the rope, putting the toe of one foot to the heel of the other. Only 27.5% ($n = 11$) showed a positive result in the test: jumping with open eyes alternately on the right and left leg at a distance of 5 m. The obtained results indicate the inability of a significant number of 5-6-year-old children with impaired speech development to perform motor tests, which indicates the need to find means that would allow for a purposeful influence on the speech and motor skills of older preschool children.

The analysis of the scientific literature shows the significant interest of scientists in studying issues related to the correction of the speech development of children of older preschool age. According to researcher K. Alimova (2022), speech therapy work should be carried out through a system of games and exercises. The gradual assimilation of new knowledge and the development of hand movements together with fine motor skills can influence the formation of mental abilities, cognitive activity, and visual-motor coordination. G. Ibatova *et al.* (2021) and L. Stakhova & A. Loza (2022) suggest using mobile games

in the corrective process to overcome children's speech disorders. According to scientists, mobile games, which include the performance of certain motor actions, contribute to the simultaneous satisfaction of children's needs in motor activity and allow them to solve educational tasks, help reduce tension, increase work efficiency, and improve the quality of knowledge acquisition.

Researcher A. Hrydasova (2022) conducted a theoretical analysis of the expediency of using logopaedic rhythms in early childhood education for the purpose of preventing speech disorders, considered the possibility of using the author's method of logopaedic rhythms during music classes with preschoolers, and also gave examples of speech therapy rhythm exercises that can be used in music classes. Features of the use of speech therapy rhythm exercises in classes with children with underdeveloped speech are considered in the work of I. Samoilova & O. Kolomiychuk (2022). Scientists note that speech therapy rhythm classes contribute to the correction of small and general movements, the development of "speech-movement" coordination, the increase of children's vocabulary, the improvement of psychophysical functions, and the development of emotionality and communication skills. Logarithmic classes are based on the close relationship "word – movement – music" and include exercises for the development of fine motor skills, finger, language, music-movement, and communicative games; dance exercises for rhythm declamation or singing; rhythm games using musical instruments; and reading poems in combination with movements.

M.Ye. Takhirova (2022) notes that classes in speech therapy rhythms contribute to the strengthening of the locomotor apparatus, the development of breathing and motility, the formation of correct posture, motor skills and abilities, and the development of physical qualities. According to the researcher, speech therapy classes should be divided into two groups: the first is aimed at the development of coordination, orientation in space, muscle strengthening, as well as the development of cognitive processes such as memory, thinking, attention, and imagination; the second is speech exercises that form correct breathing, the ability to control the voice, the perception of speech and other sounds by ear, the formation of pronunciation, intonation, etc. Authors Y. Akamoglu *et al.* (2019) emphasise the need to create an environment in which speech-impaired children can improve their communication skills while performing motor tasks.

In the scientific literature, the data on the use of physical education tools for the comprehensive (speech and movement) development of older preschool children are presented rather fragmentarily. In particular, the work of N. Petrenko (2018) presents the author's programme of dance-corrective orientation for children with speech disorders, which involved the inclusion of sports dance exercises, exercise ball gymnastics, dance gymnastics, fairy-tale therapy, speech therapy rhythm exercises, as well as breathing exercises. The programme included 4 stages (adaptive-organisational, corrective-complicating, corrective-stabilising, and final-summary), each of which involved the use of dance exercises and games aimed at correcting speech, forming accuracy and speed of reaction to sound and verbal signals, improving qualities of attention and memory, verbal regulation of actions by matching words and movements, as well as the formation of skills to perform motor actions according to a conditional signal.

Scientists N. Panhelova & T. Krutsevych (2019) substantiated and determined the effectiveness of the influence of motor activity on the speech development of older preschool children. During the research, the authors monitored the level of speech development of preschool children and implemented technologies aimed at integrating their speech and physical development. The scientists came to the conclusion that the implementation of an integrated approach based on the use of finger, articulation, breathing, rhythmic gymnastics, fitness technologies, and story-role speech therapy rhythm exercises effectively affects the speech and motor development of children. Therefore, the most effective and appropriate means of working with children with speech disorders have been identified by scientists as logopaedic rhythms, exercise ball gymnastics, rhythmic gymnastics, breathing exercises, and mobile games (Table 1).

Table 1. Tools used in working with children with speech disorders

Means	Content and orientation
Logopaedic rhythms	Musical-movement, music-speech tasks and exercises, and movement games that combine the performance of movements with musical accompaniment are aimed at correcting the child's speech development.
Exercise ball gymnastics	A system of physical exercises on exercise balls, which are performed from different starting positions (sitting on the ball, lying on the back or on the stomach; standing, holding the ball in the hands), contribute to the development of coordination in children's movements, allow you to create a positive emotional atmosphere, and increase children's interest in physical exercises.
Callisthenics	Exercises aimed at the development of physical qualities (strength, speed, endurance, flexibility, coordination), the formation of tempo, and the development of metro-rhythmic sense.
Breathing exercises	A system of breathing exercises aimed at forming the ability to control breathing. In the process of using breathing exercises, respiratory muscles are trained, proper rhythmic breathing is formed, the child is freed from respiratory and speech spasms, cerebral blood circulation improves, sleep quality is reduced, and anxiety is reduced.
Moving games	Contribute to the normalisation of motor function, the development of hand movements in combination with fine motor skills, influence the formation of mental abilities, cognitive activity, visual-motor coordination, form game skills, and encourage the creativity of children.

Source: created by the authors

The obtained data on the assessment of expressive and impressive speech in preschool children correlates with the results of the study by T. Ovsienko (2021). The author notes that preschool children with motor alalia are characterised by medium and low levels of expressive speech and the development of auditory perception and understanding of speech. Scientific research data by O. Bielova (2023) indicate that the average level of impressive speech is characteristic of 29.4% of older preschool children with speech disorders, and 7.8% of children experience difficulties when performing tasks. In the process of evaluating expressive speech, the researcher found 45.9% of children who need help while performing tasks and 13.2% of children with speech pathology are not able to analyse pictures with objects. The results of scientific investigations by L. Rodgers *et al*. (2023) indicate that 36% of 4-year-old children have expressive speech characteristics, and most of them experience difficulties in understanding spoken language. Signs of a phonological speech disorder are a change in the order of words in a sentence, verbal substitutions, and questioning, which are the consequences of a limited vocabulary, which is consistent with the results of the evaluation of children's impressive speech. Research results by H. Motychka & K. Barna (2019) and C. Varuzza *et al*. (2022) testify that children with general underdevelopment of speech have a lag in the development of physical qualities, difficulties in the correctness and accuracy of performing motor tasks, memorising the sequence of movements, performing exercises according to verbal instructions, reproducing the given pace and rhythm of movements, and underdevelopment of fine motor skills. Such conclusions are consistent with the results obtained in this study, in particular, when children with speech disorders perform motor tests.

The obtained data are consistent with the results of research by foreign scientists C. Varuzza *et al*. (2022), who testify that 4-7-year-old children with speech disorders have difficulties performing tasks related to the manifestation of coordination abilities, in particular, in performing balance exercises. Scientists have determined general, small, and visual-motor skills in children aged 4-7 years with speech disorders, which are divided into three subgroups: speech disorder, sound-pronunciation disorder, and combined. During the research, it was confirmed that children who were included in the combined subgroup (speech and sound-pronunciation disorders) have disorders of coordination, fine motor skills, and visual perception. E. Smolak *et al*. (2020) assessed and compared the attention of children with speech disorders and children with typical speech development and determined the relationship between visual-spatial attention, visual-spatial memory, and speech abilities. The authors came to the conclusion that children with impaired speech development have a deficit of visual-spatial attention and its stability. Based on the analysis of scientific literature, it was established above in the article that the use of games and exercises can positively influence the development of a child's speech, improving his visual-spatial attention.

The results of research by Z. Mukhtoraliyevna & B. Odilovna (2023) testify to the need in the process of the child's speech development to form cause-and-effect relationships in various life situations, in particular, in the process of performing motor tasks. This will allow the child to independently determine the ways to achieve the goal and to choose means of activity, for example, games, to form independence. In the research based on the experiment, it was proven that children with speech disorders have difficulties performing both motor and other tasks, which is shown by the results of the assessment of successive, expressive, and impressive speech. The use of game-based means of physical education, in particular those summarised in Table 1, can help the child gain more independence. The work of L. Anoško (2019) presents the results of the assessment of the motor abilities of preschool children with speech disorders. The author established that children with speech disorders have an insufficient level of development of strength and speed-strength abilities, endurance, and coordination abilities. In this study, on the basis of a motor test, it was also established that most preschool children with language disorders have difficulties performing exercises. L. Anoško (2019) found a direct relationship between the speech disorders of preschoolers and their physical development, in particular their fine motor skills. Thanks to the application of a set of exercises that included both speech therapy and physical classes, the children's fine motor skills significantly increased, and with it, the overall development of communication skills improved.

Among the various types of psychophysical disorders of the development of preschool children, a significant number of disorders of speech development are recorded. In the studies of a number of scientists, the relationship between children's general and speech motor skills has been studied and confirmed. The formation of motor skills is an important factor in the activation of speech and the elimination of speech disorders in children of older preschool age. However, the attempts of scientists to solve these problems are characterised by a fragmented approach; there are practically no scientific developments aimed at comprehensively solving issues related to improving the communicative and motor development of children with speech disorders. Despite the data available in the scientific literature, which testify to the effectiveness of the use of physical education tools in the process of working with children of older preschool age with impaired speech development, the solution to the outlined problem requires the search and development of modern, complex approaches that will allow the correction of speech and motor development in aged children 5-6 in the educational process of preschool education institutions.

Conclusions

In the process of assessing the communicative abilities of 5-6-year-old children with speech disorders, it was established that the operations of successive analysis and synthesis at the non-verbal level are not formed. 10% of children are able to independently complete tasks aimed at reproducing the number series. The results of the evaluation of expressive speech indicate that children with speech disorders are characterised by a long verbal change, distortion of the sound-syllabic structure of the word, and incorrect construction of the grammatical form of the word, which indicates that the nominative function of speech is not formed. The results of the assessment of impressive speech proved that children aged 5-6 years with impaired speech

development experience difficulties in understanding the speech addressed to them and, as a result, make mistakes when performing the assigned tasks.

It has been established that a feature of children with impaired speech development is a lag in the development of the motor skills, which is confirmed by the results of conducted studies, which indicate the inability of most children (up to 77.5%) to perform motor tests, in particular standing on toes with eyes open, jumping with open eyes alternately on the right and left leg, throwing a ball at a target at a distance, jumping over a rope stretched at a height, and walking on the rope by putting the toe of one foot to the heel of the other. In the process of physical education for older preschool children with speech disorders, it is advisable to alternately use a system of mobile games and exercises, speech therapy rhythms, dance exercises, and exercise ball gymnastics, finger, articulation, breathing, and rhythmic gymnastics during the day. Prospects for further research are in the diagnosis of the motor and communicative skills of children aged 5-6 years with impaired speech development as a key prerequisite for the development of a complex corrective programme of classes.

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Conflict of Interest

None.

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Доцільність застосування засобів фізичного виховання в освітньому процесі з дітьми дошкільного віку з порушеннями мовлення

Надія Гулюк

Аспірант
Національний університет фізичного виховання і спорту України
03150, вул. Фізкультури, 1, м. Київ, Україна
https://orcid.org/0009-0006-9067-3330

Любомир Пасічняк

Кандидат наук з фізичного виховання і спорту, доцент
Національний університет фізичного виховання і спорту України
03150, вул. Фізкультури, 1, м. Київ, Україна
https://orcid.org/0000-0001-7296-8510

Марія Пальчук

Кандидат наук з фізичного виховання і спорту, доцент
Національний університет фізичного виховання і спорту України
03150, вул. Фізкультури, 1, м. Київ, Україна
https://orcid.org/0000-0003-2774-1960

Анотація. Порушення мовлення дітей дошкільного віку є лідером серед найбільш поширених нозологій. Актуальність вивчення доцільності застосування засобів фізичного виховання у роботі з дітьми з порушеннями мовленнєвого розвитку зумовлена даними наукових досліджень, у яких наголошується на взаємозв'язку між мовленнєвою та руховою сферами дітей дошкільного віку. Мета дослідження полягала у вивченні особливостей комунікативних здібностей та рухового розвитку дітей 5-6 років із порушеннями мовлення та визначенні на основі аналізу наукової літератури найбільш доцільних засобів фізичного виховання, які використовуються у роботі з дітьми зазначеної нозології. Дослідження проводились на базі закладів дошкільної освіти № 779 та № 652 комбінованого типу м. Київ. У дослідженні взяли участь 40 дітей 5-6 року життя з порушенням мовленнєвого розвитку. У процесі констатувального експерименту здійснено оцінку комунікативних здібностей дітей та рівня їхнього рухового розвитку. Встановлено, що в 50 % дошкільнят із порушеннями мовленнєвого розвитку не сформовано операції сукцесивного аналізу й синтезу на невербальному рівні, оцінка яких здійснювалася на основі методики «Черепаха». Виявлено, що в більшості дошкільнят не сформована номінативна функція мовлення для спілкування з оточуючими – здатність передавати свої думки за допомогою слів, жестів, знаків, про що свідчать результати оцінки експресивного та імпресивного мовлення. У дітей із порушеннями мовленнєвого розвитку виявлено відставання в розвитку рухової сфери, про що свідчать результати рухових тестів. Отримані результати повинні слугувати підґрунтям у виборі засобів фізичного виховання в освітньому процесі з дітьми дошкільного віку з порушеннями мовлення та під час розробки комплексних програм, спрямованих на їх корекцію

Ключові слова: дошкільнята; загальний недорозвиток мовлення; руховий розвиток; освітній процес; вправи; ігри

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Justification for the system of corrective measures to improve the physical condition of adolescent girls through health-enhancing recreational physical activity

Olena Andrieieva*

Doctor of Physical Education and Sport, Professor
National University of Ukraine on Physical Education and Sport
03150, 1 Fizkultura Str., Kyiv, Ukraine
https://orcid.org/0000-0002-2893-1224

Liubov Yerakova

PhD in Physical Education and Sport, Professor
National University of Ukraine on Physical Education and Sport
03150, 1 Fizkultura Str., Kyiv, Ukraine
https://orcid.org/0000-0002-4797-6305

Alina Maksymenko

Postgraduate Student
National University of Ukraine on Physical Education and Sport
03150, 1 Fizkultura Str., Kyiv, Ukraine
https://orcid.org/0009-0008-5460-4172

Olha Bozhenko-Kurylo

Lecturer
National University of Ukraine on Physical Education and Sport
03150, 1 Fizkultura Str., Kyiv, Ukraine
https://orcid.org/0000-0002-2232-559X

Abstract. Deviations from the body weight norm are becoming increasingly common among children. This is an urgent problem that limits the health level of a significant number of children, adolescents, and youth, which requires urgent intervention. The aim of the study was to create a system of corrective measures to improve the physical condition of underweight adolescent girls through health-enhancing recreational physical activity. To find out the peculiarities of designing a comprehensive programme of health-enhancing activities for underweight girls, an expert assessment was conducted, which included methodological features of developing programmes based on the use of health fitness and criteria for programme effectiveness. The involvement of experts in the study allowed to identify approaches that are appropriate to use for correcting physical conditions in 12-13-year-old underweight girls. It was found that the most effective approaches are regular physical exercise and changes in eating behaviour. The most effective means of improving physical condition, according to experts, are strength fitness, functional training, dance aerobics, and stretching. The results of the expert assessment showed that the system of corrective measures should include physical exercises, including health fitness, psychological correction, and motivational training. The methodological features and criteria for the effectiveness of the system of corrective measures were identified, and the experts' opinions on these issues were consistent. The obtained data became the basis for building a programme of health-enhancing activities, the distinctive features of which are the consideration of the physical condition and physical activity of underweight girls. The developed programme should be implemented in practice as a part of extracurricular physical education activities, which will improve the physical development, fitness, and performance of secondary school girls

Keywords: expert assessment; programme; fitness; body weight; underweight

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*Corresponding author

Introduction

The problem of abnormal body weight is ubiquitous among children, adolescents, young, mature, and elderly people. In most cases, researchers choose overweight or obese individuals as the object of study. Nevertheless, examination of the problem of underweight among adolescent children indicates its prevalence and negative health outcomes. The adolescent population is considered a particularly vulnerable age group. Insufficient body weight can lead to severe physiological and psychological problems, such as gastrointestinal diseases, hormonal disorders, reproductive disorders, a weakened immune system, deteriorated physical condition (physical development, performance, fitness), chronic fatigue, depression, etc. The negative outcomes can be prevented through the implementation of preventive and corrective programmes, which should include health fitness, psychological correction, and motivational training. However, the relationship between insufficient body weight and the participation of adolescents in physical activity has rarely been the subject of scientific research.

Researchers emphasise the fact that both overweight and underweight children have a low level of physical activity. In particular, F.F. Ma & D.M. Luo (2023) argued that a simple increase in physical activity and the transition from a sedentary to a healthier lifestyle can bring the mass of obese children to the age-related norm. C. Liang *et al.* (2022) emphasised a decrease in both participation in physical activity and interest in it among underweight children. This trend is likely due to the fact that underweight adolescents have lower levels of physical fitness, which affects their ability to participate in physical exercise programmes. According to O. Andrieieva *et al.* (2022), the means of health-enhancing recreational physical activity are effective for the correction of physical condition indicators. The majority of the scientific community agrees with this opinion. L.Ya. Chekhovska *et al.* (2023) reviewed existing developments on body weight management in primary and secondary school students. The researchers pointed to a significant number of scientific studies aimed at preventing and eliminating body weight disorders in children. Both Ukrainian and foreign researchers, such as A.K.G. Tan *et al.* (2019), studied the level of physical activity in the adolescent population. In particular, attention was drawn to the role of exercise in the formation of a healthy lifestyle and obesity management.

S. Trachuk *et al.* (2023) examined the possibility of improving the health status of adolescent girls through health-enhancing recreational physical activity. G. Battaglia *et al.* (2021) also pointed out the importance of planning targeted motor programmes considering the characteristics of body weight disorders in children and adolescents. G. Chen *et al.* (2022) established that children and adolescents with a body mass index above or below the normal range have significantly lower physical fitness compared to students with a normal body weight, which requires the development of measures such as improving the quality of physical education lessons and promoting a balanced diet and regular exercise, which should be carried out in a targeted manner. M. Palchuk *et al.* (2023) found that moderate physical activity is prevalent among girls aged 12-13. Only 15% of girls demonstrated a high level of physical activity, which emphasises the relevance of finding effective methods to encourage adolescent girls to participate in organised physical activity. L. Tolvanen *et al.* (2023) note that despite the significant prevalence of underweight among adolescent girls, which is comparable to the prevalence of overweight, most health-enhancing programmes are focused on preventing and combating obesity. At the same time, these recommendations do not address the problem of underweight. Despite the high prevalence of this problem among adolescent girls, there are no professional publications on appropriate recommendations aimed at correcting their physical condition, which makes research in this area relevant. The aim of this study was to develop a comprehensive health fitness programme as a basis for the correction of physical condition indicators in secondary school children.

Materials and Methods

The analysis and generalisation of scientific and methodological literature data were used to provide justification for the direction of the study and to clarify unresolved issues. In this study, the method of expert assessments was used to identify the features of the methodological justification for the use of health fitness, psychological correction, and eating behaviour modification in comprehensive programmes aimed at improving physical condition in underweight girls. The research was conducted from September 2022 to May 2023. The group of experts consisted of nine professionals in the fields of health fitness, sports nutrition, and psychology who were experienced in working with the adolescent population (Kyiv, Ukraine). The survey was anonymous and conducted using Google Forms. The expert evaluation sheet on the development of the system of corrective measures to improve physical condition in underweight adolescent girls by means of health fitness included the following questions: which approaches are appropriate for using to correct the indicators of physical condition in underweight girls aged 12-13; which means of health fitness should be included in the programme for correcting the indicators of physical condition in underweight adolescent girls; what are the methodological features of the health fitness programme for girls aged 12-13 years; what can form the basis of the criteria for the effectiveness of comprehensive programmes for the group of girls considered in the study.

In the expert assessment, the preference ranking method was used. This method expects the experts to rank the evaluated items in descending order of importance. The ranking of each item is determined by its total score; the higher the score, the more important the object is considered to be. To ensure the reliability of the experts' opinions, a concordance coefficient (W) was calculated. This coefficient measures the degree of consistency of experts' opinions. The process of expert assessment by the ranking method involved creating an expert table for the preference method and calculating the coefficient of concordance of expert opinions using the following equation:

$$Wp = \frac{12 \times S}{m^2(n^3 - n)}, \quad (1)$$

where S is the sum of the squared deviations of the sums of ranks assigned to each assessed item from the average rank value, calculated using the equation:

$$S = \sum_{j=1}^{n}(\sum_{i=1}^{m} R_{ij} - \frac{m(n+1)}{2})^2, \quad (2)$$

where m is the number of experts; n is the number of items to be assessed; Σ is the sum; and R is the rank of the j-th item assigned to it by the i-th expert. The quality of the expert assessment was determined based on the calculated concordance coefficient, which ranges from 0 (no agreement between experts) to 1 (complete agreement of experts). If the coefficient Wp is equal to or greater than the reference concordance coefficient Wrp, set at 0.7, the expert assessment is considered valid and successful. Conversely, if Wp was less than Wrp (0.7), the most divergent opinions (those considered to be those of less competent experts) were removed in order to improve the assessment procedure. The results of the expert assessment showed that the system of corrective measures should include physical exercises, including health fitness, psychological correction, and motivational training. The consistency of the experts' opinions was tested using Kendall's W, and the statistical significance was tested with Friedman's χ^2 with multiple comparisons. The level of statistical significance was 0.05 ($p < 0.05$).

The duration of the programme was 9 months. The programme was designed using the algorithmic method, which included the assessment of physical condition indicators, their comparison with the proper norms, the programming of physical activity, and the application of proper methods of medical and pedagogical control. The programme design took into account the general principles of physical education, conditioning training, and health-enhancing recreational physical activity. The transformative pedagogical experiment involved a total of 69 underweight girls aged 12-13 years. The study was conducted in compliance with the principles of the Declaration of Helsinki (2013). All parents of adolescent girls signed an informed consent to participate in the study. The study was conducted in accordance with the Research Plan of the National University of Ukraine on Physical Education and Sport for 2021-2025 3.1. "Theoretical and technological principles of health-enhancing recreational physical activity and healthy lifestyle of different population groups" (state registration number 0121U107534).

Results and Discussion

According to the results of the expert assessment, it was found that it is advisable to include physical exercises, in particular health fitness, along with psychological correction and motivational training in the system of correctional means. The involvement of experts in the study allowed to identify approaches that are appropriate to use for correcting physical conditions in 12-13-year-old underweight girls. According to the agreed opinion of the experts ($W = 0.82$; $\chi^2 = 51.67$; $p < 0.05$), regular physical activity and eating behaviour modification were the most effective approaches. Experts believed it is advisable to use psychological correction and motivational training. In contrast, the use of medications took the last place in the ranking of approaches to correction of physical condition in underweight girls aged 12-13 years (Fig. 1). It should be noted that experts agreed on the low effectiveness of the use of hygienic factors and dietary nutrition.

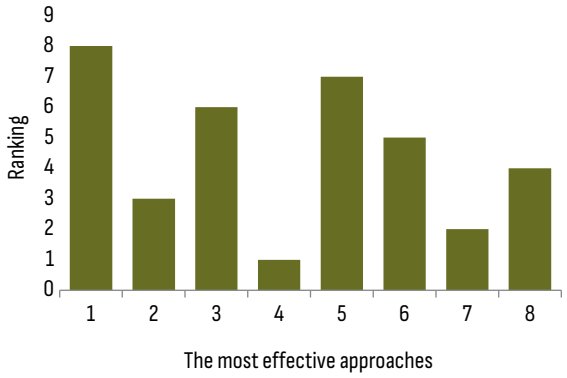

Figure 1. Ranking of the approaches to improving physical condition in 12-13- year-old underweight girls
Note: 1 – regular physical activity; 2 – hygienic factors (body hardening procedures); 3 – means of psychological correction; 4 – medication; 5 – eating behaviour modification; 6 – motivational training; 7 – dietary methods; 8 – natural forces
Source: made by the authors

The authors of the study asked experts about the means of health fitness that, in their opinion, should be included in the programme to improve the physical condition of underweight adolescent girls. Statistical analysis showed a high consistency of experts' opinions ($W = 0.81$; $\chi^2 = 80.57$; $p < 0.05$), who indicated exercise promoting muscle gain, in particular strength exercise (such as bodyweight exercises, exercises with a resistance band, body bars, stuffed balls, free weights, etc.), as well as functional training as the most effective means (Fig. 2). Functional training involves the deepest stabilising muscles, which play a key role in performing everyday movements and improving intermuscular coordination and balance.

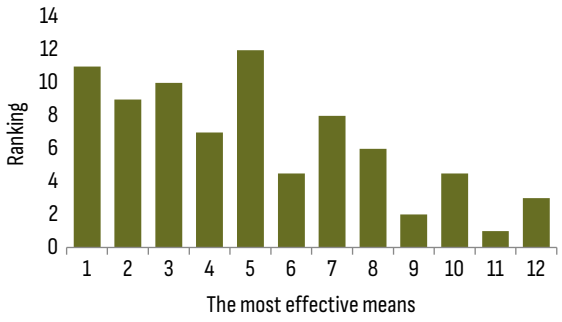

Figure 2. Ranking of the means of health fitness to be included in the programme for the improvement of physical condition in underweight adolescent girls
Note: 1 – functional training; 2 – stretching; 3 – dance aerobics; 4 – zumba; 5 – strength training; 6 – yoga; 7 – pilates; 8 – aqua fitness; 9 – aerobics (slide, step); 10 – exercise ball aerobics; 11 – spinning; 12 – Tae Bo aerobics
Source: made by the authors

In the course of the study of methodological features of the health fitness programme for underweight girls aged 12-13 years, it was found that experts consider it most effective to take into account the individual characteristics of participants ($W = 0.79$; $\chi^2 = 56.59$; $p < 0.05$). Experts emphasise

the importance of taking into account such methodological features as the possibility of simultaneously solving a wide range of health improvement tasks; compliance with the rules of self-control and injury prevention; variety and interchangeability of means; and a high degree of innovation and emotionality (Fig. 3).

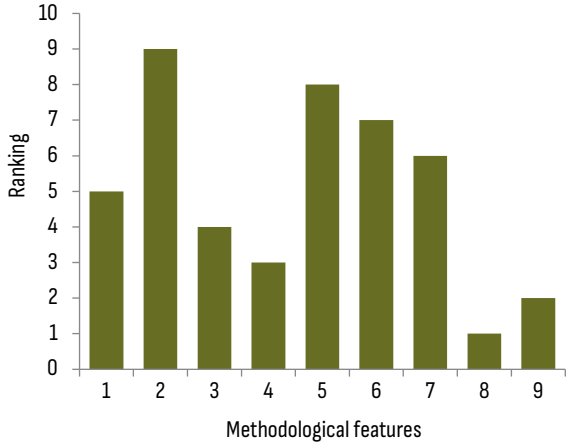

Figure 3. Ranking of the methodological features of the health fitness programme for underweight girls aged 12-13 years

Note: 1 – monitoring of parameters of physical condition; 2 – taking into account individual characteristics of participants; 3 – observance of rules of self-control and prevention of injuries; 4 – providing selective influence on the body; 5 – possibility of simultaneous solutions to a wide range of health-enhancing tasks; 6 – high degree of innovation and emotionality; 7 – variety and interchangeability; 8 – possibility of exact dosing of training loads; 9 – ability to transform for the differentiation of loads

Source: made by the authors

An examination of the criteria for the effectiveness of comprehensive programmes for underweight girls aged 12-13 years, which should be the basis for assessing their impact on physical condition, showed that efforts should be directed primarily to changing eating behaviour and value orientations ($W = 0.81$; $\chi^2 = 51.15$; $p < 0.05$). In addition, the criteria for effectiveness should include the formation of motivation for regular physical exercise and the reduction of stress and school anxiety (Fig. 4). The experts' opinion along with the data of the analysis of practical experience were used as the basis to develop a comprehensive health fitness programme for underweight girls aged 12-13 years, the parameters of which are presented in Table 1.

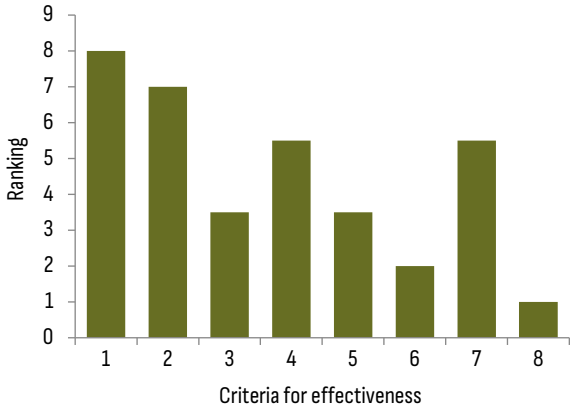

Figure 4. Ranking of the criteria for effectiveness of comprehensive programmes for underweight girls aged 12-13 years

Note: 1 – change in eating behaviour; 2 – change in value orientations; 3 – normalisation of body weight; 4 – development of motivation for regular physical exercise; 5 – increase in physical activity; 6 – improvement of physical condition; 7 – reduction of stress and school anxiety; 8 – improvement of exercise testing results

Source: made by the authors

Table 1. Parameters of targeted organised physical activity for adolescent girls aged 12-13 years

Parameters	Conditioning	Health-enhancing recreational activities
Frequency	3 times a week	daily
Duration	45-60 min	from 20 min on weekdays up to 120 min on weekends
Means	dance aerobics, functional training, strength training, stretching, mental fitness	walks, short hikes, park orienteering, recreational games with friends and family
Intensity	moderate	low
Heart rate zones for aerobic training loads	120-140 bpm	up to 100 bpm
Intensity of strength training loads (perceived exertion ratings)	12 to 14 on the Borg scale	8 to 10 on the Borg scale

Source: made by the authors

The developed programme was designed to flexibly take into account the peculiarities of the current situation related to quarantine restrictions and the legal regime of martial law, provide opportunities for both offline and online group training, and include daily independent classes (with a duration of up to 20 min), once a week group psychological correction classes, nutritional correction, and weekend recreational activities for girls and their families and friends. The content of the programme included such areas of health fitness as dance aerobics, functional training, strength fitness, stretching, and mental fitness. Given the significant interest of teenage girls in dance classes, dance aerobics was included in the programme. In addition, the health fitness classes included static exercises of local impact with body weight and dosed weights. This made it possible to differentiate physical activity depending on the individual characteristics of the girls. For the first two months of the programme, the girls were recommended

to perform strength exercises to train the lagging muscle groups using equal amounts of static and dynamic loads.

The programme included exercises with additional weights, such as dumbbells (1-4 kg), fitness bands, resistance bands, medicine balls (1-3 kg), body bars (up to 6 kg), etc. To ensure effective mastery of complex exercise, the technique of movements was corrected during the performance of the exercise. The transition to the study of the next step was carried out after a 2-3-times correct repetition of the previous movement. The comprehensive programme for underweight 12-13-year-old girls included exercises for the development of correct posture, which is of great importance for the normal functioning of both individual systems and the body as a whole because an increase in growth rate combined with poor posture can cause a number of significant defects in the musculoskeletal system. To develop flexibility, stretching was used, which included dynamic, static, and dynamic-static exercises.

It was also planned to inform the parents about the organisation of rational nutrition and physical activity for adolescent girls. This information included sending daily email messages during a month-long period. For parents, the daily letter contained brief information on health issues and recommendations for eating behaviour modification. For girls, the letter included guidance on fluid intake, recommendations for healthy nutrition, an overview of techniques of psychological self-control and psychological correction, physical activity regimens, methods of self-control during health fitness classes, etc. Participants were encouraged to use any of the messengers for feedback. The programme was designed using a block principle, including introductory-diagnostic, practical, and control-correctional blocks, which differed in their aim and objectives, the means of health fitness used, and organisational and methodological instructions for participants.

The programme also included psychological correction classes, during which adolescent girls learned various methods of self-control to improve their self-esteem, change eating habits, and relieve high levels of anxiety and internal stress. The programme included 10 sessions of psychological correction (2 hours per week), followed by 4 more sessions (1 hour per week) to consolidate the effect. There were a total of 14 sessions for almost 3 months. The use of motivational training in the developed programme contributed to a change in the patterns of adolescents' dietary behaviours, which is a successful guarantee not only of normalising body weight but also of improving physical condition. The frequency of the motivational training classes, which lasted for 40 min was once a week.

The effectiveness of the developed programme was evaluated in the course of a transformative pedagogical experiment. Significant differences ($p < 0.05$) were identified in the majority of physical fitness indicators characterising strength, flexibility, and coordination abilities. Notable positive changes (with statistical significance, $p < 0.05$) were observed in various indicators of physical fitness (shuttle run (4x9 m), long jump from a standing position, sprint run for 30 m, run for 60 m, lifting the torso in a sitting position for 30 s, torso tilt forward from a sitting position). There was an improvement in the physical performance of these girls. An assessment of the eating behaviours of underweight adolescents also demonstrated positive changes. The study showed a statistically significant decrease in the number of eating disorders among underweight girls aged 12-13 ($p < 0.05$). It turned out that after the study, there were noticeable changes in the value orientations of underweight girls. An analysis of the values of motives for various types of health-enhancing recreational physical activity in 12-year-old underweight girls revealed a tendency to strengthen cognitive-developing and creative motives and weaken prestige motives. Among 13-year-old underweight girls, a statistically significant increase was observed in the values of health, psychological, and recreational motives.

The importance of using such approaches is emphasised in the research studies addressing body weight disorders. Such developments are relevant due to the significant prevalence of underweight among adolescents (generally about 8-9%), especially in Eastern Europe, and there has been a slight upward trend over the past decade, as reported, for instance, by M. Garrido-Miguel *et al.* (2021) and C.A.S. Alves Junior *et al.* (2023). As correctly noted by J.K. Singh *et al.* (2021), the adolescence period is critical because it is during this period that rapid growth and development occur, and therefore adolescents need more attention. Health and nutrition behaviours are developed during this period, making adolescents more vulnerable to health problems than other age groups. Taking into account the physical and psychological state of 12-13-year-old girls, the authors of this study agree with this opinion. The importance of the influence of family and friends on the development of eating behaviour was also discussed by D. Levchenko (2023). The attitude of the family during childhood and adolescence can dramatically change the further development of eating culture in a child. That is why part of the developed system of corrective measures was to inform not only the girls themselves but also their parents about healthy eating.

According to the results reported by B.E. Holstein *et al.* (2022), the prevalence of underweight among 11-15-year-old adolescents was significantly higher among girls than boys. The results obtained by the authors provide additional evidence of the greater vulnerability of girls to weight loss, especially in early adolescence (12-13 years). This fact is confirmed by the findings of K. Dereń *et al.* (2021), who established that this particular age period is sensitive to social behaviour disorders, which are manifested by eating disorders, bad eating habits, and unhealthy body image. Similar arguments are presented by the authors in this study. The impact of being underweight on the health of adolescent girls is significant. This can lead to increased vulnerability of various body systems, more frequent illnesses, decreased immunity and resistance against infections, nervous breakdowns, depression, decreased mental and physical performance, and reduced physical activity. Similar results were obtained in the authors' current research. G. Drosopoulou *et al.* (2021) emphasised the need to address this problem as body weight disorders are a factor that significantly worsens the psychosocial health of children and adolescents. The research findings obtained by the authors significantly extended the existing knowledge on supporting mental health in underweight children. Physical exercise classes are useful for relieving stress, reducing fears and anxiety, and restoring communication with peers. Furthermore, M. Zeiler *et*

al. (2023) emphasised that underweight negatively affects the motivation to exercise. In the same study, psychological correction classes were used to correct the moral status of underweight girls, which is an integral part of the whole complex, to achieve a sustainable result.

D. Manzano-Sánchez *et al.* (2023) reported the low level of physical activity in underweight people, which confirms the relevance of developing programmes such as the one described in this article. To develop the programme, the block principle was used, which has proven to be effective in earlier studies by O. Andrieieva *et al.* (2022). In programming classes, the need to follow a certain sequence of stages was taken into account. Similar approaches to planning health-enhancing activities, designing a clear system of classes, and ensuring continuity in learning exercises for people with body weight disorders were outlined by M. Palchuk *et al.* (2023). According to the World Health Organization (2020) statement, 81% of children and adolescents do not meet recommended levels of physical activity. Thus, a sedentary lifestyle, insufficient or high body mass index, and a lack of physical activity are among the main risks for adolescent health, as habits acquired in childhood are essential for long-term healthy growth. This was the basis for the development of a preventive and corrective exercise programme for underweight girls in this study. The method of expert assessment was used to justify the means and methodological features of its implementation. The appropriateness of using expert assessment for justification of health-enhancing programmes was reported by D. Maltsev *et al.* (2022).

The implementation of the developed fitness programme allowed for the identification of qualitative and quantitative changes in the physical condition of the study participants, which complemented the data reported by G. Chen *et al.* (2022). The main changes were observed in the indicators of physical fitness (agility, speed and speed-strength qualities, strength, and flexibility), which is consistent with the results of the study by M. Palchuk *et al.* (2023). Furthermore, positive changes were found in the physical performance of underweight girls. The findings of this study expanded the data reported by O. Yarmak *et al.* (2023) on the possibility of using health fitness means to correct physical conditions and normalise body weight in early adolescent children. It was found that the main focus of exercise classes for underweight adolescent girls should be on the development of general endurance and strength. This is consistent with the research findings reported by R.A. Lima *et al.* (2021). These researchers emphasised that insufficient physical activity in adolescents is accompanied by negative changes in such physical qualities as strength, speed, and endurance. There were also equally pronounced changes in the functional status of the cardiovascular and respiratory systems. Adolescent children with low physical activity are characterised by lower efficiency of functional systems, including the cardiovascular and respiratory systems, and low physical performance. This also confirms the reasonability of using health fitness programmes (including strength, functional, mental, and aerobic exercises). Taking individual characteristics of physical condition into account will help to harmonise physical development and improve the quality of life for adolescent girls.

Conclusions

The development of programmes for the management of body weight disorders in children remains relevant. The involvement of experts in the study allowed to identify approaches that are appropriate to use for correcting physical conditions in 12-13-year-old underweight girls. It was found that the most effective approaches were regular physical exercise and eating behaviour modification ($W = 0.82$; $\chi^2 = 51.67$; $p < 0.05$). The system of corrective measures should include physical exercises, including health fitness, psychological correction, and motivational training. Among the means of health fitness, the most effective were strength training, functional training, dance aerobics, and stretching ($W = 0.81$; $\chi^2 = 80.57$; $p < 0.05$). The methodological features and criteria for the effectiveness of the system of corrective measures were identified. The experts' opinions on these issues were consistent ($W = 0.81$; $\chi^2 = 51.15$; $p < 0.05$). Thus, the effectiveness criteria substantiated by the experts became the basis for evaluating the impact of the proposed health-enhancing programme for underweight adolescents.

The experts' recommendations were used as the basis for designing the 9-month health fitness programme that included health fitness (conditioning training), health-enhancing recreational physical activity (daily independent exercise and weekend recreational activities with family and friends), psycho-correctional sessions (once a week), nutritional guidance, and motivational training. The implementation of the comprehensive training programme that included fitness, psychological correction, and nutritional behaviour modification resulted in qualitative and quantitative improvement of physical health in 12-13-year-old underweight girls. There was a statistically significant increase ($p < 0.05$) in girls' health-oriented motivation to exercise. Positive changes were observed in their eating behaviour as well as in their value system, including improved self-perception and body image, which led to more appropriate self-esteem. These findings emphasise the effectiveness of the developed programme for underweight adolescent girls and support its implementation in the physical education and health-enhancing activities of out-of-school educational institutions working with this population. Future research will be focused on the development of recommendations for the correction of physical condition indicators in overweight adolescent girls.

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None.

Conflict of Interest

None.

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Обґрунтування системи корекційних заходів із підвищення фізичного стану дівчат-підлітків засобами оздоровчо-рекреаційної рухової активності

Олена Андрєєва

Доктор наук з фізичного виховання і спорту, професор
Національний університет фізичного виховання і спорту України
03150, вул. Фізкультури, 1, м. Київ, Україна
https://orcid.org/0000-0002-2893-1224

Любов Єракова

Кандидат наук з фізичного виховання і спорту, професор
Національний університет фізичного виховання і спорту України
03150, вул. Фізкультури, 1, м. Київ, Україна
https://orcid.org/0000-0002-4797-6305

Аліна Максименко

Аспірант
Національний університет фізичного виховання і спорту України
03150, вул. Фізкультури, 1, м. Київ, Україна
https://orcid.org/0009-0008-5460-4172

Ольга Боженко-Курило

Викладач
Національний університет фізичного виховання і спорту України
03150, вул. Фізкультури, 1, м. Київ, Україна
https://orcid.org/0000-0002-2232-559X

Анотація. Відхилення від норми маси тіла набувають усе більшого поширення серед дитячого контингенту. Зазначене постає актуальною проблемою, яка лімітує рівень здоров'я значної кількості дітей, підлітків, молоді, що потребує невідкладних утручань. Метою дослідження було створити систему корекційних заходів для підвищення рівня фізичного стану дівчат-підлітків із дефіцитом маси тіла засобами оздоровчо-рекреаційної рухової активності. З метою з'ясування особливостей побудови комплексної програми оздоровчих занять для дівчат із недостатньою масою тіла було проведено експертне опитування, що включало методичні особливості розробки програм на основі використання засобів оздоровчого фітнесу та критерії ефективності програми. Залучення експертів до дослідження дозволило встановити підходи, які доцільно використовувати для корекції показників фізичного стану дівчат 12-13 років із недостатньою масою тіла. З'ясовано, що найбільш ефективними підходами є регулярна рухова активність та зміна харчової поведінки. Найбільш ефективними засобами для підвищення фізичного стану експерти вважають силовий фітнес, функціональний тренінг, танцювальну аеробіку та стретчинг. За результатами експертного опитування встановлено, що в систему корекційних засобів доцільно включати фізичні вправи, засоби оздоровчого фітнесу, засоби психокорекції, мотиваційне навчання. Визначено методичні особливості та критерії ефективності системи корекційних засобів, думка експертів із цих питань виявилася узгодженою. Отримані результати стали основою для побудови програми занять, відмінними рисами якої є урахування особливостей фізичного стану та рухової активності дівчат із дефіцитом маси тіла, на основі чого було визначено розподіл та зміст педагогічних засобів у процесі занять із використанням засобів оздоровчого фітнесу. Розроблену програму доцільно впровадити на практиці в процес позашкільних занять із фізичного виховання, що сприятиме покращенню фізичного розвитку, підготовленості та працездатності дівчат середнього шкільного віку

Ключові слова: експертна оцінка; програма; фітнес; вага тіла; дефіцит ваги

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The "3x3 basketball" game main characteristics as a new type of activity for students

Iryna Yuzkovets*

PhD in Physical Culture and Sport, Associate Professor
Hryhorii Skovoroda University in Pereiaslav
08401, 30 Sukhomlynskyi Str., Pereiaslav, Ukraine
https://orcid.org/0000-0001-9372-550X

Oleksandr Krasov

Senior Lecturer
Hryhorii Skovoroda University in Pereiaslav
08401, 30 Sukhomlynskyi Str., Pereiaslav, Ukraine
https://orcid.org/0000-0001-9826-2065

Abstract. Non-traditional forms of physical culture and sports activities, characterised by dynamism and the possibility of variable use at any time of the year, on many sites, and with different levels of physical and special preparation, are becoming more and more relevant among student youth. The game "basketball 3x3" has great potential for the development of both physical and personal qualities in students. The goal was to reveal the main characteristics of the game "basketball 3x3" and conduct an experiment to determine the feasibility of its use in the process of physical education for student youth. Based on the generalisation of data from the scientific and methodological literature, it was established that 3x3 basketball is the most dynamic of all types of basketball (the game lasts 10 min of playing time, there is no pause in the game after a goal is scored, the time for an attack is up to 12 s, the size of the playground is reduced, and there are a smaller number of players). After the conducted pedagogical experiment, it was established that classes using a new type of motor activity, "basketball 3x3", had a positive effect on the development of the physical qualities of female students in the experimental group and could be introduced into the educational process at a higher educational institution. According to the results of the survey, it was established that 65.3% of students have a desire to play 3x3 basketball and participate in competitions. Based on the results of the ascertainment experiment, the initial level of physical development of female students was established, and the number of forms of physical exertion that will be applied in the formative experiment was determined. It was established that regular 3x3 basketball classes have a positive effect on the development of the physical abilities of female students in the experimental group. It is proposed to include this type of motor activity in the students' learning process because it will have a positive effect on the development of physical qualities, increase the level of technical preparation, and strengthen their health. According to the results of the pedagogical experiment, it was established that 3x3 basketball is an effective means of physical education for students. The results of the study can be used by physical education teachers at higher education institutions to prepare annual lesson plans

Keywords: institution of higher education; physical education; sports games; streetball; non-traditional forms of sports activities

Introduction

For many years, sport has been functionally adapted to the needs of society. As a result of social changes such as technological progress, a fast pace of life, and increased physical activity, new types of competitive activity appear. This significantly affects the nature of physical activity and leads to a variety of forms of competition, as motor activity is expanded due to the addition of various non-Olympic sports. In addition to recognised sports, there are a huge number of other forms of physical activity in the world, each of which strives to become a sport and later enter the

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*Corresponding author

programmes of various international complex competitions (World Games, Olympic Games, Paralympic Games, etc.). 3x3 basketball is a relatively new type of physical activity, but its popularity among student youth is high. The main reasons for the popularity of this type of game are the educational process, which is quite simple to organise, does not require a lot of equipment, and allows students to communicate and achieve a sufficient level of motor activity. The variety of movements that are inherent in 3x3 basketball contribute to the strengthening of all systems of the human body, the activation of the circulatory and respiratory organs, the work of all major muscle groups, and the improvement of metabolism. 3x3 basketball is a research-relevant means of developing physical abilities and strengthening the health of students.

Scientists O. Klius *et al.* (2022a; 2022b) came to the conclusion in their work that female students of institutions of higher education are interested in the game of basketball 3x3 and want to try their hand at this sport. During practical classes, they have a desire to gain theoretical knowledge. According to scientists, in institutions of higher education, basketball 3x3 can be used as a means of physical education only to a limited extent, usually within the framework of the main topics of classes, such as basketball. But 3x3 basketball can be included as an additional sports section available to female students on a voluntary basis. As G. Lavrin (2019) notes in his work, to increase students' interest in physical education, non-traditional sports games such as streetball, korfball, netball, speedminton, ringo, floorball, and ultimate can be introduced into the physical education process. They are easy to master, do not require a lot of inventory, and, at the same time, are interesting for student youth. A. Hakman *et al.* (2019) came to the conclusion that the most important thing in the process of involving students in physical education is a close relationship between the teacher and the student in order to take into account interests and motives and to form a positive attitude towards physical education.

The work of A. Aydiner (2021) presents the results of a study in which the author highlights specific differences between 3x3 basketball and classic basketball. According to his data, the specifics of conducting 3x3 basketball classes and competitions have a great impact on the game behaviour and level of players' training due to differences in the rules of the game. D. Ferioli *et al.* (2022a; 2022b) conducted a comparative analysis of men's and women's 3x3 basketball competitions. They found the following differences in the process of conducting matches: men played games with a greater intensity of physical exertion, while women's teams had a lower level of physical activity. Scientists recommend that team coaches, when developing training sessions, take into account gender and the specific requirements of matches. A. Musienko & Zh. Tsymbalyuk (2021), analysing the historical aspects of the development of 3x3 basketball, came to the conclusion that in Ukraine, the country needs to pay more attention to this type of motor activity because its intensive development in the world has an impact on the development of 3x3 basketball in the middle of the country. Scientists R.A. Birrento Aguiar *et al.* (2023) in their work drew attention to the fact that the expansion of scientific knowledge about the rules of 3x3 basketball and their modification taking into account the age of athletes is an urgent task and initiated the conduct of more research on this issue. But the content, organisation, and conduct of this game and its main characteristics are not sufficiently covered in the special literature, which determined the relevance of this study. The goal was to identify the impact of 3x3 basketball classes on the physical condition of female students with the help of pedagogical research methods and functional diagnostic methods and determine the expediency of introducing a new type of motor activity into the educational process of physical education in a higher educational institution.

Materials and Methods

The following theoretical methods were used to solve the research tasks: analysis and generalisation of data from scientific and methodological literature. Pedagogical methods: observation, ascertainment experiment (it was carried out to determine the initial positions of the study, an analysis of medical records was carried out, as well as the initial level of physical development of female students was determined), and a formative experiment (during the formative experiment, the effect of the use of 3x3 basketball on the physical condition and level was determined for the physical fitness of female students in the experimental group). Mathematical statistics methods were used to calculate the research results. The study was conducted at the Hryhorii Skovoroda University in Pereiaslav (Pereiaslav, Ukraine). 52 students from the 1st and 2nd years of the Faculty of Ukrainian and Foreign Philology took part in the experiment. The participants consented to participate in the study, and the students were informed about its purpose. The study was conducted in accordance with ethical norms (Declaration of Helsinki, 2013).

The work was carried out in two stages in the 2022-2023 academic year. The participants of the experiment were divided into a control group of 26 people and an experimental group of 26 people. The control group of female students was engaged in a typical programme of physical education, and the programme of the experimental group included 3x3 basketball as the main type of motor activity in educational and extracurricular activities. At the first stage, the current state of physical culture and recreation and leisure activities among female students was studied, as well as the hypothesis, goal, and tasks of the study. Before conducting the study, an analysis was used to review the medical records of female students. Information was obtained regarding the lifestyle, physical activity, and health status of female students in the 1st and 2nd years. At the second stage of the research, an assessment of the effectiveness of the introduction of elements of street basketball into educational classes on physical education, as well as into some extracurricular forms (the organisation of 3x3 basketball competitions (class duration: 90 min)) was carried out. The following tests were used to determine indicators of physical fitness: 1,000 m run (strength endurance); 30 m run (speed); pull-ups on a low bar and long jump from a place (dynamic strength); physical working capacity (PWC_{170}) was measured by assessing heart rate (heart rate) during standard muscle work using the formula:

$$PWC_{170} = N_1 + (N_2 - N_1) \times \frac{(170 - f_1)}{f_1 - f_2}, \qquad (1)$$

where N_1, N_2 – power of two applied loads, f_2, f_1 – corresponding heart rate. A survey was conducted to find out the level of motor activity. The survey was conducted face-to-face during a physical education class in October 2022 and included the following questions. 1. Do you consider your lifestyle healthy? 2. How many hours during the last week did you spend on physical exercises or other types of motor activity? 3. How many hours a day do you usually spend sitting or lying down? 4. How do you rate your health? 5. How do you maintain your physical form? 6. What types of physical activity/sports do you do? 7. How often do you do physical activity/sports? 8. Does physical activity/sports help you overcome stress and improve your mental health? 9. Where do you usually engage in any types of physical activity or sports? 10. Would you like to play 3x3 basketball to maintain your physical shape and take part in competitions? 11. Do you use online classes for self-paced physical activity/sports?

Results and Discussion

As of 2023, work on physical education in institutions of higher education does not meet the requirements of organising the educational process with student youth. The modern educational process in higher education is characterised by an increase in volume and intensification, which negatively affects the physical condition of the future specialist. Increasing the level of motor activity in students is the most rational way to solve this problem. The introduction of new types of motor activity, which are the most widespread among student youth, will contribute to increasing their interest and forming motivation for regular physical exercises. T. Krutsevych & Zh. Malakhova (2020) note that modified types of classic sports games are quite popular among students: mini-football, streetball, beach volleyball, beach handball, rugby-7, and others. However, the use of new types of motor activity in the process of physical education in higher education is complicated due to the fact that in the scientific and methodical literature there are only episodic data on the organisation and methods of conducting classes with elements of new types of sports.

A pedagogical study was conducted with the aim of expediting the application of the elements of the streetball game in the process of physical education for female students in the junior years of higher education institutions. The analysis of the medical records of female students shows that 19.2% of the studied female students are assigned to the preparatory group and 17.3% to the special medical group. In addition, according to the results of the survey, it was found that 67.3% of female students have a low level of physical activity. The analysis of indicators of the physical fitness of female students shows that the greatest non-compliance with regulatory requirements is observed in indicators of strength endurance (61.5%), dynamic strength (57.6%), speed (46.1%), and physical work capacity (42.3%). In the course of the survey, it was found that female students showed the greatest interest in the modifications of sports games, in particular streetball, although it is a relatively new type of physical activity. The main reasons for this popularity are: the dynamic nature of the game; the opportunity to show oneself in a short period of playing time; the ability to quickly interact and communicate with teammates; and obtaining a sufficient level of motor activity.

The application of streetball elements in the process of academic classes and the organisation and conduct of street basketball competitions with female students of the 1st and 2nd years were based on taking into account the following components: ensuring conditions for the necessary daily energy expenditure; the main motives that determine the interest and desire to play streetball; determining the main parameters of streetball game movements; determining the amount of physical exertion (volume, intensity, duration, and nature of rest) of special exercises and game modes in streetball; and the organisation and features of 3x3 basketball competitions. In the course of the ascertainment experiment, it was established that during one game of streetball, each participant covers a distance of up to 500 m, performs at least 25-30 jumps, accelerations with the ball handling up to 100 m, 15-20 passes, and 18-20 throws of the ball into the basket. Movements during the game occur with a change in intensity; running at maximum speed alternates with pauses and walking. Taking into account that in the process of classes and competitions, a student can participate in three or more games, the total physical load varies from medium to large. In addition, it is also characterised by high emotional stress.

Determining the physical load of street basketball exercises made it possible to differentiate them according to the direction and magnitude of the impact on the cardiovascular system of female students. Aerobic exercises (heart rate up to 150 bpm^{-1}). This group includes the following elements: uniform running on the court; technical actions in the attack (passing the ball, free throw). Exercises performed in an aerobic-anaerobic mode (heart rate up to 180 bpm^{-1}). Elements of actions in attack and defence: "opening" for the ball; game without a ball; dribbling the ball with a change in the direction of movement; "pick-up", "tear-out", "knock-out", "interception"; transmission in motion; shots from a distance. Anaerobic exercises (heart rate 180 bpm^{-1} and higher). These include: accelerations that are necessary to perform an attack; hindering the attacking actions of a player of the opposing team; jerks on the ball; quick transition from attack to attack; offensive actions on the move and shots from a distance with the active actions of the defender; dribbling with active tackling and attacking the ring. Playing streetball can be the content of conditioning training (the main goal is to increase the level of physical condition to the proper level) in a mixed zone of energy supply (anaerobic-aerobic). The average heart rate of female students who participated in the game is 168 ± 4 bpm^{-1}, which is about 80% of the maximum possible heart rate at this age. The reduction in body weight during one training session (3-5 games) was 1-2 kg, depending on the weight of the participants in the game, due to the loss of moisture in the body.

At the end of the formative experiment, it was found that the use of elements of the streetball game in the process of physical education of female students in the experimental group contributed to the improvement of indicators in the tests "run 1,000 m", "run 30 m", "pull-ups on a low bar", "long jump from a standing position". During the experiment, the results in the 1,000 m race improved

from 4:29.3 ± 3.7 to 4:12.6 ± 3.2; in the 30 m run, from 7.1 ± 0.1 to 6.6 ± 0.2; in pull-ups on the low bar, from 13 ± 1.0 to 15 ± 2.0 times; and in the standing long jump, from 161.4 ± 7.2 to 179.2 ± 7.1. It should be noted that the indicators of physical fitness of the girls in the control groups did not undergo significant changes. As for the indicator of physical work capacity, during the experiment in the control group they remained unchanged (before the experiment 981 ± 19.31 kp·m min^{-1}, after 989 ± 19.61 kp·m min^{-1}) ($p > 0.05$), while in the experimental group, after a year of regular streetball training, the PWC_{170} index significantly increased from 987 ± 19.7 kp·m min^{-1} to 1,087 ± 17.5 kp·m min^{-1}). 3x3 basketball has a lot in common with classical basketball, and among the important differences are the competitive struggle and the organisation of competitions in the 3x3 basketball format (Table 1).

Table 1. Main features of the basketball 3x3 game

The nature of the game	3x3 basketball is the most dynamic of all types of basketball (absence of a game pause when playing the ball after a goal, game duration up to 10 m of playing time, time for attack up to 12 s, smaller court size, fewer players).
Competition intensity	Competitions are held for 1-4 days, with a rest between games of one to several hours.
Energy supply mechanisms	At the competitive level, athletes' game actions take place both in aerobic and anaerobic metabolisms. During the match, the average heart rate is ≈ 163 bpm, and during the most intense loads, it reaches 200, which affects decision-making.
Contact	The small size of the court and the intense pace of the game lead to a significant increase in player contact, which makes the game even more rigorous. Taking into account the interpretation of fouls and their number in the rules, players prefer a power style that requires a high level of special physical training.
Universalisation of players	Players on high-end 3x3 teams are multifunctional and almost identical in characteristics. What is important is the collective action – the players' use of the best aspects of each of them.
Process management	The coach of the team actively interacts only during training, always looking for new tactical options that correspond to modern trends in the development of the game of 3x3 basketball and also choosing modern approaches in the process of training athletes. Players make independent decisions during the game; they are the initiators of tactical actions.

Source: made by the authors based on Rules of basketball 3x3 game (n.d.)

3x3 basketball is gaining more and more popularity in the world and in Ukraine and is in no way inferior to classic basketball, as noted by M. Hopei (2021). In particular, the scientist observed an increase in the desire to lead a healthy lifestyle and an improvement in one's own physical condition while continuing to practice 3x3 basketball. O. Klius *et al.* (2022b) add that, given that 3x3 basketball received the status of an Olympic sport, the holding of a number of regional, state, and world competitions among both professionals and amateurs became possible thanks to the development of uniform international rules. The European and World 3x3 Basketball Championships have been held every year since 2016. Competitions are held over two to five days, with teams playing multiple games each day. Since 2010, the International Basketball Federation (FIBA) has organised a complex of competitions for youth teams (up to 18 years old): the Youth Olympic Games, the World, European, Asian, and African Championships, the World Cup for players under 23 years old from 2018, and the League of Nations from 2017, respectively. The FIBA 3x3 World Tour, which has been held by FIBA since 2012 and consists of several stages held around the world, is particularly popular (Klius *et al.*, 2022b).

Optimising physical activity in institutions of higher education is an important issue because it is closely related to the organisation and content of physical education. As noted by leading scientists T. Krutsevych & Zh. Malakhova (2020) and N. Moskalenko *et al.* (2021), the main condition for optimising physical activity is taking into account students' interest during classes. Streetball (basketball 3x3), as a separate sport, has both specific and common characteristics with classical game types that affect the organisation of the training process. The differences between "3x3 basketball" and classical basketball have been studied by many scientists. In particular, scientists B. Figueira *et al.* (2022) compared basketball 3x3 with 5x5. As in this study, an experiment was conducted; however, its purpose was different. The scientists found that the condition of the athletes did not differ much during the games in both types of basketball, but there were significant differences in technical and tactical actions.

F. Erčulj *et al.* (2019) conducted pedagogical experiments to compare technical actions, such as throwing the ball and dribbling the ball. In particular, P.G. Montgomery & D.B. Maloney (2018) came to the conclusion that elite players with high physical capabilities who can qualitatively carry out such actions as throws have a chance for greater success in sports. Z. Boros *et al.* (2022) and G. Csurilla *et al.* (2023) also consider it necessary to take into account the gender differences of players. Their opinion is interesting: in men's basketball, victories depend more on luck (the difference between expected and obtained results) than in women's basketball. Offensive and defensive play are also different between classic basketball and what players use in 3x3 basketball. Each of the scientists focused on the fact that it is important for coaches to take into account the specifics of this type of sport, choose optimal loads, and take into account the conditions of classes and competitions.

As indicated by the research results of V. Ilchyshina & A. Bondar (2019) and O. Klius *et al.* (2022a), a large number of students have a desire to play 3x3 basketball and participate in competitions. Therefore, there is a need to update the content of the process of physical education in institutions of higher education, to give it a vital and practical orientation, and to meet the needs and individual characteristics of students. V. Ilchyshina & A. Bondar (2019) note that 3x3 basketball has many elements in common with classical basketball. However, this sport is separate

and has its own characteristics in terms of technical, functional, tactical, and psychological training. It differs from classic basketball in that 3x3 teams play on one ring, and the size of the court is 15 by 11 m. A shot through the arc is worth two points; anything else is one point.

The work of A. Blaghii *et al.* (2018) is interesting. Regarding the involvement of students in health and recreational activities. The study emphasises the importance of how young people spend their leisure time and whether people implement health-improving practices in their free time. In the author's opinion, although 3x3 basketball is a new type of motor activity, it can be used as a means of health and recreational activity for students. It is interesting for student youth. Research by N. Hodun (2022) confirms this thesis. The scientist established that the majority of the surveyed youth have deviations in their state of health, which makes the issue of improving their physical condition urgent. According to the authors of the study, 3x3 basketball can provide not only effective but also interesting physical exercise for strengthening physical conditions and leading a healthy lifestyle.

Taking into account the results of the conducted experiment, the information of V. Banakh & G. Iedynak (2021) about the fact that extracurricular physical education activities contribute to the greater development of morpho-functional and psychophysiological characteristics of female students of higher education institutions was confirmed. 3x3 basketball is an effective means of physical education for students. This type of physical activity is easy to organise, does not require a lot of equipment, and can be played on any basketball court, both outdoors and indoors. During competitions as well as trainings, musical accompaniment is often used, which helps to increase the emotionality of classes and creates a positive atmosphere among players. The game also has a positive effect on the development of physical qualities and functional abilities in the students' bodies. The game of 3x3 basketball requires the "inclusion" of energy supply mechanisms of an aerobic and anaerobic nature; therefore, the use of 3x3 basketball as a means of physical education for students of higher education institutions is effective for the development of endurance, which is important for future specialists of various specialties since the majority of them require long physical and mental loads.

Conclusions

Summarising the obtained information, the following conclusions can be drawn: 3x3 basketball is a fairly new type of physical activity that is quickly gaining popularity among children and student youth in Ukraine. During the period of the experiment, female students received comprehensive knowledge of the technical techniques (throws, jumps, movement, dribbling, and passing the ball) and tactical techniques (various combinations and actions in attack and defence) of the game "basketball 3x3" and saw which elements differ from the classic basketball. During the 3x3 basketball competition, the students easily used the acquired knowledge. During the experiment, it was found that 3x3 basketball classes have a positive effect on the development of such physical qualities in female students as: dynamic strength (pull-ups on a low bar, long jump from a standing position), endurance (running 1,000 m), speed (running 30 m), and the indicator of physical working capacity. After the end of the experiment, these indicators increased significantly. Female students showed interest in classes and therefore had good results in mastering the elements of the game, participated in competitions, and thus increased the level of motor activity.

At streetball classes, female students were able to improve their physical condition because this type of motor activity was used as an element of conditioning training. Playing 3x3 basketball outside of school hours gave female students the opportunity to find new friends and be more open in communicating with like-minded people, so this type of physical activity can be considered not only a way to improve one's physical condition but also an opportunity to find new friends and spend free time with benefit for himself. Further directions of research consist in the development of methodological guidelines for the inclusion of 3x3 basketball in the educational process of physical education in higher educational institutions, not only during the educational process but also outside the educational (sectional classes) time.

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Conflict of Interest

None.

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Основні характеристики гри «баскетбол 3х3» як нового виду рухової активності студентської молоді

Ірина Юзковець

Доктор філософії з фізичної культури і спорту, доцент
Університет Григорія Сковороди в Переяславі
08401, вул. Сухомлинського, 30, м. Переяслав, Україна
https://orcid.org/0000-0001-9372-550X

Олександр Красов

Старший викладач
Університет Григорія Сковороди в Переяславі
08401, вул. Сухомлинського, 30, м. Переяслав, Україна
https://orcid.org/0000-0001-9826-2065

Анотація. Дедалі більшої актуальності серед студентської молоді набувають нетрадиційні форми фізкультурно-спортивної діяльності, що вирізняються динамічністю, можливістю варіативного використання в будь-яку пору року, на багатьох майданчиках, із різним рівнем фізичної та спеціальної підготовленості. Гра «баскетбол 3х3» володіє великим потенціалом у розвитку як фізичних, так й особистісних якостей студентів. Мета – розкрити основні характеристики гри «баскетбол 3х3» та проведення експерименту для визначення доцільності її застосування в процесі фізичного виховання студентської молоді. На основі узагальнення даних науково-методичної літератури встановлено, що баскетбол 3х3 з усіх різновидів баскетболу є найбільш динамічним (гра триває 10 хв. ігрового часу, після забитого м'яча відсутня ігрова пауза при його розіграші, час на атаку до 12 с, зменшений розмір майданчика, менша кількість гравців). Після проведеного педагогічного експерименту встановлено, що заняття з використанням нового виду рухової активності «баскетбол 3х3» мали позитивний вплив на розвиток фізичних якостей студенток експериментальної групи та може бути впроваджено в навчальний процес у вищому навчальному закладі. За результатами опитування встановлено, що 65,3 % студентів мають бажання займатися баскетболом 3х3 і брати участь в змаганнях. З результатів констатувального експерименту встановлено вихідний рівень фізичного розвитку студенток і визначено об'єм та форми фізичного навантаження, які будуть застосовані в формувальному експерименті. Встановлено, що регулярні заняття баскетболом 3х3 мали позитивний вплив на розвиток фізичних здібностей студенток експериментальної групи. Запропоновано включити даний вид рухової активності в процес навчання студентів, адже він буде позитивно впливати на розвиток фізичних якостей, підвищення рівня технічної підготовленості та зміцнення їх здоров'я. За результатами проведеного педагогічного експерименту встановлено, що баскетбол 3х3 є ефективним засобом фізичного виховання студентів. Результати дослідження можуть бути використані викладачами фізичного виховання закладів вищої освіти для складання річного планування занять

Ключові слова: заклад вищої освіти; фізичне виховання; спортивні ігри; стрітбол; нетрадиційні форми спортивної діяльності

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Indicators of competitive activity of the handball club Motor in the conditions of the German Bundesliga

Alexander Solovey

PhD in Physical Education and Sport, Associate Professor
Prydniprovsk State Academy of Physical Culture and Sport
49094, 10 Naberezhna Peremohy Str., Dnipro, Ukraine
https://orcid.org/0000-0001-8480-2323

Dmytro Solovey

PhD in Physical Education and Sport, Associate Professor
Prydniprovsk State Academy of Physical Culture and Sport
49094, 10 Naberezhna Peremohy Str., Dnipro, Ukraine
https://orcid.org/0000-0001-8105-2061

Serhii Ovcharenko

PhD in Physical Education and Sport, Associate Professor
Prydniprovsk State Academy of Physical Culture and Sport
49094, 10 Naberezhna Peremohy Str., Dnipro, Ukraine
https://orcid.org/0000-0003-4345-4021

Artem Yakovenko

PhD in Physical Education and Sport, Associate Professor
Prydniprovsk State Academy of Physical Culture and Sport
49094, 10 Naberezhna Peremohy Str., Dnipro, Ukraine
https://orcid.org/0000-0003-0338-8437

Yaroslav Maloivan

Associate Professor
Prydniprovsk State Academy of Physical Culture and Sport
49094, 10 Naberezhna Peremohy Str., Dnipro, Ukraine
https://orcid.org/0000-0002-6026-5057

Abstract. The indicators of the competitive activity of handball clubs affect their preparation for responsible competitions to achieve the desired sports result. The analysis of competitive activity allows to improve the training process and increase the efficiency of players in the future; therefore, the purpose of the study was to analyse and evaluate the components of the competitive activity of the handball club Motor, which participated in the German championship of the 2. Bundesliga. Using the methods of analysis and comparison, the game of the handball club Motor and its opponents in the 2. Bundesliga 2022/2023 was studied. Methods of mathematical statistics were used to calculate the quantitative and average values of indicators and their effectiveness. The results of the study show that the most productive (72 goals) and less productive (47 goals) games of the handball club Motor were observed with the clubs that took 20th and 12th places in the standings; the most productive (35 goals) and less productive (21 goals) matches were with the clubs in 20th and 2nd places; handball club Motor scored 7 and 2 goals against opponents per match in a row; during the winning matches, the maximum goal difference was +10 goals, the minimum +1 goal; the opponents' advantage was +13 goals. The analysis of the competitive activity of the handball club Motor shows athletic competition, integration of the play style, and preservation of membership in the 2. Bundesliga. The results of handball players are

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*Corresponding author

characterised as unstable. A low level of technical and tactical actions components is observed in 60.5% of matches of the 2. Bundesliga championship. The results of the study can be used in practice to improve individual and team play and to compare the relationship with the team rating of opponents

Keywords: handball; opponents; effective game; effective team; throws; motor activity

Introduction

Team sports games are popular in many countries around the world. Handball, as a representative of the sport of higher achievements, has gone through a long period of historical development. It achieved a high degree of perfection in terms of the movement content of the game and the informational and methodological support of the process of training highly qualified handball players. Modern training of athletes depends on the effective use of indicators of the competitive performance of players and teams of the highest sportsmanship and participants in competitions on Ukrainian and international arenas. Leading scientists pay great attention to the study of indicators of the competitive activity of teams in sports games and in handball in particular.

Such scientists as V. Kostiukevych (2017) and O. Mitova (2020) have focused their research on improving the control of competitive activity and various aspects of the training of highly qualified athletes in team sports games. In their works, the authors R. Sushko & E. Doroshenko (2019) and O. Solovey *et al.* (2022) emphasise that the indicators of the competitive activity of the leading handball clubs (HCs) in Europe constantly influence the formation and development of other HCs. The coaching staff must have information about the quantitative and qualitative indicators of the players who will participate in the training and competitive processes before starting the preparation plan for new competitions. The dynamics of indicators for determining the level of physical, general, and special fitness of highly qualified handball players have a stable upward trend and indicate variable dynamics of indicators during the annual macrocycle. All this affects the indicators of competitive activity.

Foreign scientists M. Oytun *et al.* (2020) and M.Q.H.K. Anwar *et al.* (2022) note that competitive performance indicators in various game sports are of great importance for coaches, as they use relevant information to plan the training process, offensive play, and defence, as it directly affects the results of matches. Scientists and specialists distinguish various characteristics of competitive activity: individual and team technical and tactical actions, their scope, and their effectiveness. The study of H. Lisenchuk & V. Tyshchenko (2019) confirms the usefulness of using various indicators of technical and tactical skill of highly qualified football players in the general system of complex control of their special training and readiness for teams in general. The authors have created criteria that allow for evaluating the effectiveness of individual technical and tactical actions.

According to V. Tsyhanok (2021), using the information support system, which includes the computer programs InfoHandball and StatsHBall, significant data was collected on the technical and tactical aspects of the game of qualified handball players of various positions during the competitive process (in matches, series of matches or tournaments) with their subsequent integration into the training process. A number of authors emphasise that the study of the competitive activity of handball players allows: to identify factors that affect the outcome of the match; to develop game models for athletes of various roles and to determine game development trends and technical and tactical features of the game of individual teams, as written by J.C. Zapardiel *et al.* (2019) and J.C. Lane *et al.* (2020). Scientists focus attention on the fact that versatile training of players is necessary to maximise productivity and minimise exhaustion, when performing in long tournaments, and also recommend correcting the training process considering the analysis of game activity.

The use of new, more effective training methods is reflected in the improvement of sports results, which becomes the main goal of any changes in training methods. Sports results are an integral indicator of athletes' preparedness. Hungarian scientists L. Petridis *et al.* (2021) note that in strength training, it is recommended to use various loads with resistance, which act on the entire range of the speed-force spectrum, thus optimising the development of forces and, ultimately, improving sports results. At the level of higher sportsmanship, a number of authors, including V. Lochman *et al.* (2021) consider competitive activity as the most important form of complex control, and the achievement of sports results as one of the leading criteria for the success and effectiveness of the training process. The effectiveness of control provides current information about the course of competitive activity of almost every match and season. All of this determined the relevance of this study. The purpose of the work was to analyse and evaluate the components of the competitive activity of handball players of the HC Motor, who participated in the German championship of the 2. Bundesliga.

Materials and Methods

During the research, a set of theoretical scientific research methods was used, which made it possible to fully and objectively show the results and achieve the goal of the work. Using the analysis method, 38 matches were analysed with the participation of the leading Ukrainian HC Motor (Zaporizhia, Ukraine), a participant in the foreign championship of the German 2. Bundesliga for the 2022/2023 season. Accordingly, the materials selected for the study cover the years 2022-2023. The materials for the competition results were used from the official protocols of the 2. Bundesliga handball championship among men's teams. The studied results are available on the websites of the Handball Federation of Ukraine (n.d.) and HC Motor (All news: Handball club Motor, n.d.). The following indicators of competitive activity were analysed: the high and low performance of HC Motor and their opponents in the championship, as well as the performance of matches, the largest and smallest victories, consecutive goals scored, and

the difference in goals scored in a match. This analysis provided an opportunity to gain a deep understanding of the performance of the team during the season.

The method of analysis and generalisation was used for detailed data analysis of scientific and methodical literature, which was necessary for understanding the research problem in a broad context. The processing of scientific sources made it possible to qualitatively present the experiences of other countries in the context of the researched topic. Documentary materials contributed to the analysis of the protocols of competitive activity: the number of matches, victories, goals scored, productive matches and teams, and indicators characterising the course of matches. The method of system analysis turned out to be very useful for organising and structuring the obtained data. In addition, the chronological method was used to systematise data and study sources that reflected the essence of the study from the beginning to the end of the competition.

In this study, the comparison method proved to be a useful tool used to achieve two goals. It was used to compare the indicators of the competitive activity of HC Motor with the indicators of their opponents. This made it possible to draw conclusions about the difference in the performances of the teams during the matches. The analysis of comparative data became an important stage in understanding and evaluating the effectiveness of the game of the HC Motor team. The comparison method was also used to analyse the results of the study in comparison with the knowledge obtained from other scientific works. This made it possible to expand the context of the study and draw more reasonable conclusions.

The use of methods of induction and deduction in combination with comparative analysis enabled the author to draw his own conclusions regarding the competitive activity of HC Motor within the framework of the 2. Bundesliga. The methods of mathematical statistics are aimed at calculating the total and average values of the indicators, their effectiveness, and the percentage presentation of the obtained results. For the mathematical analysis of the research results, standard statistical methods and calculations of quantitative and qualitative indicators of the competitive activity of handball players – participants of the 2. Bundesliga of the German championship were used using the Excel 2007 application programme package.

Results

Handball players of HC Motor do not have serious rivals in the domestic arena and high-quality competitive practice during the martial law in Ukraine. The management of the club considered the possibility of participating in the championships of countries such as Poland, Hungary, and Slovakia. Negotiations with representatives of German handball turned out to be the most effective, after which HC Motor was included in the 2. Bundesliga. This league is considered the strongest national championship in Europe; it covers a significant number of HCs, and its second division, in terms of power and potential, can surpass most European championships. Zaporizhzhia HC Motor became the first in the history of Ukrainian clubs to play in the elite foreign division. In the 2. Bundesliga of the German championship, 20 clubs took part, which, according to the round-robin system, played matches on their own ground and on the ground of their opponents – 38 rounds from August 2022 to June 2023. Dusseldorf was the home city of HC Motor. The game of the opening round for the Zaporizhia team was a return to the court after the beginning of the large-scale invasion of russian troops into Ukraine (Handball Federation of Ukraine, n.d.; All news: Handball club Motor, n.d.).

According to the evaluation system specified in the methodology and based on the materials used, the following results were established: HC Motor played 38 matches with its opponents and took 17th place in the final tournament table. At the same time, they won 11 matches (28.9%), drew 4 matches (10.6%), and lost 23 matches (60.5%). Thrown and missed balls were 1,087:1,143, the difference being 56 balls. On average, during the match, the handball players of HC Motor had the indicators of thrown balls at 28.6:30.1 and a difference of 1.5 goals. The final results of the matches directly depended on the high execution of shots in the final stage of the attack throughout the match, as well as the game activity of the players in the attack. In the matches of the 2. Bundesliga in all HCs, the indicators were distinguished by a large number of effective attacks. The most effective match between the handball players of the HC Motor and the HC Velfe, which took 20th place in the tournament table, was marked by a total of 72 goals; the score was 35:37. Among the less productive matches, 47 goals were scored; the score of 25:22 was noted in the game between HC Motor and HC Lübeck-Schwartau, which took 12th place in the tournament table.

At the next stage of the research, the results of the quick and positional attack of the handball players and the high efficiency of the Ukrainian handball players (they threw 35 balls into the opponents' goal) were noted. The overall result of the match between HC Motor and HC Welfe is 35:37. At that time, the handball players had a low performance, only 21 goals. In a match with HC Eisenach, which took 2nd place, the score was 21:27. The positive final result depended on the effective interactions of the opponents' handball players and their combination play at the final stage of the attacks. A successful game and high efficiency of competitive activity in team interactions testify to the high number of balls thrown by the opponents into the goal of HC Motor. 37 goals were scored in the championship matches between HC Motor and HC Tusem (27:37) and HC Bietigheim (25:37), which took 8th and 4th places in the final table, respectively. Analysis of the results with the lowest number of goals conceded by the opponents' handball players, 22 goals each, was registered in the championship games of HC Motor and HC Bayer (28:22) and HC Lübeck-Schwartau (25:22). These HCs took 15th and 12th places, respectively.

The maximum difference between the goals scored and missed by the handball players of HC Motor confirmed the attacking style of play in the attack. A large margin of victory (+10 goals) was established in the match between HC Motor and HC Ludwigshafen; the score was 34:24, 9th place. The smallest difference (+1) was in the winning match between HC Motor and HC Rostok, with a score of 31:30 and 19th place in the table. Indicators of attacking actions in the attack of opponents of Ukrainian handball players differed from the identical generalised indicators of HC Motor by a large number of combined attacks. This attacking style in

the attack was confirmed by the maximum difference between thrown and missed balls. The big difference in the victory of the opponent (+12) was noted in the match between HC Motor and HC Bietigheim (25:37), which took 4th place. The minimum victories (+1 goal) over HC Motor opponents received in 13.2% of matches at the initial stage of the championship in the most productive (71 goals) match with HC Lübeck-Schwartau (35:36), which is in 12th place, and in less productive (55 goals each) matches with HC Guttenberg and HC Konstanz (27:28), they took 13th and 18th places in the final table, respectively.

Due to the high level of preparation in matches with their opponents, the handball players of HC Motor consecutively threw balls into the goal 140 times against 142 opponents, which is a high result. On average, the indicators were 3.68 and 3.7 goals per match, respectively. The most goals in a row, 7 goals each, were scored in the winning matches by HC Motor against HC Welfe (32:28) and HC Lübeck-Schwartau (25:22), respectively; they are in 20th and 12th places in the tournament table. The lowest figures, 2 goals each, were scored consecutively into the goal of their opponents in 15.8% of the matches; in these matches, the handball players of HC Motor were defeated. Accordingly, the opponents of the Zaporizhian handball players in 21.1% of the matches, in which 4 wins, 1 draw, and 3 defeats of the HC Motor were recorded, had the highest figures, 5 balls thrown in a row into the goal of the Ukrainian handball players, the smallest 2 balls each, in the match between the HC Motor and HC Ludwigshafen (34:24), which took 9th place.

The analysis of the maximum advantage of thrown balls during the offensive actions of highly qualified teams during the championship shows that they make +116 in HC Motor and +182 of their opponents, on average per match, respectively +3.1 and +4.8 goals. The biggest difference, by +10 goals scored, was made by HC Motor over its opponents during winning matches with HC Ludwigshafen (34:24), HC Coburg 2000 (30:23), and HC Bayer (28:22), which are, respectively, in the 9th, 11th, and 15th places of the tournament table. The smallest difference, by +1 goal, is in 23.7% of matches of the 2. Bundesliga championship in which HC Motor was defeated. Opponents of HC Motor had an advantage in the score difference (+13 goals) during the match between HC Motor and HC Bietigheim (25:37), 4th place in the table, minimum, +1 goal each, in 15.8% of championship matches. From the above, it can be stated that the defining characteristic of handball players' attacking play is the effectiveness of their attacking actions.

An in-depth analysis of the matches between HC Motor and their opponents in the German 2. Bundesliga handball championship gives an idea of how handball players of different teams tactically competently implement throws during the game from different distances and playing positions, use different options for throws at the final stage of attacks, and individual game ranges of matches. The difference between the indicators of the competitive activity of HC Motor and the opponents in the framework of the German championship of the 2. Bundesliga indicates the level of preparation of both teams and players, the tournament position, and the rating of the teams. Handball, as a professional sport, is constantly developing and improving. If at least one year is missed in the preparation of the HC and its competitive activities, it can take many years to recover. Therefore, the Ukrainian national team should continue training and playing in order to perform decently at competitions of various ranks.

Discussion

The purpose of the study was to analyse and evaluate the components of the competitive activity of the HC Motor players who participated in the German championship. The general statistics of HC Motor in the foreign championship were considered, and an assessment of their results was provided. The observations of the components of competitive activity and the results achieved confirm the opinion of scientists and handball specialists, such as O. Mitova (2019) and J.N. Prudente *et al.* (2019), that individual and team deficiencies lead to missed goals and, as a result, do not produce results. During the championship, HC Motor won 28.9% of the matches and lost 60.5% of the matches. The matches used different means of conducting the game and team interactions, which differed in their effectiveness. These components of competitive activity are becoming more and more relevant and agree with the results obtained by C. Manchado *et al.* (2021), who also showed a significant difference between offence and defence, with higher values of defensive efficiency. Coaches should take this fact into account when planning their programme.

As noted by scientists J.N. Prudente *et al.* (2019), studying the opinion of the coaching staff of the HC on improving the preparedness of their teams, firstly, correction of tactical preparation is necessary, secondly, correction of technical and psychological preparation, and then the shortcomings of functional, physical, and integral preparation of handball players. According to specialists B. Giovanini *et al.* (2021) and M.Q.H.K. Anwar *et al.* (2022), the main factor that determines the effectiveness of a team's competitive performance is its ability to "score goals in soccer" and "shoot balls in the basket in basketball". Teams with a high rating and a place in the tournament table have a high rate of attacking actions, score more goals, and win a large number of matches. These data provide relevant information for the development of new approaches to planning the training process.

The combination play in the attack testifies to the effective attacks of the handball players, both Ukrainian and German. Teams effectively threw the ball into the goal at the final stage of attacks in 52.6% of the matches of the German 2. Bundesliga with the participation of Ukrainian handball players. As noted by Spanish scientists G. Daza *et al.* (2017) and Portuguese colleagues W. Ferrari *et al.* (2019; 2020), handball experts, match wins, player activity, and its relationship with team results can be good tools for evaluating different features of the game. The analysis of the differences between the winning and losing teams shows the quantitative relationship between the goals scored and, therefore, with the final result of the team. The physical, technical, and tactical readiness of players can be monitored considering these indicators, and performances in long tournaments can be considered.

The highest and lowest indicators of thrown and missed balls in matches with opponents indicate that the handball players of HC Motor had advantages over teams of different ratings in the final table. The obtained results are supported

and confirmed in the works of other authors in team sports, such as H. Vila & C. Ferragut (2019) and C. Manchado *et al.* (2021), who note the absence of significant differences between teams with better and lower ratings. Modern handball requires high game activity from players and their level of development of the leading physical components, regardless of the game role. Tactically prepared players follow a designed game plan to be able to win their matches, including goals scored and missed attempts on goal.

A. Maulana *et al.* (2019) and P. Francisco *et al.* (2020) suggest that the number of shots per game can be an adequate indicator of team performance, with the speed of shots being one of the most important actions during a handball match. In the German championship, high demands are placed on each playing position of the players, and the individual tactical actions of the attack differ from each other for the players of the first and second lines of attack. As stated by V. Tsyhanok (2021), the analysis and expert interpretation of indicators of technical and tactical actions in handball by highly qualified players during competitions show that the highest level of efficiency in competitive activity is possessed by players in the "right half-middle" role, while according to the number of goals scored, "left half-middle". The analysis of the competitive activity of HC Motor shows that the Ukrainian handball players were not inferior to their opponents in any match, but their individual skill was insufficient, and the handball players' different contribution to the final result was observed. For the entire Ukrainian handball, the main result is the balls thrown into the goal of their opponents by the players of HC Motor (1,087:1,143, on average per match 28.6:30.1 and consecutive balls thrown during the match 140:142, 3.68:3.7 per match). The difference (−56, −1.5 per match) indicates that most of the matches were of an attacking, intense nature, and the court was an even, bright, but less stable struggle.

Foreign handball specialists aim their players at improving the tactical principles and strategy of the game in attack against disorganised defence, at meeting the special technical requirements of fast play, and at providing various options for passing the ball with one hand. Considering the indicators of the competitive activity of the leader of Ukrainian handball, the coaching staff of the team needs to adjust the individual and team programmes of the training process, both after each match and the season played. Matches with German teams in the 2. Bundesliga left different impressions: speed, sharpness, throws, and thrown balls – all of this was reflected in the competitive activity of the handball players. The final result (17th place) turned out to be rather ambiguous, considering the short period of preparation and the status of the opponent. There are positive points, and in general, the coaching staff should figure out what needs to be changed in the game of the Ukrainian HC. Coaches' attention must be focused on the game-related statistics that have the greatest impact on future match results in order to effectively plan training and competition strategies.

Conclusions

The main goal of the participation of the HC Motor players in the competitions of the German 2. Bundesliga was adaptation to the foreign championship and maintenance of high-quality competitive practice. German handball has a special status in the international arena because of its style of play, wide geographical coverage of HCs and tournaments held in the country, their popularity, and the large number of foreign handball players and coaches who work in teams of various levels. The analysis of the indicators of the competitive activity of the handball players of the HC Motor and their opponents shows that the level of preparation and the style of play affect their positive dynamics: a productive match – 72 goals; the effective team of the HC Motor – 35 goals, and the opponent's HC – 37 of goals; the biggest victory – +10 goals; and their opponents – +12 goals. In a row, they scored an average of 3.9 goals per game against 3.7 of their opponents.

It can be noted that the final place in the tournament table and the acquired experience of HC Motor are not a coincidence: a low level of component technical and tactical actions was observed in 60.5% of the championship matches, and they were characterised as unstable. The results of competitive activities testify to the nature of sports fighting during the championship and the integration of the style of play of the new championship into the training and competitive processes. The obtained results can be useful for coaches in planning and building strategies for training and competition processes, paying special attention to game-related statistics that will have a greater impact on future game results. Further research involves the analysis of sportsmen's performances in competitions at the level of European and Ukrainian handball championships and cups.

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Conflict of Interest

None.

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Показники змагальної діяльності гандбольного клубу «Мотор» в умовах німецької Бундесліги

Олександр Соловей

Кандидат наук з фізичного виховання і спорту, доцент
Придніпровська державна академія фізичної культури і спорту
49094, вул. Набережна Перемоги, 10, м. Дніпро, Україна
https://orcid.org/0000-0001-8480-2323

Дмитро Соловей

Кандидат наук з фізичного виховання і спорту, доцент
Придніпровська державна академія фізичної культури і спорту
49094, вул. Набережна Перемоги, 10, м. Дніпро, Україна
https://orcid.org/0000-0001-8105-2061

Сергій Овчаренко

Кандидат наук з фізичного виховання і спорту, доцент
Придніпровська державна академія фізичної культури і спорту
49094, вул. Набережна Перемоги, 10, м. Дніпро, Україна
https://orcid.org/0000-0003-4345-4021

Артем Яковенко

Кандидат наук з фізичного виховання і спорту, доцент
Придніпровська державна академія фізичної культури і спорту
49094, вул. Набережна Перемоги, 10, м. Дніпро, Україна
https://orcid.org/0000-0003-0338-8437

Ярослав Малойван

Доцент
Придніпровська державна академія фізичної культури і спорту
49094, вул. Набережна Перемоги, 10, м. Дніпро, Україна
https://orcid.org/0000-0002-6026-5057

Анотація. Показники змагальної діяльності гандбольних клубів впливають на їх підготовку до відповідальних змагань задля досягнення бажаного спортивного результату. Аналіз змагальної діяльності дає змогу удосконалити тренувальний процес та підвищити ефективність гравців у подальшому, тому метою роботи було проаналізувати й оцінити складові змагальної діяльності гандбольного клубу «Мотор», який брав участь у німецькому чемпіонаті Другої Бундесліги. За допомогою методів аналізу та порівняння досліджено гру гандбольного клубу «Мотор» та його опонентів у Другій Бундеслізі 2022/2023. Методи математичної статистики застосовувалися для підрахунку кількісних і середніх значень показників та їх ефективності. Результати дослідження свідчать: результативна (72 м'ячі) і менш результативна (47 м'ячів) ігри гандбольного клубу «Мотор» помічено з клубами, які посіли 20 та 12 місця у турнірній таблиці; результативний (35 м'ячів) і менш результативний (21 м'яч) матчі були з клубами на 20 та 2 місцях; гандбольний клуб «Мотор» поспіль закидав опонентам за матч 7 та 2 м'ячі; під час переможних матчів максимальна різниця закинутих м'ячів склала +10 м'ячів, мінімальна +1 м'яч; перевага опонентів склала +13 м'ячів. Аналіз змагальної діяльності гандбольного клубу «Мотор» засвідчує спортивну боротьбу, інтеграцію стилю гри та збереження прописки в Другій Бундеслізі. Результати гандболістів охарактеризовано як нестабільні. Низький рівень складових техніко-тактичних дій спостерігається у 60,5 % матчів чемпіонату Другої Бундесліги. Результати дослідження можна використовувати на практиці для удосконалення індивідуальної і командної гри, для порівняння зв'язку з командним рейтингом опонентів

Ключові слова: гандбол; опоненти; результативна гра; результативна команда; кидки; рухова активність

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E-mail: info@tppcs.com.ua
https://tppcs.com.ua/

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