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# CONTENT

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# GENDER COMPONENT OF SELF-ASSESSMENT OF PHYSICAL DEVELOPMENT OF SCHOOLCHILDREN AGED 11-13

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**Purpose:** to study of the peculiarities of self-assessment of physical development of schoolchildren aged 11-13 in the gender dimension.

**Material and methods:** a set of research methods was used to solve the set tasks: theoretical (analysis, comparison, generalization, systematization); psychological-diagnostic (E.V. Bochenkova's questionnaire "Self-description of physical development", S. Bem's test-questionnaire "Masculinity - femininity"); generally accepted methods of mathematical statistics with the calculation of arithmetic means.

**Results:** considers the peculiarities of the perception of their physical development of boys and girls 11-13 years, their gender identity (femininity, masculinity, androgyny) and identifies the impact of gender identity of students on the level of their overall self-esteem of physical development.

**Conclusions:** the results of self-assessment of physical development and physical fitness of students gave us the opportunity to analyze the interdependence of

the general level of self-esteem of students and their individual gender characteristics. It was found that the overall self-esteem of boys is influenced by more indicators than that of girls. Inflated self-esteem of physical development is mainly boys - representatives of masculine and androgynous psychological types.

**Keywords:** boys, girls, self-assessment of physical development, masculinity, femininity, androgyny, gender, physical education, physical culture.

## Introduction

The main goal of the educational policy to modernize the physical education of young people is to provide a new quality of education through the introduction of new content, forms and methods of teaching schoolchildren in the field of physical culture and sports.

Today, the domestic educational space requires such a scientific paradigm of theoretical searches that could balance gender discrimination and asymmetry in the pedagogical society and explore reality from the standpoint of tolerance, harmonization of gender-role interaction [21, 36]. The gender approach in the field of physical culture and sports has certain features, which makes it a separate area of gender cognition of structural and functional approaches, according to which all pedagogical and sociocultural aspects in the physical education of young people can have a gender dimension [23, 29, 31, 39]. The study of issues related to the phenomenon of sex causes difficulties not only because of their complexity and multidimensionality, but also because of the lack of certainty and ambiguity of the terms used by scientists. The existence of the concepts of "sex" and "gender" in English literature, for which there are no analogues in our language, has led to the fact that their interpretation is not generally accepted and requires the author's self-determination. At the same time, the definition of the terms "sex" and "gender" depends both on the professional affiliation of scientists and their preferences [1].

The term "gender" is used in modern domestic and Western humanitarian studies to define sex as a social phenomenon, in contrast to purely biological sex.

Therefore, sex is biological, and gender is a cultural and symbolic definition of sex [6, 7, 29, 41].

A systematic analysis of the world array of scientific knowledge and international experience in the study of gender issues indicates that today gender issues in physical education have become deeper in understanding, wider in terms of the scope of its application, in addition, new aspects of its implementation have appeared [9, 20, 31, 33, 34 ]. Certain theoretical developments in the coverage of this process in the field of physical education are noted in the study by I.V. Evstigneeva (2012), which indicates that the main criteria for gender education of primary school students in the process of physical education are: cognitive, emotional [14]. O.V. Fashchuk (2011) substantiated the peculiarities of adolescents' attitude to the lesson of physical culture, taking into account gender identification [40]. In the work of V.I. Lukashchuk (2012) noted that sport as an activity forms an androgynous personality type in women and leads to an increase in masculinity in men [28]. Gender features in the choice of sports, the manifestation of the psychophysical and motor abilities of boys and girls were studied M. Slingerland, L. Haerens, G. Cardon, L. Borghouts (2014) [29, 51, 52, 53].

Scientists note that the most representative sign of adolescence are fundamental changes in the sphere of self-awareness, which are important for the further development and formation of personality [5]. We share the unconditional opinion of scientists who consider youth not only a period of physical development, but also a unique stage of cognitive maturation, when self-esteem of boys and girls largely depends on stereotypical ideas about men and women, and differentiation of values occurs in accordance with male and female standards [5, 29, 48]. However, today, unfortunately, there are no thorough comprehensive studies of self-assessment of the physical development of schoolchildren in terms of the influence of gender identity, which determined the relevance of our study.

**Purpose of the article** is to study the features of self-assessment of the physical development of schoolchildren aged 11-13 in the gender dimension.

## Material and Methods of research

The results of the study are based on testing materials for schoolchildren aged 11-13 years (251 respondents: 105 boys and 146 girls) of the General Secondary Education Institutions of Poltava. The scientific research procedure was carried out in accordance with the ethical standards of the responsible human rights committee. To solve the tasks set, a set of methods was used:

- *theoretical* (analysis, comparison, generalization, systematization, theoretical modeling) were carried out in order to generalize the experience of scientists involved in the study of the problem of gender approach in education and upbringing, modern approaches to the development and improvement of the system of physical education;
- *psychological and diagnostic* (questionnaire of E.V. Bochenkova "Self-description of physical development", test questionnaire of S. Bem "Masculinity - femininity");
- *generally accepted methods* of mathematical statistics with the calculation of arithmetic mean values (x), standard deviation (S); the Spearman rank correlation coefficient was calculated. All calculations were made in the SPSS 17.0 program. All data were processed on a personal computer using a standard software package (Excel – 2007; Statistica – 10.0).

The scientific work was carried out in accordance with the Research Plan in the field of physical culture and sports on topic 3.1 "Improving the system of pedagogical control of the physical fitness of children, adolescents and youth in educational institutions" for 2021-2025.

## Results of the research

In our exploration, it is important to establish the features of the perception of their physical development in boys and girls aged 11-13, to determine their gender identity (femininity, masculinity, androgyny) and to consider the influence of gender identity on the level of general self-esteem of boys and girls aged 11-13.

The conducted studies of self-assessment of the physical development of boys and girls aged 11-13 show their certain disagreements, which can be associated both

with the lifestyle and the content of the process of physical education in the General Secondary Education Institutions (Table 1).

*Table 1*

**Average value of the indicators of the questionnaire "Self-description of physical development" (boys, girls aged 11-13), (% of the maximum score), (n=251)**

| Grade | | Health (48) | Coordination of movements (36) | Physical activity (36) | Body slimness (36) | Sports ability (36) | The global physical I (36) | Personal appearance (36) | Strength (36) | Flexibility (36) | Endurance (36) | Self-esteem (48) | General level of self-description (420) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th grade | b | 86,11 | 89,81 | 81,30 | 97,04 | 81,67 | 87,78 | 74,07 | 79,44 | 85,00 | 81,67 | 86,53 | 84,68 |
| | g | 74,70 | 83,93 | 89,58 | 85,71 | 84,52 | 82,14 | 71,43 | 73,81 | 83,53 | 92,66 | 83,11 | 82,09 |
| 6th grade | b | 84,96 | 83,11 | 78,50 | 83,00 | 80,89 | 78,00 | 70,78 | 77,22 | 75,00 | 80,28 | 77,67 | 79,17 |
| | g | 82,14 | 85,13 | 78,24 | 76,34 | 79,63 | 81,69 | 76,34 | 74,02 | 75,05 | 69,44 | 81,13 | 78,31 |
| 7th grade. | b | 82,29 | 82,03 | 75,98 | 79,17 | 80,23 | 80,88 | 74,35 | 76,47 | 74,02 | 81,70 | 82,35 | 79,23 |
| | g | 82,00 | 85,33 | 77,71 | 85,47 | 78,35 | 83,26 | 83,12 | 76,50 | 80,20 | 74,36 | 85,31 | 80,88 |

To compare the results of the test "Self-description of physical development" on separate scales, we chose relative indicators, for this, converting absolute scores into a percentage of the maximum score (according to E.V. Bochenkova).

Consequently, the average value for both boys and girls is from 71% to 86% of the maximum score, which generally indicates a somewhat overestimated level of schoolchildren's ideas about their own physical development and physical fitness (Table 1). According to the average score, the children of the 5th grade gave the highest marks on the following scales: "slimness of the body" (97,4% of the maximum score), "coordination of movements" (89.8%) and "global physical "I" (87,7%). For girls of the 5th grade, "endurance" received the highest score (92,6%), followed by the following indicators: "slimness of the body" (85,9%) and "sports ability" (84,5%). Comparing the self-assessment of the physical "I" of boys and girls, we find that in the 5th and 6th grades, out of eleven indicators of physical development, boys rated eight with a higher score than girls. In the 7th grade, the situation changed somewhat: on almost all scales of the questionnaire, the self-esteem

of the physical development of boys is equal to the self-esteem of girls, and on the scales "global physical "I", "strength" and "endurance" it becomes even lower.

Analyzing the indicators of self-assessment of the development of physical qualities and physical "I" of the guys, we conclude that their physical fitness has a weak level, they are not confident in their own appearance (Table 1). The worst indicators of the guys were noted on the scales: "appearance" and "flexibility", while "self-esteem" has one of the highest indicators. Girls aged 11-13, evaluating their own physical "I", gave the highest score to the following physical qualities: "slenderness" (5th grade: 97,4%, 6th grade: 76,3%, 7th grade: 85,4%), "self-esteem" (5th grade: 83,5%, 6th grade: 81,1%, 7th grade: 85,3%) and "global physical "I" (5th grade: 82,1%, 6th grade: 81,6%, 7th grade: 8,2%). At the same time, there is low physical activity in grades 6-7 and an underestimation of strength abilities. The scale "global physical I" gives a general assessment of the physical condition of the respondents, that is, it allows you to obtain aggregate data on the level of development of both your own physical qualities and health status, and appearance. On this scale, the guys have a slightly overestimated self-esteem.

Comparing the self-description of the physical development of boys and girls, we find that with a low level of physical activity and low self-esteem of physical qualities, the guys have an overestimated general self-esteem and an indicator of their own health. Girls aged 11–13 years with low physical activity, underestimation of their own physical qualities, have too high a general self-esteem and too highly appreciate the harmony of their bodies. That is, at this age, children with low self-esteem of physical qualities consider themselves quite attractive.

Having studied the indicators of the test "Self-description of physical development" of children aged 11-13, using a separate formula, we determined the general level of self-assessment of physical development and physical fitness of our respondents. The results obtained are presented in Table 2.

Thus, the general level of self-assessment of the physical development of children aged 11-13 has a high and overestimated level.

At the next stage of the study, we determine the gender personality type of the respondents. To do this, we carry out standardized testing according to the method of Sandra Bem "Masculinity - Femininity".

*Table 2*

**General level of self-assessment of the physical development of schoolchildren (boys), n= 105, (%)**

| № | General level of self-esteem | 5th grade | | 6th grade | | 7th grade | |
|---|---|---|---|---|---|---|---|
| | | boys | girls | boys | girls | boys | girls |
| 1 | Elevated | 38,10 | 32,08 | 8,00 | 16,67 | 17,65 | 23,08 |
| 2 | High | 61,90 | 43,40 | 74,00 | 59,26 | 58,82 | 58,97 |
| 3 | Medium | 0,00 | 24,07 | 18,00 | 24,07 | 23,53 | 17,95 |
| 4 | Low | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |

The terms "masculinity" and "femininity" give normative ideas about the psychological and behavioral qualities that are characteristic of men and women and are associated with the differentiation of sex roles [45]. In humans, sexual differentiation is socially determined. Children traditionally differ in the nature of their activities: they perform different gender roles. The distribution of these roles occurs in childhood, it contains not only games that are common for children of different sexes, but also other significant differences between children. [13].

*Table 3*

**Distribution of the total number of respondents according to the S. Bem test results, (n=251)**

| Androgenic psychotype | Masculine psychotype | Feminine psychotype | Androgenic psychotype | Masculine psychotype | Feminine psychotype |
|---|---|---|---|---|---|
| *Boys, 11-13 years old, n=105* | | | *Girls, 11-13 years old, n=146* | | |
| 64,92% | 20,15% | 14,93% | 49,12% | 5,85% | 45,03% |

An analysis of the data given in Table 3 allows us to state that the number of androgynous guys aged 11-13 years (64,92%) exceeds more than three times the number of masculine (20,15%) and more than four - feminine (14,93%). The number of androgynous and feminine girls with a small difference (4%) is 49,12% and 45,03%. However, only 5,85% are masculine among them.

In order to identify the relationship between the general level of self-esteem of the respondents and their belonging to the psychological gender, we conducted a

comparative analysis of the indicators of the test of self-description of physical development and the IS parameter of the respondents. Groups of respondents with the level of self-assessment by getting into the corresponding cluster were considered (4). Thanks to the study, we have established how the psychological type of personality affects the overall level of self-assessment of the physical development of boys and girls aged 11-13.

Analysis of the results shows that the children have an overestimated self-esteem of physical development, mainly representatives of the masculine psychological type. It should be noted that among the masculine children there were no respondents with low self-esteem of physical development. That is, the presence of masculine character traits in a person can contribute to an overestimated self-esteem of physical development and one's own abilities. In girls, an increased level of self-esteem of physical development is mainly for representatives of the androgynous psychotype, high and medium levels are for representatives of the feminine and masculine psychological types. Guys assigned to the feminine gender type underestimate their abilities (average self-esteem in 24% of boys and 30% of girls). Low self-esteem was found only in representatives of the feminine and androgynous psychological types (Table 4)

*Table 4*

**General level of self-assessment of the physical development of boys of different psychological types, (n=251), %**

| General level of self-esteem | Androgynous psychological type | | Masculine psychological type | | Feminine psychological type | |
|---|---|---|---|---|---|---|
| | girls | boys | girls | boys | girls | boys |
| Elevated | 28 | 18 | 4 | 32 | 12 | 22 |
| High | 48 | 62 | 64 | 53 | 55 | 54 |
| Medium | 22 | 18 | 32 | 15 | 30 | 24 |
| Low | 2 | 2 | 0 | 0,00 | 3 | 0,00 |
| Total | 100 | 100 | 100 | 100 | 100 | 100 |

Thus, the results of the scientific experiment suggest that the respondents' belo nging to a certain type of gender identity has an impact on the level of general self-assessment of physical development.

## Conclusions / Discussion

Scientists argue that self-assessment of physical development and health status is a subjective indicator, but is based on objective indicators of physical fitness and morbidity [4, 5, 29, 44]. The formation of the level of need for achievements depends on the self-esteem of the individual. Only in the presence of reflection as an internal state of self-understanding and self-understanding can a person's self-esteem, self-confidence and self-respect can be brought up and strengthened [29]. Psychologists rightly point out that in the formation of self-control of educational activity, a significant incentive and regulatory role is played by the self-esteem of schoolchildren, which can manifest itself at different levels: overestimated, high, low, underestimated. The best option is an adequate level of self-assessment of physical development, physical condition and physical health [27, 29, 34]. The scientist E. Erickson notes that the physical qualities of a teenager, which form the basis of the physical "I", are an important factor in creating his identity and "I-concept" as a whole [42]. M. O. Mdivani (1991) foresaw that the “I-physical” has its own structure and content [28], however, due to the formation of sex-role stereotypes in boys and girls, the “I-physical” may partially change.

Based on the fact that a number of interrelated factors influence the formation of motivation for physical activity of schoolchildren, scientists argue that needs arise first, and then a goal is formulated. In order for the goal to become an effective and driving force, external and internal factors must play their role, which will form the motivation for a person’s own program of behavior, who consciously chooses one or another type of physical activity in accordance with preferences, interests and desires and actively directs his activity towards the goal. [32, p. 60]. Self-assessment of physical development in this case can be one of the internal factors influencing the formation of motivation for physical activity. This indicates the ambiguity and complexity of the process of interconnection between the internal sphere of the personality and external factors and circumstances that are stimuli for action, deed or activity, forming the proper motivation of schoolchildren for physical education and sports [29] .

According to the results of the obtained data on the self-assessment of the physical development of schoolchildren, we found that the self-assessment of physical development is directly connected by the boys with their strength and physical activity, the girls with the appearance and coordination of movements. The results of self-assessment of physical development and physical fitness of schoolchildren gave us the opportunity to analyze the interdependence of the general level of self-esteem of schoolchildren and their individual gender characteristics, which we determined using the S. Bem questionnaire "Masculinity - Femininity". It was found that more indicators affect the overall self-esteem of boys than girls. The overestimated self-assessment of physical development is predominantly the boys - representatives of the masculine and androgynous psychotypes. That is, the presence of male character traits in a person contributes to increased self-esteem of physical development and one's own abilities. In girls, an increased level of self-esteem of physical development is mainly found in representatives of the androgynous psychotype. Low self-esteem was found only in representatives of the feminine and androgynous psychological types. In girls, representatives of the androgynous psychotype have increased self-esteem. Boys and girls assigned to the feminine psychotype demonstrate average self-esteem or underestimate their own abilities.

Summing up the above, we emphasize that the gender of a person is a complex mental formation and, transforming educational tasks, has an impact on personal orientations, interests, preferences and self-esteem of the physical development of schoolchildren, which is formed under the influence of various factors. And no matter what judgments underlie self-esteem, one's own or other people's, it is always subjective.

So, the gender component is one of the components of a personality-oriented approach to the physical education of schoolchildren, takes into account their individual characteristics in accordance with gender and their gender identity, allows, on this basis, the choice of content, forms and methods of education and upbringing, creating a developing educational environment in accordance with with the natural potential of boys and girls. The use of gender characteristics of boys and girls in the

theory and methodology of physical education provides us with ample opportunities for constructive interaction between the content of gender studies and existing teaching methods and concepts in the field of physical education.

The conducted research does not exhaust the problem of studying the gender approach in the physical education of schoolchildren, but asks a number of questions affecting the means and methods in physical education for the formation of an individual's individual physical culture.

**Prospects for further research.** Our subsequent studies will be devoted to determining the adequacy of the self-assessment of the physical development of schoolchildren of different age groups, namely, to comparing the results of the "Self-description of physical development" test with the results of control standards for physical education.

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# FACTOR STRUCTURE OF PREPAREDNESS OF YOUNG ATHLETES IN AEROBIC GYMNASTICS

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**Purpose:** to conduct a multifactor analysis of the training of young athletes in aerobic gymnastics, to identify the leading factors and justify the planning of the training process of athletes in this sport.

**Material and methods:** the study involved 20 athletes aged 7-9 years. Research methods: analysis and generalization of data of scientific and methodical literature, pedagogical observation, pedagogical testing, pedagogical experiment and methods of mathematical statistics.

**Research methods:** analysis and generalization of data of scientific and methodical literature, pedagogical observation, pedagogical testing, pedagogical experiment and methods of mathematical statistics.

**Results:** the current state of the training process of young athletes in aerobic gymnastics has been studied and the specifics of this sport have been studied. The factor structure of training of young athletes of aerobic gymnastics is determined and 6 main factors are established. It has been experimentally proved and mathematically

confirmed that the first and most important factor included indicators of speed and strength training and topping test in combination with anthropometric data. The obtained data coincide with the data of correlation analysis and indicate that in modern aerobic gymnastics the accuracy of movements should be combined with speed and strength training and anthropometric data.

**Conclusions:** the results of factor analysis showed that when teaching the basic technical elements in aerobic gymnastics should focus not only on the spatio-temporal parameters of performance, but also on the speed-power aspect of their performance.

**Keywords:** aerobic gymnastics, factor analysis, young athletes 7-9 years old.

## Introduction

Modern aerobic gymnastics requires the development of methods that will optimize the training process [3, 6, 14]. This is quite a difficult task, because the volume and intensity of training loads can not increase indefinitely [4, 5, 13]. This problem is further complicated by the fact that aerobic gymnastics is a complex coordination and athletic sport, which requires the development of all physical qualities [2, 3, 11], as well as possession of a wide arsenal of techniques and elements of complexity [1, 3, 11]. Therefore, for the harmonious construction of the educational and training process in aerobic gymnastics, the first priority is the need to determine the main directions of its construction.

According to leading experts in gymnastics [8, 9, 12], for a competent construction of the training process in aerobic gymnastics should use a wide range of indicators of preparedness, modern methods of analysis of the data [2, 11, 15]. Based on the synthesis of a wide arsenal of indicators of readiness to create training methods that best meet the requirements of the training process in a particular period of time, becomes quite relevant. Of the modern mathematical tools, the most suitable for this is factor analysis [10] of a wide range of indicators of preparedness.

*Connection of research with scientific programs, plans, topics, programs.* The study was conducted in accordance with the initiative theme of the Department of Gymnastics, Dance and Choreography Kharkiv state Academy of Physical Culture, «Theoretical and methodological foundations of system-forming components of physical culture (sports, fitness and recreation)» for 2020-2025, state registration number 0120U101215.

**Purpose of the** work is to conduct a multifactor analysis of the training of young athletes in aerobic gymnastics, to identify the leading factors and justify the planning of the training process of athletes in this sport.

**Objectives:**

1. To study the current state of the training process of young athletes in aerobic gymnastics.

2. To determine the factor structure of training of young athletes in aerobic gymnastics.

**Material and Methods of research**

The study was conducted on the basis of the municipal institution of children's youth sports school № 13 in Kharkiv. The experiment was attended by 20 athletes (7-8 years), the initial training group of the second year of study.

To solve this goal, research methods were used: analysis of scientific and methodological literature and documentary materials; questionnaire; pedagogical observation (in particular through video recording, analysis and evaluation of results to understand the characteristics of competitive activities and individual sportsmanship and training loads of athletes in aerobic gymnastics); pedagogical testing (to adjust tactics and training strategies); pedagogical experiment; expert evaluation (to identify and predict the degree of effectiveness of the results of the study); pedagogical testing and medical and biological examinations to determine the level of physical fitness; methods of mathematical statistics (correlation and factor analysis), using licensed packages of statistical computer programs «SPSS» and «XLSTT» (add-on to Excel) – to summarize the results and form objective conclusions.

The material for the analysis of the research results was the indicators of the extended complex testing of young athletes of aerobic gymnastics. The choice of tests to obtain information on the level of assessment of special physical and technical fitness was based on the analysis of the dominant motor mode of competitive exercises and the specifics of aerobic gymnastics, age characteristics of athletes and modern competition rules, as well as previous research in complex coordination sports (sports and rhythmic gymnastics, sports acrobatics, figure skating, cheerleading, etc.) [8, 9, 13]. Given this, to assess the level of special physical fitness of young athletes developed and used a set of control exercises, which are justified by the authors and meet the requirements of the theory of standardization of tests and sports metrology [4, 5, 7]. In addition, as an indicator of the level of development of the body of athletes, physical development was determined: 1) age (years); 2) height (cm); 3) weight (kg); 4) heart rate (beats, min); 5) VCL (ml). The results were processed using the methods of mathematical statistics [10].

**Results of the research**

Based on the results of extended comprehensive testing of young athletes, standardization of set values of variables was carried out. Pearson's correlation coefficients between the considered variables were calculated and the so-called relative variances of simple components (factors) or eigenvalues of factors, the number of which coincides with the number of indicators, were determined on the basis of the correlation matrix. The eigenvalues of the components (factors) were sorted in descending order (Fig. 1). Orthogonal rotation by the varimax method was performed to obtain unambiguous solutions.

As you can see from this chart, the number of main factors is six. At the next stage of the study was determined by the characteristics of the main factors whose contribution to the total variance is 100% of the total variance (Table 1).

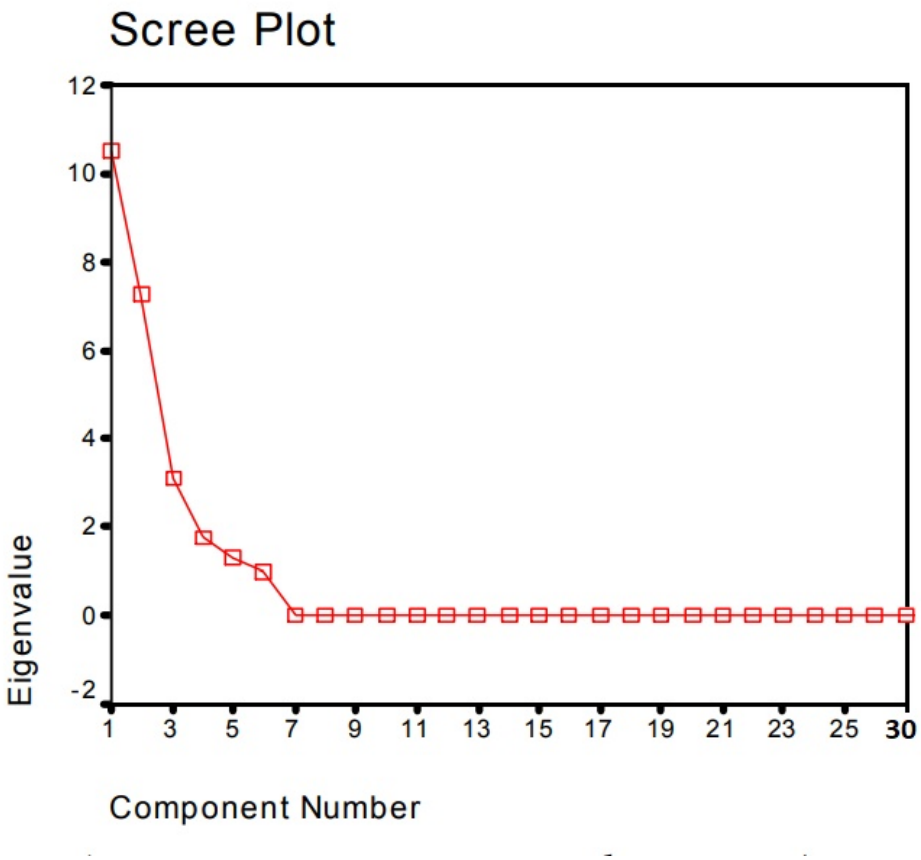


**Fig.1** Diagram of eigenvalues of factors

Table 1 highlights the factor loads, based on which the semantic value of the factors is identified (Fig. 2).

The first factor (28,7%) conditionally named the factor of «speed and strength» included the following test indicators: height, weight, speed jump, jump, PWC170, shuttle speed and the complexity of aerobic gymnastics «group jump». It is easy to see that the growth, weight and absolute value of PWC170 are interdependent naturally: it is natural that with increasing growth, weight and PWC170 increase. In addition, it should be noted that the first, main factor is the indicators of speed and strength training in combination with coordination accuracy.

The second factor (26,9%) conditionally called by us the factor of «coordination abilities» included indicators of technical elements – «connection of aerobic tracks», «2 overturns, jump with a 360° rotation», «flamingo» test and indicator musicality. The obtained data indicate that after the speed and strength training of gymnasts in connection with anthropometric data and accuracy of

movements, the most important is the coordination and ability of the body to adapt quickly, as evidenced by the negative correlation coefficient in the topping test and positive correlation coefficient in heart rate.

*Table 1*

**Factor structure of complex testing of young athletes of aerobic gymnastics (n = 20; p <0,05)**

| № i/o | TESTS | FACTORS | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | Body length (cm) | **0,52** | | | | | |
| 2 | Body weight (kg) | **0,57** | | | | | |
| 3 | Shuttle run 3x10 (s) | **0,67** | | | | | |
| 4 | Jumping uphill from a deep squat in 20 s (number of times) | **0,71** | | | | | |
| 5 | Jump uphill with a wave of the hands (cm) | **0,55** | | | | | |
| 6 | Alternate swings of the legs forward (not less than 90°) in 20s (number of times) | **0,63** | | | | | |
| 7 | Raising and lowering straight arms from the starting position of the leg apart, hands down for 20s (number of times) | **0,77** | | | | | |
| 8 | Jump «grouping» (points) | **0,65** | | | | | |
| 9 | Flamingo (s) | | **0,48** | | | | |
| 10 | Turns on the inverted gymnastic bench (number, s) | | **0,53** | | | | |
| 11 | 2 forward jumps, 360° turn jump (points) | | **0,63** | | | | |
| 12 | Aerobic track connections (points) | | **0,78** | | | | |
| 13 | Top-clap musicality test (points) | | **0,62** | | | | |
| 14 | 360° rotation in vertical twine (points) | | **0,59** | | | | |
| 15 | Topping test (s) | **0,48** | **0,51** | | | | |
| **16** | Age (years) | | | **0,56** | | | |
| **17** | Heart rate (beats/min) | | | **0,51** | | | |
| **18** | Flexion and extension of the arms in the supine position (number of times) | | | **0,74** | | | |
| **19** | Lifting the torso to the seat from a sitting position (number of times) | | | **0,82** | | | |
| **20** | Holding the «chair» position near the wall (s) | | | **0,68** | | | |
| **21** | Emphasis on the angle of the leg apart (s) | | | **0,66** | | | |
| **22** | Bridge (points) | | | | **0,55** | | |
| **23** | Unscrew with gymnastic stick (points) | | | | **0,49** | | |
| **24** | Tilt the torso forward from a sitting position on the floor (cm) | | | | **0,75** | | |
| **25** | Twine right, left, lumbar | | | | **0,68** | | |
| **26** | Pike (Bali) | | | | **0,66** | | |
| **27** | Running on the spot for 5s (number of times) | | | | | **0,61** | |
| **28** | Dietrich falling stick grip (cm) | | | | | **0,73** | |
| **29** | VCL (ml) | | | | | | **0,58** |
| **30** | PWC170 | | | | | | **0,47** |
| **Contribution to variance%** | | **28,7** | **26,9** | **20,8** | **14,6** | **5,2** | **3,8** |
| **Cumulative contribution to variance%** | | **28,7** | **55,6** | **76,4** | **91,0** | **96,2** | **100** |

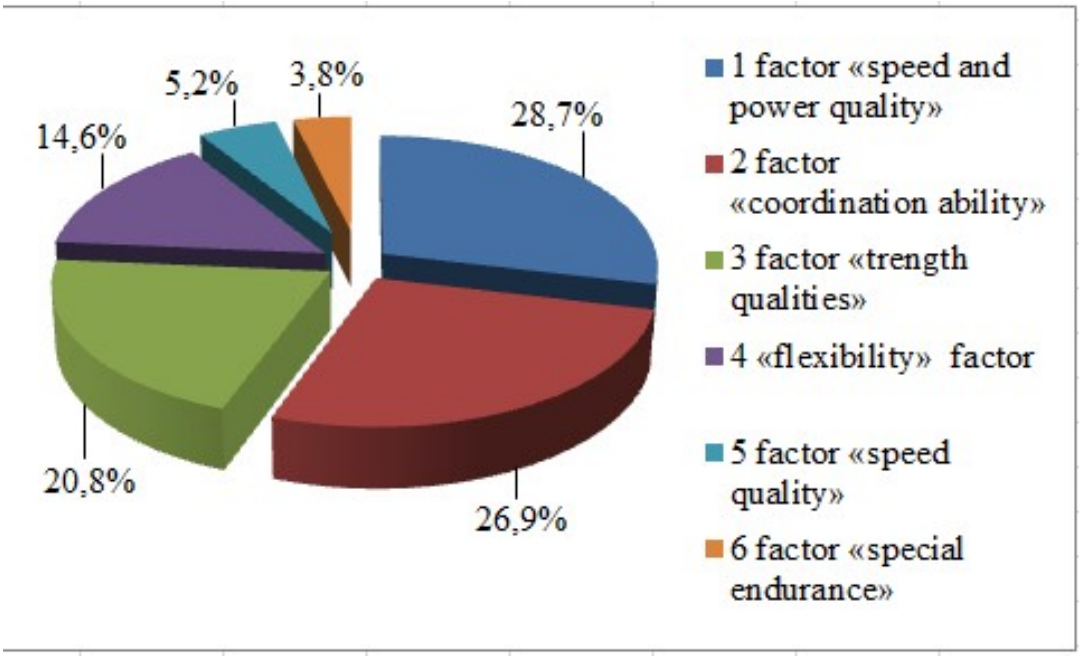


**Fig. 2** Percentage value from the total variance of the main factors of complex testing of young aerobic gymnastics athletes

The third factor (20,8%) was interpreted as a factor of «strength qualities» which included such indicators as flexion and extension of the arms in the supine position, lifting the torso in the buttocks from a sitting position, «emphasis at the angle of the leg apart», which indicates enough a significant contribution to the strength training of athletes in this sport

The fourth factor (14,6%) determining «flexibility» included indicators - twine, slope, city and the element of complexity «cake», which indicates the relationship of flexibility indicators with the technical component.

The fifth factor (5,2%), which we named as the factor of «speed qualities», included indicators of speed technique and heart rate, which indicates the relationship of technique with the ability to relax, and the sixth factor (3.8%) – «special endurance», included $PWC_{170}$ and VC. However, the fact that the first and most important factor includes indicators of speed and strength training and accuracy of movement in combination with anthropometric data.

The obtained data coincide with the data of correlation analysis and indicate that in modern aerobic gymnastics the accuracy of movements should be combined with speed and strength training and anthropometric data.

## Conclusions / Discussion

The results of the study confirm the existing opinion that the problem of improving the training process is still relevant [4, 5]. The authors of the works argued the planning of the training process for young athletes. In our study, the specifics of the training process in aerobic gymnastics at the stage of initial training were studied for the first time. Effective means, methods and methodical methods of training process are revealed and practically substantiated.

The results of the factor analysis showed that the applied indicators of the extended complex testing of young athletes of aerobic gymnastics are divided into six main factors. The first and most important factor included indicators of speed and strength training and topping test in combination with anthropometric data. The obtained data coincide with the data of correlation analysis and indicate that in modern aerobic gymnastics the accuracy of movements should be combined with speed and strength training and anthropometric data.

When teaching the basic technical elements in aerobic gymnastics, emphasis should be placed not only on the spatio-temporal parameters of performance, but also on the speed-power aspect of their performance. This requires the development of appropriate teaching methods.

**In the perspective of further research** it is planned to develop individual training programs for aerobic gymnastics athletes based on factor models of their training.

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# EXPERT ASSESSMENT OF THE NEED TO IMPROVE THE MANAGEMENT OF PHYSICAL CULTURE AND SPORTS AT THE LOCAL LEVEL

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**Purpose**: to determine an expert assessment of the need to improve the management of physical culture and sports at the local level, namely in the regions and territorial communities.

**Material and methods:** expert survey by questioning in digital and correspondence format. To create an expert group, scientific and pedagogical workers were interviewed. 38 correctly completed questionnaires were received, which were filled in by 38 scientists (doctors of sciences, professors) from specialized institutions of higher education and faculties of physical education.

**Results:** an expert assessment was given by the statement included in the questionnaire, aimed at establishing the attitude of leading scientists to improving the management of physical culture and sports at the local level. On all claims, the experts expressed support for improving the management and use of research results. In this case, it is recommended to use the achievements of sports science as an important trigger for increasing the level of management of sports development.

**Conclusions:** 97,4% (of which 81,6% completely agree and 15,4% rather agree) of the experts expressed that the level of management significantly determines the state of sports development and the quality of physical culture and sports services at the local level. 89,5% (50% and 39,5%) of experts agree with the statement that the level of management of sports development at the local level is insufficient. 95,7%

(65,8% and 28,9%) of the respondents agree that there are significant reserves for improving the management of sports development at the local level. 100% of respondents (84,2% and 15,8%) support the opinion that sports science should be involved in improving the management of sports development at the regional and community level. 100% (81,5% and 18,4%) believe that the introduction of high-quality scientific developments into practice will improve the management of sports in the regions. As you can see, the opinion that the management of sports development at the local level requires significant changes and qualitative improvement was fully confirmed by experts.

**Keywords:** expert assessment, management, development of physical culture and sports at the local level, the use of research results.

## Introduction

In recent years, the attention of scientists has already turned to the management of physical culture and sports at the local level. Thus, N. F. Vlasova studied the regional specifics of the social management of physical culture and sports on the example of the Zaporozhye region[5]. V. A. Bazenko considered the mechanism for supporting the development of physical culture and sports in the conditions of decentralization [1]. V. V. Prikhodko focused on the development of sports in the conditions of united territorial communities [6]. T. Dorofieieva considered the problem of service quality as a criterion for the activity of physical culture and sports organizations [10], as well as the relationship between the quality of physical culture and sports services and the state of the organization providing services [11]. In addition, S. M. Bondarenko and A. A. Kasich drew attention to the concept of total quality management (TQM) in local governments [3].

The problem of managing physical culture and sports at the local level was studied by specialists abroad. Referring to I. Alaj, F. Arifi & Z. Metaj, who studied the structural characteristics of sports organizations in the Republic of Kosovo [7]. A. Carmeli drew attention to the features of the behavioral integration of the senior

management team and the effectiveness of organizations serving individuals involved in physical culture and sports [8]. E. Chojnacka considered public-private partnerships as a source of financing for sports and recreation infrastructure in Poland [9]. M. Gobikas &V. Čingienė studied the public-private partnership for the development of youth sports from the point of view of local government [12]. The features of the maintenance by changes of objects built under the program "My Boysko ORLIK 2012" are revealed [13].

Meanwhile, there is a need for an objective assessment of the state of physical culture and sports management at the local level in Ukraine, which can draw attention to this area of activity in this area in order to improve its condition. Starting our research, it was assumed that the management of sports development at the local level requires significant changes and qualitative improvement.

**Purpose of the study** is to determine an expert assessment of the need to improve the management of physical culture and sports at the local level, namely in the regions and at the same time in the formed territorial communities.

## Material and Methods of research

An expert survey was applied using a questionnaire in digital and correspondence format. To create an expert group, scientific and pedagogical workers of higher education institutions were interviewed. 38 correctly completed questionnaires were received, which were filled in by 38 scientists (doctors of science, professors) from specialized institutions of higher education and faculties of physical education.

Specialized program SPSS for Windows 22.0 for processing information collected during the survey [4], methods of mathematical statistics, extrapolation, modeling, search and normative forecasting were used. Quantitative methods are applied after empirical data are translated into the language of numbers. The prerequisite and the beginning of the introduction of quantitative methods in sociological research is measurement. Usually, measurement is understood as “a cognitive process in which the ratio of one (measured) quantity to another

homogeneous quantity, taken as a certain unit of measurement" is determined. [4, P. 8].

**Results of the research**

Regarding the first statement, that the level of management essentially determines the state of development of sports and the quality of physical culture and sports services, we have the following results. According to the data obtained, shown in Fig. 1, a significant majority, namely 81,6% of experts, agree with the above statement. 15,8% of respondents noted that they "rather agree with it", and 2,6% of the surveyed experts noted that they "rather disagree" with this statement. None of the experts chose the options "Disagree" or "Difficult to answer".

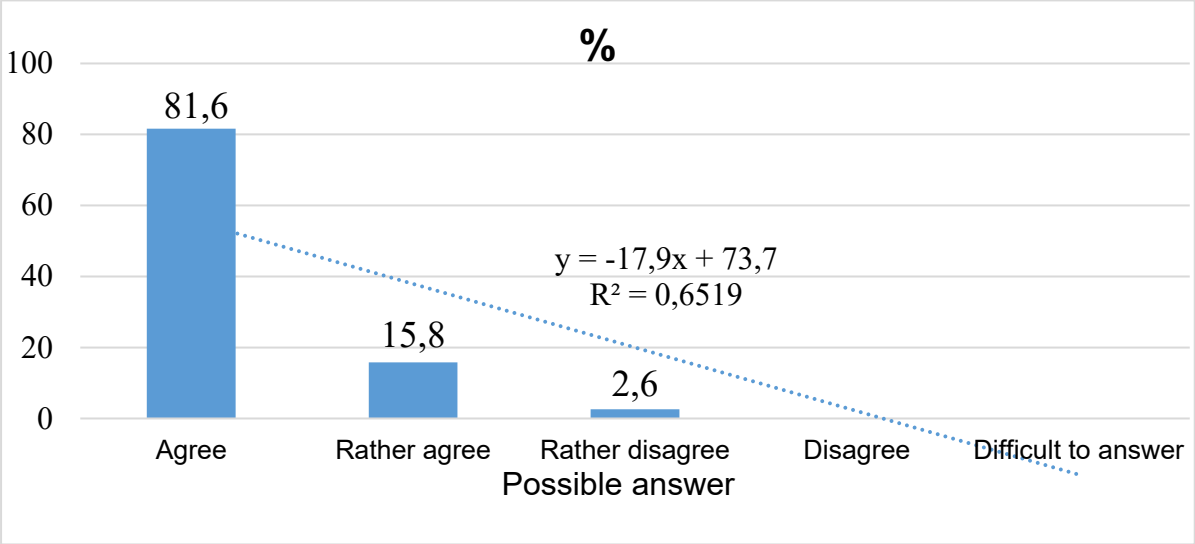


**Fig. 1** Distribution of answers to the statement that the state of development of sports and the quality of physical culture and sports services determine the level of management

Figure 1 shows a linear type trend line, where $R^2$ is the reliability of the actual data, y is the sequence of values, x is the number of the period. From this formula and computer calculation, it can be seen that the possibility of the "Disagree" option was, theoretically, quite low, which is confirmed by the data in Figure 1.

Based on the data obtained, we can say that the vast majority of experts agree that the level of management determines the state of development of the sports sector and the quality of sports services. From this it follows that the level of management

should be given considerable attention, since it is a driving force and an important factor for improving the state of development of sports and the quality of physical culture and sports services.

As for the statement about the existing weak and insufficient level of sports development management at the local level, we can say the following (Fig. 2). 50% of respondents agree with this statement, 39,5% of respondents "rather agree" with the above statement, and 10,5% of experts indicated that they "rather disagree" with this statement. This figure also shows a trend line of a logarithmic type, where $R^2$ is the reliability of the actual data, the value of y is a sequence of values, ln(x) is the number of the period. From this formula and the results of the computer calculation, we can say that there was a certain possibility for the respondents to choose the option “Disagree”, as evidenced by the data presented.

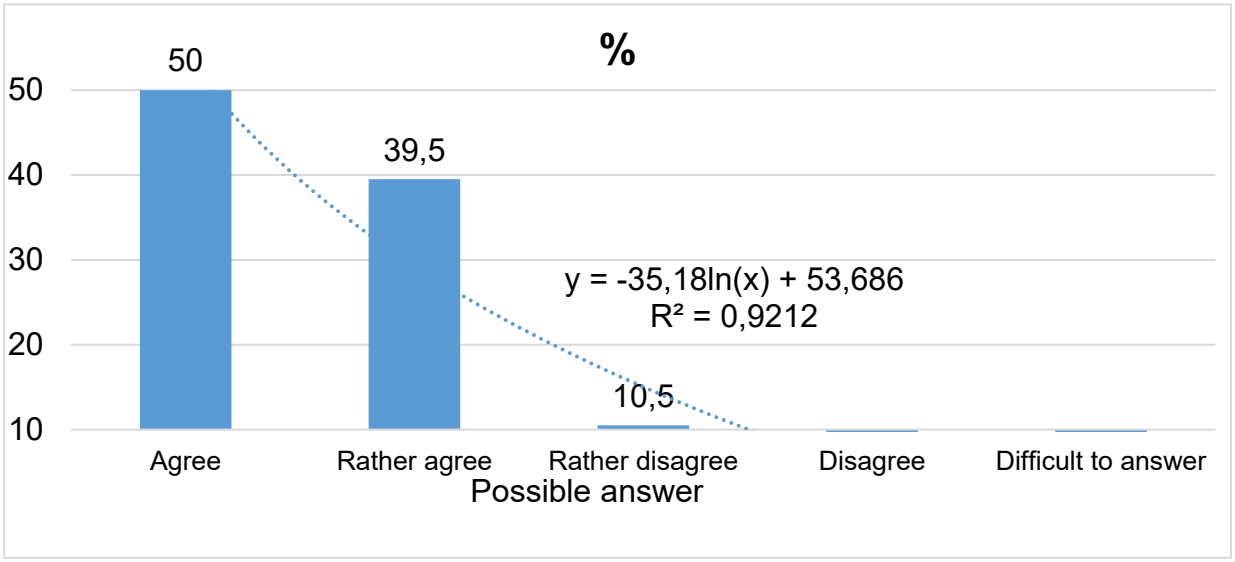


**Fig. 2** Distribution of experts' answers to the statement about the weak and insufficient existing level of sports development management at the local level

After analyzing the data obtained, we can conclude that the vast majority of the surveyed experts agree with the statement about the weak and insufficient existing level of sports management. Therefore, it is necessary to study the management practices at the local level in more detail, analyze them in accordance with the standards of the management system, make appropriate adjustments if necessary, and

introduce the necessary changes at the local level to improve the development of the sports sector.

According to the data presented in Figure 3, namely the assessment of the statement about the existence of significant opportunities and reserves for improving the management of sports development at the local level, we have the following data: 65,8% agree with this statement, 28,9% of respondents noted that they "rather agree" with this statement, and 2,6% of respondents indicated that they "rather disagree" with the above statement. The option "I disagree" was not chosen by the experts, and as for the option "Difficult to answer", it was chosen by 2,6% of the experts. On Figure 3 shows a trend line of polynomial type, where $R^2$ is the reliability of the actual data, the value of y is the sequence of values, ln(x) is the number of the period. From this formula and the results of the calculation, we can say that the possibility of choosing the option "Disagree" by the respondents had a high level.

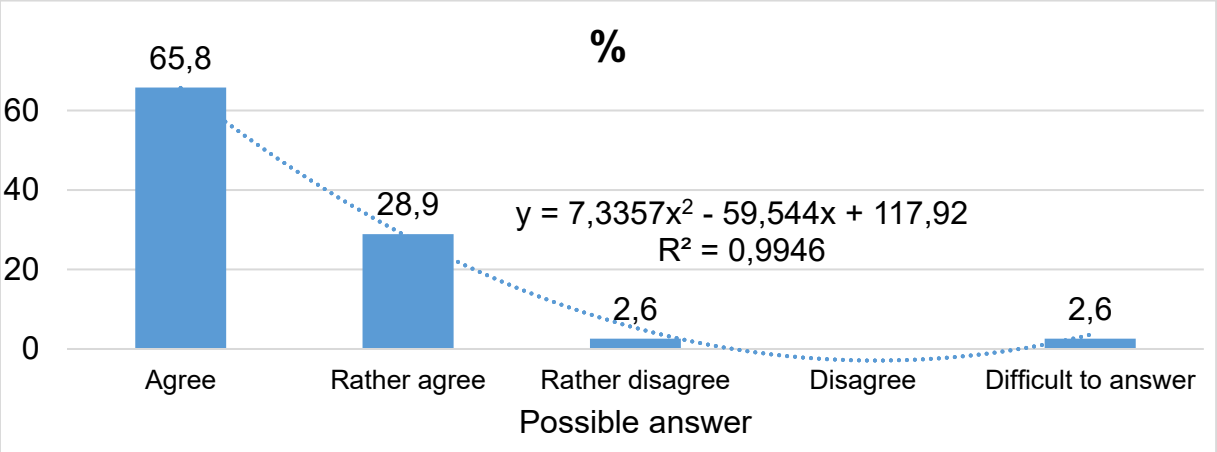


**Fig. 3** Distribution of experts' answers to the statement about the possibilities and reserves for a significant improvement in the management of sports development at the local level

Based on the data obtained, it can be said that the majority of respondents support the assertion that there are significant opportunities and reserves for improving the management of sports development at the local level. From this we can conclude: in order to improve the level of sports development management at the local level, it is important to use existing tools and opportunities, if available, since

their use, according to experts, will directly affect the improvement of the quality of the level of sports development.

The next question of the research is the statement about the need to attract the assets of sports science to improve the management of sports development at the regional level. Paying attention to the data shown in Figure 4, we can say that the vast majority of respondents, namely 84,2%, agree with this statement, 15,8% of experts "rather agree" with this opinion. As you can see, all respondents agree with the above statement. Thus, the options “Rather disagree”, “Disagree” and “Difficult to answer” were not selected. According to the linear trend line, where $R^2$ is the reliability of the actual data, the value of y is the sequence of values, ln(x) is the number of the period, we can say that the possibility of choosing the “Disagree” option by the respondents was low.

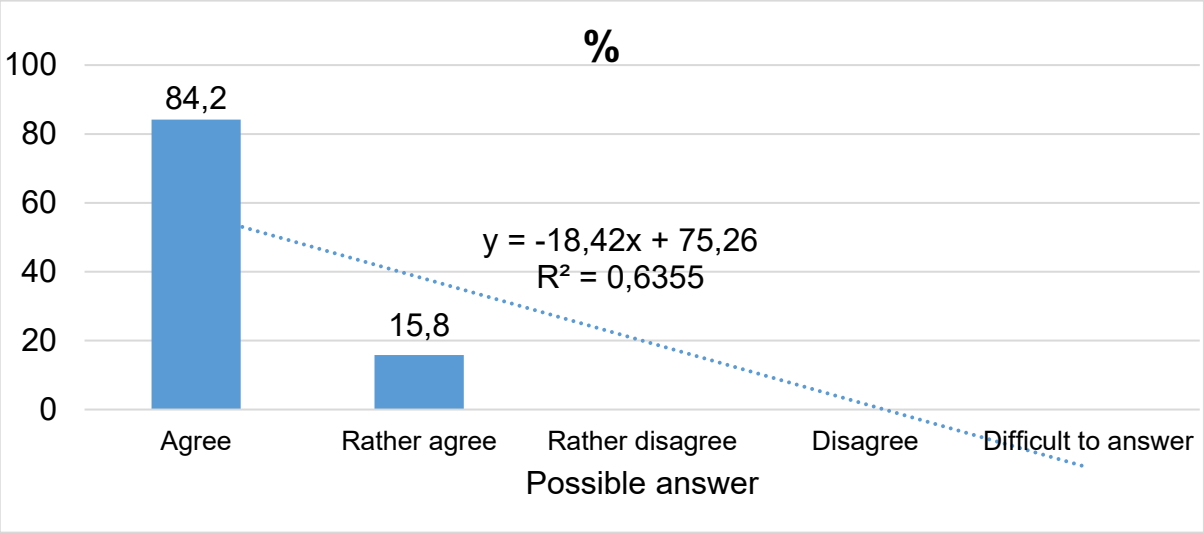


**Fig. 4** Expert opinion on the statement about the need to involve science in improving the management of sports development at the regional level

After analyzing and processing the data obtained, we can say that the respondents support the need to involve sports science in improving the management of sports development at the regional level. In this case, it is recommended to further apply the achievements of sports science as an important trigger for increasing the level of sports development management.

The next and last statement about the need to improve the management of sports development was regarding the statement about improving the management of sports in the regions through the introduction of high-quality scientific developments into practice. Summarizing the data shown in Figure 5, we can say the following: the vast majority, namely 81,5%, agree with the above statement, and another 18,4% of experts "rather agree" with it. As we can see, there is an existing trend of results: according to Figure. The 5 options “Rather disagree”, “Disagree” and “Difficult to answer” were not chosen by any of the respondents.

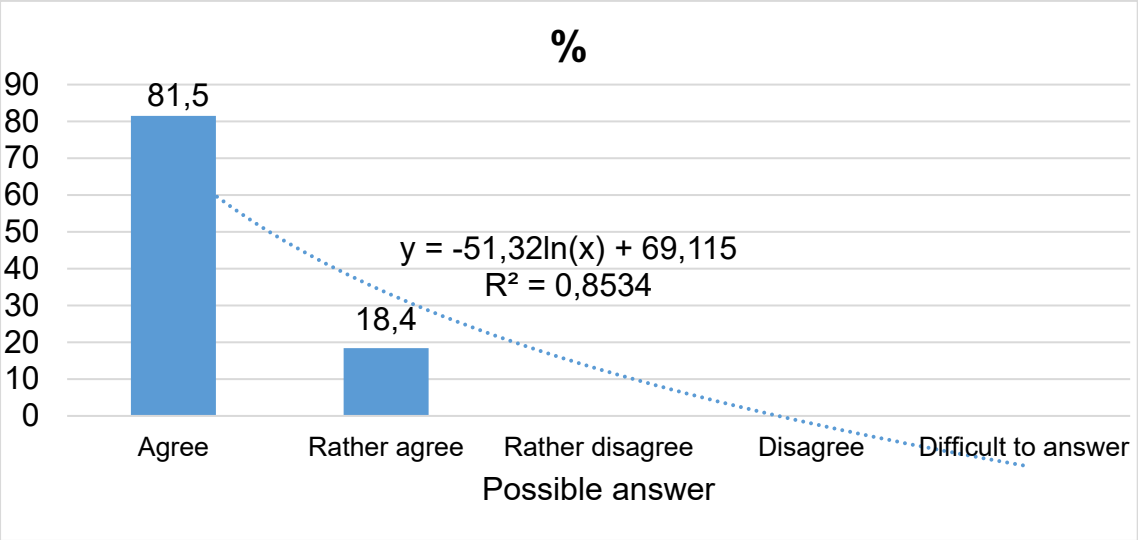


**Fig. 5** Distribution of experts' answers to the statement about improving sports management in the regions through the introduction of high-quality scientific developments into practice

Figure 5 shows a logarithmic trend line, where $R^2$ is the reliability of the actual data, the value of y is the sequence of values, ln(x) is the number of the period. From the formula and the results of the calculation presented in the figure, we note that the ability of the respondents to choose the option “Disagree” had an average level.

**Conclusions / Discussion**

According to the data obtained, we can conclude that the interviewed scientific and pedagogical workers agree and support the improvement of sports management in the regions through the introduction of high-quality scientific developments into

practice. From this it follows that the need to substantiate, create and implement high-quality scientific developments is an extremely important task for sports and a significant improvement in the level of sports management in the regions of Ukraine.

The conducted expert study showed that according to the statements about the need to improve the management of sports development, 97,4% (81,6% strongly agree and 15,4% of those who agree more quickly) of respondents support the opinion that the level of management significantly determines the state of sports development and the quality of physical education and sports services at the local level, including communities.

89,5% (50% and 39,5%) of experts agree with the statement that the current level of sports development management at the local level is insufficient. 95,7% (65,8% and 28,9%) of the respondents agree that there are significant opportunities and reserves to improve the management of sports development at the local level. 100% of respondents (84,2% and 15,8%) support the opinion that sports science should be involved in improving the management of sports development at the level of regions and communities.

All 100% of specialists (81,5% and 18,4%) believe that the introduction of high-quality scientific developments into practice will improve sports management in the regions. As we can see, the prediction that the management of sports development at the local level requires significant changes and qualitative improvement, which was confirmed by experts.

**Prospects for further research** are related to the search, testing and adaptation of modern management tools to increase the capacity and quality of physical culture and sports management at the local level.

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# DETERMINATION OF THE CORRELATION DEPENDENCE OF MASTERING THE BASIC ELEMENTS OF RHYTHMIC GYMNASTICS ON THE USE OF THE CLASSICAL EXERCISE BY GIRLS 5-6 YEARS OLD

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**Purpose:** to establish the correlation between the basic elements of rhythmic gymnastics and special exercises of classical exercise.

**Material and methods:** the research was carried out on the basis of the Complex Children's Sports School No.1, Kyivskyi District (Kharkov) among girls 5-6 years old, going in for rhythmic gymnastics. The experiment involved 60 young athletes. 3 choreographers and 4 rhythmic gymnastics trainers were involved to establish the correlation dependence. Due to the fact that the research was carried out in groups of initial training of the second year of study, a 10-point assessment scale was applied. At the beginning of the study, the influence of classical exercise on the assimilation of the basic elements of rhythmic gymnastics was determined. In the end, a correlation was established between the elements of rhythmic gymnastics and special exercises of the classical exercise.

**Results:** in the process of using special exercises of classical exercise, the level of fulfillment of the basic elements of rhythmic gymnastics increased, such as: jump "Cossack" ($t = 2,12$; $p < 0,05$), balance "forward" ($t = 3,57$; $p < 0,001$), balance

"attitude" (t = 2,68; p < 0,01), turn "passé" (t = 2,21; p <0,05), "wheel" (t = 1,72; p> 0,05).

**Conclusions:** as a result of the research, the correlation relationship of the basic elements of rhythmic gymnastics with special exercises of classical exercise was determined.

**Keywords:** rhythmic gymnastics, basic elements, classic exercise, correlation.

## Introduction

Modern types and trends of choreography are becoming extremely popular among children and youth [5]. The motor and physical development of 5-6 years old girls engaged in rhythmic gymnastics are especially relevant. Therefore, there is a need to form the basis of the culture of movements in the training process of young athletes.

The formation of the basics of movement culture of 3-6 years old children due to their propensity for their susceptibility to different structures of motor activity from its qualitative and quantitative characteristics, is naturally considered the establishment of the structure of somatotype features of the contingent and the establishment of all its "marginal" groups. In this case, the culture of movement will be determined by the technique of mastered movements available for this age [11].

These days in the world of rhythmic gymnastics, there have been changes in the rules of judging for the next Olympic cycle (2022-2024). According to the basic requirements in individual exercises, a gymnast must perform only the elements that she can perform safely and with a high degree of aesthetic and technical training. Very poorly executed elements will not assessed by the Judges Difficulty (D) and will be penalized by a penalty by the Judges Execution (E) [10].

Thus, for better mastering of the basic elements of rhythmic gymnastics, you need to pay special attention to learning special exercises of classical exercise for 5-6 years girls.

According to I. O. Yeltsova, the exercise of classical dance is an ideal and universal system of exercises and combinations, created in the process of long choreographic experience, the elements of which, after natural selection, became part of the exercise, as, indeed, necessary exercises that develop and train. The muscles of the legs, torso, arms and head are comprehensively developed in the exercise, the coordination of movements is improved.

In this regard, the search for the most effective means of choreography for the training of young athletes in rhythmic gymnastics is being especially relevant.

**Aim of the research:** to establish the correlation between the basic elements of rhythmic gymnastics and the special exercises of classical exercise.

**Material and Methods of research**

The following research methods have been used in the work: theoretical analysis and generalization of scientific and methodological literature, pedagogical observation, pedagogical experiment and methods of mathematical statistics.

The research has been carried out on the basis of the Complex Children's Sports School No.1, Kyivskyi District (Kharkiv) among 5-6 years old girls, who are going in for rhythmic gymnastics. The experiment involved 60 young athletes whose parents consented to their participation. 3 choreographers and 4 rhythmic gymnastics trainers have been involved to establish the correlation dependence. Due to the fact that the research was carried out in groups of initial training of the second year of study, a 10-point assessment scale was applied. At the beginning of the study, the influence of classical exercise on the assimilation of basic elements of rhythmic gymnastics has been determined. In the end, a correlation has been established between the elements of rhythmic gymnastics and the special exercises of classical exercise.

*Relationship of research with scientific or practical tasks, plans, programs.* The research has been carried out in accordance with the initiative theme of the scientific research of the Department of Gymnastics, Dance Sports and Choreography of KSAPC: Theoretical and methodological foundations of the backbone components

of physical culture (sports, fitness and recreation) for 2020-2025, state registration number 0120U01215.

**Results of the research**

The experience, which has been conducted for two months, aimed to determine the impact of classical exercise on the mastery of basic elements of rhythmic gymnastics. For this purpose preliminary and final evaluations of performance of both elements of rhythmic gymnastics and the exercises of classical exercise have been carried out.

The obtained results and the analysis carried out on their basis, which are presented in table 1, indicate the certain choice of the special exercises of classical exercise for mastering the basic elements of rhythmic gymnastics. The most significant effect ($t = 3,57$; $p < 0,001$) from the usage of these exercises has been obtained when performing such an element as balance "forward". This indicates that the set of involved training exercises has contributed to the development of strength of the muscles of the shoulder girdle and leg muscles, elasticity of ligaments and stability in girls.

To a less extent, but the results of the performance of the balance "attitude" ($t = 2,68$; $p < 0,01$), the turn "passé" ($t = 2,21$; $p < 0,05$) and the jump "Cossack" have been improved ($t = 2,12$, $p < 0,05$). This is due to the fact that during the training process, young athletes have not sufficiently mastered the basic movements, which were studied at the machine.

It should be noted that the exercises used in their statics and dynamics are as close as possible to the basic elements of rhythmic gymnastics that are being studied. Thus, it is easier for 5-6 years old girls to master the curriculum in rhythmic gymnastics due to such exercises of classical dance. However, the performance of such an element as "wheel" ($t=1,72$; $p>0,05$) was not significantly affected by the usage of the special exercises, which requires their adjustment and further application.

To identify the effectiveness of the usage of the special exercises of classical exercise to master the basic elements of rhythmic gymnastics, a correlation analysis has been conducted.

*Table 1*

**Statistical indicators of influence of special exercises on mastering of basic elements of rhythmic gymnastics (n = 60), points**

| Element of rhythmic gymnastics | Special exercises of classical exercise | Scores | | $t_e$ | $p$ |
|---|---|---|---|---|---|
| | | previous $\bar{X} \pm m$, points | final $\bar{X} \pm m$, points | | |
| Jump "Cossack" | Relevé<br>Demi-plié<br>Grand battement<br>Sauté<br>Assemble | 5,98±0,19 | 6,63±0,24 | 2,12 | <0,05 |
| Balance "forward" | Hand positions (I, III, II)<br>Leg positions (VI, I, III, V)<br>Battement tendu<br>Battement tendu jete<br>Grand battement jete<br>Adajio | 5,63±0,20 | 6,80±0,26 | 3,57 | <0,001 |
| Balance "attitude" | Hand positions (I, III, II)<br>Leg positions (VI, I, III, V)<br>Battement tendu<br>Battement fondu<br>Grand battement jete<br>Relevé | 5,68±0,18 | 6,55±0,27 | 2,68 | <0,01 |
| Turn "passé" | Hand positions (I, III, II)<br>Leg positions (I, IV, VI)<br>I, II, III port de bras<br>Aplomb<br>Keeping the position of one leg in the "passé"<br>Keeping the position of one leg in the "passé" on the relevé | 5,95±0,18 | 6,63±0,25 | 2,21 | <0,05 |
| "Wheel" | Motor actions near the machine<br>Adajio<br>Grand battement jete<br>Hand holding (II, III positions) | 5,75±0,16 | 6,22±0,22 | 1,72 | >0,05 |

According to the obtained results, the exercises used in mastering such an element as the jump "Cossack" have a positive effect, as the correlation coefficient is at the level of the average (r = 0,51-0,60). An integral part of this element is a special exercise "grand battement" (r = 60), "big throw", swing at 90° and above the outstretched leg in the desired direction. This exercise develops leg strength, sharpness of foot movement, step [9] (Table 2).

*Table 2*

**Matrix of correlation dependence of special exercises of classical exercise and performance of the basic element of rhythmic gymnastics jump "Cossack"**

| № i/o | Special exercises of classical exercise | Correlation coefficient |
|---|---|---|
| 1 | Relevé | 0,34 |
| 2 | Demi-plié | 0,43 |
| 3 | Grand battement | 0,60 |
| 4 | Sauté | 0,53 |
| 5 | Assemble | 0,51 |

Performing the element of balance "forward" includes various technical components: raising the leg by 90°, holding the pose on the "relevé", changing the position of the body and hand position, so the most effective is a special exercise - "adajio" (r = 0,63) and "grand battement jete" (Table 3). Also for balance, no less important is the exercise for training hand position (r = 0,49), which stabilizes the position of the body in space.

*Table 3*

**Matrix of correlation dependence of special exercises of classical exercise and performance of the basic element of rhythmic gymnastics balance "forward"**

| № i/o | Special exercises of classical exercise | Correlation coefficient |
|---|---|---|
| 1 | Hand positions (I, III, II) | 0,49 |
| 2 | Leg positions (VI, I, III, V) | 0,32 |
| 3 | Battement tendu | 0,36 |
| 4 | Battement tendu jete | 0,42 |
| 5 | Grand battement jete | 0,57 |
| 6 | Adajio | 0,63 |

The exercises used to perform the basic element of rhythmic gymnastics - the balance "attitude", provide the specifics of the formation of movements as in dance

sports. Particular attention should be paid during the training of young athletes to the basic movements of classical dance in the reverse positions of the legs, body position and keeping the free leg. All the above exercises (Table 4) are of great importance for creating individual components of the basic element, especially "grand battement jete" (r = 0,68) and "battement fondu" (r = 0,58).

*Table 4*

**Matrix of correlation dependence of special exercises of classical exercise and performance of the basic element of rhythmic gymnastics balance "attitude"**

| № i/o | Special exercises of classical exercise | Correlation coefficient |
|---|---|---|
| 1 | Hand positions (I, III, II) | 0,44 |
| 2 | Leg positions (VI, I, III, V) | 0,39 |
| 3 | Battement tendu | 0,31 |
| 4 | Battement fondu | 0,58 |
| 5 | Grand battement jete | 0,68 |
| 6 | Relevé | 0,47 |

According to the results of the evaluation of the basic element of the turn "passé", the most effective is a special exercise "holding the position of one leg in the "passé" on the relevé" (r = 0,70) (Table 5). The usage of this exercise affects the muscles of the legs and arms, combines body movements into one whole. The groups of muscles that fix the torso and back in the lumbar region allow you to stay in a strictly vertical position and still.

*Table 5*

**Matrix of correlation dependence of special exercises of classical exercise and performance of the basic element of rhythmic gymnastics turn "passé"**

| № i/o | Special exercises of classical exercise | Correlation coefficient |
|---|---|---|
| 1 | Hand positions (I, III, II) | 0,47 |
| 2 | Leg positions (I, IV, VI) | 0,33 |
| 3 | I, II, III port de bras | 0,29 |
| 4 | Aplomb | 0,51 |
| 5 | Keeping the position of one leg in the "passé" | 0,59 |
| 6 | Keeping the position of one leg in the "passé" on the relevé | 0,70 |

Thus, a special exercise "holding the position of one leg in the "passé" on the relevé", produces stability of the body, which does not deviate from the intended direction and gives aesthetics to the element.

During the implementation of the basic element "wheel" it was found that the implementation of "motor action near the machine" - significantly influenced (r=0,57) the learning of this motor action (Table 6). A lower value (r=0,48) was found in the exercise "grand battement jete", which indicates that a certain exercise should be performed consistently with increasing level of coordination of the whole body.

*Table 6*

**Matrix of correlation dependence of special exercises of classical exercise and performance of the basic element of rhythmic gymnastics "wheel"**

| № i/o | Special exercises of classical exercise | Correlation coefficient |
|---|---|---|
| 1 | Motor actions near the machine | 0,57 |
| 2 | Adajio | 0,41 |
| 3 | Grand battement jete | 0,48 |
| 4 | Hand holding (II, III positions) | 0,37 |

## Conclusions / Discussion

The obtained results of the study lead to the conclusion that the usage of the special exercises of classical exercise allowed to increase the level of performance of such basic elements of rhythmic gymnastics as balance "forward" ($t = 3,57$; $p < 0,001$), the score increased by 21%; balance "attitude" ($t = 2,68$; $p < 0,01$), the results improved by 15%; turn "pass" ($t = 2,21$; $p < 0,05$), score improved by 11% and jump "Cossack"

($t = 2,12$; $p < 0,05$), score improved by 11%.

The usage of the special exercises of classical exercise, as expected, contributed to the formation of motor qualities of 5-6 years old girls, aimed at the effectiveness of the basic elements of rhythmic gymnastics.

The results of the evaluation have shown the correlation dependence of the performance of the basic elements of rhythmic gymnastics and the special exercises of classical dance, providing the performance of the elements: jump "Cossack" has a

medium level of correlation with special exercises: "grand battement" (r = 0,60), "sauté" (r = 0,53) and "assemble" (r = 0,51); balance "forward" with "adajio" (r = 0,63) and "grand battement jete" (r = 0,57); balance "attitude" with a special exercise "grand battement jete", which has a high level of correlation (r = 0,68) and "battement fondu" (r = 0,58); turn "pass" with a special exercise "holding the position of one leg in the "passé" on the relevé", which has a high level of correlation (r = 0,70) and "holding the position of one leg in the "passé"" (r = 0,59), "aplomb" (r = 0,51); "wheel" with "motor actions near the machine" (r = 0,57).

The conducted research confirms the data of correlation between the basic elements of rhythmic gymnastics and the special exercises of classical exercise, which give the opportunity to use them in the training process of young gymnasts.

**The prospect of further research** is to adjust and further apply additional exercises of classical exercise for improving the assimilation of basic elements of rhythmic gymnastics by young athletes.

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# DETERMINATION OF MODEL CHARACTERISTICS OF TECHNICAL AND TACTICAL INDICATORS OF HIGHLY QUALIFIED FEMALE SWIMMERS, WHO SPECIALIZE ON THE DISTANCE OF 50 METERS BY DIFFERENT STROKES

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**Purpose:** to develop the model characteristics of technical and tactical indicators of highly qualified female swimmers, who specialize on the distance of 50 meters by different strokes.

**Material and methods:** analysis of literary sources, timing, video filming, methods of mathematical statistics. The surveyed contingent consisted of participants of the final heats of the Swimming Championships and Cups of Ukraine at the distance of 50 meters by different strokes. The level of sports qualifications of the sportswomen corresponded to the titles of Master of Sports of Ukraine and Master of Sports of Ukraine of international class.

**Results:** the influence of indicators of swimming speed, tempo and «step» of the cycle of rowing movements on the result of overcoming the distance of 50 meters by different strokes by highly qualified sportswomen investigated; the most significant parameters of the technical and tactical skill of highly qualified female swimmers depending on the swimming stroke determined and their model characteristics developed.

**Conclusions**: the influence of the indicators of swimming speed, tempo and «step» of the cycle of rowing movements on the result of overcoming the distance of 50 meters by highly qualified sportswomen has characteristic features depending on the swimming stroke. The most significant technical and tactical parameters in front crawl swimming is the speed on the segments «15 m - 25 m» and «45 m - 50 m», the tempo of the rowing movements on the sections «35 m - 45 m» (R is - 0,60, - 0,72 and - 0,72 respectively). In the backstroke swimming the result mainly depends on the fast swimming of the first 35 meters of the distance (R values are in the range of - 0,57 - 0,98), as well as the tempo values on the segment «25 m - 35 m» (R = -0,50). Efficiency at the distance of 50 meters by breaststroke swimming is influenced by the speed indicators of overcoming the sections «emerging - 15 m», «25 m - 35 m» and «45 m - 50 m», the tempo of rowing movements on the segments «emerging -15 m» and «15 m - 25 m», the ability to maintain a large «step» on the sections «15 m - 25 m» and «25 m - 35 m» (R at the level of values - 0,88, - 0,56, - 0,86, - 0,55, - 0,70, - 0,79 and - 0,69 respectively). The result in the butterfly stroke mostly depends on the fast passage the underwater area and the second half of the distance of 50 meters (R within 0,58 – 0,86). The tempo and «step» of the cycle of rowing movements closely correlate with the final result on the second half of the competitive distance (R values vary from – 0,70 to – 0,97). Orientation on the developed model characteristics of the most significant indicators of technical and tactical skill of highly qualified female athletes, who have the different swimming specializations, will contribute to the improvement of training and competitive activity in modern swimming.

**Keywords:** sportswomen, 50 meters, swimming strokes, technical and tactical indicators, correlation, model characteristics.

## Introduction

The level of development of modern swimming, what is characterized by the demonstration of high results, expanding the arsenal of distances at which athletes perform, dictates the need to find the ways to improve the training and competitive

activities [1; 7].

A significant role in this direction is given to the analysis of competitive activities of highly qualified athletes, the study of a wide range of issues that relate to its individualization and optimization. [3; 6].

To date, thanks to numerous scientific achievements, the main components of the structure of competitive activities were identified, the degree of connection between them and various parameters of the structure of special preparedness of swimmers was determined, etc [2; 9].

The parameters of technical and tactical skills of sportswomen, which are a kind of reflection of the ability to realize the results of the conducted work in conditions of the competition, are of particular interest among the studied indicators [5; 8; 11; 12].

However, it should be noted that the attention of experts is mainly focused on studying the features of technical and tactical actions of female athletes during swimming the competitive distances by front crawl, while the nuances of overcoming distances by other sports strokes remain incompletely considered [4; 10].

In the modern literature there are not enough the works which relate to the comparative analysis of the parameters of technical and tactical skills of swimmers during overcoming the distances of different lengths, taking into account age, stroke of swimming, level of sports skills, determining their model characteristics.

Carrying out of researches in this direction will allow to reasonable approach to differentiation of preparation of sportswomen of various swimming specializations that in turn will promote improvement of quality of their training process, will increase the efficiency of performance at competitions.

**Purpose of the work** - to develop the model characteristics of technical and tactical indicators of highly qualified female swimmers who specialize at the distance of 50 meters by different strokes.

**Objectives of the study:**

1. To study the influence of speed, tempo and «step» of the cycle of rowing movements on the result of overcoming by highly qualified sportswomen the distance

of 50 meters by different strokes.

2. To determine the most important parameters of technical and tactical skills of highly qualified female swimmers depending on the stroke of swimming.

3. To develop the model characteristics of technical and tactical indicators of highly qualified sportswomen during swimming the most important sections of the distance of 50 meters by different strokes.

**Material and Methods of research**

The following methods were used to solve the described tasks: analysis of literature sources, timing, video recording, methods of mathematical statistics.

The surveyed contingent consisted of participants of the final heats of the Ukrainian Swimming Championships and Cups at the distance of 50 meters by front crawl, backstroke, breastroke and butterfly. The level of sports qualification of sportswomen corresponded to the titles of Master of Sport of Ukraine and Master of Sport of Ukraine of international class.

**Results of the research**

For develop of the model characteristics of technical and tactical indicators of highly skilled female swimmers who specialize at the distance of 50 meters by different strokes, we investigated the degree of correlation between the parameters of speed, tempo and «step» of the cycle of rowing movements and the end result of swimming this competitive distance by front crawl, backstroke, breastroke and butterfly.

The conducted analysis of the obtained data allowed to determine that the parameters of speed on the segments «15 m – 25 m» and «45 m – 50 m» are the most important for achieving high results at the distance of 50 meters by the front crawl swimming (R is equal to - 0,60 and - 0,72 respectively) (Figure 1 a).

The tempo of rowing movements on the segment «35 m – 45 m» has the close correlation with the result (R= - 0,72) (fig. 1 b).

The parameter of the «step» of the cycle of rowing movements on the section «15 м – 25 м» significantly affects the final result (R= -0,50) (Figure 1 c).

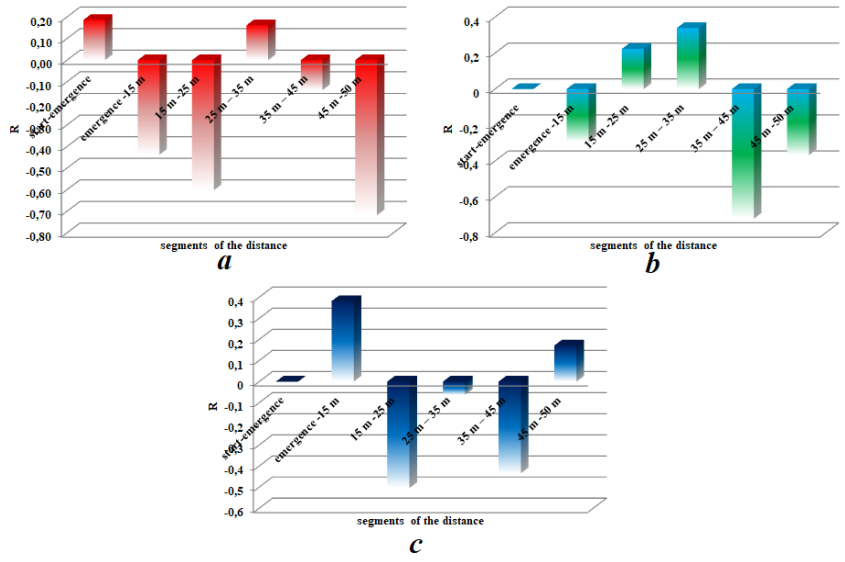


**Fig. 1** The influence of technical and tactical indicators of highly qualified sportswomen during overcoming different sections of the distance of 50 meters by front crawl on the final result: a – speed, b – tempo, c – «step» of the cycle of rowing movements

The result in the backstroke swimming largely depends on the fast overcoming the first 35 meters of the distance (R values vary within - 0, 57 – - 0, 98) (Figure 2 a).

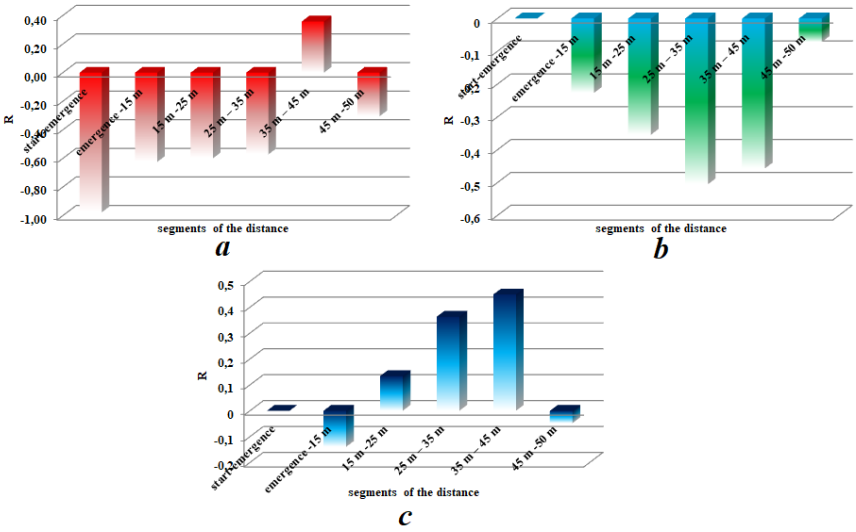


**Fig. 2** The influence of technical and tactical indicators of highly qualified sportswomen during overcoming different sections of the distance of 50 meters by backstroke on the final result: a – speed, b – tempo, c – «step» of the cycle of rowing movements

Moreover, as the distance passes, the influence of speed parameters is steadily decreasing. Therefore, sportswomen should be ahead of competitors on the first half of the distance, especially during overcoming the segment «start- emergence».

The tempo on the segment «25 m – 35 m» of the backstroke swimmers is significant among other technical and tactical indicators (R= - 0,50) (Figure 2 b).

In turn, the «step» of the cycle of rowing movements by backstroke swimming on the shortest competitive distance by this stroke is insignificant in degree of importance (Figure 2 c).

The performance at the distance of 50 meters by breaststroke swimming depends on the speed of overcoming by female athletes the sectons «emergence – 15 m», «25 m – 35 m» and «45 m – 50 m» (R is equal to - 0,88, - 0,56 and - 0,86 respectively) (Figure 3 a).

The tempo of rowing movements, which highly qualified breastroke swimmers demonstrate on the segments «emergence – 15 m» and «15 m – 25 m», has a significant impact on the result (R is at the level of values - 0,55 and - 0,70 respectively) (Figure 3 b).

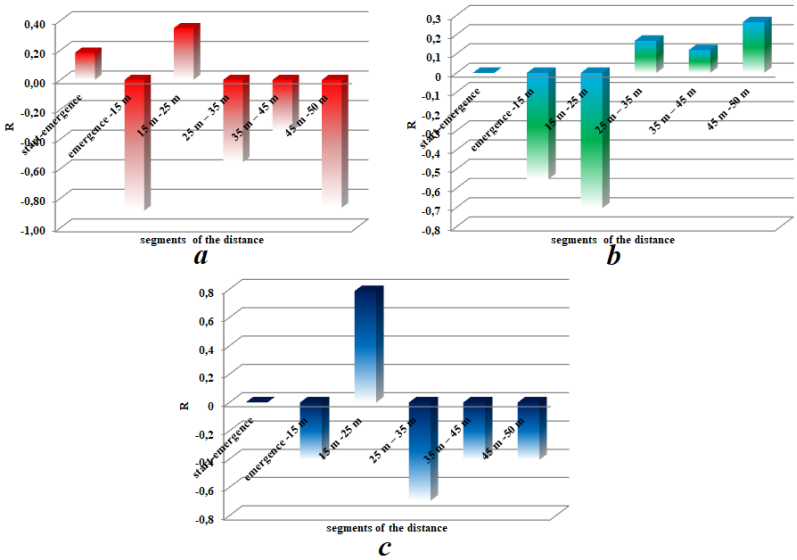


**Fig. 3** The influence of technical and tactical indicators of highly qualified sportswomen during overcoming different sections of the distance of 50 meters by breastroke on the final result: a – speed, b – tempo, c – «step» of the cycle of rowing movements

The ability of sportswomen to maintain a large «step» on the sections of distance swimming, namely within the limits «15 m –25 m» and «25 m – 35 m» has the great importance. The values of the correlation coefficient reach the values of 0,79 and - 0,69 (Figure 3 c).

The result in the butterfly swimming is due to the speed of overcoming the underwater area and the second half of the competitive distance of 50 meters (R is equal to 0,58 - 0,86) (Figure 4 a).

The ability of the sportswoman to maintain a stable indicators of tempo of rowing movements on the second half of the distance plays a significant role in this most difficult in terms of strength and functional preparedness stroke of swimming. The influence of tempo indicators on the result increases when approaching to the finish line. The value of R enlarges from - 0,70 to - 0,97 (Figure 4 b).

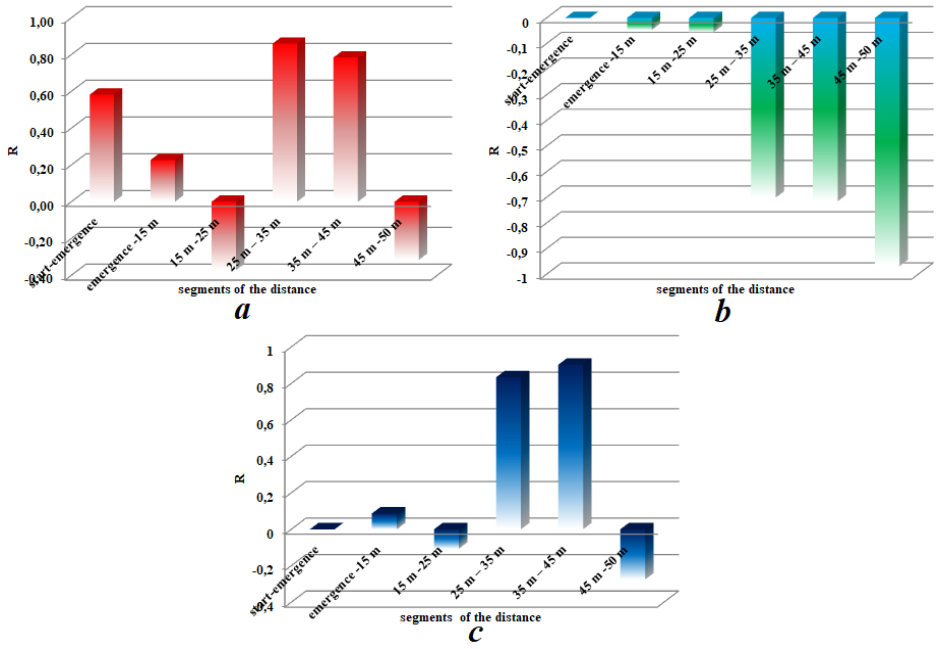


**Fig. 4** The influence of technical and tactical indicators of highly qualified sportswomen during overcoming different sections of the distance of 50 meters by butterffly on the final result: a – speed, b – tempo, c – «step» of the cycle of rowing movements

The «step» of the cycle of rowing movements, as well as the tempo, has a close correlation with the result on the second half of the distance of 50 meters (R is at the

level of values 0,83 and 0,90 respectively) (Figure 4 c).

Thus, it can be argued that the overcoming by female swimmers of high class the second half of the dictance of 50 meters by butterfly stroke at high speeds while maintaining high indicators of tempo of movements and length of rowing will allow to demonstrate the good results and succeed in competitions.

Based on the identified correlations, we developed the model values of the most important indicators of technical and tactical skills of highly qualified sportswomen who successfully overcome the distance of 50 meters by different swimming stroke (Table 1).

*Table 1*

**Model characteristics of indicators of technical and tactical skills of highly qualified sportswomen in process of overcoming the most important sections of the competitive distance of 50 meters by different strokes of swimming**

| № | The sections of the competitive distance | The model values of indicators of technical and tactical skills | | |
|---|---|---|---|---|
| | | Speed | Tempo | «Step» |
| **Front crawl** | | | | |
| 1. | 15 m – 25 m | 1,90±0,23 | 58,98±7,61 | 1,80±0,14 |
| 2. | 35 m - 45 m | 1,75±0,11 | 56,07±10,40 | 1,90±0,18 |
| 3. | 45 m -50 m | 1,62±0,26 | 63,60±10,27 | 1,70±8,11 |
| **Backstroke** | | | | |
| 4. | start- emergence | 2,06±0,13 | - | - |
| 5. | emergence -15 m | 1,65±0,07 | 49,38±3,95 | 2,01±0,15 |
| 6. | 15 m - 25 m | 1,57±0,06 | 49,20±4,96 | 1,94±0,19 |
| 7. | 25 m - 35 m | 1,67±0,06 | 49,47±6,35 | 2,05±0,23 |
| **Breastroke** | | | | |
| 8. | emergence -15 m | 2,04±0,37 | 64,26±12,48 | 1,92±0,20 |
| 9. | 15 m - 25 m | 1,46±0,08 | 61,32±7,04 | 1,43±0,17 |
| 10. | 25 m - 35 m | 1,58±0,12 | 60,85±7,26 | 1,56±0,14 |
| 11. | 45 m - 50 m | 1,24±0,02 | 59,82±7,42 | 1,28±0,13 |
| **Butterffly** | | | | |
| 12. | start - emergence | 1,96±0,22 | - | - |
| 13. | 25 m - 35 m | 1,84±0,20 | 59,92±4,06 | 1,86±0,34 |
| 14. | 35 m - 45 m | 1,81±0,12 | 57,54±6,87 | 1,91±0,33 |
| 15. | 45 m - 50 m | 1,10±0,51 | 51,47±4,76 | 1,25±0,39 |

The developed model characteristics can be used as guidelines for improving the training and competitive activities of highly qualified sportswomen of various swimming specializations.

**Conclusions / Discussion**

The obtained results agree with the statement of many authors that the indicators of technical and tactical skills significantly affect the result of overcoming the distance of 50 meters regardless of the stroke of swimming.

It is determined that parameters of the speed on the segments «15 m – 25 m» and «45 m – 50 m» and the tempo of rowing movements on the section «35 m – 45 m» have the greatest impact on the result of overcoming the sprint distance of 50 meters by front crawl (R at the level of values - 0,60, - 0,72 and - 0,72 respectively).

It was found that in the backstroke the result depends more on the fast swimming of the first 35 meters of the competition distance (R is within - 0,57 – - 0,98) and the indicators of frequency of movements on the segment «25 m - 35 m» (R=-0,50).

It is proved that the effectiveness at the distance of 50 meters during swimming by breaststroke depends on the speed of overcoming the segments «emergence – 15 m», «25 m – 35 m» and «45 m – 50 m», (R is equal to - 0,88, - 0,56 and - 0,86 respectively), the tempo on the section «emergence – 15 m» and «15 m – 25 m» (the value of the correlation coefficient reaches - 0,55 and - 0,70 respectively), the ability to maintain a significant length of the rowing in the range of 15 - 35 meters (R is on levels of values - 0, 69 – 0,79).

It was found that the result in the butterfly swimming is determined by the speed of the overcoming by sportswomen the underwater area and the second half of the competition distance of 50 meters (R in the range of 0,58 - 0,86). The tempo and the «step» of the cycle of rowing movements have a close correlation with the final result on the second half of the distance (R is in the range from - 0,70 to - 0,97).

The orientation on the developed model characteristics of the most important technical and tactical indicators of highly qualified sportswomen of various swimming specializations will contribute to the improvement of training and competitive activities in modern swimming.

**The prospect of further research** is to determine the features of technical and tactical actions of sportswomen of different specializations during swimming

distances of 100 and 200 meters.

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# CLASSIFICATION OF ACROBATIC MOVEMENTS OF GROUP P - "PLATFORMS" AND THEIR VARIETIES IN ARTISTIC SWIMMING

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**Purpose:** to classify and determine the methodology for constructing the technical value of acrobatic movements of "group P".

**Material and methods:** theoretical analysis and generalization of scientific and methodological literature data, analysis of competition results, polls, methods of mathematical statistics. The competitive programs of the World and European Championships (2009-2021) and the Olympic Games (2008-2021) are analyzed.

**Results:** analyzing the performances of leading athletes at the Olympic Games, World and European Championships, from 2004 to 2021, we developed a diagram where we can determine what platforms are performed least of all in comparison with other groups. The next step we have combined the existing types of acrobatic movements of "group P" into a single table, forming the criterion for assessing the "area of support" or "value of the type of connection" (grip). In total, the value of 30 types of connections was calculated in the group P - "platforms". Taking into account all the data obtained, a matrix was built, an algorithm for calculating the technical value of the "group P". Based on the developed methodology for calculating the technical value of acrobatic movements, a unified table (scale) of the technical value of acrobatic movements of "group P" was developed - a platform where acrobatic movements were distributed in order from the easiest to the most difficult according to the calculated technical value.

**Conclusions:** the data of our research made it possible to create the author's system of classification of acrobatic movements, sort it out in detail and develop a methodology for determining and calculating the technical value of 81 acrobatic movements of "group P". The obtained data became the basis for the development of a unified table of the technical value of acrobatic movements of "group P" in artistic swimming. Preliminary approbation of this system and their discussion at international seminars of specialists, coaches and judges of various qualifications in artistic swimming made it possible to make a number of clarifications, additions and improve the development of a classification system for acrobatic movements of "group P" and an assessment of their complexity.

**Keywords:** artistic swimming, classification, competitive compositions, acrobatic movements, platforms.

## Introduction

The current stage of development of artistic swimming demonstrates a significant increase in the "saturation" (filling) of competitive programs. The variety of elements has increased, which is an integral part of demonstrating the complexity of competitive programs. New complex combinations, connections, acrobatic movements and elements appear. At the same time, the requirements for executable elements are increasing from year to year. Claims that artistic swimming has reached the limit in its development are false. And every new World championship is a confirmation of that. Only those teams that invent new, original elements, demonstrate high stability of complexity of compositions and acrobatic movements reach the top of the pedestal [4; 9; 12].

For the practice of artistic swimming, the global problem is the availability and objectivity of quantifying the complexity of competitive programs [1; 3; 11].

Currently, the rules of FINA competitions in artistic swimming do not contain specific information about which element is more difficult than another, and an objective approach to determining its technical value [7; 8].

Analysis of the videos of the competitive programs of the leading teams in artistic swimming revealed that the greatest variety of acrobatic movements of group P "platform", compared to other years analyzed, was demonstrated in performances among “team free combination” routines at the 2018 European Championships in Glasgow (Scotland). Of all the movements performed, the platform took 18%, and in other competitions, this group occupies no more than 10%. Experts attribute this to the fact that performing these acrobatic movements requires the participation of 6 to 8 "basic" (lower) athletes, and a lot of time to perform, which is quite difficult to do in “team free routines”, because coaches prefer to demonstrate more understandable to judges components of the routine - "hybrids" of elements.

**Purpose:** to classify and determine the methodology for constructing the technical value of acrobatic movements of "group P".

## Material and Methods of research

The following methods were used to solve the planned tasks: theoretical analysis and generalization of scientific and methodological literature data, analysis of competition results, systematical analysis (competitive programs were considered as a set of interconnected components, taking into account their properties and biomechanical characteristics), polls, methods of mathematical statistics. The competitive programs of the World and European Championships (2009-2021) and the Olympic Games (2008-2021) are analyzed.

## Results of the research

The group "platform" got its name from Fr. plateforme from "flat" + forme "form". That is, athletes must demonstrate a "plane" on the water, formed from their body-parts (hands or legs) or the whole body, on which for some time the “featured-swimmer” balancing and demonstrates acrobatic movements.

In previous publications [2; 5; 6] identified two types of acrobatic movements of group P. Based on the principles of identifying structural groups in spectacular sports [10], the movements of this group were divided into two subgroups:

1) Classic Platforms (or “Standard”);

2) «Floats» (eng. Floats – to float, verb: stay on the surface of the liquid and do not drown).

Both subgroups differ significantly. First of all, due to the specifics of the formation and emergence from under the water to the surface to demonstrate acrobatic movement. Thus, all structures of the first subgroup "Classic Platforms" are formed by athletes under water, after which the whole “construction”, including the "featured-swimmer" rises, then held on the surface for some time, after which the entire structure is immersed back under water.

And the “constructions” of the subgroup "Floats" are formed on the surface of the water, after which the "«featured-swimmer» " climb on the formed "pattern" on the surface of the water and performs actions, then usually jumps into the water and the structure disintegrates.

Analyzing the performances of leading athletes at the Olympic Games, World Championships and European Championships, from 2004 to 2021, we developed a chart where we can determine that compared to other acrobatic groups, the platforms are the least performed. Leading experts attribute this fact to several reasons:

1) long-time maintenance of the «featured-swimmer» on the lying in a static position "support" (middle) athlete requires a lot of effort, which automatically requires the presence of a large number of athletes in the “base level”;

2) The acrobatic movement itself takes a long time, and coaches usually prefer more "fleeting" acrobatic movements to be able to demonstrate a greater variety of other elements during the routine.

It should also be noted that in acrobatic movements of the subgroup "Classic" (or "Standard") "support" (middle) athlete is always in a horizontal position, parallel to the water surface, regardless of the position of the limbs and «featured-swimmer».

The subgroup "Floats", as mentioned above, is formed on the water surface. Athletes form from their legs and/or arms a geometric pattern-plane on the surface of the water, thus forming a stable floating support on which "the «featured-swimmer» demonstrates various gymnastic actions.

The most important component that distinguishes the acrobatic movements of subgroups of group P, both "Classic" (Standard) and "Floats" - is the construction. The main criterion by which the constructions are divided among themselves is the position of the body of the "support" (middle) athlete. That is, in group P, subgroup "Classic" (Standard), always one or two “support” athletes rise from under the water in a horizontal position. And the complexity of the position of the body of the support athlete in the construction depends on whether the knees of the support athlete are bent, whether one of the legs is raised or both legs of the support athlete up. Experts attribute the complexity of such body positions to the fact that maintaining such static body positions for a long time is extremely difficult for the support athlete.

And for the subgroup "Floats" complexity and technical value depend on the number of support athletes, which are kept by basic athletes. There are constructions: "rhombus" (two support athletes from the legs form a geometric figure of a rhombus on which the «featured-swimmer» balances), "triangle" (where three athletes form a geometric figure on the surface of a triangle with legs with special leg grip on which the «featured-swimmer»balances), star "(Where 6-8 athletes form a special pattern leg grip on the surface of the water, on which the «featured-swimmer» balances), etc.

For group P - platforms, the value of "Connection" (“grip”) also plays an important role. Group P differs from B in that the support (middle) athlete lies in a horizontal position and so she and the «featured-swimmer» are lifted out of the water. That is, they begin their acrobatic movement already underwater, clinging (connecting) to each other. Therefore, it is very important for base (lower) athletes to carefully lift both athletes up and make a lot of effort to keep both athletes above the water for a long time, giving them a stable support on the water surface:

• large area of support - when the support athlete is "connected" to the «featured-swimmer's” abdomen or back (ie, the «featured-swimmer» is sitting or standing on the support-swimmer 's abdomen / back);

• middle support area - when the «featured-swimmer» is standing on two legs; leans on the shoulders, buttocks, lower abdomen on the support-athlete ;

• small area of support - when the «featured-swimmer» leans on the knees of the support athlete or when the «featured-swimmer» is standing on her head;

• very small ("extreme") support area - when the «featured-swimmer» is standing on hyк hands (leaning on the palms/hands), or when the support athlete holds the «featured-swimmer» with her hands.

It is important to note that the complexity depends not only on the area of support provided by the support athlete, but also on what part of the body leans or stands «featured-swimmer» on this area.

That is, if the «featured-swimmer» sits with her hips (large support area) on a very small support area, it cannot be evaluated in the same way as a stand on the «featured-swimmer's" hands (very small support area), which leans only on the support athlete's hand (very small support area). Taking into account these factors, we assigned numerical values to each type of area (Table 1).

*Table 1*

**Numerical values and "size" of the area**

| Size of the area | Technical value of the component (points) |
|---|---|
| Large | 0,1 |
| Medium | 0,3 |
| Small | 0,5 |
| Very small | 0,6 |

In the next step, we combine the existing types of acrobatic movements of groups P into a single table, which creates a criterion for estimating "Support area", or "Value of the connection type" (grip). In total, the value of 30 types of connections (grips) in groups P - platform was calculated.

The next factor that affects the technical value of acrobatic movemnts of group P - is the position demonstrated by the «featured-swimmer» .

As a basis for evaluating this criterion, we took developed by prof. Medvedeva [10] system of determining the technical value in rhythmic gymnastics.

The movements of the leg were distributed in the following directions: forward, sideways and backward. And depending on the degree to which it rises will receive +0,1. For example: evaluation starts at 90° and has a value of 0,1 (forward and sideways), 135° has a value of 0,2; and full “split” 180° is estimated at 0,3 points.

Except for the backward direction, where the value is slightly higher because it is physiologically harder to bend the back than to lift the leg forward.

Among the criteria for evaluating the position, we also derived certain "bonuses":

• if balancing is performed standing on one leg +0,1;

• both hands catch and grip the leg +0,1;

• the position is performed without "own support" (lying down) +0,15;

• the position is performed upside down +0,2.

The next component is the rotation of the construction. Group P refers to those types of acrobatic movements where the whole construction rotates. That is, the lower (base) athletes hold and rotate the lying support (middle, horizontal) athlete with the «featured-swimmer» on her. Depending on whether the «featured-swimmer» is sitting or standing, the rotation of the construction was divided into two types. Also, depending on the degree of rotation, the technical value increases.

Taking into account all the obtained data, a matrix, an algorithm for calculating the technical value of group P was constructed (Figure 1).

This figure shows that, depending on which components the coach chooses for the competitive routine, the "way" of building the matrix depends.

There can be 4 ways:

1) Construction + Position + Type of connection + Bonus = Technical value;

2) Construction + Position + Type of connection + Rotation of the construction = Technical value;

3) Construction + Position + Type of connection + Bonus + Rotation of a construction = Technical value;

4) Construction + Position + Type of connection = Technical value.

Take for example the acrobatic movement of group P, which is performed in competitions of all ages, from the construction "Simple Platform" (the number obtained by adding all the components of the structure = 1,1), where the construction rotates on 180 °, the featured-swimmer stands with both feet on the support athlete (whose body is straight) in the "Eye" position. To determine the value of this

acrobatic movement, we need to consider all the "components" of the acrobatic movement in the same units (points) to get an acceptable number for future mathematical operations, according to the existing system of coefficients of complexity (degrees of difficulty) of the required elements in technical routines and add them to each other.

It will look like this: 1,1 + 0,1 + 0,65 + 0,3 = 2,15

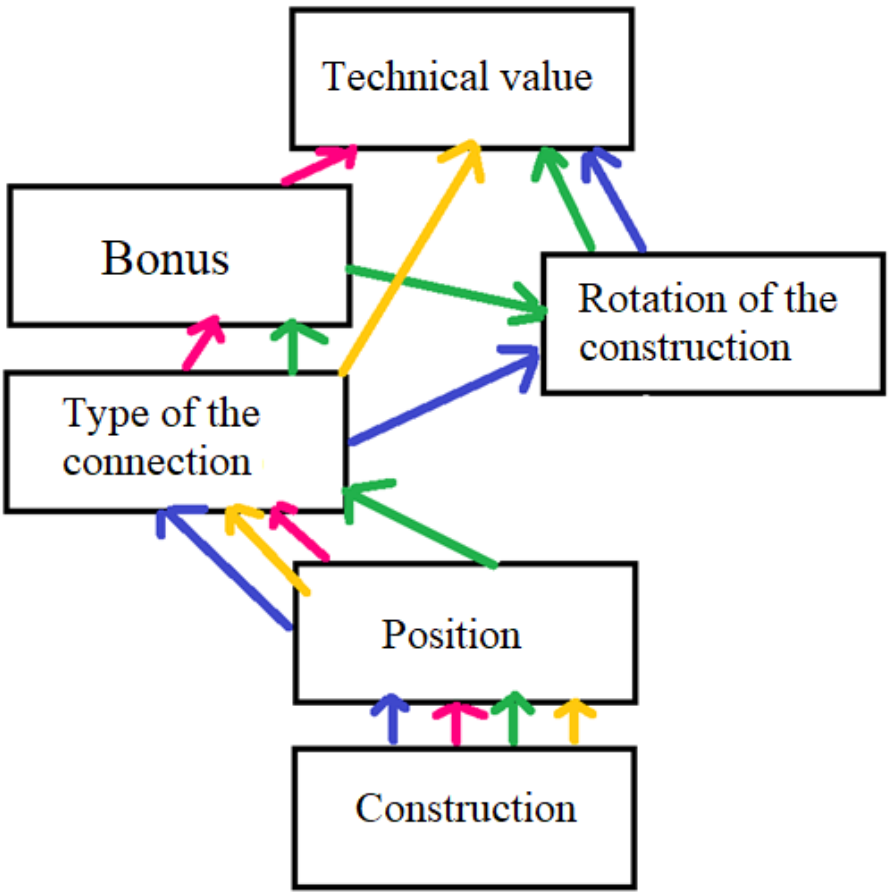


**Fig. 1** Algorithm for determining and constructing the technical value of acrobatic movemets of group P - "platform" in artistic swimming.

Note: red arrow - demonstrates the "first" way to build a matrix of technical value of acrobatic movements of group P - "platform"; blue arrow - demonstrates the "second" way to build a matrix of technical value of acrobatic movements of group P - "platform"; green arrow - demonstrates the "third" way to build a matrix of technical value of acrobatic movements of group P - "platform"; yellow arrow - demonstrates the "fourth" way to build a matrix of technical value of acrobatic movements of group P - "platform".

That is, the total technical value depends on the sum of the points of all components of the acrobatic movement. In this example, it is 2,15 points. This score

is the coefficient by which the average execution score for a particular acrobatic movement is multiplied.

The technical value varies among all the acrobatic movements in this group, depending on the different components chosen by the coach. The developed system allows to create any combination ("set") of components that does not destroy the creativity of performance in artistic swimming, which is one of the main ideas in this sport.

Based on the developed method of calculating the technical value of acrobatic movements, a single table (scale) of technical values of acrobatic movements "Group P" – platform were developed, where acrobatic movements were distributed in order from easiest to most difficult according to the calculated technical value.

**Conclusions / Discussion**

The data of our study allowed to create an author's system of classification of acrobatic movements, to sort in detail and develop a method of determining and calculating the technical value of 81 acrobatic movements of group P. The obtained data became the basis for the development of a single table of technical value of acrobatic movements of group P in artistic swimming. Preliminary tests of this system and their discussion at international seminars of specialists, coaches and judges of various qualifications in artistic swimming allowed to make a number of clarifications, additions and improve the development of classification system of acrobatic movements of group P and assess their difficulty. The data of the research of Professor Miwako Homma [12], which considered the composition and components of competitive routines in artistic swimming in 2013, have been supplemented.

**Prospects for further research.** In the future, it is planned to analyze the relationships of hybrid-elements and classify them by complexity, taking into account the components of difficulty.

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# BADMINTON AS ONE OF THE MEANS OF HEALTH AND RECREATIONAL ACTIVITIES OF STUDENTS

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**Purpose:** to assess the influence of badminton classes according to the health-improving and recreational program on the physical fitness and health of students.

**Material and methods:** 13 female applicants for higher education of the second year of the Kharkov State Academy of Physical Culture took part in the study. The health-improving and recreational program was implemented within 6 months. To assess its effectiveness at the beginning and at the end of the experiment, the participants were determined by anthropometric indicators (body weight, standing height, muscle strength of the hand), physiological indicators (vital capacity of the lungs (VC)). The assessment of the physical working capacity of female students and the effectiveness of their respiratory system was carried out using the tests of Rufier, Shtange, Genche. The level of their health was assessed according to Pirogova's method.

**Results:** the studies carried out confirmed the information of scientists about the unsatisfactory state of physical fitness and the level of health of student youth. The presented materials made it possible to state the positive influence of health-

improving and recreational classes using badminton means on the indicators of the functional state of the cardiovascular and respiratory systems, the level of physical performance and physical health of girls.

**Conclusions:** the results of the studies indicate that the indicators of body weight, standing height did not change almost, and indicators of hand strength, vital capacity of the lungs improved during the cycle of training sessions. The results of the conducted research testify to the improvement of the functional state and the level of health of the female students, who trained according to the health-improving and recreational program, which is based on the means of badminton.

**Keywords:** health, physical fitness, physical development, functional tests, Shtange's test, Genche's test, students, badminton.

## Introduction

In recent years, there has been a steady increase in the number of students with disabilities. According to a number of researchers [5, 8], the level of physical health of students is assessed as "unsatisfactory", and the level of their physical health as "below average". Most experts attribute the low level of health of student youth not only to unfavorable socio-economic living conditions, but also to a decrease in students' interest in physical education and a decrease in their physical activity. Analysis of special studies has shown that only 25-30% of the total daily need for physical activity in students is occupied by physical education classes [1, 2, 7, 9]. The analysis of special literature also shows that today the number of students who are assigned to a special medical group, as well as the number of young students who after a medical examination are exempt from exercise within the system of physical education [6, 10, 11]. The problem of assessing the current functional state of the body [4] and control over it are important in human life, because one of the most important indicators of their health is the level of functional development of adaptive systems of the human body [12, 13, 14].

**Purpose** of the study was to evaluate the impact of badminton classes on the health and recreation program on the physical fitness and health of students.

## Material and Methods of research

The consistent pedagogical experiment was attended by 13 students who studied in the discipline "Recreational Games" in the second year of the Kharkiv State Academy of Physical Culture (KhSAPC). Health and recreational classes were held twice a week on the basis of SHVSM. The experiment lasted for 6 months. To assess the impact of health and recreation badminton on the health and fitness of students at the beginning and end of the experiment, they measured body weight, standing height, hand muscle strength, vital capacity of the lungs (VCL), as well as tests Rufier, Shtange, Genche, Romberga, The level of health of female students was assessed according to the method of O. Pirogova. Student's criterion was used for comparative analysis of average group indicators of sample groups.

## Results of the research

The results of the study are presented in table 1. They indicate that at the beginning of the experiment, the level of health of female students was assessed according to the method of O. Pirogova and was – 0,66 units, which is assessed as "average". After the entire cycle of health and recreational badminton, it was – 0,9 units, which is estimated as "above average".

During the experiment, the absolute indicators of body weight and height in female students who participated in the experiment remained virtually unchanged. Thus, the average group weight at the beginning and end of the experiment was 55,92 kg and 55,07 kg, respectively. The difference between the mean group values is statistically insignificant $t<t_{kr}$, (Table 1). The obtained data also show that the difference between the average group growth rates has not changed either. Thus, the average growth rate at the beginning of the experiment in female students was 168,07 cm, and at the end – 168,2 cm. The results showed that the value of the Kettle Index at the beginning of the experiment was 19,8 kg / m², and at the end of 19,5 kg / m², which indicates a normal ratio of body weight and height in the participants of the experiment. The results obtained during the implementation of the health and

recreation program "Badminton" also indicate that the difference between the average group indicators of vital capacity of the lungs in participants at the beginning (3,64 l) and at the end of the experiment (3,96 l) is not statistically significant.

The results of the study indicate that the girls who participated in the implementation of the health and recreational program, the average group strength of the hand during the experiment significantly improved. If at the beginning of the experiment it was – 24,9 kg, at the end – 32,4 kg ($t_r$ = 2,28, and $t_{kr}$ = 2,06 ($t_r > t_{kr}$.)) (Table 1).

The functional state of the cardiovascular system of the participants of the experiment was assessed by the results of the Rufier test. The results obtained indicate that during the period of health and recreational training they have significantly improved their ability to work. If at the beginning of the experiment it was assessed as "satisfactory" (Rufier index = 11,3), then at the end as "average" (Rufier index = 8,89).

*Table 1*

**Level of health and physical development of girls who are engaged in health and recreational badminton**

| № | Indicators | At the beginning of the experimental (n= 12) | | At the end experimental (n=12) | | $t_r$ | $t_{kr}$ | The result of the comparison $t_r$ with $t_{kr}$ | The difference between the averages |
|---|---|---|---|---|---|---|---|---|---|
| | | $\bar{X}_1$ | $m_1$ | $\bar{X}_2$ | $m_2$ | | | | |
| 1 | Level of physical health | 0,66 | 0,04 | 0,90 | 0,02 | 2,77 | 2,06 | $t_r > t_{kr}$ | significant |
| 2 | Body weight, kg | 55,92 | 1,89 | 55,07 | 1,65 | 0,34 | 2,06 | $t_r < t_{kr}$ | not significant |
| 3 | Standing height, cm | 168,07 | 1,74 | 168,2 | 1,64 | 0,05 | 2,06 | $t_r < t_{kr}$ | not significant |
| 4 | VCL | 3,64 | 0,16 | 4,02 | 0,13 | 1,9 | 2,06 | $t_r < t_{kr}$ | not significant |
| 5 | Brush strength, kg | 24,9 | 1,00 | 32,4 | 0,8 | 2,28 | 2,06 | $t_r > t_{kr}$ | significant |
| 6 | Rufier index | 11,3 | 1,58 | 8,89 | 1,3 | 2,69 | 2,06 | $t_r > t_{kr}$ | significant |

The influence of regular badminton classes on the health and recreational program on the functional state of the girls' body was assessed by the results of tests by Shtange, Genche, Romberga (Fig. 1). The materials presented in the figure indicate that the Barbell test, which was used to assess respiratory function in female

students at the beginning of the experiment, was 39,2 s, which is normal for healthy but not trained individuals. At the end of the experiment, it was already 53,69 s, which is the norm for athletes.

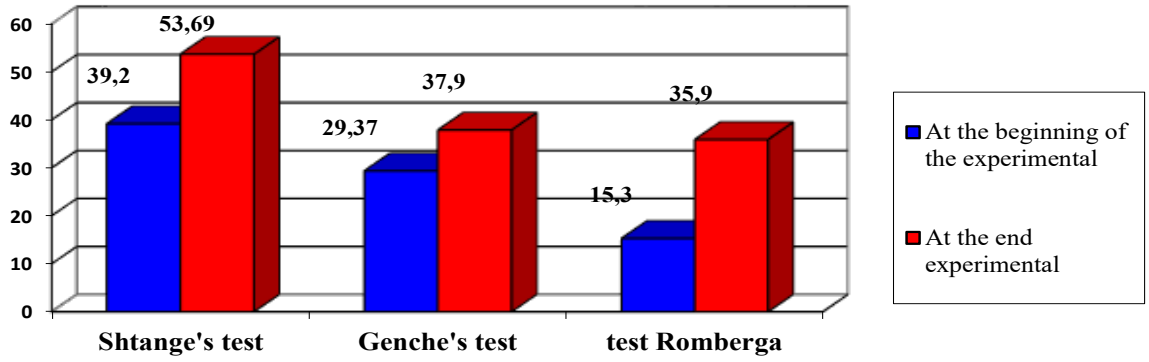


**Fig. 1** Changes in the indicators of the functional state of the body of girls during badminton classes according to the health and recreational program

Evaluation of changes in the system of external respiration in the participants of the experiment under the influence of health and recreational training was conducted on the basis of the Genche test. Presented in Figure 1 results indicate that at the beginning of the experiment the sample rate was 29,37 s, which corresponds to the level of healthy untrained individuals. After the experiment, it was 37,9 s, which corresponds to the level of women athletes.

Romberg's test was used to evaluate the effectiveness of the vestibular apparatus in the participants of the experiment. According to the results of the study, during the experiment the stability of the vestibular apparatus in them improved. If at the beginning of the survey the preservation of posture without tremor occurred for 15,3 s, then at the end of the cycle of training sessions of health and recreational orientation, this figure was 35,9 s.

## Conclusions / Discussion

An analysis of the special literature shows that 90% of students have serious health problems. More than 50% of student youth do not meet the average level of the state standard of physical fitness (Krutsevich T.Yu., Bezverkhnyaya G.V., Shapovalova V.A., Dovgan N.Yu., Golovanova N., Asaulyuk I., Dyachenko A. ). In

the study of Malkhazov O.R. there has been a significant deterioration in students' fitness and health over the past 20 years. Scientists O.A. Tomenko, S.A. Lazorenko, N.Yu. Dovgan, S.S. Galuza also noted in her research that the physical health of student youth is unsatisfactory. 95% of boys and 99% of girls have low and below average levels of physical health, according to our study.

Comparison of the results of our research with the results of research by a constellation of authors (K.E. Bezukh, V.V. Chistyakov, V.Y. Volkov, S.M. Kuchkin, V.V. Chistyakov, I.O. Asaulyuk, A.A. Dyachenko, G.V. Tolcheva) shows that a significant number of indicators of the functional state of students is mostly at an unsatisfactory level.

The study confirmed the results of the authors [3; 8; 10] on the need to study changes in indicators of physical condition of students under the influence of various sports, and deepens the data of scientists [3; 9; 11] on this issue.

The conducted researches allowed to establish positive significant changes in the indicators of the functional state of the cardiovascular and respiratory systems, the level of physical capacity and physical health of female students under the influence of badminton according to the health and recreational program. Their level of physical health has improved and is 0,9 units (above average).

The results of the study indicate that during the period of health and recreational badminton classes in female students significant changes in standing body length and body weight did not occur.

The results of the study indicate that the girls who participated in the implementation of the health and recreational program, the average group index of hand strength and vital capacity of the lungs during the experiment significantly improved. During this time, their respiratory function has significantly improved, as evidenced by the results of the Shtange and Genche tests.

Summarizing the data obtained, it can be concluded that badminton recreation program has a positive effect on the functional state of the cardiovascular and respiratory systems, as well as the level of physical fitness and physical health of students.

**Prospects for further research in this area.** Correction and improvement of the training process, which is based on health and recreational technologies using badminton.

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# INFLUENCE OF CROSSFIT EXERCISES ON THE POWER ABILITIES OF HIGH SCHOOL PUPILS

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**Purpose:** to determine the influence of CrossFit exercises on the power abilities of high school-age children.

**Materials and methods:** theoretical analysis and generalization of scientific and methodological literature, pedagogical testing, pedagogical experiment, and methods of mathematical statistics. Such tests as the lifting of straight legs hanging (number of times); bending and extension of hands lying on the floor (number of times); triple jump on the right and left leg (m) were used to determine the level of the strength development of the 10th–11th-grade pupils. The studied results were compared to norms and evaluated with a certain number of points. Statistical analysis: the research materials were processed using the licensed program Excel. The study involved 113 schoolchildren in grades 10-11.

**Results**: at the beginning of the school year, we conducted the stating experiment, according to the results of which it was established below the average level of development of power abilities in high school pupils. According to the results of the primary research, pupils were assigned to the main and control groups for further conducting the forming experiment. Pupils of control groups were engaged only in the generally accepted state program on physical education for the 10th–11th grades of general secondary education institutions, and the educational process on

physical education of pupils of the main groups was supplemented by the variant module “CrossFit” developed by us. According to the results of researches obtained after the introduction of the experimental technique into the educational process for physical education, it was determined that in schoolchildren of the main groups, the level of development of power abilities increased from below average to above average. Changes weren’t found on the score scale in the test control groups. In the age aspect, there is mainly an improvement in results with age, both in the main and control groups ($p>0,05$). In the gender aspect, it was revealed, mainly, the reliable primacy of the data of boys over the indicators of girls ($p< 0,05–0,001$).

**Conclusions:** significant positive changes were revealed in the indicators of the level of the strength development of the 10th–11th-grade pupils of the main groups, after using the experimental technique proposed by us in the educational process on physical education.

**Keywords:** variable module, CrossFit, high school pupils, power, physical culture lessons, motor activity.

## Introduction

The problem of deterioration of the state of health and decrease in the level of motor preparedness of pupils was on a number of priority problems of the national level [8]. Numerical research [1; 2; 4; 20] determined that most often the cause of various abnormalities in the health of children and adolescents is insufficient motor activity, which progresses every year. Therefore, today the most urgent task of our country is to increase the movement activity of pupils as a foundation for maintaining health and increasing the level of physical fitness [15].

Scientific research [3; 5; 14; 22] proved that physical training and sports contribute to the improvement of the physical and functional state of the body of children of different school ages. However, according to a number of experts [1; 6; 8; 9], it is determined that the modern lesson of physical culture not only doesn’t compensate for the deficit of motor activity but also is not effective enough for pupils

of different school age. The main reasons for this problem are the uniformity of the educational material, a decrease in pupils' interest in physical education, insufficient awareness, and limited access of teachers to modern trends in physical education [1; 9; 10]. That is why; the priority issue of today is the modernization of the educational process of physical education, due to the inclusion of innovative sports in the system of school physical education.

A number of leading specialists in the field of physical culture and sports were engaged in the problem of improving the educational process of physical education, through the introduction of new, innovative types of motor activity, as a result of which there is an increase in the level of physical preparedness of pupils, in particular, the development of strength abilities [1; 2; 4; 8; 10; 13]. It is known that force is an integral motor quality, on which the manifestation of all other motor abilities depends, which indicates the great importance of its purposeful upbringing [17]. Particular attention in this aspect should be paid to older children of school age since the sensitive period of development of strength falls at the age of 15–18 years. At this age, the intense increase in strength can be explained by an increase in muscle mass, puberty, an increase in the rate of muscle contraction to a long static tension [18].

Numerous studies of leading specialists proved the improvement of the level of development of strength under the influence of classes of various types of motor activity. So, scientists T.M. Kravchuk, T.V. Karpunets, I. V. Stepanenko [5], indicate that the introduction of functional exercises in the main part of the lesson contributed to a significant improvement in the strength abilities of high school pupils; T.I. Suvorova, M.S. Moroz, A.H. Karabanov [14], note that under the influence of athletic gymnastics, the level of development of strength in high school pupils significantly improved; L. Horbunov [3], shows that boys and girls of the 10$^{th}$ grade have a tendency to improve the level of development of power under the influence of health tourism; I. M. Skrypka, S.V. Cheridnichenko, M.O. Lysiak [13] showed positive dynamics of the level of development of power capabilities among 16–17-year-old boys after the introduction into the training process of the developed

program of power direction. It should be noted that the available scientific and methodological literature doesn't reveal scientific papers that would raise questions about the impact of CrossFit exercises on the level of development of high school pupils, which justified the feasibility of our research.

In Ukraine, CrossFit every day becomes very popular among people of all ages, including pupils. Its uniqueness lies in variability, a wide range of effects on the basic systems of the body, the combination of exercises from different sports [19; 21; 23; 24].

Thus, we believe that the use of CrossFit in the educational process of physical education is appropriate and timely; because it will optimize the content of the lesson of physical culture, make it more modern, interesting, and effective.

**The purpose of the research** is to determine the influence of CrossFit exercises on the power abilities of high school-age children.

*Connection of work with scientific programs, plans, topics.* The research was conducted according to the Thematic Plan of the Research Work of Kharkiv state academy of physical culture for 2015–2020 on the topic "Improving the process of physical education in educational institutions of different profiles" (number of state registration 0115U006754) and for 2020–2026 "Improving the process of physical education of different segments of the population" (state registration number 0120U101110).

## Material and Methods of research

The following methods were used during the experiment: theoretical analysis of scientific and methodological literature on this problem; testing, experiment (pedagogical), and methods of mathematical statistics.

The level of development of the strength of the $10^{th}$–$11^{th}$ grade pupils was determined by tests proposed by L.P. Serhiienko [12] and V.A. Romanenko [11], namely: the lifting of straight legs hanging (number of times); bending and extension of hands lying on the floor (number of times); triple jump on the right and left leg (m).

*Statistical analysis:* research materials were processed using the licensed program Excel. Calculated: arithmetic mean of variation series ($\overline{X}$); error of representativeness (m) and reliability of differences (p) in order to establish homogeneity of control and main groups, degree of difference of indicators in the age aspect, and change of mean values of the studied parameters after the experiment using the parametric Student criterion (t) at the level of significance not lower than 0,05.

The research was conducted on the basis of secondary schools № 146 and № 57 in Kharkiv during the academic year. 113 pupils aged 16–17 took part in it, of which 2 main and 2 control groups were formed. The main groups included 59 pupils: the first group - boys and girls 16 years (n=27), the second group - boys and girls 17 years (n=32); the control groups included 54 pupils: the first group - boys and girls 16 years (n=21) and the second group - boys and girls 17 years (n=33). All children who took part in the research were referred to the main and preparatory medical group, were practically healthy, and were under the supervision of a school doctor. The parents of all pupils agreed to participate in the pedagogical experiment.

In the course of the research, pupils of control groups were engaged in the generally accepted state program on physical culture, and the educational process for physical education of pupils of the main groups was supplemented by the variable module “CrossFit” developed by us. CrossFit classes were held twice a week. The content of which included theoretical information, special physical training (elements of gymnastics, light and weightlifting, weight sports, general development exercises), and technical training (specially selected CrossFit exercises “Burpee”, “Box Jump”, “Farmer’s Walk”, “Burpee bench jump”, etc. After the development of the "Crossfit" module, pupils performed a set of exercises in lightweight conditions, which consisted of special and technical elements of CrossFit in different modes of operation (EMOM, AMRAP, AFAP, Tabata, Chipper) and with a specified number of rounds [16].

**Results of the research**

Considering the indicators of the level of development of force obtained as a result of the statement experiment (Table. 1), the absence of reliable differences between the results of the investigated groups on all parameters (p>0,05) was found.

*Table 1*

**Comparison of development indicators of power abilities of pupils of the main and control groups before the experiment**

| Grades / Sex | | Groups | | | | t | p |
|---|---|---|---|---|---|---|---|
| | | n | Main groups | n | Control groups | | |
| | | Indicators $\overline{X}$ ±m | | | | | |
| **Lifting of straight legs hanging (number of times)** | | | | | | | |
| 10 grade | Boys | 17 | 14,35±1,74 | 10 | 12,90±1,26 | 0,68 | >0,05 |
| | Girls | 12 | 7,83±1,93 | 11 | 7,27±1,44 | 0,23 | >0,05 |
| 11 grade | Boys | 10 | 16,00±2,35 | 17 | 14,76±0,83 | 0,50 | >0,05 |
| | Girls | 22 | 9,86±0,99 | 16 | 9,31±1,41 | 0,32 | >0,05 |
| **Bending and extension of hands lying on the floor (number of times)** | | | | | | | |
| 10 grade | Boys | 17 | 27,47±2,10 | 10 | 27,60±3,82 | 0,03 | >0,05 |
| | Girls | 12 | 8,50±1,68 | 11 | 9,82±1,35 | 0,61 | >0,05 |
| 11 grade | Boys | 10 | 30,70±2,54 | 17 | 31,76±2,46 | 0,30 | >0,05 |
| | Girls | 22 | 11,50±1,28 | 16 | 12,06±0,99 | 0,35 | >0,05 |
| **Triple jump on the right and left leg (cm)** | | | | | | | |
| 10 grade | Boys | 17 | 5,63±0,15 | 10 | 5,33±0,30 | 0,89 | >0,05 |
| | Girls | 12 | 3,94±0,17 | 11 | 3,65±0,17 | 1,24 | >0,05 |
| 11 grade | Boys | 10 | 5,71±0,21 | 17 | 5,64±0,20 | 0,25 | >0,05 |
| | Girls | 22 | 4,96±1,13 | 16 | 4,94±0,18 | 0,02 | >0,05 |

In the age aspect, the improvement of data with age in pupils of both studied groups is established, but these distinctions are inaccurate (p>0,05). It should be noted that the true nature of the differences is observed only by the results of a triple jump on the right and left leg in girls of control groups (p<0,001). Comparing the indicators for the article revealed, basically, a reliable prevalence of boys data, over the results of girls (p<0,05–0,001).

Determining the general level of development of power abilities to conduct a pedagogical experiment, it is established that for the 10th–11th-grade pupils, both groups, the results correspond to below the average level.

After applying the variation module “CrossFit” in the educational process of physical education, a significant improvement in all the parameters studied, both in boys and girls of the main groups, and these distinctions are reliable (p<0,05–0,001). Thus, the increase in results reflecting the level of development of the maximum dynamic strength of abdominal muscles in the 10th-grade boys was - 24,5%, the 11th-grade - 23,7%; in girls, respectively - 55,3% and 43,3%; maximum strength - for the 10th grade boys is 27,8%, the 11th-grade - 17,9%; in girls - 44,1% and 30,8% respectively; speed power - for the 10th-grade boys is 6,6%, the 11th-grade - 9,4%; in girls, 20,5% and 46,7% respectively.

The analysis of secondary data by age and gender in pupils of the main groups found that basically, the trend of discrepancies remained unchanged compared to the initial results. By examining the pupils of control groups after the experiment, it was found that they also improved somewhat, but these changes are insignificant or reliable (p>0,05). Thus, the increase in results varied from 0,3% to 10,1%. It should be noted that there are no changes in age and gender compared to the original data.

*Table 2*

**Comparison of development indicators of power abilities of pupils of main and control groups after the experiment**

| Grades / Sex | | Groups | | | | t | p |
|---|---|---|---|---|---|---|---|
| | | n | Main groups | n | Control groups | | |
| | | Indicators $\bar{X}$±m | | | | | |
| **Lifting of straight legs hanging (number of times)** | | | | | | | |
| 10 grade | Boys | 17 | 17,88±2,11 | 10 | 13,70±1,34 | 1,67 | >0,05 |
| | Girls | 12 | 12,17±2,06 | 11 | 7,91±1,31 | 1,74 | >0,05 |
| 11 grade | Boys | 10 | 19,80±1,53 | 17 | 15,12±0,86 | 2,67 | <0,05 |
| | Girls | 22 | 14,14±0,93 | 16 | 10,19±1,25 | 2,54 | <0,05 |
| **Bending and extension of hands lying on the floor (number of times)** | | | | | | | |
| 10 grade | Boys | 17 | 35,12±1,56 | 10 | 27,80±3,78 | 1,79 | >0,05 |
| | Girls | 12 | 12,25±1,69 | 11 | 10,82±1,45 | 0,64 | >0,05 |
| 11 grade | Boys | 10 | 36,20±2,00 | 17 | 32,94±2,54 | 1,01 | >0,05 |
| | Girls | 22 | 15,05±1,20 | 16 | 12,38±1,00 | 1,71 | >0,05 |
| **Triple jump on the right and left leg (cm)** | | | | | | | |
| 10 rade | Boys | 17 | 6,01±0,13 | 10 | 5,42±0,29 | 1,83 | >0,05 |
| | Girls | 12 | 4,75±0,18 | 11 | 3,79±0,20 | 3,62 | <0,01 |
| 11 grade | Boys | 10 | 6,25±0,18 | 17 | 5,65±0,20 | 2,20 | <0,05 |
| | Girls | 22 | 7,27±0,16 | 16 | 4,97±0,17 | 9,74 | <0,001 |

Comparing the data obtained by pupils of the main and control groups (Table 2) after the introduction of CrossFit exercises, we found that the results of pupils of the main groups are better than those of pupils of control groups. It should be noted that the true nature of the differences is traced by the indicators of the lifting of straight legs hanging of the 11th-grade pupils ($p<0,05$); triple jump on the right and left leg in the $10^{th}$-grade girls ($p<0,01$) and the 11th-grade pupils ($p<0,05$; 0,001).

By establishing the general level of development of power abilities, after applying the variable module "CrossFit" in the system of school physical education, it is determined that the data improved from below average to above average in the 10th–11th-grade pupils of the main groups. It should be noted that the indicators of pupils of control groups didn't change significantly and correspond, as at the beginning of the research below the average level.

Therefore, the above indicates that the introduction of CrossFit exercises in the educational process of physical education positively influenced the level of development of strength of pupils of older school-age of the main groups.

**Conclusions / Discussion**

According to the results of the research, it is established that after the introduction into the educational process of physical education of the experimental program, there is a significant improvement in the level of development of power abilities of high school pupils. Thus, reliable changes are traced to all the parameters studied, both in boys and in girls of the main groups ($p<0,05$; 0,001).

The obtained by us results are consistent with the data of H.M. Shamardina (2007), B.M. Shyian (2009), Yu. Kuramshin (2010), shows that the highest rates of increase in absolute strength, according to the nine main muscle groups are noted in boys from 13–14 and 16–18 years-old, in girls from 10-11 and 16–17-years-old. The relative strength indicators of especially significant rates increase in of 9–11 and 16–17-year-old children.

These are supplemented by numerous works, leading specialists, according to which there is an improvement in the level of development of strength in high school children under the influence of classes of various types of motor activity. So,

scientists T.M. Kravchuk, T.V. Karpunets, I. V. Stepanenko (2019), indicate that the introduction of functional exercises in the main part of the lesson contributed to a significant improvement in the strength abilities of high school pupils; T.I. Suvorova, M.S. Moroz, A.H. Karabanov (2011), note that under the influence of athletic gymnastics, the level of development of strength in high school pupils significantly improved; L. Horbunov (2016), shows that boys and girls of the $10^{th}$ grade have a tendency to improve the level of development of power under the influence of health tourism; I. M. Skrypka, S.V. Cheridnichenko, M.O. Lysiak (2018) showed positive dynamics of the level of development of power capabilities among 16–17 year old boys after the introduction of the developed program of power direction into the training process.

Considering the level of development of pupils of control groups obtained after the experiment, it is determined that they also improved somewhat, but these changes are less significant than in the experimental groups and inaccurate ($p>0,05$).

So, our studies indicate the positive impact of the proposed CrossFit exercises on the level of development of strength abilities of the 10th–11th-grade pupils, which makes it possible to recommend teachers of physical culture to introduce a variable module “CrossFit” into the educational process of physical education of high school pupils.

**Prospects for further research** in this area can be carried out by determining the level of physical preparedness of high school pupils under the influence of CrossFit exercises.

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# MODERN TRENDS IN PHYSICAL CULTURE AND SPORTS MANAGEMENT IN UKRAINE

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**Purpose:** to highlight modern trends in the management of physical culture and sports in Ukraine on the basis of generalization of the scientific heritage of domestic scientists.

**Material and methods:** theoretical and practical research of domestic scientists, official documents, methods of comparison, synthesis, analysis.

**Results:** in the context of our country's European integration, the norms and standards introduced by the European Union governing physical activity and sports should be adhered to, and a roadmap for the development of sports should be developed at the state level. There is a need to separate the field of sports at the legislative and organizational level, so in scientific circulation and in the legal field, in accordance with European law, it is advisable to introduce the concept of "sports" to describe the activities of sports organizations and other business entities physical culture and sports services and carry out activities in such areas as health physical activity, sports in education and training, mass sports and sports for all, high-achievement sports and professional sports. The concept of "physical culture" should be included in scientific and social circles to outline the activities of people related to

the use of physical exercises. These issues should be regulated at the legislative level and appropriate amendments should be made to the Law of Ukraine "On Physical Culture and Sports" and bylaws governing the field of sports.

**Conclusions:** modern trends in the management of physical culture and sports in Ukraine are the transition to European standards, changing the mechanisms of state policy, decentralization of power, market development and improving the quality of physical culture and sports services through the introduction of state standards.

**Keywords:** physical culture, sports, sphere of physical culture and sports, sphere of sports, physical culture and sports organizations, management, decentralization, reform.

## Introduction

Domestic scientists [4, 10, 12, 26] in their studies substantiate the need to reform public administration in the field of physical culture and sports in the context of decentralization of power, while the authors [3, 10, 16] suggest using the experience of other states. Researchers [9, 12, 25] agree that the expansion of the powers of local governments will have a positive impact on the use of local resources and will contribute to increased responsibility. O. Kuzmenko, relying on Western European experience, notes that national minimum standards guaranteed within the framework of a decentralized administration structure will help to balance the development of physical culture within the state.

Along with the reform of the administrative system and the distribution of powers between state authorities and local self-government, researchers are interested in the issues of commercialization of sports [2, 11], transition to a market economy [6, 18], changes in the forms of economic activity in the field of physical culture and sports [9, 11, 16]. In their studies [6, 16, 18], scientists noted that the sphere of physical culture and sports is specific and characterized by features of economic activity, since it is aimed primarily at improving people's health, taking this into account, the market of physical culture and sports services is developing. In addition,

there is sport as a separate type of economic activity, and this issue was also considered by modern researchers [6, 11]. A. Krasovskaya, A. Koshevoy [9] developed a marketing concept of sports management and substantiated the possibility of its use in the context of the institutional transformation of the sports sector.

In the course of analyzing the results of modern scientific research on the problem of managing physical culture and sports, questions arose that require clarification and additional study, in particular:

- use of the concepts "branch of physical culture and sports", "sphere of physical culture and sports", "sphere of sports";

- mechanism for the implementation of state policy in the field of physical culture and sports in the context of decentralization of power

Given the above, the purpose of the study was to highlight the current trends in the management of physical culture and sports in Ukraine based on the generalization of the scientific heritage of domestic scientists.

## Material and Methods of research

The study used theoretical and practical research of domestic scientists, official documents, methods of comparison, synthesis, analysis.

## Results of the research

The study showed that today there is no doubt about the important role of physical culture and sports in the life of a person, society, state, this is discussed in the scientific works of modern researchers and legal documents [17, 22, 25]. In domestic literature, the issues of sectoral management and the formation of state policy in the field of physical culture and sports are widely disclosed [1, 3, 10] with reference to Article 49 of the Constitution of Ukraine, which states that the state takes care of the development of physical culture and sports. In addition, the basis for further scientific exploration in the direction of finding effective ways to introduce a fundamentally new model of physical culture and sports management in our state has been formed [26].

When summarizing the array of scientific legacies of domestic authors, we were faced with the need to define such definitions as "sphere of physical culture and sports" and "sphere of sports", which the authors widely use in their works, sometimes identifying them. At the same time, we did not meet the interpretation of these concepts in modern scientific literature and regulatory documents. It should be noted that the Law of Ukraine "On Physical Culture and Sports" [20] contains the wording "sphere of physical culture and sports", however, the text of the document does not specify this term, but only definitions and directions of physical culture and sports are presented (Table 1).

*Table 1*

**Definition of the terms "physical culture", "sport" and their directions in accordance with the Law of Ukraine "On physical culture and sports"**

| Physical culture | Sport |
|---|---|
| The activities of the subjects of the sphere of physical culture and sports are aimed at | |
| ensuring the physical activity of people with the aim of their harmonious, primarily physical, development and maintaining a healthy lifestyle | identification and unified comparison of people's achievements in physical, intellectual and other fitness through sports competitions and appropriate preparation for them |
| Directions | |
| - physical education of different groups of the population,<br>- mass sports,<br>- physical culture and sports rehabilitation | - children's sports,<br>- children's and youth sports,<br>- reserve sport,<br>- sports of the highest achievements,<br>- professional sports,<br>- sports of veterans,<br>- olympic sport,<br>- non-Olympic sport,<br>- service-applied and military-applied sports,<br>- sports of persons with disabilities, etc. |

Table 1 shows that physical culture and sports are the activities of subjects in the sphere of physical culture and sports that have different goals and directions. In the scientific works of modern domestic scientists, you can find different concepts for designating the types of activities associated with the use of physical exercises, in particular, domestic scientists actively use the concepts of "branch of physical culture and sports", "sphere of physical culture and sports", "sphere of sports". Let's consider these concepts in the context of the sources we analyzed. Domestic authors use in

their works the concept of "branch of physical culture and sports" in the context of managing the sector of the national economy [3, 11, 12, 16].

This use of the term is inherent in post-Soviet countries, including Ukraine, since already at the time of independence until 1994, the “All-Union Classifier of Branches of the National Economy” (1976) was used on the territory of our state, in which physical culture was an integral part of the industry “Health care, physical culture and social security”, referred to the non-productive sphere of activity. In 1994, the "General Classifier" of "Sectors of the National Economy of Ukraine" (1994) was approved, in which the object of classification was "a branch of the national economy of Ukraine, that is, a set of production units that perform one or more similar types of production activities". In this Classifier, physical culture was also classified as a non-productive sphere of activity "Health care, physical culture and social security" (code 91000), sports belonged to this industry within the sub-sector "Physical culture and sports" (91700) [5]. The classifier noted that the type of production activity is not a type of economic activity as in the international classification, where the type of economic activity is used as a classification feature of economic entities, regardless of ownership and organizational and legal forms of management. Therefore, in this case, the concept of "branch of physical culture and sports" means a non-productive sphere of activity, a branch of the national economy - namely: a set of economic entities, regardless of ownership and organizational and legal forms of management.

It turned out that the concept of "sphere of physical culture and sports" is used by the authors in the study of the state management of physical culture and sports and the formation of state policy in this area [1, 2, 22] in accordance with the Law of Ukraine "On physical culture and sports" [20].

In his own scientific works V.A. Sutula notes that the phrase "physical culture and sport" is widely used in Ukraine in the scientific works of domestic scientists and at the legislative level to determine and regulate people's activities in the relevant area of public life, namely in the "sphere of physical culture", in this concept "sphere physical culture" is defined as a sphere of people's activity associated with the use of

physical exercises, and "physical culture" is a historically determined activity of people associated (directly or indirectly) with the use of physical exercises and its individual and socially significant results, the main areas of physical culture are physical education, sports, physical fitness (physical recreation) [23].

The concept of "sphere of sports" [6, 9, 11] is more often used in studies devoted to the management of physical culture and sports organizations, entrepreneurial activities of business entities in the provision of physical culture and sports services, and other issues related to economic activity in the field of sports. This, in our opinion, is explained by changes in the Classifier of types of economic activity in accordance with international standards, in which only sports are classified as types of economic activity [8].

Considering the concept of "sphere of sports", we note that the concept of "sport" in modern scientific literature is used for the property of a specific area of human activity, the feature of which is the presence of competitive activity and special training for it, and the goal of playing sports is the greatest result [19]. Sport is a special socio-cultural phenomenon, which is a historically determined activity of people associated (directly or indirectly) with the use of physical exercises aimed at preparing for and participating in competitions, as well as individual and socially significant results of such activities [23].

According to the Law of Ukraine "On Physical Culture and Sports" (in the first edition), which was put into effect in 1994, the term "sport" was defined as "an organic part of physical culture...". This is reflected in the title of Chapter III "Sport is a special area of physical culture activity" [21].

In 1996, the State Classifier of Ukraine DK 009:96 Classification of Economic Activities was approved, the objects of classification in which were already the types of economic activities of business entities (individuals and legal entities) within the framework of the State Program for the Transition of the International System of Accounting and Statistics [14]. According to the Classifier, economic activity is a process of combining actions leading to the receipt of an appropriate set of products or services. The type of activity takes place when resources (equipment, labor,

technological means, raw materials and materials) are combined to create the production of specific products and the provision of services. As in the "General Classifier" of "Sectors of the National Economy of Ukraine" (1994), an industry is a set of all production units involved mainly in the same or similar types of production activities. To highlight sectors of the economy, Section and Subsection are introduced, and for deeper detailing of Classifier groupings: section, group, class, subclass. In this classifier, physical culture disappears as a type of economic activity, and Section O Collective, public and personal services included sports in Section 92 “Activities in the field of recreation and entertainment, culture and sports”, Group 92.6 “Activities in the field of sports”. For the first time in regulatory documents we meet the term "sphere of sports" [7].

In 2011, the Law of Ukraine "On Physical Culture and Sports" came into force in a new edition, where sport is a separate type of activity of subjects of the sphere of physical culture and is regulated by Section IV "Sport" [20].

In 2012, the National Classifier “Classification of Types of Economic Activities” DK 009:2010 [15] was put into effect, created on the basis of European classifications, where the most generalized groupings of types of economic activity at the section level, which make it possible to identify the main sectors of the economy. In accordance with the Classifier, sport was included in the “Section R” “Arts, sports, entertainment and recreation”, Section 93 “Activities in the field of sports, recreation and entertainment”, group 93.1. "Activities in the field of sports" [8].

Therefore, it is advisable to use the term "sphere of sports" in cases related to the types of economic activity reflected in the Classifier. At the same time, there is a contradiction between the current Law of Ukraine "On Physical Culture and Sports" (1994), which regulates the activities of the subjects of the "sphere of physical culture and sports" in the areas of physical culture and sports and the classification of economic activities DK 009:2010 (2010), in which presents the types of economic activity in the "sphere of sports", according to European standards and there is no mention of the "sphere of physical culture and sports". This issue needs to be settled at the legislative level in order to get rid of the dualism in the management of the

sphere, which is divided into "physical culture" and "sport", the directions of which are regulated by various ministries and departments.

The concept of “sphere of sports” is also found in works devoted to the study of the “European model” of the sphere of physical culture and sports” [4] and the experience of European countries in regulating physical activity and sports [10, 25] for further use in the process of reforming the domestic system of physical culture management. culture and sports This is explained by the fact that in the countries of the European Union all the activities of people related to the use of physical exercises are classified as "sports" [27]. In the White Paper on Sport of the European Union, the Council of Europe defines "sport" as all forms of physical activity which, through casual or organized activities, aim at the expression or improvement of physical fitness and mental well-being, the formation of social relations or the achievement of results in competitions at all levels [28].

The main directions of the development of motor activity and sports in European countries are: health-improving physical activity (as a means - sports movement); sports in education and training (sports and physical activity); mass sports and sports for all broad sections of the population; elite sports and professional sports [13].

You can see the contradiction between the areas of motor activity and sports of the European Union defined by the Council of Europe and the areas of physical culture and sports established by the current legislation of our country (Table 1), which requires additional study and regulation at the legislative level and making appropriate changes to the Law of Ukraine "On physical culture and sports.

To implement the five functions of sports defined in the White Book on Sports, in Ukraine, according to European requirements, it is necessary to ensure the proportional development of professional, mass and elite sports [13]. This requires reforming, firstly, the mechanism for implementing state policy in the field of sports; secondly, the system of authorities and the expansion of the powers of local governments and public physical culture and sports organizations.

The state policy in the field of sports should be aimed at forming a conscious attitude of citizens to physical exercises, awareness of their need to promote a healthy lifestyle, increase the effectiveness of elite sports. The instruments of state policy should be state social standards and norms determined by laws in order to provide social support to the population and guarantee consumers the quality of physical culture and sports services [4]. However, the procedure for establishing such guarantees in our country is not defined, which confirms the need to adopt the relevant Law of Ukraine "On state social standards and state social guarantees in the field of physical culture and sports" [26].

Today, in the field of physical culture and sports, there is a dependence of management objects on subjects, which is especially evident in the interaction of national sports federations and the central executive body. Thus, the balance between state power and municipal power, between the state and civil society in the process of managing the sphere of physical culture and sports in Ukraine is violated [13]. To ensure the implementation of European standards, it is necessary to define the scope of sports and its directions at the legislative level, in accordance with which to single out the subjects of the sports sector and determine the administration system. In many countries of the world, the following sports management structure has been built, where: mass sports - the public sector; big sport - non-state sector. The state should finance sports for all, and in big sports the share of state financial participation can be reduced to the required minimum. But state control over the activities of professional sports, on the contrary, should be strengthened [17].

**Conclusions / Discussion**

Among the current trends in the management of physical culture and sports, the main ones are the transition to European standards, changes in the mechanisms for implementing state policy, decentralization of power, market development and improving the quality of physical culture and sports services through the introduction of state standards. Since Ukraine is striving to become a full member of the European Union, it must comply with European norms and standards, including those regulating issues of physical activity and sports, which means that a roadmap for the

development of sports should be developed at the state level in accordance with the tasks and directions specified in white paper of the european union. There is a need to single out the sphere of sports at the legislative and organizational level, therefore, in the scientific circulation and in the regulatory field in accordance with European legislation, it is advisable to introduce the concept of "sphere of sports" to determine the activities of sports organizations and other business entities that provide sports and sports services and activities in areas such as recreational physical activity, sports in education and training, grassroots and sports for all, elite sports and professional sports. The concept of "physical culture" is expedient to involve in scientific and public circulation to determine the activities of people associated with the use of physical exercises. These issues should be resolved at the legislative level and appropriate changes should be made to the Law of Ukraine "On Physical Culture and Sports" and by-laws regulating the field of sports.

At the same time, the so-called “European sports model” should not be built in Ukraine, because due to the diversity and complexity of European sports structures, an unrealistic attempt to determine a single model for organizing sports in Europe [28]. This means that we should, based on the core values and functions of sport defined by the Council of Europe, transform the field of physical culture and sports into the field of sport, taking into account the existing conditions, opportunities, resources, traditions and values that are characteristic of our country.

**Prospects for further research** in this direction are to improve the system of regulation of the market of physical culture and sports services.

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# MIDDLE MOUNTAINS TRAINING OF HIGH-QUALIFIED VISUALLY IMPAIRED SPRINTERS

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**Purpose:** determine the impact of middle mountains training on the visual acuity and the level of preparadness of highly qualified visually impaired sprinters.

**Material and methods:** we studied the indicators of the level of preparadness and visual acuity of the Honored Master of Sports of Ukraine in para-athletics among athletes with visual impairmants in the middle mountains. The following methods were used: analysis and generalization of scientific and methodological literature, analysis of training loads and processing of parameters of training activity, pedagogical observation, pedagogical experiment (auto experiment), visometry, methods of mathematical statistics.

**Results:** middle mountains training led to positive changes in the indicators of the functional state of the visual analyzer and the level of preparadness of athlete.

**Conclusions:** the use of preparation of highly qualified visually impaired sprinter in middle mountains training positively influenced the development of the level of special preparadness and the visual acuity.

**Keywords:** middle mountains, special preparadness, visual acuity, visually impaired.

## Introduction

Training in mid-mountain conditions has long been an effective means of preparing qualified athletes for high-level competitions [8, 11].

It is generally accepted that in mid-mountain conditions there are a number of factors that cause hypoxia in the human body. The main ones are: atmospheric pressure density, reduction of atmospheric and partial pressure [2, 4]. Most scientists believe that it is hypoxia that is one of the factors of successful preparation for competitions and an effective means of mobilizing the body's functional reserves and transferring it to a new, higher level of adaptation for competitions in plain conditions [6, 8, 9, 11]. J. Kolba believes that training in the mountains contributes to the economy of work, which is expressed in an increase in the oxygen capacity of the blood and oxygen diffusion into muscle tissue [3]. V. N. Tutevich, D. B. Dill, L. G. C. E. Pugh in their works note that when moving in cyclic sports in a rarefied atmosphere, it is possible to develop higher speeds, especially its individual components: the frequency of movements and the speed of a single muscle contraction [17]. The impact of hypoxia caused by a decrease in the partial pressure of oxygen in the inhaled air and hypoxia arising under the influence of high-intensity loads on the preparedness of athletes are devoted to the work of A. S. Kolchinskaya, V. M. Platonov, M. M. Bulatova [2, 4]. In the works of J. Vigil, F.P. Suslov, E.B Gippenreiter, T.V. Samolenko and V.M. Platonov, exemplary models of mesocycles of training of highly qualified athletes in the middle and high mountains during the preparation for the main competitions are given [6, 8, 9, 10, 13, 14]. According to Ya. M. Kots [6], an increase in the sensitivity of sensory apparatuses under the influence of a complex of climatic factors in the middle mountains leads to a decrease in the speed of a motor reaction: latent time, contraction and relaxation of muscles. V. M. Platonov points out that training in mid-mountain conditions, along with improving the capabilities of various parts of the energy supply system, can negatively affect the most important components of technical and tactical skill, as well as a number of important components of physical and mental fitness [9]. At the same time, A. S. Kolchinskaya in her research found that training in mid-mountain

conditions using traditional means and methods significantly improves the endurance and speed-strength qualities of runners than the use of the same means in plain conditions [4].

In the scientific and scientific-methodical literature, the use of training in mid-altitude conditions in many sports, especially those related to the manifestation of endurance, is widely described. Much less work is devoted to the training of athletes in mountain conditions, in whose sports activity endurance is not a determining factor (strength, speed-strength, complex coordination, martial arts). The use of training in mid-mountain conditions in the training of Paralympic athletes with visual impairments today has no scientific justification. There is also no information about the influence of loads in mid-mountain conditions on the functional state of the visual analyzer. Coaches of the National Paralympic Team of Ukraine use "mountain" training in the preparation of athletes, relying on their own experience and the experience of training athletes who do not have health problems. Therefore, the study and elucidation of the influence of training in mid-altitude conditions on visual acuity and the level of special preparedness of highly qualified sprinters with visual impairments are relevant.

**Purpose** of the study is to determine the effect of training in mid-altitude conditions on visual acuity and the level of special preparedness of highly qualified athletes with visual impairments, specializing in sprinting.

The study was conducted on the topic "Features of the temporal-spatial characteristics of sports (athletics) and everyday motor activity" for 2020-2021 (state registration number 0119U103785).

## Material and Methods of research

The study was conducted in July-August 2021 during the preparation of athletes for the XVI Paralympic Games, which were held in Tokyo (Japan). The Honored Master of Sports of Ukraine in athletics among athletes with visual impairments, Paralympic champion, world record holder took part in the study. The study was conducted in the city of Kayseri (Turkey) in mid-mountain conditions and

complied with bioethical standards. The sportswoman in the national Paralympic athletics team of Ukraine lived at an altitude of 1059 m above sea level.

During testing, the athlete performed each exercise three times. All results were consistent with model performance for visually impaired sprinters. The athlete participating in the study was 27 years old and had a congenital damage to the visual apparatus: partial atrophy of the optic nerve in both eyes. The percentage of damage to the left eye is higher than the right. The visual acuity of the studied athlete was determined by the doctor of the national Paralympic athletics team of Ukraine according to the Sivtsev table. Since the athlete's vision did not allow seeing the symbols of the table from 5 m, Snellen's formula was used for accounting:

VISUS = d/D,

where V - visual,

d - distance from which the athlete saw the symbol of the table,

D - tabular value indicated on the left in the Sevtsev table.

Visometry was carried out during each test three times, the athlete's rest between measurements was 10-12 minutes in a sitting position with her eyes closed. According to the international classification, the visual acuity indicators of the athlete corresponded to the T13 class.

The following methods were used in the study: analysis and generalization of scientific and methodological literature, analysis of documentary materials (diaries and training plans), pedagogical observation, pedagogical experiment (auto experiment), visometry, methods of mathematical statistics.

Statistical analysis of the obtained data was carried out on a personal computer using Statgraphics Centurion 18 (version 18.1.11), using a t-test for the significance of differences in the means of related (dependent) samples.

**Results of the research**

The great practical experience of scientists and trainers allows us to assert that training in mid-altitude conditions is quite effective for athletes specializing in various sports, including those requiring the manifestation of speed-strength abilities [13, 15, 16, 19] . In order to prepare for the culminating competitions of the year, a

training plan was drawn up and the initial indicators of visual acuity and the level of preparedness of the athlete participating in the study were determined (Tables 1-2).

*Table 1*

**Indicators of the level of preparedness of an female athlete at the beginning of the study (n=1)**

| Indicators | Result | |
|---|---|---|
| | $\overline{X}$ | $\sigma$ |
| Standing long jump (m) | 2,60 | 0,03 |
| Triple Jump (m) | 7,31 | 0,03 |
| Running 10 m low start on command (s) | 1,62 | 0,03 |
| Running 30m(s) | 4,01 | 0,04 |
| Running 100m (s) | 12,65 | 0,05 |
| Running 150m(s) | 19,78 | 0,03 |

Testing data at the beginning of the study were consistent with model characteristics for visually impaired highly skilled sprinters.

The visual acuity of the left eye at the beginning of the study is lower than the right one. According to the international classification, the indicators of visual acuity of the studied athlete corresponded to the T13 class.

*Table 2*

**Visual acuity scores at the beginning of the study (n=1)**

| Visual acuity (V) | Result | |
|---|---|---|
| | $\overline{X}$ | $\sigma$ |
| Right eye | 0,063 | 0,003 |
| left eye | 0,065 | 0,001 |

In the first 3 days of the training camp, the training sessions were aimed at adapting the athlete to physical activity in mid-altitude conditions. The athlete trained 2 times a day. Morning workouts consisted of a warm-up, special exercises to develop running technique, attention exercises, a run of 4-5 segments and a hitch. Evening workouts were mostly power in nature. When performing physical activity, the athlete experienced shortness of breath, slight dizziness, heart rate after exercise was 186-192 beats / min, but after 1,5-2 minutes. rest, they decreased to 120-126 beats / min. In our opinion, this is the athlete's reaction to natural hypoxia, which is the main sign of mid-mountain conditions.

After adaptation to the conditions of the middle mountains, the athlete's training week consisted of 5 training sessions at the stadium (Ataturk Sport Hall, located at an altitude of 1079 m above sea level), 3 training sessions in the gym, 3 training sessions in the pool, 2 cross-country in the mountains at an altitude of 1200 m and 1 ascent to the mountains at an altitude of 1750 m above sea level.

The athlete noted that after the cross at an altitude of 1200 m above sea level, she felt an influx of energy, which was noted in the ease and speed of running at the stadium. There was an adaptation to mountain conditions, which was reflected in the disappearance of shortness of breath, dizziness; there was more light and brightness in the eyes. The day before the re-testing of the level of preparedness, the group climbed to a height of 1750 m.

At the end of the training camp in mid-mountain conditions, in all the studied indicators, except for the triple jump from a place, statistically significant differences were observed (Table 3).

*Table 3*

**Indicators of the level of preparedness at the end of the study in mid-mountain conditions (n=1)**

| Indicators | At the beginning of the study | | | At the end of the study | | | t | P |
|---|---|---|---|---|---|---|---|---|
| | $\overline{X}$ | m | $\sigma$ | $\overline{X}$ | m | $\sigma$ | | |
| Standing long jump (m) | 2,60 | 0,02 | 0,03 | 2,66 | 0,02 | 0,03 | 17,00 | <0,01 |
| Triple Jump (m) | 7,31 | 0,02 | 0,03 | 7,35 | 0,01 | 0,02 | 2,08 | >0,05 |
| Running 10 m low start on command (s) | 1,62 | 0,02 | 0,03 | 1,56 | 0,02 | 0,03 | 19,00 | <0,01 |
| Running 30m(s) | 4,01 | 0,03 | 0,04 | 3,91 | 0,02 | 0,03 | 17,32 | <0,01 |
| Running 100m (s) | 12,65 | 0,04 | 0,05 | 12,23 | 0,05 | 0,08 | 6,93 | <0,01 |
| Running 150m(s) | 19,78 | 0,02 | 0,03 | 19,28 | 0,13 | 0,19 | 4,80 | <0,05 |

The greatest increase was observed in the results in the 10m run from a low start on the team – 3,7% and in the 100m run – 3,3%. The results of the female athlete in standing jumps improved from 2,60±0,03 m to 2,66±0,03 m. In the triple jump from the spot, there were no statistically significant differences between the results at the beginning and end of the training camp (p>0,05). A slight increase in the results in the triple jump from a place is explained by the relatively short time

between testing, as well as spontaneous insurance of the athlete's right foot after an injury on the eve of the training camp in mid-altitude conditions.

Under the influence of loads in mid-mountain conditions, the athlete improved visual acuity (Table 4) of the right eye by 7,9%, the left eye – by 3,07%. The difference between the increase in visual acuity of the right and left eyes, in our opinion, is associated with the peculiarities of congenital damage to the visual analyzer of the studied athlete.

*Table 4*

**Visual acuity indicators at the end of the study in mid-altitude conditions (n=1)**

| Visual acuity (V) | At the beginning of the study | | | At the end of the study | | | t | p |
|---|---|---|---|---|---|---|---|---|
| | $\overline{X}$ | m | $\sigma$ | $\overline{X}$ | M | $\sigma$ | | |
| Right eye | 0,063 | 0,02 | 0,03 | 0,068 | 0,02 | 0,033 | 14,00 | <0,01 |
| left eye | 0,065 | 0,001 | 0,001 | 0,067 | 0,004 | 0,006 | 0,67 | >0,05 |

After the descent from the mountains, the weekly microcycle was carried out according to the restorative-supporting principle, with a significant decrease in the total volume and intensity of loads. The period of stay in the middle mountains was based on the recommendations of specialists [2, 6, 8, 10] for athletes specializing in speed-strength sports and was equal to two weeks.

To identify the delayed training effect of "mountain training", the female athlete was tested 10 days after the descent from the mountains in the plains (Tables 5-6).

*Table 5*

**Indicators of the level of preparedness after the descent from the mountains (n=1)**

| Indicators | At the end of the training camp in mid-mountain conditions | | | 10 days after the descent from the mountains | | | t | P |
|---|---|---|---|---|---|---|---|---|
| | $\overline{X}$ | m | $\sigma$ | $\overline{X}$ | m | $\sigma$ | | |
| Standing long jump (m) | 2,66 | 0,02 | 0,03 | 2,68 | 0,02 | 0,03 | 5,00 | <0,01 |
| Triple Jump (m) | 7,35 | 0,01 | 0,02 | 7,40 | 0,04 | 0,05 | 1,99 | >0,05 |
| Running 10 m low start on command (s) | 1,56 | 0,02 | 0,03 | 1,55 | 0,02 | 0,03 | 2,00 | >0,05 |
| Running 30m(s) | 3,91 | 0,02 | 0,03 | 3,90 | 0,01 | 0,02 | 2,00 | >0,05 |
| Running 100m (s) | 12,23 | 0,05 | 0,08 | 12,04 | 0,05 | 0,07 | 29,00 | <0,01 |
| Running 150m(s) | 19,28 | 0,13 | 0,19 | 19,07 | 0,08 | 0,12 | 3,67 | >0,05 |

*Table 6*

**Indicators of visual acuity after descending from the mountains (n=1)**

| Visual acuity (V) | At the beginning of the study | | | 10 days after the descent from the mountains | | | t | p |
|---|---|---|---|---|---|---|---|---|
| | $\overline{X}$ | m | $\sigma$ | $\overline{X}$ | M | $\sigma$ | | |
| Right eye | 0,068 | 0,02 | 0,033 | 0,073 | 0,002 | 0,003 | 16,00 | <0,01 |
| left eye | 0,067 | 0,004 | 0,006 | 0,068 | 0,002 | 0,003 | 1,00 | >0,05 |

The increase in the studied indicators revealed the most delayed training effect from loads in mid-mountain conditions on the results of the female athlete's competitive distance - in the 100-meter run, it improved by 1,6% compared to the previous test.

Indicators of visual acuity of the right eye improved by 7,4%, the left remained almost unchanged.

So, the obtained results testify to the positive effect of training loads in mid-mountain conditions on visual acuity and the level of special preparedness of the studied female athlete.

**Conclusions / Discussion**

The analysis of scientific and scientific-methodological literature showed that training in mid-altitude conditions is used in most sports, mainly related to the manifestation of endurance, however, no scientific materials on the use of this methodological technique in the training of Paralympic athletes have been found.

As a result of the study, the opinion of M. M. Bulatova on the construction of the training process in mid-mountain conditions was confirmed. It has been established that the rational planning and use of training loads is based on the systematic passage of the stage of initial (acute) adaptation of the studied athlete to the conditions of the middle mountains. The decrease in loads in the first 3 days of the training camp led to the successful passage of the period of acute acclimatization in a visually impaired female athlete.

The information of A. S. Kolchinskaya, V. M. Platonov on the effect of hypoxia on the preparedness of athletes has been expanded and supplemented. It was

found that training under conditions of natural hypoxia improves visual acuity and the level of preparedness of sprinters with visual impairments.

Analysis of the results of a highly qualified sprinter athlete with visual impairments, obtained after applying training loads in mid-altitude conditions, indicates that the results in long jumps from a place, 10-meter running from a low start on command, 30-meter, 100-meter and 150-meter runs reliably changed. Significant changes were observed only in visual acuity of the right eye. Thus, the use in training of a highly qualified sprinter with visual impairments of training in mid-altitude conditions had a positive effect on the level of special preparedness and visual acuity indicators.

A reliable increase in results at the competitive distance after a ten-day stay in the conditions of the plain allows us to say that such loads can be used in the competitive period at the stage of direct preparation for the main competitions.

**Prospects for further research.** The research materials will allow to analyze the training of highly qualified sprinters with visual impairments, taking into account the organization of their annual training.

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# PHYSICAL PREPARATION OF FOOTBALL PLAYERS AT THE STAGE OF PRELIMINARY BASIC TRAINING

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**Purpose:** to consider theoretical issues of physical preparation of football players at the stage of preliminary basic training.

**Material and methods:** in order to get acquainted with the state of the issue under study, an analysis and generalization of scientific, scientific and methodological literature, theoretical provisions on the physical preparation of football players at the stage of preliminary basic training was carried out. Analyzing scientific sources, the questions on the results of the study were considered: the use of means and methods of various orientations in the training of young athletes. The objectives and didactic purpose of the preliminary basic training phase were described. The place of physical training of young football players in achieving a sports result has been determined.

**Results:** it was found that the selective increase in training loads at all stages of sports training of children and adolescents is determined by the laws of the development of physical abilities. A high level and growth of development at a young age is assessed as a sensitive period and is fundamental for increasing the means of influence on a specific physical quality. Some researchers believe that the best sensitive period for the development of strength in young football players is the age of 13-15 years, others - 14-16 years.

**Conclusions:** analyzing scientific sources, the following issues were considered based on the research results: the use of means and methods of various orientations in the training of young athletes. In organizing the training process of football players, it is necessary to take into account the high intensity of metabolic processes and the age characteristics of a growing child's body. The relatively low functional development of the cardiovascular and respiratory systems with boys aged 13–14 significantly limits the ability to perform long-term intense loads. As a result of studying the literature, it was found that, in accordance with the playing role, all-round physical training (with an emphasis on speed and speed-strength qualities) of young footballers aged 13-14 is an actual scientific research.

**Keywords:** physical preparation; physical training; young footballers; preliminary basic training.

## Introduction

The search for gifted, capable, promising children who can further achieve high sports results at the domestic and international level is one of the directions for improving the training system in modern sports of the highest achievements. This scientific and practical direction is considered as relevant with clearly expressed organizational, pedagogical, socio-economic and ethical aspects [5; 6]. In the training of young athletes, a variety of means and methods of various orientations are used, the use of which is widely represented in sports, including football, with the predominance of the game method of performing exercises [3; 4; 7; 11].

Physical training of young football players occupies a key place in achieving a sports result. The effectiveness of competitive activities is largely due to the level of physical preparation of football players. Without a sufficiently high level of development of strength, speed, agility and endurance, it is impossible to successfully apply technical techniques and perform the planned tactical actions in the minimum periods of time and throughout the game. Therefore, the activity and effectiveness of

team, group and individual technical and tactical actions depend on physical preparation [11, p. 9].

**The purpose -** is to consider theoretical issues of physical preparation of football players at the stage of preliminary basic training.

**Material and methods of the research**

In order to get acquainted with the state of the issue under study, an analysis and generalization of scientific, scientific and methodological literature, theoretical provisions on the physical preparation of football players at the stage of preliminary basic training was carried out. Analyzing scientific sources, the questions on the results of the study were considered: the use of means and methods of various orientations in the training of young athletes. The objectives and didactic purpose of the preliminary basic training phase were described. The place of physical training of young football players in achieving a sports result has been determined.

**Results of the research**

Physical training is one of the most important components of sports training. There are general, functional and special physical training. General physical training is understood as the process of harmonious development of motor qualities that positively affect the achievements of the football player and ensure the effectiveness of the training process. Functional physical training is focused on creating a special basis necessary for the effective performance of large amounts of work on the development of special motor qualities. Special physical training is aimed at developing motor qualities in accordance with the requirements of the specifics of football and the peculiarities of competitive activity [11, pp. 36-55].

Functional readiness serves as the foundation, the basis for successful work on the development of special physical qualities and abilities. It means the functional capabilities of a football player, manifested in motor actions related to the chosen sport, the body's ability to endure large specific loads, to intensive recovery processes.

Special preparedness is characterized by the level of development of physical qualities, the capabilities of organs and functional systems that directly determine the achievements in football.

Selective increase in training loads at all stages of sports training of children and adolescents is determined by the regularities of the development of physical abilities. A high level and growth of development at a young age is assessed as a sensitive period and is fundamental for increasing the means of influence on a specific physical quality. Research by Z.I. Kuznetsova, A.A. Guzhalovskaya, L.V. Volkova, Yagello V. (2000) found that physical qualities in the age aspect develop heterochronously, an increase in the rate of development, their decline and rise is clearly considered. Knowledge of the sensitive periods of age-related development of individual components of physical preparation allows using them with the greatest efficiency to increase the motor potential of young athletes, their abilities and capabilities due to pedagogical influence.

So at primary school age, a more pronounced increase in strength in boys is noted from 11-12 years old. Some researchers believe that the best sensitive period for the development of strength in young football players is the age of 13-15 years, others 14-16 years. By the same period, children begin to show, mainly, the strength of the muscles of the right arm. In adolescence, muscle strength develops quite rapidly. The study of the endurance of schoolchildren to work of different intensities (60, 70 and 90% of the maximum) shows that the greatest growth rate of endurance to cyclic work with an intensity of 90% is observed in boys aged 10-14 years. Football players are 12-14 years old, according to O.V. Zlygosteva, an increase in the force gradient is due to an increase in maximum strength and a decrease in the time to reach it. It was found that in 42% of the study participants the annual increase in maximum strength was 12-14%, in 36% of young football players - 5-8%, 22% of the participants showed an insignificant increase in muscle strength, which was 4-6% [5].

The results of physical preparation testing of young football players aged 14-16, conducted by Y.D. Svistun et al., revealed that they had slightly lower average indicators of the development of speed qualities, dynamic strength, anaerobic and

aerobic endurance, in comparison with the normative indicators of the Children's and youth sports school [9],

V.A. Belenko et al. propose a training program using exercises of the "general physical preparedness" block and the "special physical preparedness" block. In the course of the study, the authors found a high correlation between them in the range from 0,62 to 0,78. More often, a correlation relationship is observed with exercises that characterize the level of physical preparation: running 15 m, 30 m, 60 m, 400 m directly determining the achievements in football [1].

**Conclusions / Discussion**

The analysis of scientific sources confirms that there are many questions in this direction that require study, clarification, scientific substantiation.

So, according to the research results of A.N. Berdnikova of football players 13-14 years old, a high level of endurance development, which was found in 18.2% of football players, speed-strength readiness – 45,4%, speed-strength endurance – 36,4% and a high level of development of speed abilities - 45, is given, 4% of players [2]. Correction of the training process of athletes according to the technology of individualization of physical training, according to the author, provided a significant increase in the results in field tests: test, hitting the ball at a distance (from 38,6 ± 3,7 m to 40,6 ± 4,4 m), throw-in ball from behind the head (from 13,7 ± 2,1 m to 15,4 ± 1,7 m) and 30 m running on the move (from 4,5 ± 0,2 s to 4,3 ± 0,2 with). The use of the technology of individualization of the training process made it possible to increase the level of endurance and speed readiness, as well as to keep the indicators of speed-power endurance at a high level. The special physical preparation of football players is manifested in exercises with a ball. These exercises require maximum coordination of the manifestation of most physical qualities: strength, agility, agility, flexibility.

As a means of developing physical preparation A.M. Galimov et al. recommend the use of physical exercises of general influence, borrowed from other sports. During the means of dexterity education, S.E Volozhanin et al. recommend the use of exercises in gymnastics, acrobatics, athletics, motor and sports games [3].

Among the means of physical training, according to V.A. Kharlanov, a significant place is occupied by exercises with objects: stuffed, basketball, volleyball, tennis balls; with a rope, rubber shock absorbers, dumbbells, exercise equipment [10].

E.A. Maslovsky et al. believe that thanks to the special exercises of complex impact, included in the combinations, there is a positive dynamics of indicators of general and special physical training of young football players [1; 7; 8]. The introduction of the integral training methodology into the training process of 13-14 year old football players, taking into account the complex use of game exercises of physical, technical-tactical and psychological orientation, according to P.P. Kolupanov, contributed to a significant improvement in technical readiness indicators [6].

One of the most important directions of intensification and improvement of the training quality of young football players is the use of the circular training method for the development of motor abilities and the improvement of the technical qualities of athletes. During the research V.P. Guby et al. found that the inclusion of a set of circuit training complexes into the training process allowed not only to increase the level of motor qualities development, necessary for the training and competitive activity of football players, but also to more effectively optimize the training process for the development of motor and technical qualities development [4].

During the period of active biological development, the priority task is not to achieve maximum results, but to comprehensive and harmonious physical development, which will ensure not only the active accumulation of a technical and tactical arsenal, but also the creation of a foundation for a qualitative increase in specific functional reserves in accordance with specialization in conditions of single combat with an opponent, a large number of sudden movements, jumping out, high speed of running, high-speed technique, hitting the ball, speed, strength and jumping are largely needed. To be able to jump well, the necessary speed, and to be able to run well and quickly or to stop, respectively, requires strength. Consequently, one of the most significant physical qualities for a modern football player is speed, including strength, which greatly affect the playing activity of a football player. Also, the

performance of game actions (defense-attack and vice versa) requires a high level of development of speed and speed-power qualities, as well as the necessary aerobic and anaerobic components of endurance, that is, this requires differentiation of motor actions of young football players.

The generally accepted definition of speed qualities speaks of speed as a quality that allows you to perform movement in a very short period of time. Speed qualities are very complex and purely nervous and muscular components can be distinguished in them. The first of them consists in the transmission of nerve impulses and brain activity, and the second is associated with the speed of muscle contraction. When the exercise is short-lived and of high intensity, it means the nerve component, since it affects the efficiency and frugality of the movements. Thus, running with maximum speed makes extremely high demands on the athlete's neuromuscular apparatus and the supply of his energy resources. In organizing the training process of football players, it is necessary to take into account the high intensity of metabolic processes and the age characteristics of a growing child's body. The relatively low functional development of the cardiovascular and respiratory systems in boys aged 13–14 significantly limits the ability to perform long-term intense loads. In accordance with the playing role, all-round physical training (with an emphasis on speed and speed-strength qualities) of young footballers of 13-14 years old is a topical scientific research.

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