ISSN 2311-6374

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

KHARKIV STATE ACADEMY OF PHYSICAL CULTURE

SLOBOZHANSKYI HERALD OF SCIENCE AND SPORT

Scientific and theoretical journal

Published 6 times in a year
English ed. Online published in October 2013

Vollum 8 No. 2

Kharkiv
Kharkiv State Academy of Physical Culture
2020

P 48
UDC 796.011(055)"540.3"

Slobozhanskyi herald of science and sport : [scientific and theoretical journal]. Kharkiv : KhSAPC. 2020, Vol. 8 No. 2, 137 p.

English version of the journal "SLOBOZANS`KIJ NAUKOVO-SPORTIVNIJ VISNIK"

The journal includes articles which are reflecting the materials of modern scientific researches in the field of physical culture and sports.
The journal is intended for teachers, coaches, athletes, postgraduates, doctoral students research workers and other industry experts.

Contents Themes:
1. Physical education of different population groups.
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4. Human health, physical rehabilitation and physical recreation.
5. Biomechanical and informational tools and technologies in physical education and sport.
6. Management, psychological-educational, sociological and philosophical aspects of physical education and sport.

Publication of Kharkiv State Academy of Physical Culture
Publication language – English

ISSN (English ed. Online) 2311-6374
ISSN (Ukrainian ed. Print) 1991-0177
ISSN (Ukrainian ed. Online) 1999-818X
Key title: Slobozhanskyi herald of science and sport
Abbreviated key title: Slobozhanskyi her. sci. sport

SLOBOZHANSKYI HERALD OF SCIENCE AND SPORT

scientific and theoretical journal **Vollum 8 No. 2, 2020**

CONTENT

UDK 796.011.009 (100)

ISSN (English ed. Online) 2311-6374

2020, Vol. 8 No. 2, pp.5-16

ORGANIZATIONAL AND PEDAGOGICAL CONDITIONS FOR ENSURING THE QUALITY OF PHYSICAL EDUCATION FOR SCHOOLCHILDREN

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Purpose: to determine the organizational and pedagogical conditions for ensuring the quality of physical education of students in secondary schools of Ukraine on the basis of extrapolation of foreign experience.

Material and methods: the studies were conducted in Pridneprovsk State Academy of Physical Culture and Sports. The study was used the following methods: theoretical analysis and synthesis of data from scientific and methodological literature and documentary materials, the method of comparison, the method of system analysis.

Results: the organizational and pedagogical conditions for ensuring the quality of physical education of schoolchildren are determined. The observance of them will allow to achieve the appropriate level of physical fitness and health of students, the formed system of students` knowledge in the field of physical education, including the organization of independent motor activity, the formed habit of doing physical exercises throughout life, students` sustained interest in the types of physical activity, the presence of social connections and skills interaction, the developed ability of teachers and students to carry out reflection.

Conclusions: analysis and generalization of the experience of organizing physical education in the countries of Europe, Asia and the USA made it possible to determine the organizational and pedagogical conditions for ensuring the quality of the physical education process that can be applied in the secondary education system of Ukraine.

Key words: conditions, quality, foreign countries, experience, performance criteria.

Introduction

The development of physical education of children and youth in the education system, bringing it to the world level should be carried out in the context of wide integration into the international education system and the exchange of best practices [18].

Many foreign countries have already come a long way in the transformation of school education, including physical education, and have reached a high level of its quality. A large number of foreign [11, 12, 13, 16, 19] and domestic [4, 6, 10] researchers have devoted their work to studying the features of the system of schoolchildren's physical education. Therefore, the accumulation of knowledge on various aspects of physical education organization from other countries will contribute to the creation of the most effective domestic model, taking into account national characteristics [8, 9].

Current trends in secondary education in Ukraine are reflected in the Law "About Complete General Secondary Education" [3], which complements the Law "About Education" [2] and offers real mechanisms for the implementation of the project "New Ukrainian School" [5]. The main ones are to ensure the individual educational trajectory of students by choosing the forms of general education, curricula, subjects (integrated courses) and their levels of complexity, teaching means, pace of learning the educational program, etc.; application of different types of assessment of students` learning outcomes (formative, current, summative, certification, independent external testing); introduction of pedagogical internship for persons who have no experience of pedagogical activity; inclusion; system of internal

and external quality assurance of complete general education; ensuring academic integrity in the field of general education; compliance with the requirements of state standards of primary, basic secondary and specialized secondary education; certification of teachers; introduction of academic freedom, which provides creation of author's teaching programs, the development of assessment system and encouragement of students. This means that at this stage of reforms Ukraine is applying the practice of building a system of basic education like in European and American countries.

Thus, an important source of determining the modern strategy for the development of physical education in Ukraine is the analysis of best practices in the organization of the educational process and ensuring its quality, research patterns and features of this important component of education in different countries [1, 7].

The purpose of the study: to determine the organizational and pedagogical conditions for ensuring the quality of physical education of students in secondary schools of Ukraine on the basis of extrapolation of foreign experience.

Material and Methods of the research

The studies were conducted in Pridneprovsk State Academy of Physical Culture and Sports. The study was used the following methods: theoretical analysis and synthesis of data from scientific and methodological literature and documentary materials, the method of comparison, the method of system analysis.

Results of the research

The study of foreign experience in ensuring the quality of the process of schoolchildren's physical education in some countries of Europe, Asia and America allowed us to determine the organizational and pedagogical conditions. The compliance of these conditions will improve the system of physical education of Ukrainian students.

It should be noted that "quality physical education" is a widely used term among experts in the field of physical culture. The most common are the following definitions, which have many common aspects and elements in the characterization of quality physical education:

1. UNESCO defines: “Quality Physical Education is the planned, progressive, inclusive learning experiences that take place as part of the curriculum in early years, primary and secondary education, and acts as the foundation for a lifelong engagement in physical activity and sport. The learning experiences offered to children and young people in physical education lessons should be developmentally appropriate to help them acquire psychomotor skills, cognitive understanding, and social and emotional skills they need to lead a physically active life” [14].

2. AIESEP (Association Internationale des Écoles Supérieures d'Éducation Physique) defines quality physical education, at any level, “as that which concerns the physical, affective, social and cognitive development of young people, exposing them to positive individual and collective learning experiences where they develop knowledge, skills and dispositions that allow them to be informed and responsible decision makers relative to engagement in physical activity and sport in their lives”.

3. SHAPE America: “Quality Physical education develops physically literate individual through deliberate practice of well-designed learning tasks that allow for skill acquisition in an instructional climate focused on mastery. Physical education addresses the three domains of learning: cognitive or mental skills related to the knowledge of movement; affective, which addresses growth in feelings or attitudes; and psychomotor, which relates to the manual or physical skills related to the movement literacy” [17, 21].

The European Framework for Quality Physical Education (EFQPE) includes the content of quality physical education:

– healthy students who eat well, have the ability and are ready to learn, as well as are supported in learning by family and society;

– a healthy, safe, protected environment that takes into account gender and also provides sufficient resources and tools for learning;

– content reflected in curricula and materials that promotes the acquisition of basic motor skills, healthy living skills, as well as knowledge of areas such as health, nutrition, disease prevention;

– processes through which teachers use child-centered approaches to learning in well-equipped schools, adequate assessment of skills for successful learning;

– results, covering knowledge, skills, attitude in accordance with the goals of education, social activity.

In addition, according to EFQPE, the criteria for the effectiveness of physical education process for schoolchildren can be:

1. Positive attitude to physical activity through a sense of achievement and satisfaction from physical activity.

2. Motivation and confidence to continue active participation in motor activities.

3. Competence in movement, which corresponds to the physical potential of students.

4. Experience in performing various movements.

5. Realistic self-knowledge and self-awareness, which allows students to set appropriate personal goals for physical activity.

6. Understanding the nature of movement, the importance and significance of physical activity as a contribution to the formation of a physically active lifestyle.

7. Finding ways to access physical activity outside the school [21].

Quality physical education in the United States of America is considered as:

– the most effective and comprehensive means of providing all children with the skills, attitudes, values, knowledge and understanding to participate in physical activity throughout life;

– helps to ensure the comprehensive development of mind, body and spirit;

– the only school subject, the main emphasis of which is on the body, physical activity, physical development and health;

– helps children to develop interest in physical activity, which is important for healthy development, lays the foundations for a healthy lifestyle of adults;

– helps children to develop respect for the body – both their own and others;

– forms an understanding of the role of physical activity in promoting health;

– promotes trust and self-esteem of children;

– enhances social development by preparing children to fight competition, win and lose, cooperation and interaction;

– forms skills and knowledge for future activities in the field of sports, physical activity, recreation and leisure [11, 22].

Indicators of quality physical education in Asia are: democracy of physical education; cultural orientation of the subject; focus on physical training; physical education as a mean of preparation for participation in physical activity and sports throughout life; holistic orientation of physical education for mind and body [15, 20].

As we can see, there are many common features in the criteria for the effectiveness of schoolchildren's physical education in different countries, but the main ones are the physical development of children, the formation of theoretical knowledge, motor skills, the need for exercise throughout life, maintaining social relationships. Summarizing the features of physical education process in different countries we can conclude that the criteria for the effectiveness of the educational process can be different organizational and pedagogical conditions. Implementation of these conditions will realize a comprehensive approach to ensuring the quality of physical education (Fig. 1):

• the presence of a legislative framework in the field of physical education, which declares the basic requirements for the educational process at school;

• availability of curricula, their quality content;

• material and technical base and sports equipment of the appropriate level for the implementation of the process of physical education;

• the number of hours to study the subject, ensuring compliance with time requirements and recommendations for physical activity;

• compliance of the subject content to existing standards;

• a wide range of types of physical activity in the curriculum;

• appropriate level of qualification of physical education teachers;

• holistic approach to student development (development of mental abilities, physical and socio-spiritual development);

• methods and approaches to learning;

• number of students per 1 teacher;

• taking into account the interests of students in planning the process of physical education (including for children with special needs);

• ensuring participation in various forms of physical education classes (curricular and extracurricular);

• constant monitoring of physical condition indicators;

• comprehensive assessment of students' academic achievements in psychomotor, cognitive and emotional spheres;

• feedback from students and parents.

The results of compliance with these organizational and pedagogical conditions will be: the appropriate level of physical fitness and health of students; formed system of students' knowledge in the field of physical education, including for the organization of independent motor activity; formed habit of exercise throughout life; steady interest in types of motor activity; availability of social connections and interaction skills; developed ability of teachers and students to reflect. Undoubtedly, every country has its own problems in organizing physical education for schoolchildren. Therefore, to achieve a high level of quality in the educational process it is necessary to address critical issues related to staff (all teachers must be competent in teaching physical education, constantly improve their skills), learning environment (security, proper logistics to enable all students to participate in all stages of the educational process), planning and implementation of recommendations (development and implementation of the planned sequence of educational programs based on learning standards, providing students with the knowledge, skills and competencies needed to participate in physical activity throughout life, inclusion of all students in various physical education activities), assessment of academic achievement (regular, comprehensive, consistent with national or local standards, application of various methods, technologies, tools and forms, designed to help students understand and improve knowledge, skills and competencies related to physical activity and improve physical fitness, provision feedback to students).

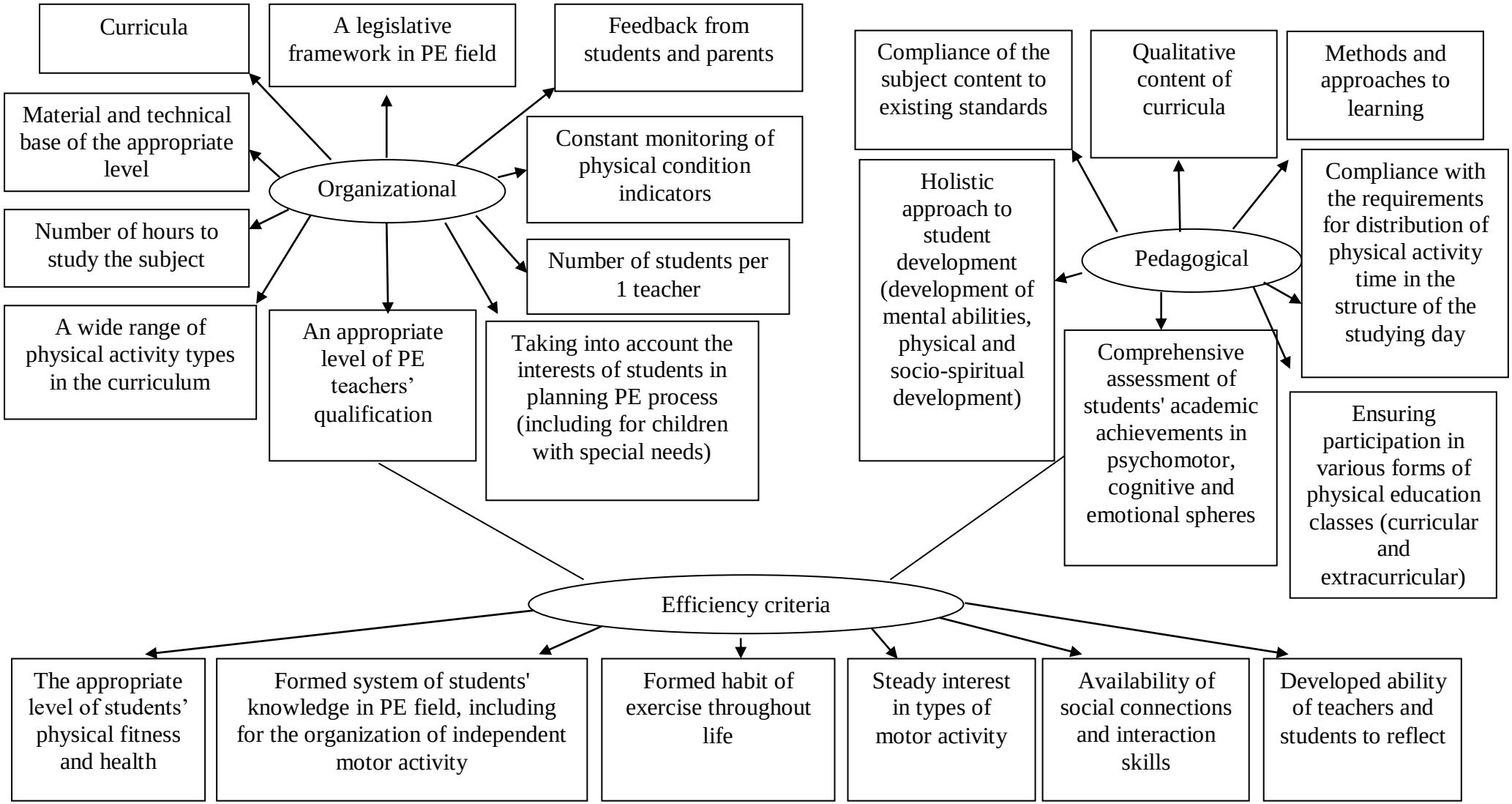

Fig. 1. Organizational and pedagogical conditions for ensuring the quality of physical education for schoolchildren

Conclusions / Discussion

The study allowed determining the criteria for the effectiveness of physical education in general education for the formation of a harmoniously developed personality of a student with a certain level of competence for use of physical culture throughout life. At the same time, achieving high quality of physical education requires solving some pressing problems in the organization of physical education process specific to different countries.

Analysis and generalization of the experience of physical education in Europe, Asia and the United States of America allowed us to determine the organizational and pedagogical conditions for ensuring the quality of physical education process. These conditions can be used in the system of general education in Ukraine. The organizational ones include: proper legislative, logistical, staffing, providing students with the opportunity to choose different types of physical activity, and so on. The pedagogical ones include: the quality of educational programs, their compliance with the established requirements and standards, applied methods and approaches to teaching and others.

Prospects for further research are to determine the effectiveness of the proposed measures to improve the system of physical education in Ukraine.

Conflict of interests. The authors declare that no conflict of interest.

Financing sources. This article didn't get the financial support from the state, public or commercial organization.

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Received: 06.04.2020.
Published: 04.05.2020.

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UDK [796.332:796.012.572.45+796.062:061.28]

ISSN (English ed. Online) 2311-6374

2020, Vol. 8 No. 2, pp.17-28

FEATURES OF EFFECTIVE GOAL SHOTS BY FOOTBALL PLAYERS IN GAMES OF HIGH LEVEL TEAMS

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Purpose: to establish the peculiarities of effective goal shots by highly qualified football players.

Material and Methods: registration of technical and tactical actions (TTA) was carried out using the games of the teams of 2019/2020 UEFA Champions League. In total, 108 games were analyzed. The following research methods were used in the article: analysis of scientific and methodological literature, registration of TTA, methods of mathematical statistics.

Results: the paper presents data that characterize the features of effective goal shots by football players in the games of high-level teams. In total, 344 shots were recorded and analyzed in 108 games of the teams of 2019/2020 UEFA Champions League. All effective goal shots were classified according to the time, place, situation, method and conditions of performing.

Conclusions: it was established that highly qualified football players were more likely to perform effective goal shots from 76 minute to 90 from the penalty area (except for goal area), after receiving the ball from a team partner, with the first touch, to kick the ball on the ground, to the lower part of a goal.

Keywords: shots, penalty area, goal area, goal frame, lead leg, set piece, goal area, playing position.

Introduction

Football is a type of sport in which the result is determined by the difference between scored and conceded goals. Therefore, situations that lead to scored and conceded goals have always been within the scope of national [4-6, 8] and foreign [11-15] theorists and practitioners.

Thus, in one study [5], we found that the teams participating in the 2014 World Cup in average scored 1.3 goals per game. The highest number of effective shots (25.2% of all goals) by football players in the games of this tournament was made from 76 to 90 minute of play. Analyzing the place of performance of effective shots in the 2014 FIFA World Cup games, it was determined that almost half of all goals (46.4%) were scored from the area between the goal area and the penalty mark. The results of the study indicate that players had to do 60.3% of all effective shots with the first touch, 23.8% after receiving and only 15.9% after dribbling the ball.

These data are partially confirmed by the results of another study [6], in which we analyzed the peculiarities of performing effective shots by football players of the teams of the first league of Ukraine.

According to the results of this study, the players of one team of the first league of Ukraine scored averaged 1.4 goals per game. More goals were scored from 16 to 30 minute (30.0% of all goals), less - from 1 to 15 and from 46 to 60 minute (10.0% of all goals). 34.5% of the goals were scored from the goal area by the players of this team. From the area between the goal area and the penalty mark 41.4% of the goals were scored. 6.9% of the goals were scored from the area between the penalty mark and the penalty area. From outside the penalty area, the players scored 17.2% of the goals. At the same time, 78.3% of all the goals of the team were scored by the players after passing the ball from a partner and 21.7% of the goals after bouncing the ball from the goalkeeper, defenders or goal frame. 56.5% of all effective shots were made

with the first touch, 34.8% of goals were performed after receiving the ball and 8.7% of goals – after dribbling the ball.

It should be noted that experts have recently been increasingly favoring the exploration of those individual and team actions on which, in their view, the outcome of a particular game depends. It is that technical and tactical actions are considered by many authors as shots on goal [7, 9, 10].

The analysis of some studies [2, 7, 9, 10] allows to think that high-level teams perform between 2 and 23 shots on the goal. At the same time, according to the observations of 12 UEFA Champions League games [7], it was found that 14.5% of all shots successfully ended with scoring on goal.

Thus, summarizing the data obtained in previous studies, we can conclude that high-class players under the competitive conditions are more likely to perform shots on goal:

- stationary or moving ball,
- after passing the ball from a partner,
- one touch,
- low shot,
- from the penalty area.

However, despite the great importance of set pieces for modern football [1, 3], football players are increasingly less likely to perform free and penalty kicks.

Connection of the study with scientific programs, plans, topics. This study was performed in accordance with the research theme of the Departments of Football and Hockey, Sports Games and Martial Arts of the Kharkiv State Academy of Physical Culture for 2016-2020 on the topic "Psycho-sensory regulation of athletes' motor activity in situational sports".

Purpose of the study is to establish the features of effective goal shots by highly qualified football players.

Material and Methods of the research

The registration and analysis of the TTA took place in the UEFA Champions League group stage games in the 2019/2020 season in accordance with known

recommendations. In total, 108 games of the thirty-two UEFA Champions League teams in the 2019/2020 season were analyzed (96 group stage games and 12 play off round).

Results of the research

Table 1 shows the quantitative indicators of effective goal shots in different period of playing time by football players in the games of 2019/2020 UEFA Champions League.

Table 1

Number of scored goals in different period of playing time by football players in the games of 2019/2020 UEFA Champions League

Period of Time	Number	Percentage,%
1-15 minutes	41	11,9
16-30 minutes	43	12,5
31-45 minutes	59	17,2
46-60 minutes	55	16,0
61-75 minutes	57	16,6
76-90 minutes	85	24,7
91-105 minutes	2	0,6
106-120 minutes	2	0,6
Amount of scored goals	344	100,0

The results of the table show that the greatest number of goals of Champions League teams were scored from 76 to 90 minute of play (24.7% of all goals). The lowest number of effective shots (11.9%) is characteristic for the beginning of the match.

This seems rather logical. First, at the beginning of the match teams usually play cautiously, the players do not take any unnecessary risk, seek to perform all technical and tactical actions reliably. Secondly, team players are not tired during the first minutes of the match and, as a result, rarely make unforced errors. In turn, the players get tired by the end of the game, and defenders make mistakes more often. At the same time, changes in the teams composition more often affect the attacking players, that when entering the field take precedence over the tired opponents. It should also be noted that in most cases, in the last minutes the play becomes more open, teams tend to change the score in the match, and often take the risk.

It should be noted that we have registered 344 goals in 108 Champions League games. Of these, 9 goals were scored by the players at their own goal. Thus, in order to determine the peculiarities of performing the effective goal shots by highly qualified football players in the UEFA Champions League games of the 2019/2020 season, we analyzed only 335 goals.

Table 2

Number of scored goals from different areas of the football field by football players of teams 2019/2020 UEFA Champions League

Football field area	Number	Percentage,%
Goal area	74	22.1
Penalty area (except for the gate area)	222	66,3
From outside the penalty area	39	11.6
Amount of scored goals	335	100,0

Thus, as a result of the conducted research, it was found that the players of the teams participating in this tournament scored more often from the penalty area without taking into account the goal area (66.3% of all goals). At the same time, 22.1% of all goals were scored from the goal area, and only 11.6% of all goals were scored from outside the penalty area (Table 2).

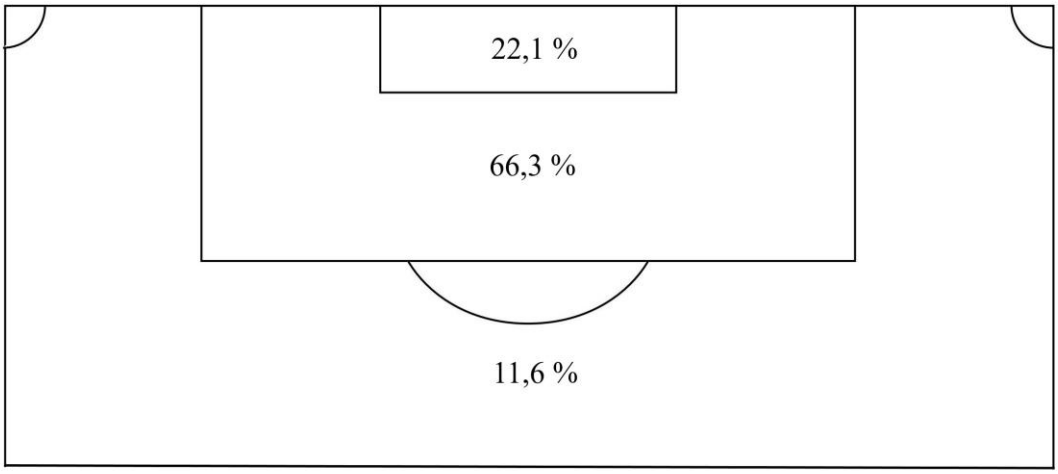

Fig.1. Percentage of goals scored from different areas of the football field by football players of teams 2019/2020 UEFA Champions League

Analyzing the goals scored during the game and from set piece by teams of Champions League season 2019/2020, it is clear that only 9.6% of all goals were scored by a direct kick from the set pieces (Table 3).

Table 3

Number of goals scored during the game and from set piece by football players of teams 2019/2020 UEFA Champions League

Goal Shots	Number	Percentage,%
During the game	303	90,4
From the set piece	32	9.6
Amount of scored goals	335	100,0

Moreover, out of the 32 goals scored from the set piece, only 1 was scored from a free kick and 31 from a penalty kick (Table 4). This can be explained, first, by the discipline of the players near their penalty area (football players violate the rules less in dangerous areas) and, secondly, by the organization of defensive actions of the team players, which defends when performing a free kick to the opponent (setting up a wall, positioning of goalkeeper and players who defense him and more).

Table 4

Number of goals scored during the game and from the set piece by football players of teams 2019/2020 UEFA Champions League

Set piece	Number	Percentage,%
Penalty kick	31	96.9
Free kick	1	3.1
Amount of scored goals	32	100,0

The analysis of the effective shots performed with the foot and the head of high-qualification football players shows (Table 5) that out of 335 goals of the Champions League teams, 191 goals (57.0%) were scored with the right foot, 102 goals (30.4%) with the left foot and 42 goals (12.5%) with the head.

Table 5

Number of scored goals with foot and head by football players of teams 2019/2020 UEFA Champions League

Goal shots	Number	Percentage,%
Right foot	191	57,0
Left foot	102	30.4
Head	42	12.5
Amount of scored goals	335	100,0

Interesting data we received in the analysis of the effective goal shots, which players performed with the lead and non-lead legs. Thus, out of the 293 goals that the players scored with legs, 231 goals were scored with the lead leg and 62 goals with the non-lead one (Table 6).

Table 6

Number of scored goals by the lead and non-lead legs by football players of teams 2019/2020 UEFA Champions League

Goal shots	Number	Percentage,%
Lead leg	231	78,8
Non-lead leg	62	21.2
Amount of scored goals	293	100,0

Moreover, if from the set piece (free kick or penalty kick), when the players had time and opportunity to think over their actions and perform a kick with a stronger leg, the players scored goals only with the lead leg. That is, in the play, when they had to act in conditions of shortage of time and space, football players performed 23.8% of effective shots with a non-lead leg (Table 7).

Table 7

Number of goals scored with the lead and non-lead legs in the open play by football players of teams 2019/2020 UEFA Champions League

Goal shots	Number	Percentage,%
Lead leg	199	76,2
Non-lead leg	62	23,8
Amount of scored goals	261	100,0

Table 8 presents the quantitative indicators of the effective goal shots that were performed by the players in different game situations.

Table 8

Situations in which effective goal shots (open play) were performed by football players of teams 2019/2020 UEFA Champions League

Goal shots	Number	Percentage,%
After passing the ball from a partner	249	82,2
After bouncing the ball from goalkeeper, defenders, goal frame	54	17,8
Amount of scored goals	303	100,0

The table shows that 82.2% of all goals were scored by football players after passing the ball from a partner and 17.6% after bouncing the ball from the goalkeeper, defenders or goal frame.

It has long been known, that every year during the play football players have to perform TTA more often under the conditions of high tension, on a limited field area, struggling with an opponent and at high speed. This is especially true of those TTA carried out by players within the penalty area.

The results of our studies partially confirm this tendency. Thus, Table 9 shows that 63.4% of all goals scored with one touch, 20.1% of goals after receiving the ball and only 16.5% of goals after dribbling the ball.

Table 9

Ways of performing effective goal shots (open play) by football players of teams 2019/2020 UEFA Champions League

Goal shots	Number	Percentage,%
First touch	192	63,4
After receiving the ball	61	20,1
After dribbling the ball	50	16.5
Amount of scored goals	303	100,0

Table 10 shows that 69.9% of the 335 total effective shots were made from the ground. Such goals included set piece shots (free or penalty kicks) or hitting the moving ball. In turn, 30.1% of all goals were scored by the players kicking the flying ball in this tournament. These goals included head and leg kicks, after passing the ball from a partner or bouncing it from the goalkeeper, defenders, goal frame, in one and two touches.

Table 10

Conditions under which effective goal shots were performed by football players of teams 2019/2020 UEFA Champions League

Goal shots	Number	Percentage,%
On the ground ball	234	69,9
Flying ball	101	30,1
Amount of scored goals	335	100,0

Analyzing the goal area, in which the players have often performed effective shots in the UEFA Champions League games, it is clear that 68.1% of all goals were

scored performing low-driven shot to the bottom part of the goal and 31.9% of all effective goals were scored to the upper part of the goal (Table 11).

Table 11

The goal area where the effective shots were performed by football players of teams 2019/2020 UEFA Champions League

Part of the goal	Number	Percentage,%
Upper part	107	31.9
Bottom part	228	68.1
Amount of scored goals	335	100,0

During the match, the players are assigned certain functional responsibilities. This is due to the main purpose of the game - to score more goals at the opponent's goal than to miss into their own. Therefore, one group of players is mainly attacking, and the other one is defensive.

Table 12 presents the numbers of goals scored by football players of different playing position of teams 2019/2020 UEFA Champions League.

Table 12

Number of effective goal shots by players of different playing positions of teams 2019/2020 UEFA Champions League

Playing Position	Number	Percentage,%
Goalkeepers	0	0.0
Central backs	12	3.6
Wing backs	14	4.2
Central halfbacks	68	20.3
Wingers	21	6,3
Central forwards	144	43,0
Outside forwards	76	22.7
Amount of scored goals	335	100,0

The given table shows that 43.0% of all Champions League goals were scored by central forwards, 22.7% by outside forwards, 20.3% by central halfbacks, 6.3% by wingers, 4.2% - wing backs and 3.6% - central backs.

The results of our research are in many ways consistent with previous studies that indicate the impact of playing position of football players on the structure of competitive activity of individual players and the team as a whole.

Conclusions / Discussion

The results of the study indicate differences in the quantitative indicators of effective goal shots of the teams participating in the 2019/2020 UEFA Champions League. High-skill football players were found to score more often from 76 to 90 minute of play, from the penalty area (except for the goal area), after passing the ball from a teammate, with the first touch, the ball from the ground, into the bottom part of the gate.

The results of the study confirmed the information [4-6, 8] regarding the time, place, methods and conditions of performing the effective goal shots by high-skilled football players.

The data [5, 6] concerning the number of scored goals by football players of high-level teams with the right and left foot, when there is an open play or a set piece, into the upper or bottom part of the goal, has been supplemented and expanded.

For the first time, the number of goals scored by football players in UEFA Champions League games with the lead and non-lead legs and by players having different playing position was obtained.

The main ideas and conclusions of this study should be taken into account while creating the individual or team exercises aimed at improving the technique and tactics of shots.

Prospects for further research in this area. Further studies will be devoted to the research of peculiarities of effective goal headshots by high-qualified football players under the competitive conditions.

Conflict of interests. The authors declare that no conflict of interest.

Financing sources. This article didn’t get the financial support from the state, public or commercial organization.

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Received: 07.04.2020.
Published: 04.05.2020.

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UDK 796.922:796.696

ISSN (English ed. Online) 2311-6374

2020, Vol. 8 No. 2, pp.29-39

DEVELOPMENT OF COORDINATION QUALITIES IN CROSS-COUNTRY SKIERS AGED 13-14 YEARS IN THE PREPARATORY PERIOD OF THE ANNUAL MACROCYCLE

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Purpose: determine the influence of coordination qualities on the results of the special physical fitness of cross-country skiers aged 13-14 years in the preparatory period. **Material and Methods:** the study involved 30 athletes aged 13-14 years, whose experience of cross-country skiing 4-5 years, the qualification of athletes III - II category. The following methods are used in the work: analysis and generalization of scientific and methodological literature, pedagogical observation, pedagogical testing, pedagogical experiment. The methods of mathematical statistics to analyze the obtained data were used.

Results: the use of special training for the development of coordination qualities young cross-country skiers led to improved results in overcoming the competitive distance in rollersking with a free style of 5000 m by 12.5%, at a distance of 100 m in a free style by 8.7% and a classic style on 8.5% ($p<0.05$).

Conclusions: the use of exercises for the development of coordination qualities among 13-14 year old cross-country skiers and riders during the preparatory period made it possible to improve the results in rollersking with a classic and free style of movement.

Keywords: cross-country ski, young cross-country skiers, coordination qualities,

preparation period, free style, classic style.

Introduction

It is known that the modern system of training in sport of higher achievements causes profound functional changes in the activity of the whole body of the athlete [6; 14; 15].

The level of development of physical qualities of a person reflects a harmonious combination of innate psychological and morphological abilities and acquired in the course of life and training of opportunities. The higher the level of development of physical qualities of a person, the higher his ability to work [1; 3; 16].

The specifics of the current activities of the competition can be attributed to cross-country skiing to the sports complex of technical-tactical activity that requires a high level of development of coordination abilities. This is because the athlete at high speed must quickly and accurately assess the situation, which is constantly changing, and to make the right decision, to be able to overcome unexpected obstacles in the race with a mass start and relay races, to be able to respond to a sharp change of direction and speed of rivals in the sprint race, the coordination to respond to race the skiathlon, when you change the style of movement, the right to place in the group of opponents the elements of skiing equipment. All the above mentioned skills are formed on the basis of coordination qualities [2; 4; 6; 7]. For balance of the body crucial information about gravitational vertical from the vestibular apparatus and from proprioceptors body in contact with the plane of the support. Ancillary, but very significant role playes visual information about gravitational vertical. With unstable support leading reference system can be a tactile contact with a fixed object of the environment that surrounds, and even without the props on it [5; 8; 9].

The analysis of domestic and foreign scientific and methodological literature shows that there are different views on the development of coordination qualities in the process of athletes training. Some authors propose to integrate their development in the course of technical training [2; 7; 8; 10]. Others believe that the development

of coordination qualities does not boil down to either side of the preparation, but forms the basis [3; 5; 9]. Still others continue to consider the place of coordination training through the lens of agility in the physical training system [13; 16]. Finally, a number of scientists and coaches are convinced of the need to allocate coordination training as an independent and important section of the athlete's training, which is characterized by certain tasks, means and methods of developing coordination qualities in a particular sport [4; 11; 12; 14].

According to experts, the most important specific coordination qualities include: the ability to orientation in space; the ability to balance; the ability to rhythm; the ability to playback, differentiation, evaluation and measuring the spatial, temporal and force parameters of movements; responsiveness; ability to rebuild the motor activity; the ability to harmonize movements, random muscle tension and relaxation; statoconia resistance [8].

The age of cross-country skiers aged13-14 years is the most responsible period in the formation of the basic potential of human motility and coordination qualities, so the question of the development of coordination of movements and balance is of practical interest [3; 13; 15]. When training young cross-country skiers, as a rule, is not planned separate activities that develop coordination qualities. In our opinion, insufficient attention to the development and improvement of coordination qualities is one of the reasons for the unsuccessful performances of Ukrainian cross-country racers at international competitions. Therefore, it is important to look for ways to improve the training process for young cross-country skiers, using exercises to develop coordination qualities and balance in the preparatory period.

Purpose of the study: determine the influence of coordination qualities on the results of the special physical fitness of cross-country skiers aged 13-14 years in the preparatory period.

Material and Methods of the research

Choice of research methods was determined by the goal, objectives and existing requirements to conduct educational research. The study was used following methods: analysis and generalization of scientific-methodic literature, pedagogical

observation, pedagogical testing, pedagogical experiment. For the data analysis we used generally accepted methods of statistical processing. All calculations were carried out on Statistica 12, SPSS and Excel.

The study involved 30 athletes (15 control group and 15 experimental group) aged 13-14 years, experience of which is cross-country skiing 4-5 years, qualification athletes III - II level. To address the main objectives of the study program training in groups of temporary measures did not differ in each weekly regime of training and work was 20 hours. The volume and intensity of training loads were not significant differences between groups who participated in the study. The control group studied the traditional curriculum of cross-country skiers for children and youth sports schools in Ukraine, while the experimental group according to the method, which included special exercises on development of coordination skills, and balance. Performed exercises to develop equilibrium in the static regime, exercises for balance with the use of rollersking, hemisphere, balance-bordo.

Tests were conducted in which assessed: the level of development stability of the vestibular reactions, the ability to perform difficult coordination of movements, ability to rebuild motor actions, spatial-temporal and dynamic parameters of movements, maintaining equilibrium, orientation in space.

To assess the level of development of the coordination qualities of the athletes were used the following test exercises: the test for determination of motor memory, the test to determine the level of movement coordination test to determine the balance (according to the method of V. I. Liah); the test to determine the ability to estimate dynamic and spatial-temporal parameters (according to the method of D. K. Miller); the test to assess the ability of coordination and rhythmicity of movements (according to method F. Raczek); the test in which we evaluated the level of stability of the vestibular reactions (according to the method of K. I. Arikov and A. A. Matvienko); to identify the static coordinate were used improved sample Romberg (on one and two feet in the ski rack on the platform-skiing). To evaluate the start coordination and technical actions during acceleration used to overcome rollerskiing segments of 100 m and 20 m from the personal and the general launch.

Communication of work with scientific programs, plans, themes. The study was performed in accordance with the plan of scientific-research work of the department winter sports, cycling and tourism of Kharkiv state academy of physical culture of the Ministry of education and science of Ukraine for the years 2019-2023 on the topic of "Optimization of training process in cyclic and extreme sports" (state registration number 0119U100439).

Results of the research

To determine the level of special physical fitness at the beginning of the pedagogical study, pedagogical testing of cross-country skiers aged 13-14 years was conducted, in which no significant differences in the results of testing between groups were found ($p>0.05$).

After the preparation in the preparatory period of the annual macrocycle, pedagogical testing of cross-country skiers aged 13-14 years was carried out. As a result of testing, it was found that the cross-country skiers of the experimental group who used training to develop coordination qualities and balance, the results of overcoming the distance on the rollersking 5000m free style improved by 12.5%, the distance 100m free style, 7% and classical by 8.5% ($p<0.05$), while in the control group the growth results were: 5000 m – 9,7%; 100 m free style – 2,0% and classic style – 1,8% (Table 1, Fig. 1).

Table 1

Indicators of special fitness after conducting a study of pedagogical study of young cross-country skiers aged 13-14 years at the beginning of the study

($n_1=n_2=15$)

Indexes	Group - K $X_1 \pm m$	Group - E $X_2 \pm m$	t	P
Running on 30 м, *sec*	5,15 ± 0,05	4,97 ± 0,06	2,21	<0,05
Rollersking free style 5000 м, *sec*	755,12 ± 8,21	733,10 ± 5,12	2,28	<0,05
Shuttle running 4x9 м, *sec*	12,71 ± 0,14	11,22 ± 0,21	6,71	<0,05
Rollersking free style 100 м, *sec*	25,37 ± 0,51	24,01 ± 0,33	2,24	<0,05
Rollersking classic style 100 м, *sec*	26,80 ± 0,72	24,71 ± 0,52	2,43	<0,05
Rollersking free style 20 м, *sec*	6,10 ± 0,03	5,86 ± 0,02	6,66	<0,05
Rollersking classic style 20 м, *sec*	7,05 ± 0,08	6,53 ± 0,06	5,22	<0,05

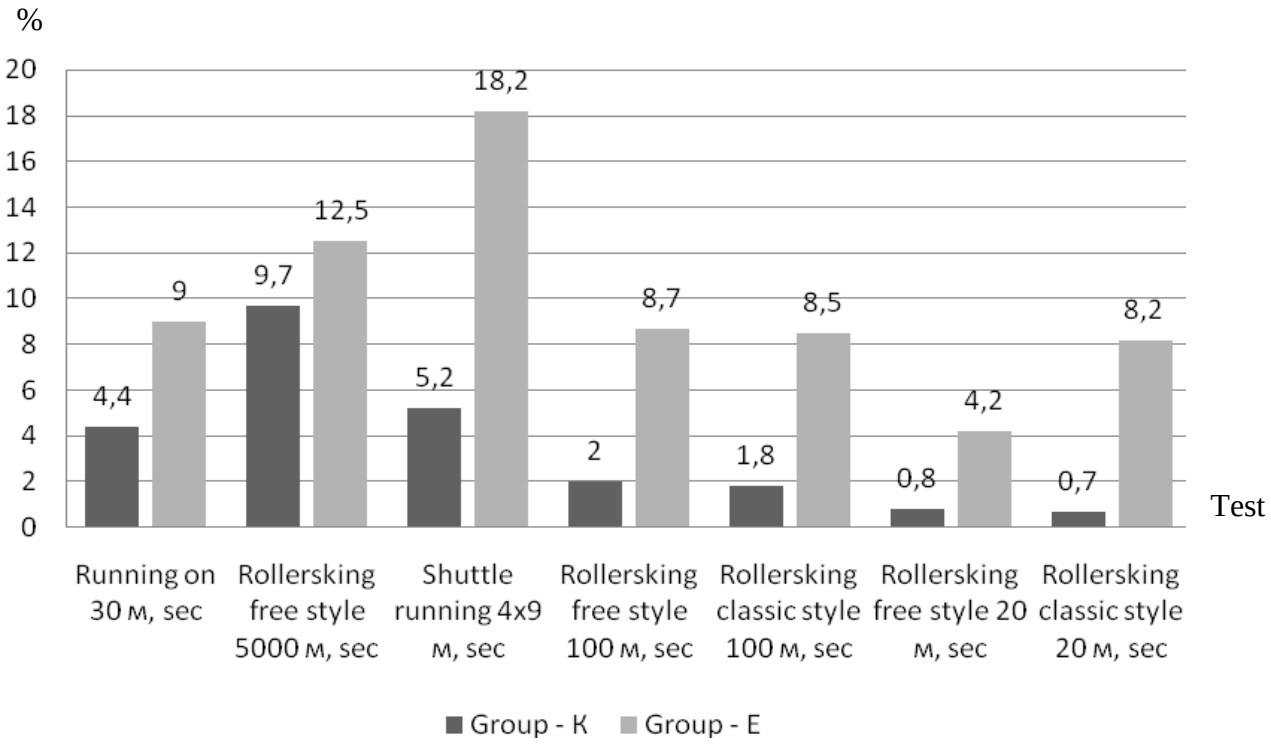

Fig. 1. Percentage increase in the results of special testing in the control and experimental groups after the study

Analysis of the results of special tests on rollersking revealed that the results of the distance overcome improved in both groups, but in the experimental group the increase was 18.2 - 4.2%, and in the control - 9.7 - 0.7% ($p < 0.05$) (Fig. 1).

Significant ($p < 0.05$) differences in indicators of special preparedness revealed the advantage of skiers of the experimental group over the control: in speed rollersking free style at 100 m by 5.1% and classical style by 7.8%; in the length of the cycle on the plain free style by 9.2% and classical style 10.7%; in speed of acceleration free style 3.9% and classical style 7.4% (Table 1, Fig. 1).

To identify the relationship between the indicators that characterize the coordination ability and the result of the control of the distance the rollersking free style 5000 м, a correlation analysis was conducted (Table 2).

The result of the analysis revealed a high correlation between running distance and ability to respond ($r=0.94-0.78$; $p<0.05$), ability to coordinate and rhythmic movements ($r=0.98-0.84$; $p<0.05$), dynamic equilibrium ($r=0.97-0.89$; $p<0.05$) and average speed of sprinting by free and classic style of 100 m, respectively.

Table 2

Significant correlation between the indicators characterizing the coordination ability and the result of the control of the distance race of the classic and skating style cross-country skiers at the stage of preliminary basic training (n=30); p <0,05

№	Indexes	1	2	3	4	5	6	7	8	9	10
1	Rollersking free style 5000 м	1,00									
2	Rollersking classic style 100 м	0,37	1,00								
3	Rollersking free style 100 м	0,46	0,58	1,00							
4	Dynamic equilibrium	0,78	0,81	0,73	1,00						
5	Ability to coherence and rhythm of movements	0,84	0,98	0,92	0,44	1,00					
6	Ability to evaluate and regulate dynamic and space-time motion parameters	0,39	0,53	0,46	0,19	0,31	1,00				
7	Time to maintain the stability of the posture	0,70	0,57	0,89	0,35	0,41	0,63	1,00			
8	Motor memory	0,91	0,81	0,92	0,13	0,78	0,64	0,21	1,00		
9	Coordination of movements	0,86	0,89	0,78	0,32	0,81	0,62	0,16	0,86	1,00	
10	Responsiveness	0,78	0,92	0,94	0,13	0,35	0,27	0,47	0,23	0,51	1,00

Therefore, it can be concluded that the coordination capabilities make a significant contribution to the overall result in racing in the classic and free style on rollersking.

Noteworthy is the presence of correlation relationships between indicators that characterize coordination abilities: level of coordination of movements and motor memory ($r=0.86$; $p<0.05$); rhythmicity and consistency of movements and dynamic equilibrium ($r=0.81$; $p<0.05$) and results in rollersking ($r=0.94$-0.78; $p<0.05$).

Thus, the study of training cross-country skiers aged 13-14 years in the preparatory period of the annual macrocycle at the stage of preliminary basic training revealed the effectiveness of the experimental method, in which increased the development of coordination qualities and balance.

Conclusions / Discussion

In the special literature covering sports training in cross-country ski racing, the problems of development and improvement of the required coordination qualities in

accordance with the modern requirements of training athletes, is not given sufficient attention. The greatest number of experts believe that only the development of endurance and speed-power qualities can lead to success in the training of racers.

But German experts believe that good coordination in cross-country ski racing is an indispensable factor in sportsmanship [12].

In their turn, Austrian experts [10] point out that the modern technical requirements in cross-country skiing are extremely complex and assume the presence of a whole set of coordination abilities, which include spatial orientation, taking into account the changing conditions of terrain and route, subtle perception reactions of the body when sliding, complex reaction and adaptation when changing the quality of snow or in extreme situations and the ability to adjust their own rhythms of movement when moving [4; 10].

Coordination qualities, previously being the leading physical quality of cross-country skiers, with the advent of the program of competitions in ski racing the sprint disciplines, skiathlon, the new discipline in ski cross, resulting in different kinematic and dynamic structure of movements, physiological tension, and also the peculiarities of technical and tactical solutions motor tasks, determine the feasibility of directed their development and improvement in the structure of the annual cycle of sport training of young cross-country skiers.

Therefore, to improve the coordination qualities of cross-country skiers aged 13-14 years in the preparatory period at the training stage of training, it is necessary to start with the exercise in static mode without the use of different shells and simulators (different stands, straps, etc.), dynamic balance exercises (exercises in the rollersking, hemisphere, balance board and more), exercises to develop the ability to relax muscles.

Insufficient number of scientific studies on the problem of development of coordination qualities in young cross-country skiers substantially reduces the effectiveness of the training process, improvement of technical skill that affects athletic performance.

Significant differences in the indicators of special preparedness showed the advantage of cross-country skiers of the experimental group over the control in overcoming the competitive distance the rollersking 5000 m freestyle 2.8%, in the speed of 100 m free style 5.1% and classic style 7.8%; cycle length on plain free style by 9.2% and classic style 10.7%; speed of acceleration in 20 m free style 3.9% and classic style 7.4% ($p < 0.05$).

The results of correlation analysis between the results of passing of competition distance of rollersking 100 m free and classic style, and rollersking free style 5000 m found a close correlation between the responsiveness ($r=0.94-0.78$; $p<0.05$), the ability to coherence and rhythm of movements ($r=0.98-0.84$; $p<0.05$), dynamic balance ($r=0.97-0.89$; $p<0.05$) and average speed of passage.

According to the results of the survey coordination qualities, you can make individual conclusions about the level and dynamics statodynamic stability in the structure of the functional and technical preparedness of young cross-country skiers.

Therefore, it can be concluded that the use of exercises for the development of coordination qualities among 13-14 year old cross-country skiers and riders during the preparatory period made it possible to improve the results in rollersking with a classic and free style of movement.

Prospects of further studies lie in the theoretical and experimental justification and the development of model characteristics of the coordination qualities of qualified cross-country skiers.

Conflict of interests. The authors declare that no conflict of interest.

Financing sources. This article didn’t get the financial support from the state, public or commercial organization.

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Received: 08.04.2020.
Published: 04.05.2020.

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UDK 797.253

ISSN (English ed. Online) 2311-6374

2020, Vol. 8 No. 2, pp.40-51

CHOICE OF GAME ROLE OF THE MIDFIELDERS AND MOVING FORWARDS OF PLAYERS IN FEMALE WATER POLO

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Purpose: to develop and experimentally substantiate the method of choosing the game role of the midfielders and moving forwards of players in female water polo.

Material and Methods: analysis and generalization of literary sources, pedagogical observation, anthropometric and physiological measurements, testing of swimming performance, special and technical training, analysis of the game activities of water polo players using test game protocols, methods of mathematical statistics. The contingent of the surveyed were members of the team of the Kharkiv region on the female water polo.

Results: the authors determined the features of the structure of special preparedness of qualified female water polo players who perform functions as midfielders and moving forwards, investigated the relationship between physical development indicators, technical and special swimming training and efficiency of game actions of sportswomen of this game role, developed model characteristics of the most significant parameters of the structure of special preparedness of qualified female water polo players, which can serve as reference points to determine game role of the midfielders and moving forwards.

Conclusions: the definition of game role of players in women's water polo should be

based on a comprehensive analysis of indicators that reflect different aspects of preparedness of qualified sportswomen.

Keywords: water polo, sportswomen, midfielders and moving forwards, interconnection, model characteristics.

Introduction

The continuous growth of sport achievements in modern sport, high competition in the international arena require the relentless search for effective methodological, organizational and managerial solutions in the many-years preparation of athletes. An important place in this system is the process of improving the integrated control, selection and orientation at all stages of many-years preparation (V. N. Platonov, 2004; O. A. Shynkaruk, 2011 etc.).

Water polo is a situational sport that differs in terms of gaming, due to the aquatic environment (V. Y. Davydov, 2007; Ch. Cicciarella, 2000). Therefore, the requirements to representatives of this kind of sport is very versatile.

Obviously that efficient gaming action of water polo players determined by the level of physical development, swimming and technical training (O. A. Pilipko, A. V. Poproshaev, 1999; M. V. Ostros'kij, O. V. Poprpshaiev, M. M. Chaplins'kij, O. J. Sidorko, 2013). However, which of these components largely affects the performance of athletes who playing different roles, how in this regard correct accentuation of the training actions – these and other issues question require of specialists more attention and the holding relevant experimental studies.

Choise of the game role is one of the most important moments in the career of the water polo player. From the correct choice of narrow game specialization of the athlete depends largely on the achievement of tops of sports skill (I. F. Zemtsov, 2008; O. A. Pilipko, A. V. Poproshaev, 2007; A. V. Poproshaev, A. V. Chumakov, 2014; N. Rebytska, 2002; O. Pilipko, A. Pilipko 2019 etc.).

Review of current literature allowed to conclude that to date have been sufficiently studied questions which relate to the definition of the factors which

influence of the effectiveness and efficiency of competitive activity in water polo, Considered the method of sports training of qualified water polo players, defined the ways of optimization of competitive activity, etc (N. Evpak, 2015; I. F. Zemtsov, 1988; D. C. Karangozashvili, 1990; Y. V. Kolosov, 2003; V. M. Chernov, 2006; G. Balline, 2012; G. Melchiorri, A. Campagna, 2018). At the same time, the conducted researches mainly associated with the preparation of male athletes. Problems of female water polo still remain insufficiently illuminated, and thus require close attention and study.

Purpose of the study: to develop and experimentally substantiate the method of choosing the game role of the midfielders and moving forwards in female water polo.

Objectives of the study:

1. Identify the features of the structure of special preparedness of qualified female water polo players who serve as midfielders and moving forwards.

2. Investigate the relationship between indicators of physical development, technical and special swimming preparedness of qualified female water polo players selected game role.

3. To develop model characteristics of indicators of the structure of special preparedness of qualified female water polo players to determine the game role of the midfielders and moving forwards.

Material and Methods of the research

To solve the tasks, the following methods were used in the work: analysis and generalization of literary sources, pedagogical observation, anthropometric and physiological measurements, testing of swimming performance, special and technical training, and analysis of the game activities of water polo players using special protocols of control games, methods of mathematical statistics.

The experimental study was conducted on the basis of the NSC NTU "KPI" in the period from October 2017 to November 2018.

The surveyed group consisted of water polo players who had the level of sports qualification of master of sport and were members of the team of the Kharkiv region.

Results of the research

Features of the structure of special training of skilled water polo players that perform the functions of midfielders and moving forwards, determined on the basis of the study 29 parameters that reflect the level of physical, technical and special swimming preparedness of sportswomen. Among the indicators of physical development, we measured parameters such as length and weight, length of upper and lower extremities and their segments, the excursion of the chest, the hand power (right and left hand), arm circumference and thigh. Technical preparation was assessed in terms of: «15 m dribble the ball», «throw at a distance», «the basic technique of the throw from the place», «the processing time of the ball during the throw from the place», «the basic technique of the throw in stride», «the processing time of the ball during the throw with the go», «technique of hinged cast of the throw from the place», «technique of hinged cast of the throw with the go», «modernized 7 minute special test». Among the criteria of special swimming preparation were considered the results of the tests: «5x3 m in the gateway», «15 m front crawl», «10 m front crawl», «2x10 m front crawl», «10 m backstroke», «2x10 m trudgen on the back», «30 m frontcrawl», «10 jumping», «7-minute special test». Based on the obtained digital material was built averaged profiles, which describe characteristics of physical development, technical and special swimming preparedness of the representatives of this game role (Figure 1 - 3).

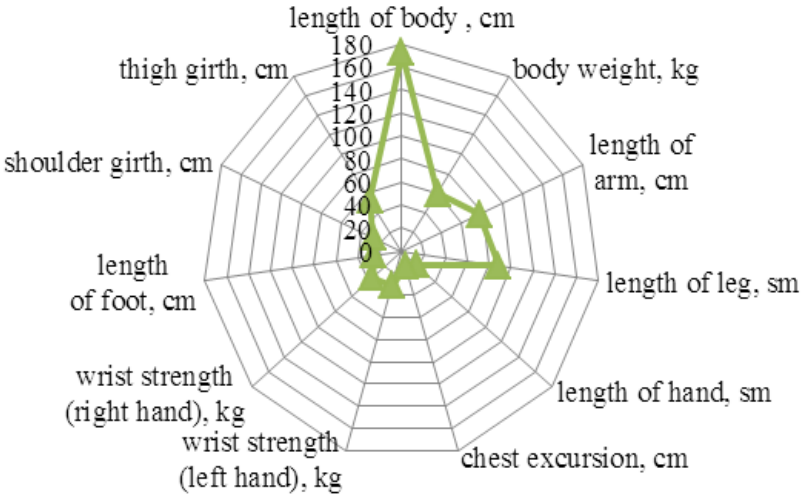

Fig. 1. The profile of physical development of qualified water polo players who perform the functions the midfielders and moving forwards

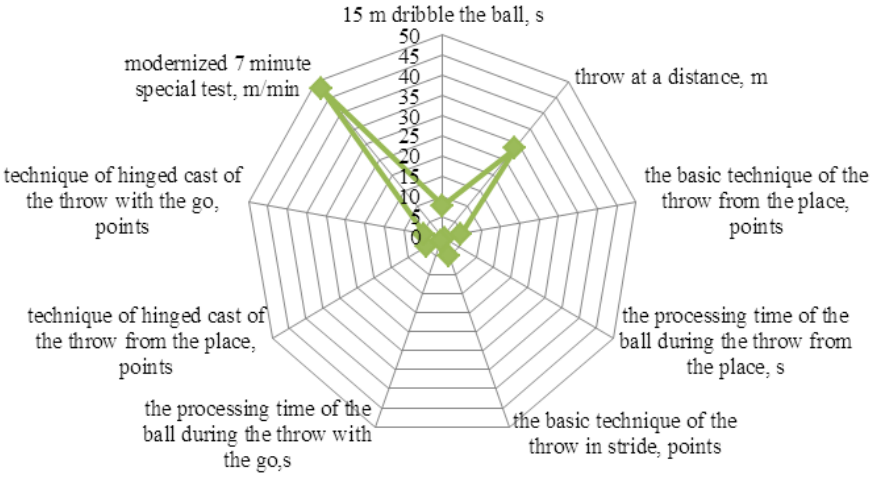

Fig. 2. The profile of technical preparation of qualified water polo players who perform the functions the midfielders and moving forwards

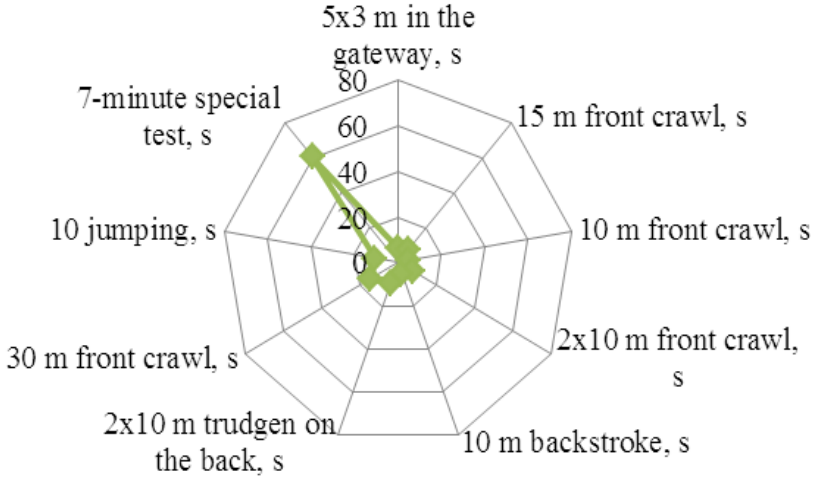

Fig. 3. The profile of special swimming preparation of qualified water polo players who perform the functions the midfielders and moving forwards

The efficiency of the game actions of the midfielders and moving forwards was assessed according to 7 indicators: the number of shots on goal, number of goals scored, the number of earned deletions, the performance of pass, passing accuracy, number of removals from the field, time spent in the game.

After analyzing the degree of correlation between the indices of structure of special preparation and the efficiency of the game actions of the midfielders and moving forwards we get the next data.

Close correlation with the number of goals scored is noted in such parameters

of physical development of athletes as arm length (r = 0,74), leg (r = 0,76) and foot length (r = 0,71).

Among the representatives of this game role in close correlating relationship with the parameters of efficiency of gaming action are the indicators of technical skill as the number of shots on goal - shot on the range and upgraded special test (r = 0,71 and 0,78 respectively); the number of goals scored - upgraded special test, technique of hinged cast of the throw from the place and the technique is a basic throw on the move (r = 0,91, of 0,86 and 0,86, respectively); the amount earned deletes - upgraded special test (r = 0,87), the result of the pass – «15 m dribbling» and upgraded special test (r = -0,82 and 0,77); the time spent in the game - throw range and upgraded special test (r = 0,83 and 0,89 respectively).

Close correlation relationship with the efficiency of the game actions show the next indicators of special swimming preparation of water polo players: «15 m front crawl» and the result of the throw and the time spent in the game (r = -0,76 and -0,76 respectively); «10 m front crawl» and earned deletions, the performance of the pass and the number of deletions from the field (r =-0,75; -0,83 and 0,72 respectively); «2x10 m front crawl» and earned deletions, the performance of the pass and the number of deletions from the field (r =-0,90; -0,82 and 0,78 respectively); «10 m backstroke» and earned deletions, the performance of the pass and the time spent in the game (r =-0,94; -0,88 and -0,85 respectively); «2x10 m trudgen» and the number of shots on goal, goals scored, number of earned penalties, the performance of the pass and the time spent in the game (r =-0,80; -0,72; -0,86; -0,90 and -0,94 respectively); «30 m front crawland the number of shots on goal, goals scored, efficiency of passing and the time spent in the game (r = -0,76; -0,70; -0,88 and -0,87 respectively); «10 jumping» and the number of shots on goal, goals scored and the performance of the pass (r = -0,83; -0,93 and -0,88 respectively); «7-minute special tests» and the number of shots on goal, goals scored, efficiency of passing and the time spent in the game (r = 0,91; 0,78; 0,90 and 0,95 respectively).

The analysis allowed to conclude that the efficiency of game actions of water polo players of this game role is under the predominant influence of the level of

speed-power qualities.

At the same time, the number of shots on goal due to the level of swimming efficiency of the athletes (Figure 4).

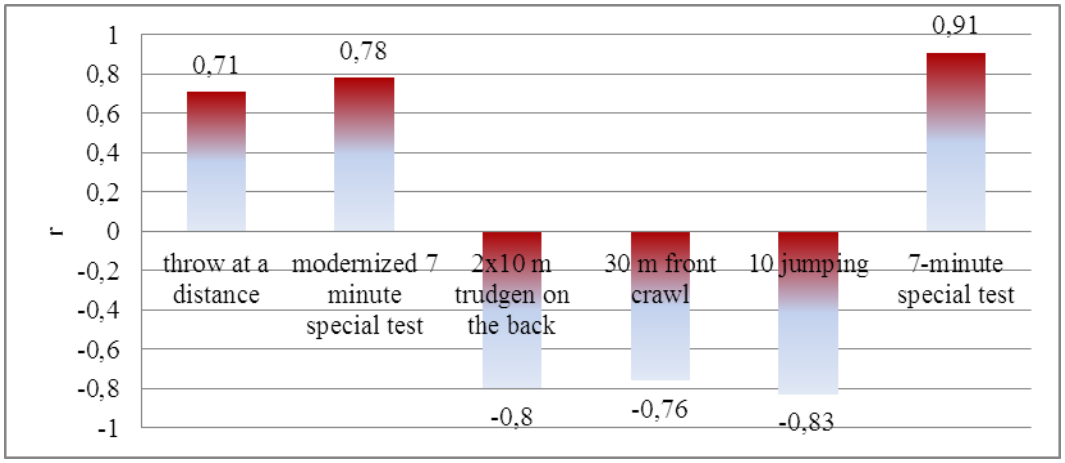

Fig. 4. Degree of correlations of the most influential indicators of the structure of special preparation of midfielders and moving forwards with the number of shots on goal

The ability to long-term performance of a large amount of swimming work in conjunction with the technique of possession of ball allows the sportswomen to show the best indicators on the number of goals scored (Figure 5).

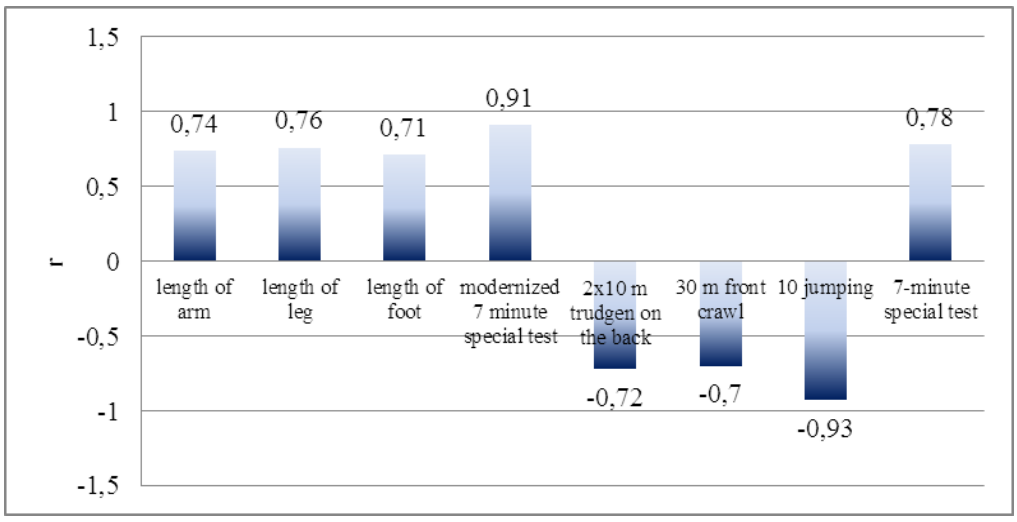

Fig. 5. Degree of correlations of the most influential indicators of the structure of special preparation of midfielders and moving forwards with the number of goals scored

In turn, the effectiveness of performance a pass due to the high level of swimming preparedness of water polo players of this game role (Figure 6).

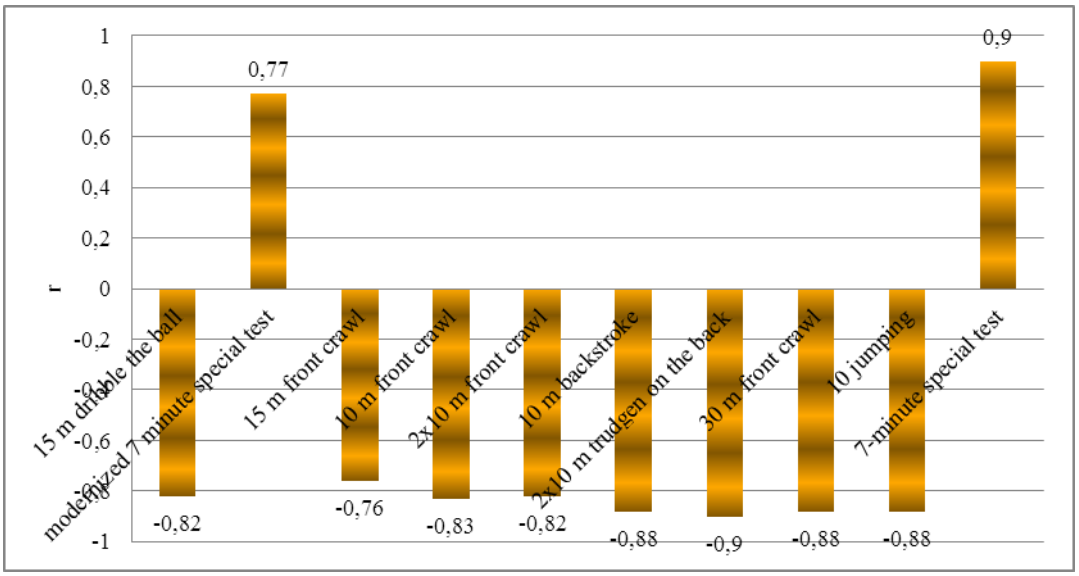

Fig. 6. Degree of correlations of the most influential indicators of the structure of special preparation of midfielders and moving forwards with the a pass

Thus, the efficiency of the game actions of the midfielders and moving forwards mainly determined by the level of development of swimming preparation and speed-strength qualities.

Based on the obtained digital material appeared the possibility to develop a model of the characteristics of the most significant indicators of the structure of special preparedness, compliance with which will allow to sportswomen choose the best way to realize themselves in the chosen playing position (Table 1).

Table 1

Model indicators of the most significant parametersof the structure of the special preparedness of the midfielders and moving forwards

Indicator	Model value	Standard deviation
modernized 7-minute special test, m/min	48,00	1,04
7-minute special test, m/min	60,31	1,05
10 jumping, s	10,40	0,18
10 m backstroke, s	5,01	0,16
2x10 m trudgen on the back, s	9,50	0,45
30 m front crawl, s	14,13	0,30

As can be seen from table 1, among the parameters that can be used as guidelines when we choose the game role of the midfielders and moving forwards are: 7-minute and modernized special test, 10 jumping, swimming on the distance 30 m front crawl, 10 m backstroke and 2x10 m trudgen on the back.

Thus, the definition of game role of players should be based on the basis of a comprehensive analysis of indicators which reflecting the various components of the structure of special preparedness of sportswomen who specialize in water polo.

Conclusions / Discussion

The results of the study confirm the existing opinion that the main components of the structure of special training of skilled water polo players that affect the effectiveness of their actions in the game, is physical, technical, and swimming preparedness. We have proved that sportswomen who perform the function of moving midfielders and moving forwards have high values of parameters of technical preparedness and the average values of the indicators of special swimming preparedness and physical development.

The obtained results confirm the assumption that some separate structure indicators of the special preparedness of water polo players have different degree of influence on the efficiency of game actions depending on the role. We found that the performance of the midfielders and moving forwards much due to the level of swimming preparedness and the development of speed-power qualities (r is in the range of 0,70 – 0,83 and 0,91 – 0,93).

It is confirmed that the definition of the game role of players should be based on a comprehensive analysis of parameters that reflect different sides of the structure of special preparedness of water polo players. A comparison of individual characteristics of the structure of special preparedness with model values will allow to the sportswomen to determine in what roles they will be able to better realize themselves.

Prospect of further research is to develop the model characteristics of the parameters of the structure of the special preparedness to determine the game role of qualified water polo players.

Conflict of interests. The author declares that no conflict of interest.

Financing sources. This article didn't get the financial support from the state, public or commercial organization.

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Received: 09.04.2020.

Published: 04.05.2020.

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UDK 796.42/797.2:159.9

ISSN (English ed. Online) 2311-6374

2020, Vol. 8 No. 2, pp.52-63

GENDER SIMILARITY AND GENDER DIFFERENCE OF MALE AND FEMALE ATHLETES IN CYCLIC SPORTS

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Purpose: to determine the gender characteristics of male and female athletes specializing in cyclic sports.

Material and Methods: the study involved 115 students and female students aged 17 - 23 years who are engaged in cyclic sports and have different sports qualifications. Of these, 54 female athletes and 61 male athletes. Research methods used: analysis and generalization of literary sources and Internet resources on the investigated problem; psychological methods: S. Bam's "Masculinity / Femininity" methodology and the 16-factor Kettell questionnaire; methods of mathematical statistics.

Results: the group of cyclic sports from the point of view of their influence on the formation of gender identity was examined, and gender similarities and gender differences among male and female athletes were identified who are involved in running athletics, swimming, cycling, skiing, short track, and rowing. Among the investigared athletes, the percentage ratio of masculine (48% of boys, 54% of girls) and androgynous (52% of boys, 46% of girls) personalities was revealed. Feminine personalities have not been identified. Most masculinization of athletes contributes to swimming (67%) and cross-country skiing (55%). The similarities and differences

between masculine and androgynous girls and boys engaged in cyclic sports in relation to their personal qualities.

Conclusions: the obtained results indicate the different level of personal qualities in both male and female athletes of the masculine and androgynous types. Young men showed the greatest differences in terms of such personal qualities as: subordination - dominance ($t = 5.38$; $p < 0.001$) and restraint - expressiveness ($t = 5.63$; $p < 0.001$) in favor of masculine-type male athletes. For girls, the most significant reliability was obtained by indicators: restraint - expressiveness ($t = 4.89$; $p < 0.001$), timidity - courage ($t = 5.19$; $p < 0.001$), self-confidence - anxiety ($t = 6.17$; $p < 0.001$) and conservatism - radicalism ($t = 5.61$; $p < 0.001$) with better results in masculine type female athletes, except for the "stiffness – sensitivity" factor, which is higher for androgynous type athletes. In addition, the highest reliability was determined among athletes ($p < 0.001$) in 6 factors, and among female athletes in 7 factors. The foregoing indicates that a significant difference in performance corresponds to the possibilities of conducting competitive activities, which affects the formation of the personality of athletes.

Key words: cyclic sports, gender similarity, gender differences, masculinity, femininity, androgyny.

Introduction

Much attention is currently being paid to the issue of gender distribution. A gender role is a set of social norms that determine what types of behavior are considered permissible, which are suitable or desirable for a person depending on his gender, that is, belonging to women or men.

Gender roles are especially important, as they determine how to behave, what to strive for depending on the biological gender of the individual. But despite the positive that they carry gender roles, they can still limit the individual's ability to reveal his personality. Sports activities in terms of the distribution of gender roles are considered the prerogative of men. But the number of women involved in sports

every year is growing. This can be seen not only in mass sports, but also in sports of the highest achievements. Women master sports that until recently were considered purely male. Sports results that women demonstrate do not lag behind, and sometimes exceed the results of men. The IOC pays more and more attention to the gender balance of participants in Olympic competitions. At the Games of the 32th Olympiad, the number of participants was planned in the ratio: 51.2% of athletes and 48.8% of athletes. It was stated that these Games should be the first gender-balanced and history of the Olympic movement.

Sporting activity proves the need to review gender roles as such that society attributes to women or men. In recent years, a certain number of works by both domestic and foreign authors such as N. Tsykunov have been devoted to gender issues in sports. (2003; 2009), Artamonova T.V., Shevchenko T.A. (2009), Damadaev A.S. (2010; 2011; 2013); Shakhov Sh.K. (2011) Maskaev T.Yu., Germanov G.N. (2014); Rechkalov A.V. (2017) Baranova A.V. (2017) Dementieva I.V. (2017) Bosenko Yu.M., Kharitonova I.V., Raspopova A.S., Stoyanova Zh.O. (2018), Colker R. (1980), Matteo S. (1986), Lamont-Mills A. (1998), Lantz C.D., Schroeder P.J. (1999) and others. But the problem of the influence of many years of sports on the formation of a gender type of personality is highly debatable and requires further study. Thus, the study of the gender characteristics of the personality of male and female athletes is relevant.

Purpose of the study: to determine the gender characteristics of male and female athletes specializing in cyclic sports.

Material and Methods of the research

Research methods: analysis and generalization of literary sources and Internet resources on the investigated problem; psychological methods: S. Böhm's “Masculinity / Femininity” methodology, which diagnoses the psychological gender and reveals the degree of androgyny, masculinity or femininity of the person [16] and Kettell's 16-factor questionnaire, which diagnoses personality traits; methods of mathematical statistics.

The study involved 115 male and female students aged 17 - 23 years, studying at the Kharkiv State Academy of Physical Culture, the National University of Physical Education and Sports of Ukraine and Sumy State Pedagogical University named after A.S. Makarenko, engaged in running athletics, swimming, cycling, cross-country skiing, short track, rowing and have various sports qualifications, of which 54 athletes and 61 athletes.

Results of the research

In the process of studying athletes and sportswomen, both qualified (MSIG, MS, CMS), and mass category using the S. Boehm method of "masculinity / femininity", the percentage ratio of masculine, feminine and androgynous personality types was revealed among students engaged in various cyclic sports. The study involved 115 athletes, of which young men - 61 and women - 54, specializing in running athletics, swimming, cycling (track and highway), rowing, short track, cross-country skiing, sports tourism and orienteering.

The results of the study are presented in table 1.

Table 1

Percentage of gender personality types among male and female athletes in cyclic sports

Gender personality type	Biological gender	
	boys, n= 61	girls, n = 54
masculine	48%, n = 29	54%, n = 29
androgynous	52%, n = 32	46%, n = 25
feminine	0	0

If we compare male and female athletes in cyclic sports regarding their affiliation with a particular sociocultural gender, then among girls there are more masculine persons (54%), and among boys - androgynous (52%). The difference between masculine and androgynous boys is 4% in favor of androgynous type athletes, and between masculine and androgynous girls 8% in favor of masculine girls is not significant in the first or second case ($p>0,05$). This suggests that sports such as swimming, skiing, track and field athletics, short track, sports tourism, orienteering, rowing, cycling are gender neutral. Initially, approximately the same number of boys

and girls come to these sports, who have been training together for many years. And as a result, they adopt from each other both ways of behavior, and lifestyle, and attitude to certain issues, smooths out their gender differences.

As for the difference between masculine male and female athletes and androgynous male and female athletes, it was found that it is the same and makes up 6% among masculine personalities and androgenic ones, the only difference is that in the first case this difference is in favor of girls, and in the second in favor of young men.

We also revealed the percentage ratio of male and female athletes of different sociocultural sexes in individual cyclic sports. Only those sports were considered in which among the studied there were representatives of both male and female in the amount of at least 8 people (skiing, swimming and running athletics).

Table 2

Percentage of male and female athletes of various gender groups in individual cyclic sports

Kind of sport	Boys		Girls	
	Masculine	Androgynous	Masculine	Androgynous
Ski race	36%, n = 4	64%, n = 7	55%, n = 6	45%, n = 5
Swimming	47%, n = 7	53%, n = 8	67%, n = 8	33%, n = 4
Athletics (running disciplines)	40%, n = 4	60%, n = 6	43%, n = 6	57%, n = 8

In all analyzed sports, they belong to the group of cyclic species; the majority of representatives of the androgynous type of personality were identified in athletes. Female athletes - masculine girls have more in cross-country skiing and swimming, and representatives of running disciplines of athletics have an androgynous personality.

Thus, the formation of a masculine type of personality in girls is facilitated by swimming and skiing, and among the youths from the sports considered, no ones have been found that contribute to their masculinization.

We have identified the percentage ratio of gender personality types among male and female athletes specializing in cyclic sports relative to their sports

qualifications. All subjects with respect to their biological sex were divided into two groups. The first group is qualified male and female athletes. These include those with the title MSIG, MS and CMS. The second group is male and female athletes (1 and 2 sports categories). It was found that among qualified athletes, the ratio of masculine (49%) and androgynous (51%) personalities does not differ significantly. Among categories athlete, androgynous type personalities also predominate in a small amount (46% of the masculine and 54% of the androgynous). Among qualified athletes, the majority of masculine girls were found - 68% (androgynous – 32%), and among athletes with mass sports categories the ratio between girls from masculine and androgynous types of personality was recorded as 41% and 59%, respectively. Thus, it was found that among athletes specializing in cyclic sports, high sports qualifications contribute to masculinization of the individual, but this trend was not revealed in athletes.

Using the method of S. Boehm "Masculinity / Femininity", which diagnoses the psychological gender and reveals the degree of androgyny, masculinity and femininity of the personality and the 16-factor Kettell questionnaire, which diagnoses personality traits, we found out the similarities and differences between masculine and androgynous boys and girls specializing in sports games regarding their personal qualities (Table 3 and Table 4).

Table 3

Average indicators of personal qualities of youth athletes specializing in cyclic sports taking into account the gender type of personality, x±m, c. u.

Personal qualities	Masculine n1 = 29	Androgynous n2 = 32	t	p
Closure - Sociability (A)	7,59 ± 0,10	7,31 ± 0,08	2,19	< 0,05
General intelligence (B)	4,07 ±0,07	4,53 ± 0,09	4,04	< 0,001
Emotional instability - emotional stability (C)	7,52 ±0,10	7,16 ± 0,08	2,81	< 0,01
Subordination - Dominance (E)	**7,28** ±0,15	6,28 ± 0,11	5,38	< 0,001
Restraint - Expressivity (F)	5,55 ±0,10	5,06 ± 0,09	3,63	< 0,001
Sensitivity to feelings - high normative behavior (G)	8,79 ±0,12	8,22 ± 0,11	3,52	< 0,001
Shyness - Courage (H)	8,17 ±0,14	7,69 ± 0,12	2,61	< 0,05
Stiffness - Sensitivity (I)	*5,31* ±0,10	*5,67* ± 0,11	2,42	< 0,05
Gullibility - Suspicion (L)	**5,83** ±0,12	**5,13** ± 0,11	4,32	< 0,001

continuation of the Table 3

Practicality - Advanced Imagination (M)	6,38 ±0,11	6,84 ± 0,12	2,84	< 0,01
Straightforwardness - Diplomacy (N)	5,48 ±0,10	5,00 ± 0,10	3,40	< 0,01
Self Confidence - Anxiety (O)	5,83 ±0,10	5,48 ± 0,09	2,61	< 0,05
Conservatism - Radicalism (Q1)	*6,97* ±0,12	*6,63* ± 0,11	2,10	< 0,05
Conformism - Nonconformism (Q2)	5,66 ±0,11	6,00 ± 0,12	2,10	< 0,05
Low self-control - high self-control (Q3)	7,21 ±0,12	6,72 ± 0,11	3,02	< 0,01
Relaxation - Tension (Q4)	4,86 ±0,11	4,50 ± 0,10	2,13	< 0,05
Adequacy of Self-Assessment (MD)	7,72 ±0,14	6,97 ± 0,12	4,08	< 0,001

The results obtained indicate the existing difference in the reliability in the studied indicators of the personal qualities of young athletes, which are divided into three levels. The first level (p <0,05) includes indicators: isolation - sociability (t = 2,19), timidity - courage (t = 2,61), rigidity - sensitivity (t = 2,42), self-confidence - anxiety (t = 2.61), conservatism - radicalism (t = 2,10), conformism - non-conformism (t = 2,10), relaxation - tension (t = 2,13). To the second level (p <0,01): emotional instability - emotional stability (t = 2,81), practicality - developed imagination (t = 2,84), straightforwardness - diplomacy (t = 3,40), low self-control - high self-control (t = 3,02). The most significant reliability (p <0.001) was determined by indicators: general level of intelligence (t = 4,04), subordination - dominance (t = 5,38), restraint - expressiveness (t = 3,63), susceptibility to feelings - high normative behavior (t = 3,52), gullibility - suspiciousness (t = 4.32), adequacy of self-esteem (t = 4,68). Similar results were obtained in terms of personal qualities of girls-athletes (Table 4).

Table 4

Average personal characteristics of female athletes specializing in cyclic sports, taking into account the gender type of personality, x ± m, c. u.

Personal qualities	Masculine n1 = 29	Androgynous n2 = 25	t	p
Closure - Sociability (A)	8,17 ± 0,13	7,52 ± 0,12	3,67	< 0,001
General intelligence (B)	4,17 ± 0,08	4,48 ± 0,10	2,42	< 0,05
Emotional instability - emotional stability (C)	7,69 ± 0,12	7,04 ± 0,11	4,01	< 0,001
Subordination - Dominance (E)	6,45 ± 0,10	6,00 ± 0,09	3,33	< 0,01
Restraint - Expressivity (F)	6,28 ± 0,10	5,62 ± 0,09	4,89	< 0,001
Sensitivity to feelings - high normative behavior (G)	**9,07** ± 0,12	8,60 ± 0,11	2,90	< 0,01

continuation of the Table 4

Shyness - Courage (H)	8,07 ± 0,12	7,26 ± 0,10	5,19	< 0,001
Stiffness - Sensitivity (I)	6,72 ± 0,10	7,04 ± 0,11	2,16	< 0,05
Gullibility - Suspicion (L)	**5,48** ± 0,09	**6,12** ± 0,10	2,91	< 0,01
Practicality - Advanced Imagination (M)	6,17 ± 0,10	6,60 ± 0,11	2,90	< 0,01
Straightforwardness - Diplomacy (N)	4,55 ± 0,08	4,92 ± 0,09	3,08	< 0,01
Self Confidence - Anxiety (O)	6,28 ± 0,11	**7,28** ± 0,12	6,17	< 0,001
Conservatism - Radicalism (Q1)	7,48 ± 0,12	*6,36* ± 0,11	5,61	< 0,001
Conformism - Nonconformism (Q2)	5,10 ± 0,11	5,64 ± 0,12	3,33	< 0,01
Low self-control - high self-control (Q3)	6,59 ± 0,10	7,12 ± 0,12	3,40	< 0,01
Relaxation - Tension (Q4)	5,66 ± 0,08	5,92 ± 0,09	2,17	< 0,05
Adequacy of Self-Assessment (MD)	7,21 ± 0,12	6,60 ± 0,11	3,77	< 0,001

Female athletes also identified three groups of confidence levels.

The smallest confidence values ($p < 0,05$) are defined in terms of the general level of intelligence ($t = 2,42$), rigidity - sensitivity ($t = 2,16$), relaxation - tension ($t = 2,17$).

A significant number of indicators of personal qualities have an average level ($p < 0,01$): subordination - dominance ($t = 3,33$), susceptibility to feelings - high normative behavior ($t = 2,90$), credulity - suspiciousness ($t = 2,91$), practicality - developed imagination ($t = 2,90$), straightforwardness - diplomacy ($t = 3,08$), conformism - non-conformism ($t = 3,33$), low self-control - high self-control ($t = 3,40$).

The highest level of certainty ($p < 0.001$) has indicators: emotional instability - emotional stability ($t = 4.01$), isolation - sociability ($t = 3.67$), restraint - expressiveness ($t = 4,89$), timidity - courage ($t = 5,19$), self-confidence - anxiety ($t = 6,17$), conservatism - radicalism ($t = 5,61$), adequacy of self-esteem ($t = 3,77$).

Conclusions / Discussion

Thus, the obtained results indicate the different level of personal qualities in both girls and boys of the masculine and androgynous types. The greatest differences were found among youth athletes in terms of such personal qualities as: subordination - dominance ($t = 5,38$; $p < 0,001$) and restraint - expressiveness ($t = 5,63$; $p < 0,001$) in favor of athletes of the masculine type. In female athletes, the most significant reliability was obtained in terms of: restraint - expressiveness ($t = 4,89$; $p < 0,001$),

timidity - courage (t = 5,19; p <0.,001), self-confidence - anxiety (t = 6,17; p <0.,001) and conservatism - radicalism (t = 5,61; p <0,001) with better results in athletes of the masculine type, in addition to the indicator of the factor “rigidity - sensitivity”, which is higher in athletes of the androgynous type of personality. In addition, among youth athletes, the highest reliability (p <0,001) was determined in 6 indicators, and among athletes in 7 indicators. The above indicates that a certain difference in indicators corresponds to the possibilities of conducting competitive activity and affects the formation of the personality type of athletes.

Prospect of further research in this direction. Further research is planned to be carried out in the direction of identifying similarities and differences among male and female athletes of various gender types regarding their personality characteristics, taking into account the specifics of sports activities and sports qualifications.

Conflict of interests. The authors declare that no conflict of interest.

Financing sources. This article didn’t get the financial support from the state, public or commercial organization.

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Received: 10.04.2020.
Published: 04.05.2020.

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UDK [796.853.26:796.012.444.2/616.28-008.1]

ISSN (English ed. Online) 2311-6374

2020, Vol. 8 No. 2, pp.64-72

ANALYSIS OF ATTACK TECHNIQUES OF HIGHLY SKILLED FEMALE KARATEKAS WITH HEARING HEARING IMPAIRMENTS

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Purpose: to determine the frequency of kicks by highly qualified female karatekas with hearing impairments, as well as their effectiveness.

Material and Methods: the method of video recording and the method of analysis of literary sources were used in the study. The performance of 8 female athletes in 8 duels was investigated, 276 attacking actions were analyzed.

Results: it was found that high-skilled karate athletes most often use Jodan (top-level, head-on) kicks, followed by Jodan kicks in the second place; Jodan kicks hitting the target (7.2% of the target) bring Ippon to the athlete which means 3 points, while Yuko (1 point) hits 17.27% of the target. The average time between strikes is 4.7 seconds, however, most of the time between strokes is from 1 to 3 seconds.

Conclusions: optimization of individual training of highly qualified female karatekas can be done by changing the proportion of kicks in the way of increasing amount of kicks in the upper sector (Jodan), at the cost of kicks in the middle sector (Chudan), which according to the study are the least effective.

Keywords: karate, highly skilled female athletes, deaf, competitive activities.

Introduction

Karate is a sport, a martial art that is part of the Deaflympics program. The requirement for athletes to participate in the Deaflympics is that the athlete must have 55 dB hearing loss in the best ear. Participation and victory in these competitions is the highest sports result for female karatekas with hearing impairments.

Improving the system of training highly qualified karatekas requires trainers and athletes to constantly search for new methodological approaches to the organization and content of the educational process [1]. Athletes must have the ability to high pace, the variability of technical actions, the ability to withstand the psychological stress that occurs during the fight [1]. The works of sports researchers are devoted to improving the physical qualities of highly qualified athletes based on the requirements of competitive activity [9-10].

Many domestic and foreign scientists studied the biomechanical criteria of the optimal karate technique, in particular, the frequency and effectiveness of fighting action was studied [2]. So, D. N. Samuylov investigated the volume and effectiveness of kicking actions in kumite of highly qualified athletes and showed the proportions of legs and hands kicks, in different levels, as well as the execution of a series of kicks [1]. V. Busol and S. Vishnevetsky [2] investigated the types of percussion and the extent of their use in competitions at various levels. The effectiveness of kicking technical actions in the kumite of the absolute world champions [3] was also investigated and recommendations were given on the number of kicks delivered, the number of kicks that reached the goal, and the efficiency ratio of technical actions. The above indicates that the analysis of competitive activity of highly qualified karatekas is extremely relevant for further research and development of training programs for athletes of various levels.

As for highly skilled female karatekas with hearing impairments, according to our knowledge, a study of their competitive activity has not been conducted. A rather small number of publications abroad was devoted to the training process of karatekas with hearing impairments [4-7]. According to Akınoğlu B., Kocahan T. [8] there are very few studies conducted with the participation of deaf athletes around the world,

despite the development and long history of Deaflympic sports. Given the above, there is a need for additional coverage of the problems of the training and competitive process of deaf athletes.

Purpose of the study: to determine the frequency of kicks by highly qualified female karatekas with hearing impairments, as well as their effectiveness.

Material and Methods of research

To conduct the study, we used the method of analysis and generalization of literature on the research problem, the method of filming and subsequent analysis, descriptive methods of mathematical statistics that allowed us to determine average values (X), standard deviation (SD), minimum (min) and maximum (max) values. The karate fights of the open category of women at the 2017 Deaflympics were analyzed. The study involved 8 highly skilled female karatekas.

Results of the research

As a result of the study, it was revealed that female karatekas of high qualification at the Deaflympic Games 2017 most often used kicks in the Jodan sector (upper level, a blow to the head), in second place kicks in the Jodan sector (Table 1).

Table 1

Most frequently performed highly qualified female karatekas kicks with hearing impaired in the 2017 Open Weight category of the Deaflympics.

	N	X	Me	Min	Max	SD
Number of kicks made by leg in the Jodan sector	14	4,1	2,5	0	13	4,2
Number of kicks made by leg in the Chudan sector	14	3,8	3	0	10	3,5
Number of kicks made by hand in the Jodan sector	14	5,7	5	1	15	3,7
Number of kicks made by hand in the Chudan sector	14	1,6	1	0	6	1,8

Remark: the table shows the results of one athlete for 1 kumite.

Since the data we obtained did not correspond to the normal distribution, the table shows the average value, median, minimum and maximum values, and standard

deviation. Thus, we can observe a large run from the minimum number of kicks to the maximum. So, the smallest value of the kicks at the Jodan level with the hand is equal to one, and most of all - fifteen. The indicated is explained by the activity of each female athlete. Female karatekas, who conduct active attacking actions, force rivals to defend themselves and conduct a significantly smaller number of attacking techniques.

After analyzing all the kicks, it was revealed that various kicks (Tsuki - direct and Uchi - circular) in the Jodan and Chudan level account for 46.6% of kicks, 29.2% of kicks in the Jodan sector, and kicks in Chudan sector - 24.2% (see Figure 1.).

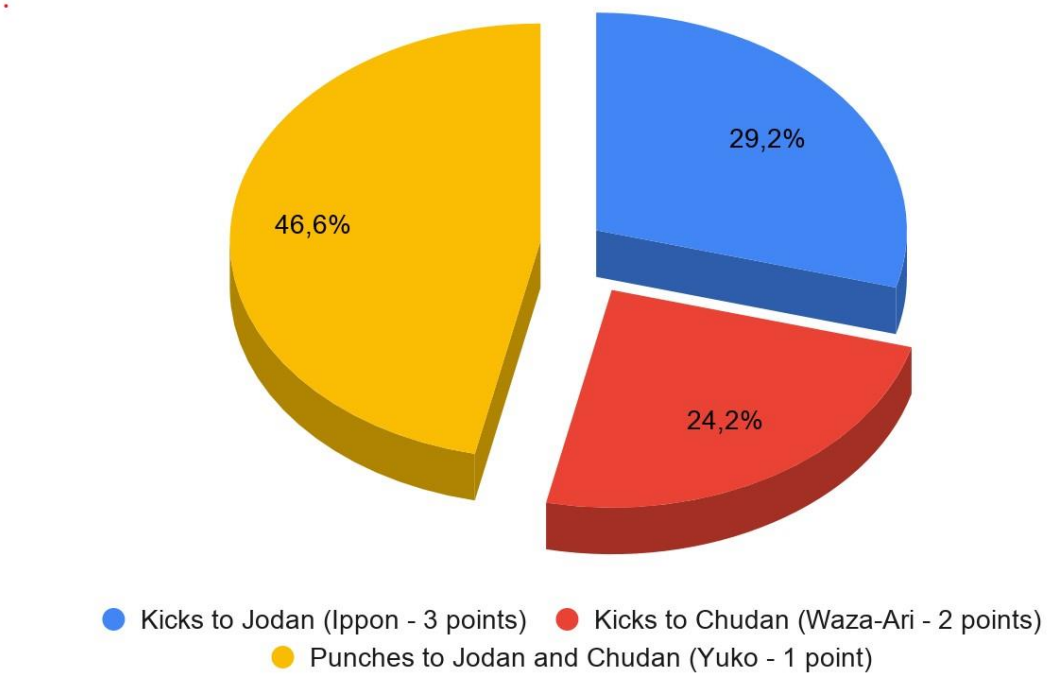

Fig. 1. Percentage of kicks (n = 276) delivered by female karatekas during the Deaflympics (open category)

The analysis of accurate kicks (Fig. 2) showed that kicks in the Jodan sector achieve the goal in 7.25% of cases among the studied contingent of athletes, giving them Ippon - 3 points. Kicks in the Chudan sector achieve the goal in 3.51% of cases, the karatekas gets a Waza-Ari score of 2 points. Kicks in the Jodan and Chudan sectors kicks the target in 17.2% of cases, giving the athlete who successfully carried

out this attacking action, Yuko - one point. It should be noted that in successfully conducted attacking actions were those for which the athletes received points from the judges and therefore met the requirements of the karate rules, namely:

a) good form;

b) sports attitude;

c) concentration;

d) readiness to continue the battle;

e) correct timing;

e) correct distance.

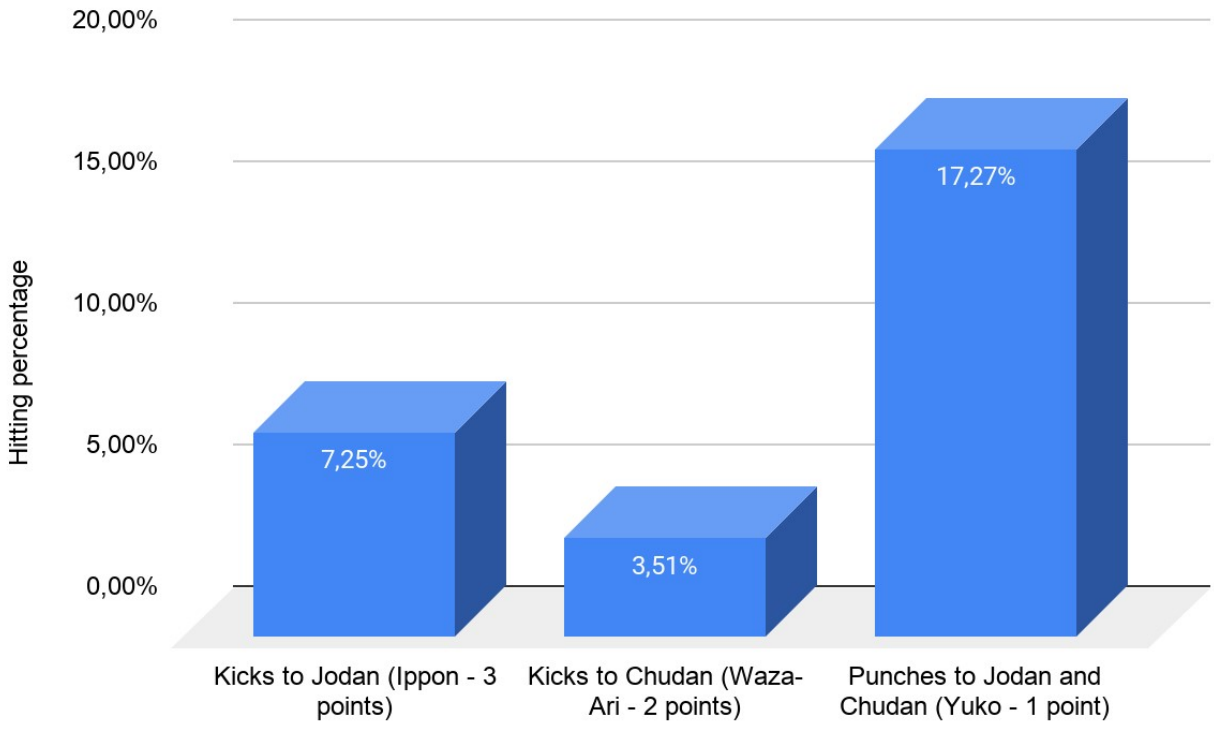

Fig. 2. Percentage of successfully carried out attacking actions (n = 276) of female karatekas of the open category at the 2017 Deaflympics

During the study, the time intervals between the kicks were found, the data are shown in Table 2 and Figure 3. This information helps to determine the density of the kumite at high karate competitions among women with hearing problems. So, the average value is 4.7 s, the standard deviation is 7.1; the minimum value is 0, which means several kicks in a row, without a break, the maximum value is 43 s.

Table 2

Time intervals between kicks in highly qualified female karatekas with hearing impaired

	N	X	Min	Max	SD
Time interval between kicks, s	219,0	4,7	0,0	43,0	7,1

For a more informative display of data on the time intervals between kicks, the data are presented in Figure 3 as a Gaussian distribution.

From Figure 3 it is seen that most often between kicks in karate, the length of the gaps is from 0 to 3 seconds. The above indicates a high density of the duel and related requirements for the physical, tactical and technical training of highly qualified female karatekas with hearing impairments.

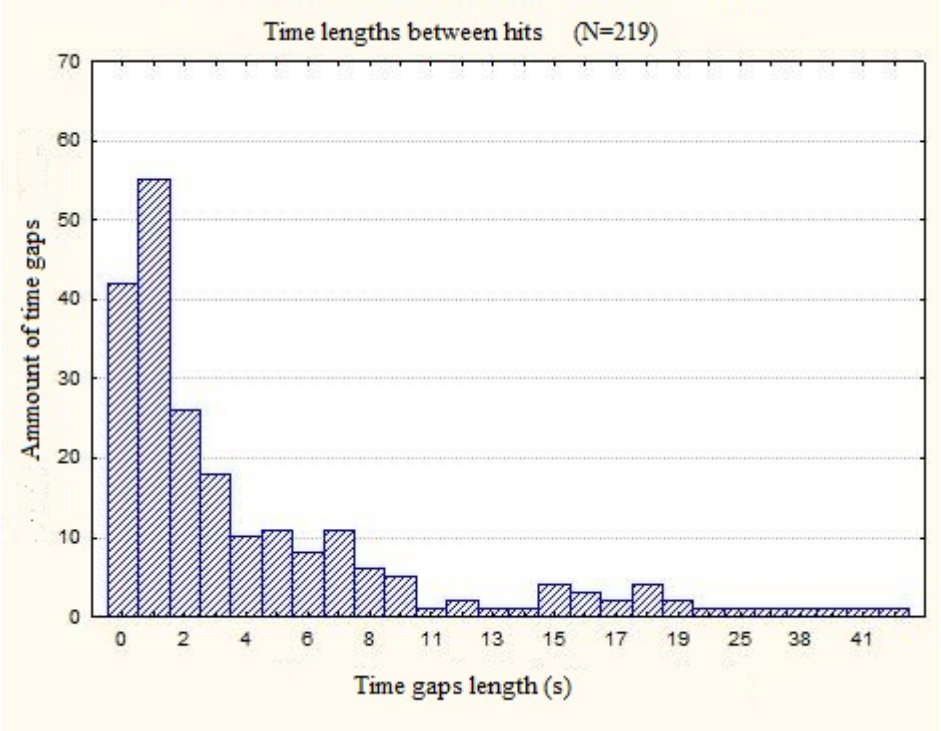

Fig. 3. The time intervals (s) between the kicks of female karatekas of high qualification of the open category Deaflympic Games 2017

Conclusions / Discussion

According to the results of the study, highly skilled female karatekas most often use hand kicks in the upper and middle sectors (Jodan and Chudan). Also, these attacks most often bring a positive result in 17.27% of cases. It should be noted that

kicks to the upper sector (Jodan), reaching the goal in 7.2% of cases, bring the Ippon athlete 3 points, while kicks Yuko (1 point).

Based on the data obtained, it is possible to optimize the individual training of highly qualified female karatekas by changing the proportion of kicks in the direction of increasing kicks to the upper sector (Jodan), by reducing kicks to the middle sector (Chudan), which according to the study is the least effective.

When studying the density of kumite, it was found that on average the interval between kicks is 4.7 seconds. But most often there are intervals between kicks from 1 to 3 seconds. Given the above data, the training process can be adjusted so that the physical technical and tactical training of highly qualified female karatekas meets the requirements of competitions at the highest level.

Prospects for further research are the development of individual training programs for highly qualified female karatekas with hearing impairments for the XXIII Deaflympics to be held in 2021.

Conflict of interests. The authors declare that no conflict of interest.

Financing sources. This article didn’t get the financial support from the state, public or commercial organization.

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Received: 13.04.2020.

Published: 04.05.2020.

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UDK [796.012.35:796.012.2+796.015.31]-053.67

ISSN (English ed. Online) 2311-6374

2020, Vol. 8 No. 2, pp.73-83

IMPROVING THE COORDINATION ABILITIES OF YOUNG ATHLETES IN THE INITIAL PHASE OF TRAINING IN SPORTS DANCES

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Purpose: to identify the features of improving the coordination abilities of young athletes at the stage of initial training in dancesport.

Material and Methods: a set of scientific research methods was used (theoretical analysis, systematization and generalization of scientific literature; pedagogical observation, pedagogical testing). The experimental part was attended by 10 sports duets of the first year of study (7-8 years). Were formed two groups (control - 5 couples and experimental - 5 couples).

Results: due to the use of experimental techniques, selection of tools and the optimal combination of loads, taking into account the age characteristics of young athletes, the differences between the arithmetic mean values obtained in the experiment are considered plausible. When conducting a research to determine the development of coordination abilities by means of dancesport, the probability (P) of obtaining similar results (when the arithmetic mean values of the experimental groups are higher than the control) is more than five percent significance, or less than 95 cases out of 100.

Conclusions: the developed method of improving the coordination abilities of young athletes in the process of sports dances provides reasonable provisions for the targeted use of elements for the development of coordination abilities in young athletes, solves the main tasks of the stage of initial training in sports dances, sensitive period of coordination sports.

Keywords: coordination abilities, coordination of movements, the indicators, athletes, sports dances.

Introduction

Currently, sports dances are becoming increasingly popular in Ukraine and around the world. Sports dances are a complex and coordinated sport. Athletes must perform many different complex elements on the floor, including reusable steps, turns, and jumps and so on.

Since dancesport is complex coordination sports with stereotypical (standard) movements of qualitative value and relatively stable manifestation of kinematic characteristics of movements, so among the parties of training of dancers an exceptional place is occupied by the development of coordination abilities.

As shown by scientific research of Mrs. Mullagildina, A., Mrs. Deineko, A., Mrs. Krasova I., Mr. Platonov, V., Sadowski, J. [7; 10; 11] that coordination abilities of man should begin to develop as early as primary school age. The older children are, the longer the learning process of their coordination abilities is. In modern dances, the age of the first great successes is earlier than in most sports, and high results can be achieved only after strenuous exercises.

Successes in the development of sports dances are largely due to the results of scientific research Mr. Bernstein, N., Mrs. Erokhina, O., Mr. Kovalenko, A., Sarabon, N., and others [1; 3; 4; 11]. In this regard, from athletes require a high level of accuracy, speed, stability and comprehensive coordination in time and space.

The purpose of the research: Identifying the features of improving the coordination abilities of young athletes at the stage of initial preparation in dancesport.

Material and Methods of research

The research used a set of scientific research methods: (theoretical analysis, systematization and generalization of scientific literature; pedagogical observation, pedagogical testing). The experimental part of the research involved 10 sports

couples of the first year of study (7-8 years). Two groups were formed (control - 5 couples and experimental - 5 couples).

Results of the research

Studies of these literature sources suggest that dancesport is a unique combination of performing arts and sports. From each of these components dancesport has absorbed the main characteristics. The main characteristics of art - emotionality, aesthetics of perception, empathy for the process of taking place on the stage (parquet). In this sports dances fully correspond to the main directions of art: theater, ballet, painting, music. Along with figure skating and rhythmic gymnastics, belong to the group of complex coordination sports. And therefore many scientific achievements, methodical principles of these kinds of artistic sports can and should be used adapted to sports dances [6].

In real training and competitive activities, all these abilities are manifested not in pure form, but in complex interaction. In specific situations, some coordination abilities play a leading role, others - a supporting one, and it is possible to instantly change the role of different abilities in connection with changed external conditions. This is especially evident in gymnastics, aerobic gymnastics, acrobatics, sports games, martial arts, alpine skiing, sports dances, i.e. in all those types in which the result largely depends on the coordination abilities [2; 7].

Athlete's coordination abilities are very diverse and specific for each sport. However, they can be differentiated into individual types according to the features of manifestation, evaluation criteria and factors that determine them. Based on the results of research, we can identify the following relatively independent types of coordination abilities: spatio-temporal and dynamic parameters of movements; maintaining stability; sense of rhythm; orientation in space; arbitrary muscle relaxation; coordination of movements.

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change the role of different abilities in connection with changed external conditions [2; 7].

In dances with complex coordination, the sequence of providing information about movement is clearly observed. The dance begins "from the floor", and it is extremely important to show and explain in the appropriate sequence: where we step (how we transfer weight); how to put the foot (how the foot works); how the knee works; how the body works; what is the position of the hands; where the gaze is directed (head position) [4; 8].

In sports dances the control over the level of development of coordination abilities usually occurs during the improvement of technical training on the basis of subjective, empirical views and conclusions of the coach. Therefore, this process requires the development of appropriate requirements, specialized tests and an evaluation system.

In order to achieve success in sports dancing, you must have a high level of development of endurance, flexibility, coordination abilities. And therefore, sports dances are recognized as one of the sports that require the development of the scientific foundations of sports training, analysis of means, forms and methods of working with athletes in sports dances [5].

In the scientific and methodological literature, you can find a large number of options for determining "coordination". However, the most expressive of them, given the specifics of sports activities, was suggested by Mr. Bernstein N., who believed that coordination of movements is the overcoming of excessive degrees of freedom of the body, which moves due to the purposeful organization of active and reactive forces [1].

Training of young athletes involves the use of the entire combination of means, methods, and conditions, with the help of which athletes are more prepared for sports achievements. Dexterity, coordination and the rhythm. These qualities are of great importance for successful sports dances.

As Mr. Kovalenko A. notes, in sports dances, the idea of training athletes-dancers is radically changing. In addition to sports-technical and special physical

training, musical-rhythmic, choreographic and compositional training are distinguished [5].

First of all, the initial training stage covers primary school age and proceeds to the next stage, and the initial preparation begins already at the age of 5-6 years old.

This period is designed for 2-3 years of continuous educational work from 3-4 lessons per week for at least 120 minutes each.

Coordination abilities occupy an important place in the physical education of children. The research of Mrs. Erokhina A., Mrs. Mullagildina A., Sadowski, J., Sarabon N. [3, 9; 11; 12] shows that the development of coordination abilities occurs heterochronously. That is, if you deliberately influence coordination abilities during a period of accelerated age development, the pedagogical effect will be significantly higher than in other periods.

When consolidating the studied movements and combinations, elements of novelty were used to maintain interest, new requirements and tasks were set. According to the principle of accessibility and individualization, they are fully consistent with the age and psychological characteristics of athletes-dancers, physical fitness, and the level of their sports and dance skills.

In the process of technical training, dancers need not only to master the complex coordination of movements, but also to learn to keep it in conditions with external obstacles, which is of great importance in sports. This is of great importance in sports activities. For this purpose, at the training athletes-dancers were put in new, unusual for them conditions: changing the usual direction of movements, exchanging between partners, etc.

The competitive combinations studied in training were accessible and complicated as the skills of young dancers developed.

Testing of coordination abilities of young athletes engaged in sports dances was carried out in dynamics: before classes and at the end of research in 10 indicators: 1) shuttle run 3x10 m with running around medicine balls; 2) assessment of the feeling of time; 3) running to numbered medicine balls; 4) jump with a turn; 5) static equilibrium according to the technique of Mr. Bondarevsky; 6) dynamic

balance when making turns on the gymnastic bench; 7) walking with splashing palms in a given rhythm; 8) rhythmic movements of the upper and lower limbs; 9) exercises test to determine motor memory; 10) control over the ability to relax muscles (table 1).

Table 1

Development indicators of the coordination abilities of young athletes in sports dances at the beginning of the research (n = 10)

No.	Indicators	Output at the beginning of the research	
		(X±m)	(V) %
1	Shuttle run 3x10 m with running around stuffed balls (sec)	10,66±0,09	2,97
2	Assessment of the feeling of time	0,87±1,03	9,35
3	Running to numbered medicine balls	23,31±1,02	8,82
4	Jump with a turn	1,68±1,72	6,34
5	Static equilibrium according to the technique of Mr. Bondarevsky	1,78±0,38	23,52
6	Dynamic balance when making turns on the gymnastic bench (sec)	6,57±0,24	13,58
7	Walking with splashing palms in a given rhythm (marks)	3,27±1,12	19,66
8	Rhythmic movements of the upper and lower limbs	3,56±0,89	4,77
9	Exercises test to determine motor memory	18,84±0,6	13,36
10	Control over the ability to relax muscles	3,71±0,25	2,65

To find the relationship between the samples on the basis of the experimental data, the correlation analysis out between the studied indicators of the experimental group was carried; the correlation coefficients are presented in table 2.

As a result of the correlation analysis, high (r = 0,98, r = 0,97, r = 0,96, r = 0,94, etc.) and medium (r = 0,68, r = 0,67, r = 0,65, etc.) the relationship between the parameters that are being studied.

This is due to the fact that all parameters are interconnected and, when optimally distributed in the training process, they effectively influence the effectiveness of the competitive activity of athletes in sports dances.

Thus, when planning the training process for athletes-dancers at the initial training stage, when improving coordination abilities, it is recommended to pay

attention to the spatio-temporal characteristics (r = 0,95), the ability to orientate in space (r = 0,91) and to maintain balance both dynamic (r = 0,96) and static (r=0,94) nature.

Table 2

Correlation interconnections of the results of testing the coordination abilities of young athletes in sports dances (n = 10p <0.05)

Coordination Ability Indicators	Shuttle run 3x10 m with running around stuffed balls (sec)	Assessment of the feeling of time	Running to numbered medicine balls	Jump with a turn	Static equilibrium according to the technique of Mr. Bondarevsky	Dynamic balance when making turns on the gymnastic bench (sec)	Walking with splashing palms in a given rhythm (marks)	Rhythmic movements of the upper and lower limbs	Exercise test to determine motor memory	Control over the ability to relax muscles
Shuttle run 3x10 m with running around stuffed balls (sec)	1									
Assessment of the feeling of time	0,95	1								
Running to numbered medicine balls	0,41	0,67	1							
Jump with a turn	0,87	0,91	0,75	1						
Static equilibrium according to the technique of Mr. Bondarevsky	0,57	0,77	0,94	0,83	1					
Dynamic balance when making turns on the gymnastic bench (sec)	0,92	0,96	0,675	0,94	0,81	1				
Walking with splashing palms in a given rhythm (marks)	0,78	0,90	0,91	0,93	0,96	0,92	1			
Rhythmic movements of the upper and lower limbs	0,40	0,64	0,98	0,75	0,96	0,67	0,89	1		
Exercise test to determine motor memory	0,68	0,87	0,93	0,91	0,95	0,88	0,89	0,93	1	
Control over the ability to relax muscles	0,87	0,94	0,79	0,93	0,79	0,89	0,91	0,87	0,97	1

The sense of rhythm (r = 0.98) and the coordination of movements (r = 0.95) are the most important indicators of coordination abilities for sports dances performers, since these qualities are interconnected with the technical training of the dancers and are manifested not in isolation, but in a complex interaction.

To research the level of development of the coordination abilities of dancers, the control test method was used. The test involved 10 pairs from the experimental and control groups. According to the test results, the arithmetic mean of their X values was determined (table 3)

Table 3

Development indicators of the coordination abilities of young athletes in sports dances

The name of the test	Control group	CV %	Experimental group	CV %
Static equilibrium according to the technique of Mr. Bondarevsky (sec)	29 ±4,01	39,1	31.62 ± 3	26,5
Walking in a straight line with eyes closed (cm)	425 ±68,13	45,3	445.5 ±61,9	39,3
Ten Eights (Kopylov test) (sec)	10.62 ± 1,28	34,1	6.62 ± 0,9	40,3
Rhythmic movements of the upper and lower limbs (The number of cycles)	6.62 ± 0,98	41,9	7.87 ± 1	34,2
Visual assessment of the quality of the execution of the flywheel and splint-like movements	2.87 ±0,30	29	2,87 ± 0,2	22,3
Determination of motor memory (number of times)	4.5 ± 0,57	35,6	4.37 ±0,6	40,4

According to the obtained results, it was found that the group is heterogeneous: all values of the coefficient of variation are CV> 15. Therefore, improving the coordination abilities of young athletes at the initial training stage in sports dances is the basis for further high results.

Conclusions / Discussion

In the process of analysis of scientific and methodological literature [4; 5; 6; 7; 9; 10, 11] the features of improving the coordination abilities of young athletes at the initial training stage in sports dances were revealed. Any movement, no matter how new it may be, is always carried out on the basis of old coordination ties. The more young athletes have a stock of motor skills, the easier it is to learn new movements, while developing coordination abilities. Improving the development of coordination

abilities is the foundation for achieving high results in the competitive activity of young dancers in sports dances.

As a result of the pedagogical experiment, we determined how much the movements of sports dances of the European program affect the development of the coordination abilities of adolescents during six months of training.

To analyze the obtained results, methods of mathematical statistics were used. Thus, in the control group, the ability to preserve motor memory (28.57%) achieved the greatest development, and spatial orientation (9.74) achieved the smallest. In the experimental group, the greatest development was observed in the ability to coordinate movements (70.83%) and in preserving motor memory (71.39%)), and the least - in the ability to relax muscles (12.9%). Differences between the results obtained during the experiment are considered significant.

It was established that the testing and the obtained test results of athletes-dancers showed a very low level of development of coordination abilities. Thus, when planning the training process of young athletes at the initial training stage, it is recommended to pay attention to these indicators when improving coordination abilities.

Prospects for further research. It is planned to devote further research to identifying other value priorities in the direction of sports dances and finding ways to solve them.

Conflict of interests. The authors declare that no conflict of interest.

Financing sources. This article didn’t get the financial support from the state, public or commercial organization.

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Received: 14.04.2020.
Published: 04.05.2020.

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ISSN (English ed. Online) 2311-6374

2020, Vol. 8 No. 2, pp.84-95

DETERMINATION OF THE CORRELATION BETWEEN THE INDICATORS OF COMPETITIVE AND SPECIAL EXERCISES AND THE MORPHOFUNCTIONAL INDICATORS IN 12-15 YEARS OLD FEMALE WEIGHT-LIFTERS ATHLETES

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Purpose: to establish the level of correlation between the sports result of the morphofunctional indicators of female weightlifters aged 12-15 years and the level of special physical fitness.

Material and Methods: 30 young athletes of 12-15 years old were involved in the study. The study was conducted on the basis of the department of martial arts of the Kharkov State Academy of Physical Culture and the Children's Sports School No. 16 and the Children's Sports School No. 8.

Results: it is established the dependence of competitive and specially-preparatory exercises on morpho-functional indicators between a jerk of a weight of 8 kg per 10 min and anthropometric indicators - body length (r=0,488), upper limb length (r=0,431), chest circumference on inhalation and exhalation (r=0,676; r=0,640) and body weight (r=0,412). The indicators of general physical fitness are pulling up on the bar (r=0,431), bending and unbending the arms in a lying position (r=0,426), hanging on a bar 1.5 cm (r=0,588) and hanging on the bar on one arm (r=0,488). Squats with a weight of 24 kg correlate with morphological indicators and body weight and length of the lower limb (r=0,520; r=0,482, respectively), chest circumference on inspiration - r=0,540; on exhalation - r=0,620, as well as the

circumference of the thigh (r=0,752) of special physical preparedness: with a 30-meter run (r=-0,568) and a standing long jump (r=0,587). The results of a deadlift with a weight of 24 kg correlate with body weight (r=0,695), chest circumference on inhalation and exhalation (r=0,443; r=0,426), as well as the thigh circumference (r=0,654) with a 30 m run (r=-0,495), long jump from standstill (r=0,494), hanging on the bar 1.5 cm (r=0,418) and hanging on the crossbar on one arm (r=0,418). The results in a 8 kg kettlebell press revealed an interconnection only with body weight (r=0,606) and push-ups (r=0,620) and heart rate at rest (r=0,731), lung capacity (r=0,430) and breath holding on inhalation (r=0,482).

Conclusions: the correlation between the results of competitive exercises and special preparatory exercises that affect the strength training and endurance of female weight-lifting athletes is revealed, which makes it possible to take into account their use in the training process of female weightlifters aged 12-15 years.

Key words: sports result, morphofunctional preparedness, competitive exercises, special preparatory exercises.

Introduction

Studying the dependence of the results of competitive exercises on the level of morphofunctional and special physical fitness of young kettlebells is an important condition for building an effective training program for athletes at the initial stage. A number of studies are devoted to identifying the relationships between indicators of physical development, athletic preparedness, and athletic performance in various strength sports. V.M. Platonov, 2001, 2015; V.V. Prontenko 2010; K.V. Prontenko 2009; V. G. Oleshko, 2011 investigated the correlation between morphological characters, speed-strength qualities and sports and technical indicators in various strength sports [1; 6; 8]. The research results showed that with increasing sportsmanship, the height of a long jump from a place increased and had an average significant relationship with body length, bench press, jerk kettlebell, squats with a kettlebell.

In the research of V.V. Prontenko [12], V.Yu. Jim [4] was revealed a reliable correlation of biomechanical indicators of projectile movement with the level of development of motor abilities, strength and speed-strength parameters of equipment when lifting weights with an indicator of speed and power qualities of highly skilled weightlifters when performing classical exercises. P. Griban [3] recommends using the exercises “bending the arms in the supine position” and “lifting the body from the supine position” as auxiliary to increase the level of strength in the exercises of heavyweights.

In this work, we studied the dependence of a sports result on physical development data, the functional state of the cardiovascular and respiratory systems of the body and the special strength training of weightlifters at the initial training stage.

Purpose of the study: to establish the level of correlation between the athletic result of female weightlifters aged 12-15 years and indicators of special physical and morphofunctional preparedness.

Material and Methods of research

According to the methodological approach in solving the problem and tasks, the research program included a set of research methods: analysis of scientific and methodological literature, pedagogical testing of the level of special physical fitness, measuring anthropometric indicators of young weightlifters and methods of mathematical statistics.

Young pupils of the Children's and Youth Sports School No. 16 and the Children's and Youth School No. 8 of Kharkov took part in this study. 30 female weightlifters aged 12-15 years were involved in the experiment. The research participants trained 3-4 times a week in accordance with the program of the Children's and Youth Sports School.

Results of the research

To establish the dependence of the sports result on morphofunctional indicators and the level of special physical fitness of athletes, the correlation analysis was carried out, as a result of which it was found that most indicators correlate with each

other, but the degree of these relationships is different. Correlation coefficients range from 0.104 to 0.820 (Tables 1, 2, 3).

Table 1

Value of the correlation between the indicators of competitive and special exercises and anthropometric indicators female weightlifters aged 12-15 years (*n*= 30)

Indicators	Body weight.kg	Body length, cm	Body length sitting cm	Length of the upper limb, cm	Length of the lower limb, cm	Chest circumference (inhalation), cm	Chest circumference (expiration), cm	Thigh circumference, cm
8 kg kettlebell jerk in 10 minutes	**0,412**	**-0,488**	0,320	**-0,431**	0,231	**0,676**	**0,640**	0,320
Squats with a weight of 24 kg, t.	**0,520**	-0,350	0,352	-0,282	**0,482**	**0,540**	**0,620**	**0,752**
Deadlift with a weight of 24 kg, t.	**0,695**	0,218	0,205	0,194	0,329	**0,443**	**0,426**	**0,654**
Bench press 8 kg, t	**0,606**	0,104	0,155	-0,238	0,193	0,320	0,333	0,155

**Remark: reliability of the correlation coefficient r≥0,361 for n=30*

A weak and medium level of relationships between the kettlebell jerk of a weight of 8 kg per 10 min and anthropometric indicators was revealed: body length (r=0,488) length of the upper limbs (r=0,431) chest circumference on inhalation (=0,676) chest circumference on exhalation (r=0,640) and body weight (r=0,412) (Table 1).

The relationship between the result of squatting with a 24 kg weight and body weight and the length of the lower limb (r=0,520; r=0,482, respectively), the circumference of the chest on the inspiration (r=0,540) and expiration (r=0.620), as well as the hips circumference was also established (r=0,752). A significant relationship between the result of squats and the circumference of the thigh may indicate that in order to achieve the best result in this exercise, increase the mass of the muscles of the thigh.

The results of a deadlift of 24 kg weights correlate with body weight (r=0,695), chest circumference on inspiration and expiration (r=0,443; r=0,426), as well as the circumference of the thigh (r=0,654) (Table 1).

This indicates that during strength training, the deadlift increases due to the volume of the extensor muscles of the trunk and affects the circumference of the chest.

The result in a 8 kg bench press has an average relationship only with body weight (r=0,606). The correlation was observed between the results in the kettlebell jerk of 8 kg per 10 minutes and indicators of general physical preparedness – pulling up on the bar (r=0,431), push-ups (r=0,426), hanging on a bar 1,5 cm (r=0,588) and pull-ups on the crossbar (r=0,488) (Table 2).

This is explained by the fact that fast-contractile muscle fibers of the upper extremities are involved in the kettlebell jerk, which play a decisive role in the performance of these exercises.

Squats with a weight of 24 kg has a relationship with physical preparedness indicators: running 30 meters (r = -0,568) and standing long jump (r=0,587).

Table 2

Value of the correlation between the indicators of competitive and special exercises and the indicators of general physical preparedness of female weightlifters aged 12-15 years (*n*= 30)

Indicators	Running 30 m, s	Standing long jump, cm	Pull-ups on the crossbar, times	Push-ups, times	Hanging on a bar 1,5 cm wide, s	Hanging on the crossbar on one arm, s	Lifting legs to the crossbar, times
8 kg kettlebell jerk in 10 minutes	-0,312	0,215	**0,431**	**0,426**	**0,588**	**0,488**	-0,228
Squats with a weight of 24 kg, t.	**0,568**	**0,587**	0,142	0,269	0,199	0,169	-0,329
Deadlift with a weight of 24 kg, t.	**0,495**	**0,494**	0,319	0,183	**0,418**	**0,418**	-0,318
Bench press 8 kg, t	0,106	0,138	0,193	**0,620**	0,304	0,304	-0,204

**Remark: reliability of the correlation coefficient r≥0,361 for n=30*

An average correlation between the result of a deadlift with a 24 kg weight and 30 m run (r=-0,495), a standing long jump, (r=0,494), a 1,5 cm hanging (r=0,418) on

the bar and the crossbar on one arm, (r=0,418) (Table 2) was also established. This may indicate the relationship of speed and strength endurance preparedness of young athletes 12-15 years old, specializing in kettlebell lifting.

The result in a 8 kg kettlebell press has a relationship only with push-ups (r=0,620) (Table 2), which is due to the involvement of the same muscle groups, in particular the deltoid, three-headed shoulder muscles when performing these exercises.

Table 3

Value of the correlation between the indicators of competitive and special exercises and functional indicators of a 12-15-year-old female weight-lifting athletes (*n*= 30)

Indicators	Heart rate at rest beats for min	Absolute values PWC 170 (kgm/min)	Vital capacity of the lungs, l	Respiration rate per minute, times	Breath holding on inhalation, s	Breath holding on exhalation, s
8 kg kettlebell jerk in 10 minutes	**-0,713**	-0,278	**0,430**	**0,515**	**0,441**	**0,456**
Squats with a weight of 24 kg, t.	**-0,771**	**-0,399**	**0,462**	**0,627**	**0,472**	0,359
Deadlift with a weight of 24 kg, t.	**-0,655**	**-0,470**	**0,390**	**0,534**	**0,399**	**0,483**
Bench press 8 kg, t	**-0,506**	-0,104	0,355	0,338	0,293	0,120

**Remark: reliability of the correlation coefficient r≥0,361 for n=30*

So, when performing competitive exercises in kettlebell lifting, muscle fibers are involved in the work, which allow performing physical work for a long time, which is manifested in the value of the correlation coefficient between the maximum oxygen absorption and PWC170 (r=0,470) (Table 3).

It can also be explained by an increase in aerobic endurance and the level of physical performance of the body that occur in the process of sports training.

A jerk with an 8 kg kettlebell has a relationship between heart rate at rest (r=0,731), lung capacity (r=0,430) and breath holding on inspiration (r=0,482) (Table 3).

We also found a weak correlation between the result of squats with a 8 kg weight and PWC170 data (r=0,399), which can be explained by the dependence of aerobic endurance on the level of physical performance of the body that occurs during the sports training of female young athletes. The results of the deadlift with a weight of 24 k correlate with the indicated exercise and heart rate at rest (r = 0.655).

The obtained results of the correlation relationship between competitive, c-preparatory, specially-preparatory exercises and morphofunctional indicators were taken into account later in the construction of the training process for female weightlifters aged 12-15 years of the experimental group.

Conclusions / Discussion

An analysis of the scientific literature confirmed that research in the field of kettlebell lifting was mostly of a singular nature. In recent years, scientists have conducted studies on the content and methodology of the training process of young female athletes, female weightlifters aged 12-15 years with various methods of forming motor skills and strength qualities [1], planning the training process for a one-year macrocycle of female weightlifters aged 12-15 years [8-9] and the impact of the training process of female weightlifters aged 12-15 years on the manifestation of physical qualities. However, the question of the correlation relationship between competitive and special-preparatory exercises, which affect the strength preparedness and endurance of female weightlifters aged 12-15 years wasn’t investigated.

Therefore, the main attention should be focused on: the development of general and static endurance, flexibility, strength qualities of the muscles of the back and legs; improving special qualities by performing appropriate special preparatory exercises; improving the functional capabilities of the cardiovascular and respiratory systems; continuous improvement of the technique for performing competitive exercises in general and its individual parameters (reduction of static phases, observing the necessary angles between body parts, observing the appropriate pace during the performance of kettlebell lifting exercises).

We have confirmed that the most significant morphological indicators for ensuring a high sports result in competitive exercises in kettlebell lifting are the

length of the lower limb, the length of the upper limb, chest circumference and body weight. The results of our correlation analysis confirm the data obtained in the study of V. Oleshko [9]. The author shows a high correlation relationship (from r=0,6 to r=0,9) between the level of achievement in competitive exercises of athletes involved in power sports, with competitive exercises and length, body weight, chest circumference [8].

Thus, the study confirmed the results of other authors [1; 2] on the need to take into account the impact of training on the physical performance of female weightlifters aged 12-15 years at the stage of preliminary basic training. Domestic data were also expanded [4-5; 8; 9; 11] and foreign authors [17-22] on raising the level of the most significant indicators of physical qualities on the young body of athletes engaged in weightlifting.

The dependence of competitive and special preparatory exercises on morpho-functional indicators between the kettlebell jerk of 8 kg per 10 min and anthropometric indicators: body length (r=0,488), length of the upper limb (r=0,431), chest circumference on inhalation and exhalation (r=0,676; r=0,640) and body weight (r=0,412) with indicators of general physical fitness: pulling up on the bar (r=0,431), push-ups (r=0,426), hanging on a bar 1.5 cm (r=0,588) and hanging on the crossbar on one arm (r=0,488).

It was found that squats with a weight of 24 kg correlate with morphological indicators and body weight and length of the lower limb (r=0,520; r=0,482, respectively), chest circumference on inspiration (r=0,540), on exhalation (r=0,620), and also the circumference of the thigh (r=0,752), special physical preparedness with a 30 m run (r=-0,568) and standing long jump (r=0,587).

The results of a deadlift with a 24 kg kettlebell correlate with body weight (r=0,695), chest circumference on inspiration and expiration (r=0,443; r=0,426), as well as the thigh circumference (r=0,654) with a 30 m run (r=-0,495), long jump from standstill (r=0,494), hanging on the bar 1,5 cm (r=0,418) and hanging on the crossbar on one arm (r=0,418).

Results in a 8 kg kettlebell press: only a relationship was found with body weight (r=0,606) and push-ups (r=0,620) and the heart rate at rest (r=0,731), lung capacity (r=0,430) and breath holding on inhalation (r=0,482).

The correlation between the results of competitive exercises and special preparatory exercises that affect strength training and endurance of female weightlifters was found, which makes it possible to take into account their use in the training process of female weightlifters aged 12-15 years.

Prospects for further research include determining the construction of the training process for female weightlifters aged 12-15 years in separate mesocycles, taking into account the CMC phases.

Conflict of interests. The authors declare that no conflict of interest.

Financing sources. This article didn't get the financial support from the state, public or commercial organization.

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Received: 15.04.2020.
Published: 04.05.2020.

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UDK: 611.711/616.8-009.2:001.53

ISSN (English ed. Online) 2311-6374

2020, Vol. 8 No. 2, pp.96-108

INFLUENCE OF DYNAMIC LOADS DIFFERENT IN DURATION ON CHANGES IN THE ACTIVITY OF LACTATE DEHYDROGENASE ISOENZYMES IN INTERVERTEBRAL DISC CELLS

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Purpose: to determine the effect of long-term dynamic loads on changes in the activity of isoenzymes lactate dehydrogenase (LDH) in the cells of the intervertebral discs in the age aspect.

Material and Methods: the study was performed on male Wistar rats of three age groups: 1, 3 and 12 months. A total of 90 animals of the experimental series and 90 animals of the control series were observed. Dynamic loads were created by running in a horizontal treadmill. Using histochemical methods, the analysis of changes in the activity of lactate dehydrogenase isoenzymes in the cells of the intervertebral discs of Wistar rats after 20- and 90-day experimental run was performed.

Results: it is experimentally established that changes in the activity of lactate dehydrogenase isoenzymes depend on the age of the animals and the duration of dynamic loads. There was a decrease in the activity of LDH-1 and LDH-2 isoenzymes in the cells of the intervertebral disc, but an increase in the activity of LDH-3 and LDH-4 isoenzymes.

Conclusions: the identified age features of changes in enzyme activity are proposed to be used as a histochemical test to objectively assess the degree of destructive effect of prolonged running on the fibrous cartilage of the intervertebral disc.

Keywords: lactate dehydrogenase, intervertebral disc, treadmill, experimental running.

Introduction

Lesions of the musculoskeletal system, especially large joints and spine have a high social significance. The basis of clinical manifestations of back pain in most cases is the defeat of the intervertebral discs [8]. Such cases have been reported spinal overload [17,18], as well as after inadequate physical activity in sports [7; 11].

Therefore, finding out the adaptive capacity of cartilage during exercise is an urgent task.

An indicative model for studying the processes of anaerobic and aerobic metabolism of motor activity in different modes is the reaction of lactate dehydrogenase. There are some reports of the activity of this reaction in the serum of athletes [9]. The value of histochemical studies lies in their ability to localize the biochemical reaction and assess the activity of the reaction in cell structures.

Connection of research with scientific programs, plans, topics. The research was performed within the framework of the departmental theme of research work "Medical and biological substantiation of rehabilitation measures and the appointment of physical rehabilitation for young people of different levels of training".

Purpose of the study: to determine the change in the activity of isoenzymes lactate dehydrogenase (LDH) in the cells of the intervertebral discs during prolonged dynamic loads in the age aspect with histochemistry methods.

Material and Methods of the research

The study was performed on male Wistar rats of three age groups: 1, 3 and 12 months, which corresponds to immaturity, puberty and old age [5]. Work with laboratory animals was carried out in accordance with the requirements of the "European Convention for the Protection of Vertebrate Animals Used for Experimental and Other Scientific Purposes" [16]. A total of 90 animals of the experimental series (ES) and 90 animals of the control series (CS) were observed.

The animals were trained to run in a horizontal treadmill using an electronic counter to determine the length of the run. Rats of the I group ran for 20 days 10560 m, and of the II group, for 90 days 2 17280 m.

For all age groups of the experimental series, the maximum running speed was calculated and the equal treadmill speed was selected – 40 m / min. This speed allowed to use a long-distance running in experiments. Animals in the control series were in normal vivarium conditions.

Studies were performed by using macro-microscopy, histology (hematoxylin-eosin) and histochemistry.

Histochemical reactions are performed on enzymes that reflect the state of anaerobic energy supply systems in cells: lactate dehydrogenase (LDH) (K.F.1.1.1.27), its isoenzymes. LDH is an enzyme of anaerobic glycolysis that catalyzes the conversion of pyruvate to lactate [2, 19]. The method of spectrophotometry usually determines the activity of LDH and its five isoforms. By Histochemical methods Four LDH isoenzymes were detected: LDH-1, LDH-2, LDH-3, LDH-4. The reactions were performed on frozen in the cryostat sections of the MX disc, held parallel to the base of the vertebral bodies. The thickness of the sections was 4-5 μm. The setting of histochemical reactions was carried out in compliance with the same conditions [1] and taking into account the recommendations for processing and evaluation of the results of histoenzymological studies [10]. Control sections were incubated under the same conditions without substrate.

Quantitative evaluation of enzyme activity was performed on a two-beam scanning cytophotometer MUF-5. Measurements were performed by the plug method using a probe with a diameter of 200 μm and a lens of 50 and an operating wavelength of 546 nm. Extinction rates were determined at five points in the cytoplasm of each cell, after which the average value was calculated. The suitability of the material for photometric works with registration of the absorption spectrum on objects of different density was determined befor measurements.

The obtained digital material of biometric and cytophotometric studies was processed by the method of variation statistics.

Results of the research

After a 20-day run of the animals in the treadmill, a change in the orientation of the collagen fibers and cells of the fibrous ring of the intervertebral discs was observed. After a 90-day run, changes in the shape, structure and internal organization of the intervertebral discs were detected. On the territory of the fibrous ring there was a defibering of bundles of collagen fibers, disruption of fibrous plates course and cell orientation. In the ventral parts of the fibrous ring, blood vessels appeared, which were oriented along the fibrous plates. Signs of dystrophic changes were especially pronounced in the intervertebral discs of animals aged 1 and 12 months.

Under conditions of hyperkinesia, the morphology of fibrous ring cells and enzyme activity changed. LDH activity varied, but the degree of change was determined by the age of the animals and the level of physical activity (Fig. 1).

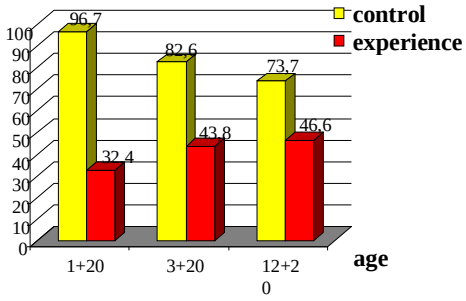

Fig.1. Indicators of total LDH activity in fibrous ring cells after 20 days of hyperkinesia. Age of animals: 1, 3 and 12 months + 20 days of running

In series 1 + 20 hyperkinesia, dark brown granules of diformazan densely located around a kernel were found in cells. The cells of the inner layer of the fibrous ring were located less orderly than in the control, and in places - as part of small isogenic groups. At the same time reduction to 80% of number of active cells is noticed. LDH activity decreased compared to control by 66.49%.

In the 3 + 20 series of hyperkinesia, densely spaced granules of diformazan filled most of the cytoplasm. LDH activity decreased by 46.97%.

In a series of 12 + 20 hyperkinesia, a change in LDH activity was detected against the background of impaired cell orientation and polymorphism of difformazan granules: large, small, and dusty forms appeared among them. LDH activity decreased by 37.6%.

As for LDH isoenzymes after a 20-day run, their changes were specific (Fig. 2).

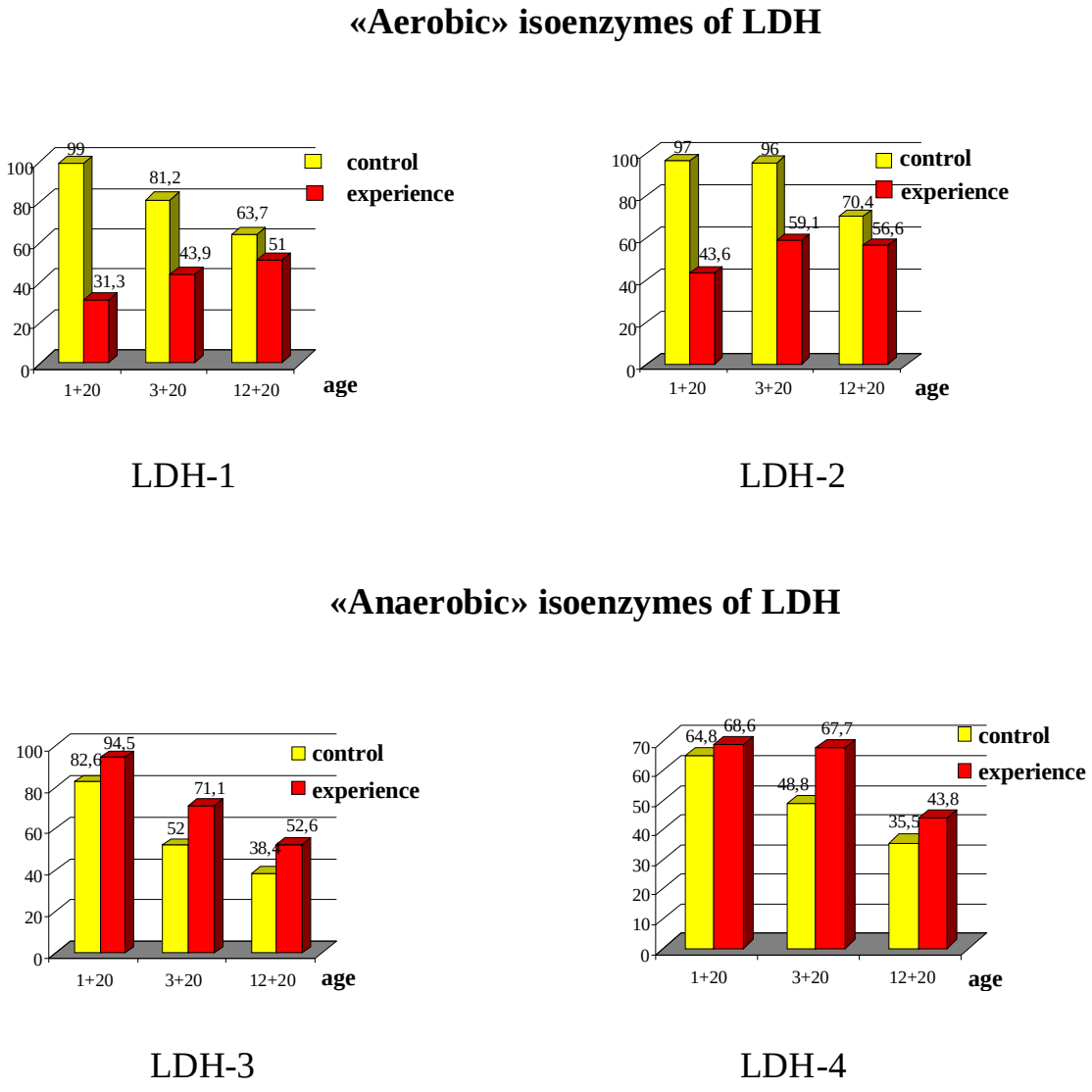

Fig. 2. Indicators of LDH isoenzyme activity in fibrous ring cells of the disc after a 20-day run. Age of animals: 1, 3 and 12 months + 20 days

In series 1 + 20 of hyperkinesia, the activity of LDH isoenzymes varied differently. Significantly decreased the activity of LDH-1 (by 68.3%) and LDH-2 (by

55%). At the same time, the activity of LDH-3 increased (by 12.6%) and even less, the activity of LDH-4 (by 5.53%).

As a result, the gradient of activity of LDH isoenzymes in the intervertebral disc cells of the of 1-month-old rats after a 20-day run was: LDH-3 – LDH-4 – LDH-2 – LDH-1

In the series 3 + 20 hyperkinesia, among LDH isoenzymes decreased: the activity of LDH-1 (by 45.9%) and LDH-2 (by 38.4%), while the activity of LDH-3 and LDH-4 increased (by 26.9 and 27.9% respectively).

The gradient of activity of LDH isoenzymes in disc cells in 3-month-old rats after a 20-day run was LDH-3 – LDH-4 – LDH-2 – LDH-1.

In the 12 + 20 series of hyperkinesia, the change in the activity of LDH isoenzymes was manifested by a decrease in the activity of LDH-1 and LDH-2 (by 19.9% and 19.6%, respectively) and an increase in the activity of LDH-3 and LDH-4 (by 26.9 and 18, 9% respectively).

As a result, the gradient of LDH activity of 12-month-old animals after a 20-day run was: LDH-2 – LDH-3 – LDH-1 – LDH-4.

A long 90-day run caused a change in LDH activity, which had age differences. At the end of the experiment, the animals reached the age of 4, 6 and 15 months. A peculiarity was in the increase in LDH activity in the intervertebral discs of animals trained in the treadmill from 1 month of age. In the intervertebral discs of older animals, LDH activity decreased (Fig. 3).

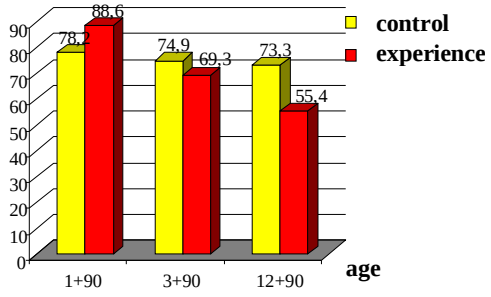

Fig.3. Indicators of total LDH activity in the fibrous ring cells of the disc after a 90-day run. Age of animals: 1, 3 and 12 months + 90 days

In series 1 + 90 hyperkinesia, in the outer layer cells of the fibrous ring were dark brown granules of diformazan, tightly arranged around the nucleus. The inner layer cells of the fibrous ring were arranged in a less orderly manner, in places as part of small isogenic groups. LDH activity increased by 11.7%. *In series 3 + 90 hyperkinesia*, LDH activity reduced by 75%. Large difformazan granules appeared in the cytoplasm, scattered among the small granules that predominated in the ectoplasm. *In the series 12 + 90 hyperkinesia*, LDH activity decreased by 24.4%. Diformazan granules densely filled the endoplasm and clearly delineated the contours of the nucleus; most of the granules differed in dark brown color and medium size. The distribution in the fibrous ring of enzyme-labeled cells was uneven, and the characteristic orientation of the cells along the fibrous plates, which is inherent in the control, was absent. Changes in the activity of LDH isoenzymes also had age differences (Fig. 4).

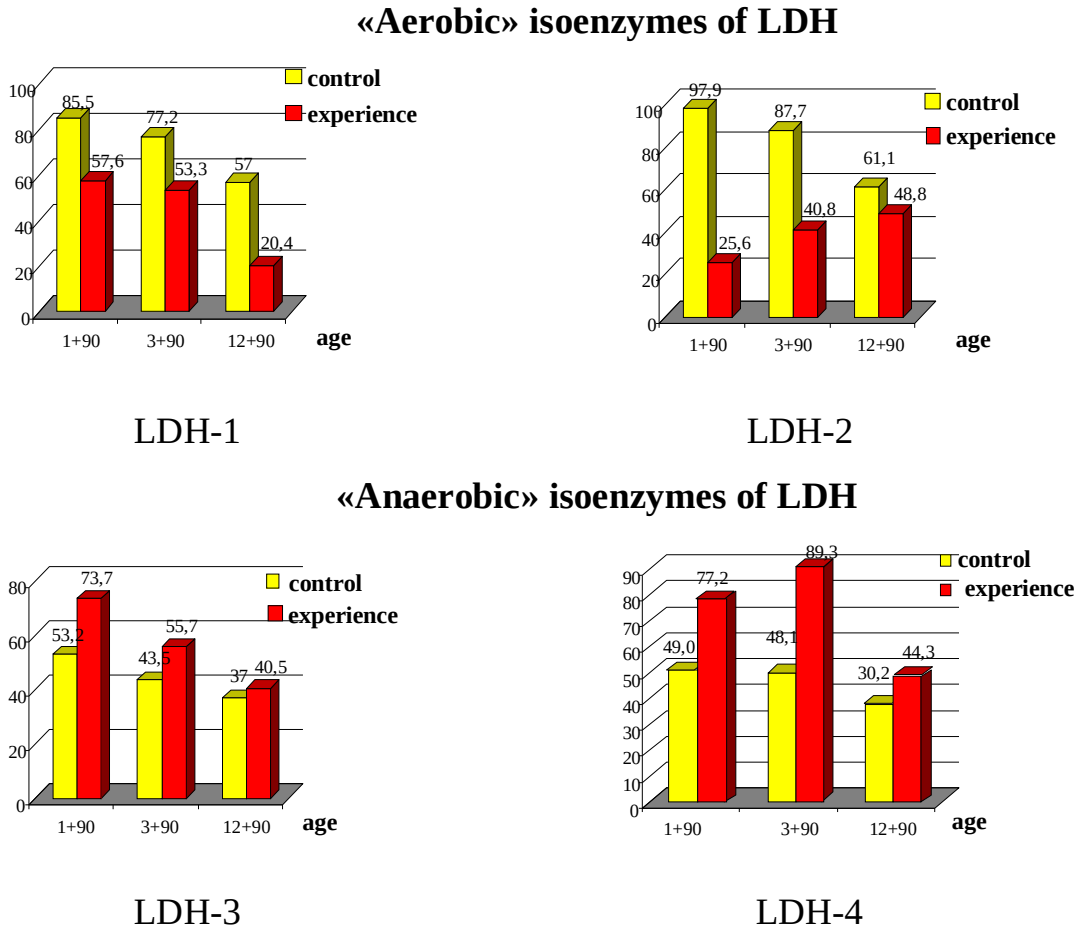

Fig.4. Histogram of LDH isoenzyme activity indicator in fibrous ring cells after 90-day run. Age of animals: 1, 3 and 12 months + 90 days of running

In series 1 + 90 of hyperkinesia, the activity of LDH isoenzymes varied differently. A decrease in the activity of LDH-1 isoenzyme (by 32.6%) and LDH-2 (by 73.8%), but an increase in the activity of LDH-3 and LDH-4 isoenzymes (by 27.8 and 6.6%, respectively).

The activity gradient of LDH isoenzymes (in descending order) to the cells of the intervertebral discs of 1-month-old rats after a 90-day run had the following sequence: LDH-4 – LDH-3 – LDH-1 – LDH-2.

In the series 3 + 90 hyperkinesia, it was revealed changes in the activity of LDH isoenzymes: the activity of LDH-1 decreased by 30.9%, LDH-2 – by 53.5%; at the same time, the activity of LDH-3 increased by 21.9%, and LDH-4 – by 46.1%.

The activity gradient of LDH isoenzymes of 3-month-old rats after 90-day run: LDH-4 – LDH-3 – LDH-1 – LDH-2.

In the series of 12 + 90 hyperkinesia, the change in the LDH isoenzymes activity after prolonged hyperkinesia was expressed by a decrease in the activity of LDH-1 (64.8%) and LDH-2 (20.1%) isoenzymes and an increase in LDH-3 activity (8.6%).) and more significantly – LDH-4 (by 31.8%).

As a result, the gradient of activity of LDH isoenzymes of 12-month-old animals changed: LDH-2 – LDH-4 – LDH-3 – LDH-1.

Therefore, under conditions of long-term dynamic loads, the decrease in LDH activity in adult animals is accompanied by a change in the ratio of the activity of its isoenzymes.

In the cells of the intervertebral discs of young animals after a 90-day run, there is a clear tendency to reduction of the activity of isoenzymes LDH-1 and LDH-2 and growth of the activity of isoenzymes LDH-3 and LDH-4.

In animals of older age groups, in conditions of hyperkinesia there was the most significant decrease in LDH activity. The analysis of the activity of isoenzymes revealed a decline in the activity of LDH-1, and then LDH-2 with increasing LDH-4 and less significantly – LDH-3. Thus, animals of different ages have similarities in the response of cells to high dynamic loads, but with some differences in the quantitative expression of these reactions.

Among the isoenzymes LDH-1 and LDH-2 belong to the more "aerobic" isoforms, LDH-3 and LDH-4 – to the "anaerobic". The increase in the activity of anaerobic LDH isoenzymes can be compensation for the decrease in the activity of total LDH under conditions of prolonged dynamic loading and serve as a marker of reduced aerobic oxidation in the glycolysis system.

Thus, in the conditions of hyperkinesia there were changes in the activity of total LDH, the general direction of which was its reduction in animals of mature and older groups with a subtle response of isoenzymes to changes in the structure and function of intervertebral discs. Only in immature animals, the activity of total LDH, during prolonged running, increased.

The decrease in the activity of total LDH was accompanied by a decrease in the activity of more "aerobic" LDH-1 and LDH-2, but an increase in the activity of more "anaerobic" LDH-3 and LDH-4 isoenzymes of LDH.

In this case, changes in carbohydrate metabolism in conditions of prolonged hyperkinesia are combined with the activation of apoptosis of cells of the intervertebral disc and hyaline cartilage [4]. Activation of apoptosis – a normal, genetically programmed process of cell death during the development of the organism, indicates the acceleration of involutive processes in the intervertebral discs under prolonged dynamic loads, and the spread of dystrophic processes. This confirms the high mechanosensitivity to physical exercise not only hyaline [13] but also fibrous cartilage.

Evaluation of LDH activity, and especially its isoenzyme spectrum, has a high diagnostic value and is used in the diagnosis of a number of diseases [14, 15]. However, most studies are based on biochemical analysis of serum and give only indirect information about intracellular metabolism in tissue cells. The presented histoenzymological data can be used in the analysis of biopsy material, the possibility of obtaining which is currently increasing due to the expansion of methods for diagnosing pathology of the spine [3, 8].

Conclusions / Discussion

Histoenzymological and cytophotometric methods are sensitive and accurate methods for determining the activity of enzymes [12]. The fibrous ring of the intervertebral disc is made of dense conjunctive and fibrous cartilaginous tissue, the cells of which have high glycolytic activity. The analysis showed that the dynamic load contributes to the biochemical changes in the activity of LDH in the cells between the vertebral discs.

After a 20-day run, the activity of total LDH in fibrous ring cells decreased in animals of all ages with a maximum decrease in young rats. After a 90-day run, the total LDH activity was more stable. A significant decrease in its activity was found only in older rats. Regarding LDH isoenzymes, the change in their activity was multidirectional. A characteristic response to dynamic loads was a change in the cells of the ratio of the activity of "aerobic" and "anaerobic" isoenzymes of LDH, which depended on the age of the animals and the duration of the run.

Normally, the intervertebral disc has the highest activity of LDH-2, then - LDH-1, ie aerobic isoforms of LDH. LDH-4 isoforms have the lowest activit. At the same time, the activity of all LDH isoforms decreased with age.

Prolonged physical activity caused a decrease in the activity of aerobic isoforms – LDH-1 and LDH-2 and especially, more than twice, in young animals after a 20-day run.

The 90-day run also conduced to reduction of activity of aerobic isoforms and especially LDH-2 in young animals. Regarding anaerobic isoforms of LDH, their activity increased in rats of the studied age groups, and especially after a 90-day run.

It is known that when LDH activity decreases, metabolic acidosis develops, which contributes to the disruption of tissue structure [6]. Damage to the tissues of the intervertebral disc is a prerequisite for damage to the motor spinal segment as a whole. Therefore, the obtained indicators of LDH activity and, personally, its isoenzymes can serve as a histochemical test for an objective assessment of the degree of damaging effect of prolonged running on fibrous cartilage at different ages.

Prospects for further research. Further research can be aimed at elucidating the change in the activity of enzymes of the redox cycle under dynamic loads to increase the reliability of the diagnosis of the condition of the intervertebral disc under exercise.

Conflict of interests. The authors declare that no conflict of interest.

Financing sources. This article didn’t get the financial support from the state, public or commercial organization.

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Received: 16.04.2020.
Published: 04.05.2020.

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UDK [797.2:796.015.15/044.4]

ISSN (English ed. Online) 2311-6374

2020, Vol. 8 No. 2, pp.109-122

INFORMATION SUPPORT FOR THE TRAINING PROCESS OF YOUNG SWIMMERS BY MEANS OF DEVELOPING MOBILE APPLICATIONS

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Purpose: substantiation of the need to develop a mobile application to control training loads in the preparation of young swimmers.

Material and Methods: theoretical analysis and synthesis of references; methods of information modeling & programming, questionnaire, methods of mathematical statistics.

Results: «SwimmDiary» mobile application on the Android Studio and Java platforms was developed; the development is aimed at individualizing control and planning of physical activity in young swimmers. The development allows you to create and adjust a personal profile of an athlete, register individual indicators, establish a daily training program in the calendar, view existing standards and compare your own results with them, statistics of physical activities performed for a specific training period. The program includes such indicators as: the name of the physical exercises, the time of their completion, the mileage of the preparatory exercises to cover the main distance. The mobile application contains the following swimming styles: butterfly stroke, brass, crawl on the back, freestyle and integrated

swimming style. A questionnaire was conducted, the main purpose of which was to identify the respondents' attitude to the mobile application. It was found that young athletes liked the development the most (11,2±0,07), and their parents gave the lowest marks (8,3±0,08) on a 12-point scale.

Conclusions: it was found that the use of modern information technologies in the educational process of young swimmers is possible using mobile applications, survey of respondents found a high level of attitude towards the development of young swimmers, coaches and swimming scientists. The survey revealed a high level of evaluation of respondents of the mobile application SwimmDiary (48%) and indicated the strongest components of the program (design solution and presentation of the mobile application) and weak (data visualization).

Keywords: young swimmers, training, mobile applications, programming, information technology.

Introduction

The use of information technology in the field of training students, qualified and young athletes, according to A. Azhippo and T. Dorofeeva, is the need to develop a balanced system of pedagogical control and management. Particular attention should be paid to the process of training young athletes, requiring high attention from trainers, doctors, psychologists, scientists. The training system for young swimmers, as noted by V. Platonov, requires a search for new directions for improving the system of sports training, dictates the need for the full use of hidden reserves that are inherent in the personality of the athlete. These opportunities can be opened using modern information systems for planning and accounting training loads.

In swimming, the problem of the scientific justification of fundamentally new directions of development and further improvement of the training process was quite clearly outlined, since the possibilities of the currently existing training methods have almost exhausted themselves. That is why A. Pilipko, V. Politko, A. Poproshaev and

other specialists pay more and more attention to the communication of quantitative and qualitative characteristics of training in swimming.

A. Rovny, A. Tsos, Mandzák, P., Mandzáková, M., Pavlíková, R. and other authors point out that the attention of trainers and scientists is aimed at studying, comparing and selecting the most effective training tools and methods that represent increased requirements for the functional systems of the body, the capabilities of which determine the success of competitive activity.

The intensity of life of a modern young man, the glut of information is so high that, according to V. Ashanin, L. Filenko, G. Poltoratskaya, requires the attraction of additional energy resources of the body. These resources should be systematically replenished and restored to maintain health. According to Piercy, K.L., Troiano, R.P., Ballard, R.M., Carlson, S.A., Fulton, J.E., Galuska, D.A. and other authors, information technologies allow optimizing the interaction between the trainer and the sports doctor, systematically regulating the level of physical development of children and their health. Studies by Zhou, M., Fukuoka, Y., Mintz, Y., Goldberg, K., Kaminsky, P., Flowers, E., & Oi, A. indicate that owing to computer programs the coach has a variety of information about the condition of children who came to classes: who of them was recently ill and what, who has chronic diseases, undergone surgery or injury, contraindications to classes.This information, promptly provided to the trainer before the start of the training, allows him to plan individually physical activity for each child, select sets of exercises, combinations of technical elements and the like.

Especially relevant for the training of modern athletes, according to V. Pasko, A. Rovnyi, Chang, Y.K., Etnier, J.L., Wiemeyer, J. and other scientists, the use of mobile applications for the operational management of training. In the studies of V. Golokha, V. Romanenko, L. Podrigailo, S. Ermakova, Jennifer L. Etnier, Yu-Kai Chang, Ho, CL, Fu, YC, Lin, MC, Chan, SC, Hwang, B., & Jan, SL and other authors present the development of mobile diaries for trainers and athletes, programs for obtaining individual indicators of athletes and analysis of training results. The authors provide a detailed justification of the appropriateness of using modern information

technologies in the training process and bring their direct impact on the functional capabilities of the body of athletes.

The rationale for the use of information technologies in the field of physical culture and sports is presented in the fundamental scientific topic “Scientific and methodological foundations of the use of information technologies in the formation of professional competence of specialists in physical education and sports”, within the framework of which the study is presented.

Purpose of the study: is to justify the development and application of a mobile application to control training loads in the preparation of young swimmers.

Material and methods of research

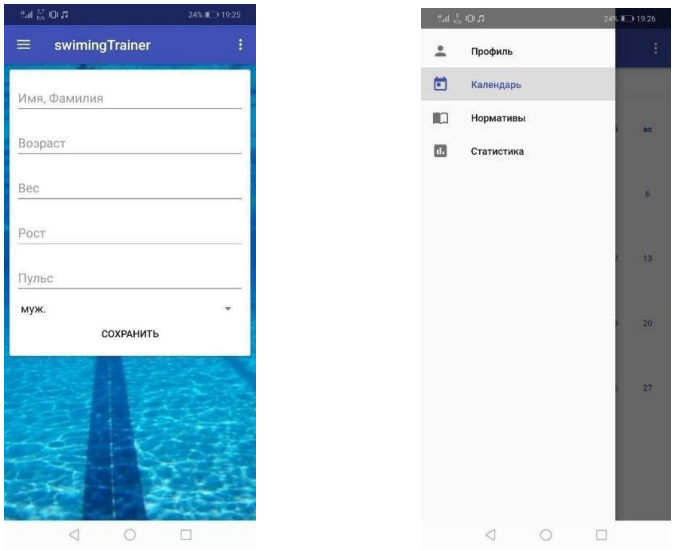
The study was conducted on the basis of the Kharkov State Academy of Physical Culture and the Kharkov gymnasium No. 172. The study involved 124 respondents, including 82 young swimmers 10-14 years old (50 boys and 32 girls), 8 swimming coaches, 8 specialist swimming scientists, 26 parents of young athletes. The following methods were used: theoretical analysis and generalization of literary sources; pedagogical observation (processing of educational and methodical literature, attending training sessions for young swimmers) methods of information modeling and programming (development of a mobile application algorithm, creating a program), questioning, methods of mathematical statistics.

Results of the research

In the presented study, the SwimmDiary mobile application was developed for fixing the main indicators of a training session and controlling physical activity in swimming. When working with a mobile application, the user should register and enter personal data (Figure 1a): last name, first name, age, body weight, body length, resting heart rate, gender. When registering the primary data of young athletes, their personal profiles are created, access to which are available to the athletes themselves, their trainer and system administrator. At the request of the user, it is possible to add other entries to the registration window. All user profiles are recorded and stored in a single database on the application developers server. Also, the personal profiles of

young swimmers can be copied to a local mobile device, because they do not occupy a large amount of memory - approximately 10 MB.

An application was developed when registering personal data that allows you to insert graphical information (athlete's photo, diagrams, drawings, videos), but such profiles require significantly more memory.



a) registration window b) list of "Menu" functions of the program

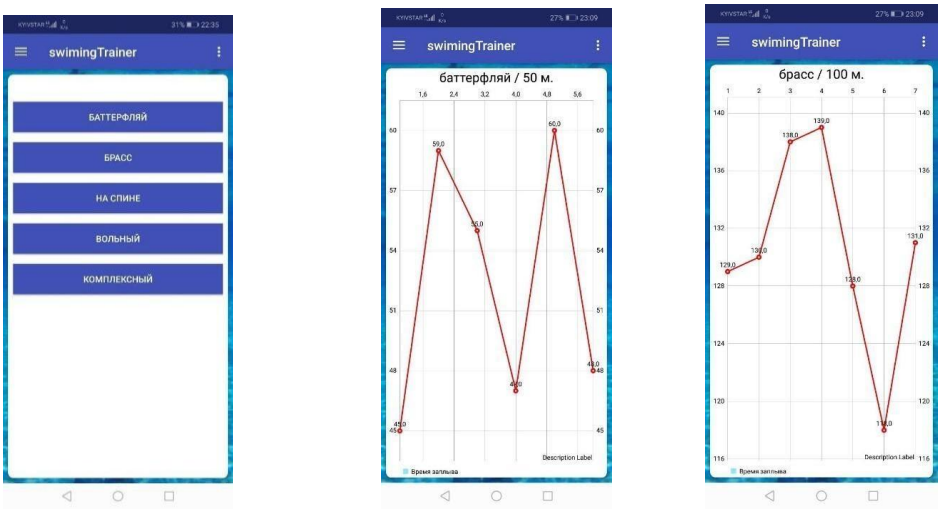
Fig. 1. Registration window and "Menu" of functions of the mobile application of the "SwimmDiary" application

To manage the mobile application, you should use the "Menu" (Fig. 1b), in which it is possible to adjust your personal profile, set the daily training program on the calendar, review existing standards and compare your own results with them, as well as view statistics of physical activity performed for the selected period workouts.

By clicking on the "Profiles" tab, the user can again return to the data logging tab and adjust it. When the "Calendar" function is activated, a window opens in which the days when the training session takes place are selected. Dots mark the most active days with high training loads. These days, the training process indicators are recorded. All previous results can be viewed by referring to the function "View statistics." Also, all previously entered results can be analyzed using mathematical statistics by activating the function "Statistics".

When you click on the "Statistics" button, a window opens (Fig. 2a), in which the athlete can choose a swimming style. If an athlete trains only in some of these styles, then he doesn’t activate others, but only uses them. The study involved young athletes 10-14 years old, who are actively involved in all types of swimming. During the survey, the dominance of such swimming styles as breaststroke, crawl on the back and free style was revealed.

The SwimmDiary mobile application included the basic swimming styles provided by the program for constructing training sessions for young swimmers: butterfly stroke, breaststroke, crawling on the back, freestyle and integrated swimming style. By clicking on each of these swimming styles, you can activate the bookmark with the definition of the length of the distance. For each swimming style, young athletes choose different distances: in Butterfly 25m, 50m, 100m, 200m; breaststroke 25m, 50m, 100m, 200m, 400m, 800m, 1500m; in crawling on the back 25m, 50m, 100m, 200m, 400m, 800m, 1500m; in the freestyle 25m, 50m, 100m, 200m, 400m, 800m, 1500m.



a) window for choosing the style of swimming b) statistical analysis of indicators

Fig. 2. Features of the "Statistics" function

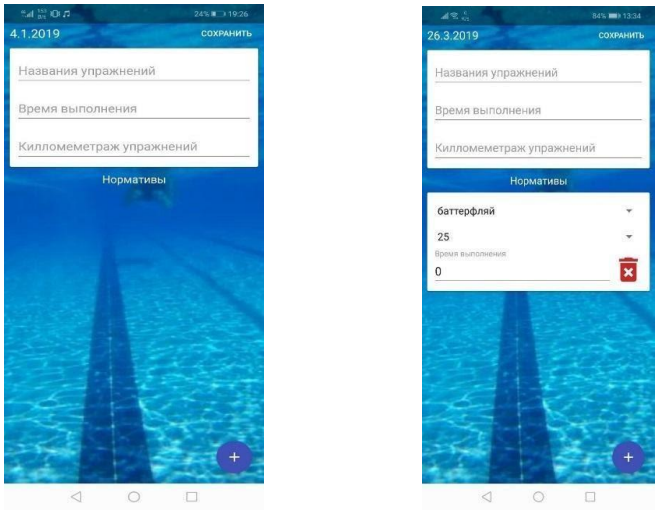
In each age group of athletes, different styles of swimming and distance are dominate. So, for the 10-11 years old athletes breaststroke and freestyle are more characteristic, and among distances trainers prefer segments of up to 200 m. For the

10-11 years old athletes, there is also a crawl on the back, distances increase to 400 m. Young swimmers 14 years and older, who already have basic training in swimming, can master the style of butterfly stroke and complex combinations of types of swimming, their functional capabilities allow training loads in swimming distances of 800 m and 1500 m.

After the training session is over, each young athlete with the SwimmDiary application configured on his mobile phone will enter the time for each distance. The program gives statistical indicators (Figure 2b.) Swimming of each segment of the distance. The Y-axis diagram shows the time taken to complete the distance in seconds. The indicators are not reflected in the usual form 1-25", but in the full format of seconds - 85". The X axis represents the days on which the training sessions were held. At the intersection of the X and Y axes, a performance indicator of the young athlete is formed. In fig. 2b it is shown that the athlete showed the best result in passing the 50 m butterfly stroke in the first training session (45 s), fourth (47 s) and sixth (48 s) lesson. Also, the red graph curve indicates the dynamics of changes in the performance indicator in this style over the course of a week.

In a similar way, one can analyze the effectiveness of passing other distances over a longer period of time. Figure 2b analyzes the performance of passing a distance of 100 m breaststroke for one week. It is shown that the athlete received the best result in the sixth training session. The coach and the athlete can analyze, using the mobile application presented in the study, previous achievements, completed physical exercises and physical activity, which contributed to a significant improvement in sports results.

The SwimmDiary mobile application allows you to enter information on the use of funds in a training session, general developmental exercises, breathing exercises, physical exercises on land, special preparatory exercises, exercises with objects, water exercises, swimming distances with additional equipment and other tools and methods. The following indicators are entered: the name of the physical exercise, the time of its completion, the mileage of the preparatory exercises to cover the main distance (Figure 3a).



a) data entry window b) window for activating standards

Fig. 3. A window for entering information on physical exercises performed in a training session and comparing with standards

If the young athlete was absent from the training session for objective reasons, then he can review the physical exercises performed by others in the training session if he enters the general database on the server. He may also review the training loads planned for the next training session, provided that the trainer places this information for public access. Another feature of the developed SwimmDiary application is the ability to copy a physical exercise and training program for a while ahead from the network server. This option allows the young athlete to warm up and feed precisely those muscle groups that will be most actively involved in the training before starting a training session. Also, an athlete can, knowing preliminary information about training, adjust the training load according to his individual physical condition and well-being. By clicking on "+", an additional window with standards can be activated, thanks to which the young athlete can analyze and compare his own results (Figure 3b).

Thanks to this feature, young athletes can, using a mobile application, analyze and compare their own results with standards, understand at what level they are swimming the distance and how much they need to improve their own results. The "Standards" option is programmed in this way to stimulate and motivate young

swimmers to do swimming and to get the best performance. If it becomes necessary to correct, add or delete a training session, the user can click on any day in the Calendar tab and perform the necessary function, for example, add training. Thus, the developed SwimmDiary mobile application is multifunctional, it allows you to plan and record training and physical activities in swimming, both for young and adult athletes. To solve the research tasks, a questionnaire was conducted, the main purpose of which was to identify the respondents' attitude to the SwimmDiary mobile application on a 12-point scale (Figure 4). An analysis of the results indicates a high level of assessment of the majority of respondents, almost half of the respondents gave points from 10 to 12.

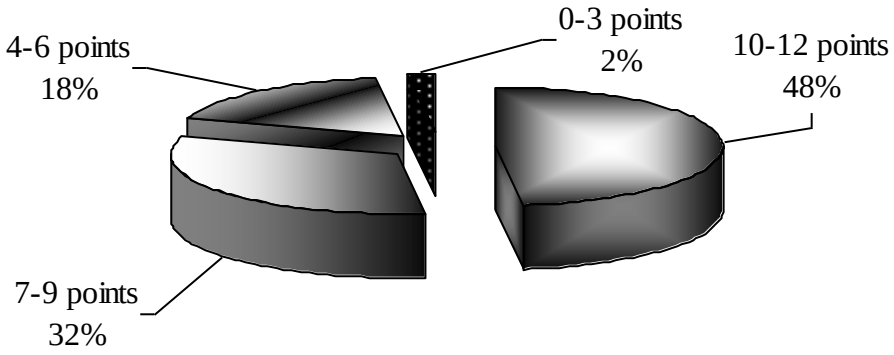


Fig. 4. Percentage of ratings of the mobile application "SwimmDiary"

Young athletes dominate in the quality ratio of the ratings (Figure 5), who on average rated the development at 11.2±0.07 points, trainers (10,9±0,06) and scientific experts (10,5±0,05) rated the development at approximately the same high level; parents of young athletes gave low ratings for development (8,3±0,08).

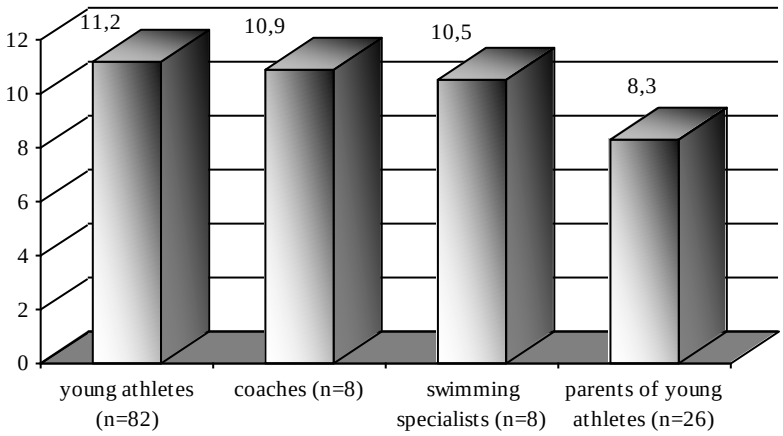


Fig. 5. Respondents' ratings of the SwimmDiary mobile application on a twelve-point scale

Another important factor in the expert evaluation during the survey was to determine the respondents' attitude to the program components. 84 respondents (70%) expressed their positive attitude to the design of the program, 66 (55%) expressed for the application design, 30 (25%) for the structure of the mobile application, 48 respondents liked the mobile application (40%). In general, 12 respondents (10%) did not like anything. The data obtained allows us to identify the strongest components of the program (design solution and presentation of the mobile application) and weak (data visualization). This leads to the conclusion that the structural components of the program should be somewhat simplified, as well as the quality of visual information should be improved.

To establish the reliability of the answers of the respondents, who are actually subjective to information, a correlation analysis was carried out according to the Spearman method. The analysis made it possible to find the coefficient of rank correlation of the correspondence of the rating given by the respondent for the mobile application and his knowledge with other similar developments. This indicator indicates the presence of interconnection, indicates the consistency of expert opinions and can be interpreted as one of the factors for assessing the quality of the developed SwimmDiary mobile application.

Conclusions / Discussion

During the study, issues of attracting information technology to the process of training swimmers were considered. It has been established that the use of modern innovative information technologies in the educational process of young swimmers is an innovative and relevant research area in the field of physical culture and sports. The SwimmDiary mobile application has been created on the Android Studio and Java platforms. The development is aimed at individualizing control and planning the volume of physical activity in young swimmers. The SwimmDiary mobile application allows you to enter information on the use of funds in a training session, general developmental exercises, breathing exercises, physical exercises on land, special preparatory exercises, exercises with objects, physical exercises on water, swimming distances with additional equipment and other tools and methods.

The questionnaire revealed a high level of assessment of respondents of the SwimmDiary mobile application (48%) and pointed to the strongest components of the program (design solution and presentation of the mobile application) and weak (data visualization). It was established that the young athletes liked the development the most (11,2±0,07), and their parents gave low marks (8,3±0,08) on a 12-point scale. The coefficient of rank correlation indicates the consistency of opinions of respondents.

In the **future prospect of further research**, it is planned to develop mobile applications for optimizing the educational process and analytical support of competitive activity in game sports.

Conflict of interests. The authors declare that no conflict of interest.

Financing sources. This article didn't get the financial support from the state, public or commercial organization.

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Received: 17.04.2020.

Published: 04.05.2020.

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UDK: 796.42

ISSN (English ed. Online) 2311-6374

2020, Vol. 8 No. 2, pp.123-136

PROGRAMMING OF INVOLVEMENT OF INNOVATIVE TECHNOLOGIES IN TRAINING OF MEMBERS OF THE ATHLETICS TEAM OF UKRAINE

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Purpose: theoretical and methodological substantiation of programming technology for the involvement of innovative technologies in the training process of the national team of Ukraine in athletics.

Material and Methods: The research was carried out among athletes of the national team of Ukraine at the level not lower than the Master of Sports of Ukraine by conducting a questionnaire, self-experiment, pedagogical observation and pedagogical experiment.The total number of respondents is 43 athletes. Among the participants of the experiment are the winners of the Olympic Games and world championships, champions and winners of the European championships, champions of Ukraine.

Results: The article presents programming as a rigidly determined system of sequential and time-tested operations within a certain time on the basis of the developed design of the control system. The algorithm for constructing a system for attracting innovative technologies to the preparation of athletes is carried out on the basis of regression analysis with numerical coefficients according to the formulas.

Conclusions: the proposed programming technology makes it possible to create an effective system for constructing an individual training process in the national team of Ukraine in athletics.

Keywords: model, programming, innovative technologies, athletes.

Introduction

The modern system of training athletes of the national team of Ukraine in athletics is characterized by intensification of the training process, a large number of official international competitions, which, in turn, requires athletes to constant high physical and psychophysical loads, rapid recovery of the central nervous system and body [1; 6].

Studies show that basic systematic usage of programming of training's innovative technologies in the training process of the national athletics team of Ukraine, that could help make the training process more rational and effective, promote better recovery of athletes after significant training and competitive loads [2].

Innovative technologies such as hypoxic training (except for members of the endurance group), psychophysical, mental training, analysis of the current state of the body are not programmed at all or used sporadically, detached from the constant training process. There is no constant support of the national team by specialists in biochemistry, biomechanics. Natural biorhythms are not taken into account in the training building process. Electrical stimulation methods are not used for recovery, there is no consulting work on pharmacological support of the athlete's body. Taking biologically active dietary supplements has exclusively individual character and often leads to disqualification of athletes for the use of illicit drugs [3; 10].

The relevance of the introduction of innovative training technologies in the training process of athletes has been confirmed by researchers [4; 10]. Theoretical developments and methodical developments of implementing of innovative technologies in training process are insignificant in volume. The content of innovative technologies, forms, methods, means of training, questions of increase of training process efficiency, taking into account the chosen discipline of track and field athletics, were investigated by scientists. However, the constant growth of international competitions, increasing the level of results, increasing competition - all this requires constant review of the structure, content and direction of the training

process in general, and the involvement of programming of innovative technologies in particular [1; 4].

Programming is a rigidly determined system of successive operations and actions worked out in practice, which lead to the achievement of a specific sports result within the allotted time [1; 12].

At the present stage of development of the system of preparation for the Olympic Games, it is not enough to use knowledge from only one specific field of knowledge.

The triumphant progress of science is characterized by countless applications and improvements. There are fundamental laws of this process. The Pareto 80/20 law is one of the most universal. The influence of this law on the training process in sports on endurance in general and athletics in particular has been confirmed by research by scientists [9]. Of course, "80/20" is not a magic formula. The actual ratio in practice is very rarely 80/20. The universe is supposedly unstable, but in most of the processes taking place in it, a proportion of about 80/20% is stable. So, directly or indirectly, but the principle of 80/20 is familiar to most programmers and executives of computer corporations IBM, Microsoft and others [5].

The theory and methods of sports and sports training in athletics should play an integrative role in combining all the knowledge that provides scientifically sound principles and patterns of training, methodological approaches and training technologies based on physiology, psychology, anatomy, biochemistry of muscle activity and others [10; 11].

Therefore, the modern system provides for the integration of new technologies into the theory and especially the practice of training of the national athletics team of Ukraine. Developments of scientists in the field of pharmacology, sports nutrition, new computer technologies are associated with the improvement of sports uniforms, inventory and equipment.

The problem of lack of involvement of innovative technologies was investigated in the development of training programs of individual plans for the year for members of the national team of Ukraine in athletics, but the lack of programming

technology and long-term planning and plans for the Olympic cycle to attract innovative technologies requires further research.

Purpose of the study: theoretical and methodological justification of programming technology to attract innovative technologies to the training process of the national athletics team of Ukraine.

Material and Methods of the research

The research was carried out among the athletes of the national team of Ukraine at the level not lower than the Master of Sports by conducting a questionnaire, self-experiment, pedagogical observation and pedagogical experiment. The total number of respondents is 43 athletes. Among the participants of the experiment are the winners of the Olympic Games and world championships, champions and winners of the European championships, champions of Ukraine.

Results of the research

The system of innovative technologies for training athletes solves the problems facing the elite athletes group of the national team of Ukraine in modern conditions - increasing the efficiency of the training process, promoting faster recovery after exercise etc. It is important to keep in mind that only the development and recommendations for the implementation of quality theoretical developments and provisions of the system of innovative training technologies, even for all their importance, still can give little to professionals, athletes and coaches in accordance with the demands of practice. Therefore, for the real conditions of functioning of an effective system of attracting innovative technologies to the training process it is necessary not only to determine and theoretically substantiate the necessary possibilities of using of the innovative technologies system in the preparation and solution of specific targets, but also to evaluate its parameters (points), which reflect some real parameters of the analyzed system. Accordingly, the question of testing and diagnosing the main models of indicators of the athletes' involvement degree in innovative technologies in their training process is relevant. The question is to determine the quantitative characteristics of the innovative technologies system to

ensure the desired result and, accordingly, the study of methodological approaches to solving the necessary tasks.

In our study, we propose specific directions for the formation of a methodology for evaluating the effectiveness of various innovative technologies, in this case, for elite athletes. The proposed methodological approach is based on the idea of models for attracting innovative technologies as the optimum to which the system of innovative technologies is directed in its development. With this approach, the potential of the system is formed by dynamic characteristics that reflect the movement of the innovative technologies system along the path of development and focus on assessing its place in the athletes' training process in relation to the process of preparation for competition in general. In this case, from the point of view of the purpose of the assessment, both actual and forecast estimate is carried out.

In the first case, the real characteristics of the training parties are evaluated, which show changes in the characteristics of the selected benchmarks of the models for comparison, i.e. it is determined how significant the impact of a particular innovative technology was on the final result of an athlete. In the second case, it is determined which innovative technologies need to be involved in the training process or change the scope or conditions of their use so that its results correspond to the model. In this case, in essence, the problems of feedback, feedback interpolation are being considered and solved, for which the known conditions are the end result - optimal models of psychophysical fitness or training models to be achieved by an athlete in the intermediate (end of the general season) or final (end of sports career) stage of sports activities.

The assessment of the studied model parameters of both the system as a whole and its individual indicators is important not in itself, but first of all in relation to their degree of sufficiency for the successful solution of the athlete's training tasks. It is possible to determine the parameters of models of innovative training technologies only by comparing its general characteristics, or individual elements with a specific selected analogue. It is advisable to use some relative or significant indicators for comparison.

To determine the degree of involvement of each of the innovative technologies in the training process of individual athletes, a questionnaire method was used and a special scale was developed, by which each respondent on a four-point scale determined the degree of involvement of each technology in their training process (from "1 - never used" to "4 - use constantly throughout the training process".

As a benchmark, we will choose the athlete model that has the highest rates of involvement of innovative technologies in the training process according to a survey conducted among members of the Ukrainian national track and field team, i.e. the highest amount of points corresponding to the maximum use of all proposed innovative technologies. To successfully solve the problems of this study, it was necessary to create standardized scales for all innovative technologies and reduce the final results of athletes of different disciplines to a common indicator, which allowed to compare the results of athletes from different groups of athletics - IAAF Scorecards. Each of the innovative technologies reflects only a certain part of the impact on the training process and the end result of the athlete as a whole. For completeness of the information all indicators of physical qualities both special, and the general are united in one whole.

In order to be able to correlate the indicators for different qualities, they are given in one-dimensional scale. But for the reliability and compliance of the relationship of the developed scales with the objective indicators of success of athletes in sports, it is necessary to periodically compare the coefficients' correlation . All testing methods must meet and be tested for validity and reliability and other requirements of testing theory.

Substantiation of quantitative values of regression coefficients was based on the classification of training loads (quantitative scale) depending on the purpose of their implementation (according to Volodymyr Zatsiorsky, 1995, in edition [4], which is a quantitatively ranked scale from "1" to "5" , in which the rank "1" corresponds to the lowest load, and "5" - the highest); Borg scale, where the level of workload is assessed by pedagogical and sport-specific (from 6 to 20) indicators; developed specifically for this study table [7] and IAAF scorecard indicators.

To assess training and competitive loads, loads are estimated in conventional units using the criterion of intensity "K_{and}" and the criterion of specific volume "K_o" (it is found by multiplying K_{and} by the length of the distance).

To find the numerical values and K_{and} developed tables, the creation of which is the main selection of equivalent results, which are evaluated by an equal number of points and determine the points for different results in the same type of running. In the development of K_{and} were taken from the World Data Bank results of athletes [8].

Regulatory indicators for physical qualities are determined by dividing the scale into the necessary corridors-intervals in accordance with the requirements for each of the groups of athletics' disciplines. If it is necessary to check the normative indicators, discriminant and variance analyzes are applied to a specific discipline.

The algorithm for building the training process using innovative technologies provides the basic conditions and operations that must be performed to achieve effective training of members of the national athletics team of Ukraine. The algorithm for constructing the process of attracting innovative technologies involves the factor approach methodology. The logic of the factor approach involves identifying the level of impact on the outcome of each innovative technology that is necessary for successful competitive activities. The control algorithm is based on elementary mathematical operations.

Innovative training technologies: training in hypoxia, psychophysiological training (mental, ideomotor training, autogenic training, visualization), innovative methods of recovery (cryotherapy, massage, swimming and running in the pool, vibrotherapy), monitoring the current state of the body (resting heart rate(RHR), blood tests and all individual body systems), the use of stretching in the training process, strength toning before competitions, the use of BADS, simultaneous reactivation, taking into account biorhythms, electrostimulation.

Accordingly, the maximum integrated use of the above mentioned innovative technologies is necessary to maximize the quality of the training process, perform training tasks and quickly recover between training and competitive activities.

After the survey and pedagogical experiment, which lasted for two competitive seasons, a low level of use of innovative technologies was established in the national athletics team of Ukraine and significantly higher sports results of athletes who integrated innovative technologies in the training process. The sports results of the representatives of different disciplines of athletics were compared according to the IAAF points table, and the level of involvement of innovative technologies was compared according to the scale developed by us. The survey showed that athletes who used innovative training technologies in an integrated manner had a higher level of results, which was confirmed by further research.

According to the calendar for 2017-2018 years, the system-pedagogical design was carried out. Sports and pedagogical innovations were used as a necessary technology, which allowed to develop and create a system of athletes training from micro to macro level on the basis of the latest scientific data and practical experience of the modern system of athletes training. Planning was carried out on the basis of the purpose and tasks of organizational, substantive and methodological aspects of the future training process.

Accordingly, programming was performed as a rigidly determined system of sequential and time-tested operations within a certain time of microcycles and macrocycles on the basis of the developed design of the control system.

After processing the questionnaire materials, diagnostics, testing, the following was done (based on the methodology of the factor approach): the obtained data were combined into integrated indicators, the level of integrated use of innovative technologies was determined by a formula, not a simple summation of standardized indicators. To develop an algorithm of this type, a regression equation is used, i.e. a method of multiple regression, which makes it possible to establish the presence of relations, while allowing to determine the contribution of each of the independent variables to the dependent variable.

To design an integrated indicator, so that the obtained indicators were compared with each other, all indicators are reduced to a single system of

measurements. We have developed scales in which the degree of involvement of each of the innovative technologies is converted into conventional units (points).

This diagnostic system is used due to the presence of a normal, almost formal distribution of scores obtained in practice. In this case, the low values of the survey results correspond to the low level of development of the studied qualities, the average - to the average, and the high indicators - high respectively. The attractiveness of the result scales of different evaluation types of tests lies in the ability to reduce large arrays of heterogeneous data into easy-to-understand, visual and convenient to analyze. For ease of comparison, they are presented in the form of tables.

Developed integrated models, the indicators of which are converted into points, for each of the innovative technologies and in points (when comparing the results of athletes), provide an opportunity for comparison, mathematical and statistical processing using computer technology and the formation of an integrated indicator. At the same time, the coefficients of values of individual innovative technologies are derived, which are of paramount importance for achieving high results by representatives of various disciplines of athletics. Certainly, each elite athlete requires an individual approach and must have a coefficient of individual scales. The corrective indicator for the calculation of this coefficient should be the real feedback system in general.

The algorithm for building a system for attracting innovative technologies to train athletes in each of the groups of disciplines of athletics is based on regression analysis by the formula:

$$I=a_0+a_1*H+a_2*PT+a_3*R+a_4*Ph+a_5*An+a_6*S+a_7*T+a_8*Pr+a_9*B+$$
$$+a_{10}*E+a_{11}*SM+a_{12}*SEM+a_{13}*EFM+a_{14}*DFM+a_{15}*SFM+a_{16}*GEM+$$
$$+a_{17}*StEM+a_{18}*AM+a_{19}*FM\ ,$$

where I - an integrated indicator of the use of innovative technologies;

a_1, a_2.... a_{19} - numerical coefficients of multidimensional linear dependence of the integral indicator on specifically important qualities;

H- hypoxic training;

PT- psychophysical training;

R - Innovative methods of recovery;

$_{Ph}$ - use of pharmacological agents and dietary supplements;

An- analysis of the current state of the organism;

$_{S}$ - stretching;

T- toning;

Pr- simultaneous preactivation;

B- taking into account biorhythms;

E- electrostimulation;

SM - models of means for development of speed;

SEM - models of means for the development of speed endurance;

EFM - models of means for development of explosive force;

DFM - models of means for development of dynamic force;

SFM - models of means for development of slow force;

GEM - models of means for development of the general endurance;

StEM - models of means for the development of strength endurance;

AM - models of means for development of agility;

FM - models of means for development of flexibility.

The programming algorithm involves determining the degree of deviation of individual indicators of functional status, psychophysical fitness, the use of innovative technologies with the norms in accordance with the model of the athlete who makes maximum use of innovative technologies in the training process.

Programming involves:

– determination of effective directions, forms, means of correction of deviations from the model;

– determination of optimal parameters of use of each of the specified technologies for representatives of each of groups of disciplines of track and field athletics.

Conclusions / Discussion

In the course of our study, most of the successful training programs during H.E.'s auto-experiment correlated with Pareto's "Principle 80/20" law. In particular, this ratio was in practice with a small deviation in the use of the main traditional aerobic and anaerobic loads in micro- and macrocycles, depending on the stages and periods of the training process - from 90/10 (in the base period) to 70/30 (in the pre-competition period), which confirms the research of scientists [9].

During this study, a system and forms of integration of innovative technologies were created, which are based on the characteristics of each group of athletics disciplines and which the athlete can use constantly during the training process, rather than sporadically and detached from the logic of training programs. Based on the information exchange on the effectiveness of various innovative technologies, the most effective of them for specific athletics disciplines and the algorithm of their integrated involvement are determined, taking into account the specifics of each of the disciplines.

To create an effective system of integration of innovative technologies in the process of programming the training of athletes during the experiment in the national athletics team of Ukraine according to previous studies created conditions for training using innovative technologies such as hypoxic training, electrical stimulation, toning, simultaneous reactivation, mental training, innovative recovery methods etc.

The efficiency of the programming system was tested by the 9-time champion of Ukraine, master of sports of international class H.E. to prepare for performances in running at distances of 400 m and 800 m. Achieved results for 400 m - 45.89 sec. and 800 m - 1.46.56, this is the sixth result in the history of performances of Ukrainian athletes.

Analysis of practice and literature sources [1, 4, 6] showed that in the existing system of training of athletes of the national team of Ukraine there was no integrated use of innovative technologies.

The proposed technology of programming the involvement of innovative technologies for the training of athletes makes it possible to create an effective

system for building an individual training process in the national athletics team of Ukraine.

Experimental testing of programming technology involving innovative training technologies in the national athletics team of Ukraine confirmed the effectiveness of this programming technology, which was introduced in the training of individual members of the national team of Ukraine.

Prospects for further research include research, development of computer programs, technologies for integrated involvement of innovative technologies for training elite athletes.

Conflict of interests. The authors declare that no conflict of interest.

Financing sources. This article didn't get the financial support from the state, public or commercial organization.

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Received: 21.04.2020.
Published: 04.05.2020.

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SLOBOZHANSKYI

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Editor:

Svetlana STADNYK

Publication of Kharkiv State Academy of Physical Culture

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