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CONTENT

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Sports selection of volley-ball players: genetic criteria to define motor endowments (information 2)

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***Purpose**: to define genetic criteria which can be used while selecting gifted volley-ball players.*

***Material & Methods:** the study involved 50 high class volley-ball players and 50 women at the age of 20–29 years old. There were used methods of theoretical analysis and general conclusion, systematic analysis, genealogic methods of genetics, methods of dermatoglyphic and serologic analyses.*

***Results**: family gift for going in for sport was detected. At was revealed that gifted volley-ball players had peculiar finger tips prints and distribution of blood groups: the system AB0 in comparison with the total population.*

***Conclusions**: the obtained quantitative characteristics of finger dermatoglyphic, some blood groups and rhesus-factor as genetic markers of motor endowments of volley-ball players are proposed.*

Keywords: *genetic markers, motor endowments, sports selection, genealogical method.*

Introduction

Now hereditary conditionality of sports endowments is obvious. Only a talented person possessing a certain set of genetic prerequisites to this activity can achieve high sports results. The sports genetics allows carrying out the prediction of sports endowments of a person.

Sports genetics is rather young science. Its development is intensively carried out in Ukraine [5; 6], abroad – Canada, the USA [11; 13], Russia [2; 10]. The course for students of specialty physical education and sport on sports genetics is developed and taught in Ukraine.

Provisions of sports genetics were realized practically in the system of the individual prediction of the development of various signs and abilities of a person and used successfully at various stages of sports training and selection. Practical criteria of the individual prediction are data on family sports endowments, features of genetic conditionality of signs (morphological, motive, psychophysiological) in the development, identification of the genetic markers which are defining predisposition to certain activity of a person or development of signs.

The essence of genetic marking is explained with the following regularities. The gene coding a certain property which is shown at late stages of ontogenesis is sometimes closely linked (or it is in a genetic zone of the same chromosome; pic. 1) with other gene (marker) which is forming external, easily observed sign already at the birth. The signs, which are controlled by them, tend to be inherited together, when coupling genes.

The graphic card of distribution of the genes on chromosomes which are controlling good health and physical development of a person is shown in pic. 1. 170 genes and genetic zones are given in the card, which are connected with the interesting us signs and features of physical development, the number of which increases constantly with the development of biological science.

It is possible to judge not only the existence, but also the lack of predisposition in the development of the studied sign of a person at the identification of a sign-marker [4].

However studying of genetic markers of endowments to high achievements in separate sports is studied not enough.

Communication of the research with scientific programs, plans, subjects

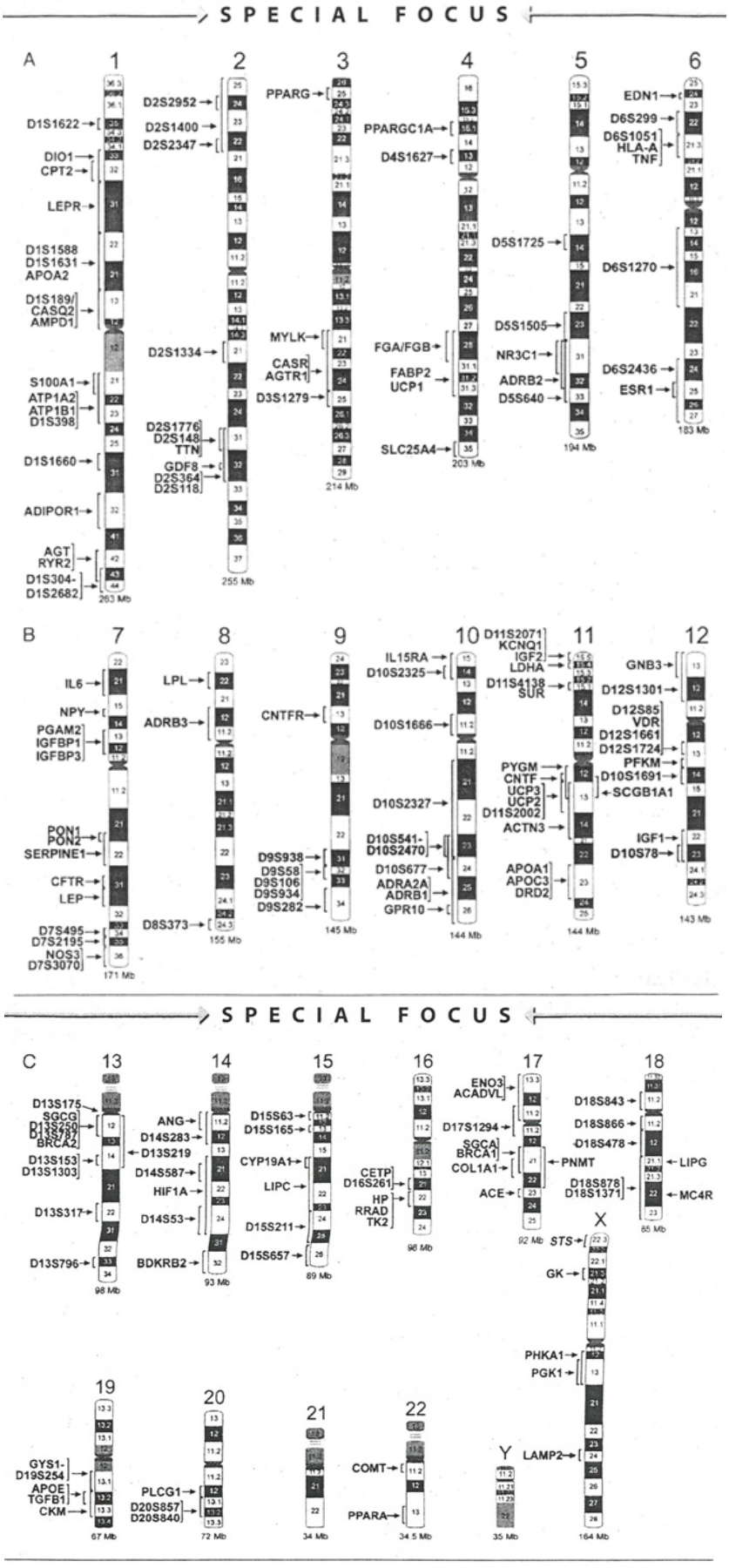
The work is performed in the compliance "The consolidating plan of the research work in the sphere of physical culture and sport for 2011–2015" of the Ministry of Ukraine for family, youth and sport on the subject "Theoretic-methodical bases of individualization of the educational and training process in game sports" (No. of the state registration is 0112U002001).

The purpose of the researches

To define genetic criteria which are possible for using at the selection of the gifted volleyball players.

Material and Methods of the research

Methods of the theoretical analysis and generalization, the system analysis, the genealogical method of genetics, methods of the dermatoglyphic and serologic analysis were used in the work. 50 high-class female volleyball players, 50 girls of the general population who didn't engage in sports, at the age of 20–29 years old took part in the researches.



Pic. 1. The card of an arrangement of genes and genetic zones which are controlling a phenotype of physical development and good physical health in chromosomes of a person [13]

Results of the research and their discussion

Genealogical researches. It turned out in the genealogical research of the qualified female volleyball players that parents of sportswomen had often high physical activity and good results in different types of sport in young years. It was revealed that sportswomen have 56,4% of fathers and 32,7% of mothers who engaged in sports earlier. Whereas there were 27,8% and 11,4% in the compared group of youth at 20–29 years old which don't engage in sports according to fathers and mothers who were sportsmen earlier. In 8,3% families of the qualified female volleyball players both parents played sports earlier, and not sportsmen of such families had only 2,8%.

These results can be compared to earlier conducted researches of R. Kovár [12]. Results of researches on sports activity of parents of outstanding sportsmen of different types of sport are given in tab. 1. As we see, family enthusiasm for sport of probands – volleyball players in many respects coincides with family motive endowments of representatives also of other populations and sports. This genetic regularity allows claiming that family motive endowments can be informative criterion in the system of sports selection of young volleyball players.

Dermatoglyphic researches. Three main papillary patterns of fingers (pic. 2) were defined in the researches: A – arches, L – loops, W – whorls, and also the fourth option of difficult (compound) dermatoglyphic patterns of fingers of hands (type LW) (pic. 3). Two options of loopback patterns were compared: U – an ulnar loop which is open in the ulnar (fibular) part and R – is open in the radial (tibial) part. The quantity of combs on separate fingers of the right and left hands and totally on right, left and two hands were counted. It is possible to get acquainted with a full technique of the analysis of dermatoglyphic of fingers of hands in the monograph of L. P. Sergienko [9].

Table 1

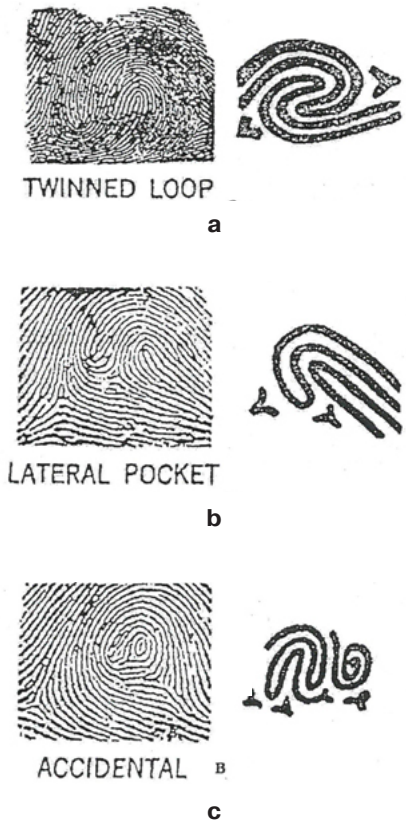
Sports activity of parents of outstanding Czech sportsmen

Sports activity	Father	Mother	Both parents
Sports activity	56,8	35,0	26,8
High sports results	39,2	21,6	18,5
Average sports results	57,7	69,0	44,3
Insignificant sports results	3,1	9,4	—

a b c

Pic. 2. Main types of papillary patterns of fingers: *a – an arch, the number of deltas exactly 0, a numerical indicator of combs is equal to 0; – a loop, the number of deltas – 1, a numerical indicator – 13; b – a whorl, the number of deltas – 2, a numerical indicator – 17 (according to the bigger left miscalculation)*

The qualified volleyball players had the following distribution of types of patterns of fingers (tab. 2) in comparison with the control group of not training women. We see the essential distinction of percentage of arc dermatoglyphs at two groups of the investigated. The occurrence of the simplest patterns is more (18,7%) at women of the general population, than at sportswomen is (8,5%). There aren't essential distinctions on loopback patterns at two investigated groups (U+R=59,3 and 58,1% respectively at the engaged and not engaged in sports). At the same time patterns distribution of difficult (whorl) differ at the investigated. Sportswomen have more frequent occurrence of difficult patterns (W+LW=32,2%), than at women of the general population (W+LW=23,2%).



Pic. 3. Various types of difficult (compound) dermatoglyphic patterns of fingers of hands: *a – a double loop (TL conventionally), b – a lateral pocket loop (LPL conventionally), c – three-deltoid patterns (ACC conventionally)*

The local distribution of the comb account on separate fingers of the right and left hand was defined at two groups of the investigated in the researches (tab. 3). The average amount of occurrence of quantity of combs is from 12 till 20 on separate fingers at sportswomen, and at women of the general population is from 10 till 17. The total quantity of combs on the right and left hand (TRC) also differs at sportswomen and women of the general population: respectively 154,6 and 128,5. Separately the essential distinctions are revealed on 4 fingers: RC-1 the left hand, RC-2 the right hand, RC-3 – the right and left hands. In all cases sportswomen had big absolute measures of the comb account, than at the women who don't engage in sports. TRC variations was within 140–160 at sportswomen, and at women of the general population – 120–130 (the level of distinctions is high $p<0,01$).

Comparing these results to our previous researches (L. P. Serhiyenko, 1995; L. Serhiyenko, 1999), we will note the following (tab. 4). The children, who are having higher development of high-speed abilities, (the ability which is basic for volleyball players) have a big occurrence on fingers of hands of difficult patterns (type W) and a smaller occurrence of simple patterns (type A). These distinctions are even more expressed (from 12,8 till 27,3%) when comparing the sportsmen – sprinters with fingers who don't engage in sports. For example, it is revealed from 5 till 8 of whorl types of patterns on two hands at masters of sports – men [9].

The similar indicators are received in many respects in the researches of T. F. Abramova, T. M. Nikitina, N. N. Ozolin [1]. A proportion of types of patterns (A, L, W) at volleyball players made respectively 0–62,7–37,3%. Indicators of TRC were 145,0±41,3 of combs.

The above-stated material allows claiming that it is possible to use the following informative dermatoglyphic criteria at the sports selection of young volleyball players:

– type of patterns of fingers of hands. The quantity of whorl patterns on two hands has to make from about 30 to 40% at the gifted volleyball players; the occurrence of difficult (whorl) patterns will be most often within 20–25% at the children who aren't predisposed to this entrance of sport;

– the total comb account on two hands (TRC) can be the second criterion of dermatoglyphic. As a rule, it is ranging from 140 till 160 combs at the children who are predisposed to volleyball classes, and at the children who don't have such predisposition – ranging from 120 till 130 combs.

Serologic researches. Blood groups of the system AB0 and a Rhesus factor of female volleyball players and people of the general population were studied in the serologic researches. The data were undertaken from medical records of participants of the researches.

The distribution of blood groups at the qualified female volleyball players is presented in tab. 5. The distribution of blood groups is given in the control group and people of the Ukrainian population for comparison in this table. Comparisons show that blood group I(0) occurs most often at the qualified female volleyball players. It is twice more often observed at sportswomen, than in the control group of women, and for 16% in comparison with the population data. The insignificant percentage is noted on the II(A) blood group at female volleyball players. Women of the control group and people of the general population have insignificant differences. The third blood group exceeds occurrence of III(B) at sportswomen, as in the control group, and population almost twice. The fourth blood group occurs rather seldom at all people, besides female volleyball players with such blood group weren't revealed at all.

Table 2

Distribution of the main types of patterns of fingers at the qualified female volleyball players and the group of women who don't engage in sports, %

Contingent of the investigated	n	Types of patterns of fingers of hands				
		A	U	R	W	LW
Sportswomen	50	8,5	54,8	4,5	25,4	6,8
Women of the general population	50	18,7	56,0	2,1	15,3	7,9

Table 3

Quantity of combs (RC) on fingers of the right and left hands at sportswomen and women of the general population

The comb account on fingers	Right hand			Left hand		
	Sportswomen	Not sportswomen	p	Sportswomen	Not sportswomen	P
RC-1	15,5±1,4	14,1±1,7	>0,05	16,5±1,2	12,1±1,4	**<0,05**
RC-2	17,2±0,4	12,6±1,3	**<0,05**	15,1±1,1	14,4±1,7	>0,05
RC-3	20,0±1,2	16,9±1,9	**<0,05**	18,2±1,3	13,7±1,2	**<0,05**
RC-4	12,1±0,9	10,9±1,0	>0,05	13,2±1,9	10,4±1,6	>0,05
RC-5	14,5±1,6	11,8±0,9	>0,05	12,3±1,7	11,6±1,4	>0,05
Amount	79,3±1,4	66,3±2,6	**<0,05**	75,3±1,2	62,2±1,8	**<0,05**

Table 4

Distribution of the main types of patterns of fingers (total indicators of two hands) at children at 11–17 years old of the Ukrainian population with high and low development of high-speed abilities

Indicators	Sex	Types of patterns of fingers, %		
		A	L	W
High motive reaction	M–W	3,8	59,8	56,4
Low motive reaction	M–W	9,4	67,8	22,8
High speed of run	M–W	6,8	62,4	30,8
Low speed of run	M–W	10,0	68,0	22,0

The presence of a Rhesus factor at the examined sportswomen to the control group of women who didn't engage in sports is given in table 6. As we see, female volleyball players have generally positive Rhesus factor (+Rh).

Comparing the obtained data with the generalized results of the serologic researches (L. P. Sergienko, 2004), we will note that the I(0) blood group, as a rule, is associated with high development of high-speed and power abilities and most often occurs at sportsmen of high-speed strength sports. This blood group is a genetic marker of good health and considerable prospects to physical development. The third blood group III(B), as a rule, meets at the people who are more often having high coordination abilities. It is associated with motive activity which provides complex manifestation of motive abilities in the changing situations (for example, such which occur in sports). We will remind that high-speed and power and coordination abilities are basic sports success of volleyball players. The positive Rhesus factor, as a rule, characterizes a high predisposition of a person to the development of anaerobic efficiency [7].

The above-stated results of the serologic researches allow claiming that informative criteria of high prospects to classes at the individual forecast in the system of sports selection by volleyball can be:

– existence of I(0) or III(B) of a blood group. Besides, in our opinion, sportsmen with the I(0) blood group can be more perspective as forwards, and with the III (B) blood group – setter;

– existence of a positive Rhesus factor (+Rh) at occurrence of I(0) and III(B) of blood groups.

It is methodologically justified to carry out the genetic prediction of prospects of young volleyball players at the second and third stages of sports selection. Features of the development of morphological features, motive abilities and family sports endowments are defined at the second stage. And genetic markers are used in the system of the sports prediction at the third stage of sports selection (selection for the improvement in a certain sport is carried out here).

The regularities which were received on the selection of female volleyball players, in our opinion, can be extrapolated to the man's contingent of sportsmen.

Conclusions

1. The results of the genealogical researches allow claiming that family motive endowments can be informative criterion in the system of sports selection of young volleyball players.

2. Dermatoglyphic criteria in the individual prediction of motive endowments of volleyball players are:

– existence of difficult type of dermatoglyphic pattern of fingers of hands. The quantity of whorl patterns on two hands has to make from 30 till 40% at the gifted volleyball players;

– existence of the bigger, than on average in population number of the total comb account on two hands (TRC). As a rule, it is ranging from 140 till 160 combs at the children who are predisposed to classes with volleyball.

3. Blood groups of the system AB0 can be criteria of predisposition to volleyball classes. A serologic marker can be I(0) and III(B) of blood group at a positive Rhesus factor (+Rh) at the perspective volleyball players. Sportsmen with the I(0) blood group are more predisposed to performance of functions of forwards, and with the III(B) blood group to performance of functions of setters.

Prospects of further researches

Further the researches of features of formation at the gifted volleyball players of such genetic markers can be of interest: iridologic, odontologic, morphometric, molecular.

Table 5

Distribution of blood groups at the qualified female volleyball players, at women of the investigated group and people of the Ukrainian population, %

The investigated group	Blood groups			
	I(0)	II(A)	III(B)	IV(AB)
Female volleyball players (n=50)	56	12	32	0
The control group of women (n=50)	28	42	18	12
The Ukrainian population (L. P. Serhiyenko, 2004)	40	37	17	6

Table 6

Distribution of a Rhesus factor on blood groups at the female volleyball players and women who don't engage in sports professionally, %

The investigated groups	Blood groups and Rhesus factor							
	I(0)		II(A)		III(B)		IV(AB)	
	+Rh	–Rh	+Rh	–Rh	+Rh	–Rh	+Rh	–Rh
Female volleyball players (n=50)	83,3	16,7	100,0	0,0	66,7	33,0	0,0	0,0
The control group of women (n=50)	66,7	33,3	60,0	40,0	75,0	25,0	33,3	66,7

Conflict of interests. The authors declare that there is no conflict of interests.
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Improvement of coordination abilities of sportsmen of 13–15 years old in fighting sambo

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Purpose: *to determine the level of coordination abilities of sportsmen of 13–15 years old in fighting sambo.*

Material & Methods: *the following methods of the research were used: theoretical analysis and synthesis of data of special scientific and methodical literature; pedagogical supervision; pedagogical testing; methods of mathematical statistics. 12 sportsmen of fighting sambo are tested for ability of support of static and dynamic balance before and after the pedagogical experiment.*

Results: *the metrological control of coordination abilities of sportsmen of fighting sambo is considered. The individual estimated results are received on ability of support of static and dynamic balance. The dynamics of the level of the development of coordination abilities of sportsmen of 13–15 years old in fighting sambo is defined.*

Conclusions: *the positive changes of the level of the development of coordination abilities, which are received under the influence of a technique of improvement of statodynamic firmness and sensomotor coordination, allow us to recommend this technique for application in the educational-training process of sportsmen of fighting sambo.*

Keywords: *coordination abilities, sportsmen of fighting sambo, static and dynamic balance.*

Introduction

Fighting sambo is the unique system of self-defense, which is made in real fighting activity, grounded on the principles of conducting a real fight with one or several opponents (standing and lying), on the principles of natural movements and special preparation of mentality in the conditions of a stressful situation. The development of coordination abilities is represented to one of actual and significant problems in fighting sambo [11].

The coordination abilities, which are based on manifestations of motive reactions, are the cornerstone of activity of sportsmen in fighting sambo. To provide remote interactions with partners and an opponent, to switch from one action to another, to choose a moment to start actions – are the most wideapread specialized abilities of sportsmen of fighting sambo who demand the subsequent development of their abilities. The prompt development of world sport constantly demands the incessant search of more and more effective remedies, methods and forms of training of sportsmen [4; 6; 7].

The purpose of the research

To develop and to prove experimentally a technique of improvement of coordination abilities of sportsmen of 13–15 years old in fighting sambo.

Tasks of the research:

1. The analysis of scientifically methodical literature on the problem of development of coordination abilities of sportsmen of 13–15 years in fighting sambo.

2. To define maintenance and influence of an experimental technique on the level of coordination abilities of sportsmen of 13–15 years old in fighting sambo.

3. To prove efficiency of a technique of improvement of coordination abilities of sportsmen of 13–15 years old in fighting sambo and to analyze dynamics of indicators of the level of their development.

Material and Methods of the research

Th research was conducted from September, 2015 till March, 2016 on the basis of SC "Hermes" Kyiv. 6 sportsmen of – 15 years old of fighting sambo of the control group (CG) and 6 sportsmen of 13–15 years old of fighting sambo of the experimental group (EG) took part in the researches (the 1st category, candidates of the Master of Sports). We tested sportsmen for static and dynamic balance, and also the test for ability to orientation in space was carried out for identification of the level of development of vestibular function [9].

The following methods of research were used in the research: theoretical analysis and synthesis of data of special scientifically methodical literature; pedagogical supervision; pedagogical testing; methods of mathematical statistics.

Results of the research and their discussion

Statistics of testing of sportsmen of fighting sambo of CG for static and dynamic balance and on ability to orientation in space were received at the beginning of pedagogical experiment.

Four sportsmen showed the maximum result, two sports-

men – closer to maximum in the test (No. 1) of Bondarevsky for static balance with open eyes.

Sportsmen showed average results in the group in the test (No. 10) blindly on a limited and unstable support (on a stuffed ball) – 40,2 s that is much lower than a standard indicator – 60 s. Individual results are very different in the group – from 13 s to maximum 60 s (V – 55,3%).

Individual results make from 23 till 60 s in a rack on one leg blindly by a technique of Bondarevsky (No. 2) that is also much lower than a standard indicator – 60 s (pic. 1).

In the dynamic balance tests: average results of a deviation from a straight line back – 39,2 sm and 33,5 sm respectively received walking of 5 m blindly forward and back (No. 8, 9). One of sportsmen managed to pass a straight line without deviation, and the maximum deviation made 99 sm. After ten turns blindly (No. 13) one sportsman evaded from initial situation on 180° and one sportsman executed the test unmistakably. Average result of a deviation from a straight line in group – 45,8°. Heterogeneity of group is the highest (V – 146%) by this test. After rotations in a bent standing position blindly throughout 10 s (No. 3) sportsmen of fighting sambo could stay on tiptoe on average 16,5 s from 30 standard.

All sportsmen could stay maximum 30 s, except one (24 s) after 10 turns with a head inclination down and open eyes (No. 12). But one sportsman hasn't coped with the test with a head up and one fixed balance only of 3 s in the similar test (No. 11). An adequate irritant of the vestibular system is lack of visual control and unusual position of a head in tests No. 3 and No. 12 that became the forcing-down factors for this group of sportsmen.

At the implementation of the combined test (No. 7): throwings over in combination with jumps with turn on 360°, results were found which testify to heterogeneity of the studied group (V – 60%).

Results of nine tests indicate that sportsmen didn't use special exercises on the development of vestibular function earlier. Wide intervals of results are received answer specific features of vestibular function of sportsmen.

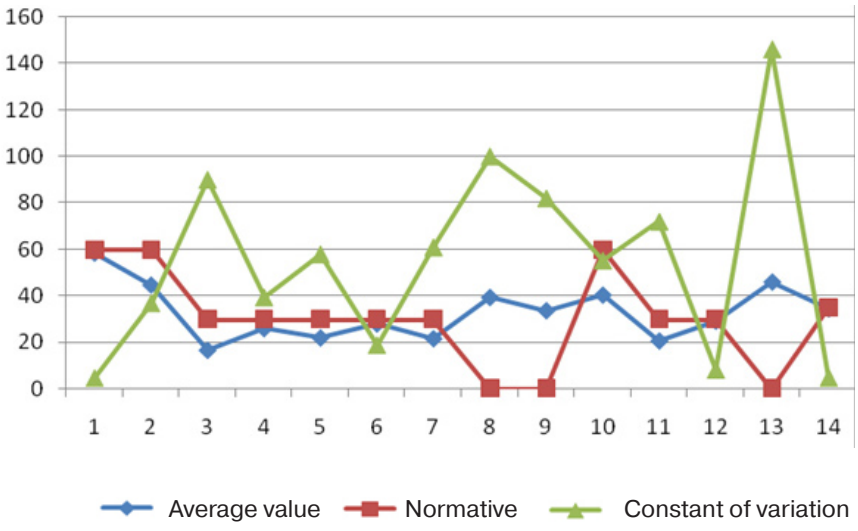
In the statodynamic test (No. 5), the average result in group made 21,8 s, the worst, – 3 s, after three throwings over forward to stand in balance on one leg. the average result is better (No. 6) – 27,8 s in balance after three throwings over back. Throwings over are carried out more slowly back that is connected with safety measures.

In the test for statodynamic firmness with the performance of simple acrobatic exercises and the maintenance of balance in different racks (No. 4): five sportsmen shown the maximum contents (30 s), one – 5 s after five over turns by a side.

Statistics of testing of sportsmen of fighting sambo of EG at the beginning of the pedagogical experiment were the following.

With open eyes five sportsmen shown the maximum result in the test (No. 1) of Bondarevsky for static balance, and one sportsman showed approximately maximum result.

Sportsmen showed average results in the group – 38,8 s that below a standard indicator – 60 s in the test (No. 10) blindly on a limited and unstable support (on a stuffed ball). Individual results in the group are very different – from 5 s till maximum



Pic. 1. Indicators of statodynamic firmness of sportsmen of fighting sambo at the beginning of the pedagogical experiment (CG, n=6):

Average value of results in tests:

1. Bondarevsky with open eyes, s – 58,2; 2. Bondarevsky blindly, s – 44,5; 3. Balance after rotations in a bent standing position for 10 s – 16,5; 4. Balance after five overturns, s – 25,8; 5. Three throwings over forward, balance on one leg, s – 21,8; 6. Three throwings over back, balance on one leg, s – 27,8; 7. Balance after throwings over and jumps with turn, s – 21,5; 8. Walking of 5 m blindly forward, sm – 39,2; 9. Walking of 5 m blindly back, sm – 33,5; 10. Balancing on a stuffed ball, s– 40,2; 11. Balance after 10 turns with a head up, s – 20,5; 12. Balance after 10 turns with a head down, s – 29,0; 13. The test for ability to orientation in space, degree. – 45,8; 14. Rotation by a head 35 s – 34,3.

60 s (V – 59,7%).
Individual results make from 22 till 60 s that is also much lower than a standard indicator – 60 s in a rack on one leg blindly (pic. 2) by the technique of Bondarevsky (No. 2).

In the dynamic balance tests: average results of a deviation from a straight line back – 34,5 and 33,5 sm respectively were received walking of 5 m blindly forward and back (No. 8, 9). One of sportsmen managed to pass a straight line without deviation, and the maximum deviation made 90 sm.

One sportsman evaded from initial situation on 160° after ten turns blindly (No. 13), and one sportsman executed the test with the minimum deviation – 3°. Average result of a deviation from a straight line in the group – 43,8°. Heterogeneity of the group is the highest by this test (V – 131,8%).

Sportsmen of fighting sambo could stay on tiptoe on average 17,5 s from 30 standard after rotations in a bent standing position blindly throughout 10 s (No. 3).

Four sportsmen could stay the maximum 30 s after 10 turns with a head inclination down and open eyes (No. 12). But one sportsman didn't cope with the test with a head up and one fixed balance only of 5 s in the similar test (No. 11). At the implementation of the combined test (No. 7): throwings over in combination with jumps with turn on 360°, results which testify to heterogeneity of the studied group were found (V – 50,3%).

Results of nine tests indicate that sportsmen didn't use special exercises on the development of vestibular function earlier. The received wide intervals of results answer specific features of vestibular function of sportsmen.

In the statodynamic test (No. 5), to stand in balance on one after three throwings over forward, average result in the group made 22,8 s, the worst, – 7 s. The average result is better in balance after three throwings over back (No. 6) – 26,3 s. Throwings over are carried out more slowly back that is connected with safety measures.

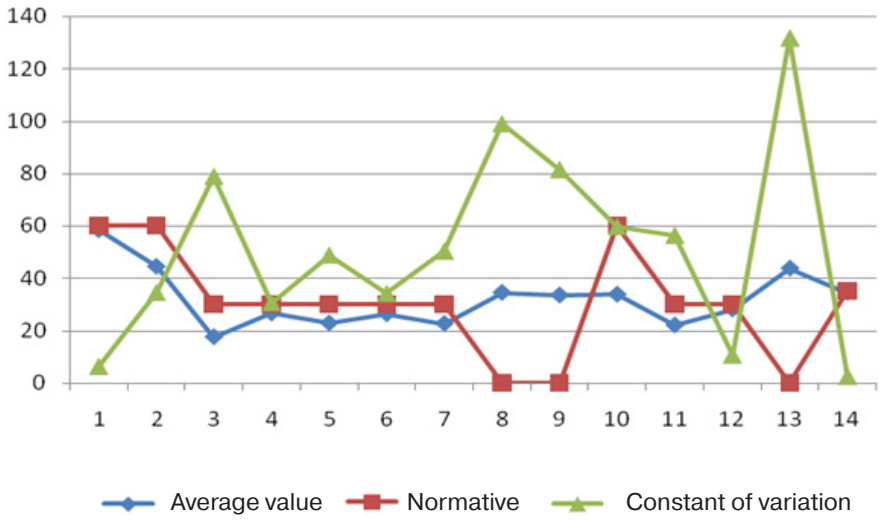
In the test for statodynamic firmness with the performance of simple acrobatic exercises and the maintenance of balance in different racks (No. 4): 5 sportsmen showed the maximum contents (30 s) and only one – 10 s after five overturns by a side.

We developed the technique of increase of coordination abilities of sportsmen of 13–15 years old in fighting sambo on the basis of the conducted research. Exercises for the development of a vestibular mechanism without visual control, on a mobile and not resistant support, throwings over forward with imitation of different blows, throwings over towards and from a rack with imitation of different blows, jumps with rotation for the help and without hands, jumps with imitation – fight with "shadow", rotation around a vertical axis in a bent standing position with performance of different blows are included to it for the first time.

We applied the technique of improvement of statodynamic firmness and sensomotorny coordination of sportsmen of fighting sambo in the experimental group (EG, n=6). The educational and training process was carried by a traditional technique of training of sportsmen in the control group (CG, n=6). Exercises were used in the preparatory, main and finishing part of training.

We received statistics of testing of sportsmen of fighting sambo of CG at the end of the pedagogical experiment.

Four sportsmen showed the maximum result in the test (No. 1)



Pic. 2. Indicators of statodynamic firmness of sportsmen of fighting sambo at the beginning of the pedagogical experiment (EG, n=6)

Average value of results in tests:

1. Bondarevsky with open eyes, s – 58,5; 2. Bondarevsky blindly, s – 44,5; 3. Balance after overturns in a bent standing position for 10 s – 17,5; 4. Balance after five overturns side, s – 26,6; 5. Three throwings over forward, balance on one leg, s – 22,8; 6. Three throwings over back, balance on one leg, s – 26,3; 7. Balance after throwings over and jumps with turn, s – 22,6; 8. Walking of 5 m blindly forward, sm – 34,5; 9. Walking of 5 m blindly back, sm – 33,5; 10. Balancing on a stuffed ball, s – 33,8; 11. Balance after 10 turns with a head up, s – 22,0; 12. Balance after 10 turns with a head down, s – 28,1; 13. The test for ability to orientation in space, degree. – 43,8; 14. Rotation by a head 35 s – 34,6.

of Bondarevsky for static balance with open eyes. Two sportsmen showed result less maximum, but it is more, than before the experiment.

Sportsmen showed average results in the group in the test (No. 10) blindly on a limited and unstable support (on a stuffed ball) – 42,8 s that is closer to a standard indicator – 60 s. Individual results in the group are rather different – from 15 s till maximum 60 s (V – 46%).

Individual results make from 24 till 60 seconds in a rack on one leg blindly by the technique of Bondarevsky (No. 2) that is also much lower than a standard indicator – 60 s (pic. 3).

Average results of a deviation from a straight line back – 29,6 cm and 27,1 respectively were received in the dynamic balance tests: walking of 5 m blindly forward and back (No. 8, 9). One of sportsmen managed to pass a straight line without deviation, and the maximum deviation made 70 sm. After ten turns blindly (No. 13) one of sportsmen evaded from initial situation on 170°, and one sportsman executed the test unmistakably. Average result of a deviation from a straight line in group – 39,1°. Heterogeneity of the group is the highest by this test (V – 165,4%).

Five sportsmen could stay the maximum 30 s after 10 turns with a head's inclination down and open eyes (No. 12). But one sportsman fixed balance only 5 s from 30 s with a head up in the similar test (No. 11).

At the implementation of the combined test (No. 7): throwings over in combination with jumps with turn on 360°, results from 14 s and 15 s till 30 s were found that made an aberration of 17,3%.

Results of nine tests indicate that sportsmen didn't use special exercises on the development of vestibular function and the educational and training process was carried out by a traditional technique during the experiment. The received wide intervals of results answer specific features of vestibular function of sportsmens.

In the statodynamic test (No. 5), after three throwings over forward to stand in balance on one leg, the average result in the group made 25,2 s, the worst, – 13 s. The average result is better (No. 6) in balance after three throwings over back – 28,3 s. Throwings over are carried out more slowly back that is connected with safety measures.

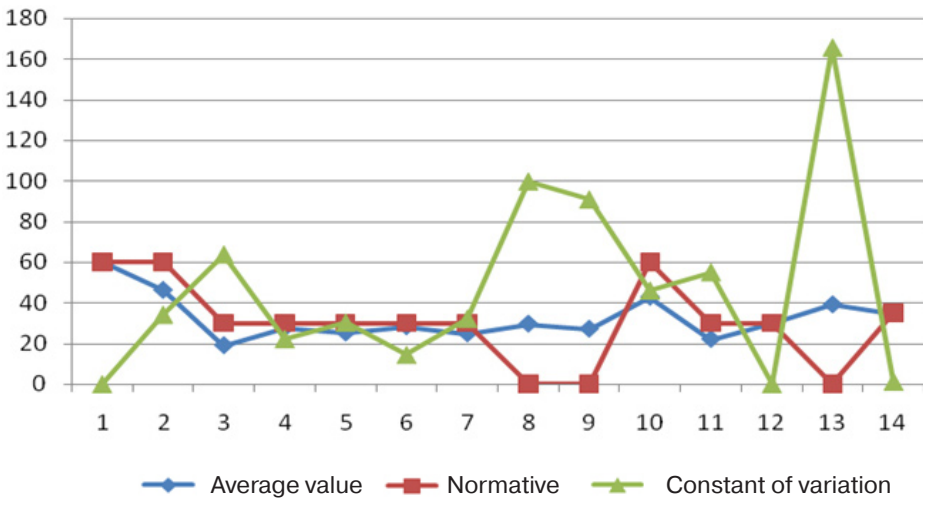
In the test for statodynamic firmness with the performance of simple acrobatic exercises and the maintenance of balance in different racks (No. 4): five sportsmen showed the maximum results (30 s) after five overturns by a side, one sportsman showed result of 15 s.

We received statistics of testing of sportsmen of fighting sambo of EG at the end of the pedagogical experiment.

Five sportsmen showed the maximum result in the test (No. 1) of Bondarevsky for static balance with open eyes, and one sportsman showed the result which is brought closer to maximum.

Sportsmen showed average results in the group in the test (No. 10) – 51,3 s blindly on a limited and unstable support (on a stuffed ball) that is much higher than average result at the beginning of the experiment (38,8 s). Individual results in the group grew from 40 s till maximum 60 s (V – 16,1%) in comparison with results at the beginning of the experiment from 5 s to maximum 60 s (V – 59,7%).

Individual results grew and made from 43 till 60 s (V – 16,1%)



Pic. 3. Indicators of statodynamic firmness of sportsmen of fighting sambo at the end of the pedagogical experiment of CG (n=6)

Average value of results in tests:

1. Bondarevsky with open eyes, s – 58,8; 2. Bondarevsky blindly, s – 46,2; 3. Balance after rotations in a bent standing position for 10 s – 19,0; 4. Balance after five overturns side, s – 27,5; 5. Three throwings over forward, balance on one leg, s – 25,2; 6. Three throwings over back, balance on one leg, s – 28,3; 7. Balance after throwings over and jumps with turn, s – 24,8; 8. Walking of 5 m blindly, sm, – 29,6; 9. Walking of 5 m blindly back, sm – 27,1; 10. Balancing on a stuffed ball, s – 42,8; 11. Balance after 10 turns with a head up, s– 22,1; 12. Balance after 10 turns with a head down, s – 29,3; 13. The test for ability to orientation in space, degree. – 39,1; 14. Rotation by a head 35 s – 34,8.

in a rack on one leg blindly by the technique Bondarevsky (No. 2) in comparison with results at the beginning of the experiment from 22 till 60 s (V – 34,5%) (pic. 4).

In the dynamic balance tests: average results of a deviation from a straight line – 22,5 sm and 21,3 sm respectively were received walking of 5 m blindly forward and back (No. 8, 9), in comparison with 34,5 sm and 33,5 sm before the experiment. One of sportsmen managed to pass a straight line without deviation, and the maximum deviation made 60 sm.

After ten turns blindly (No. 13) one of sportsmen evaded from initial situation on 100°, and one sportsman executed the test with the minimum deviation – 10°. Average result of a deviation from a straight line in the group – 25,8° in comparison with average result before the experiment – 43,8°. Heterogeneity of group is the highest by this test (V – 144,2%).

Sportsmen of fighting sambo could stay on tiptoe on average 27,5 s from 30 standard after rotations in bent standing position blindly throughout 10 s (No. 3).

Only four sportsmen could stay the maximum 30 s after 10 turns with a head's inclination down and open eyes (No. 12). In the similar test (No. 11), but one sportsman fixed balance only of 22 s with a head up. At the implementation of the combined test (No. 7): throwings over in combination with jumps with turn on 360°, results were found which testify to uniformity of the studied group (V – 10,2%).

Results of nine tests indicate that sportsmen raised the level of the development of vestibular function.

In the statodynamic test (No. 5), after three throwings over forward to stand in balance on one leg, the average result in the group made 28,1 s, the worst, – 22 s. The average result is better (No. 6) in balance after three throwings over back – 28 s. Throwings over are carried out more slowly back that is connected with safety measures.

In the test for statodynamic firmness with the performance of simple acrobatic exercises and the maintenance of balance in different racks (No. 4): five sportsmen showed the maximum results (30 s) after five overturns side, except one sportsman.

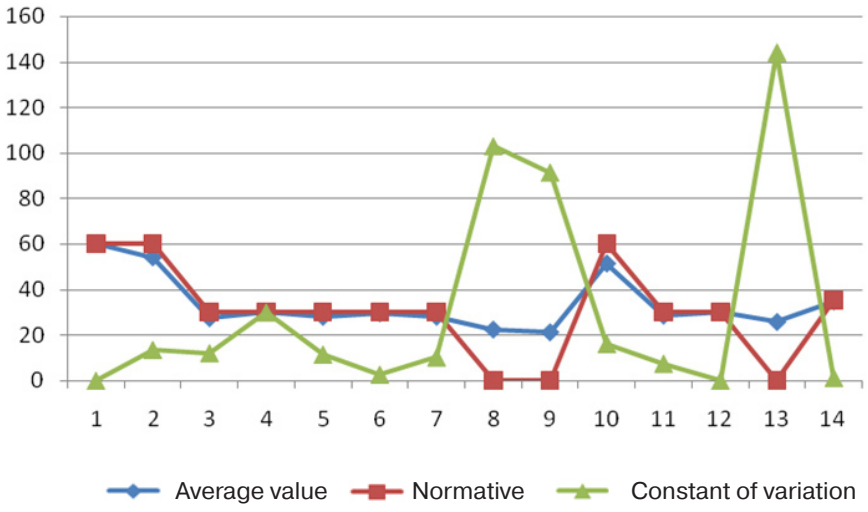
Statistics of the level of the development of coordination abilities of sportsmen of fighting sambo of CG (n=6), EG (n=6) at the beginning and at the end of the pedagogical experiment are shown in tab. 1 and tab. 2.

Using methods of mathematical statistics, it is possible to claim that:

1) difference of average values on the whole experimental group (EG) grew – by 25,1%; 2) difference of average values on the whole control group (CG) grew – by 9,6%;

– the difference of ditinctions of average values of the experimental and control groups of the pedagogical experiment makes 15,5%.

It is improved average value of a percentage ratio of an aberration for 12,6% by all tests by means of the offered technique of improvement of coordination abilities of sportsmen of fighting sambo in the experimental group in indicators of statodynamic firmness. The worst result (6,2%) is shown considerably in the control group which confirms efficiency of the offered technique of improvement of coordination abilities of sportsmen of fighting sambo in the experimental group during the pedagogical experiment.



Pic. 4. Indicators of statodynamic firmness of sportsmen of fighting sambo at the end of the pedagogical experiment of EG (n=6)

Average values of results in tests:

1. Bondarevsky with open eyes, s – 58,8; 2. Bondarevsky blindly, s – 54; 3. Balance after rotations in bent standing position-for 10 s – 27,5; 4. Balance after five overturns side, s – 27,5; 5. Three throwings over forward, balance on one leg, s – 28,1; 6. Three throwings over back, balance on one leg, s – 29,6; 7. Balance after throwings over and jumps with turn, s – 28,1; 8. Walking of 5 m blindly, sm, – 22,5; 9. Walking of 5 m blindly back, sm – 21,3; 10. Balancing on a stuffed ball, s – 51,3; 11. Balance after 10 turns with a head up, s – 28,6; 12. Balance after 10 turns with a head down, s – 28,8; 13. The test for ability to orientation in space, degree – 25,8; 14. Rotation by a head 35 s– 34,8.

Table 1

Level of development of coordination abilities of sportsmen of fighting sambo at the beginning of the experiment (p<0,05)

Tests	Experimental group (n=6)	Control group (n=6)	t	$t_{gr.}$	p
	$\bar{X}$±m				
1. Bondarevsky with open eyes, s	58,5±1,64	58,2±1,27	0,14	2,45	>0,05
2. Bondarevsky blindly, s	44,5±6,88	44,5±7,32	0	2,45	>0,05
3. Balance after rotations in bent standing positionfor 10 s	17,5±6,19	16,5±6,68	0,10	2,45	>0,05
4. Balance after five overturns side, s	26,6±3,65	25,8±4,57	0,13	2,45	>0,05
5. Three throwings over forward, balance on one leg, s	22,8±4,9	21,8±5,71	0,13	2,45	>0,05
6. Three throwings over back, balance on one leg, s	26,3±4,02	27,8±2,38	0,32	2,45	>0,05
7. Balance after throwings over and jumps with turn, s	22,6±5,09	21,5±5,9	0,14	2,45	>0,05
8. Walking of 5 m blindly, sm	34,5±15,38	39,2±17,6	0,20	2,45	>0,05
9. Walking of 5 m blindly back, sm	33,5±12,2	33,5±12,32	0	2,45	>0,05
10. Balancing on a stuffed ball, s	33,8±9,05	40,2±9,96	0,47	2,45	>0,05
11. Balance after 10 turns with a head up, s	22,0±5,56	20,5±6,6	0,17	2,45	>0,05
12. Balance after 10 turns with a head down, s	28,1±1,34	29±1,09	0,52	2,45	>0,05
13. The test for ability to orientation in space, degree	43,8±25,9	45,8±29,89	0,05	2,45	>0,05
14. Rotation by a head 35 s	34,6±0,36	34,3±0,73	0,36	2,45	>0,05

Table 2

Dynamics of development of coordination abilities of sportsmen of fighting sambo at the end of the experiment (p<0,05)

Tests	Experimental group (n=6)	Control group (n=6)	t	$t_{rp.}$	p
	$\bar{X}$±m				
1. Bondarevsky with open eyes, s	58,8±1,27	58,8±0,82	0	2,45	>0,05
2. Bondarevsky blindly, s	54±3,2	46,2±7,05	1,0	2,45	>0,05
3. Balance after rotations in bent standing positionfor 10 s	27,5±1,5	19±5,43	1,5	2,45	>0,05
4. Balance after five overturns side, s	27,5±2,74	27,5±2,74	0	2,45	>0,05
5. Three throwings over forward, balance on one leg, s	28,1±1,45	25,2±3,43	0,77	2,45	>0,05
6. Three throwings over back, balance on one leg, s	29,6±0,36	28,3±1,83	0,69	2,45	>0,05
7. Balance after throwings over and jumps with turn, s	28,1±1,28	24,8±3,59	0,86	2,45	>0,05
8. Walking of 5 m blindly, sm	22,5±10,4	29,6±13,2	0,42	2,45	>0,05
9. Walking of 5 m blindly back, sm	21,3±8,74	27,1±11,04	0,41	2,45	>0,05
10. Balancing on a stuffed ball, s	51,3±3,7	42,8±8,83	0,88	2,45	>0,05
11. Balance after 10 turns with a head up, s	28,6±0,96	22,1±5,45	1,17	2,45	>0,05
12. Balance after 10 turns with a head down, s	28,8±0,9	29,3±0,72	0,43	2,45	>0,05
13. The test for ability to orientation in space, degree	25,8±16,7	39,1±29	0,39	2,45	>0,05
14. Rotation by a head 35 s	34,8±0,18	34,8±0,18	0	2,45	>0,05

Conclusions

1. The analysis of scientifically methodical literature confirms the insufficient level of researches of coordination abilities of sportsmen of fighting sambo.

2. The content of the educational and training process is developed which is directed to the improvement of coordination abilities of sportsmen of fighting sambo. The level of statodynamic firmness and sensomotorny coordination of sportsmen of 13–15 years old of fighting sambo in EG and CG was defined.

3. The technique of improvement of coordination abilities of sportsmen of 13–15 years old in fighting sambo is developed.

4. The offered experimental technique influenced effectively the increase of the level of coordination abilities of sportsmen of fighting sambo.

Using methods of mathematical statistics, we can say that: 1) Difference of average values on the whole experimental group (EG) grew by 25,1%; 2) Difference of average values on the whole control group (CG) grew by 9,6%; 3) The difference of ditinctions of average values of the experimental and control groups makes 15,5% at the end of carrying out pedagogical experiment.

Dynamics of indicators of average value of a percentage ratio of an aberration by all tests of statodynamic firmness for 12,6% is found during the pedagogical experiment in the experimental group. The worst result (6,2%) is shown considerably in the control group which confirms efficiency of the offered technique of improvement of coordination abilities of sportsmen of fighting sambo in the experimental group during the pedagogical experiment.

Prospects of the subsequent researches will be sent to the search for new means and methods of physical training of sportsmen of fighting sambo and improvement of an arsenal of techniques.

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Indicators functional condition of sportsmen-handball player

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Purpose: *to investigate the functional state of the female handball players to develop a comprehensive methodology for determining the prospects of athletes in a chosen sport.*

Material & Methods: *the complex of kinematic characteristics was studied among girls of different age (15–16 years and 17–18 years) and sportsmanship, in all 45 persons, according to our method of measuring the training activities effect, as well as sensorimotor responses to auditory and visual stimuli, the air-flow rate , accuracy of a given muscle force were determined.*

Results: *in the process of studying the fitness and functional training changes of athletes of different ages, we discovered that the professional development increases the athlete capability in the performance of complex physical actions, which provides a set of actuators of various anatomical and physiological systems aimed at achieving the desired final result.*

Conclusions: *the functional indicators change is due to the general regularities of growth and development and the specific influence training and sport activities. The obtained data can be used to refine the muscle loading at different levels of functional fitness, motor activity, morpho-functional capabilities of the organism, and the athlete health state.*

Keywords: *handball, functional state, pace, accuracy of movements, sensorimotor response, the air-flow speed, dosing accuracy of muscular effort*.

Introduction

The competitive activity of handball player requires certain skills and abilities. To mastering of techniques and tactical actions of an athlete requires special physical training. High-speed movement without or with a ball, jumps, powerful throws, large-amplitude motions, long-distance running with variable speed and intensity during the game require the active cooperation of all physical qualities [2; 3].

The demonstration of force is dynamic, and often needs to be used as high-speed force (throw, handing and keeping of the ball), and explosive force (jump, spurt), i.e. strength endurance in handball-player preparedness is essential [6].

Handball requires a maximum demonstration of all speed abilities components: speed of simple and complex reactions, single movements, and the pace (rate) of movements. Play activity is characterized by choosing the reaction to a moving object, the repeated starting speed-up with the change of direction of the ball, the other players, replacement of some techniques and actions others [7].

To master techniques handball player requires a certain flexibility and agility, which reveal themselves in the ability to perform complex techniques timely and efficiently during the game under a sudden changing situation [4].

In the implementation of competitive activity, physiological qualities and properties of the individual handball player are of great importance. Special attention is paid to the processes of information reception, processing, storage and transmission. For proper solution of tactical tasks, players must have information about the partners' location at the court, the ball location, possible opposition of the rival, coach and partners' signals, etc. [5; 8].

Of a great value in handball are the characteristics of visual and auditory perception, connected with remote-dynamic peculiarities of the perception object, with the ability to estimate the distance to the flying ball, moving partner, their location within the playing area [8].

The specific features of the activity form of the complex perception of a handball player, which is based on a fine differentiation of stimuli coming from different analyzers: muscular-skeletal, vestibular, visual, auditory, tactile. Such specialized perception is available to high-standing players [2].

In the conditions of the intensity increase of the game actions and the time shortage psychological resistance is very important, as it provides a data processing, and prediction of further course of the situation. The player instantly analyzes several options and applies the one that, in his opinion, is the most consistent to the situation. Generally athletes choose an

option from a number of known and previously studied, in this case operational thinking includes elements of creative thinking [10].

The implementation of competitive activity requires certain functionality of an athlete, and appropriate aerobic-anaerobic energy supply. However, the level of special endurance is determined not only by energy supply system. It depends on the activity of the central nervous system, the endocrine system, the state of the musculoskeletal system, intramuscular specific changes [3].

Highly qualified athletes perform a large number of technical and tactical actions with the ball and without it. Both women and men have higher rates of maximum oxygen consumption, but at the same frequency of heart rate, energy consumption of male handball players is higher than of female handball players [6]. Athletes with more marked aerobic abilities make more work during the game. There are no significant differences in the magnitude of physiological changes among handball players of different game specialization. This shows that in the modern handball there are same high requirements for functional training to all players[9].

The purpose of the research

To investigate the functional state of the female handball players to develop a comprehensive methodology for determining the prospects of athletes in the chosen sport.

Material and Methods of research

University students and students of the Higher School of Physical Education, girls, were examined: 15–16 years – the second sports category, 25 people aged 17–18 – the first category and candidates for master of sports – 20 people. We have developed a test measuring the training activities effect based on tapping-test which determines the set of kinematic characteristics according to the pace and accuracy of movements (total and single), as well as characterizes some physical properties. Measuring of the training activities effect was carried out in three periods – 15 sonds, 60 sonds, 15 sonds. Athletes were asked to hit targets in the center, at a distance of 30 cm, as quickly and accurately as possible. The results were recorded automatically and processed by variational statistics method with the reliability of $p<0,05$. The technique was published in the Slobozhanskiy herald of the scientific and sport, 2015, № 4, S. 19–25 [1].

Results of the research and their discussion

Test indicators of training activities effect among the group of girls aged 15–16 are shown in Table 1. Movement pace in the first period of the test was 29±1,56 shots with total score of 222±6,03 points and accuracy of 7.65±0.09 points. The difference between the minimum and maximum values were significant in pace from 21 to 42 shots, total score from 160 to 262, accuracy of actions from 6.3 to 9.3 points. In the secondperiod, based on 15, i. e. bringing the indicators to a common observation time, pace was 32±2.06 shots, an increase by 3 or 10.3%, with a minimum amount – 21.5 and the maximum – 49,25 shots; total score 233±6,42 increased by 11% or 5; with a minimum amount – 131.5 points, and the maximum – 319 points; accuracy of movements – 7.28±0.37 points slightly decreased by 0.37 points, at the minimum value was equal to 4.38 points, i. e. decrease by 1.92 points, at the maximum amount – 9.38 points, an increase of 0.35 points. In the third period of the test pace was 30±1,71 shots on one shot more than in the first period and on 2 shots less than in the sond; total score was equal to 225±6,32, with a minimum indicator – 148, and the maximum – 287; accuracy of movements was 7.50±0.31 points, compared with the first period it was less on 0.15% or 2 points and with the second- more on 0.22 or 3.02% points. The total indicator for the three periods in the pace – 31,1±1,84 shots, the total score – 229.8, accuracy of movements – 7,41±0,33 points. In this group during the study of movement pace was maintained at a high level (29–32 shots) and satisfactory accuracy of movements (7,28–7,65 points).

Indicators of sensorimotor response to sound – 0.198±0.007 s, with a minimum reaction time of 0.173 s and a maximum reaction time – 0.254 s; to a visual stimulus – 0,230 ± 0,006, with minimum reaction time – 0.193 s and the maximum – 0.259 s.

The air-flow rate on inspiration, on average was 4,01±0,71 $l \cdot s^{-1}$, at the maximum – 5.0 $l \cdot s^{-1}$ and the minimum – 2.7 $l \cdot s^{-1}$; on exhalation, on the average – 4,45±0,192 $l \cdot s^{-1}$, maximum – 5.6 $l \cdot s^{-1}$, the minimum – 3.0 $l \cdot s^{-1}$.

Performing accuracy of a given muscle effect was 20 kg with an error for the right and left hands, respectively, – 0.89 ± 0.19 kg and 1.31±0.35 kg at the minimum value – 0.15 kg and 0.32 kg and the maximum – 2.50 kg and 4.75 kg.

In the group of girls aged 17–18 (Table 2) while measuring the training activities effect in the first period, pace of movement was 28±0,817 shots, total score – 249±4.92, accuracy of shooting the target 8,89±0,13 points. The best result was with the pace of 34 shots, the total score of 314, the accuracy – 9.26 points; minimum – pace of 23 total score – 176, accuracy – 7.65 points. In the secondperiod pace was 30 shots, total score – 263, and accuracy – 8.8 points. Compared to the first period of the pace was increased to 2 shots or by 7.1%, the total score – to 5.6%, the accuracy was practically not changed. Maximum result: pace – 37 strokes, total score – 351, accuracy – 9.5 points; minimum: pace – 25 strokes, total score – 200, and accuracy – 8.0 points. In the third period, pace movements increased to 32 ± 1.19 shots, total score – 271, accuracy – 8.46 points. At the maximum rate: pace – 40 shots, total score – 384, accuracy – 8,46 points; and a minimum rate: the pace – 25 shots, the total score – 180, accuracy – 7.2 points. In the third period, compared to the first one the pace increased by 14.2%, the total score – 8.8%, the accuracy of movements decreased by 0.43 points, i.e. practically remained at the same level, but compared to the secondperiod the pace increased by 6.6%, total score by 3%, accuracy decreased by 0.34 points.

On average, the following results within all 3 periods were obtained: pace – 31±0.816 shots, total score – 262±6,546, accuracy – 8,7±0,10 points, while the maximum rate: pace of 37 shots, total score – 340, accuracy – 9.4 points and the minimum rate: pace – 24 shots, total score – 185, accuracy – 7.7 points.

The reaction time in the sensorimotor stimuli was: to sound – 0,186±0,005 s with the best time – 0.154 s and the worst reaction – 0.226 s; to visual – 0,196±0,006 s with minimum re-

Table 1

Research results of female handball players aged 15–16

		Static indicators	M±m	M_{max}	M_{min}	G	C
Measuring of the training activities effect	The first period	Pace	29±1,56	42	21	6,05	20,86
		Total score	222±6,03	262	160	23,39	17,24
		Accuracy	7,65±0,09	9,03	6,3	0,34	14,37
	The second period	Pace	128±8,24 (32±2,06)	197 (49,25)	86 (21,5)	6,99	24,99
		Total score	932±25,70 (233±6,42)	1276 (319)	526 (131,5)	21,61	23,19
		Accuracy	7,28±0,37	9,38	4,38	1,44	19,54
	The third period	Pace	30±1,71	46	23	6,63	22,10
		Total score	225±6,32	287	148	20,05	17,80
		Accuracy	7,50±0,31	8,83	4,63	1,21	16,67
	Total	Pace	187±11,06 (31,1±1,84)	281 (46,8)	132 (22)	6,94	22,48
		Total score	1379±37,53 (229,8±6,25)	1755 (292,5)	919 (153)	24,09	17,47
		Accuracy	7,41±0,33	9,21	4,71	1,30	17,50
Tests	EMR	Sound	0,198±0,007	0,254	0,173	0,023	1,172
		Visual	0,230±0,006	0,259	0,193	0,019	2,938
	PT	Inspiration	4,01±0,171	5,0	2,7	0,66	6,53
		Exhalation	4,55±0,192	5,6	3,0	0,75	6,88
	Dmrev.	right	0,89±0,19	2,50	0,15	0,72	2,21
		left	1,31±0,35	4,75	0,32	1,37	3,45

Note. *The data given in parentheses is of a single time record of 15 sonds, in particular the pace in the secondperiod was 128:4=32 shots, total – 187:6=31.1 shots.*

Table 2

Research results of female handball players aged 17–18

		Static indicators	M±m	M_{max}	M_{min}	G	C
Measuring of the training activities effect	The first period	Pace	28±0,817	34	23	5,17	11,28
		Total score	249±4,92	314	176	19,07	7,66
		Accuracy	8,89±0,13	9,26	7,65	0,52	5,36
	The second period	Pace	120±3,34 (30±0,83)	148 (37)	100 (25)	8,97	10,81
		Total score	1052±25,77 (263±6,44)	1406 (351)	800 (200)	10,0	9,51
		Accuracy	8,8±0,12	9,5	8,0	0,46	5,24
	The third period	Pace	32±1,19	40	25	4,61	14,11
		Total score	271±8,10	384	180	21,41	11,59
		Accuracy	8,46±0,18	9,6	7,2	0,69	8,23
	Total	Pace	181±4,9 (31±0,816)	221 (37)	155 (24)	9,02	10,51
		Total score	1573±39,28 (262±6,546)	2040 (340)	1110 (185)	15,24	9,69
		Accuracy	8,7±0,10	9,4	7,7	0,40	4,64
Tests	EMR	Sound	0,168±0,005	0,226	0,154	0,021	1,112
		Visual	0,196±0,006	0,257	0,171	0,024	1,264
	PT	Inspiration	4,0±0,26	5,5	3,0	1,008	7,26
		Exhalation	4,5±0,18	5,5	3,1	0,69	5,37
	Dmrev.	right	1,2±0,16	2,5	0,3	0,63	2,83
		left	1,3±0,22	3,1	0,2	0,84	4,29

action time – 0.171 s, maximum – 0.257 s.

The air-flow rate on inspiration averaged 4,0±0,26 $l \cdot s^{-1}$, maximum – 5.5 $l \cdot s^{-1}$, the minimum – 3.0 $l \cdot s^{-1}$ and on exhalation averaged – 4,5±0,18 $l \cdot s^{-1}$, maximum – 5.5 $l \cdot s^{-1}$, the minimum – 3.1 $l \cdot s^{-1}$.

Accuracy of performing a given muscle effect was observed with an error for the right hand, on average – 1,2±0,16 kg, maximum – 2.5 kg, minimum – 0.3 kg; for the left hand on average – 1,3±0,22 kg, maximum – 3.1 kg, minimum – 0.2 kg.

When comparing the data obtained in the age groups of 15–16 years and 17–18 years, one should note that the pace in the younger group in the first and second test periods were better on 3.5% and 6.6%, and in the third period worse on 6.6%, but the total score and the accuracy of movements were better in the older group, respectively, in the first test period 12.1% and 16.2%, in the second – by 12.8% and 20.8% in the third – by 20.4% and 12.8%, on average within all periods – 13.9% and 17.4%.

The reaction rate for sound and visual stimuli in older athletes was better on 6.45% and 7.3%, respectively.

The air-flow rate on the inspiration and exhalation at the average and maximum results was almost the same, but the difference between the maximum and minimum values were lower in athletes aged 17–18, than those of 15–16 years.

Accuracy of performing a given muscle effect was almost the same in both age groups, the arithmetic average error is less in the older group.

While researching the training activities effect we obtained the results that characterize the change of fitness and functional training of female athletes of different ages. With age increase, the strength and lability level of the musculoskeletal system are improved and thus there is an active formation of the coordination mechanisms and motor skills.

The complex of actuators of various anatomical and physiological systems provides the performance of motor actions in the minimum period of time and, therefore, aims at achieving the desired final result, in which a large role is played by touch regulation mechanisms that activate and carry out the correction of regulatory and executive functions.

In the course of systematic trainings and improvement of athlete professional skill of performing complex motor acts that are adaptive and aim at saving a balance between the body and the environment. Different requirements to the functional state of the physiological systems contribute to the creation of new coordination relationships that meet certain conditions.

Conclusions

The examination of female handball players of two age groups has established that in the group of athletes aged 17–18 the reaction rate, accuracy of performing actions and efficiency of action were better and indicators more stable than in the group aged 15–16. Consequently, indicators of sensorimotor reactions, pace, total score and accuracy of movements, as well as air-flow rate, accuracy of performing a given muscle effect can characterize the fitness of an athlete and be used at the selection stages. Improving of psycho-physiological characteristics is due to the general regularities of growth and development and the specific influence of training and sport activities.

The research results can be used to refine the physical activity at different levels of functional fitness, motor activity, morphological and functional capacity of the organism, the athlete health atate.

Prospects for further research

Prospects are to develop criteria and methodology for determining the prospects of an athlete in a chosen sport, based on the comparative analysis of the functional state of the survey of athletes of different age groups and kinds of sports.

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The degree of parental awareness of using means of physical rehabilitation on the frequently ill children

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Purpose: *to establish the degree of parental awareness of using means of physical rehabilitation on the frequently ill children with acute respiratory viral infections.*

Material & Methods: *analysis of scientific and methodological literature, surveys and questionnaires.*

Results: *the research involved 54 families with the frequently ill children. The paper characterizes and establishes the degree of parental awareness in the sphere of physical rehabilitation of the frequently ill children, determines the level of parental interest in cooperation, presents the plan of seminars with parents.*

Conclusions: *increasing the degree of parental awareness by studying and explaining is a prerequisite to achieve high effectiveness in health recovery process of the frequently ill children.*

Keywords: *children who are sick, parental awareness, physical rehabilitation.*

Introduction

Nowadays the priority task of our country is child care, one of the directions of which is the decrease in number of incidence among children and the assistance to the harmonious development of a child. Diseases of the respiratory system among which respiratory diseases prevail, take first place on the last statistics in the structure of incidence of children [6; 8–10].

Children, at whom the quantity of respiratory diseases for a year equals or exceeds 4 times, are referred to the category of often ill [1; 7]. Frequent and long diseases promote the emergence of the pathological process in the growing organism which can serve as a cause of infringement of processes of the growth and development, ripening of functional systems, that significantly reduces the quality of life not only of a child, but also of his parents. O. V. Peshkova notes that children who are often ill with ARVI even when transferring a disease in a light form, functions of central nervous, cardiovascular, respiratory, muscular and other systems decrease in much bigger measure, than at children who seldom are ill [4]. V. Yu. Albitsky and co-authors specify that the pathological process and the morphofunctional deviation reduce the resistance of a children's organism which conducts to the repeated episodes of an illness [1]. A. Yu. Polyanina with co-authors notes that to take that fact at the rate of social and economic cogency that serious somatic and neurologic complications which treatment is a difficult task, quite often develop after the postponed infections, then there a special value of rehabilitation of such children becomes clear [5].

In recent years, the considerable attention is paid to children who are ill frequent and lasted [3], namely concerning the correction of physical state and the organization of physical education (L. A. Solovyova 2014, L. V. Kozibroda of 2006, O. M. Myatyga, 2004); features of the development of mental functions (A. V. Katasonova, 2006, O. V. Vladimirov, 2012); prevention and improvements (K. L. Vakhova, 2004, V. O. Ivanov, 2007, M. G. Mikhaylova, 2009), concerning the priority application of separate means of rehabilitation: use of medical physical culture (O. V. Peshkova, 2015), applications of reflexotherapy (V. V. Polunina, 2008), carrying out balneotherapy (D. Kh. Balalayeva, 2010), aromatherapy (O. V. Tolkacheva, 2009, T. Ye. Khristova, 2012, O. M. Konov with co-authors, 2014), hydrorehabilitations (O. S. Kozlovaya, 2015), but other. Multi-factor productivity of influence on the correction of deviations in a state of health gives uncommon opportunities to predict a decrease in indicators of number of diseases on respiratory and viral infections among the children's population or at least the decrease in aggression of the course of an illness. The position of parents is one of the factors which influence the process of implementation of the developed programs in our opinion. To the large extent it depends on awareness degree in the sphere of the offered program.

Communication of the research with scientific programs, plans, subjects

The work is performed according to the plan of the research work of NNIFK of Sumy state pedagogical university of A. S. Makarenko of MES of Ukraine for 2011–2015 by the subject «Increases of the level of health and physical preparedness of different groups of the population by means of physical culture» (number of the state registration is 0111U005736) and by the subject «Theoretico-methodological and organizationally-methodical problems of health and physical rehabilitation and correctional pedagogics» (number of the state registration is 0107U002826) for 2015–2021.

The purpose of the research

To establish the degree of awareness of parents concerning the application of means of physical rehabilitation for children who are often ill with acute respiratory and viral infections.

Research tasks:

1. To develop the questionnaire for the definition of degree of

awareness of parents and to analyze the received results.

2. To prepare and to conduct the course of educational and explanatory classes for parents of children who are often ill with respiratory and viral infections.

Material and Methods of the research

The following methods were used in the research: analysis of scientifically-methodical literature, polls and questioning. The research was conducted on the basis of the teaching – educational complex No. 11 "Zhuravonka". Parents of children of middle preschool age who are often ill, total 54 families, took part in the questioning.

Results of the research and their discussion

Children, who are often ill, are that the contingent of the population which needs uncommon attention [2] from experts and parents, whose participation, is the integral component of the whole improving renewal process. The efficiency of application of physical rehabilitation depends on the level of interest and preparedness for the cooperation of participants of this process. As a rule, if a participant of the improving process has a certain knowledge base concerning the use of means of improvement or renewal, a technique of their carrying out and value of its application, then there is a high probability of high productivity. As children of preschool age can't comprehend and estimate completely importance of the set process, it is rational to conduct interview with parents of children and to involve them in cooperation.

We carried out questioning for receiving initial results, concerning awareness, interest and possibility of attraction to cooperation among parents of children of middle preschool age. The questionnaire in general consisted of 16 questions which were divided into blocks by pithiness, namely:

– interpretation of the concept «a child who is often ill» and «physical rehabilitation» of such children;

– understanding of the concepts «prevention of a disease» and «improvement of a child»;

– understanding of the major factor in preservation of health;

– desire to have additional information concerning application of means of the improving-renewal character;

– receiving additional consultation concerning renewal and preservation of health of a child.

Parents owed an opportunity to choose already an available option or to provide their own during the answer. In general the considerable part of families preferred already the existing options; some of parents chose several variations of answers at once.

As a result of questioning the following data were obtained. 23 respondents (42,6%) specified that it is children with pathologies or disabled children, 32 families (59,2%) provided approximately correct answer under the concept «a child who is often ill». 39 interrogated (72,2%) noted that first of all the psycho-emotional state is broken on the question concerning frequent diseases and their influence on the harmonious development of a child. Concerning the questions about the reasons of frequent respiratory diseases of children, 7 respondents (12,9%) noted heredity, 18 families (33,3%) – the low level of an immune resistance, 29 persons (53,7%) elected visit of kindergarten as the reason of frequent diseases on ARVI.

The prevention of diseases on respiratory and viral infections are vaccination in understanding 17 among the interrogated parents (31,4%), 9 families (16,6%) annually do preventive flu inoculations to their children; 26 (48,1%) rovided advantage of vitaminization of a children's organism. Parents who chose this version of the answer really carry out vitaminization for the children by the use of vitamins of synthetic production and dietary supplement, their part makes 13 families (24%). According to parents, they carry out step by step vitaminization, mostly in two steps acceptances of vitamins (on the eve of new teaching –ducational year and during the spring period), the course of application of vitamin complexes usually lasts one month. 11 respondents (20,3%) elected the procedure of hardening as a version of the answer. It is rather interesting that 6 parents (11,1%) who noted hardening as a prophylactic, didn't understand that training can happen not only by the water environment. We will note that only 3 supporters (5,5%) of this type of prevention of diseases really carry out the procedure of hardening. Now these families apply contrast showers and rinsing of a throat by water of a low temperature.

The understanding of 32 parents (59,2%) chose the option of classes as physical culture and sport concerning the improvement of a children's organism. From them only 7 families (12,9%) drive their child on sports sections, in 4 families (7,4%) their child is engaged in physical exercises at home and the lion's share of parents who provide advantage to physical culture and sport, noted that children aren't engaged in this kind of activity, relying on unwillingness of the child. As option, 28 interrogated (51,8%) noted the sanatorium treatment and only 9 of them (16,6%) specified that make this type of treatment annually. The complex application of physical rehabilitation as means of improvement of a children's organism was chosen by 7 parents (12,9%). 24 families (44,4%) elected to specification with what types of influence on a human body you associate the concept physical rehabilitation, absolutely other direction of rehabilitation. The poll concerning the influence factor which is the most important in preservation of health of a child show that 19 parents (50%) chose a way of life, 7 (12,9%) – noted heredity, 23 persons (42,5%) noted an ecological state environment and 11 (20,3%) – allocated the medicine level.

Concerning obtaining the additional information by parents about the application of means of the improving-renewal character, the desire was expressed by 48 families (88,8%), 6 interrogated (11,1%) took a neutral position concerning providing information to them. Among versions of answers concerning a type of the derived consultation 43 (79,6%) – chose carrying out a respiratory gymnastics, 27 interrogated (50%) expressed the desire to get advice concerning application of elements of massage, 17 families (31,4%) would like to improve knowledge of occasion hardening of an organism, 34 (62,9%) became interested in information of rather healthy nutrition. Separate families noted all offered options at once, their part makes 46,2%. Some parents specified the options which concerned actions of the correction of violations of a bearing of 9 persons (16,6%) and applications of rehabilita-

tion actions at frequent violations of work of a digestive tract of a child – 1 person (1,8%).

The assessment of the degree of awareness of parents was carried out by the results of definition of the awareness index (AI) which equals to number percentage according to the right choices (RC) to total number of questions (16): AI=(RC/16)·100%. Depending on the awareness index, parents were divided into three groups:

– with the sufficient degree of awareness (AI is higher than 50%);

– with the average degree of awareness (AI from 20 to 50%);

– with the low degree of awareness (AI from 0 to 20%).

In general, the obtained data confirm that the parental awareness of children who take part in the research in the sphere of improvement and physical rehabilitation, is low, this indicator makes: is lower than 20% at 27 (57,4%) the interrogated, 15 (27,7%) parents showed the result within the average degree of awareness and only 8 (14,8%) respondents have the sufficient degree of awareness.

The insufficient level of knowledge concerning the use of means of renewal and maintenance of a children's organism of natural, organic, available to each family promotes somewhat long course of an illness or developing of frequent diseases. Considering indicators of interest of parents in independent use of means of physical rehabilitation and for the purpose of the increase of the degree of awareness of parents, we organized several parental seminars. 5 classes with a general duration of 5,4 hours were given within two months with parents of EG. Seminars were held by the specialist in physical rehabilitation in the form of educational and explana-

Structure of seminar classes with parents of children of EG who are often ill with respiratory and viral infections

No	Topic of seminar	Duration
1	**Children who often are ill, – the contingent of the population which needs attention:**	
	concept COI, etiology, pathogenesis of frequent respiratory diseases;	5 min
	a psychoemotional condition of a child – the important part of states of health at frequent and long diseases on respiratory and viral infections;	5 min
	value of physical rehabilitation for preservation of health of a child and her harmonious development;	15 min
	contents and organization of the program of physical rehabilitation of children who are often ill;	20 min
	question and answers.	10 min
2	**Features of carrying out respiratory gymnastics in the structure of MPC:** acquaintance with physiology of breath of a person, its types;	10 min
	physiology of influence of breathing exercises on the child's organism;	10 min
	technique of performance of breathing exercises (starting positions, the number of repetitions, ratio BE to ADE);	10 min
	practical performance of breathing exercises in combination with all-developing (parents learn to breathe correctly, acquire methodically correct performance of breathing exercises);	30 min
	question and answers.	10 min
3	**Massage as the integral component of physical rehabilitation of children who are often ill:**	
	expediency of application of massage at frequent respiratory diseases (acupressure according to Umanskaya, massage of a thorax);	5 min
	physiology of influence of massage manipulations on the child's organism;	10 min
	rules of the search of points and a technique of performance of acupressure according to Umanskaya (practical performance of this massage);	30 min
	question and answers.	10 min
4	**Importance of procedures of hardening in the course of increase of the immune rezistance of a child who is often ill:**	
	types of hardening of children's organism, their influence on physiologic processes (application of available types of hardening);	10 min
	concept of crio-massage of feet, way of preparation of crio-packets and technique of performance of procedure (practical application);	25 min
	question and answers.	10 min
5	**Features of application of bell-therapy in the course of physical rehabilitation:**	
	concept about vegetative dysfunctions, its manifestations, reasons;	10 min
	influence of bell music on "somatic and mental" health of a child who is often ill;	10 min
	ways of a combination of bell music to the offered means of physical rehabilitation;	10 min
	practical acquaintance with types of "alive» bell music and its audio recordings;	20 min
	question and answers..	10 min
Total:	5 lectures	325 min (5,4 hours)

tory classes with the involvement of medical personnel and psychologist of this teaching and educational institution. The working program of these seminars is provided in the table. Parents could ask all questions during classes or send them on a physical rehabilitolog's e-mail address.

Conclusions

1. The results of the analysis of answers according to the developed questionnaires at the initial stage of the research gave the chance to define the low degree of awareness of parents in the sphere of physical rehabilitation of children who are often ill with respiratory and viral infections, and the sufficient level of interest in carrying out improving and rehabilitation classes.

2. The prepared and the conducted thematic course of classes with parents provided the subsequent cooperation during the whole process of rehabilitation.

Prospects of the subsequent researches will be connected with studying of features of the formation of improving and rehabilitation culture of parents of children who are often ill, and the development of practical recommendations for them concerning the application of means of physical rehabilitation in house conditions.

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The research of tactics of the competitive activity of the qualified sportswomen in long jumps

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Purpose: *to research features of competitive tactics of the qualified sportswomen in long jumps from the running start.*

Material & Methods: *such methods were applied the in researches: analysis of scientific and methodical literature, pedagogical supervision, content analysis (analysis of protocols of competitions). Results of 15 2 jumpers in length, who executed 886 attempts, are analyzed for the solution of the stated purpose.*

Results: *options of competitive tactics of the qualified sportswomen in long jumps are defined. It is established when studying tactics of conducting a competitive fight of the strongest sportswomen of the world that questions of tactics of competitive activity of sportsmen in hopping types become of current importance at the present stage of the development of track and field athletics.*

Conclusions: *the analysis of the obtained data demonstrates that it is necessary to adhere to such tactical option which testifies to need of achievement of the maximum result already in the first attempts, but at the same time to conduct an active fight before the last attempt.*

Keywords: *tactical actions, sportswomen, long jumps.*

Introduction

The achievement of high sports results and the growth of the competition in professional sport make new increased requirements not only to technical and physical preparedness, but also to the formation of tactical style of the competitive activity [1; 4; 9].

The increase of reliability of realization of sports-technical potential is the important factor of the growth of results in difficult coordination sports, to which track and field athletics jumps belong [2; 3; 8].

The research of ways of conducting a competitive fight can define ways of an individual approach of formation of a tactical style of the competitive activity.

The research of physical and technical preparedness was defined by the problematic issues at the need of individualization of training of sportsmen, and also the evidence-based recommendations, concerning ways of conducting a competitive fight [5; 6].

The analysis of materials of the research of the system of training of the qualified sportsmen demonstrates that the choice of a tactical style of conducting wrestling depends on individually strengths of preparedness [7; 10; 11].

Unfortunately, such approaches to training in high-speed and power types of track and field athletics remain insufficiently reasonable.

Due to the above, the need grows for the development of tactical models of the competitive activity of jumpers in length.

The purpose of the research

The research of dynamics of sports results of jumpers in length for the definition of tactical models of the competitive activity.

Research tasks:

1. To learn features of technical and tactical preparedness of the qualified jumpers in length from the running start on the basis of the analysis of scientifically-methodically of literature.

2. To find features of tactical options of a competitive fight in highly skilled jumpers in length from the running start.

Material and Methods of the research

The analysis of references, video with application of the biomechanical computer analysis, pedagogical supervision, the content analysis (the analysis of protocols of competitions of the championship, the Cup of Ukraine of 2010–2011), and methods of a mathematical statics were used in the research.

Results of the research and their discussion

The analysis of modern researches and publications demonstrates that now the leading sportsmen of the world rating act in continue to year more than in thirty competitions in connection with the expansion of a winter and summer calendar of competitions and increases in number of starts by the individual invitation. The constant aspiration to achieve high sports results and prize-winning places within different competitions

is connected with psychological and physical activity that promotes decrease in reliability and stability of the competitive activity. The optimization of tactics of the competitive activity is one of means of the increase of reliability of the competitive activity.

Analyzing materials of scientifically-methodical literature, the lack is felt in the researches of tactics of the competitive activity in the jump types of track and field athletics.

In this regard the problem of the definition of tactical options of the competitive activity in the jump types of track and field athletics becomes relevant and represents scientific and practical interest.

Analyzing materials of scientific publications and pedagogical supervision of the competitive activity of the leading athletes of the world, the following is established:

– the considerable attention is paid to questions of tactics of the competitive activity in the jumps types on the modern development of track and field athletics;

– the physical, technical, intellectual and psychological preparedness of sportswomen is the connected link of tactics of the competitive activity, which is directed to the achievement of good results in the jumps types of track and field athletics;

– the important factors which influence the tactical competitive activity represent not only the level of preparedness, behavior of sportswomen, but also external conditions;

– the tactical actions in the jump jumps of track and field athletics are always directed to the solution of the previously created task;

– the condition of the nervous system can lead both to confidence in own and to good results, and to low results;

– the underestimation of a condition of the rival can lead to the decrease in result;

– the individual level of preparedness defines the direction of tactics of its realization.

As a result of the content analysis of protocols of the championship and the Cup of Ukraine from long jumps at women, it is established that there is a number of tactical actions which repeat and interact with each other. In this case two directions of manifestation of tactics of the competitive activity are defined.

1. The behavioral line of a sportsman:

– the previous psychological mood influences the solution of the previously put task (meditation, hypnosis, massage, intellectual and physical activity);

– during the preparatory part to start (an exit to the place of competitions, warm–up, behavior manner);

– in the course of competition (an observation by a performance of the opponent, communication with partners in a team, a behavior manner on the place of competitions);

– after the previous competitions (a behavior manner at an exit from the platform, an emotional state, ability to show it to the rival).

2. The use of specially directed options of tactical actions on the achievement of sports result. It is specially formed a behavioral action which depends on specific psychological features, preparedness and situations, which are formed during competitions.

Results of each attempt of long jumps from running start in special protocols were registered and tactics of competitions and efficiency of its use were defined in the course of competitions.

A number of typical actions for long jumps are established on the basis of the conducted researches:

1. The sportsman considers that he is ready to gradual improvement of result and can reach it in the last attempt.

2. The sportsman defines even before competitions, in what attempt he will achieve the best result.

3. He is adjusted psychologically on the best result in the first attempt.

4. The distribution of efforts in competitions through one attempt. From six attempts – 3 are with maximum effort.

5. The concentration of efforts to one of attempts. For example, having missed the 3 and 4 attempts, and in the fifth – is the maximum result.

6. Such combinations, one-two maximum are provided among six attempts: the first and the fifth, the third and the sixth.

7. The achievement of the maximum result in the first and last attempt.

8. The special concentrated mood on the third attempt, but the best result can be also in the following attempts.

9. All attempts are carried out with the maximum opportunities.

Materials aren't revealed in the analysis of references, which characterized names of options of a tactical fight of sportswomen in long jumps from the running start. We created 10 options of tactics of the competitive activity of jumpers in length from the running start on the basis of the analysis of protocols of competitions:

1. «Growing» (the gradual increase of result from an attempt to an attempt).

2. «Selective» (the best result in one of the attempts).

3. « Initial» (the best result in the first attempt).

4. «Final» (equal indicators in the first attempts, and in the last – the maximum effort).

5. «Breaking» (the distribution of efforts through one attempt).

6. «Risky» (the concentrated effort on one of attempts, previously having passed one, or several attempts).

7. «Step» (during all attempts maximum one, two).

8. «Rigid» (the maximum efforts in the first and last attempts).

9. «Concentrated» (the first two attempts at the same time are weak and the third maximum).

10. «Limit» (all attempts with the maximum effort).

The most applied options of tactics of the competitive activity were found and their names in jumpers in length from the running start were defined on the basis of the researches. The questionnaire «Wrestling tactics options» was developed for the establishment of their efficiency, which was offered 30 leading coaches.

Results of the poll of coaches are given in the table concerning the efficiency of the options of tactics of wrestling which we offered jumpers in length.

The descriptive results of the efficiency and the frequency of use of options of tactics of conducting wrestling have considerable divergences. If the effective options of tactics "growing" and "selective" are defined by track and field athletics coaches, then "risk" and "final" options are chosen by sportswomen in practice of applications.

Conclusions

1. The tendency to the decrease in the efficiency of the carried-out attempts with a small gain of activity on the result of competitions is observed at the qualified jumpers in length.

2. Analyzing results of the poll of coaches and carefully applied options of tactical actions by sportswomen during the competitions, it is visible that jumpers in length choose tactics options depending on the specific features and the level of preparedness.

Percentage application of options of tactics of jumpers in length

Respondents	Options of tactics, %									
	«Growing»	«Selective»	«Initial»	«Final»	«Breaking»	«Risky»	«Step»	«Rigid»	«Concentrated»	«Limit»
Coaches (n=30)	11,79	11,84	10,96	8,86	10,24	9,64	10,41	10,15	8,09	8,00

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Methodical features of physical rehabilitation of victims with consequences of mine and explosive trauma

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Purpose: *the analysis of modern approaches to application of means and forms of physical rehabilitation of victims with mine and explosive trauma at an out-patient stage.*

Material & Methods: *the analysis of actual special references on a problem of the mechanism of defeat, treatment and rehabilitation of consequences of mine and explosive trauma.*

Results: *it is defined that the percent of use of nonconventional methods of non-drug therapy increases objectively and significantly in the last decade in physical rehabilitation along with a broad application of traditional complex techniques of medical physical culture, massage and physical therapy.*

Conclusions: *kinesiotherapy, hydro-bathing technologies, reflexotherapy are most demanded in practical techniques of physical rehabilitation at mine and explosive trauma for today among methods of non-drug therapy.*

Keywords: *physical rehabilitation, mine and explosive trauma, explosive defeat, out-patient stage of treatment.*

Introduction

The increase in frequency of armed conflicts, natural disasters and industrial accidents naturally leads to the increase of number of wounded, patients and victims. Mine and explosive wounds in armed conflicts were included into ten leading causes of death in the world and continue to increase for the last decade the 20th century and the beginning of the 21st century (Yu. N. Shanin, 1997). The problem of the fastest restoration of combat preparedness and working ability of wounded and patients – remains relevant decades in this regard for a health service of the state of Lebanon. Ukraine faced the similar problem quite recently on a substantial scale, but the relevance of subject, unfortunately, increases.

The set of the held events at wounds and injuries of wartime unites the concept «medical rehabilitation» (V. A. Dolinin, 1981; Yu. L. Shevchenko, 1994; Yu. N. Shanin, 1997; A. M. Shchegolkov, 2002). Its complete concept has begun to develop in the years of World War II, and modern contents – during armed conflicts of the last time. Physical rehabilitation of wounded and patients is the integral link of a medical support of staff of armed forces of any country and the strategic source of completion of sanitary losses in modern armed conflicts.

The well-known data on armed conflicts in the history of mankind demonstrate that the weapon using an explosion as the striking factor has appeared in the Middle Ages, and various mine devices were widely used during all subsequent wars, especially of the two World Wars. However the data of the analysis of special literature obtained by us demonstrate that the specific weight of wounded with a mine and explosive trauma was small at such mass application of explosive elements at stages of medical evacuation in the past. For example, injuries of a shin from antipersonnel mines made in the years of World War II of 1938–1945 no more than 1% from among all wounds of this localization. Authors (E. K. Gumanenko, 2008; A. I. Rudnev, 2012) assume that it was a result of limited efficiency of explosive devices of that time and most of seriously wounded with MEW perished because of the late evacuation and imperfection of the subsequent treatment. The second half of the XX century brought a significant increase in frequency of MEW: they made 13% of sanitary losses of the American troops in Vietnam (1964–1973), 30% among wounded of the limited contingent of the Soviet troops in Afghanistan (1979-1989), 15% – in the North Caucasus (1994–1996, 1999–2002), 23,5% – in troops of the USA in Afghanistan and Iraq (2001).

We found out that in the conditions of local armed conflicts the most frequent damage at the military personnel, and also at civilians when carrying out acts of terrorism, are the mine and explosive trauma and mine and explosive wound with injuries or a separation of one or both lower extremities. According to the official figures, the total number of disabled veterans in Chechnya made about 52 thousand people; from them 1500 people received amputations (A. I. Rudnev, 2012).

Considerable difficulties in diagnostics and feature of clinic, treatment and forecasting of result of the defeats inflicted by the explosive weapon have led researchers to allocation from the general class of gunshot wounds of separately mine and explosive trauma. Explosive defeats are a poly-trauma which arises at a person as a result of pulse influence of a complex of the striking factors and is characterized by the interconnected and mutually burdening influence as deep and extensive destructions of tissue structures, and the general contusion-coma syndrome. The poly-trauma is characterized by weight, plurality, extensiveness of damages of the human body which is in an explosion zone on the earth, or on the vehicle (civil transport, armored machinery).

The opened and closed injuries which resulted from influence

of factors of explosion, throwing action of explosive ammunition, action of surrounding objects and also owing to defeat by explosive ammunition in armored machinery and the enclosed space, in special literature are called explosive injuries.

The wounds which resulted from influence of explosive ammunition in a defeat zone splinters belong to the category of missile wounds. Experts emphasize that the wounds by splinters arising out of a defeat zone a shock wave belong not to a mine and explosive trauma, and to usual missile wounds (V. K. Yarova, 2011).

Thus, the main striking factors at explosion are: the explosive gases possessing a high pressure and high temperature; shock wave; splinters of ammunition (mine) and secondary shells. Thermal influence of explosive ammunition is shown by the burns limited on the area which are localized, as a rule, in an explosion zone. Gases (CO2, CO, NO, HCN, etc.) are formed at explosions in the strong, badly ventilated rooms which don't disappear and can cause poisoning in addition. In certain cases toxic effect of the inhaled gases (carbon monoxide, nitrogen oxide) can be extremely heavy (E. K. Gumanenko, 2008.)

The subject-matter of our research is physical rehabilitation of victims with a mine and explosive trauma at an out-patient stage therefore we first of all were interested in the post-traumatic syndromes and pathological states arising after a while after the patient's extract from a hospital. As it became clear, as a result of the analysis of data of modern literature, questions of prevention and treatment of post-traumatic syndromes and pathological conditions of the musculoskeletal device and the nervous system of victims at an out-patient stage are reflected in literature selectively and insufficiently volume.

The rich orthopedic and neurologic symptomatology is characteristic of post-traumatic syndromes and pathological states after a mine and explosive trauma, vegetotrophic violations are shown which quite often manifestations of numerous syndromes of osteochondrosis are. Such patients are under supervision of neuropathologists, orthopedists and surgeons long time.

The rehabilitation problem after a mine and explosive trauma has not only medical, but also social value.

Modern knowledge of consequences of a mine and explosive trauma is beyond any one narrow medical specialty (traumatology, neurology, orthopedics, rehabilitation and so on) and this disease of all organism has a long current and conservative forecasts.

Communication of the research with scientific programs, plans, subjects

The researches were conducted within the dissertation work according to the direction of the research work of the chair of physical rehabilitation and recreation of HDAFK in the section «Physical rehabilitation in traumatology, neurology and orthopedics».

The purpose of the research

To define modern methodical features of application of means of physical rehabilitation of victims with a mine and explosive trauma at an out-patient stage.

Material and Methods of the research

Methodical features of physical rehabilitation of victims with consequences of a mine and explosive trauma at an out-patient stage became clear on the basis of the analysis of modern references on field medicine, traumatology, and physical rehabilitation.

Results of the research and their discussion

The concrete methods of traditional medicine and physical rehabilitation, which are used in programs of rehabilitation of victims with a mine and explosive trauma at an out-patient stage of treatment of a surgical and therapeutic profile still aren't allocated and in literature, are discussed sometimes fragmentary (V. A. Dolinin, 1981; I. A. Yeryukhin, 1996; V. P. Bershinsky, 1999; M. V. Lyamin, 1999; L. F. Vasilyeva, 2002; V. G. Zilov, 2003).

Similar mechanisms of pathogenesis of damages at a mine and explosive trauma and morpho-functional features of sanogenez cause a certain analogy of rehabilitation programs within rendering specialized medical care, treatment and physical rehabilitation of wounded and patients during military operations, armed conflicts, natural disasters (F. Z. Meyeson, 1979, 1986; I. M. Gelfand, 1982; B. Ya. Rudakov, 1998; A. A. Hadartsev, 1999; A. M. Shchegolka, 2002, 2003).

Similar programs are partially developed, but often with insufficient and selective application of traditional methods of physical rehabilitation which role is insufficiently estimated at stages of medical rehabilitation. Meanwhile the specific weight of nonconventional methods of non-drug therapy (reflexotherapy, phytotherapy, reflexotherapy, hydro-bathing technologies, manual therapy, kinesiotherapy) significantly increases in physical rehabilitation and makes up to 70–80% in some researches (V. D. Kochetkov, 1984; V. P. Veselovsky, 1991; Dzhi Wu Pak, 1993; L. F. Vasilyeva, 1999; V. G. Vogralik, 2001; I. A. Yegorova, 2002; D. J. Harmam, 1983; Harold I. Sr. Vagoun, 1994; W. G. Sutherland, 2000, 2002).

The scientific assessment of a role and efficiency of traditional and nonconventional means and methods of physical rehabilitation in rehabilitation programs of wounded and patients – is among the most important problems of recovery medicine.

The system of actions for the combined application of traditional and nonconventional methods of treatment in the system of physical rehabilitation of victims with consequences of a mine and explosive trauma in the conditions of the versatile rehabilitation center at an out-patient stage can significantly increase efficiency of recovery of health of victims and reduce terms of their return to the most full-fledged life.

According to a number of authors, the traditional means and methods of physical rehabilitation of the mine and explosive wounds, which were injured with consequences applied in an evidence-based complex with nonconventional methods effectively prevent complications and restore functions of the damaged bodies (L. F. Vasilyeva, 1999; V. G. Vogralik, 2001; I. A. Yegorova, 2002; O. V. Ilyina, 2002).

The established staging of physical rehabilitation of victims

at an out-patient stage decides on consequences of a mine and explosive trauma in the work of the versatile rehabilitation center by the extent of restoration of functions and provides in general the use of bland-training and training motive modes.

As the main methods of treatment included in individual rehabilitation programs of wounded and patients, authors of techniques recommend options of the combined action of two or three methods for one session that considerably increases efficiency of medical rehabilitation. Authors recommend applying in addition to traditional such methods as elements of reflexotherapy, kinesiotherapy, manual therapy, phytotherapy in surgical and traumatologic offices in 72% of modern techniques. In therapeutic and psychoneurological offices – are in 78% of techniques in the same combinations.

The volume, structure, contents and combination of the traditional and nonconventional methods of treatment included in individual rehabilitation programs of wounded with consequences of mine and explosive damages at an out-patient stage of treatment have to be defined by a clinical profile, a stage and a form of pathological process in an organism. At the same time security of patients with techniques on the basis of non-drug methods of treatment of surgical and traumatologic offices can make more than 40%, and the highest security with nonconventional methods of treatment in these offices is applied to a thicket at wounds and injuries of the extremities which are followed by injury of nerves (70%) with an etiology of a mine and explosive trauma (45%). It is recommended the combination of several traditional and nonconventional methods of treatment that considerably increases efficiency of medical rehabilitation by drawing up the program of physical rehabilitation of wounded with consequences of a fire and mine and explosive trauma in the conditions of the versatile rehabilitation center (S. A. Neborsky, 2005).

By drawing up the program of physical rehabilitation at a mine and explosive trauma at an out-patient stage of treatment traumatologists, it is suggested to consider the following:

– general condition of a patient, his psychological status;

– condition of a bone tissue (degree of expressiveness of a bone callosity, osteoporosis) and correctness of an union of bone fragments;

– character of the applied immobilization (plaster bandage, skeletal extension, osteosynthesis) and immobilization duration;

– condition of skin, sinews, capsular and copular device, muscular tissue, vessels and nerves;

– localization of a trauma (the top, lower extremities, basin bones, a backbone) and their character (opened or closed close - or inside articulate damages);

– existence of damages of nervous trunks and vessels accompanying a bone trauma;

– existence and expressiveness of post-traumatic contractures;

– existence and expressiveness of contractures and cicatricial solderings after a burn disease (A. N. Belova, O. N. Shchepetov, 1998; H. A. Musalatova, G. S. Yumashev, 1995; Yu. G. Shaposhnikova, 1997).

We determined features of formation of programs of physical rehabilitation on the basis of studying of references by a problem of physical rehabilitation of persons with fractures of bones of the lower extremities, detailed consideration of questions of etiology, pathogenesis, clinical and phasic course of disease after a mine and explosive trauma, mechanisms of medical action of physical exercises. Similar programs provide appointment to the patient of the corresponding motive mode, MPC complexes, and procedures of massage and physiotherapeutic procedures (V. F. Trubnikov, 1984; A. F. Kaptelin, 1987).

Also authors (V. M. Bogolyubov, 2006; N. M. Valeyev, 2004) consider that the post-traumatic period is clinically characterized by restoration of anatomic integrity of a bone (the process of consolidation of bone fragments comes to the end, the wound epithelizes). However, despite restoration of anatomic integrity, obvious dysfunction of an extremity is observed (muscular atrophy, rigidity in joints, cicatricial contractures, etc.), this period before the formation of a secondary bone callosity proceeds.

Everything told results in need of the further theoretical development, clinical approbation and the subsequent evidential description of efficiency of the combination of traditional and nonconventional means and methods of physical rehabilitation of victims to consequences of a mine and explosive trauma at an out-patient stage of treatment.

Conclusions

1. The analysis which is carried out by us showed that mine and explosive wounds in armed conflicts of the XXI century were included into ten leading causes of death in the world and the statistics continues to increase, at the same time the relevance of subject for Ukraine and Lebanon, unfortunately, steadily increases at the moment.

2. The combined application of the traditional and nonconventional means and methods of treatment which are used in programs of physical rehabilitation of victims in out-patient clinics and sanatoria of a surgical and therapeutic profile in special literature available to us, are discussed with a mine and explosive trauma rather fragmentary, at the same time the role of physical rehabilitation within medical, in our opinion, is estimated insufficiently.

3. The standard techniques of MPC, massage, physiotherapeutic treatment remain the fixed non-drug assets of physical rehabilitation of patients with consequences of a mine and explosive trauma at an out-patient stage in the conditions of the versatile rehabilitation center today.

4. As a result of the analysis of modern programs of physical rehabilitation in treatment of patients with a mine and explosive trauma at an out-patient stage it is defined that application of nonconventional methods (reflexotherapy, hydro-bathing technologies, manual therapy, kinesiotherapy) significantly increases for today in physical rehabilitation and makes up to 70–80% in some modern researches.

Prospects of further researches. The data, which are received in this research, will be used in the subsequent scientific and practical work on the subject of the dissertation research.

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Definition and assessment of physical efficiency of students – basketball players

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Purpose: *assess the level of physical efficiency of students – basketball players by using the Harvard step test.*

Material & Methods: *the analysis of scientific-methodical literature, educational testing, pedagogical experiment, methods of mathematical statistics. For determination and assessment physical efficiency of students – basketball players used the Harvard step test. In pedagogical testing for assessing special performance was attended by 14 students – basketball players (n=14) men's teams of the Medical Institute of Sumy State University.*

Results: *the analysis of scientific and technical literature showed gaps in training basketball players, namely, to improve the physical performance. Especially these problems are when basketball training sessions combine with study in higher educational institutions. The load that caused a combination of mental and physical labor is enough to affect on the performance, develop resistance to fatigue. Still need to look for approaches that can help in conditions of single 3–4 workouts per week to maintain a high level of physical capacity of basketball players.*

Conclusions: *analyzing the test results of basketball team players at Medical Institute of Sumy State University, we can say that the level of physical performance is satisfactory and functional status is mediocre. Players need more regular training which includes special exercises with high intensity close to competitive conditions.*

Keywords: *basketball, physical efficiency, index of Harvard step test.*

Introduction

Training loads of a basketball player throughout the training period provide mastering or improvement of the range of technical and tactical actions, increase and optimization of functional preparedness and special working capacity along with the development of special physical qualities. In this regard the most effective realization of game abilities of a basketball player is possible only on condition of a rather high level of his functional preparation, optimum adaptation to training and competitive loadings (M. M. Bulatova, 1999; A. A. Viru, 1982; V. M. Volkov, 1992).

The increase in the competition on the international sports scene forces to look for additional reserves for the subsequent improvement of skill, the growth of sporting achievements at all stages of long-term training of sportsmen at the present stage of the development of sport. One of such reserves as most of researchers mark out (S. I. Guskov, V. N. Platonov 2000; P. K. Anokhin 1990), is the optimization of training loads in long-term training of sportsmen. Different in volume of preparation training loads, are used practically in all sports. Their size is defined by the number of classes, their duration, and total amount of work, intensity and intensity of a training load. Researchers and practical men turn special attention to the character and the maintenance of loadings which use in the training process when training sportsmen.

In modern basketball the competitive period lasts till 8–9 months that demands from a sportsman of high level of functional preparedness and special working capacity.

All this has a significant effect on the level of a condition of sportswear of a player, substantially component of which are its indicators of special physical working capacity.

The higher the level of functional reserves of the main physiologic systems of an organism of a sportsman is, the more prerequisites for the subsequent growth of his special working capacity are.

Considering the above stated, carrying out special researches that are directed to the interconnected analysis of the system of estimation of special efficiency of students-basketball players, is worth of attention.

Communication of the research with scientific programs, plans, subjects

The research is executed according to the Thematic plan of the research work in the sphere of physical culture and sport for 2011–2015 by a subject 2.4 "Theoretical-methodical bases of individualization of the educational and training process in game sports".

The purpose of the research

To estimate the level of special efficiency of students-basketball players due to the Harvard step-test.

Research tasks:

1. To analyze data of modern literature on a condition of the problems which are connected with special efficiency of students-basketball players.

2. To define a condition of physical efficiency of students-basketball players by the Harvard step-test.

3. To analyze results of testing of special efficiency of students-basketball players.

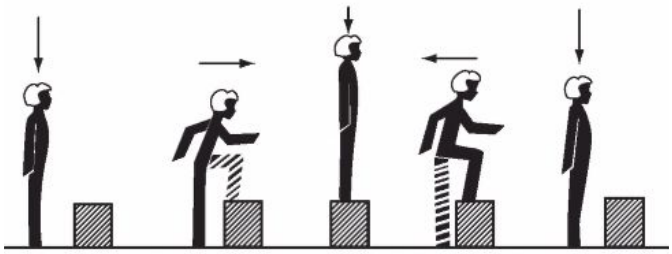
Material and Methods of the research

Research methods: analysis of scientifically-methodical literature, pedagogical testing, pedagogical experiment, methods of mathematical statistics.

14 students-basketball players (n=14) of a men's team of Medical institute of Sumy state university of Sumy took part in the pedagogical testing for an assessment of special working capacity.

It was used the Harvard step-test for the definition and assessment of special efficiency of students-basketball players, which is offered by scientists of Harvard university of the USA in 1942.

Physical activity happened in the form of ascensions on a step 50 sm high. The rate of ascension is constant and equaled 120 steps in 1 minute. Each cycle of rise made 4 steps: one – a rise by one leg on a step; two – an investigated becomes both legs on a step; three – an investigated lowers a leg from which he began ascension on a floor; four – an investigated lowers the second leg on a floor (pic. 1). The duration of execution of the test made 5 minutes. If a sportsman was tired and didn't owe an opportunity to maintain the set speed, the test stopped and then was fixed operating the time by the time of decrease in speed.



Pic. 1. Scheme of the test of "ascension on step 50 sm high"

The index of the Harvard step-test (IHST) was defined by a mathematical method by a formula:

$$IHST = \frac{t \cdot 100}{2(f1 + f2 + f3)}$$

where t – ascension time for a step, s; f1, f2, f3 – pulse for 30 s in the 2, 3 and 4 minutes of renewal.

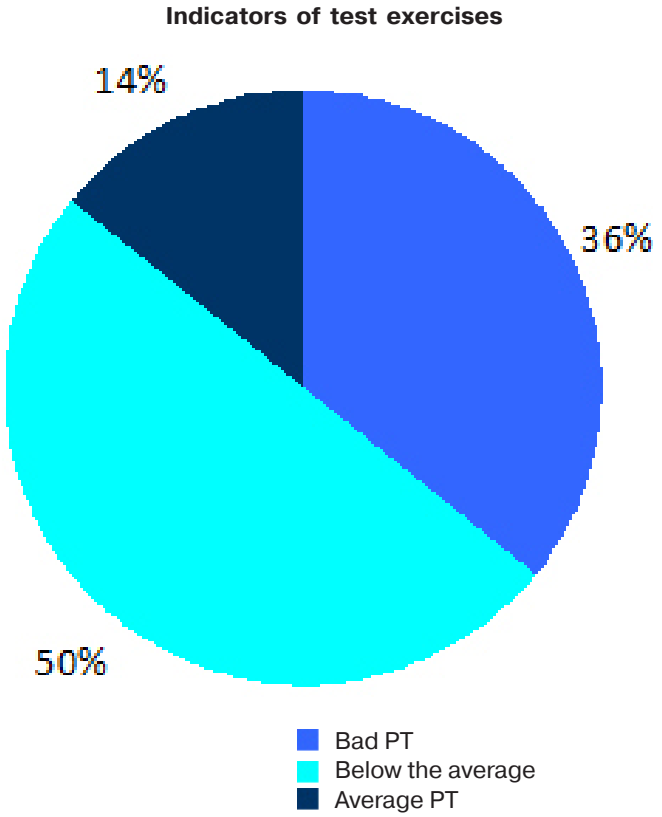
Results of the research and their discussion

Results of an assessment of physical efficiency of students-basketball players are reported in tab. 1.

The assessment of results of sportsmen was carried out in comparison with average sizes of the index of the Harvard step-test which are specified in table 2.

Thus, the results of the research showed that the Harvard step-test is heavy physical activity for students-basketball players of Medical institute.

The analysis of the received test results found the insufficient level of physical efficiency of students-basketball players. So, the average result was shown by only 14,3% of students, below the average – 50% of students, and 35,7% of students (pic. 2) have bad result. Estimating the received results, one may say, that the volume and intensity of the training process are not sufficient at the moment.



Pic. 2. Results of testing of physical efficiency of students-basketball players

Conclusions

Analyzing results of testing of students-basketball players of the team of Medical institute of Sumy state university, we can claim that the level of physical working capacity is satisfactory, and the functional state – average. The average result was shown by only 14,3% of students, below the average – 50% of students, and 35,7% of students have bad result. Thus, it is possible to draw a conclusion that team players need more regular trainings with inclusion of special exercises with the increased intensity and approximate to competitive conditions.

Prospects of the subsequent researches. Our subsequent researches will be directed to the search for new means and methods of physical training for the purpose of support of rather high level of physical efficiency of students-basketball players.

Table 1

Results of an assessment of physical efficiency of students-bas all players

№ sportsmen	Results of execution of the Harvard step-test	Level of working capacity
1	60	Bad
2	80	Average
3	79	Average
4	71	Average
5	59	Bad
6	66	Below the average
7	57	Below the average
8	63	Below the average
9	73	Average
10	74	Average
11	80	Average
12	64	Below the average
13	72	Average
14	70	Below the average
Md	69,1	
S	7,8	

Table 2

Assessment of physical working capacity by size IHST

Physical working capacity	IHST for representatives of acyclic kinds of sport
Bad	Less than 61
Below the average	61–70
Average	71–80
Above the average	81–90
Good	91–100
Excellent	More than 100

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Improvement of the competitive program of woman's pair in acrobatics by means of choreography at a stage of the specialized basic preparation

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Purpose: *to prove experimentally the technique of improvement of the competitive program of woman's pair in acrobatics by means of choreography at a stage of the specialized basic preparation.*

Material & Methods: *the following methods of the research were used: theoretical analysis and synthesis of data of special scientific and methodical literature; pedagogical supervision; pedagogical testing; methods of mathematical statistics. 10 competitive programs of woman's pair in acrobatics are analyzed before and after the pedagogical experiment.*

Results: *the estimated results of the technique of execution of the competitive program of each woman's pair separately were received on the basis of a rating scale of criterion of implementation of the competitive program of woman's pair in acrobatics (Rules of FIG, 2013–2016). The dynamic of the level of the competitive program of each woman's pair separately is defined.*

Conclusions: *it is established that additional resources of choreography influence significantly the level of the competitive program of woman's pair in acrobatics at a stage of the specialized basic preparation.*

Keywords: *competitive program, woman's pair, choreography, acrobatics.*

Introduction

Women's pairs in sports acrobatics – is one of the beautiful, dynamic, spectacular and popular sports. The World Cups and Europe, competition on the World Cup and other prestigious international tournaments are constantly held on this sport [1; 5].

As the analysis of scientifically methodical literature showed, the type of sports acrobatics, – women's pairs tested considerable changes in recent years, both in improvement of technical skill of sportswomen, and in internal structure of the competitive program. Together with skill of performance of elements, more and more requirements disclosure of dramatic art of music of the competitive program belongs to the level of choreographic preparedness of sportswomen also. So, our research concerning the influence of means of choreography on the level of the competitive program is relevant [1–3; 6; 7].

Communication of the research with scientific programs, plans, subjects

The research was conducted in the implementation of the complex scientific project for 2015–2017. "Theoretic-methodical bases of formation of culture of physical health at student's youth".

The purpose of the research

To prove experimentally a technique of improvement of the competitive program of an acrobatics woman's pair by means of choreography at a stage of the specialized basic preparation.

Tasks of the research:

1. To learn a problem of improvement of the competitive program of woman's pair on acrobatics by means of choreography at a stage of the specialized basic preparation on the basis of the analysis of scientifically-methodical literature.

2. To prove efficiency of a technique of improvement of the competitive program of an acrobatics woman's pair by means of choreography and to analyze dynamics of indicators of the level of their performance.

Material and Methods of the research

The research was conducted from September, 2015 till March, 2016, the following methods of the research were used in the research: theoretical analysis and synthesis of data of special scientifically-methodical literature; pedagogical supervision; pedagogical testing; methods of mathematical statistics. 10 competitive programs of women's pairs on acrobatics are analyzed before and after the pedagogical experiment.

10 sportswomen (5 acrobatics women's pairs) of 11–16 years old of the control group (CG) and 10 sportswomen (5 acrobatics women's pairs) of 11–16 years old of the experimental group (EG) took part in the researches (the 1st category, candidates of the Master of Sports).

Results of the research and their discussion

The analysis of an expert assessment showed the level of implementation of the competitive program of acrobatics women's pairs before the pedagogical experiment in tab. 1

and 2. The variation coefficient (V, %) shows that groups are uniform.

The provided referee's points in tab. 1 and 2 are average values of three partial estimates of criteria: "A" – choreography (artistic compositions) – from 0 till 10 points; "D" – difficulty of exercise (0–10 points); "E" – exercise performance (0–10 points). Also we gave penalties for technical mistakes taking into account a scale of decreases: small mistakes – 0,1–0,2; considerable mistakes – 0,3; gross errors – 0,5; 1,0. The reduction for performance of a separate element, including an entrance at it, can't exceed 1,0 point. Errors of virtuosity are subtracted from the maximum assessment of 10,00 points and include the following scale of decreases: small, considerable, gross errors – from 0,1 till 0,5 points.

The foundation of a technique of improvement of the competitive program of a woman's pair on acrobatics by means of choreography and its appendix in the experimental group are carried out [1]. Results of indicators of implementation of the competitive program of a woman's pair on acrobatics in tab. 3 and 4 after the pedagogical experiment are reported.

The analysis of results of indicators of implementation of the competitive program of acrobatics women's pairs showed that women's pairs No. 4 and No. 5 were perspective in EG, No. 2 and No. 1 lagged behind at the beginning of the pedagogical experiment. These ranks remained practically and after the pedagogical experiment.

Inter-rank differences: the only change is that women's pairs No. 1 and No. 3 traded places.

Women's pairs No. 1 and No. 5 were perspective, No. 2 and No. 4 lagged behind at the beginning of the pedagogical experiment in CG. These ranks remained practically and after the pedagogical experiment.

Inter-rank differences: the only change is that women's pairs No. 1 and No. 5 traded places.

We established dynamics of their changes in the experimental and control groups on the basis of indicators of criteria for evaluation of implementation of the competitive program of a woman's pair on acrobatics before and after the pedagogical experiment, (tab. 5 and tab. 6)

The indicator of changes of criterion "A" (artistic compositions) grew by 5,2% in the experimental group in a percentage ratio. The indicator of changes of criterion "A" grew by 0,8% in the control group in a percentage ratio. The difference of indicators of changes of criterion "A" makes 4,4% during the pedagogical experiment. The indicator of changes of criterion "D" (difficulty) grew by 1,7% in the experimental group in a percentage ratio. The indicator of changes of criterion of "D" grew by 1,1% in the control group in a percentage ratio. The difference of indicators of changes of criterion of "D" makes 0,6% during the pedagogical experiment. The indicator of changes of the criterion "E" (performance) grew by 2,3% in the experimental group in a percentage ratio. The indicator of changes of the criterion "E" grew by 1,1% in the control group in a percentage ratio. The difference of indicators of changes of the criterion "E" makes 1,2% during the pedagogical experiment. The total difference of dynamics of changes of indicators of criteria ("A" + "D" + "E") implementation of the

Table 1

Results of indicators of implementation of the competitive program of a woman's pair on acrobatics before the pedagogical experiment (EG, n=10)

Criterion for evaluation of the competitive program of a woman's pair on acrobatics		Women's pairs				
		1	2	3	4	5
A	Choreography (artistic compositions) points	9,1	8,9	9,1	9,5	9,3
D	Difficulty of exercise, points	9,1	9,1	9,2	9,1	9,3
E	Exercise performance, points	9,4	9,1	9,2	9,4	9,1
Total point score ("A"+"D"+"E"), points		27,6	27,1	27,5	28,0	27,7
Rank		3	5	4	1	2
Average arithmetic		9,26	9,2	9,2	9,3	9,26
Average square deviation		0,17	0,11	0,05	0,21	0,11
The variation coefficient, %		1,8	1,2	0,5	2,2	2,5

Table 2

Result of indicators of implementation of the competitive program of a woman's pair on acrobatics before the pedagogical experiment (CG, n=10)

Criterion for evaluation of the competitive program of a woman's pair on acrobatics		Women's pairs				
		1	2	3	4	5
A	Choreography (artistic compositions) points	9,2	9,2	9,1	9,1	9,4
D	Difficulty of exercise, points	9,4	9,1	9,3	9,0	9,2
E	Exercise performance, points	9,2	9,0	9,2	9,3	9,4
Total point score ("A"+"D"+"E"), points		27,9	27,3	27,6	27,4	28,0
Rank		2	5	3	4	1
Average arithmetic		9,3	9,1	9,2	9,13	9,33
Average square deviation		0,1	0,1	0,1	0,15	0,11
The variation coefficient, %		1,1	1,1	1,1	1,6	1,2

Table 3

Result of indicators of implementation of the competitive program of a woman's pair on acrobatics after the pedagogical experiment (EG, n=10)

Criterion for evaluation of the competitive program of a woman's pair on acrobatics	Women's pairs				
	1	2	3	4	5
A Choreography (artistic compositions) points	9,6	9,5	9,7	9,8	9,7
D Difficulty of exercise, points	9,3	9,3	9,4	9,3	9,3
E Exercise performance, points	9,5	9,4	9,4	9,6	9,4
Total point score ("A"+"D"+"E"), points	28,4	28,2	28,5	28,7	28,6
Rank	4	5	3	1	2
Average arithmetic	9,46	9,4	9,5	9,56	9,53
Average square deviation	0,15	0,1	0,17	0,25	0,21
The variation coefficient, %	1,6	1,1	1,8	3,1	2,2

Table 4

Result of indicators of implementation of the competitive program of a woman's pair on acrobatics after the pedagogical experiment (CG, n=10)

Criterion for evaluation of the competitive program of a woman's pair on acrobatics	Women's pairs				
	1	2	3	4	5
A Choreography (artistic compositions) points	9,3	9,3	9,2	9,2	9,4
D Difficulty of exercise, points	9,5	9,2	9,4	9,1	9,3
E Exercise performance, points	9,4	9,1	9,3	9,4	9,4
Total point score ("A"+"D"+"E"), points	28,2	27,6	27,9	27,7	28,1
Rank	1	5	3	4	2
Average arithmetic	9,4	9,2	9,3	9,23	9,36
Average square deviation	0,1	0,1	0,1	0,15	0,05
The variation coefficient, %	1,1	1,1	1,1	1,6	0,5

Table 5

Dynamics of changes of indicators of criteria for evaluation of implementation of the competitive program of a woman's pair on acrobatics after the pedagogical experiment (EG, n=10) (P<0,05)

Criterion for evaluation of the competitive program	$\bar{X}$		σ		m		$t_{r.}$	$t_{gr.}$	P
	before	after	before	after	before	after			
1. "A" Choreography, points	9,66	9,18	0,11	0,23	0,05	0,11	3,97	2,57	<0,05
2. "D" Difficulty, points	9,32	9,16	0,04	0,08	0,02	0,04	3,57	2,57	<0,05
3. "E" Performance, points	9,46	9,24	0,08	0,15	0,04	0,03	4,4	2,57	<0,05

Table 6

Dynamics of changes of indicators of criteria for evaluation of implementation of the competitive program of a woman's pair on acrobatics after pedagogical experiment (CG, n=10) (P<0,05)

Criterion for evaluation of the competitive program	$\bar{X}$		σ		m		$t_{r.}$	$t_{gr.}$	p
	before	after	before	after	before	after			
1. "A" Choreography, points	9,28	9,2	0,08	0,12	0,04	0,06	1,11	2,57	>0,05
2. "D" Difficulty, points	9,3	9,2	0,15	0,15	0,07	0,07	0,94	2,57	>0,05
3. "E" Performance, points	9,32	9,22	0,13	0,14	0,06	0,07	1,5	2,57	>0,05

Table 7

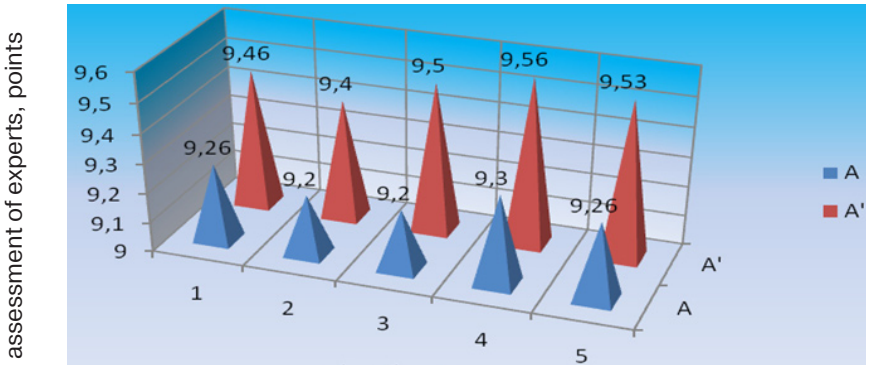
Statistics of implementation of the competitive program of a woman's pair on acrobatics before the pedagogical experiment (p<0,05)

№ of women's pairs and their criterion for evaluation of the competitive program	Experimental group (n=10)	Control group (n=10)	t	$t_{gr.}$	p
	$\bar{X}$±m				
1. ("A"+"D"+"E"), points	9,26±0,08	9,3±0,05	0,14	2,57	>0,05
2. ("A"+"D"+"E"), points	9,2±0,05	9,1±0,05	0	2,57	>0,05
3. ("A"+"D"+"E"), points	9,2±0,02	9,2±0,05	0,10	2,57	>0,05
4. ("A"+"D"+"E"), points	9,3±0,1	9,13±0,07	0,13	2,57	>0,05
5. ("A"+"D"+"E"), points	9,26±0,1	9,33±0,05	0,13	2,57	>0,05

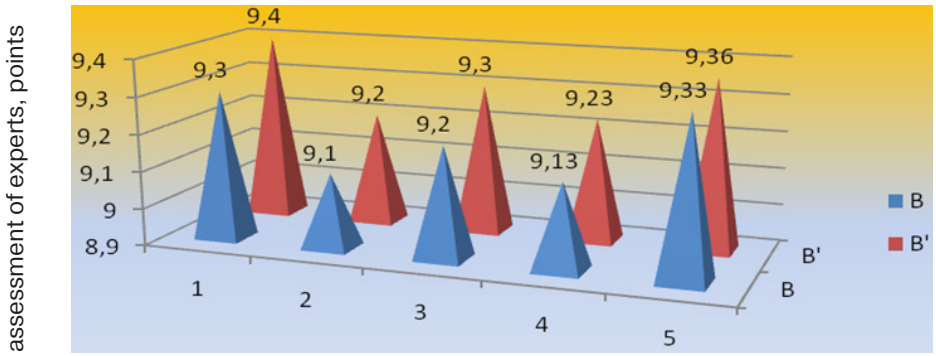
Table 8

Statistics of implementation of the competitive program of a woman's pair on acrobatics after the pedagogical experiment (p<0,05)

№ of women's pairs and their criterion for evaluation of the competitive program	Experimental group (n=10)	Control group (n=10)	t	$t_{gr.}$	p
	$\bar{X}$±m				
1. ("A"+"D"+"E"), points	9,46±0,07	9,4±0,05	0,69	2,57	>0,05
2. ("A"+"D"+"E"), points	9,4±0,05	9,2±0,05	2,82	2,57	<0,05
3. ("A"+"D"+"E"), points	9,5±0,08	9,3±0,07	1,88	2,57	>0,05
4. ("A"+"D"+"E"), points	9,56±0,12	9,23±0,07	2,37	2,57	>0,05
5. ("A"+"D"+"E"), points	9,53±0,1	9,36±0,02	1,66	2,57	>0,05



Pic. 1. Comparative statistics of acrobatics women's pairs (EG):
A – statistics to carrying out the pedagogical experiment;
A' – statistics after application of the experimental technique during the pedagogical experiment.



Pic. 2. Comparative statistics of acrobatics women's pairs (CG):
B – statistics to carrying out the pedagogical experiment;
B' – statistics after carrying out the pedagogical experiment.

competitive program of a woman's pair on acrobatics makes 6,2% after the pedagogical experiment between EG and CG in percentage a ratio. Statistics of implementation of the competitive program of a woman's pair on acrobatics before and after the pedagogical experiment of the experimental and control groups presented in tab. 7, 8.

Using methods of mathematical statistics, we can say that: difference of average values on the whole experimental group grew by 2,7%; difference of average values on the whole control group grew by 0,9%. The difference of differences of average values of the experimental and control groups of the pedagogical experiment makes 1,8%. Difference of average values in a percentage ratio for 3,1% improved by means of the offered technique of improvement of the competitive program of acrobatics women's pairs by means of choreography in the experimental group in indicators of criteria for evaluation of the competitive program ("A" + "D" + "E"). The worst result (1,0%) is shown considerably in the control group that confirms efficiency of the offered technique of improvement of the competitive program of acrobatics women's pairs by means of choreography in the experimental group during the pedagogical experiment. We compared the received results of statistics of acrobatics women's pairs of the experimental and control groups before carrying out the pedagogical experiment to their indicators after carrying out the pedagogical experiment. Comparative statistics of acrobatics women's pairs of the experimental and control groups are presented in pic. 1, 2.

Conclusions

1. The analysis of scientifically-methodical literature confirms the insufficient level of researches concerning the improvement of the competitive program of a woman's pair on acrobatics by means of choreography at a stage of the specialized basic preparation.

2. The content of the educational and training process is developed which is directed to the improvement of the competitive program of woman's pair on acrobatics by means of choreography.
3. The technique of improvement of the competitive program of woman's pair on acrobatics at a stage of the specialized basic preparation is developed.

4. Statistics of implementation of the competitive program of woman's pair on acrobatics in a percentage ratio are defined: difference of average values on the whole experimental group (EG) grew by 2,7%; difference of average values on the whole control group (CG) grew by 0,9%; the difference of differences of average values of the experimental and control groups of the pedagogical experiment makes 1,8%.

The average value of a percentage ratio for 3,1% improved by means of the offered technique of improvement of the competitive program of women's pairs on acrobatics by means of choreography in the experimental group in indicators of criteria for evaluation of the competitive program ("A" + "D" + "E"). The worst result (1,0%) is shown considerably in the control group, which confirms the efficiency of the offered technique of improvement of the competitive program of woman's pair on acrobatics by means of choreography in the experimental group.

Prospects of the subsequent researches will be sent to the search for new means and methods of special physical and technical training of acrobatics women's pairs.

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Assessment of functional preparedness of athletes specializing in the sprint, using new methodological approaches

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Purpose*: study the character of the changes the level of functional preparedness of sportsmen in the autumn-winter preparatory period training cycle of one year.*

Material & Methods*: in the study to take part ten of athletes specializing in the sprint at the age of 19–23 years, and which have sports rank master of Sport and international master of sports. Methods: analysis scientific and methodical literature, pedagogical supervision, pedagogical experiment, methods for assessing functional training using computer technology, methods of mathematical statistics.*

Results*: is defined integrated quantitative value of the level functional of preparedness and her individual components using new methodical approaches.*

Conclusions*: it is shown that the conduct of the optimization functional of preparedness athletes is an important factor in enhancing the effectiveness of the training process.*

Keywords: *functional preparedness, the preparatory process, training process, microcycle.*

Introduction

The increases of the level of sports results, the considerable point of a competitive fight on the world scene in many Olympic sports demands the subsequent improvement of the training process of sportsmen.

According to the opinion of the leading experts in the branch of physical culture and sport, the search of new modern methodical approaches concerning an assessment of functional preparedness of organism of high-class sportsmen is one of the perspective directions of the increase of system effectiveness of sports preparation in different types of sports activity, and in particular in sprint [6; 8].

The analysis of scientific sources specifies also that studying and improvement of the process of formation and realization of functional preparedness of sportsmen in the course of their training and competitive activity is one of the most actual directions of modern sports science which is directed to the increase of efficiency of adaptation reactions to training and competitive load for the purpose of correction and optimization of the creation of different structural elements of the training process, – microcycles, microcycles, mesocycles, and also the purposeful use of integrated indicators of functional preparedness of organism of sportsmen when developing models which characterize morphological features of an organism and possibility of separate systems and their parts which provide a certain level of functional preparedness and competitive activity [1–4].

The relevance and the high practical importance of this problem served as the prerequisite for carrying out this research.

Communication of the research with scientific programs, plans, subjects

The work performed within the state budgetary subject "The development of modern approaches of improvement of the system of renewal actions among sportsmen " No. of the state registration – 1/15, IP 0115U000819 for 2015–2016.

The purpose of the research

Studying of nature of changes of the level of functional preeparedness of organism of sportswomen who specialize in sprint in the autumn and winter preparatory period of an annual cycle of preparation.

Material and Methods of the research

Research methods: the analysis of scientifically-methodical literature, pedagogical supervision, pedagogical experiment, methods of an assessment of functional preparedness with a use of computer technologies, methods of mathematical statistics.

Within the experiment we conducted the examination of 10 sportswomen who specialize in sprint, of 19–23 years old and who have a sports rank of MS and MSIC.

The research was conducted in the course of their preparation for starts in the winter general period at the beginning and at the end of the autumn and winter preparatory period. The level of functional preparedness of organism and its separate components by means of the computer program were registered at all investigation phases at sportswomen [5]. Every-

body who were investigated, carried out the standard velo-ergometric test PWC_{170} and measured length (sm) and mass (kg) of a body for this purpose.

Results of the research and their discussion

The assessment of the level of functional preparedness of organism of girls at the beginning of their preparation for a winter competitive season was provided at the first investigation phase (tab. 1). Sportswomen had characteristic average values of indicators which characterize their general, high-speed, high-speed and power endurance, profitability of the system of power supply of muscular activity, also reserve opportunities of this system on the basis of the obtained data at the beginning of the autumn and winter preparatory period.

So, $oPWC_{170}$ and oMCO values which display the level of the general endurance of an organism made respectively 19,13±0,54 kgm·min^{-1}·kg^{-1} and 60,37±1,27 ml·min^{-1}·kg^{-1} that allowed to state the "average" level of the development of these functional indicators. Also indicators which characterize the level of profitability of the work of the system of power supply of an organism (PANO, HR_{PANO}, GMC) which made respectively 57,61±1,73%, 154,55±4,69 b.·min^{-1},187,54±4,24 stand.units were registered within the "average" functional class.

Also indicators which characterize high-speed and power endurance of sportswomen were registered within the average values. Average values of LACp and LACc (respectively 5,16±0,13 w · kg^{-1} and 32,63±0,72 stand.units.) served as a confirmation of it. It should be noted that indicators which characterize high-speed endurance were registered at the "average" level, size of ALACp and ALACc made respectively 5,42±0,18 w · kg^{-1} and 35,92±1,06 stand.units.

The obtained experimental data were used for the analysis of numerical scores by the levels of the general, high-speed, high-speed and power endurance of sportswomen and integrated numerical scores of the level of their functional preparedness. Results which are presented in the table 1 demonstrate that numerical scores of the general endurance, high-speed and power endurance and profitability of work of power supply of the work of muscular activity (respectively 54,61±3,10 points, 55,18±2,0 points and 62,28±4,58 points) were registered at the beginning of the autumn and winter preparatory period at sportswomen.

The level of high-speed endurance of sportswomen and reserve opportunities of their organism answered the functional classes "below the average" (respectively 42,75±2,58 points and 48,90±2,47 points).

The integrated numerical scores of the level of functional preparedness of sportswomen which made 53,18±2,98 points that answers the "average" level of functional preparedness of organism of sportswomen was calculated on the basis of an assessment of separate components of functional preparedness.

The received experimental data in our research in general are coordinated with the opinion of the leading experts [5–7] that carrying out optimization of functional preparedness of organism of sportswomen is one of the important factors of the increase of efficiency of the training process as in the preparatory and competitive periods of macrocycle, and in the

Table 1

Indicators which characterize the level of functional preparedness and size of numerical scores by the level of functional preparedness of organism of sportswomen at the beginning of the autumn and winter preparatory period, X±m

Indicators	Size of indicators and numerical scores	Functional class
$oPWC_{170}$, kgm·min^{-1}·kg^{-1}	19,13±0,54	average
oMCO, ml·min^{-1}·kg^{-1}	60,37±1,27	average
ALACp, w·kg^{-1}	5,42±0,18	average
ALACc, stand.units.	35,92±1,06	average
LACp, w · kg^{-1}	5,16±0,13	average
LACc, stand.units.	32,63±0,72	average
PANO,%	57,61±1,73	average
HR_{PANO}, b.·min^{-1}	154,55±4,69	average
GMC, stand.units.	187,54±4,24	average
General endurance, points	54,61±3,10	average
High-speed endurance, points	52,75±2,58	average
High-speed and power endurance, points	55,18±2,0	average
Profitability of power supply of an organism, points	62,28±4,58	average
Reserve opportunities of an organism, points	48,90±2,47	below the average
Level of functional preparedness, points	53,18±2,98	average

Note. *$oPWC_{170}$ –relative aerobic power, oMCO – maximum consumption of oxygen, ALACp – alactate power, ALACc – alactate capacity, LACp – lactate power, LACc – lactate capacity, PANO – threshold of an anaerobic exchange, HR_{PANO} – heart rate at the level of PANO, GMC – general metabolic capacity.*

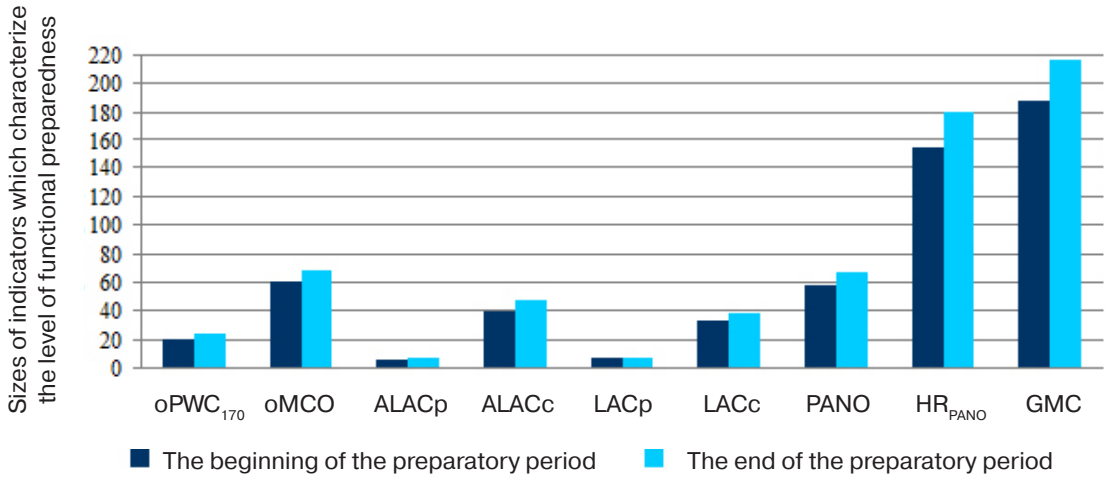
system of long-term sports improvement. Therefore the experimental data became the subsoil for carrying out the optimization of functional preparedness of organism of sportswomen are presented. The correction of the training process was directed to the increase of the general level of functional preparedness and its separate components which provide the achievement of high sports results in sprint.

The repeated examination of sportswomen was conducted at the end of their period of preparation for a winter competitive season. Results which are presented in pic. 1, demonstrate that the correction of the training process of sportswomen promoted the expressed optimization of structural components of functional preparedness of their organism.

It should be noted that the reliable improvement practically of all parameters which characterize functional preparedness of organism of sportswomen was observed at the end of the autumn and winter preparatory period.

So, authentically statistical gain of $oPWC_{170}$ to 23,97±1,52 kgm·min^{-1}·kg^{-1} (or for 19,07% in comparison with the beginning of the preparatory period), oMCO – to 67,89±2,56 ml·min^{-1}·kg^{-1} (or for 12,46%), ALACp – to 6,94±1,78 w·kg^{-1} (or for 28,04%), ALACc – to 47,25±3,89 stand. units. (or for 21,40%), LACp – to 6,92±0,85 w·kg^{-1} (or for 17,49%), LACc – to 38,23±3,44 stand.units (or for 17,58%), PANO – to 67,01±1,54% (or for 16,32%), HR_{PANO} – to 180,25±6,80 b.·min^{-1} (or for 16,67%), GMC – to 215,87±8,12 stand.units (or for 15,20%) was registered till the end of the preparatory period. Also results of the analysis of numerical scores became the confirmation to the above-stated data for levels of functional preparedness of organism of sportswomen at the end of the preparatory period (tab. 2).

The reliable increase of numerical scores was watched the level of the general endurance (to 68,53±6,19 points or for 25,49% that answered "above the average" to the functional class), the level of high-speed endurance (to 73,54±5,04 points or for 39,41%, "above the average), level, high-speed and power endurance (to 77,87±5,23 points or for 41,20%, "above the average"), profitability of work of the system of power supply of muscular activity (to 85,14±6,47 points or for 36,71%, "high"), reserve opportunities of an organism



Pic. 1. Indicators which characterize the level of functional preparedness of organism of sportswomen at the beginning and at the end of the autumn and winter preparatory period

Table 2

Sizes of numerical scores by the level of functional preparedness of organism of sportswomen at the beginning and at the end of the autumn and winter preparatory period

Indicators	The beginning of the preparatory period	The end of the preparatory period	% incremental rate
General endurance, points	54,61±3,10	68,53±6,19*	25,49±6,22
High-speed endurance, points	52,75±2,58	73,54±5,04**	39,41±8,25
High-speed and power endurance, points	55,18±2,0	77,87±5,23**	41,20±6,21
Profitability of power supply of an organism, points	62,28±4,58	85,14±6,47*	36,71±6,32
Reserve opportunities of an organism, points	48,90±2,47	72,58±6,59**	48,42±8,69
Level of functional preparedness, points	53,18±2,98	74,90±6,82**	40,84±7,25

Note. ** – p<0,05 ** – p<0,01 in comparison with the beginning of the preparatory period.*

(to 72,58±6,59 points or for 48,42%, "above the average"), and also the level of functional preparedness (to 74,90±6,82 points or for 40,84%, "above the average" the functional class) on the basis of the experimental data which are presented in tab. 2 at the end of the preparation period at sportswomen.

It should be noticed that the greatest relative gain was noted at indicators which characterize reserve opportunities of an organism, which can demonstrate that sportswomen executed the large volume of a training load of different orientation in the autumn and winter preparatory period, which makes a positive contribution to the sports result.

The relative gain raised rather evenly – from 36,71% till 40,84% that demonstrates a harmonious use of a training load in other parameters of the general functional preparedness.

Conclusions

It is determined on the basis of the conducted research that the complex studying of features of dynamics of functional preparedness of organism of sportswomen in the course of sports improvement by means of new methodical approaches, is the perspective direction of the increase of system effectiveness of sports preparation, in particular in sprint. It will allow to create as necessary conditions for the rational management of physical condition of sportsmen, which provides the compliance of the level of preparedness of organism of the sportsman with the set sports result, and to carry out timely correction of programs of training loads in the different periods of a macrocycle. The integrated quantities of the level of functional preparedness of an organism and its separate components, which were received by means of new methodical approach, can be also used for the development of models, which characterize the main parties of preparedness of sportsmen and provide effective competitive activity. The obtained experimental data allowed to state a rather high informational content of the used computer program in work in the autumn and winter preparatory period of an annual cycle of preparation.

Prospects of the subsequent researches in this direction consist in the subsequent studying of the dynamics of the level of functional preparedness of organism of sportswomen who specialize in sprint.

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Importance of early physical rehabilitation in recovery of pain and tactile sensitivity of women with postmastectomy syndrome

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Purpose: *to determine the expediency of early application of physical rehabilitation to improve the pain and tactile sensitivity of women with postmastectomy syndrome.*

Material & Methods: *theoretical analysis of scientific and methodical literature, analysis of heart rate variability, methods of mathematical statistics. The study involved 135 women with postmastectomy syndrome who underwent radical mastectomy by Madden.*

Results: *at the end of the annual research it was found that women of MG showed significantly better indicators of pain sensitivity in the areas of armpit, deltoid, triceps and forearms; tactile sensitivity – only by armpit compared to* MG_1.

Conclusions*: identified the feasibility of early rehabilitation intervention to improve the pain and tactile sensitivity in women during the year training by the first personality-oriented rehabilitation program.*

Keywords: *women, postmastectomy syndrome, sensitivity, physical rehabilitation.*

Introduction

The problem of rehabilitation of women with the postmastectomy syndrome occupies an important place in the modern stage of breast cancer treatment not only in Ukraine but throughout the world. This is due not only to the stable growth of morbidity, but also the necessity to improve the quality of life of these patients [4; 5]. Postmastectomy syndrome manifests edematous, cerebrovascular and mixed neuropathic symptoms, has early and late signs, which are very dynamic and variable over time [2; 3; 4], that is why physical rehabilitation is an integral component of the treatment.

Recent studies of A. Cheville, 2010 [8], K. M. Cavanaugh, 2011 [7], M. Scaffidi, M. C. Vulpiani, M. Vetrano та ін., 2012 [10], C. Arving, I. Thormodsen, G. Brekke et al., 2013 [9] prove the feasibility of early detection and continuous monitoring of postmastectomy syndrome signs for timely overcoming negative functional disorders and improvement of life quality at all stages of rehabilitation.

The above definitely indicates the importance of developing, conducting and determination the usefulness of timely rehabilitation measures to improve pain and tactile sensitivity in women with postmastectomy syndrome.

Relationship with the academic programs, plans, themes

The selected research direction corresponds to the research topic of Zaporizhzhya National University "The development, experimental testing and implementation in practice the measures of physical rehabilitation to improve the health status of different categories of people" (state registration 0114U002653) and Lviv State University of Physical Culture "Basis of physical rehabilitation of women with the postmastectomy syndrome" (state registration 0114U007008).

The purpose of the research

To determine the expediency of early application of physical rehabilitation to improve the pain and tactile sensitivity of women with the postmastectomy syndrome.

Material and Methods of research

The article used the following methods: theoretical analysis of scientific and methodical literature, assessment of pain and tactile sensitivity, methods of mathematical statistics. The study of pain and tactile sensitivity of the upper extremity was performed to assess the presence and severity of these disorders as a result of breast cancer treatment. Evaluation of sensitivity was conducted in ten areas of the upper limb that meet certain zones of innervation brachial plexus.

Each of the ten areas considered as follows: 0 – no sensitivity; 1 – impaired sensitivity; 2 – normal sensitivity [1], which generally provides an opportunity to get maximum points (20) if you have normal sensitivity. The results on the operated side of the upper extremity compared to nonoperated. Study of the pain sensitivity was conducted by needle, tactile – by brush [1]. Sensitivity was studied in these areas: shoulder blade, the upper part of the trapezius muscle, ectopectoralis, under the arm, deltoid, biceps, triceps, forearms, hand and phalanxes of fingers.

Organization of the research. The researches were conducted on the base of Zaporozhye regional oncology dispenser. In the research 135 women with post mastectomies syndrome participated (50 patients were on inpatient and dispensary rehabilitation stages, 85 – only on dispensary).

Table 1

Comparison of pain sensitivity indicators of women with postmastectomy syndrome at dispensary stage of rehabilitation, $\bar{X}$±m

Indicators	6 months				12 months			
	MG_1 (n=45)	MG (n=25)	MG_2 (n=40)	CG (n=25)	MG_1 (n=45)	MG (n=25)	MG_2 (n=40)	CG (n=25)
shoulder blade	1,68±0,06	1,32±0,09**	1,65±0,09	1,40±0,12	1,73±0,06	1,56±0,10	1,80±0,08	1,64±0,09
the upper part of the trapezius muscle	1,86±0,05	1,84±0,07	1,72±0,07	1,76±0,11	1,95±0,03	1,92±0,05	1,82±0,06	1,84±0,07
ectopectoralis	1,68±0,06	1,80±0,08	1,67±0,09	1,76±0,08	1,75±0,06	1,96±0,04**	1,75±0,08	1,84±0,07
under the arm	1,33±0,07	1,60±0,10*	1,37±0,08	1,60±0,10	1,60±0,07	1,92±0,05***	1,70±0,07	1,76±0,08
deltoid	1,82±0,05	1,96±0,04*	1,80±0,05	1,76±0,08	1,88±0,04	2,00±0,00**	1,87±0,05	1,84±0,07
biceps	1,88±0,04	1,96±0,04	1,85±0,05	1,92±0,05	1,91±0,04	2,00±0,00*	1,87±0,05	2,00±0,00••
triceps	1,42±0,07	1,72±0,09**	1,60±0,07	1,48±0,14	1,71±0,06	2,00±0,00****	1,72±0,07	1,72±0,09
forearm	1,77±0,06	2,00±0,00**	1,80±0,08	1,88±0,06	1,86±0,05	2,00±0,00**	1,85±0,07	1,92±0,05
hand	2,00±0,00	2,00±0,00	2,00±0,00	2,00±0,00	2,00±0,00	2,00±0,00	2,00±0,00	2,00±0,00
phalanxes of fingers	1,97±0,02	2,00±0,00	1,95±0,03	2,00±0,00	2,00±0,00	2,00±0,00	1,95±0,03	2,00±0,00
sum of points	17,46±0,16	18,20±0,20**	17,42±0,30	17,56±0,49	18,42±0,13	19,36±0,15***	18,35±0,28	18,56±0,38

Notes. ** – p<0,05, ** – p<0,01, *** – p<0,001 when comparing MG_1 and MG; •• – p<0,01 when comparing MG_2 and CG.*

Table 2

Comparison of tactile sensitivity indicators of women with postmastectomy syndrome at dispensary stage of rehabilitation, $\bar{X}\pm m$

Indicators	6 months				12 months			
	MG_1 (n=45)	MG (n=25)	MG_2 (n=40)	CG (n=25)	MG_1 (n=45)	MG (n=25)	MG_2 (n=40)	CG (n=25)
shoulder blade	1,66±0,07	1,40±0,10*	1,70±0,08	1,56±0,10	1,80±0,06	1,64±0,09	1,80±0,08	1,72±0,09
the upper part of the trapezius muscle	1,84±0,05	1,88±0,06	1,77±0,06	1,88±0,06	1,91±0,04	1,92±0,05	1,82±0,06	1,92±0,05
ectopectoralis	1,68±0,06	1,76±0,08	1,65±0,09	1,88±0,06•	1,71±0,06	1,84±0,07	1,80±0,08	1,92±0,05
under the arm	1,44±0,08	1,68±0,09	1,35±0,07	1,60±0,10•	1,53±0,07	1,92±0,05***	1,62±0,07	1,60±0,10
deltoid	1,77±0,06	1,96±0,04*	1,87±0,05	1,60±0,10•	1,84±0,05	1,96±0,04	1,95±0,03	1,60±0,10••
biceps	1,84±0,05	2,00±0,00**	1,95±0,03	1,56±0,10•••	1,93±0,03	1,96±0,04	1,95±0,03	1,64±0,09••
triceps	1,48±0,07	1,80±0,08**	1,55±0,07	1,76±0,10	1,80±0,06	1,92±0,05	1,82±0,06	1,80±0,08
forearm	1,77±0,06	2,00±0,00***	1,82±0,06	1,96±0,04	1,93±0,03	2,00±0,00*	1,85±0,05	1,96±0,04
hand	1,97±0,02	2,00±0,00	2,00±0,00	2,00±0,00	1,97±0,02	2,00±0,00	2,00±0,00	2,00±0,00
phalanxes of fingers	2,00±0,00	2,00±0,00	1,95±0,03	2,00±0,00	2,00±0,00	2,00±0,00	1,97±0,02	2,00±0,00
sum of points	17,51±0,17	18,48±0,22**	17,62±0,21	17,80±0,23	18,44±0,14	19,16±0,29*	18,60±0,23	18,16±0,24

Notes. ** – p<0,05, ** – p<0,01, *** – p<0,001 when comparing MG_1 and MG; • – p<0,05, •• – p<0,01, ••• – p<0,001 when comparing MG_2 and CG*

Average age of the tested was 60.27±0.79 years. At inpatient stage women were divided into two groups: main group (n=25) and comparison group (n=25). At dispensary stage they were divided into first main group (n=45) and second main group (n=40). The groups were completed in compliance with wishes of the patients and their motivations for training by personality oriented physical rehabilitation program. Before dividing into groups all women were consulted about specificities of training in every group. The first complex, personality oriented program [4] included: aqua-fitness (aqua-motion), aqua building, aqua stretching), conditional swimming; health related aerobic (first main group and main group); conditional swimming and pilates (group [3] – second main group and comparison group). Women of main groups trained as per appropriate programs during one year. Effectiveness of trainings was controlled after every half of year. Admission to trainings was given by oncologist. Patients of these groups belonged to third clinical group. At the beginning of trainings all groups were equal by all indicators of external respiration system functioning.

Results of the research and their discussion

To determine the feasibility of early application of physical rehabilitation to improve pain (Table 1) and tactile (Table 2) sensitivity in women with the postmastectomy syndrome we conducted a comparative analysis of these indicators in six months and in a year of training by personality-oriented programs of physical rehabilitation.

Advantages of early physical rehabilitation were noted after six months of training by the first personality-oriented program of physical rehabilitation. In women of the main group compared to the first main group was found significantly better performance pain sensitivity (Table 1) in areas under the arm, deltoid, triceps and forearms – by 0.33 points ($p<0.05$), 0.14 points ($p<0.05$), 0.33 points ($p<0.01$) and 0.23 points ($p<0.01$) after 6 months' trainings; in a year – by 0.32 points ($p<0.001$), 0.12 points ($p<0.01$), 0.29 points ($p<0.001$), 14 points ($p<0.05$) respectively.

In a comparison group of women compared with the second main group it was showed significantly better indicators of pain sensitivity just over the projection biceps by 0.13 points ($p<0.05$) after year of training by the second personality-oriented program of physical rehabilitation.

Comparative analysis of tactile sensitivity in 6 months also showed the important role of early application of physical rehabilitation on stationary phase: women of the MG compared to the MG_1 revealed significantly better sensitivity in the parts of the deltoid, biceps, triceps and forearms – by 0.19 points ($p<0.05$), 0.16 points ($p<0.01$), 0.32 points ($p<0.01$) and 0.23 points ($p<0.001$) respectively.

At the end of the study, the women of MG have shown better sensitivity only in the area of the armpit by 0.39 points ($p<0.001$) and forearm – by 0.07 points ($p<0.05$) compared with women of MG_1.

Comparing the results of tactile sensitivity in women CG and MG_2 it had not been established the feasibility of early application physical rehabilitation at the stationary phase.

Conclusions

The worked out and tested personality–oriented physical rehabilitation programs for women with postmastectomy syndrome facilitate improvement of both pain and tactile sensitivity. However the results of the semi–annual and annual monitoring were shown feasibility of early rehabilitation intervention to restore the pain and tactile sensitivity in the areas of the deltoid, biceps, triceps and under the arm.

The prospects of further researches imply determination of purposefulness of early personality-oriented physical rehabilitation programs directed on improvement of respiratory system of women with postmastectomy syndrome.

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The providing of youth's life quality in health promoting schools of L'viv region

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Purpose: *to establish the role of health-promoting schools in providing of life quality of youth of school age.*

Material & Methods: *the project activity and its benefits for youth's life of 69 health promoting schools were analyzed. 2108 students of 10–11 grades was surveyed. 1080 students was studied in health promoting school.*

Results: *the objective conditions for life quality formation according project activities 'Health promoting school' were described. The factors that contribute high life quality level of school youth were identified with regression analysis.*

Conclusions: *the increasing of odds ratio for life quality was identified for males (in 2,2–2,6 times), for respondents with high levels of physical activity (in 1,3–2,8 times) and respondents which studied in health promoting schools (in 2,3–3,1 times).*

Keywords: *health, quality of life, physical activity, youth, school.*

Introduction

The search of effective ways of the improvement of quality of life of the population in the conditions of an unsatisfactory medico-demographic situation and difficult economic realities remains relevant for the Ukrainian state.

Quality of life – is the multicomponent and dynamic structure which is identical for everybody, irrespective of age, sex, residence, social status, and so forth [2–4; 10]. The model of quality of life, which is concluded according to the hierarchical principle, contains components of a different order (physical, psychological and material components, social activity, development and self-identification, external environment), moderators and mediators (variables that predetermine or explain the communication between the independent factors and the general indicator of wellbeing), and also indicators [3]. Physical training and sport has got the concept "the quality of life that is connected with health" in the branch of the development, which actually involves only domains "Physical component", "Psychological component" and "Social activity" whereas other components are transferred to the category of independent variables, moderators and mediators [3; 9].

It is necessary to consider that such structure emphasizes the existence in quality of life of objective conditions which can be observed and measured definitely, and also the subjective part which is displayed in the form of personal judgments or answers of the interested persons. Studying of their wellbeing taking into account conditions and opportunities of the school environment is important in the case of children and youth. It is necessary for the identification of factors which are capable to provide high rates of quality of life of younger generation [5].

Nowadays Ukraine actively participates in the program of WOHC "Schools of assistance of health" [8], the total of such educational institutions in our state makes over 4 thousand. Schools of health actively work in the direction of ensuring the high level of physical activity, healthy food, take measures for the prevention of consumption of psychoactive agents, change the school environment for the creation of safe and favorable conditions for study and work [8]. The participation of educational institutions in complex healthcare projects provides the complete strategic approach that will lead to the improvement of health and progress of children with high probability; however the communication between study at school of assistance to health and quality of life is investigated insufficiently.

Communication of the research with scientific programs, plans, subjects

The research was carried out with support and within tasks of the Program of the development of education of Lviv on 2009–2012 and 2013–2016.

The purpose of the research

To establish the value of activity of schools of assistance of health in ensuring quality of life of youth of school age.

Research tasks: 1) to analyze the design activity of schools of assistance to health and its advantages to quality providing life of youth; 2) to find the factors which define high quality of life of pupils.

Material and Methods of the research

The Questionnaire for the coordinator of the European network of schools of assistance of health is used for the estimation of healthcare activity of educational institution [1]. 69 coordinators of schools of assistance to health of the Lviv region took part in the poll. The influence of the healthcare design activity on subdomains of quality of life according to certain

indicators was analyzed (tab. 1) [3].

2108 pupils of 10–11 classes (47,25% of respondents from rural areas; 50,00% of respondents – female persons), in particular, 1080 pupils (50,00% of girls and 50,00% – inhabitants of rural areas) studied at schools of assistance to health took part in the questioning.

Data collection for the regression analysis was carried out according to the system "Quality and way of life of pupils of the Lviv region" [6] with use:

– the questionnaire of MOS Sf-36 – for the estimation of the general indicator of physical and mental wellbeing [7; 11];

– the questions of the questionnaire PEDSQL (The tool for the determination of quality of life of children, Pediatric Quality of Life Inventory) – the relations with schoolmates and bullying;

– PAQ-A scales (The questionnaire for the determination of level of physical activity of teenagers, Physical Activity Questionnaire for Older Children and Adolescents) – for the characteristic of physical activity of respondents;

– the questions concerning the level of the academic and sports competences and food of respondents.

The analysis of data provided an assessment of chances (odds ratio, OR) and their confidential intervals (confidential intervals, CI).

Results of the research and their discussion

The network of the schools of assistance to health (SAH) unites different educational institutions for which the major task is the preservation and the promotion of health of all participants of the teaching-educational process which in turn demands introduction of different methods of pedagogical, scheduled, hygienic, sports-improving and sports-mass maintenance. 98 educational institutions belonged for 2015 to the network of SAH of the Lviv region. Among them – are the general education I–III educational institutions of the I–III st. (55,1%), I–II st. (7,1%), schools with profound studying of separate objects (6,1%), gymnasiums, and lyceums (6,1%), teaching and educational complexes (17,3%), boarding school (1,0%), elementary schools (2,1%), preschool children's institutions (3,1%), out-of-school educational institutions (2,0%) and school (1,0%). The majority of SAH (64,3%) is located in rural areas also are small by the number of pupils and teachers. About 100 children study in six, till 300 children in 32 educational institutions, 18 – educational institutions – over 500 children among the analyzed SAH. The average number of teachers who work at these schools makes 46±23 persons, the minimum indicator – 17, maximum – 102, in particular, in a third of educational institutions of pedagogical workers is till 30 persons. A position of a social teacher is provided only in 21,2% (N=14) SAH of educational institutions, 42,4% (N=28) – a psychologist, 60,6% (N=40) – a medical worker, however in 16,6% of schools (N=11) of the last work not less than two.

Among the main reasons for entry into the network of SAH, respondents defined: 1) a requirement to create the corresponding outlook and to create conditions for the realization of capacity of society; 2) a desire to improve health of participants of the teaching-educational process; 3) a need for strengthening of work on questions of a healthy way of life of youth, in particular, sports and improving activity; 4) a desire to introduce new medico-pedagogical improving innovations, to create the system of monitoring of a state of health of pupils; 5) a requirement to set up cooperation on a healthy way of life with other educational institutions; 6) a need to improve material support of educational institution and its financing.

It should be noted the expressed administrative character of tasks which defined schools in design activity. It is possible to distinguish from them conceptual (the preservation and promotion of health of participants of the teaching-educational process, the formation of a conscientious and responsible attitude to health, the creation of favorable environment as to a necessary condition of education of the healthy personality), organizational (the adjustment of the relevant system of educational work, developing of the system of monitoring, the improvement of physical, mental and spiritual health of pupils by

Table 1

Theoretical structure of quality of life of youth

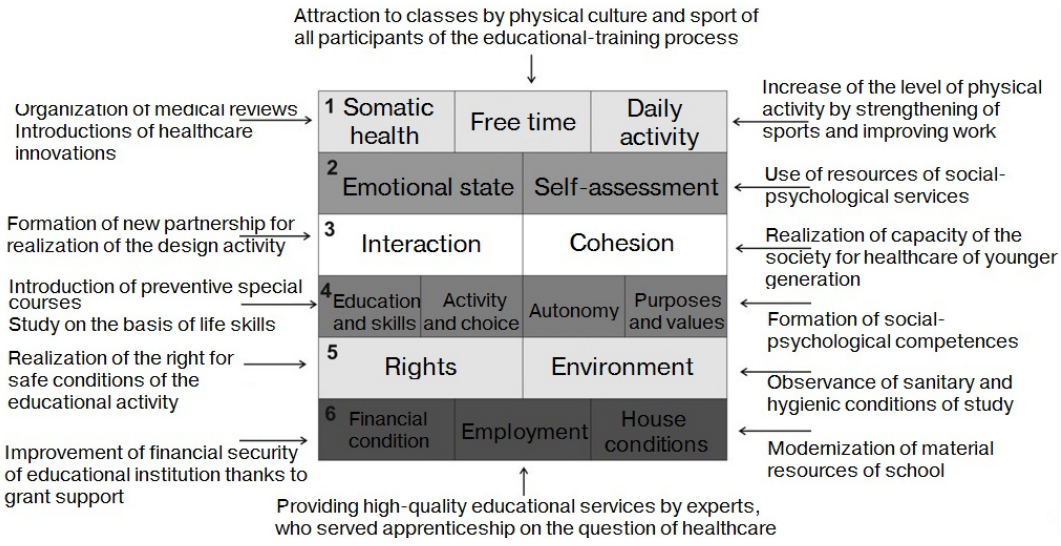
Domain	Subdomain	Indicators
Physical component	Somatic health	Health, food
	Daily activity	Level of physical activity, level of physical activity
	Free time	Recreation, hobby
Psychological component	Emotional state	Mood, feeling of happiness
	Self-assessment	Perceptions of oneself, control of own life
Social activity	Interaction	Social roles, social support, relations with a family, colleagues
	Cohesion	Social inclusion, social integration, social capital
Material component	Financial condition	Income, privileges
	Employment	Study conditions
	House conditions	Living conditions, characteristic of housing
Development and self-identification	Education and skills	Achievements, status, social, psychological, practical skills
	Activity and choice	Success, opportunities
	Autonomy	Control over own life, choice
	Purposes and values	Desires, expectations
External environment	Rights	Universal, according to legal documents
	Environment	Respect, advantage, equality, access for the public benefits, sanitary and hygienic conditions

means of introduction of the specialized preventive courses, the observance of sanitary and hygienic conditions, and so forth) and the tasks which are connected with a human factor (attraction to the healthcare activity of experts of a different profile, and to classes of physical culture and sport – to all participants of the teaching-educational process, the professional development of teachers and level of knowledge of parents concerning the preservation and promotion of health).

The expected results of activity of educational institution as Schools of assistance to health are directed to pupils, parents, pedagogical collective and society. As advantages to pupils it is possible to consider the creation of the healthcare educational environment which helps to reduce incidence, to improve the academic progress, to create and develop life skills which are necessary for the prevention of behavioral risks, ensuring positive changes in abilities and relations of pupils. According to all biographical particulars of the facultative courses of the preventive orientation – "Providing a healthy lifestyle and prevention of HIV/AIDS", "The future begins today", "Youth is at the crossroads", "Personal advantage. Safety of life. The public position", "Assistance to the educational work "Equal- is equal "among youth of Ukraine", "To be happy. I can do it", "Say NO to violence", "Useful skills" and so forth are introduced in all SAH. Hot meals, in particular, free for pupils of younger school and pupils of preferential categories are adjusted in all educational institutions. The majority of schools (84,1%) carry out the specialized study for participants of the project, in particular: 75,4% – for pedagogical workers, 76,8% – for pupils, 58,0% – for parents, 14,5% – for society. The activity of a number of schools of assistance of health promoted the integration of society, and the status of educational institution helped to get grant support according to projects of the European Union, the UN, or the Program of the development of education of Lviv which provided the modernization of material resources of school (purchasing of sports to stock, the power storing actions and so forth).

The project coordinator of the School of Assistance of Health is the director in the majority of educational institutions (49,3%), in 50,7% – these duties are fulfilled by the deputy director (23,3%), the teacher of bases of health (7,2%), the practical psychologist (4,3%), the teacher of physical culture (2,9%), the social teacher (2,9%). The working group which is responsible for the implementation of the project, functions in 68,1% of SAH of Lviv. The involvement in the healthcare design activity of health workers (at 10,1% of schools), teachers of Christian ethics (5,8%), initial classes (7,2%), members of parental committee (5,7%) and student's parliament (1,4%) is low. It is separately necessary to note on the different level cooperation which is adjusted by schools of assistance to health. SAH involve medical (91,3%), psychological (84,1%), and social (88,4%) services, religious (85,5%) and public (75,4%) organizations to the teaching-educational works. The mentioned establishments give advisory and educational help concerning a healthy lifestyle, lead discussions, lecture halls, seminars and trainings for pupils, and also round tables for parents and teachers, annual medical examinations. Only a half of Schools of assistance to health of Lviv (55,1%) set up the cooperation with other educational institutions in which activity relatively healthcare occupies the defining role, in particular, 1,4% (N=1) cooperate with foreign educational institutions, 17,4% (N=12) – with comprehensive schools which are located in other areas or the cities, 44,9% (N=31) – from SAH which are located in the same area. The cooperation at the All-Ukrainian, regional, local or regional levels was adjusted by 7,2% (N=5) schools of assistance of health of the Lviv region.

Seminars, trainings concerning the introduction of healthcare technologies, reorganizations of School, assistance of health which are focused on directors, deputy directors, teachers of bases of health, physical culture, psychologists who work at other schools of this educational district or area, are provided on the basis of the analyzed educational institutions. However SAH of Lviv carries out the important educational function and promotes the introduction of the latest healthcare technologies generally at the level of educational districts and areas. Schools of the network especially actively cooperate with other educational institutions of the respective educational districts which have no status of school of assistance



Pic. 1. Structural-function chart of influence of the healthcare design activity on quality of life of youth of school age:
1 – physical component; 2 – psychological component; 3 – social activity; 4 – development and self-identification; 5 – external environment; 6 – material component.

to health, and give them the necessary methodical help relatively healthcare and health-formation of participants of the teaching-educational process. The average quantity of SAH in the area – 3, most of all educational institutions of this type are at the Sokalskyi (9) and Brodivskyi (6) areas, least of all – in Peremyshlyanskyi and Pustomytivskyi (on one). There is at least one school of assistance to health only in a third of educational districts (31%). The greatest number of districts which are provided to SAH, in Sokalskyi and Turkivskyi areas – 71,4% and 66,7% respectively. The lowest – in Peremyshlyanskyi (16,7%) and Pustomytivskyi (12,5%) areas. The security of educational districts in other districts of the Lviv region makes 25–40%.

Respondents expect a number of positive displacements from the implementation of the project that the possibilities of educational institution connected with strengthening:

1. Integrative – transformation of the teaching - educational process in the joint activity of all its participants which is directed to the achievement of a condition of physical, spiritual and social wellbeing.

2. Adaptive – training of pupils for independent life, formation of adequate mechanisms of physiologic, psychological, social adaptation for conditions of world around which testifies to preparedness for an independent healthy lifestyle.

3. Healthcare and health-formation – creation of the healthy environment, preservation of health, decrease in chronic incidence, improvement of food of pupils, realization of right on safe and harmless working conditions and studies and so forth.

4. Academic – introduction of facultative courses of the corresponding orientation, healthcare technologies.

5. Material – improvement of material security of educational institution, improvement of security with didactic and methodical materials, concerning formation of a healthy lifestyle.

In general it is possible to claim that the design activity of schools of assistance to health provides the objective conditions of quality formation of life of youth. The activity of educational institution within the School of Assistance to Health project promotes quality providing life of youth as has the direct influence on a number of subdomains (pic. 1) [3].

So, the organization of medical reviews, introductions of healthcare innovations, strengthening of recreational, and sports and improving work provide the influence on the domain "Physical component". The healthcare activity in educational institution promotes integration and strengthening of the social capital (the domain "Social activity") by the maximum realization of capacity of society, association of efforts of experts of different level for the preservation of health of younger generation. The school of assistance of health is capable to improve wellbeing according to the domain "Material component" as additional financing for the modernization of material and technical resources helps to get the status of such educational institution and experience of design activity, and also to organize specialized study of pedagogical workers for the purpose of providing high-quality educational services. Preventive specialized training courses are introduced, study of children on the basis of life skills is organized that provides the formation of the system of values, social-psychological competence which are necessary for health, safety and success of a young person (improvement of quality of life according to the domain "Development and self-identification") at the schools of assistance to health.

The criteria of quality forecasting of life of respondents of school age taking into account the social-demographic indicators, and also indicators of the domains, "Physical component", "Emotional component", "Social activity" and "Development and self-identification" (tab. 2) are established by means of the logistic regression analysis.

According to the carried-out regression analysis the essential criteria of a high rate of physical wellbeing of youth is a sex (Or=2,20, CI=2,12–2,50), classes in sports section (Or=2,80, CI=2,56–3,21), classes of physical culture and sport more than once a week in free time, the level of physical activity at school (Or=2,43, CI=1,95–2,73), healthy eating habits (Or=1,52, CI=1,44–2,03), sports competence (Or=1,40, CI=1,21–1,65) and study at school of assistance to health (Or=2,29, CI=2,01–2,45). In case of the general mental wellbeing powerful influence studies in SAH (Or=3,11, CI=2,61–3,43) had the level of physical activity at school (Or=1,53, CI=1,34–1,68), classes in sports section (Or=2,13, CI=1,93–2,42), absence of bullying (to Or=1,82, CI=1,68–2,23), relations with schoolmates (Or=1,55, CI=1,23–1,87), sex (Or=2,60, CI=2,45–2,82), and residence (Or=2,11, CI=1,12–2,56). The row of essential predictors of wellbeing of youth is found when carrying out the analysis. Chances of a high rate of quality of life are higher by 2,2–2,6 times at males, by 2,1–2,8 times – at respondents who are engaged in sports section, by 1,3–2,4 times – at pupils who have the high level of physical activity, and 2,3–3,1 times – at youth from schools of assistance to health.

Conclusions

The number of objective conditions of quality formation of life of youth is found within the activity of educational institution according to the project "School of Assistance to Health". Wellbeing of pupils is established a predictor. Chances of a high rate of quality of life are higher by 2,2–2,6 times at males, by 2,1–2,8 times – at respondents who are engaged in sports section, by 1,3–2,4 times – at pupils who have the high level of physical activity, and 2,3–3,1 times – at youth from schools of assistance to health.

Prospects of the subsequent researches consist in introduction of the specialized preventive courses for the improvement of quality of life of participants of the teaching-educational process.

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Table 2

Predictor of quality of life of youth of school age

Indicator	General physical wellbeing		General mental wellbeing	
	OR	CI	OR	CI
Social-demographic				
Sex	2,20	2,12–2,50	2,60	2,45–2,82
Place of residence	1,15	1,10–1,38	2,11	1,12–2,56
Financial condition	0,67	0,42–1,17	0,82	0,43–0,98
Study at school of assistance of health	2,29	2,01–2,45	3,11	2,61–3,43
Physical component				
Regular nutrition	0,92	0,78–1,34	0,50	0,34–1,2
Healthy eating habits	1,52	1,44–2,03	1,32	1,21–1,45
Classes in sports section	2,80	2,56–3,21	2,13	1,93–2,42
Classes of hysical culture and sport more than once a week in free time	2,12	1,52–2,46	1,32	1,08–1,67
Level of physical activity at school	2,43	1,95–2,73	1,53	1,34–1,68
Pastimes in the fresh air	0,81	0,62–1,24	0,72	0,55–1,2
Admissions of study in connection with feeling sick	0,89	0,62–1,04	0,20	0,12–0,48
Mental component and social activity				
Relations with schoolmates	0,90	0,75–1,29	1,55	1,23–1,87
Bullying	1,14	1,12–1,38	1,82	1,68–2,23
Participation of parents in classes of physical culture and sport	1,20	1,13–1,65	1,32	1,1–1,45
Development and self-identification				
Academic competence	0,67	0,43–0,88	0,71	0,56–1,32
Sports competence	1,40	1,21–1,65	0,18	0,05–0,23

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Features of draws of corner kicks in games of teams of high qualification

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Purpose: *to define quantity and efficiency of corner kicks in games of teams-participants of the World Championship of 2014.*

Material & Methods: *analysis of scientific and methodical literature, registration of technical and tactical actions, methods of mathematical statistics. The research of the competitive activity was carried out with teams-participants of the World Championship of 2014.*

Results: *quantitative and quality indicators of draws of corner kicks in games of teams of high qualification are presented.*

Conclusions: *teams-participants of the World Cup of 2014 carried out 5,2 corner kicks. The efficiency of draw of corner kicks made 44,5% on average for a game.*

Keywords: *corner kick, pass, zone of a penalty area, flank, efficiency.*

Introduction

The works of many experts are devoted to questions of studying of the efficiency of implementation of standard provisions by football players of different qualification [1; 4; 6; 7; 8; 10].

Successful performance of any standard provision at gate of the rival is the prerequisite for a real completion of the attacking actions of a team [9; 12]. To such provisions concern: an initial blow from a midfield, penalty, free, corner, eleven-meter kick and a throw-in of a ball from behind a sideline, a blow from the gate and it is rather rare, a draw of a disputable ball.

Modern tactics and technique of draws of corner kicks creates a set of real opportunities to score a goal. The success at draws of this situation depends mainly on three major factors:

– from the clearness of planning and correctness of the organization of a game, which the ultimate aim of which – is the achievement of maximum efficiency of actions both certain football players and links, and teams in general;

– from the observance of the game discipline which us based on an accurate performance of the duties by each player;

– from the accuracy and timeliness of serving of a ball from an angular sector.

According to V. M. Shamardin [9], "contribution" of goals which are stuffed after a performance of corner kicks to the general productivity makes 5–11%.

These results are confirmed by data of G. A. Lisenchuk [5] according to which, teams in games of the World Cup of 1990 after a performance of corner kicks scored 9 goals from 115 (7,8%), and in the World Cup of 1994 – 7 goals from 141 (5%). According to some experts [2], "contribution" of the goals which are scored when performing corner kicks to the general productivity can be increased, in particular, by passes from corner kicks to those areas of a penalty area where conditions for goal optimum, and the choice of a rational trajectory of flight of a ball.

As authors [2] note, the number of the corner kicks which are carried out by a team in a game can fluctuate in very big limits – from zero to ten-fifteen. Both meeting teams are executed on average by ten-twelve corner kicks in competitions of high level for a match.

Slightly more corner kicks are appointed with the right part (from the point of view of the attacking team) that, most likely, it is possible to explain with the existence of lateral advantage at performance by a person of physical actions [3].

Players carry out corner kicks in two ways:

– a ball is sent directly to a penalty area of the defending team by the first contact (approximately in 90% of cases);

– a ball is drawn, carrying out several actions during a delivery of a ball to a shock position.

The efficiency of these ways of a performance of corner kicks from the point of view of probability of goal approximately identical (about 3%) is also comparable to the efficiency of the blows in gate which are struck from behind a penalty area from a game.

The objective of the research

To define quantity and efficiency of corner kicks in games of teams-participants of the World Cup of 2014.

Material and Methods of the research

Research methods: analysis of scientific and methodical literature, registration of technical and tactical actions, methods of mathematical statistics. The research of the competitive activity was carried out with teams-participants of the World Cup of 2014.

Results of the research and their discussion

Quantitative and quality indicators of corner kicks of teams-participants of the WC-2014 in different pieces of playing time are presented in the tab. 1.

Table 1
Quantity and efficiency of corner kicks in different pieces of playing time (n=128)

Time	Total amount	On average for a game	Efficiency
1–15	62	0,5±0,1	39,0±6,6
16–30	86	0,7±0,1	44,3±6,0
31–45	132	1,0±0,1	30,2±4,5
46–60	100	0,8±0,1	48,5±5,4
61–75	108	0,8±0,1	44,0±5,5
76–90	153	1,2±0,1	54,4±4,9
91–105	13	0,8±0,2	35,2±14,8
106–120	14	0,9±0,3	28,6±14,9
I time	280	2,2±0,1	35,7±3,5
II time	361	2,8±0,2	51,1±3,3
Overtime	27	1,7±0,4	29,9±11,1
Total	668	5,2±0,3	44,5±2,3

The results of the table demonstrate that the number of corner kicks gradually increased by the end of each of times. At the same time the efficiency of draws of corner kicks in different game pieces was unequal.

It is visible from the tab. 2 that teams executed slightly more corner kicks in the games WC-2014 on the right flank. So, from 668 corner kicks 360 was on the right flank and 308 on left. This circumstance, most likely, can be explained with the existence of lateral preference at performance by a person of physical actions.

Table 2
Quantity and efficiency of corner kicks on different flanks of the football field (n=128)

Flank	Total amount	On average for a game	Efficiency
Right flank	360	2,8±0,2	42,4±3,1
Left flank	308	2,4±0,2	46,9±3,4
Total	668	5,2±0,3	44,5±2,3

At the same time the efficiency of corner kicks on the left flank was higher (46,9±3,4%), than on the right flank (42,4±3,1%).

As a result of the conducted research it was established (tab. 3) that 113 corner kicks were drawn by means of short and average passes (on average for a game 0,9±0,1), and by means of a pass in a penalty area of the rival – 555 were drawn (on average for a game 4,4±0,2).

Table 3
Ways of draw of corner kicks (n=128)

Way of draw	Total amount	On average for a game	Efficiency
Short or average pass of a ball	113	0,9±0,1	100,0±0,0
Delivery of a ball in a penalty area	555	4,4±0,2	33,5±2,4
Total	668	5,2±0,3	44,5±2,3

It should be noted that the efficiency of draws of corner kicks by means of short passes in games of the World Cup made 100,0±0,0%, and on a delivery a ball in a penalty area – 33,5±2,4%.

Besides, it was established (tab. 4) that 533 passes were carried out from 668 corner kicks on high ground (4,2±0,2 on average for a game) and 135 – along the bottom (1,1±0,1 on average for a game).

Table 4
Trajectory of a flight of a ball at passes from corner kicks

Trajectory	Total amount	On average for a game	Efficiency
On high ground	533	4,2±0,2	33,1±2,4
Along the bottom	135	1,1±0,1	89,7±3,2
Total	668	5,2±0,3	44,5±2,3

At the same time the efficiency of passes on high ground made 33,1±2,4%, and along the bottom – 89,7±3,2%.

The analysis of ways of a delivery of a ball in a penalty area of the rival from corner kicks demonstrates that 285 were carried out from 555 passes in a goal range and 270 from gate.

Table 5
Way of a delivery of a ball in a penalty area from corner kicks (n=128)

Way	Total amount	On average for a game	Efficiency
In a goal range	285	2,2±0,2	30,9±3,2
From gate	270	2,1±0,2	35,5±3,3
Total	555	4,4±0,2	33,5±2,4

The efficiency of ways of a delivery of a ball in a penalty area of the rival was different. So, the efficiency of passes in a goal range made 30,9±3,2%, and passes from gate – 35,5±3,3%.

This situation is confirmed by practical experience and researches in different types of sport which show that it is more convenient to catch and return a ball when it moves to a sportsman, and more difficultly when the ball, moving on an

arch, as if it leaves him. It is caused by many reasons, mainly features of oculomotor reactions and biomechanical factors. Therefore it is easier for a goalkeeper and field players of the defending team to reflect the balls which were sent from corner kicks when they twist towards gate.
The data of volume and efficiency of the passes which are executed by football players from corner kicks in a goal range in different zones of a penalty area are presented in the table 6.

It is visible from the table that teams-participants of the WC-2014 executed 151 passes to the goalkeeper square, 123 passes – in the zone between a goalkeeper area and an eleven-meter mark, 10 passes – in the zone between an eleven-meter mark and the penalty line of the area and 1 pass out of limits of a penalty area.

At the same time football players in the games WC-2014 drove the ball in a penalty area in blow in a goal range of 78 times on a near bar, 166 times in an average zone and 41 times on a distant bar.

The data of volume and efficiency of the passes which are executed by football players from corner kicks from the gate in different zones of a penalty area are presented in the tab. 7.

These tables demonstrate that football players in games of the World Cup of 2014 executed in blow from gate 84 passes to the goalkeeper square, 162 passes – in the zone between a goalkeeper area and an eleven-meter mark, 22 passes – in the zone between an eleven-meter mark and the penalty line of the area and 2 passes out of limits of a penalty area. Also team players drove the ball in a penalty area in blow from gate 92 times on a near bar, 149 times in an average zone and 29 times on a distant bar.

As a result of the conducted research it was established (tab. 8) that from 668 corner kicks in the games WC-2014 33 draws (4,9%), in a penalty area – 460 (68,9%), blow in gate – 151 (22,6%), goal – 24 ended with a delivery of a ball with loss of a ball (3,6%).

Conclusions

1. Teams-participants of the WC-2014 on average for a game carried out 5,2±0,3 corner kicks, with the efficiency of 44,5±2,3%.

2. From 668 corner kicks 113 was played by means of short passes and 555 – by means of a delivery of a ball in a penalty

Table 6

The volume and efficiency of the passes executed by football players from corner kicks in a goal range in different zones of a penalty area (n=128)

Zone of area	Goalkeeper area	Between the goalkeeper area and an eleven-meter mark	Between an eleven-meter mark and the penalty line of the area	Out of limits of a penalty area	Total
Near bar	54 (13)	22 (12)	2 (2)	0	78 (27)
Average zone	85 (12)	79 (26)	1 (1)	1 (1)	166 (40)
Distant bar	12 (6)	22 (11)	7 (6)	0	41 (23)
Total	151 (31)	123 (49)	10 (9)	1 (1)	285 (90)

Note. *In brackets – exact passes.*

Table 7

The volume and efficiency of the passes executed by football players from corner kicks from gate in different zones of a penalty area (n=128)

Zone of area	Goalkeeper area	Between the goalkeeper area and an eleven-meter mark	Between an eleven-meter mark and the penalty line of the area	Out of limits of a penalty area	Total
Near bar	49 (8)	41 (12)	2 (2)	0	92 (22)
Average zone	33 (6)	104 (43)	11 (6)	1 (1)	149 (56)
Distant bar	2 (1)	17 (8)	9 (7)	1 (1)	29 (17)
Total	84 (15)	162 (63)	22 (15)	2 (2)	270 (95)

Note. *In brackets – exact passes.*

Table 8

Productivity of draws of corner kicks (n=128)

Result	Quantity	%
Loss of a ball	33	4,9
Delivery of a ball to a penalty area	460	68,9
Blow in gate	151	22,6
Goal	24	3,6
Total of corner kicks	668	100,0

area of rivals.

3. 285 from 555 passes were carried out in a goal range and 270 from gate in a penalty area of the rival.
4. The efficiency of passes in a goal range made 30,9±3,2%, and passes from gate – 35,5±3,3%.

5. Football players of the attacking and defending team have to identify from what corner and what leg a player carries out a pass. A ball is directed more often to the average zone between the line of a goalkeeper area and an eleven-meter mark, when performing corner kicks with premise a ball from gate, to what the defending team has to be ready. It is necessary to operate on a near corner of a goalkeeper area and a near bar especially attentively during corner kicks when a ball is tightened up to gate. It is desirable to leave in these zones of one or two players which will act on a ball during a defense. In the absence of the defending player on a near corner of a goalkeeper area, a player who is carrying out a pass, and the opening players have to be able to identify independently similar situations during a match and to use a free zone for the implementation of blow in gate.

Prospects of further researches. The further researches will be devoted to studying of corner kicks in games of the European championship of 2016.

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Plan physical activities for spring men based on their physical condition

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Purpose: *to find the features of physical condition of men before their vigorous physical activity sessions in the winter season, and test their effectiveness.*

Material & Methods: *investigated body mass index, physical condition of method by Baevsky in men 35–48 years leading a healthy lifestyle. Research conducted morning and evening every day. Results were compared: the day before, the day of vigorous physical activity, and with average per month. Physical activity was studied by the IPAQ method.*

Results: *found significant ($p<0,05$) differences in the physical condition of men before and the day of physical activity of high intensity. Marked changes were: body weight, the heart rate, the adaptive capacity by Baevsky. The most significant figure identified as a marker. To test its effectiveness was offer to men plan individual vigorous physical activity under this marker. The result was significant ($p<0,05$) increase the number and duration of vigorous physical activity, better physical condition to 10,73%.*

Conclusions: *the physical condition of age men plays an important role in planning their vigorous physical activity. Comparative deconditioning from the previous day for the test Baevsky 3,09%, can be used for operational planning of physical activity of high intensity on that day.*

Keywords: *vigorous physical activity, physical condition, planning of physical activity, IPAQ.*

Introduction

Physical State (PS) of a person is, at the same time, the display and the subconscious purpose of his life. All activity of a person is closely connected from his PS and directed to his improvement. An adequate adaptation of a human body to changeable external conditions is rewarded by positive health and perfect PS. The way of life of a person as an intelligent adaptation, during all his historical development depended on seasonal changes of the external environment. The external conditions of the environment have No such influence on a way of life of a person in current trends of globalization of the society. But the genetically put information on changes of a way of life according to seasonal changes is confirmed by neurohumoral processes of an organism [3; 4; 12; 20] and physical activity (PA) of a person [7; 18]. Enough researches on identification of changes of PS according to seasonal changes, both at teenagers, and among people of mature age are carried out. The supervision over teenagers of 12–13 years old found the increase in their PS by 1–2% with each increase for 10 °C of the ambient temperature [11]. Investigating PA by means of the accelerometer of Japanese of 65–83 years old within a year, the reduction of PA was revealed in the winter. The highest PA fell on spring and fall. Indicators of PA were up to standard average annual in the summer, and PA duration was more in the summer, than during other seasons [24]. Other researches claim that PA decreases in connection with a bad physical condition of people of the advanced age [10] in the winter. The weekly expense of energy in PA of men of mature age was 15-20% higher in the spring and in the summer [19]. The research of PA at teenagers 9, 15 years old also found big activity in the spring, than in the winter [17]. The analysis of references confirms the priority value of the spring season in PA of a person.

Aerobic physical activity of average and high intensity is especially effective for maintenance of an optimum functional condition of a person [8; 9; 13]. Physical activity of high intensity (PAHI) has a special value for health of which positive changes in PS are result, – pressure decrease, improvements of a metabolism, optimization, and height-weight indicators [15; 16]. The research of Gebel K., et al (2015) testifies to the value of PAHI, where for more, than 200000 Australians of 45–75 years old was observed within eight years. The mortality rate from different diseases during this time was investigated. Among people who weren't engaged in physical activity of average and high intensity it was 8,34%, among those who were engaged 10–149 min/week, – 4,81%; 150–299 min/week – 3,17%; 300 and more – 2,64%. Among those which weren't engaged PAHI, the mortality rate made 3,84%; at whom PAHI made less than 30%, the mortality rate made 2,35% and who had PAHI more than 30%, mortality rate made only 2,08% [13]. The number of classes of PAHI at men of mature age can vary from 3–4 for a week till 2–3 for a month [5]. Most of Europeans of mature age were never engaged regularly in PAHI or sport [21]. The existing recommendations of World Health Organization (WHO) concerning PAHI are limited to only a total of the recommended minutes for a week – not less than 75, and the number of classes – not less than two, or 20 min, three times for a week [14].

PA of average intensity doesn't demand considerable physical activities and can be implemented in the course of household or social activity. It is necessary certain physical pre-

paredness of an organism for the physical activity of high intensity (PAHI) at mature age which is displayed in a physical condition of a person, health and desire, to be engaged in it. The feature of planning of such PA at men of mature age has their independence [1], desire to derive pleasure and to improve the emotional state [22]. The realization of this desire is connected with a healthy organism and the corresponding physical state. Therefore, in our opinion, there will be actual data on features of their PS that precede, and it is possible, and induce to such type of PA in the spring period for planning and management of PAHI of men of mature age.

The purpose of the research

To define features of a physical condition of men of mature age which can be used for operational planning of PAHI in the spring and check their efficiency.

Material and Methods of the research

The experiment consisted of two parts, laboratory and forming. 29 people of 35–50 years old were selected without chronic diseases for the experiment which hold a healthy lifestyle and independently PAHI in the form of jogging, swimming, classes in a gym which physical condition in days of researches didn't exceed average monthly conditional norm of the adaptation potential of Bayevsky (APB) in 1,80 absolute units are engaged (a. u.) [2]. The research was conducted in the south of Ukraine in the spring within 30 days of the laboratory experiment and 30 days of the forming experiment.

The body weight index (BWI) was studied for studying of physical development of men ($kg \cdot m^{-2}$). Estimations of a physical state were carried out two times per day: in the morning and in the evening by the APB index which values calculated on a formula:

$$APB=0,011 \cdot HR +0,014 \cdot APs+0,008 \cdot APd+0,014 \cdot Age+0,009 \cdot BW–0,009 \cdot LB–0,273,$$

where HR – heart rate bpm^{-1}); APs – systolic arterial pressure (mm of mercury.); APd – diastolic arterial pressure (mm of mercury.); BW – body weight (kg); LB – length of a body (sm); Age – age of an investigated.

Body weight was measured by electronic scales with a margin error till 50 gr. Arterial pressure and heart rate (HR) were measured by automatic tonometers of Contec 08a. APB was calculated every morning after a night dream and every evening before going to bed with observance of necessary recommendations of WHO (1999). PAHI was investigated according to the international questionnaire IPAQ (International Physical Activity Questionnaire) [5; 23]. The number of classes for week and their duration were studied. The received results were fixed in individual diaries. The laboratory experiment included comparison of average monthly day indicators of PS of men with indicators the day before and in day of PAHI. The indicators of PS of men measured in the morning (M), in the evening (E) and the difference between them in a day (M-E), and for the last night (E-M) were compared. Also we gave the difference between PS indicators as a percentage, by a formula:

$$x=(b–a):a \cdot 100\%,$$

where x – percent size; a – the previous indicator, b – the following indicator of the compared couple of numbers.

The percent was considered only before the first day in case of PAHI of men which is recorded several days in succession.

Men were engaged in PAHI (run, swimming, sports, riding by bicycle) in the schedule habitual for themselves in the laboratory experiment. It was offered to them to plan PAHI according to the every day information on PS in the forming experiment. Results of the forming experiment are processed according to weekly data.

Statistical calculation was carried out by methods of nonparametric statistics as some results didn't answer normal distribution. Interquartile scopes (IS), median (Me) were defined. The comparison between groups of indicators was carried out by means of criteria of sign ranks of Wilkokson. The programs EXEL and Statgraphics16 were used.

Results of the research and their discussion

Investigating the existence of differences between usual days and days from PAHI of men, we compared their PS (tab. 1). The ssential differences were found only in some studied indicators. In usual days the body weight of men (M) was statistically identical with days of PAHI. HR (M) had also No reliable difference. APB (M) in days of PAHI was authentically big for 1,21% in comparison with usual days, and APB (E) – for 1,14%. Authentically differences in change of APB of men during the day (M-E) and for the previous PAHI night (E-M) aren't revealed.

The search of differences in PS of men the day before and in days of their PAHI (tab. 2) was the major. Body weight (M) was authentically big in days of PAHI for 0,32%, HR (M) is also 2,37% more, APB (RM) – for 3,09%, APB (E) – for 2,89%. Differences between APB indicators in a day (M-E) and for the last night (E-M) – weren't.

Investigating changes in PS of men, it was necessary to be convinced of really smaller indicators of PS of men on the eve of PAHI in comparison with usual days, have also compared indicators of PS of men on the eve of PAHI with usual days (tab. 3).

The majority of indicators of PS of men on the eve of PAHI had authentically smaller values ($p<0,05$) in comparison with usual days. So, body weight (M) is the day before 0,3% less, HR (M) is 2,56% less, APB (M) is 1,85% less, APB (E) – for 1,73%. Also reliable difference is observed between APB (E-M). In day on the eve of PAHI APB difference in a night made 0,14 a. u., and in usual days – 0,09 a. u., what is 35,71% more that demonstrates the best renewal of an organism in a night on the eve of PAHI. The essential difference in APB (E) the day before PAHI with usual days didn't appear.

Differences in PS of men of PAHI on the eve of them were used by us as markers for operational planning of PAHI in the forming experiment where it was offered to men to plan PAHI that day when APB (M) increased more than by 3,09% in comparison with previous day.

As a result of the forming monthly experiment positive changes, as in PA, so, and in PS of men (tab. 4) took place.

Table 1

Comparison of indicators of a physical condition of men of usual days with days of physical activity of high intensity

№	Indicators	Usual days (n=718)	PAHI (n=159)	Difference (%)	W (p)
		Me (95%IP)	Me (95%IP)		
1	Body weight (M), kg	88,05 (85,27;90,83)	88,07 (84,37;91,77)	–	62168> 0,05
2	HR (M), bpm^{-1}	50,53 (47,18;53,88)	50,44 (47,62;53,26)	–	55342 >0,05
3	APB (M), a. u.	1,65 (1,63;1,67)	1,67 (1,63;1,7)	1,21	76880,5 <0,05
4	APB (E), a. u.	1,76 (1,75;1,78)	1,78 (1,74;1,82)	1,14	74187,5 <0,05
5	Difference of APB (M-E), a. u.	–0,11 (–0,13;–0,09)	–0,12 (–0,16;–0,08)	–	63845,5 >0,05
6	Difference of APB (E-M), a. u.	0,09 (0,05;0,12)	0,1 (0,06;0,13)	–	57651 >0,05

Table 2

Comparisons of indicators of a physical condition of men the day before and in days of physical activity of high intensity

№	Indicator	The day before (n=131)	PAHI (n=159)	Difference (%)	W (p)
		Me (95%IP)	Me (95%IP)		
1	Body weight (M), kg	87,79 (84,04;90,84)	88,07 (84,37;91,77)	0,32	29347 <0,05
2	HR (M), bpm^{-1}	49,27 (46,82;51,72)	50,44 (47,62;53,26)	2,37	33231 <0,05
3	APB (M), a. u.	1,62 (1,57;1,67)	1,67 (1,63;1,7)	3,09	45151 <0,05
4	APB (E), a. u.	1,73 (1,70;1,77)	1,78 (1,74;1,82)	2,89	34640 <0,05
5	Difference of APB (M-E), a. u.	–0,11 (–0,15;–0,7)	–0,12 (–0,16;–0,08)	–	22531 >0,05
6	Difference of APB (E-M), a. u.	0,14 (0,94;0,18)	0,1 (0,06;0,13)	–	24878 >0,05

Table 3

Comparisons of indicators of a physical condition of men on the eve of physical activity of high intensity with usual days

№	Indicator	On the eve PAHI (n=159)	Usual days (n=718)	Difference (%)	W (p)
		Me (95%IP)	Me (95%IP)		
1.	Body weight (M), kg	87,79 (84,04;90,84)	88,05 (85,27;90,83)	0,3	68721 <0,05
2.	HR (M), bpm^{-1}	49,27 (46,82;51,72)	50,53 (47,18;53,88)	2,56	76484 <0,05
3.	APB (M), a. u.	1,62 (1,57;1,67)	1,65 (1,63;1,67)	1,85	66154 <0,05
4.	APB (E), a. u.	1,73 (1,70;1,77)	1,76 (1,75;1,78)	1,73	63478 <0,05
5.	Difference of APB (M-E), a. u.	–0,11 (–0,15;–0,7)	–0,11 (–0,13;–0,09)	–	32817 >0,05
6.	Difference of APB (E-M), a. u.	0,14 (0,94;0,18)	0,09 (0,05;0,12)	35,71	56750 <0,05

Table 4

Comparisons of indicators of physical activity and physical condition of men of the laboratory and forming experiment

№	Indicator	Before the experiment (n=105)	After the experiment (n=96)	Difference (%)	W (p)
		Me (95% IP)	Me (95% IP)		
1.	BWI (kg·m^{-2})	28,33 (24,89;31,77)	27,89 (24,38;31,4)	1,55	1747 <0,05
2.	PAHI (quant./week)	1,58 (0,07;3,66)	1,88 (0,11;3,65)	18,99	2854 <0,05
3.	PAHI (min/week)	20,92 (14,39;27,45)	30,63 (21,61;39,63)	46,41	3487 <0,05
4.	HR M (bpm^{-1})	51,95 (46,17;57,73)	49,07 (46,84;51,3)	5,54	2309 <0,05
5.	APB M (a. u.)	1,77 (1,7;1,84)	1,58 (1,48;1,68)	10,73	2852 <0,05

BWI of men has increased by 1,55%. The number of classes of PAHI in a week increased by 18,99%. Time of classes increased by 46,41%. HR (M) decreased by 5,54%. APB (M) also improved for 3,13%.

The selected contingent for the research had insignificant increase in IBW (for 12%) that can be carried, at normal indicators of PS, to the most part of muscular tissue, than to fatty. PAHI made only 25% of the recommended number of classes for week and 27% of the recommended minutes. The physical condition of men was in relative norm; APB (M) was less than 1,80 a. u., HR (M) also testified to healthy cardiovascular system.

The search of features of PS of men included comparison of their PS in usual days and days from PAHI in the spring period. It gave the chance to estimate influence of PA on their organism. The insignificant increase in APB (E) testified to tension of the cardiovascular system as a result of PAHI. The reliable increase in APB (deterioration in PS) of men in days of PAHI defined in the morning informational content of PS this test in relation to classes of PAHI.

Differences of indicators of PS of men the day before and in days of PAHI were the most significant. The increase in body weight, the relative deterioration in HR, APB (M) in days of PAHI became a reason for the accounting of these changes in the subsequent operational planning. Percent of changes of PS of men were big in comparison with usual days. APB (M) had the greatest percent – 3,09 which we used in the subsequent research for operational planning of PAHI.

The comparison of PS of men on the eve of PAHI with usual days testified that PS of men was the best not only for days of PAHI in a threshold to PAHI, but also it is better, than in daily. It indicates importance of PS of men in a threshold to classes of PAHI that it can be significant in the made decisions to classes of PAHI next day. The research APB of evening of previous day and morning (E-M) found the best obnovitelny process during a dream on the eve of PAHI, than in usual days.

The reliable differences of APB morning-evening between the comparing days weren't found that displays adequate physical activity to a physical condition of men in all studied days.

Byresults of the forming experiment, we can claim that the accounting of APB (M), especially its differences with the previous day, depends the week number and duration of PAHI of men which in turn optimum influences PS of men during the spring period.

Conclusions

Physical state plays the importance in PAHI of men of mature age. APB (M) which increase by 3,09% during the spring period, can be a reason for the operational planning this day of PAHI, can be the most informative and available indicator of PS to the mass application. The accounting of this indicator has the efficiency in optimization of PAHI and PS of men of mature age who lead a healthy lifestyle.

Prospects of the subsequent researches consist in the studied features of a physical condition of men which promote PAHI in other seasonal periods.

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Physical state of middle-aged women with consideration of experience training of aerobic orientation

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Purpose: *to study the physical state of middle-aged women with long-term experience of regular training of aerobic orientation.*

Material & Methods: *in the work presented results of the study of 2 experimental groups with experience training of aerobic orientation from 3 to 5 years and more than 10 years. The features of physical state were certain.*

Results: *it is set – women with experience of training more than 10 years had significantly lower body weight and body fat percentage, the best power indicators and tolerance to physical activities, higher aerobic possibilities in the absence of significant differences in the indicators of the respiratory system.*

Conclusions: *the results showed a positive effect on the physical state of middle-aged women with long-term training of aerobic orientation.*

Keywords: *physical state, women, middle-aged, aerobic exercises.*

Introduction

Recent studies show the close connection of health and physical work capacity with lifestyle, volume and character of physical activity of middle-aged women [2; 14]. The concept of the middle-aged specifies on the transitional state of organism of the human body when starting processes that affect all organs, systems and their regulation, increasing the likelihood of pathological conditions, but it should be noted that the above-mentioned changes at this age have of the compensatory character when the loss of one qualities is replaced by other [3; 13].

The question of optimal physical activity combined with a balanced diet and lifestyle that support indicators and parameters of the body of women are reflected in the works of both domestic and foreign authors [1; 3; 7]. Numerous studies have identified a number of patterns of dynamics body composition, functional state of middle-aged women, depending on the forms and methods of physical activity. The expediency and efficiency of the use of loading of aerobic orientation are proven [16]. Currently, the most popular are aerobics fitness training that have a stable positive motivation, a large number of areas [4; 8; 15]. A variety of means and methods which used in modern aerobics by properly organized classes can give general-health and electoral effects, but it should be noted that at this time there are differences in the results of studies related with modality of training programs, assessment criteria, characteristics of surveyed (age, status) and the duration of investigations. Thus, as a result of the impact of a six-month study program combining aerobic and strength training in middle-aged women with abdominal obesity enabled state improving lifestyle of women, reduction in serum lipids, and therefore the content of fat, increase lean body mass [8–10]. However, new technologies allow us to understand the molecular mechanisms that demonstrate the negative impact on the strength capabilities and adaptive processes in the body because of combination of aerobic and strength training, which creates negative changes in cellular protein that controls energy balance of the cell and inhibit genome eEF2, which is an important factor for protein's synthesis, which leads to disorders of skeletal muscle adaptation [11].

A study of the twelve-week aerobic exercise, which included cycling and walking for 30 min. / day at a relatively low intensity (60% of maximum heart rate) in the plasma levels of Klotho with special emphasis on arterial stiffness in postmenopausal women revealed that aerobic exercises caused an increase in the plasma concentration of Klotho, which increases the resistance of cells to disruption of the normal functioning and aging. The study also showed a correlation between plasma concentration and arterial stiffness Klotho [12].

Thus, facilities of fitness-aerobics help to improve functional status and to increase physical activity of middle-aged women, although some aspects concerning their selection and impact, combining with other types of exercise has not been studied and require clarification. There are no publications to study the impact on women with long-term experience of aerobic training. Comparison of the dynamics of adaptive changes, functional status, body composition of women who have had aerobic training for over a year we have not been found in the modern researches. That demand study and analysis and determines actuality of theme, defines the purpose of work.

The connection of work with the scientific programs and themes

The study was carried out within the topic "Differentiation use of means and methods of physical education based multifunctional criteria of physical development, functional state of the cardiovascular, respiratory and sensory-motor systems»

(№ state registration 0109U000210).

The purpose of the research

Examine the physical state of middle-aged women with long-term experience of regular physical activity of aerobic orientation.

Task of research:

1. On the basis of the literature study information on the effects of regular physical activity of aerobic orientation on middle-aged women.

2. To study the physical development of middle-aged women with long-term experience of regular physical activity of aerobic orientation.

3. Define the parameters of routine indicators of cardio-respiratory system of middle-aged women with long-term experience of regular physical activity of aerobic orientation.

4. To analyze the level of physical state of middle-aged women with consideration of experience of regular physical activity of aerobic orientation.

Material and Methods of research

In the work presents the results of the inspections of 19 women, who were divided into two experimental groups. The first experimental group (EG_1) consisted from 10 women who had experience of regular training (3 times per week) aerobic orientation since 3 to 5 years, the average age of this group of women was 37,9±5,9 years. The second experimental group (EG_2) consisted from 9 women with experience of regular training of aerobic orientation over 10 years, the average age of women – 44,6±5,5 years. At this stage were study the features in physical state, which were characterized on the basis of analysis of parameters of physical development and routine performance of the cardio-respiratory system.

The estimation of physical development was conducted by means of the basic anthropometric measuring: lengths of the body (LB, cm) and the masses of body (MB, kg), circumferences of neck (cm), waist (cm), chest (cm), thigh (cm), and dynamometry (kg). Body fat was determined by means of device of OMRON (BF, %), body mass index (BMI, kg/m^2) was calculated as weight (masses of body (kg)/height (m^2)), vital capacity of lungs (VCL, ml) was determined by dry-air lung-tester. Research of hypoxia's firmness of organism, were conducted by tests with a breath-holding on exhalation (Genchi, c) and inhalation (Shtange, c). Indexes of the cardiovascular system – heart rate (HR, min^{-1}), systolic blood pressure (SBP, mmHg) and diastolic blood pressure (DBP, mmHg) were measured in relative muscle and mental rest. Conducted measurements were the basis for calculating of the Kerdoe's vegetative index (KVI), adaptation potential of Baevsky (AP), coefficient of efficiency of circulation of blood (KECB), level of physical state (LFS) of Pirogova and Skybinskaya's index (IS) [6]. Study of aerobic capacity (VO_{2max}) was conducted by system of estimation of somatic health level (SHL) of G.L. Apanasenko. Authenticity of differences between groups was determined on the basis of non-parametric criterion of Mann-Whitney.

Results of the research and their discussion

The results of the analysis of parameters of physical development of the women studied groups are presented in table 1. Analysis of the data showed that MB of women EG_2 was significantly lower ($p<0,05$) than EG_1: EG_1 – 62,5 (54,0; 71,0) kg, EG_2 – 55,0 (54,5; 62,0) kg, while LB of women in both groups had no plausible differences: EG_1 – 163,0 (160,0; 165,0) cm, EG_2 – 163,0 (162,0, 172,0) cm. The last stipulated reliable differences of BMI ($p<0,05$) in EG_2 were less – in EG_1 – 23,7 (20,0; 26,8) kg/m^2, in EG_2 – 21,0 (20,8; 21,1) kg/m^2 (table. 1). Substantially complement information about physical development of these groups of women indicators of BF, the analysis of that witnessed substantial predominance BF in EG_1. BF in EG_1 was 30,7 (27,0; 32,7)%, and in EG_2 – 23,6 (22,5; 28,2) %. That's, women with longer experience of regular aerobic exercise indicated significantly smaller contribution of fat tissue in the structure of the component body. Complemented by the results of measurement data circumferences of the body, namely – the waist and thighs, which in EG_2 were certain less ($p <0,05$): circumference of waist in EG_1 – 75,5 (70,0; 88,0) cm, in EG_2 – 73,0 (72,0; 75,0) cm; circumference of thigh in EG_1 of – 52,5 (49,0; 54,0) cm, EG_2 – 51,0 (49,0; 52,0) cm.

That reduction in BF women of EG_2 was by decrease the layer of fat on the lower limbs and trunk (waist). A similar trend was observed in terms of circumference in pause of the chest, but in our study of probability wasn't proven ($p > 0,05$). Enough informative indicators was carpal dynamometry, which was absolute values differed significantly in women EG_1 and EG_2. It concerned the power right hand, which was significantly ($p > 0,05$) greater in women EG_2: EG_1 – 23,5 (22,0; 24,0) kg, against EG_2 – 25,0 (24,0; 26,0) kg. That was confirmed by calculating the strength's index (SI), whose meaning in EG_2 significantly higher ($p<0,01$). Some attention, from the standpoint of the characteristics of the muscular component of the body structure and strength abilities studied groups of women, deserve indicators measuring circumference of neck that in women EG_2 significantly ($p > 0,05$) higher, EG_1 – 31,5 (30,0; 32,0) cm, EG_2 – 32,0 (31,0, 33,0) cm (table 1).

An important characteristic of the physical state of the person are parameters of functioning cardio-respiratory system that define adaptive and reserve capacity of the organism and ability adequate course of adaptation and gamogenetic mechanisms. Typically any characterization of cardio respiratory system begins from the most accessible for measuring parameters such as heart rate and blood pressure (BP). To interpret the physical condition using a number of account indexes which can qualitatively describe the progress of the above-mentioned mechanisms.

Taking into account results, that we got in the investigated groups of women it should be noted that on the indicators of HR and BP of group EG_1 and EG_2 authentically ($p<0,05$) differ and show more economy variant of systemic hemodynamic in EG_2. Indicators of HR in EG_2 – 73,9 (72,6; 78,5) min^{-1} against 79,4 (71,3; 89,2) min^{-1} of EG_1; indicators of SBP in EG_2 – 100,0 (98,0, 104,0) mmHg against 110,0 (108,0, 120,0) mmHg in EG_1 (table 2). Thus, data of measuring of DBP differences not marked. Besides, it is worth noting, that indicators of SBP and DBP, as characteristic for middle-aged women are substantially higher, than got by us in the surveyed groups of women, who regularly had physical activities of aerobic orientation

Table 1

Features of parameters of physical development of women EG_1 and EG_2

Indicator	EG_1	EG_2
MB, kg	62,5 (54,0; 71,0)	55,0 (54,5; 62,0)*
LB, cm	163,0 (160,0; 165,0)	163,0 (162,0; 172,0)
Circumference of neck, cm	31,5 (30,0; 32,0)	32,0 (31,0; 33,0)*
Circumference of waist, cm	75,5 (70,0; 88,0)	73,0 (72,0; 75,0)*
Circumference of chest (pause), cm	86,0 (83,0; 91,0)	86,0 (84,0; 86,0)
Circumference of chest (inhalation), cm	91,0 (87,0; 93,0)	90,0 (87,0; 91,0)
Circumference of chest (exhalation), cm	84,5 (80,0; 88,0)	84,0 (82,0; 86,0)
Chest's amplitude, cm	6,0 (5,5; 6,5)	6,0 (5,0; 7,0)
Circumference of thigh, cm	52,5 (49,0; 54,0)	51,0 (49,0; 52,0)*
Dynamometry (right hand), kg	23,5 (22,0; 24,0)	25,0 (24,0; 26,0)*
Dynamometry (left hand), kg	21,0 (20,0; 22,0)	20,0 (18,0; 22,0)
Dynamometry of trunk, kg	50,0 (49,0; 52,0)	47,0 (43,0; 59,0)
VCI, ml	3050,0 (2900,0; 3300,0)	3100,0 (3000,0; 3500,0)
BF, %	30,7 (27,0; 32,7)	23,6 (22,5; 28,2)*
BMI, $kg \cdot m^{-2}$	23,7 (20,0; 26,8)	21,0 (20,8; 21,1)*
VCI, $ml \cdot kg^{-1}$	54, 8 (40,3; 56,1)	50,0 (48,7; 57,7)
SI, %	36,9 (33,8; 40,7)	41,9 (37,3; 47,3)**

Note. ** – data probable differences, p<0,05; ** – p< 0,01*

and range within the limits of 120/80 mmHg.

Fully logical were reliable (p<0,01) differences of derivative indexes in basis of calculation of the fixed data of HR and SBP – Robinson's index and KECB. Thus, the Robinson's index and KECB in EG_2 was 66,0 (60,0; 72,0) and 2100,0 (1980,0, 2160,0) against 78,0 (72,0; 84,0) and 3120,0 (2640,0, 3600,0) in EG_1, accordingly. To assess the tolerance of the organism to physical loading (as part of the physical state) we considered the speed of recovery of the cardiovascular system after a standard exercise – 20 squats in 30 seconds (Martine's test). We can see in the table 2, that in EG_2 time of restitution is significantly lower (p<0,05), confirming improved tolerance because of long-term of regular exercises of aerobic orientation, which is quite expected.

Certain noteworthy deserves estimation of SHL of Apanasenko; qualitative characteristic of it has directly proportional dependence from VO_{2max}. So, if we turn to the qualitative assessment of the results, the median data for both groups of women was in the middle range of the SHL, EG_1 at the lower limit, but EG_2 – on top. At the same time, between of the crossing values of points the reliable differences of groups (p<0,01) are marked.

We have to remind, that concordantly with G. L. Apanasenko middle SHL answer value of VO_{2max} 29±4 ml/min · kg, higher of the middle – 41±3 ml/min · kg, which are on verge of tolerance [1]. The last allows asserting, that the women of EG_2 had of value VO_{2max} higher. It's with consideration of the training orientation also enough expected.

Data of calculation of Pirogova's LFS are complement information about physical state and witnessed about higher LFS of women of EG_2, which with consideration of differences from men, what lies in the calculation formula, can be described as above average, while of EG_1 – average. According to a calculation by R.M. Baevsky's AP studied groups of women are not different, but their majority on the level of satisfactory adaptation: AP of EG_1 – 2,25 (1,96; 2,43), of EG_2 – 2,14 (1,77; 2,32).

Substantial, from the position of interpreting the physical state of the women were calculation of the KVI, which characterizing the prevalence and impact of sympathetic or parasympathetic branches of regulation of the vegetative involuntary nervous system, although in recent years there were publications that insist on other maintenance of this index [3,10].

At the same time, we received reliable (p<0,05) differences between the study groups of the KVI, which allow to assert, that state of vegetative regulation in EG_1 is unbalanced and, to some extent, there is predominance of parasympathetic influences, while in EG_2 – it is optimized in a sufficiently narrow range of normative values that demonstrate state of the balance of vegetative regulation.

The smallest difference between the groups EG_1 and EG_2 were in data of the functional state of the respiratory system. Recall, that we weren't registered reliable differences in data of VCL and VCI (table 1).

Analogical results we were got at the analysis of data of tests of hypoxia's firmness – Shtange and Genchi. The last found a reflection in absence of reliable differences between the calculation of data of IS, which between of the investigated groups didn't differ and for the qualitative characteristic proved satisfactory and well state of cardio-respiratory system in both groups of women (table 2).

Conclusions

1. The study of literary sources shows appropriateness and effectiveness of physical activity of aerobic orientation for middle-aged women, but some aspects concerning their se-

Table 2

Differences of conservative data of cardio respiratory systems of women of EG_1 and EG_2

Indicator	EG_1	EG_2
HR, min^{-1}	79,4 (71,3; 89,2)	73,9 (72,6; 78,5)*
SBP, mmHg	110,0 (108,0; 120,0)	100,0 (98,0; 104,0)*
DBP, mmHg	70,0 (60,0; 80,0)	70,0 (66,0; 72,0)
Robinson's index, min^{-1}· mmHg/100	78,0 (72,0; 84,0)	66,0 (60,0; 72,0)**
Time of the restitution, s	105 (60; 120)	85 (60; 90)*
A sum of marks by system of estimation SHL	7 (6; 9)	11 (7; 13)**
KVI	0,06 (-0,33; 0,17)	-0,03 (-0,06; 0,03)*
Baevsky's AP	2,25 (1,96; 2,43)	2,14 (1,77; 2,32)
Pirogova's LFS	0,443 (0,356; 0,478)	0,526 (0,394; 0,673)*
KECB	3120,0 (2640,0; 3600,0)	2100,0 (1980,0; 2160,0)**
SI	1820,4 (1208,3; 2497,2)	1589,7 (1454,5; 3091,7)
Shtange's test, s	40,5 (25,0; 57,0)	40,0 (32,0; 53,0)
Genche's test, s	25,0 (20,0; 40,0)	30,0 (24,0; 32,0)

Note. ** – data probable differences, p<0,05; ** p < 0,01*

lection and impact, combining with other types of exercise has not been studied and require clarification. There are no publications, which study of the impact of long-term experience training of aerobic- orientation on middle-aged women.

2. Research of physical development using of data of the basic anthropometric measuring showed, that women with experience of training over 10 years compared to women with experience of 3–5 years, marked characteristic of the reliable changes that can be connected with influence of training of aerobic orientation. Namely, lower body weight, body fat percentage, circumference of waist and limbs, as well as higher values of absolute and relative strength of hands and neck circumference, which, in our opinion, show the development of the trunk and neck muscles specifically. Absence of differences in data of VCL and chest's amplitude appeared enough informing. The shown differences of physical development give possibility to assume reduction of risks of origin of cardiovascular diseases, among the basic factors of development of that increase of masses of body and percentage of body fat. Complementing this assumption is no difference parameters of VCL and VCI, which reduced in women with more old age, according to other researchers.

3. Fully logical were differences at activity of the cardiovascular system with consideration of the training orientation. Women with experience of training more than 10 years had in the state of calmness less indicators of HR and SBP, thus last on the lower limit of age-old normative values and also more rapid renewal of organism after standard physical loading that allowed witness economization functions of systemic hemodynamic. Similarly, changing all indexes, that includes of heart rate and blood pressure in the formulas of calculating. Analysis of SHL by system of G. L. Apanasenko allowed assuming a higher aerobic capacity of women with longer experience of training. There was also informing absence of differences in the results of tests of hypoxia's firmness of organism and Skybinskaya's index, what witnessed age-old firmness of performance of the respiratory system of women indicators with longer training experience of aerobic orientation.

4. On the whole results, which we are received, showed a positive effect of long-term training of aerobic orientation on the physical state of middle-aged women, however, for a more complete analysis of changes in the women's body, necessary to make a number of additional instrumental, biochemical, immunological, genetic research, which would allow to characterize changes in vegetative, endocrine, immune and other systems of women under influence of long-term of exercise aerobic orientation, which determines the issue for further research in this area.

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Peculiarities of morphological indexes of the pushers of the nucleus at the stage of specialized basic preparation

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Purpose: *explore peculiarities morphological indexes of the pushers of the nucleus at the stage of specialized basic preparation.*

Material & Methods: *the study was attended by 12 core pushers 15–17 years who were at the stage of specialized basic training. We used the following methods: analysis and synthesis of scientific and technical literature, the definition of anthropometric indicators index method.*

Results: *presented morphological indexes of the pushers of the nucleus at the stage of specialized basic preparation.*

Conclusions: *the figures obtained showed that at the stage of specialized basic preparation the somatotype of shot-putters corresponds the somatotype of the highly qualified shot-putters.*

Keywords: *morphological indexes, stage of specialized basic preparation, shot putters.*

Introduction

The problem of the definition of morphological indicators of sportsmen is represented actual in the connection with questions of a sports selection [5]. Morphological indicators have to take the main place, to push the shot as much as possible further; a sportsman has to answer the corresponding morphological parameters for the selection and preparation of shot putters [1; 8]. G. Savka, F. Muzik [6; 7] noted that rates of ontogenesis depend on features of morphological indicators.

K. Singh [8], having analyzed morphological indicators of highly skilled shot putters, noted the prevalence of a hypersthene type of a constitution of a body. Also the author notes that shot putters – are sportsmen with a big weight and growth.

J. Novotny [9] provided the special value among anthropometrical indicators to scope of hands, in view of genetic conditionality of it to a sign, considered necessary his account in the course of an initial selection. The definition of individual morphological indicators of shot putters promotes the shortest management of the training process [2; 3].

However the works of most of authors are devoted to features of morphological indicators of highly skilled shot putters. Not enough attention is paid to features of morphological indicators of shot putters at a stage of the specialized basic preparation. Therefore it is very important to define features of morphological parameters of shot putters at a stage of the specialized basic preparation.

Communication of the research with scientific programs, plans, subjects

The research was carried out according to the subject of scientific researches KhSAPC "Modeling of technical and tactical actions of the qualified sportsmen in swimming and high-speed and power disciplines of track and field athletics".

The purpose of the research

To investigate morphological indicators of shot putters at a stage of the specialized basic preparation.

Material and Methods of the research

12 shot putters of 15–17 years old, who was at a stage of the specialized basic preparation, took part in the research. The following methods of the research were used: analysis and generalization of scientifically methodical literature, definition of anthropometrical indicators, and method of indexes.

Results of the research and their discussion

Having analyzed anthropometrical parameters (tab. 1), we see that in general, except the weight of sportsmen, where average uniformity (coefficient of variability of 11,79%) is observed, morphological indicators have no considerable divergences, that is uniform. Coefficients of a variation are in an interval from 2,65–7,41% that gives the chance to claim about almost identical morphological indicators of the studied sportsmen.

Table 1

Anthropometrical indicators of shot putters at a stage of the specialized basic preparation (n=12)

Anthropometrical indicators	$\bar{X}$	σ	V, %
Growth (sm)	185,58	4,96	2,67
Length of a hand (sm)	75,58	4,03	5,34
Scope of hands (sm)	199,5	9,45	4,74
Width of shoulders (sm)	48,42	3	6,19
Length of a trunk (sm)	56,25	3,36	5,97
Length of a leg (sm)	92,33	3,26	3,53
GT (sm)	104,08	7,72	7,41
Waistline (sm)	101,08	6,2	6,13
Weight (kg)	91,33	10,76	11,79

Sportsmen had a high growth, big weight, scope of hands and width of shoulders.

It was defined a somatotype of shot putters on the basis of the received indicators according to the classification of M. V. Chernorutsky [5]. All studied shot putters had a hypersthene type of a constitution of a body of pyknic type that is characteristic of highly skilled shot putters, that is, it is possible to claim that shot putters have a somatotype as at highly skilled shot putters already at a stage of the specialized basic preparation. The received indicators a somatotype testify to a strong constitution of a body, heavy and wide bones, and volume shoulders. But unlike other types of a constitution of a body at this type, a slower course of metabolic processes in an organism is observed; as a result, it is shown in an excess adipopexis.

According to the method of W. Sterna [1], the weight of a fatty layer was determined (tab. 2).

Table 2

The weight of a fatty layer of shot putters at a stage of the specialized basic preparation

Sportsmen	Weight of a fatty layer (kg)	% from body weight
1	9,742	10,26
2	11,721	10,19
3	9,042	10,28
4	8,744	10,29
5	9,532	10,25
6	8,161	10,33
7	9,453	10,28
8	9,234	10,26
9	9,707	10,22
10	10,732	10,22
11	8,002	10,39
12	8,467	10,33

Having analyzed the weight of a fatty layer, it was defined that the fatty layer doesn't exceed 10% of body weight at the studied sportsmen. As for the weight of a fatty layer, it fluctuates in the range of 9–10 kg in most of sportsmen.

The weight of segments of a body was calculated, on the basis of data of body weight and growth of shot putters, who took part in the research, by the method of V. M. Seluyanov [4], the data are noted in tab. 3.

Apparently from the noted table, in half of indicators, the average uniformity of results (coefficient of variability of 11–14,4%) is observed, it is connected first of all with differences of weight at the studied sportsmen.

Table 3

The weight of segments of a body of shot putters at a stage of the specialized basic preparation (n=12)

Indicator	$\bar{X}$	σ	V, %
Foot (kg)	1,198	0,1	8,8
Shin (kg)	3,925	0,43	11
Hip (kg)	13,283	1,62	12,2
Hand (kg)	0,616	0,05	8,2
Forearm (kg)	1,419	0,14	9,9
Shoulder (kg)	2,433	0,31	12,8
Head (кг)	5,451	0,23	4,4
Top part of a trunk (kg)	14,434	1,81	12,5
Middle part of a trunk (kg)	15,277	2,2	14,4
Lower part of a trunk (kg)	10,544	1,24	11,7

The middle part of a trunk has the largest weight – 15,277±2,2 kg from between all parts of a body, the top part of a trunk and a hip weighs a little less – 14,434±1,81 kg and 13,283±1,62 kg respectively. A foot – 1,198±0,1 kg, a forearm – 1,419±0,14 kg and a hand – 0,616±0,05 kg have the smallest weight.

The weight-growth index was defined for the definition of distribution of weight to sm of the growth and determination of excess weight, the data are provided in tab. 4
It is visible from the obtained data that the greatest indicators of the weight-growth index are observed at the second sportsman and the tenth sportsman, it demonstrates the considerable excess of weight, as for the sixth and eleventh sportsmen, they have the smallest indicators of the weight-growth index, it testifies to the lack of excess weight and compliance of weight to growth of these sportsmen. The average value of the weight-growth index makes 492±49,5 $g \cdot sm^{-1}$. In general the level of a divergence of indicators of the weight-growth index is on the verge of average uniformity (coefficient of variability of 10,00%).

Conclusions

The analysis of scientific and methodical literature showed that, despite a large number of the works which are devoted to features of morphological indicators, not enough attention is paid to features of morphological indicators of shot putters at a stage of the specialized basic preparation.

The obtained data showed that a somatotype of shot putters answers a somatotype of highly skilled shot putters already at a stage of specialized basic preparation.

Morphological indicators have to correspond the following requirements for the selection and preparation of shot

Table 4

Weight-growth index of shot putters at a stage of the specialized basic preparation

Indicator	Sportsmen												$\bar{X}$	σ	V, %
	1	2	3	4	5	6	7	8	9	10	11	12			
Weight-growth index, $g \cdot sm^{-1}$	500	605	471	459	492	444	487	479	500	568	438	456	492	49,5	10

putters at a stage of the specialized basic preparation: hypersthene structure of a constitution of a body, growth – 185,58±4,96 sm, hand length – 75,58±4,03 sm, scope of hands – 199,5±9,45 sm, width of shoulders – 48,42±3 sm, trunk length – 56,25±3,36 sm, leg length, – 92,33±3,26, GT – 104,08±7,72 sm, waistline – 101,08±6,2 sm, weight – 91,33±10,76 kg, the weight of a fatty layer, – is no more than 10% of body weight, the largest weight has to fall on a middle part of a trunk – 15,277±2,2 kg from gross weight, the weight-growth index – 492±49,5 g·sm^{-1}.

Prospects of the subsequent researches. It is provided to define the influence of morphological indicators on parameters of technical preparedness of shot putters.

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Changes of indicators of high-speed and high-speed and power preparedness at volleyball players of 12–13 years old

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Purpose: *to define changes of indicators of high-speed and high-speed and power preparedness of volleyball players of 12–13 years old.*

Material & Methods: *the test exercises, which are recommended by the training program of CYSS on volleyball, were used for the definition of the level of development of high-speed and high-speed and power abilities of volleyball players. 25 young volleyball players from the group of the previous basic preparation took part in the experiment. Sports experience of sportsmen is 3–4 years. The analysis of scientifically-methodical literature, pedagogical testing, pedagogical experiment, methods of mathematical statistics were carried out.*

Results: *the analyzed level of high-speed and high-speed and power abilities of volleyball players.* ***Conclusions:*** *the results had reliable changes ($t=2,2–2,4$ at $p<0,05$) of the level of high-speed and high-speed and power abilities of volleyball players of 12–13years old in the experimental group at the end of the experiment, except run on 30 m that demonstrates a positive influence of application of special exercises in the educational-training process.*

Keywords: *volleyball, high-speed and power abilities, exercise.*

Introduction

A successful performance of game tasks in many respects depend on ability of a volleyball player during the whole game to jump high and quickly, to do bursts promptly, to carry out active technical and tactical actions constantly [5; 8].

The analysis of scientifically methodical literature shows that the development of high-speed and high-speed and power qualities in representatives of different types of sport is observed at the youthful age [1; 2; 4].

The correctly picked up technique of high-speed and high-speed and power preparation allows to consider the aged features of sportsmen that keeps their health, doesn't need additional expenses of time and at the same time provides the increase of level of physical preparedness and, as a result, the growth of sports skill [3; 4].

A lot of experts of volleyball researched the level of physical preparedness of young volleyball players at different stages of preparation [1; 5; 7; 9], but the problem of the search of new means and methods of the development of high-speed and high-speed and power preparedness of young sportsmen always was actual.

The purpose of the research

The definition of changes of indicators of high-speed and high-speed and power preparedness of volleyball players of 12–13 years old.

There were following *tasks* in the research:

1. To analyze scientifically-methodical literature concerning features of the development of high-speed and high-speed and power preparedness of young volleyball players.

2. To establish the level of indicators of high-speed and high-speed and power preparedness of volleyball players of 12–13 years old.

3. To define the effective technique of the development of high-speed and high-speed and power qualities of young volleyball players of 12–13 years old.

Material and Methods of the research

The following methods were applied in the research: theoretical analysis and generalization of scientifically-methodical literature, pedagogical testing, pedagogical experiment, methods of mathematical statistics.

25 young volleyball players from the group of the previous basic preparation took part in the research that lasted 4 months. The sports experience of sportsmen is 3–4 years. All children, who took part in the research, were almost healthy and were under the supervision of sports doctors. The test exercises, which are recommended by the training program of CYSS of volleyball, were used for the definition of the level of development of high-speed and high-speed and power abilities of volleyball players [4]. Special exercises for the development of high-speed and high-speed and power qualities, which are taken root in the general training process of young volleyball players, were used for training of young volleyball players of the experimental group together with a study of techniques and tactical actions.

Results of the research and their discussion

As practice of the competitive activity testifies, first of all, the high level of the development of physical qualities is neces-

sary for technical and tactical skill for the achievement of the effective level by volleyball players. The motive activity of volleyball players takes place with variable intensity, with continuous and quick response to circumstances which change instantly.

The number of scientists [5; 6; 10 and others] considers that the main attention needs to be paid to the development of dexterity, speed, spring ability of young volleyball players. As pedagogical supervisions over competitive activity of volleyball players show that to execute a blow of a ball, to pass, to accept a ball, to take out hands over the net when blocking, well gathered speed of separate movements is necessary to execute a jump for the attacking blow in the shortest period. The level of high-speed and power abilities for volleyball players has the leading value at reusable performance with the minimum pauses of competitive actions of a high-speed and power character (serving, blocking, passes or blow of a ball) [6].

The primary testing of high-speed and high-speed and power qualities in the experimental and control groups in volleyball players of 12–13 years old didn't find between them reliable differences at the beginning of experiment (P>0,05) (tab. 1).

The analysis of results of testing of high-speed and high-speed and power abilities at the beginning of experiment showed that young volleyball players of 12–13 years old had approximately identical results which were determined by the program of CYSS of volleyball as low and below an average level of preparation [4]. It should be noted that there were no reliable differences between indicators of high-speed and high-speed and power preparedness in the experimental and control groups (P>0,05).

Special exercises and outdoor games which are aimed at the development of high-speed and high-speed and power qualities were included in addition in the educational and training process of young volleyball players of 12–13 years old by the program material which lasted within 4 months. Exercises by the structure answered the competitive activity of volleyball players and were carried out right after warm-up. Training with load passed 12 hours per a week.

Exercises by a visual signal or by an order of a coach - acceleration for 5, 10, 15 m from different starting positions, run with change of speed, direction, and stops, movement by added cross steps back forward, with application of different options of their watch, shuttle movements of 6 and 8 m were applied when training speed of movement. Rotations of ways of movements are carried out by the coach's signal.

Exercises were carried out at high speed; pauses of rest were regulated by means of measurement of CYSS.

The following special exercises, which included various jumps from a leg on a leg with advance forward, a leg apart and together, on the place and with advance forward with raising of knees, with advance by side and back forward, blows of attack to the suspended balls from the running start, standing jumps with a reach of the suspended balls by two and one hands, imitating exercises in outleap about a net with removal of hands over a net and imitation of blocking with movements along a net, throws of volleyball and stuffed balls by one and

Table 1

Indicators of high-speed and high-speed and power preparedness of volleyball players of 12–13 years old before the experiment

Name of exercise	Units of measure	Experimental group (12 persons)	Control group (13 persons)	t	P
		$\bar{X}$±m	$\bar{X}$±m		
Run 30 m	s	6,2±0,3	6,4±0,4	0,4	>0,05
Running in place of 10 s	times	38,5±1,5	37,5±1,5	0,47	>0,05
Long jump from the place	sm	185±8,0	182±8,5	0,26	>0,05
Jump up from the place	sm	38,0±3,9	36,8±5,2	0,18	>0,05
Throw of a stuffed ball 1kg, sitting	m	4,1 ±0,8	4,2±1,1	0,1	>0,05

Table 2

Changes of indicators of high-speed and high-speed and power readiness of volleyball players of 12–13 years old (n=25)

Name of exercise	Units of measure		At the beginning of the experiment	At the end of the experiment	t	P
			$\bar{X}$±m	$\bar{X}$±m		
Run 30 m	c	E	6,2±0,3	5,62±0,25	1,5	>0,05
		C	6,4±0,4	6,0±0,3	0,8	>0,05
Running in place 10 s	times	E	38,5±1,5	43,5±1,5	2,4	<0,05
		C	37,5±1,5	39,5±1,0	1,1	>0,05
Long jump from the place	sm	E	185±8,0	208±6,5	2,2	<0,05
		C	182±6,4	198±7,5	1,6	>0,05
Jump up from the place	sm	E	38,0±3,9	49,5±3,5	2,2	<0,05
		C	36,8±5,2	44,6±4,4	1,1	>0,05
Throw of a stuffed ball of 1 kg, sitting	m	E	4,1 ±0,8	6,3±0,6	2,2	<0,05
		C	4,2±1,1	6,0±1,1	1,2	>0,05

Note. *E – the experimental group, C – the control group.*

two hands from different sitting positions, standing, after the running start and a jump with imitation of the attacking blow were used for the development of high-speed and power preparedness of young volleyball players.

Exercises were carried out on average speed, the number of repetitions in a series – 15–20 times; a rest interval between series – 2–4 min; quantity of series – 2–4 approaches depending on problems of the training process and condition of sportsmen. Outdoor games were also applied in the training process which was aimed at the development of high-speed, high-speed and power, coordination qualities: «Day and night», «Call», «A call of numbers», «Try take out», different options of the game «Kvach», relays with run, jumps, with a ball [4; 5; 9]. The repeated testing of level of high-speed and high-speed and power readiness of young volleyball players was held in 4 months of the training process (tab. 2).

Indicators of high-speed and high-speed and power abilities in experimental group of young volleyball players had a reliable improvement ($P<0,05$), except results in run on 30 m.

So, indicators in run for 10 s improved on average on 5 times at a reliable difference ($P<0,05$), in a long jump from the place – average on 23 sm ($P<0,05$), in a jump up from the place – on average on 11,5 sm ($P<0,05$), in a throw of a stuffed ball of 1 kg from situation, sitting – on average on 2,2 m ($P<0,05$). Average results in run increased by 30 m on 0,58 s, but had no reliable difference ($P>0,05$).

Indicators of the control group didn't experience essential changes at the repeated testing ($P>0,05$).

The analysis of the obtained data demonstrates that the special exercises, which are aimed at the development of high-speed and high-speed and power abilities, increase physical preparedness of young volleyball players that positively influences ability of a sportsman as fast as possible to assess a game situation and to perform technical and tactical operations successfully in time, minimum for certain conditions. Therefore, it is possible to consider that the offered exercises by us affected positively on high-speed and high-speed and power abilities of volleyball players of 12–13 years old.

Conclusions

1. The analysis of scientifically-methodical literature demonstrates that the development of high-speed and high-speed and power abilities of volleyball players is the necessary and integral part in physical training of sportsmen. The improvement of level of these qualities promotes the increase of efficiency in the competitive activity of volleyball players.

2. The primary research of indicators of high-speed and high-speed and power preparedness allowed establishing that the insufficient level of the development of these qualities was observed at young volleyball players of 12–13 years old. Average values in run of 30 m – 6,2±0,3 s, in running in place – 10 s 38,5±1,5 times, in a long jump from the place – 186±6,8 sm, in a jump up from the place – 38,6±3,5 sm, in a throw of a stuffed ball of 1 kg, sitting – 4,1±0,4 m that are estimated as low and below an average by the standards of CYSS.

3. The application in the educational training process of specially directed exercises influenced authentically ($t=2,2–2,4$ at $P<0,05$) on the growth of the level of high-speed and high-speed and power abilities at volleyball players of 12–13 years old in experimental group, except run on 30 m. Results in run on 30 m improved, but had no reliable difference that can be defined as an insufficient orientation for work on high-speed qualities and the end of the favorable period of the development of speed in volleyball players of 12–13 years old. Results in the control group of volleyball players increased, but had no reliable difference ($P>0,05$).

Prospects of the subsequent researches. Our subsequent researches will be directed to the search for ways in the improvement of physical preparedness of volleyball players.

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Efficiency of actions in attack of diagonal players in female volleyball

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Purpose: *to define efficiency of technical and tactical actions of the diagonal player in the attacking actions of a team depending on schemes of a defensive play of the rival.*

Material & Methods: *the competitive process with participation of 10 players of the role –the diagonal forward of qualification and the adult category was investigated in the pedagogical supervision. The efficiency of actions in attack of diagonal players of women's teams of Student's volleyball league of Kharkov was defined by mathematical processing of the obtained data.*

Results: *we carried out the analysis of references on a condition of a problem of training of the diagonal player, defined tactical combinations in attack in which the diagonal player and efficiency of game actions of the diagonal player take part in the attacking actions of women's teams of Student's volleyball league of Kharkov defining indicators of efficiency of technical and tactical actions of the diagonal player in the attacking actions of women's teams of Student's league of Kharkov against various schemes of a defensive play of teams of the rival.*

Conclusions: *the offered methodical approach based on a quantitative assessment of the competitive activity will allow to rationalize the structure and distribution of means of trainings and to increase the efficiency of the whole educational and training process of training of diagonal players for a game in attack against teams which build a defensive play according to various schemes.*

Keywords: *student's volleyball, diagonal player, tactical schemes of a game.*

Introduction

Modern volleyball is an undisputed leader by the popularity in the world. The international federation of volleyball (FIVB) combines 220 countries in the volleyball family. We will note that it is more, than in any other sport. This popularity of a game is reached thanks to staginess which depends not only on productivity of actions of players, but also on beauty of movements, plasticity, coordination abilities of volleyball players.

The competitive activity of a volleyball player is a set of movements in anaerobic (sometimes alactate) and mixed modes. These movements alternate with short many numerical pauses during which skilled players owe an opportunity to relax and even to renew in some measure [1]. It became clear on statistical data of numerous supervisions that one draw of a ball lasts 35–40 seconds on average. 45 points are played on average in each party [3]. Therefore, on average 45 episodes in each party demand from a volleyball player of a maximum of physical and nervous efforts.

Not in view of the fact that the considerable attention is paid to training of sportsmen for the competitive activity in scientifically methodical literature, the attention actually isn't paid to a problem of the increase of efficiency of actions in attack of diagonal players, as defines the relevance of materials of the given research.

Communication of the research with scientific programs, plans, subjects

The research was conducted according to a subject of the plan of the RW of Kharkiv State Academy of Physical Culture 2.8. "Improvement of the educational and training process in sports games" (number of the state registration is 0111U003126).

The purpose of the research

To define indicators of the efficiency of technical and tactical actions of a diagonal player in attacking actions of women's teams of Student's league of Kharkiv against different schemes of a play in defense of teams of the rival. The following tasks are defined for the achievement of this purpose:

– to carry out the analysis of references concerning a condition of a problem of training of a diagonal player.

– to define tactical combinations in attack in which a diagonal player takes part.

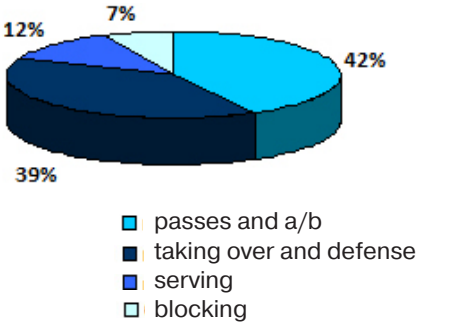
– to define the efficiency of game actions of a diagonal player in attacking actions of women's teams of Student's volleyball league of Kharkiv.

Material and Methods of the research

We investigated indicators of the competitive activity with the assistance of a diagonal player in attacking actions of women's teams of Student's volleyball league of Kharkiv; such methods of the research were used in the research: the analysis of scientific literature, pedagogical supervision, mathematical processing of the obtained data. 10 players of a role – a diagonal forward of the adult I category were investigated.

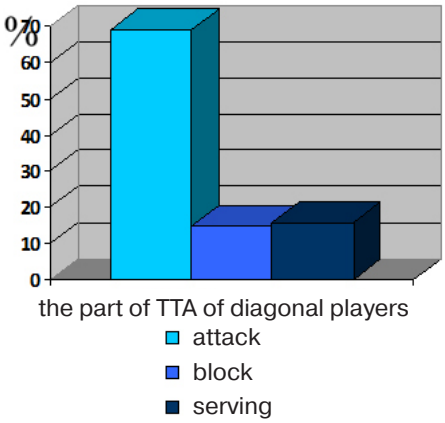
Results of the research and their discussion

We established that teams performed 14256 technical operations during 24 games (80 parties). It comes up from this indicator that the team executed 178 technical elements per a set on average. The main part of elements is occupied by passes and attacking blows – 42%. Serving taking over, defense and secure occupy 39%, serving 12%, and least of all technical actions were executed on blocking – 7% (pic. 1).



Pic. 1. A percentage ratio of performance of different technical elements during a game in volleyball

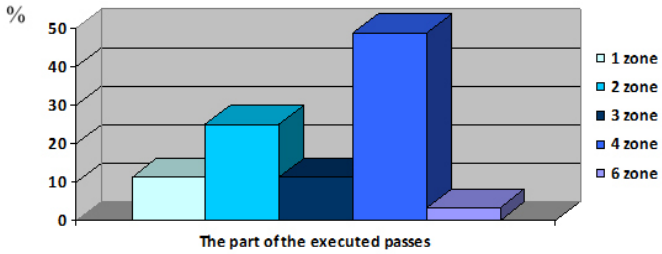
Diagonal team players performed 89 technical operations per a set from the analysis of the received results on average. Diagonal team players won on average 82 technical actions in attack in a game. The essential part of points in a game was undertaken by attack – 69%. The block and serving made 15% and 16% respectively (pic. 2).



Pic. 2. A percentage ratio of the won technical and tactical actions by diagonal players on average for a game

In general it answers to the accepted model of the diagonal player in general to whom the main technical and tactical actions present actions in attack, serving and blocking [2].

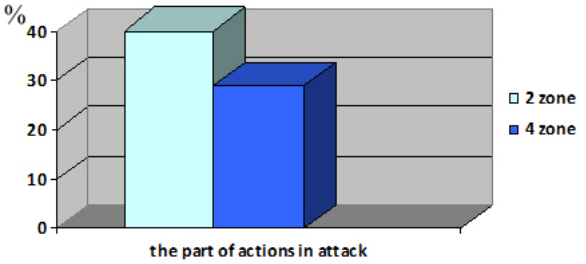
192 transfers for an attack were carried out on average for a game. The most part of passes were executed in the fourth zone 95 (49%), in the second zone a quarter (25%) of all passes (48), in the first and third zone on 11% (22 and 20) were executed, least of all attacks were executed from the sixth zone of 3% (7) (pic. 3).



Pic. 3. The number of passes which are executed in different zones for the organization of attack on average for a game

Questions are appeared by us that were more loaded from zones in attack. In this regard five zones of attack were analyzed (1, 2, 3, 4, 6). We didn't consider the fifth zone as any attack blow wasn't executed from it for three games.

Also the quality of the executed attacking actions on zones was analyzed. The analysis showed that forwards in the fourth zone won only 29% from all blows, and from the second zone of 40% (pic. 4).

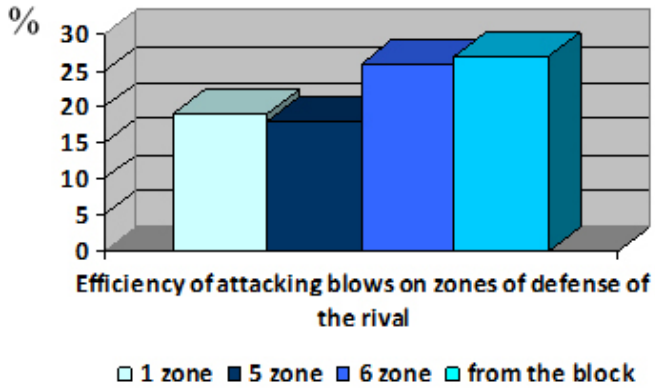


Pic. 4. Indicators of the won game actions on the main zones of attack of women's teams of Student's volleyball league of Kharkiv

The percent of winning from the second zone is more than the percent of winning from the fourth in women's teams of SVL of Kharkiv because the number of passes for the attacking blows which are executed from the fourth zone exceeds total of passes to the second zone. In our opinion, it is connected with what the main loading in the absence of high-quality reception of a serving or an unsuccessful defensive play is born by players of the fourth zone. It is always much simpler for a setter of a team to execute a high pass in the direction of own movement by the platform, than to do it in an opposite direction. Proceeding from this supervision, we have an opportunity to claim that a setter carries out a pass for a diagonal player to the second zone from more advantageous game positions, than for players of the fourth zone therefore the percent of winning from the second zone is more than the percent of winning from the fourth. The quantity of the driven balls from the fourth zone is much more, because also the number of the done passes by a setter is much more in this direction.

Analyzing the received data during the pedagogical supervi-

sions over the competitive activity, we found out that there are some features in a game of diagonal forwards depending on schemes of a game in attack of team of rivals. So, in 10 games of teams which play on the system of 5 forwards – 1 setter and insure «the outside hitter» as for the rule, these players of the first and fifth zones, from the teams won diagonal in attack of points of 28% sent to the sixth zone, 26% – game from the block, 27% – in the first and 19% – the fifth zone (pic. 5).



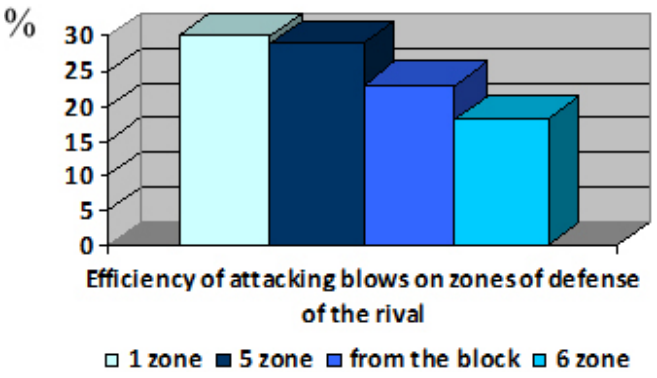
Pic. 5. Indicators of efficiency of attack of diagonal players against teams which play on the system 5–1 and insure "an outside hitter"

Despite of the fact that many balls were benefited from the block at attack, nevertheless the percent of winning of the attacking blows is more in the first and sixth zones. Therefore, teams which play on the system of 5 forwards – is 1 setter that is insured by "an outside hitter" of the back line, have weak points in the sixth and first zone. In our opinion, it can be connected with the fact that as for the rule, in the first zone the setter of the rival who at the system of 5 forwards, – is 1 setter has to come from the zone forward for performance of the second pass for the organization the attacking actions of the team plays. The player of the sixth zone has to protect not only "his" sixth zone in such game situation, but also the part, as for the rule, bigger, than the first zone from where there is a setter, for performance of the second pass to blow for the purpose of the organization of attack.

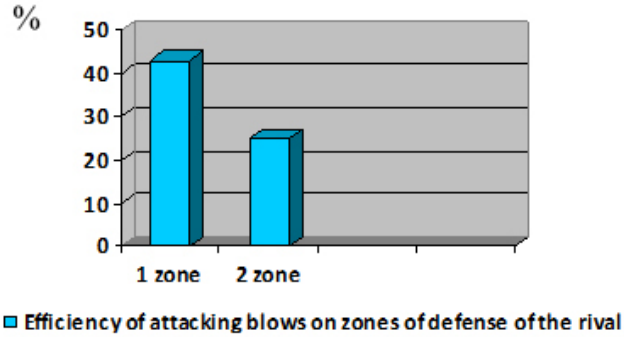
Watching ten games between teams which play 4 forwards on the system, – 2 setters and insure «a corner forward», against teams which play on the system of 5 forwards, – 1 setter, we obtained the following data: diagonal players among the attacking blows of 30% and 29% executed in the first and fifth zone, 23% – from the block and 18% – in the sixth zone (pic. 6).

In spite of the fact that it is visible according to the chart that there were a lot of won balls at game from the block, the percent winning nevertheless is higher in the first and fifth zones that demonstrates that these zones are protected worst of all at an insurance by "a corner forward". In our opinion, it is connected with the fact that as for the rule, defenders of the first and fifth zones choose the place in defense, considering the need of defense of a long distance for the sixth zone which defender is on secure of the group block.

In four games between teams which play on the system of 5 forwards – 1 setter and insure by «free against the block» the player of the forward line, from the points won in attack diagonal teams, 43% were executed in the first zone and 25% – in another (pic. 7).



Pic. 6. Indicators of efficiency of attack of diagonal players against teams which play on system 4–2 and insure "a corner forward"



Pic. 7. Indicators of efficiency of attack of diagonal players against teams which play on system 5–1 and insure "free against the block"

At teams which play on the system of 5 forwards – 1 setter and insure by «free against the block» the player of the forward line, the weakest points in defense are in the first and second zone. And in spite of the fact that the quantity of the driven in points is more in the first zone, nevertheless there is a probability of blockage of a ball in the second zone. In our opinion, it is connected with the fact that as for the rule, in the first zone the setter of the rival who at the system of 5 forwards, – 1 setter has to come from the zone forward for performance of the second pass for the organization of the attacking actions of the team plays. The same player plays on the forward line in the second zone, and, as for the rule, his main function – a pass for the organization of the attacking actions therefore all other players direct the actions in defense with the purpose to exclude him, whenever possible, from actions in defense [3].

Conclusions

The methodical approach is offered which is based on the quantitative assessment of the competitive activity will give an opportunity to rationalize structure and distribution of means of trainings and to increase the efficiency of the whole educational-training process of training of diagonal players for a game in attack against teams which build a defensive play according to various schemes.

The results of researches can be used for the analysis and the assessment by coaches of actions in attack of diagonal players against different schemes of defensive play and secure.

We think on the basis of the made research that the trace is more attention to pay to blocking and attack in training of diagonal players (as from the first and second line). Also it is necessary to reconsider priorities of the choice of the main zone of attack depending on the schemes of game which are offered by team of the rival, to connect more often to attack of players of the back line, as changes in Rules of a game are rather severely refereed a grid contact by a player during a performance of game actions in the last. It is also necessary to pay attention to indicators of productivity of the attacking actions of forwards from different zones and lines. It will give the chance to a coach to work in the training process under the use of various combinations in a game of forwards.

Prospects of the subsequent researches. In the future we see the need to analyze the interrelation between types of preparation on the basis of the obtained data of the analysis of the competitive activity of diagonal players of the women's volleyball teams SVL of Kharkiv in our research. It will give an opportunity to coaches of teams to optimize the training process of preparation for competitions and to define the main directions of the improvement in types of preparation.

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The informative providing of trade education is in industry of physical culture and sport of countries of former soviet spaces

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Purpose: *to investigate the innovative forms of the informative providing of educational process in institutions of higher learning of physical culture and sport of countries: Ukraine, Republic of Belarus, Republic of Moldova, Republic of Kazakhstan, Republic of Uzbekistan, Russian Federation.*

Material & Methods: *content-analysis of web sites and web pages of sporting institutions of higher learning of these countries.*

Results: *the informative providing of institutions of higher learning of physical culture and sport of Ukraine, Belarus, Moldova, Kazakhstan, Uzbekistan and RF differs substantially, in spite of the fact that the specific of educating in these educational establishments is identical. Institutions of higher learning of physical culture and sport of Ukraine actively offer the innovative forms of the informative providing - give possibility to the students and teachers to take advantage of e-catalog, electronic repository, virtual bibliographic certificate, electronic delivery of document. Sporting institutions of higher learning of Belarus, Kazakhstan, Uzbekistan and Russian Federation carry out the informative providing by means of the electronic-library systems, in particular "Znanium.com" and "Rukont". The system "Rukont" is erected in the grade of the national inter-branch digital resource created on the base of state educational standard and contains the informative resource of different family: books, magazines, separate articles, and also audio, video data, multimedia. Collection of electronic versions of editions of electronic-library systems "Znanium.com" unites books, magazines, articles grouped on thematic and having a special purpose signs. The unique institute of higher of Republic of Moldova does not give electronic informative services, but uses the traditional forms of the informative providing by means of catalogues and card library indexes.*

Conclusions: *higher educational establishments of physical culture and sport of countries of Ukraine, Belarus, RF, Moldova, Kazakhstan and Uzbekistan, in spite of general specific of preparation of skilled specialists, carry out different informative support of educational process. Ukraine is oriented on the European system of the informative providing, forms electronic repository are archives of storage, accumulation and providing of open access to the results of the scientific researches conducted in educational establishment. The institutes of higher of physical culture and sport of Byelorussia, Kazakhstan, Uzbekistan and RF are used by the so-called electronic-library systems on the base of state educational standard, and the informative providing carries out the sporting institute of higher of Moldova by the traditional forms of informing, not giving the users of the opened access to the electronic informative resources.*

Keywords: *informative providing, innovations, electronic resources, institutions of higher learning of physical culture and sport, trade education.*

Introduction

Reforming of higher education is carried out in many respects within the Bologna process that is originating in 1999, to which the countries of the former Soviet Union, in particular Ukraine, Belarus and Russia, and subsequently – Kazakhstan and Uzbekistan, joined in 2003–2005. The creation of the united European educational space, which is capable to compete at the international level, became the main purpose of the Bologna process finally. The strategy of modernization of education focuses higher educational institutions of physical culture and sport on the essential updating of educational activity, in this connection many experts investigate innovative methods of teaching, new pedagogical technologies, their influence on the educational process; carry out intensive search of incentives of the development of the education system in the context of a long-term outlook; consider strategic programs of reforms for the purpose of the subsequent integration of the system of higher sports education into the international educational space [1].

Training in the sphere of physical culture and sport is characterized by a number of contradictions and essential shortcomings. The society isn't fully satisfied with result and quality of work of educational institutions on training of specialists. Many graduates don't correspond to the status, don't meet social expectations, and can't solve problems of education of healthy younger generation physically and mentally. The gap is obvious between degree of preparedness of graduates of sports higher education institutions (faculties) to the work in new social and economic conditions and the growing inquiries of the society. Many scientists in the considered problem allocate two contradictions: between the quality of training of experts and requirements of social practice concerning the realization of already created values of physical culture and sport and need of creation of new types of sports activity; be-

tween information and productive (passive) nature of training which dominates in sports higher education institutions, and need of training of future sports teacher who is capable to creative understanding of professional activity and having skills of development and improvements of innovative technologies both for physical training, and for sport. Besides, there is a contradiction in development of theoretical and technological potentials of physical culture within the teaching-educational process of sports higher education institutions (faculties) in the existing pedagogical system which doesn't promote the improvement of quality of sports education, the development of professional and personal qualities of students, doesn't support the high professional level of the faculty [2].

The purpose of the research

To investigate dataware in higher education institutions of physical culture and sport of Ukraine, Belarus, Moldova, Uzbekistan, Kazakhstan and the Russian Federation by means of innovative technologies.

Tasks of the research – is to define innovative opportunities of higher education institutions of physical culture and sport in providing the open access to the electronic educational, scientific and sports information which is necessary in the modern training and educational process.

Material and Methods of the research

Methods of the research: content-analysis of websites and web-pages of sports higher education institutions, systematization of information, generalization of details.

Results of the research and their discussion

Higher education institutions of physical culture and sport of many countries of the former Soviet Union, though rather effectively function, now face a set of difficulties at integration into the all-European space of higher education and in the main directions are halfway to the Bologna process. Vocational training of a future specialist in physical culture and sport assumes the existence of the necessary components including: preparedness for training (professional qualification), assimilation of innovative technologies (research work with use of modern computer technologies), search and systematization of necessary information, existence of the information competence / culture promoting mastering a certain knowledge, skills of work with information retrieval systems of libraries and Internet.

Dataware of higher education institutions of physical culture and sport of different countries significantly differs in spite of the fact that specifics of training are identical in them. So, dataware of sports higher education institutions of Ukraine is carried out by means of the library complex which is functioning from the moment of foundation of higher education institution – the information retrieval system – catalogs and card files, and also the creation of electronic libraries which funds constantly grow including due to works of scientific and pedagogical employees of universities, academies and institutes. Providing educational and scientific information is carried out by means of website of higher education institution or web-page of library where all necessary information materials are placed. Right web-pages of libraries give the chance to students, faculty, young scientists to use electronic library: an electronic catalog online, an electronic repository – collection of educational, scientific, official sources provided in the open access (National university of physical education and sport of Ukraine, Lvov state university of physical culture), international digital libraries (National university of physical education and sport of Ukraine); inform the readers on new incomings in library, exhibit virtual exhibitions, and also offer a number of innovative services, in particular electronic delivery of the document (Lvov state university of physical culture) and the virtual bibliographic reference (National university of physical education and sport of Ukraine, Lvov state university of physical culture) [3–5].

Speaking about higher education institutions of physical culture and sport of Ukraine, it should be noted that all educational institutions are ready to provide modern innovative information services both by means of website or web-page of library today, and in the libraries in which electronic informing is carried out since 2007 (National university of physical education and sport of Ukraine, Kharkov academy of physical culture, Dnepropetrovsk state institute of physical culture and sport).

The main sports higher education institution of the Republic of Belarus –Belarusian state university of physical culture – carries out dataware by means of traditional library (catalogs, card files, information and bibliographic services), and also free access to the electronic and library system «Znaniun.com» [6]. The system provides to the registered users the round-the-clock access to electronic editions – to tens of thousands of names of monographs, textbooks, reference books, scientific magazines, theses and scientific articles in various fields of knowledge.

Some libraries of sports higher education institutions of the Russian Federation (RF) also are connected to the electronic and library system «Znaniun.com» (ELS). ELS «Znaniun.com» cooperates with libraries of these educational institutions more than four years, constantly analyzing numerous requests of students and teachers, actively studying their information requirements. All leading sports higher education institutions of the Russian Federation suggest students, scientists and teachers to use a set of innovative electronic information services: the full text database of abstracts of theses and theses of the Russian state library, electronic full text collection of theses and abstracts in the foreign languages which are published at the largest universities of the world (ProQuest Dissertations), the full text database of magazines of different countries of the world (ProQuest Journals), etc. [7; 8]. Some higher education institutions [9–12] use the electronic and library system «Rukont» (full text electronic editions, including on physical culture and sport), and also the electronic and library system «IPRbooks» in dataware of students, teachers and scientists. It should be noted that the most part of sports higher education institutions of the Russian Federation in dataware of the educational process doesn't use ELS, and creates own information electronic resources and carries out support of the educational process by formation of full text databases by means of digitization of texts of editions of library and creation of the electronic catalog.

Kazakh academy of sport and tourism (KazAST) – the richest with traditions and information events higher education institution which became the full member of the Bologna process in 2013 actively carries out innovative educational

and research activity. The academy conducts basic and applied researches in the priority directions in the field of physical culture and sport on the basis of the research institute of sport and research institute of tourism. Innovative dataware carries out by means of the automated library and information system, and also provides electronic full text resources to students, teachers, and young scientists: versions of textbooks and educational and methodical editions, articles of the periodical press of the electronic collection «KazAST in Mass Media». The web-page of library of academy offers [13] users open access to ELS of the Republican Interuniversity Electronic Library (RIEL), the electronic database of Library of the international sports information, ELS «Rukont» and «Lan», electronic information resources of library of National university of physical education and sport of Ukraine, and also possibility of full text reading the scientific magazine «Science in the Olympic Sport». Within the international cooperation the library of KazAST provides full text access to the electronic databases EBSCO, Springer, bibliographic and abstract DB of Scopus, Web of Knowledge, and Science Direct.

The only sports higher education institution of Uzbekistan (the website is in Uzbek) also provides the open access to electronic information sources to users: to e-book readers, educational and methodical grants, rules of competitions. Innovative information services are offered by the Information and resource center on the website of higher education institution instead of the web-page of library for students, teachers and young scientists, thanks to which the electronic library is actively formed. It is possible to use 35 educational and methodical materials in the open access which main part is in Uzbek [14].

There isn't enough information on fund of library, its structure and aims, among which – introduction of modern information technologies and creation of the electronic catalog, on the website of State university of physical education and sport of the Republic of Moldova (the website is in the Moldavian language), on the web-page of library [15]. The library doesn't offer to use the electronic information sources which are created for the aid to the training-educational process.

Conclusions

Higher education institutions of physical culture and sport, in the history of which there was the general period of functioning in borders of one state despite the general specifics of training, carry out different dataware of the educational process now. The analysis of dataware by means of viewing of the websites of sports higher education institutions of such countries as Ukraine, Republic of Belarus, Moldova, Kazakhstan, Uzbekistan and RF, shown that practically all educational institutions provide the open access to the information sources which are necessary in the training and educational process (manuals, textbooks, monographs, texts of lectures etc.).

Ukraine is guided by the European system of dataware where various electronic information for the aid to educational and scientific processes are provided by students, teachers and research associates along with traditional library services (catalogs and card files of libraries). For this purpose higher education institutions of physical culture and sport of Ukraine form electronic catalogs and electronic repositories – archives of the open access to results of the scientific researches which are conducted in educational institution by means of Internet, offer the virtual bibliographic reference, carry out electronic delivery of the document, exhibit electronic exhibitions; suggest to use the international digital libraries, constantly work on improvement of informing and supply of thematic material.

Sports higher education institutions of Belarus, Kazakhstan, Uzbekistan and RF don't create repositories, and use so-called electronic and library systems, in particular «Rukont», «Znanium.com», «IPRbooks» containing different content: books, periodicals, separate articles, and also audio-, video records, multimedia with daily updating that allows users to be aware of actual educational and scientific information.

Sports higher education institution of Moldova, unfortunately, doesn't provide the open access to electronic information sources, being limited to placement on the website of small information on library, its structure and funds.

Prospects of further researches assume the research of innovative opportunities of higher education institutions of physical culture and sport of the Baltic States, Europe and Asia in providing the open access to the electronic educational, scientific and sports information which is necessary in the training- educational process.

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Four-year dynamics of health indicators among the University students who practice Hatha Yoga regularly

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Purpose: *to determine the dynamics of a four-year university students in health indicators, regular practice hatha-yoga.*

Material & Methods: *the methods of theoretical analysis, synthesis and compilation of information about the study, physiological and educational testing, pedagogical experiment, methods of mathematical statistics. For experimental verification of developed on hatha-yoga program was formed by a group of 30 students enrolled in the first course of a classical university and expressed a desire for a four-year training visit this section three times a week. Age of students before the start of the experiment was 17–18 years old and they did not have special physical training.*

Results: *it was found informative characteristics, which is possible to appreciate the level of health in the student's age. The content of training programs on hatha-yoga for university students who do not have special physical training. Experimentally tested program developed by hatha-yoga with students in universities for four years and recorded the dynamics of their health indicators.*

Conclusions: *quantitative data of the study show the positive impact of regular exercise on hatha-yoga on the body of students. Positive dynamics is set according to the normalization of blood pressure and heart rate, improving posture, reducing excess body weight, improving physical qualities, enhancing the characteristics of the respiratory system.*

Keywords: *student, university, health, training, hatha-yoga.*

Introduction

The health status of nowadays youth is diagnosed at the low level. However, this period is characterized by the highest standard of activity and performance of the young people, and is favorable for the implementation of career ambitions and is the most optimal for the reproduction. The importance of preserving the existing potential at the student age, the formation of the ability to manage the reserves of the body effectively, contribute to the improvement of the life's quality in later years. General increase of the student's motor activity can be presented as the means of the health indicators improvement, the volume of which, in the framework of the university studies in physical education, is insufficient. In recent years it has become possible to increase the general motor activity of the students with the help of different popular health improving physical systems. Hatha yoga is one of them, which is mainly oriented on women. However for the widespread use of the hatha yoga classes among the university students, some special studies about the impact of this ancient eastern health improving system on the young women's health will be required.

Analysis of the recent research and publications

In the literary sources [1; 2] the main accent is made on the continuous monitoring of the students health. The authors [4–6] recommend the use of the modern means of the popular physical activities for students. The positive impact of yoga on cardiovascular [8; 11; 14] and respiratory [3; 12; 13; 15] systems, general improvement of the body's metabolic processes [9; 10] during practicing this wellness system, are widely covered by the different foreign sources. The main features of the conducting the training program in women's groups are given in [5; 7]. This article highlights the material on the health monitoring of the university students practicing hatha yoga regularly during their period of study.

The purpose of the research

To determine the four-year dynamics of health among the university students, who practice hatha yoga regularly.

Objectives of the research:

1. Indicating informative characteristics, which can help to determine the level of health at the students age.

2. Expanding the content of the hatha yoga training programs for the university students without special physical fitness.

3. Experimental testing of the hatha yoga training program, specially developed for the female students, within the four years period, and recording the dynamic of their health condition.

Material and Methods of research

Methods and procedures: methods of theoretical analysis, synthesis, and synthesis of the information relating to the research, pedagogical and psychological testing, method of pedagogical experiment, methods of mathematical statistics.

By means of theoretical analysis, has been revealed that hatha yoga raises the level of health and psycho-emotional stability, strengthen the cardiovascular and nervous systems, and helps to improve body posture. Proceeding from this, the following informative characteristics, which make it possible to determine the level of health at the students age, have been established:

Index of the physical condition according to the methodique of A. E. Pirogova;
Assessment of adaptive capacity of the circulatory system by R. M. Baevsky;
Skibinskaya's index;
Assessment of the somatical health condition by G. L. Apanasenko;
Assessment of the of the spinal column condition by Mashkov;
Assessment of the brachial's index.

Hatha yoga classes are generally more popular among the female due to the fact that during their perfomance static exercises are mainly used. Therefore, for the objectivity of the study the testing group should be formed of the students only.

The content of the hatha yoga exercises program for the university students without special physical fitness, has been illustraded at the source [5]. According to the schedule of the program, the students have been attending hatha yoga classes three times a week with a duration of an hour and a half per each session. The academic year training program was divided into four three-month periods, and the physical load have been gradually increased with the onset of each of the periods. During the weekly training cycle the following hatha yoga exercises have been performed:

standing poses;
sitting, lying, and derived poses;
twisted and abdominal poses;
balancing postures (balance);
poses with different body deflections;
inverted poses.

The perfomance of the following exercises was mainly based on the classical physical activity classes building structure : preparational (Duration 23 minutes), main part (48 min) and final part (19 min) Apart.

For the experimental verification of the special developed hatha yoga program, a group of 30 female students , who expressed their desire to attend these sessions three times a week during a four year period, was formed. At the beginning of the experiment, the age of the students was 17–18, and none of them could fit to the special index of the physical health by E. A. Pirogova.

The changes of the benchmarks have been recorded bat the beginning of the four-year experiment and by the end of each academic year. The average result of the students on each characteristic was compared with the help of the Student's t-test, between the measurements at the end of the school year and for the entire period of the experiment.

Results of the research and their discussion

In the analysis of the average group's (n=30) benchmarks diagnostics of the functional characteristics of the students body indicators during the four-year period of the regular hatha yoga sessions, the positive overall improvement of their health dynamics has been set. As it can be seen from Table – statistical significance at $p<0.05$ and $p<0.01$ between the majority of the benchmarks indicators is reflected.

At the beginning of the four-year experiment, the index of the physical condition, determined by the method of Pirogova, of the students who had just began their first year of study, was at 0.49 units. (below the average), after attending regular hatha yoga sessions, three times per week during the academic year, the same indicator was measured at the level of 0.54 units. (the average level) by the end of the academic year. At the end of the second rate, the index stood at the level of 0.61 units (the average level), during the third year, it has been improved up to 0.69 units (above average), and by the end of the Bachelor the level has reached above the average – 0.78 units.

According to the evaluation of the adaptive capacity of the circulatory system by the method of R. M. Baevsky, adaptational deficiency in the 3,75 un. experimental group has been defined at the begining. By the end of the 1st and the 2d year, the indicators have reflected the tension of the adaptation mechanisms in the students bodies: 3,11units and 2,41 units. By the end of the 3d and 4th year, the students have been considered with the satisfying body's adaptation with the following indicators: 2,09units and 1,79 un.

By the time of enrolling in University, Skibinskaya's index in the students experimental group, was measured at the level of 9.02 un., which reflects unsutisfactory ratings. By the end of the first and the second courses, the indicators have been showing positive evaluation of 15.87 and 25.09 un. By the end of the third and fourth year, students indicators were identified at a good level: 31.98 un. and 38.46 un.

According to the procedure of Apanasenko, the assessment of the students physical health, shows that their rates were at the level of 2.51 points by the time of their enrolling in University, thereby indicating a low level. After practicing hatha yoga regularly during their first year of study, a similar result was equal to 5.71 points (below average). A year later – by the end of the second year, the students score was equal to 8.24 points (average level). By the end of the third year, it has been improved up to 11.28 points (above average). By the end of the Bachelor, the level of the students somatic health has reached its highest rate – 15.63 points.

When assessing the state of the first year students spinal column by Mashkov – the asymmetry of 1.23 cm has been recorded, which indicates the presence of scoliosis. By the end of the first year of the regular hatha yoga practices, the situation has been improved to the average of 0.72 cm. After two years of the regular hatha yoga sessions (by the end

Four-year dynamics of health indicators among the students (n=30), who practice Hatha Yoga regularly

Control diagnostics	Measurement Units	Initial indicators		$\bar{X}_0 \leftrightarrow \bar{X}_1$	I academic year		$\bar{X}_1 \leftrightarrow \bar{X}_2$	II academic year		$\bar{X}_2 \leftrightarrow \bar{X}_3$	III academic year		$\bar{X}_3 \leftrightarrow \bar{X}_4$	IV academic year		$\bar{X}_0 \leftrightarrow \bar{X}_4$
		$\bar{X}_0$	m	p	$\bar{X}_1$	m	p	$\bar{X}_2$	m	p	$\bar{X}_3$	m	p	$\bar{X}_4$	m	p
I	у. е.	0,49	0,01	<0,05	0,54	0,01	<0,01	0,61	0,01	<0,01	0,69	0,01	<0,01	0,78	0,01	<0,01
II	у. е.	3,75	0,04	<0,01	3,11	0,04	<0,01	2,41	0,03	<0,01	2,09	0,02	<0,01	1,79	0,02	<0,01
III	у. е.	9,02	1,07	<0,01	15,87	1,24	<0,01	25,09	1,39	<0,01	31,98	0,87	<0,01	38,46	1,13	<0,01
IV	баллы	2,51	0,87	<0,05	5,71	0,69	<0,05	8,24	0,51	<0,05	11,28	0,96	<0,05	15,63	1,07	<0,01
V	см	1,23	0,06	<0,01	0,72	0,05	<0,01	0,48	0,04	<0,01	0,19	0,02	<0,05	0,11	0,01	<0,01
VI	%	75,13	1,99	>0,05	79,14	1,81	>0,05	82,99	1,68	<0,05	89,18	1,21	<0,05	94,82	1,42	<0,01

Note. *I – index of the physical condition by E. A. Pirogova; II – assessment of the adaptive capacity of the circulatory system by R. M. Baevsky; III – Skibinskaya's index; IV – assessment of the somatical health condition by G. L. Apanasenko; V – assessment of the spinal column condition by Mashkov; VI – assessment of the brachial's index. The boundary value of the Student's t-test for p<0,01 is 2,75, for p<0,05 – 2,04.*

of the 2nd year) the simular students indicator represents 0.48 cm, which appears to be normal asymmetry. By the end of the third and fourth year, the students have represented an excellent posture with the asymetry indicators of 0.19 cm and 0.11 cm.

At the beginning of the four-year experiment, the shoulder rate of the students was showing the presence of stoop – 75.13%. However, a slight improvement (at $p<0.05$) has been recorded by the end of the first academic year – up to 79.14%. After two years of hatha yoga regular practices, the mark has reached its norm – 82.99%. By the end of the third and fourth year, the simullar indicators have reached a level of 89,18% and 94,82%, which considered to be a good posture.

Quantitative survey data reflect the positive impact of the regular hatha yoga exercises on the students body. Four-year dynamic of the students health has been determined on the basis of normalization of the blood pressure and heart rate, posture improvement, reducing of the body weight, improvement of the physical qualities, improvement of the characteristics of the respiratory system.

Conclusions

1. The following informative characteristics, which can help to determine the level of health at the student age, have been set: index of the physical condition by E. A. Pirogova; assessment of adaptive capacity of the circulatory system by, R. M. Baevsky; Skibinsky index; assessment of the physical health, by G. L. Apanasenko; assessment of the state of the spinal column by Mashkov; assessment of the brachial index.

2. The content of the hatha yoga training programs for the university students without special physical physical fitness, has been expanded. According to the training sessions weekly programe, the following hatha yoga exercises have been used: poses performed in a standing position;

Standing poses
Sitting poses, lying, and derived poses;
twisted and abdominal poses;
balancing postures (balance);
poses with body deflections;
inverted poses.

3.During the four years of experimental testing of the hatha yoga training program with the university students, positive dynamics of their health indicators with statistical significance $p<0.01$, have been recorded.

Prospects of the research. Justification of the benchmarks of the level of mastering hatha yoga exercises by students, in accordance with the European Credit Transfer System.

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The planning of training process in triathlon

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Purpose: *is the working out of base variant of training process as the base for planning of individual training of triathlete.*

Material & Methods: *studying and generalization of special literature of basis training process for endurance in cyclic kinds of sports, the analysis of training of famous triathletes to competitions.*

Results: *mane stages of training process formation in triathlon and features of distribution of sportsman's training load in depending on period of training were considered.*

Conclusions: *comprehensive planning of training process in different kinds of triathlon is lying down in basis of improving of competition form of triathlete.*

Keywords: *triathlon, training plan, amount of training load, stages of training, macrocycle, microcycle, mesocycle.*

Introduction

As a result of that a new sport consists of three sports competitions on endurance of alternating each other in a continuous sequence, the technique of creation of the training process of triathletes includes methods of their preparation on the disciplines which are making types of the program of triathlon taking into account the extent of segments of a distance [3; 14; 15]. Specifics of the organization of trainings are defined also by the fact that a consecutive change of cyclic kinds of activity when passing super-marathon is carried out against the spent neuromuscular energy of a sportsman owing to what physiological adaptation of an organism to similar physical activities and positive changes in functions of various organs and systems appear only in result of only from a long systematic purposeful training work [1; 6; 7; 9; 10; 18].

Communication of the research with scientific programs, plans, subjects

The research is executed according to the Plan of the RW of the chair of water sports of Kharkov state academy of physical culture.

The purpose of the research

The development of the basic option of planning of the annual training process as bases for drawing up the individual plan of preparation of a qualified triathlete.

Research problems:

1. To disclose the value of planning of the training process in triathlon.

2. To prove the need of use of the four-year scheme of creation of the training process by preparation of high qualification triathletes.

3. To define the factors influencing the structure of annual planning of preparation of triathletes.

4. To consider the structure of a complex year macrocycle and feature of distribution of the volume of training loads in it.

Material and Methods of the research

1. The studying and synthesis of data of literary and Internet sources for an assessment of degree of study of a problem and definition of key provisions which are the cornerstone of planning of the training process in cyclic sports on endurance;

2. The analysis of stages of preparation of world-class triathletes in foreign and native sports practice.

Results of the research and their discussion

The long-term training process in sport triathlon needs to be considered as the effective apparatus which causes peculiar physiological and psychological changes in a human body at the correct application. Result of adequately constructed trainings of a sportsman who is specialized in this or that type of the program at the chosen distance, is the improvement of functions of an organism on delivery of oxygen and power substances to the working muscles, the increase of ability to increase power stocks (in muscles and in a liver), the acceleration of removal of by-products of a metabolism from muscular tissues, the improvement of the motive qualities specific to a concrete type of physical activity, and also the development of strong-willed qualities and the increase of self-assessment.

In spite of the fact that there are fundamental principles of effective preparation in cyclic types [6; 10; 13; 18], sports success when overcoming of the combined distance consists also of specific features of a sportsman, his personal experience and a set of other internal and external factors which have to coincide that he could show and realize in the maximum degree the potential opportunities in all three disciplines making continuous triathlon. For this purpose the triathlete

who reached a certain level of sports skill, needs the specially developed individual training plan. This plan will allow to know always what type of physical activity, in what volume and in what zone of intensity a sportsman should be engaged at this or that stage of preparation, harmoniously combining trainings with the everyday life, having united in himself richness of the saved-up experience, scientific researches, practical knowledge and innovative ideas which are developed taking into account physiological opportunities of an organism of a specific sportsman.

Planning of preparation can cover the periods, different in time (long-term, year etc.), and the existence of the individual plan gives opportunities for monitoring of the process of sports improvement in swimming, cycle driving, run and its expeditious adjustment for the purpose of improvement of the general productivity by means of application of more effective training methods of influence.

The construction of the training plan begins with the statement of the purpose and problems of the forthcoming sports preparation taking into account the level of formation of necessary qualities, and also claims of a sportsman [12]. In the basis the plan has to be directed to a complex training of a sportsman (training classes need to be used also for the optimization of food, equipment, increase of technical skill, etc.) for overcoming for the minimum possible time of the combined distance of triathlon.

The four-year training plan

As a rule, the four-year scheme of creation of the training process is used in sport of high achievements by preparation of world-class triathletes for the Olympic Games (and to other significant competitions) [6; 11; 15; 18].

The made long-term plan provides organized, intelligent and consecutive building to a maximum of training influences during the long period of sports improvement that will promote to the utmost transition of functioning of an organism of a sportsman to qualitatively higher level of his physical capacities.

The starting point by drawing up and implementation of the four-year training plan is the maximum sports result which is achieved by a sportsman at the previous stage of preparation [13].

Considering that it is necessary to a triathlete to score the required quantity of points at test 16 international competitions (the European championships and the World, World Cups) within two years (from June to June) preceding the main start for obtaining the Olympic license, this scheme of creation of the training process has to be directed to preparation for successful performances in rating races and achievement of the peak of sports form during participation in the Olympic Games [11; 15].

The factors which are influenced the structure of a year planning of preparation of a triathlete

Successful performance at competitions in triathlon is impossible without a presence of the best sports form at a sportsman in all types of physical activity entering continuous triathlon. It is necessary for achievement of the most available level of result at this or that step of sports improvement.

According to L. P. Matveyev's researches, sports form passes 3 phases as a condition of optimum preparedness for the highest achievements in the development: acquisitions, stabilization and temporary loss [9].

Various physical qualities and abilities are developed, movement skills and abilities are formed, and the level of functioning of the main systems of an organism is increased in the first phase for the purpose of the creation of prerequisites for specific changes.

The phase of stabilization of sports form is characterized by the development of the number of qualities and abilities causing high productivity of the competitive activity.

The relative stabilization of sports form doesn't mean the termination of its development. Sports form, which is acquired by the beginning of the competitive period, is exposed to certain changes in the course of the improvement of specific opportunities for the achievement of the highest result in the most responsible competitions (L. P. Matveyev, 1977).

In the third phase – temporary loss – a partial reduction of manifestations of special qualities and abilities is observed, owing to violation of the specialized coordination communications and decrease in the level of functionality of systems of an organism of a sportsman.

These phases of the development of sports form are the cornerstone of the creation of the training process in cyclic sports on endurance and correspond to three periods of macrocycle – preparatory, competitive and transitional.

Because of that starts are organized from January till December in different age groups according to «The provision on All-Ukrainian competitions in triathlon», types of the program and distances, planning of trainings of a sportsman within a year can assume one or two macrocycles (depending on qualification of a sportsman and dates of sporting events in which it is supposed to take part) [4; 15]. The additional macrocycle is allocated by the preparation for responsible international starts in the annual plan (as at one- and two-macrocyclic planning) which direct problem – purposeful training of a sportsman for participation in the main competitions. The three-cyclic scheme practices, as a rule, when planning the training process of sportsmen of high qualification.

In the presence in the annual plan of two macrocycles their contents and duration have significant differences. If planning of the training process within a year consists of 3 macrocycles, then the first of them has mainly basic character, the second has more specific focus, and the third is focused on the achievement of the highest results in key starts of a season [9; 13].

The annual training macrocycle is subdivided into three periods of preparation in the system of long-term preparation in cyclic sports on endurance – preparatory, competitive and transitional. Each of them, in turn, consists of certain types of the mesocycles differing on structure, volume of work and intensity of loadings: the preparatory period – from the basic and control-preparatory, the competitive period – from the precompetitive and competitive, the transitional period – from the recovery or involving. The involving mesocycle is planned at the initial stage of preparation and in the basis is directed

to leading of a sportsman to performance of a versatile training work. The recovery mesocycle is planned in the system of long-term preparation instead of the involving mesocycle.

Mesocycles include microcycles which are directed to the increase of level of separate components of sports preparedness (depending on problems of a concrete mesocycle) for the optimum organization of the training process.

It is necessary to consider that the above-stated periods of preparation are peculiar to each of them (preparatory, competitive, transitional), and training mesocycles in these periods have to be uniform in swimming, cycle driving and run at the organization of trainings of triathlete for three versatile cyclic disciplines within one comprehensive training program. Microcycles, on the contrary, should be varied harmoniously, combining a bigger loading in one discipline with its decrease in another and rest in the third [2; 20; 21].

Four-week microcycles (however, depending on solvable problems of a mesocycle, also options one – two – three-week microcycles are possible) are the most optimum on duration and convenient at year planning of training of a sportsman for competitions in continuous triathlon. According to it we will provide the short characteristic of five training mesocycles consisting of thirteen four-week microcycles.

The basic mesocycle (4 microcycles) by the main purpose has the creation of strong aerobic base, the increase in absolute force of the top and lower extremities (the largest force which a sportsman can develop at the maximum muscular contraction), power endurance (ability of an organism of a sportsman to resist exhaustion at rather long and high power loadings) of a sportsman, high-intensity training loads, necessary for overcoming at the subsequent steps of sports improvement.

The considerable part (60–70%) of the total training amount of the basic mesocycle is made by low-intensive long aerobic loadings during this period, 10–20% – power preparation and only an insignificant share is allocated for high-intensity trainings (tempo and mountain intervals, high-speed work).

The control – preparatory mesocycle (4 microcycles) in the basis is directed to the improvement of ability of an organism of a sportsman to carry out high-intensity cyclic loadings throughout the long period of time. For this purpose the training program of this mesocycle has to contain 50–60% of low-hard aerobic work, and also such components as high-intensity intervals (for adaptation of an organism to the raising loadings), high-speed and tempo trainings (the first increase working capacity and improve coordination of movements, and the second allow to trace dynamics of training results).

The precompetitive mesocycle (1,5 microcycles) assumes the reduction of functions of an organism of a triathlete to optimum sports form with final working off of the technical, policy and psychological strokes which are applied during competitions.

The volume of training work decreases in this bringing mesocycle, in comparison with previous, but the intensity of its separate components increases (interval, high-speed, tempo). It is expediently to give to low-intensive aerobic trainings about a half of training volume during this period for recovery of a sportsman between high-intensity loadings.

The competitive mesocycle (2–3 microcycles) the main purpose has a successful performance of a sportsman at competitions at the fullest realization of his sports potential. The regular participation in super-marathons, and also interval high-speed trainings bear in themselves a high physiological and psychological loading during this period of time. It is recommended to carry out 40–50% of training volume in the form of a low-hard physical activity for maintenance of aerobic base and ensuring active restoration of a triathlete throughout all competitive period [3; 21].

The recovery mesocycle (1 microcycle). Months-long 2-3-times daily trainings and numerous performances at continuous triathlon competitions in total with natural psychological tension often bring sportsmen to a state of an easy overtraining (fatigue) and to decrease in motivation at them to be engaged in this sport. The performance of small-volume loadings, low-intensive on character or alternative types of physical activity is recommended at this time for the purpose of restoration of the lowered vital functions of an organism of a sportsman. Active recreation during the recovery mesocycle promotes faster and full renewal of normal work of bodies and systems of a human body.

The implementation of the comprehensive year training plan will consistently and purposefully prepare a triathlete for successful overcoming of the combined distance of continuous triathlon.

The distribution of training volume in mesocycles on 13 four-week microcycles. The annual training plan of training of a sportsman consists of five mesocycles on the structure which differ on duration, frequency and intensity of loading (i.e. to its volume). At the same time each stage of sports improvement includes a certain quantity of four-week microcycles where different work in character and power is carried out, depending on that training effect which is planned to be received [3; 6; 13; 21].

The distribution of a training load on four separate microcycles both in the basic, and in the control and preparatory mesocycles has to differ slightly among them. The volume of trainings in the second microcycle of the basic mesocycle will be a little more, than in the first, in the third – it is more, than in the second etc. on increasing while the triathlete won't reach the maximum size of training influences in the last microcycle of the control and preparatory mesocycle.

Training volume in the whole microcycle in relation to the remained half-cycle, will be much more in the precompetitive mesocycle consisting of six-week microcycles.

Volumes of loadings don't differ among themselves during trainings and competitions between two-three microcycles practically (the insignificant difference depends on the number of competitions in which a sportsman takes part) in the competitive mesocycle.

The distribution of low-intensive loading and alternative types of physical activity is uniform in the recovery mesocycle as the shortest, consisting of one microcycle.

The distribution of training volume in four-week microcycles. The weekly variation of the training loads planned in each microcycle by preparation of a triathlete for competitions widely is applied as in foreign, and native sports practice.

The consecutive accumulation of their duration and intensity is most often use within the first three weeks with the subsequent decrease in the fourth (unloading week) for the purpose of a gradual change of volume of loadings in the four-week mesocycle. This scheme is most characteristic of the two first mesocycles with the distribution of training work within one microcycle on weeks in the following ratios: in the basic – 23%, 26%, 29%, 22%, in the control-preparatory – 21%, 27%, 33%, 19%.

The following option with the descending weekly distribution of training loads in microcycle from maximum to minimum is most expedient in the precompetitive mesocycle which is bringing a sportsman to competitions: 33%, 27%, 23%, 17%.

Weekly change of volume of work in microcycle can have the alternating character throughout the competitive mesocycle: 30%, 20%, 30%, 20%.
The recovery mesocycle is characterized by uniform weekly distribution of training volume in microcycle (25%, 25%, 25%, 25%).

Note. *The similar scheme of a weekly variation of loadings in microcycles was used in the preparation by the seven-time winner of the most prestigious race "Iron Man" Ray Browning and other outstanding triathletes [5; 8; 17; 19].*

The offered option of planning of the training process isn't dogma (the way to success at everyone), but can be used as the basis by drawing up the individual plan of preparation of a triathlete for continuous triathlon.

Conclusions

It is possible to draw the following conclusions on the basis of the conducted research:

1. The comprehensive individual plan of preparation of a triathlete for competitions is necessary for the rational distribution of volume of loadings in swimming, cycle driving and run, monitoring of process of sports improvement and if necessary – carrying out expeditious correction with application of more effective methods of training influences.

2. It is necessary for a world-class triathlete to make a performance at 16 rating races for the participation also within two years preceding the main start effectively at the peak of sports form in the Olympic Games that is possible at the organized and consecutive building to maximum of training influences throughout the long period of sports improvement with use only of the long-term (four-year) scheme of the creation of the training process.

3. Phases of the development of sports form of a triathlete (acquisition, stabilization, temporary loss), which have to be considered at the year planning and to be focused on the highest achievements in key starts of a season, lie at the heart of the creation of the training process in the cyclic sports which are entering continuous triathlon.

4. The structure of the annual macrocycle allocates three periods of preparation (preparatory, competitive and transitional), each of which consists of certain types of mesocycles which, in turn, are subdivided into microcycles. At the same time the training volume is distributed in them depending on the purpose of a concrete stage of preparation.

Prospects of further researches. The subsequent researches will be directed to studying of a problem of sports selection of pupils who are enlisted in groups and offices on triathlon of children's and youth sports schools.

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Technical and tactical preparedness of the team "Helios" of Kharkov in the 25th football championship of Ukraine in the first league (the first round) in 2015

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Purpose: *to define model characteristics of technical and tactical preparedness of the team which participated in the championship of Ukraine of the first league for the purpose of further improvement and correction of the educational and training process.*

Material & Methods: *researches were carried out by means of method expert estimates. 5 specialists of football were involved as experts.*

Results: *average values of the registered sizes for 10 games were analyzed. Various technical and tactical actions and their differences for the first and second times, and also separate indicators of a game of players and the team "Helios" of Kharkov are analyzed.*

Conclusions: *quantitative and qualitative indicators (flaw coefficient) were received as on team technical and tactical actions, and separately on each technical-tactical technique for every period of a game.*

Keywords: *technical and tactical actions, total of actions, flaw coefficient, indicators for the first and second times, attacking and defensive actions of a team.*

Introduction

The priority of native experts doesn't raise doubts in the creation of model characteristics of the competitive activity in football [5; 7; 10]. Technical and tactical preparedness from young football players [1; 4; 6] till veterans of football is analyzed by experts [9]. Some experts investigate separate indicators which, in their opinion, lead to the positive result of a game. Among them: passes in one touch in different zones of a football field [11], a delivery of a ball to the penalty area of the rival [8] and another. There are single researches of the competitive activity of highly skilled football players (The premier league of the Ukrainian football) which were conducted with the same team for a long time [14]. However the longitudialn researches of technical and tactical preparedness of teams of the first league of the Ukrainian football are almost absent [2; 3; 13].

Presently it is possible to allocate different approaches during the development of quantitative indices what characteristic of the set level of sports skill [12]. We used the approach that is connected with studying of considerable set of sportsmen of different qualification, dependence establishment between the level of sports skill and the dynamics of changes of this or that indicator.

Communication of the research with scientific programs, plans, subjects

The research is executed according to the Built plan of the RW in the sphere of physical culture and sport for 2011–2015 by MES of Ukraine by the subject 2.3 "Scientifically methodical bases of improvement of the system of training of sportsmen in football taking into account features of the competitive activity", and also according to the Initiative subject of SW of the chair of football and hockey of Kharkiv state academy of physical culture for 2011–2015. "Optimization of the educational and training process of football players of different qualification".

The purpose of the research

To define model characteristics and their changes in team technical and tactical preparedness of the team which participated in the 25th championship of Ukraine (the first round) of the first league for the subsequent improvement and correction of the educational and training process.

Material and Methods of the research

The researches were conducted by means of a method of expert estimation. 5 experts of football were involved as specialists. Among them are: one – the master of sports in football, one – the candidate for the master of sports, others were players of professional football teams. All experts worked with professional and amateur football teams as coaches in the past. Among experts are: two professors; one candidate of pedagogical sciences, associate professor; two candidates of science on physical education, associate professors of football and hockey; one graduate student of the chair of football and hockey of Kharkiv state academy of physical culture. If debatable questions appeared during the registration of the competitive activity of the team «Helios» of Kharkiv, they were solved by a majority vote. The technique allowed mutual control of indicators of the competitive activity that allowed to obtain more objective data during the pedagogical supervi-

sion. So, one of experts counted total of passes, and another told on a dictophone, in the same time, what concretely players (the number of a player) and which by a direction and a distance pass was executed.

Only 10 matches on the home field were registered by the scientifically methodical group at the team «Helios» of Kharkiv. 30 points were gathered and the team took the 4th place from 16 teams. The team "Helios" of Kharkiv received 7 victories, 9 draw, 2 defeats. The team "Helios" of Kharkiv scored 22 goals and passed 15.

Results of the research and their discussion

Indicators of technical and tactical activity of the team "Helios" of Kharkiv for 10 house games for the round circle in the 25th championship of Ukraine on football are reflected in the tab. 1. There were separately counted indicators for the first and second times of a game and total of technical-tactical techniques.

Analyzing indicators for the first and second times, some tendencies are shown: 1. The number of short passes forward increases in the second half, but the number of short passes across and back decreases. 2. The quantity of enclosings of rivals increases in the second half. 3. The flaw coefficient at interceptions decreases in the second half. 4. The number of performance of corner kicks increases in the second half. However all these changes aren't reliable and indicate only tendencies which are necessary to consider during the correction of the educational and training process. It is necessary to specify among reliable changes that the number of interceptions of the team «Helios» of Kharkiv decreases in the second half ($t=2,18$; $p<0,05$). The flaw coefficient at performance by players of picking up of a ball at rivals (improves) decreases in the second half ($t=3,48$; $p<0,01$).

The most active players of the team «Helios» of Kharkiv were defined by the results of each game (what had the maximum number of technical and tactical actions). The greatest individual indicators of average number of technical and tactical

Table 1

Indicators of TTA of the team "Helios" of Kharkiv for the first round of the 25th championship of Ukraine on football (n=10)

№	Technical-tactical actions	1 time	2 time	t	p	1+2
		$\bar{X}\pm m$				
1.	Receiving of a ball	45,0±1,39	43,3±2,25	0,64	p>0,05	88,3±3,16
	Flaw coefficient, %	18,75±1,51	17,64±2,27	0,4	p>0,05	18,02±1,2
2.	Passes of a ball by a leg forward (short)	104,4±2,74	111,1±6,0	1,01	p>0,05	215,5±7,23
	Flaw coefficient, %	30,62±2,57	30,21±1,74	0,13	p>0,05	30,33±1,64
3.	Passes of a ball by a leg back and across (short)	80,1±7,0	69,1±4,77	1,3	p>0,05	149,2±10,74
	Flaw coefficient, %	9,09±1,28	8,4±1,13	0,4	p>0,05	8,7±0,84
4.	Passes of a ball by a leg forward (long)	26,2±1,48	25,3±2,39	0,32	p>0,05	51,5±2,95
	Flaw coefficient, %	72,99±2,27	76,48±2,79	0,97	p>0,05	74,42±1,48
5.	Passes of a ball by a leg back and across (long)	3,3±0,57	3,9±0,67	0,68	p>0,05	7,2±0,87
	Flaw coefficient, %	60,6±10,88	66,48±9,79	0,4	p>0,05	64,06±7,87
6.	Head-playing (single combat above)	24,7±1,98	24,2±2,12	0,17	p>0,05	48,9±3,0
	Flaw coefficient, %	47,56±2,04	51,16±3,38	0,91	p>0,05	49,46±1,33
7.	Enclosing	12,5±1,27	16,6±1,77	1,88	p>0,1	29,1±2,15
	Flaw coefficient, %	44,14±4,46	44,91±2,94	0,14	p>0,05	44,73±2,92
8.	Interception	18,5±1,86	13,1±1,64	2,18	**p<0,05**	31,6±3,11
	Flaw coefficient, %	31,32±3,65	26,78±2,66	1,0	p>0,05	28,96±1,91
9.	Picking out	22,5±2,33	22,5±2,64	0	p>0,05	46,0±4,34
	Flaw coefficient, %	57,89±2,81	44,92±2,44	3,48	**p<0,01**	51,73±1,12
10.	Shoots for goal by a leg	4,8±0,82	5,6±0,83	0,68	p>0,05	10,4±0,94
	Flaw coefficient, %	47,33±7,71	55,62±7,41	0,77	p>0,05	51,18±6,15
11.	Shoots for goal by a head	1,57±0,29	1,85±0,59	0,43	p>0,05	2,66±0,52
	Flaw coefficient, %	59,51±17,0	46,65±17,45	0,52	p>0,05	62,94±11,37
12.	11^{th} penalty kicks		1	–	–	1
	Flaw coefficient, %		100	–	–	100
13.	Penalty kicks in the attacking zone	2,0±0,3	2,11±0,35	0,24	p>0,05	3,3±0,42
	Flaw coefficient, %	59,51±15,37	50,91±13,77	0,41	p>0,05	53,66±11,34
14.	Corners kicks	3,9±0,72	5,88±1,95	0,95	p>0,05	7,4±1,25
	Flaw coefficient, %	56,23±10,95	64,12±12,72	0,47	p>0,05	60,39±8,61
15.	Ball throw from behind a sideline	14,3±1,35	15,9±1,41	0,82	p>0,05	30,9±2,75
	Flaw coefficient, %	24,06±5,35	22,51±2,81	0,25	p>0,05	23,07±3,54
16.	Total of TTA for a time (a game)	362,7±9,56	358,4±9,25	0,32	p>0,05	721,1±15,54
17.	Effectiveness ratio	68,64±1,35	68,21±1,38	0,22	p>0,05	68,44±1,02
18.	Flaw coefficient, %	31,36±1,35	31,79±1,38	0,22	p>0,05	31,56±1,02

actions for a game of certain players of the team «Helios» of Kharkiv – 94±4,35, at the same time the flaw coefficient made – 28,21±1,93%.

The indicators of attacking and defensive actions of the team «Helios» for the first round of the championship of Ukraine on football are reflected in the tab. 2.

The attacking actions were divided into fast and position attacks during the registration (tab. 3).

The indicators of the interrupted attacks of the team "Helios" were also registered by experts (tab. 4).

Average values of efficiency of attacking actions of the team "Helios" were defined (tab. 5)

Conclusions

1. The number of short passes forward, enclosing of rivals and corner kicks increases in the second half, but the number of short passes across and back decreases. The flaw coefficient at interceptions decreases in the second half. However all these changes aren't reliable and indicate only tendencies which are necessary to consider during the correction of the educational and training process.

2. The number of interceptions of the team «Helios» of Kharkiv decreases in the second half ($t=2,18$; $p<0,05$). The flaw coefficient at performance by players of selection of a ball at rivals decreases (improves) In the second half ($t=3,48$; $p<0,01$).

3. The greatest individual indicators of the average number of technical and tactical actions for a game which are performed by certain players of the team «Helios» of Kharkiv – 94±4,35, at the same time the flaw coefficient made – 28,21±1,93%.

4. The summation of indicators for the round and second round of the 25th championship of Ukraine on football will allow receiving more reliable conclusions for the correction of the process educational and training of team of the first league of the Ukrainian football.

Prospects of the subsequent researches. The pedagogical supervision over the level of technical and tactical preparedness of players and this team will be continued for the purpose of identification of reliable tendencies in the creation of the educational and training process and successful performances in the subsequent.

Table 2

Attacking and defensive technical-tactical actions of the team "Helios" of Kharkiv for the first round of the 25th championship of Ukraine on football in the first league, on average for a game (n=10)

№	Indicators of technical and tactical activity		X̄±m
1.	Number of attacks of the team	Successful	23,6±1,98
		Broken	127,8±6,01
		Total	151,4±6,38
2.	Efficiency attacking actions, %		15,76±1,38
3.	Efficiency of defensive actions, %		91,02±0,72
4.	Number of attacks of the rival team	Successful	12,2±0,91
		Broken	123,9±5,35
		Total	136,1±5,43
5.	Efficiency attacking actions, %		9,13±0,61
6.	Efficiency of defensive actions, %		84,69±1,51
7.	Number of ingrained attacks of the team	Successful	23,6±1,98
		Broken	59,9±1,99
		Total	83,5±3,07
8.	Efficiency attacking actions, %		28,09±1,87
9.	Efficiency of defensive actions, %		80,78±1,5
10.	Number of ingrained attacks of the rival team	Successful	12,2±0,91
		Broken	52,1±3,55
		Total	64,3±3,8
11.	Efficiency attacking actions, %		19,38±1,41
12.	Efficiency of defensive actions, %		72,07±1,93

Table 3

Indicator of fast and position attacks of the team "Helios" and their efficiency for the first round of the 25th championship of Ukraine on football in the first league in 2015 (n=10), X̄±m

Total	Fast attacks			Position attacks		
	Quantity	% among all attacks	Effectiveness, %	Quantity	% among all attacks	Effectiveness, %
151,4±6,38	109,6±7,82	72,38±3,98	14,38±1,41	36,0±4,06	23,54±2,63	21,16±5,13

Table 4

Indicator of the interrupted attacks of the team "Helios" in different zones of the football field (n=10), $\bar{X}$±m, %

Zones of football team	Defenses	Average	Attacks
Percent of failure of attacks	5,84±0,79	41,95±2,91	43,0±3,26

Table 5

Indicators efficiency of attacking actions of the football team "Helios" (n=10), $\bar{X}$±m

Quantity of the attacking actions	Quantity of shoots for goal of the rival	The attitude of quantity of shoots for goal towards the number of the attacking actions, %	Quantity of the scored balls	The attitude of quantity of the scored balls towards the number of the attacking actions, %
151,4±6,38	12,8±0,97	21,89±13,02	1,75±0,31	1,11±0,19

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Optimizing the methods of biathlete shooting training by means of «aiming-off» with usage of «SCATT» marksmanship trainer

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Purpose: *the improvement of algorithm of biathlete shooting training by means of «aiming-off» during changing wind conditions that had been earlier developed by the authors.*

Material & Methods: *theoretical methods of scientific cognition and practical experimental training with utilization of marksmanship trainers were used.*

Results: *correction tables of hold-off during shooting under the conditions of different strength and direction of wind were developed. Elaborated algorithm of biathlete shooting training during changing wind conditions by means of «aiming-off» was optimized and divided into four stages: the objective of the first stage was to make the athlete determine the direction of hit deviation (target impact point) from the target centre at the given mutually arranged aiming devices; that of the second stage consisted in shooting training with aiming at the given target points; that of the third stage was to teach shooting at voluntary target points in playing form, and that of the fourth stage was to neutralize the interference of conventional wind. The complex of preliminary exercises providing accelerated training of «aiming-off» was presented.*

Conclusions: *suggested algorithm of training with usage of marksmanship trainer permits to reduce the cartridge expenditure significantly and accelerates mastering the shooting technique by biathletes under the real conditions.*

Keywords: *biathlon, shooting technique, training, method of «aiming-off», marksmanship trainer.*

Introduction

Shooting in biathlon is carried out in the conditions of open shooting ranges therefore the set of the external forcing-down factors (the direction and wind force, temperature and humidity of air, atmospheric pressure) influences on a trajectory of a flight of a bullet [1; 2]. Temperature, humidity of air and atmospheric pressure interfere slightly when firing in biathlon as they are successfully corrected on adjustment fire before competitions or training [3]. The greatest influence on flight of a bullet from the listed above factors when shooting on a distance of 50 meters (standard conditions of biathlon) is exerted by force and the direction of wind [3; 4]. Directly the process of training in technique of shooting in the conditions of open shooting ranges is difficult because of inconstancy of wind on force and the direction [3].

The great number of authors was engaged in studying of influence of wind on demolition of a bullet when shooting from the small-caliber weapon on open shooting ranges. In particular, questions of calculation of amendments at wind, different in force and the direction, were considered in the first works on biathlon of N. G. Bezmelnitsyn [5], and later in the works of Ya. I. Savitsky [6] and V. A. Kinl [7]. W. C. Pullum and F. T. Hanenkrat [8] in shooting sport, and A. I. udelin [9] in biathlon were engaged in definition of the main (defining) wind site in a practical method with the use of wind installations. And the Ukrainian experts on shooting sport came to the same conclusions theoretically with the use of mathematical calculations [10]. A. V. Pilin with coauthors studied a behavior of wind (redistribution of air streams) on a shooting range depending on force and the direction of it on an entrance to a shooting range [4]. A. I. Kudelin and P. A. Rostovtsev [11], and also T. Boyer [12] were engaged in calculations of size of carrying out of an aiming mark at different in force and the direction wind.

Traditionally shooting in biathlon is carried out with amending a sight at change of a wind situation [5–7]. And rather recently the second way when shooting during wind – «anticipation» or method of «aiming-off» began to use in biathlon [3; 11; 13; 14]. Amending a sight, in case of change of the direction and wind force, is carried out practically before each shooting, and sometimes and more than once during one shooting session. It not only increases the time spent of a sportsman for a distance, but also can lead to mistakes when amending that significantly reduces sports result of a sportsman. A number of authors consider that shooting with carrying out in practice is more effective, than preliminary amending a sight [3; 13]. In particular, according to A. I. Kudelin [15], a set of examples from practice exists when biathlonists, shooting at the wind changing on force and the direction, made amendments to a sight incorrectly. Long-term practice of sports bullet shooting in field conditions from the small-caliber weapon confirms

expediency of use of shooting in the method of «aiming-off» when shooting during wind [12; 16]. Especially it concerns high-speed exercises and final series of separate types of sports bullet shooting [17].

And though shooting with «aiming-off» is widespread among «practitioners» now in biathlon, directly described a technique of training in «aiming-off» - doesn't exist. We didn't reveal it in scientific and methodical literature on biathlon and shooting sport [3; 6–8; 11; 12; 16–20] that confirms the relevance of our researches.

Research hypothesis

Training of biathlonists in shooting is very problematic at constantly changing wind situation in the conditions of shooting ranges in the method of «aiming-off» as wind isn't predictable that complicates to maintain sequence of grade levels, and it is unprofitable to create especially for it the shooting ranges which are equipped with carminative installations in the financial plan. In this regard we assume that it is expedient to begin training with the use of the marksmanship trainer «SCATT», thanks to its specific properties [19; 21]. And only after training of biathlonists in technique of shooting with the method of «aiming-off» on the marksmanship trainer «SCATT» it is necessary to pass to fixing of skills of shooting at wind on an open shooting range. The offered by us algorithm of training allows a sportsman and a coach to obtain quickly information which he can't quickly receive when carrying out this sort trainings on a shooting range. A sportsman copes with skill of shooting at wind in the method of «aiming-off» quicker by means of the marksmanship trainer «SCATT» and the expense of cartridges on training is reduced.

Communication of the research with scientific programs, plans, subjects

The choice of a subject of the research is carried out according to a scientific subject "2.5. Improvement of the training process in winter sports" in the specialty "24.00.01. – Olympic and professional sport" of the Consolidating plan of the research works in the sphere of physical culture and sport for 2011–2015 of the Ministry of youth and sport of Ukraine.

The purpose of the research

The improvement of the developed by authors of article earlier algorithm of training in technique of shooting of biathlonists in the method of «aiming-off» at the changing wind situation.

Research problems:

1. To develop adjustment tables for shooting at wind of various direction and force.

2. To optimize algorithm of training of biathlonists in shooting at the changing wind situation in the method of «aiming-off» with the use of the marksmanship trainer.

3. To improve and approve the complex of the bringing exercises providing the accelerated process of training of «aiming-off».

Material and Methods of the research

The research methods: the theoretical methods of scientific knowledge, such as supervision, generalization, the analysis and synthesis and practical trainings – experiments on marksmanship trainers. The used equipment: personal weapon of biathlonists; the marksmanship trainer «SCATT» (50 m, a small-caliber rifle (5,6 mm), range to a target – 5 m, ballistic coefficient (F=0) were chosen in the program SCATT, in this case the hole settles is down in a point where a rifle is at the time of operation of the shock and trigger mechanism).

Results of the research and their discussion

In the previous researches [22] we made an attempt to describe the algorithm of training in methods of shooting with «aiming-off» in ideal conditions for shooting – in the absence of wind and on the marksmanship trainer «SCATT», excluding influences of the forcing-down factors on demolition of a bullet. However errors and inaccuracies were noticed in the described algorithm at its approbation in the training process that induced authors to improve the offered by us algorithm of training in technique of shooting with «aiming-off». In particular, authors considered initially that from two ways of targeting: «interpositions of aim devices and the target» and «aiming-off» it is expedient to use only the second option [22]. But practice showed that preliminary training in interposition of aim devices and the targets accelerates the process of training due to faster understanding by sportsmen where the hole on a target at different problems of a point of carrying out of an aiming deviates. The gradation of wind on counter, side and passing was the second mistake of authors. While side-diagonal wind in practice meets considerably more often, and its intervention in demolition of a bullet significantly differs both from side, and from a head or fair wind. The same mistakes are present also at the work of Ya. Romanova [14].

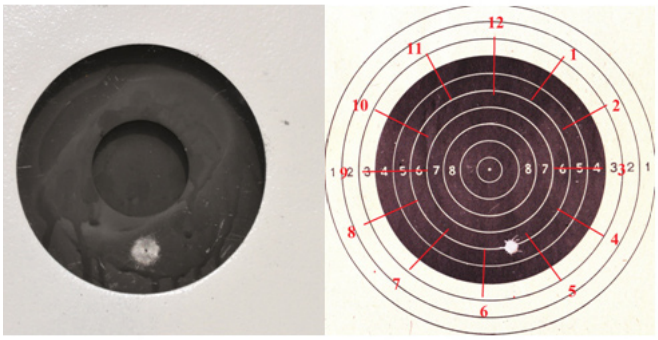
On our supervision and experiments in practice it is expediently to break all process of use of the marksmanship trainer «SCATT» into four grade levels.

The first – basic. The purpose – to teach a sportsman to define at what mutually located aim devices, in what direction a hole (a meeting point) will deviate from the center of a target. This stage is very individual as the size of a dioptrical sight, internal diameter of a ring front sight and length of the target line at athletes are very different that leads at identical statement by a coach of a task to various results of an arrangement of holes for targets. Testing of sportsmen is held on the computer training program «The mark of a shot – s dioptrical sight» at the beginning at this grade level [23]. This testing gives the answer to a question that a sportsman has acquired from a subject: «targeting».

Further it is necessary to start trainings on the marksmanship trainer at the following mutually located aim devices and a target: the front sight is pressed, but doesn't concern a target, the front sight concerns a target, the front sight «crashes» into a target on 1/2 part. A reference point – at the left-on the right, from above-from below. At the same time we try to obtain that a sportsman, «playing» by the distance «target- front sight», didn't distort an external visual ring «dioptrical sight-front sight».

When a sportsman mastered, without distorting aim devices, to aim in different points of a target and approximately began to represent where the bullet at these or those interpositions will leave «target front sight», we start *the second grade level* – shooting with an aiming in the set target points. The purpose – is to train in an aiming in the set target points with preservation of an equal «front sight" (the control of a gleam «dioptrical sight-front sight»). I.e. we change a way of targeting from the description of a relative positioning of aim devices and the target for aiming mark coordinates. The size of advantage and the direction of a hole on a target are used as coordinates.

A shooting target No. 7 is used mentally in biathlon for orientation and determination of advantage of holes on a target (it is used during the work on the marksmanship trainer and the choice of rifle exercise on 50 meters) and also the dial of a mechanical clock is imposed on it mentally. The phrase «the six on half past six» says that the bullet got to a zone of "the six" of a target number 7 from below (pic. 1a, b).



a) b)

Pic. 1. Rules of the determination of advantage and the direction of a hole in biathlon:
a – the real place of blow of a bullet to a metal target; b – the visualization of a target No. 7 with the dial of hours imposed from above [3]

At the indication of an aiming mark the first figure defines a range of removal of an aiming mark from the center of a target, the second – the direction of removal from the center of a target. In the beginning we recommend to study various aiming marks across as more natural to sportsmen who got used to shoot with horizontal transfer of a weapon. The following points are chosen: four on nine (4 on 9) is a dimension of black and white on the left side of a target; eight on nine (8 on 9) is a dimension targets for shooting from situation at the left «lying»; center; eight on three (8 on 3); a dimension of black on the right (4 on 3).

The similar set of exercises with movement of aiming marks down across is carried out after the development of the set of exercises which are described above with movements of aiming marks.

For training of biathlonists in shooting «aiming-off», having high shooting qualification, it is expedient to use for targeting training tables with differentiation of aiming marks in one dimension (tab. 1).

In all exercises for high-quality performance of tasks it is necessary to control after each shot result of a shot on the screen of the monitor of the marksmanship trainer «SCATT» – is to provide a constant feedback. For this purpose it is necessary to install the monitor so that the shooter to the monitor the cheek didn't come off a butt at transfer of a look.
Besides, the control of each shot via the monitor of the marksmanship trainer «SCATT» will allow revealing a possible asymmetry of visual perception of a biathlonist.

Training in shooting at a target with a diagonal arrangement of holes from 10 till 4 hours is carried out after the development of shooting with the method of «aiming-off» at «horizontal» and «vertical». The main reason for «aiming-off» on diagonal – is the derivation phenomenon [1; 2]. At a side wind a bullet is not only taken down aside, but also lowers down (at the wind blowing in the direction «from the left») or, on the contrary, rises (at the wind blowing in the direction «on the right»). A ratio of demolition of a bullet is about three to one [3; 12]. Therefore it is expedient to study diagonal exercises in sequence: a dimension black at a target for 10 hours, a dimension of the eight for 10 hours, the center, and a dimension the eight for four hours, a dimension black at a target for four hours or in the opposite direction.

Further (*the third grade level*) various combinations of marksmanship trainer depending on the «estimated» force and the direction of wind are offered a sportsman in playful way. The criterion of quality of performance of exercises on the marksmanship trainer «SCATT» is the measure of coincidence of holes to the set aiming marks.

It is necessary to consider specifics of feature of visual perception of force and the direction of wind at a task of characteristics of «conditional» wind.

When shooting from situation «lying» the winds blowing from the directions 11, 12 and 1 of hours are perceived by a sportsman as passers, and the winds blowing from the directions 5, 6, 7 of hours are perceived as passing. In this regard winds with the directions from 11, 12, 1 hours are united in one group in tasks of sets of exercises – «passers», and winds with the directions from 5, 6, 7 hours are united in one group – «passing». Winds with the directions 2, 3, 4 of hour are perceived as «wind on the right». Winds with the directions 8, 9, 10 of hours are perceived as «wind at the left». Dependence of demolition of a bullet under the influence of different in force, but wind, identical in the direction, is presented in the works of A. A. Yuryev [16] (tab. 2).

At the same time it is considered that diagonal wind (from 2, 4, 10 and 8 hours) takes down a bullet twice smaller, than side (from 9 and 3 hours), and the fair and head wind takes down a bullet three-four times smaller [3; 12]. At this grade level the reference value F coefficients from 25 to 35 is established on the marksmanship trainer «SCATT». The table of approximate «aiming-off» is presented in tab. 3.

The criteria for evaluation of performance of each task (a series of shots) is the measure of compliance of average points of hit to the set aiming marks and an accuracy of hits («shooting diameter» – an indicator which is used in the program of marksmanship trainer «SCATT») as well as when performing exercises of shooting with movement of aiming marks at diagonal.

And at the last *fourth grade level*, the weapon of a sportsman

Table 1

Diameters and radiuses of dimensions, distances in dimensions from the center of a target No. 7

Indicators	The serial number of dimension of a target No. 7									
Dimension	10	9	8	7	6	5	4	3	2	1
Diameter of dimension, mm	10,4	26,4	42,4	58,4	74,4	90,4	106	122,4	138,4	154,4
Radius of dimension, mm	5,2	13,2	21,2	29,2	37,2	45,2	53,2	61,2	69,2	77,2
Distance from the center, in dimensions	0,7	1,7	2,7	3,7	4,7	5,7	6,7	7,7	8,7	9,7

Table 2

Deviation of bullets when shooting from a small-caliber rifle under the influence of a side wind (according to A. A. Yuryev, 1962)

Range of shooting, м	Deviation of bullets, mm		
	Weak wind (2 m·s^{-1})	Mild wind (4 m·s^{-1})	Strong wind (8 m·s^{-1})
50	15	30	60

Table 3

The table of «aiming-off» under a condition «adjustment fire in calm (calm) – shooting at wind of various direction and force»

Force and direction of wind	«Aiming-off» at various wind					
	Passer (from half past 12 till half past 1)	Side from the right (с from half past 3 till half past 4)	Side-diagonal from the right (from half past 1 till half past 3 and from half past 4 till half past 5)	Passing (с 5 до 7 часов)	Side from the left (from half past 9 till half past 10)	Side-diagonal-diagonal from the left (from half past 7 till half past 9 and from half past 10 till half past 12)
Weak, 2 m · s^{-1}	–	9 on 3	–	–	9 on 9	–
Mild, 4 m · s^{-1}	9 on 12	7 on 4	9 on 3	9 on 6	7 on 10	9 on 9
Strong, 8 m · s^{-1}	8 on 12	4 on 4	7 on 4	8 on 6	4 on 10	7 on 9

is brought to the center of a target «SCATT» (adjust on the center) and, imitating different in the direction and wind force of a condition, make amendments to aim devices, as if wind takes down a bullet. A task of a sportsman to carry out when shooting the «aiming-off» so what, counteracting amendments, the center of a target was struck.

After the coping of exercises by a sportsman on the marksmanship trainer it is recommended to repeat the second or fourth grade level in field conditions in windless weather.

Conclusions

1. The developed by us earlier [22] algorithm of training of biathlonists in shooting is optimized at the changing wind situation by the method of «aiming-off» with the use of the marksmanship trainer. Methodical mistakes on targeting and technical mistakes are considered in new algorithm at interpretation of size and the direction of wind. The new algorithm of training is successfully approved by us in a training practice.

2. The presented set of exercises on the marksmanship trainer accelerates the process of training of biathlonists in shooting in the method of «aiming-off» in actual practice.

3. At all grade levels it is expedient to use the marksmanship trainer not only as a supportive application of training, but also as means of an operating control of formation of skill of shooting in the method of «aiming-off».

4. It is offered to use the developed tables of «aiming-off» for simplification of process of training of biathlonists in shooting at wind of various direction and force.

5. It is necessary to pass to fixing of skills of shooting at wind on an open shooting range after training of biathlonists in rules of shooting with «aiming-off» on the marksmanship trainer.

The offered by us technique allows creating a representation at biathlonists at what mutually located aim devices in what direction the hole will deviate the center of a target, and to teach a sportsman to neutralize wind influence in the method of «aiming-off».

Prospects of further researches in this direction. Further the development of a technique of improvement of technique of shooting with «aiming-off» is supposed which is including special shooting trainings in field conditions and correction of mistakes with use of the marksmanship trainer «SCATT».

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