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The journal is intended for teachers, coaches, athletes, postgraduates, doctoral students research
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2. Improving the training of athletes of different qualification.
3. Biomedical Aspects of Physical Education and Sports.
4. Human health, physical rehabilitation and physical recreation.
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Gender features of functional condition of backbone of teenagers with scoliotic posture

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Purpose: to study mobility of backbone, endurance of muscles of a trunk and to define gender features of functional condition of backbone at children of the middle school age with scoliotic posture depending on the direction of the top of arch of curvature of spine.

Material & Methods: 40 girls and 40 boys, including 18 girls and 18 boys with the right-side deformation of backbone in the thoracic department, the left-side – 22 girls and 22 boys are examined.

Results: features of changes of indicators, depending on sex of children and frontage of the top of arch of curvature of spine column, are revealed when studying the level of flexibility of backbone and endurance of muscles of a trunk at children of the middle school age with scoliotic posture.

Conclusions: it is established that the level of decrease in flexibility of backbone is higher at boys, than at girls, whereas indicators of contractile ability and tone of muscles of “muscular corset” are higher at boys.

Keywords: teenagers, scoliotic posture, functional condition of backbone, gender distinctions.

Introduction

Violations of posture remain the most widespread functional frustration of the musculoskeletal system at pupils on statistics that make from 33,4% to 80% of the children’s population [1; 5; 10].

Scoliotic deformation of backbone is the center of pathological proprioceptive impulsion, is reflected negatively in the whole organism of children, including on motor, regulatory functions and so forth [6; 12]. Violations of posture at children influence processes of growth and level of physical development, with the reduction of physiologic reserves of almost all systems of organism [3; 4; 6; 8].

Insufficient attention to this problem and untimely correction of functional violations of backbone at the children’s age promote the formation of diseases not only the musculoskeletal system, but also other bodies and systems which are the reason of decrease or loss of working capacity at the mature age [6; 8; 12; 13].

According to many researchers, the first reliable gain of frequency of violations of posture is the share of the younger school age, the second, – of the middle school age [1; 2; 8]. Features of flexions of backbone are substantially caused by such factors as age, sexual differences [1; 3; 7]. However, gender features of the musculoskeletal system of children at the choice of means of physical rehabilitation are not always considered that results in insufficient efficiency of their application.

Difference of the middle school age is that sexual ripening begins at a child that coincides with the period of completion of biological ripening of organism, the hormonal background considerably changes. At the same time the bone system grows enough in high gear, to 9–10 sm a year whereas mus-

cular tissue is not in time behind it. It results in fast fatigue even from insignificant exercise stresses, violations of coordination and constraint of movements [3; 7].

Gender features of this period of the development of organism are that it begins in 11–12 years old at girls, and at boys – in 12–13 years old. At the same time the increase in length of backbone is more expressed in group of boys [1].

The condition of backbone and the development of muscles of trunk play the major role in the formation of a correct posture [4; 7; 11]. Therefore the assessment of their functional condition, first of all, is necessary for the determination of the basic level which is the subsoil for the personified approach to the creation of programs of physical rehabilitation of pupils with violations of posture. It is known that the top of arch of curvature of spine column can be the address to the left or to the right at scoliotic posture, it has to be considered near the assessment of features of mobile ability of backbone and endurance of muscles of trunk, however such data are still absent in available to us literature.

Communication of the research with scientific programs, plans, subjects

The research is executed according to the Built plan of the RW of Dnepropetrovsk state institute of physical culture and sport of MES of Ukraine and is fragment of the research work: “Prevention of primary disability as a result of injuries and diseases of the musculoskeletal system of means of physical rehabilitation” (No. of the state registration is 0116U003014).

The purpose of the research:

to learn the level of mobile ability of backbone and endurance of muscles of trunk and to define gender features of their functional condition at children of the middle school age with

scoliotic posture depending on curvature of the top of arch of curvature of spine column.

Material and Methods of the research

The researches are carried out on the basis of CI "Anniversary comprehensive high school No. 1" of Dnipropetrovsk during the preventive review of 189 pupils of 11–14 years old. Scoliotic posture is found at 121 children (64,0%), and at girls is almost twice more often – 79 (65,3%), than at boys – 42 (34,7%), ($\chi^2=21,4$; $p=3,69E-06$). The left-side deformation of backbone (LSD) among girls was observed 3,1 times more often – at 60 children (75,9%), than right-side (RSD) – at 19 (24,1%), ($\chi^2=40,5$; $p=1,96E-10$). It often turned out among boys almost equally as LSD – at 24 (57,1%), and RSD – at 18 (42,9%), ($\chi^2=1,19$; $p=0,28$).

40 girls and 40 boys, including with the right-side deformation of spine column in the chest department – 18 girls and 18 boys, left-side – 22 girls and 22 boys in whom scoliotic disease is not established at application of tool diagnostic methods, are selected by the informed consent with parents of children for the research of mobility of backbone and endurance of muscles of trunk.

Functional state was defined by the testing of mobility of spine column forward in starting position, standing on distance which remains from the ends of fingers to the floor [9]. Mobility of spine column was defined also in starting position back, standing, on distance from the seventh cervical vertebra by the beginning of inter-buttock fold at the maximum bending back [9]. Side mobility of spine column was defined on distance from the nail phalanx of the third finger of hand to the floor in the provision of the maximum bending [9] to the right and to the left.

Power endurance of muscles of prelum abdominale was defined by the maximum time of maintenance of straight legs, lifted feet from support 45 sm by 10 sm high up (at an angle 45°) in situation, lying on back [9].

Power endurance of muscles of side zones of trunk was estimated in starting position of a child on one side at the maintenance of body muscle tension of right and left parties [9].

Static power endurance of muscles of back was defined for fitball test at the maintenance of body in situation, lying in emphasis on hips on fitball (the top part of trunk was on weight at an angle 5–10°, feet are fixed on a gymnastic balance beam,

hands on the nape) [9].

Dynamic power endurance of muscles of prelum abdominale investigated in the test bending-trunk extension from situation, lying on back in situation, sitting [9].

The tone of muscles of forward abdominal wall was determined by condition of straight line of stomach upon transition from situation, lying on back in situation, standing: if the line remained straight line, the tone was estimated as excellent (5 points), when sagging straight line less than 2 sm estimated tone of muscles as good (4 points), when sagging more than 2 sm considered satisfactory tone of muscles (3 points), considered tone unsatisfactory at fortnightly sagging, that is at the drooped stomach (2 points).

Contractile ability of muscles of forward abdominal wall was defined in static and dynamic tests behind abdominometry at the level of navel. This indicator was defined at rest, lying on back and standing in the static test, at the dynamic test – at stomach suction. Contractile ability was considered stomach circle, excellent in the absence of changes, at different measurements (5 points), contractile ability was estimated as good (4 points) at its increase up to 2 sm, over 2 sm (3 points) considered satisfactory indicators of increase in circle, and contractile ability estimated as bad at reduction of circle of stomach (2 points) [9].

Statistical processing of results of the researches was carried out by methods of variation statistics with use of standard package of the application programs SPSS 13.0 for Windows.

Results of the research and their discussion

The deviation from milestone in the chest department of backbone was more essential (5,7±0,2) sm at girls at the anthropometrical research of children with LSD, than at boys (3,8±0,4) sm ($p<0,001$). This indicator did not differ significantly among children with the right-side deformation: girls had (4,1±0,6) sm and (3,2±0,4) sm – at boys ($p>0,05$).

When determining mobility of spine column forward its limitation at boys did not depend on the part of deformation of backbone (tab. 1).

Girls with left-side deformation of backbone have its flexibility forward and was less back, than at RSD ($p<0,05$ та $p<0,001$ respectively). However in comparison with boys who had

Table 1
Gender features of mobility of backbone of the examined children

Indicator, unit	Boys (n=40)		Girls (n=40)	
	RSD of spine column (n=18)	LSD of spine column (n=22)	RSD of spine column (n=18)	LSD of spine column (n=22)
Mobility of spine column forward, sm	3,7±0,5	3,3±0,2	2,1±0,4	3,2±0,3 ¹
Mobility of spine column back, sm	7,4±0,7	6,5±0,5	4,2±0,4 ^{**}	6,1±0,2 ³
Right-side mobility of spine column, sm	2,7±0,6	7,4±1,2 ¹	2,4±0,3	4,9±0,4 ^{3/1}
Left-side mobility of spine column, sm	7,7±1,0	4,3±0,6 ²	6,2±0,4	2,9±0,2 ^{3/1}

Notes: 1. ¹ $p<0,05$; ² $p<0,01$; ³ $p<0,001$ – the level of reliability of changes between indicators of children with left-side and right-side deformation of backbone; 2. ^{*} $p<0,05$; ^{**} $p<0,01$ – the level of reliability of changes between indicators of boys and girls.

right-side asymmetry of spine column its mobility back at girls was the best what reduction of distance from the 7th cervical vertebra by the beginning of inter-buttock fold at the maximum bending testifies back by 1,4 times ($p<0,01$). He pays attention the fact that the level of flexibility both forward, and back did not depend significantly on the part of deformation of backbone at boys.

Dependence of changes of side mobility of spine column on its right-or left-side deformation was rather expected. RSD was followed by minor changes of mobility in right side both at boys, and girls. Essential reduction of flexibility as at boys, and girls in 1,8 ($p<0,01$) and by 1,5 times ($p<0,05$) respectively, in comparison with children with RSD was watched existence of LSD. At the same time limitation of mobility also was more expressive at boys ($p<0,05$).

Therefore, mobility of backbone has not only gender differences, but also depends on bend of the top of arch of its curvature. Especially it concerns boys in whom the expressed asymmetry of restriction of side mobility in side, opposite to deformation of backbone, is found.

Essential differences in static power endurance of muscles of back for fitball test at RSD or LSD are not revealed both at boys, and at girls, however, this indicator was 1,4 times lower at girls in comparison with boys ($p<0,001$) (tab. 2).

Static power endurance of muscles of side zones of trunk was more lowered at LSD both at boys ($p<0,01$), and girls ($p<0,001$), but contractile ability of muscles of side zones was 1,3 times higher at boys, than at girls ($p<0,001$).

Dynamic power endurance of muscles of forward abdominal wall less at LSD, than at RSD by 1,5 times ($p<0,01$) at boys and by 1,3 times, – at girls ($p<0,05$).

This indicator was smaller in 1,4 ($p<0,01$) and by 1,3 times ($p<0,05$) respectively in comparison with boys girls both with RSD, and LSD. Dependences of tone of muscles of prelum

abdominale on the type of deformation are not found.

It was satisfactory in comparison with boys, its decrease as was observed at RSD by 1,3 times ($p<0,001$), and LSD – by 1,5 times ($p<0,01$) at girls. Contractile ability of muscles of forward abdominal wall did not depend on type of deformation of spine column in the static test at boys and was estimated as good. This indicator was satisfactory at girls as by the existence of LSD ($p<0,01$), and RSD ($p<0,01$).

Contractile ability of muscles of forward abdominal wall was good at RSD, at LSD – satisfactory in the dynamic test boys. Girls had this indicator considerably smaller and answered satisfactory condition at RSD and more insufficient – at LSD ($p<0,01$).

Thus, mobility of backbone and endurance of muscles of trunk at children of the middle school age with violation of posture have excellent gender features that needs to be considered when developing the program of physical rehabilitation.

Conclusions

1. It is necessary to consider flexion of the top of arch of curvature of spine column at the assessment of features of mobile ability of backbone and endurance of muscles of trunk at children of the middle school age with scoliotic posture.
2. Scoliotic posture with left-side flexion of the top of arch of rachiocampsis at girls of the middle school age is followed by the reduction of flexibility both forward, and back in comparison with right-side asymmetry of backbone by 1,5 times ($p<0,05$ and $p<0,001$ respectively).
3. Level of flexibility both forward, and back at boys did not depend significantly on the part of deformation of backbone, however, mobility was smaller by 1,4 times back in comparison with girls at its right-side asymmetry ($p<0,01$).
4. It is necessary to refer more expressed asymmetry of re-

Table 2
Gender features of endurance of muscles of trunk of the examined children

Indicator, unit	Boys (n=40)		Girls (n=40)	
	RSD of spine column (n=18)	LSD of spine column (n=22)	RSD of spine column (n=18)	LSD of spine column (n=22)
Static power endurance of muscles of back (fitball-test), s	58,1±1,4	55,3±0,7	41,6±1,1 ^{***}	39,2±1,0 ^{***}
Static power endurance of muscles of side zones of trunk, s	52,4±0,7	50,1±0,4 ²	40,2±0,3 ^{***}	38,3±0,3 ^{3/***}
Static power endurance of muscles of prelum abdominale, s	76,9±2,1	74,2±1,8	68,8±0,5 ^{***}	65,2±0,7 ^{3/***}
Dynamic power endurance of muscles of prelum abdominale, times	11,9±1,0	8,2±0,6 ²	8,4±0,8 ^{**}	6,5±0,4 ^{1/}
Tone of muscles of prelum abdominale, points	3,7±0,1	3,4±0,3	2,9±0,2 ^{***}	2,3±0,2 ^{***}
Contractile ability of muscles of forward abdominal wall (static test), points	4,2±0,3	3,9±0,4	3,2±0,2 ^{**}	2,6±0,1 ^{1/} **
Contractile ability of muscles of forward abdominal wall (dynamic test), points	4,4±0,2	3,3±0,4 ¹	3,4±0,4 ¹	2,4±0,2 ^{2/}

Notes: 1. ¹ – $p<0,05$; ² – $p<0,01$; ³ – $p<0,001$ – the level of reliability of changes between indicators of children with left-side and right-side deformation of backbone; 2. ^{*} – $p<0,05$; ^{**} – $p<0,01$; ^{***} – $p<0,001$ – the level of reliability of changes between indicators of boys and girls.

striction of side mobility in side, opposite to the deformation of backbone to gender features of mobility of backbone at scoliotic posture at boys of the middle school age in comparison with girls ($p < 0,05$).

5. Gender features of power endurance of muscles were expressed in reduction of static power endurance of muscles of back of girls by 1,4 times ($p < 0,001$), in comparison with boys, and also contractile ability of muscles of side zones – by 1,3 times ($p < 0,001$), dynamic power endurance of muscles of

forward abdominal wall, tone of muscles of prelum abdominale, – by 1,3 times at right-side asymmetry of backbone ($p < 0,001$) and by 1,5 times – at left-side.

Prospects of the subsequent researches. The received results are planned to be considered when developing of the personified complexes of physical rehabilitation of teenagers with scoliotic posture with the subsequent prospect of studying of their efficiency.

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Changes of level of physical fitness of handball players of 13–14 years old under the influence of acrobatic exercises and exercises with application of coordination ladder

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Purpose: to develop sets of exercises for the improvement of physical training of handball players of 13–14 years old with use of acrobatic exercises and exercises with application of coordination ladder and to check their efficiency experimentally.

Material & Methods: two groups of handball players of 13–14 years old of Kharkov and Ternovka of the Dnepropetrovsk region participated in the research. The following methods were used in work: analysis of scientific and methodical literature, pedagogical testing, pedagogical experiment, methods of mathematical data processing.

Results: the level of physical fitness of handball players of 13–14 years old and its change under the influence of specially-selected sets of exercises are determined.

Conclusions: the received reliable positive changes of coordination preparedness, separate manifestations of speed, flexibility and high-speed and power abilities of boys allow recommending the inclusion of acrobatic exercises and exercises with application of coordination ladder in the educational-training process of handball players of 13–14 years old.

Keywords: physical fitness, handball players, acrobatic exercises, coordination ladder.

Introduction

Many experts deal with issue of the increase in physical fitness of sportsmen: some study influence of the level of physical fitness on efficiency of the competitive activity [2; 18; 21], others point to the interrelation of physical and technical fitness of sportsmen [11; 12; 15] and so forth. The necessity of the search of new means of improvement of the process of physical training is traced in many works; therefore this problem remains urgent today.

Application of acrobatic exercises in the training process of sportsmen of many specializations becomes more popular and reasonable. So, for example, L. S. Lutsenko and I. A. Zinchenko (2010) emphasize the efficiency of use of acrobatic exercises by sportsmen for performance of technical activity in cheerleading. S. A. Rudenko, L. K. Rudenko (2008) note in the researches that it is possible to raise possibilities of system, balance of sportsmen, which is responsible for function by means of gymnastic and acrobats. N. Grabik (2007) used acrobatic exercises in the works as the mean of the development of coordination abilities of moguls. N. V. Lyulina, I. V. Vetrova (2008) used exercises on trampoline which basis included acrobatic exercises for the development of vestibular mechanism of sportsmen of freestyle. The developed technique of trampoline-acrobatic preparation of taekwondists by I. P. Kravtsevich (2006) improves the efficiency of the educational and training process, promotes the reliable improvement of group results in indicators of physical fitness and competitive activity. D. A. Zavyalov, A. N. Zaremba (2012) developed the matrix of use of acrobatic exercises by sambo-wrestlers which allowed to improve indicators of the develop-

ment of dexterity and flexibility that well influenced the development of technique and promoted the increase in efficiency of the training process.

A. N. Shalaye (2008) notes that acrobatic exercises are one of the effective remedies of special training of sportsmen in volleyball. The author notes that with their help in those who are engaged speed, dexterity, determination and ability to be together, it is good to be guided in space, namely these qualities are necessary for volleyball players for fast assimilation of technique of a game. Similar provisions were expressed by S. V. Novozhilova, A. A. Melnikov (2010, 2011) who in the researches come to conclusion that use of elements of acrobatics in the educational-training process together with performance of technical elements in volleyball increases the general base of athletic ability of sportswomen, increases high-speed and power preparedness of working muscles and reduces psychological uncertainty before carrying out elements, promoting more effective implementation of technical elements of volleyball players. Yu. V. Parmuzina (2006) reached the increase in efficiency of the educational and training process at young football players, development of technical policy strokes and development of physical qualities by the systematic use of complexes of applied aerobics (set of exercises of gymnastics, acrobatics, sports). A. E. Chernenko, D. G. Serdyuk (2009) specify that application of exercises of acrobatic character allows to optimize the educational-training and competitive process at handball players. Ye. O. Nadezhdin (2004) used acrobatic exercises as means of the connected influence on the development of coordination and improvement of protective actions of handball goalkeepers of 16–17 years old.

Numerical researches emphasize the relevance of use of means of acrobatics in the course of physical and technical training of sportsmen in different types of sport, and just as traumatism prophylactic. Some scientists [7; 10; 13; 16] emphasize the positive influence of use of acrobatic exercises in the training process on the development of certain physical qualities, others note their influence on the process of the development of techniques and increase in efficiency of the competitive activity [11; 12; 15 and so forth], the third indicate the need their uses for study of safeguarding and reduction of traumatism of sportsmen [1; 8].

Recently, the increasing popularity in the training process of sportsmen is gained by exercises with application of coordination ladder. So, M. M. Srinivasan and Dr. Ch. VST. Saikumar (2012) reached the significant improvement of maneuverability of movements and use of techniques of badminton players, supplementing the classical program of trainings with classes with use of coordination ladder.

Communication of the research with scientific programs, plans, subjects

The research was conducted according to the subject of the plan of the RW of Kharkiv state academy of physical culture "Psycho-sensory regulation of motive activity of sportsmen of situational sports" (2016–2018).

The purpose of the research:

to develop sets of exercises for the improvement of physical training of handball players of 13–14 years old with use of acrobatic exercises and exercises with application of coordination ladder and to check experimentally their efficiency.

Research tasks:

1. To analyze scientifically-methodical sources concerning physical fitness of young handball players.

Changes of indicators of physical fitness of handball players of the experimental group after the pedagogical experiment (n=14)

Indicators of preparedness	Before the experiment	After the experiment	t	p	
Test of Romberg (s)	21,37±0,69	27,16±0,57	6,47	≤0,05	
Indicator of dynamic balance in exercise "walking on gymnastic bench with turns" (units)	72,61±5,58	100,09±3,08	4,32	≤0,05	
Indicator of dynamic balance in exercise "walking on the line back forward" (units)	3587,44±147,53	3914,24±40,56	2,14	≤0,05	
Mistake size at measuring off of size of the set piece (%)	9,03±1,35	5,85±0,62	2,13	≤0,05	
Mistake size at assessment of size of the set piece (%)	8,21±1,22	5,44±0,49	2,11	≤0,05	
Mistake at throwing of a handball ball on range on the set distance (m)	50% of the maximum indicator	2,00±0,60	1,45±0,17	0,89	≥0,05
	75% of the maximum indicator	1,20±0,21	0,75±0,11	1,87	≥0,05
Mistake at throwing of a handball ball on range on the set distance (m)	light	10,58±1,61	6,92±0,63	2,06	≤0,05
	sound	9,52±1,37	6,26±0,56	2,21	≤0,05
Difference of run of 30 m with run of 30 m with 5 turns (s)	1,76±0,09	1,51±0,08	2,14	≤0,05	
Mobility in shoulder joints (sm)	30,93±1,74	35,14±1,02	2,08	≤0,05	
Sagging of a back backward (%)	11,56±0,38	12,77±0,41	2,14	≤0,05	
Trunk turn aside (sm)	35,21±0,46	36,50±0,26	2,41	≤0,05	
Accelerations for a ball (s)	1,90±0,03	1,83±0,02	2,09	≤0,05	
Running on the spot with hip lift for 10 s (quantity of times)	34,43±0,57	36,00±0,50	2,07	≤0,05	
Speed of simple motive reaction to light (mls)	261,14±4,65	252,50±4,13	1,39	≥0,05	
Speed of simple motive reaction to sound (ms)	451,57±15,23	436,93±14,64	0,69	≥0,05	
Speed of reaction to the object that moves (mls)	200,21±5,07	185,43±5,10	2,055	≤0,05	
Speed of reaction of the choice (mls)	412,21±7,92	389,07±7,27	2,15	≤0,05	
Standing long-jump (sm)	189,8±2,86	197,14±2,53	1,91	≥0,05	
Run of 30 m from high start (s)	5,22±0,05	5,13±0,04	1,39	≥0,05	
Trunk raisings sitting from situation, lying on back for 30 s (quantity of times)	31,07±0,48	31,64±0,46	0,86	≥0,05	
Bending and extension of hands in emphasis, lying 15 s (quantity of times)	7,71±0,30	8,07±0,20	0,99	≥0,05	
Jump up from the place (sm)	31,79±1,13	33,50±0,69	1,30	≥0,05	
Throwings of a handball ball on range by one hand from the place (m)	29,07±0,38	30,00±0,19	2,17	≤0,05	

2. To determine the level of physical fitness of handball players of 13–14 years old.
3. To develop sets of exercises for the improvement of physical training of young men with use of acrobatic exercises and exercises with application of coordination ladder and to check experimentally their efficiency.

Material and Methods of the research

The following methods of research were used during the research: analysis of scientifically methodical literature, pedagogical testing (determination of level of coordination abilities, flexibility, speed, and high-speed and power abilities), pedagogical experiment, methods of mathematical statistics. Control exercises, which are used in the research, are recommended by the program of CYSS on handball [5; 6] and other authors [19]. The pedagogical experiment was under the construction with the assistance of two groups of young men of 13–14 years old on 14 persons in everyone: Kharkiv (experimental group) and Ternovka, the Dnipropetrovsk Region (control group). The defined by us directions of improvement of physical fitness of handball players near set of information, which is received from scientific and methodical literature, provided the bases to offer for use in the pedagogical experiment with the involvement of handball players of 13–14 years old such fixed assets: running and jump exercises, which are directed to the irritation of vestibular mechanism; jump exercises with use of coordination ladder, which are directed to the irritation of vestibular mechanism, and the maintenance of balance on one and two legs; acrobatic exercises.

The pedagogical experiment lasted 26 weeks during which 106 educational and training classes were given, according to standard requirements of the program of CYSS and that made the preparatory period of annual cycle of training of young handball players.

Results of the research and their discussion

The used by us selected sets of exercises in our pedagogical experiment brought to the reliable ($p \leq 0,05$) improvement of coordination abilities, flexibility and separate manifestations of speed of young men of 13–14 years of old years of the experimental group (tab).

The reliable improvement of static balance ($t=6,47$, at $p \leq 0,05$), orientation in space ($t=2,11-2,14$, at $p \leq 0,05$), accuracy of reconstruction of sentries ($t=2,06; 2,21$, at $p \leq 0,05$) and spatial ($t=2,11; 2,13$, at $p \leq 0,05$) parameters of movements at handball players of the experimental group due to application in the training process of acrobatic exercises has the confirmation in the researches of S. V. Novozhilova, 2010; Yu. V. Parmuzina, 2006 and so forth.

Indicators of mobility in backbone of handball players have got the statistical improvement for 10,5% and 3,6% under the influence of the experimental training program. These data have something in common with the data of Ye. O. Kozin (2008) who reached the reliable improvement of flexibility of backbone (for 56,3%) at children of the normosthenic type of constitution by introduction of technique of physical training

of the senior preschool children on the basis of use of means of sports acrobatics. The percent of the reliable improvement of mobility of backbone is noticeably lower, which is received in our research, can be explained with age of handball players and obviously smaller orientation of the flexibility development exercises which are selected by us.

The reliable improvement of indicators of speed of motive reaction to the object, which moves (8%), and reactions with the choice (6%) that were received as a result of introduction in the training process of handball players of the experimental group of special acrobatic complexes, is described in methodical literature [3; 4]. Along with it, the reliable improvements tested the frequency of movements in run on the place with high hip lift (4,5%) and indicator of time of performance of acceleration for a ball (3,8%).

The improvement of indicators of high-speed and power abilities within 1,7–5,4% was observed after the pedagogical experiment at handball players of the experimental group, however the reliable changes were observed only as a result of the control exercise “throwing of a handball ball on range».

Changes in indicators of physical fitness of the control group which were observed after the pedagogical experiment, had no reliable character ($p \geq 0,05$).

Conclusions

1. The analysis of scientifically-methodical literature confirmed the relevance of the search of new ways of improvement of physical fitness of handball players and use during the educational-training classes of acrobatic exercises and exercises with application of coordination ladder.

2. The previous researches of physical fitness of handball players of 13–14 years old satisfied to norms for sportsmen of the stage of the previous basic preparation which are stated in the program of CYSS on handball.

3. Use in the training process of handball players of 13–14 years old of exercises with elements of acrobatics and with use of coordination ladder authentically improved condition of physical fitness of handball players: coordination preparedness of sportsmen improved (results of 8 control exercises with 10 experienced the reliable improvement ($p \leq 0,05-0,01$)), mobility in shoulder joints ($t=2,08$, at $p \leq 0,05$) and backbone ($t=2,14-2,41$, at $p \leq 0,05$), experienced positive changes result of throwing of a handball ball on range ($t=2,17$ at $p \leq 0,05$). Time of performance of acceleration for a ball was authentically reduced ($t=2,09$ at $p \leq 0,05$), quantity of cycles of movements in run on the place highly increased raising hips ($t=2,07$ at $p \leq 0,05$), reaction speed with the choice improved ($t=2,15$ at $p \leq 0,05$) and on the object which moves ($t=2,055$ at $p \leq 0,05$).

Prospects of the subsequent researches. The subsequent researches will be sent to the search for ways of the improvement of other parties of preparedness of handball players to competitions.

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Level of physical development and physical preparedness of weight-lifters of 10–12 years old

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Purpose: to determine the level of physical development and physical preparedness of weight-lifters of 10–12 years old.

Material & Methods: boys of 10–12 years old, who go in for weightlifting sections in CYSS HTZ, and also in sports boarding school No 2 of Kharkiv, participated in this research. 34 boys were attracted to the experiment. Research methods: theoretical method and generalization of literature, pedagogical observation, pedagogical experiment, method of mathematical statistics.

Results: differences in intensity of gain of indicators of physical development for the biennium of observations display unevenness and heterochrony of ripening of organism of children were found. The noticeable difference in intensity of gain of the majority of the studied indicators of physical development is noted even for such rather short period (two years). The increase during the whole biennium is established for absolute values of the general physical operability of the tested. However, the size of relative intensity of gain of absolute values of general physical working capacity at stages of observations is different: the first year – 10,48%, the second – 0,86% ($t=22,3$; $p<0,01$). In other words, indicators of general physical working capacity considerably grow for the first year of observations (10–11 years old), and practically do not change for the second year (11–12 years old).

Conclusions: the established decrease in relative sizes of the general physical working capacity, which is noted at boys in total with the deterioration in results in run at distance of 1000 m, allowed to draw conclusion on the underdevelopment at them the major physical qualities and systems of organism, which define endurance and general physical working capacity. Undoubtedly, the insufficient level of endurance and general physical working capacity reduces adaptation opportunities of boys-weight-lifters.

Keywords: physical development, physical preparedness, physical working capacity, relative sizes, adaptation opportunities.

Introduction

Weightlifting is the Olympic and popular kind of sport among modern youth (V. N. Platonov, 2004; L. S. Dvorkin, 2005; M. T. Lukyanov, 1969; V. G. Oleshko, 2011) [3; 10; 14; 17]. This circumstance draws attention of experts to the development and scientific-methodically foundation of the theory and the technique of training of sportsmen of different age and qualification.

According to the researches, the stage of initial preparation is especially important, because the fast development of power abilities, the formation of sports skill, and the intensive course of processes of adaptation to specific conditions of classes by weightlifting occur during this period. Certain attention is paid to the problem of training of young sportsmen at the stage of initial preparation in weightlifting, the constant improvement of technique of training of young sportsmen occurs. In particular, the scientific research, which is devoted to various aspects of this problem, is conducted in recent years (Yu. V. Verkhoshanskyi, 2013; L. S. Dvorkin, 2005; V. G. Oleshko, 2011) [1; 3; 14; 16], two methodical manuals are published (L. S. Dvorkin, 2005; V. G. Oleshko, 2011) [3; 16]. The large number of scientific articles is published; programs for sports school are edited. All this testifies to the relevance of the studied direction.

Analyzing the available scientific and methodical literature devoted to training of the beginning sportsmen in weightlifting, it should be noted that many questions are presented rather widely.

In particular, different views about age of the beginning of classes by weightlifting are considered (L. S. Dvorkin, 2005; V. G. Oleshko, 2011) [3; 16], volume and content of the training work (Yu. V. Verkhoshanskyi, 2013; B. I. Sheyko, 2008) [1; 21], use of various training means (L. S. Dvorkin, 2005; N. A. Laputin, 1973; Yu. K. Gaverdovsky, 2007; A. V. Chernyak, 1970; V. Yu. Dzhim, 2013) [2–4; 9; 15].

At the same time the available data are often contradictory, have a fragmentary character that does not allow developing the rational system of training of the beginning sportsmen in weightlifting (V. S. Farfel, 1963; V. P. Novikov, 1990) [13; 19].

So, the analysis of the theory of sports training and practice of the educational and training activity of young sportsmen at the stage of initial preparation in weightlifting reveals the number of contradictions:

– between the traditionally applied means of the development of power abilities and opportunities of the musculoskeletal system of the beginning sportsmen in weightlifting;

– to intensify the training process already between the aspiration of most of coaches at the initial stage of preparation by the decrease in share of overall physical fitness and need of all-round development of young sportsmen;

Communication of the research with scientific programs, plans, subjects

The scientific research is executed on the subject of the Consolidating plan of the research works in the sphere of physical culture and sport for 2011–2015 on the subject 3.7 “Methodological and organizational-methodical bases of the determination of individual norm of physical condition of the person” (number of the state registration is 0111U000192).

The purpose of the research:

to determine the level of physical development and physical fitness of weight-lifters of 10–12 years old.

Material and Methods of the research

Boys of 10–12 years old who go in for sections for weightlifting in CYSS HTZ, and also in sports boarding school No. 2 of Kharkov participated in this research. 34 boys who go in for section for weightlifting were involved in the experiment; all of them had no digit standards. All participants were involved throughout 3 stages of the pedagogical experiment: the 1st stage (10 years old) – the initial level, the 2nd stage (11 years old) – the data, which are recorded after the year of observations, the 3rd stage (12 years old) – the data, which are recorded after the second year of observations. Participants of the experiment trained 3 times a week.

Research methods: theoretical method and generalizations of literature, pedagogical observation, pedagogical experiment, method of mathematical statistics.

Results of the research and their discussion

It is noted in special literature that negative tendencies in indicators of physical development of children are revealed; especially in the age groups of older than 12 years old for the last decades. The reliable decrease in length and body weight, indicators of physical fitness of teenagers in comparison with their peers is established in previous years [4; 7; 9; 14].

We made the pedagogical experiment which essence was the definition for two years of dynamics of physical development, physical fitness and general physical efficiency of the beginning weight-lifters of 10–12 years old for the assessment of features of physical development and physical fitness of modern teenagers.

Results of indicators of physical development of the examinees weight-lifters at all three stages of the pedagogical experiment (the 1st stage (10 years old) – the initial level, the 2nd stage (11 years old) – the data, which are recorded after the year of observations, the 3rd stage (12 years old) – the data, which are recorded after the second year of observations) are presented in table 1.

It is necessary to notice that the analysis of not only absolute values of the studied indicators of physical development of examinees, but also relative intensity of gain of these indicators by years is of interest to the characteristic of features of the age development of young weight-lifters.

Analyzing the submitted data, it should be noted the unevenness of gain of the studied indicators first of all. The size of relative intensity of gain for the first year of observations was higher for such indicators as: body length (4,5% in the first year and 2,74% in the second; $t=12,8$; $p<0,01$), body weight (11,44 and 8,73%; $t=8,3$; $p<0,01$), weight-growth index of Quetelet (6,89 and 6,03%; $t=2,6$; $p<0,05$), vital capacity of lungs (12,09 and 5,77%; $t=16,5$; $p<0,01$), thorax circle (2,69 and 2,33%; $t=2,2$; $p<0,05$), shin circle (4,99 and 2,91%, $t=10,1$; $p<0,01$) and dynamometry of the strongest hand (16,05 and 9,19%; $t=16,7$; $p<0,01$).

The size of relative intensity of gain was higher for such indicators as: shoulder circle (8,44 and 13,28%; $t=16,4$; $p<0,01$), hip circle (8,44 and 13,28%; $t=16,4$; $p<0,01$) and back dynamometry (12,46 and 18,1%; $t=13,1$; $p<0,01$) for the second year of observations.

The size of relative intensity of gain for such indicators as thorax circle difference on breath and exhalation, circle of waist and circle of pelvis in both years of observations was approximately identical, therefore distinctions by years are not statistically reliable ($p<0,05$).

The revealed distinctions for the two-year period of observa-

Table 1
Indicators of physical development of weight-lifters of 10-12 years old at stages of the pedagogical experiment ($M\pm m$), ($n=34$)

Indicators	10 years old	11 years old	12 years old
Length of body (sm)	142,0±0,6	149,5±0,6	155,4±0,7
Body weight (kg)	39,5±0,4	45,7±0,6	50,6±0,5
Index of Quetelet	278,1±3,3	305,7±3,4	325,6±3,0
VCL (l)	2,1±0,1	2,3±0,1	2,5±0,1
Circle of thorax (sm)	67,5±0,5	70,4±0,5	74,7±0,3
Circle of waist (sm)	59,4±0,4	61,9±0,4	64,3±0,4
Circle of pelvis (sm)	63,0±0,3	65,8±0,3	67,9±0,3
Circle of shoulder (sm)	18,1±0,2	19,7±0,2	21,1±0,2
Circle of hip (sm)	36,2±0,2	40,8±0,3	43,3±0,3
Circle of shin (sm)	22,3±0,2	23,9±0,2	24,7±0,3
Hand dynamometry (kg)	21,3±0,4	26,6±0,4	31,7±0,4
Back dynamometry (kg)	48,9±0,7	55,3±0,7	61,3±0,7

tions reflect in intensity of gain of indicators of physical development, in our opinion, unevenness and heterochrony of maturing of organism of children. The noticeable difference in intensity of gain of the majority of the studied indicators of physical development is noted even for such rather short period (two years).

Indicators of physical development at young weight-lifters for two years of the pedagogical experiment were determined by results of the control exercises (run on 30 m from low start, standing long-jump, throw of shot of 3 kg forward from the place two hands, run on 1000 m) allowing to judge their physical fitness. Results of measurements are presented in table 2.

In general the submitted data characterize age changes of the level of physical fitness of examinees. At the same time it is revealed that the continuous progress from one stage of observations to another is observed in the exercises, which are connected with high-speed and high-speed and power qualities. The similar dynamics is not revealed for results of run on 1000 m characterizing endurance of examinees. If the reduction of time of run of distance of 1000 m is noted ($5,24 \pm 0,15$ min at the beginning of observations and $5,11 \pm 0,15$ min in one year; $t=2,5$; $p<0,05$) for the first year of observations, some deterioration in results ($5,11 \pm 0,15$ min after the first year of observations and $5,08 \pm 0,16$ min at the end of experiment; $t=0,3$; $p>0,05$) occurs for the second year. Change of results of run at distance of 1000 m is not statistically reliable for the second year of observations for this selection of examinees ($n=34$), but demonstrates, in our opinion, manifestation of tendency of decrease in endurance of weight-lifters of 12-years old.

The important information characterizing age features of the development of modern boys can be received studying dynamics of indicators of physical working capacity (tab. 3).

Analyzing the submitted data, first of all, it should be noted two opposite tendencies: increase from one stage to another of absolute values of the general physical working capacity and along with it decreases in relative values (in terms of kilogram of body weight) of the general physical efficiency of boys of weight-lifters.

It is visible from the submitted data that the multidirectional changes of indicators of physical fitness and general physical working capacity throughout the two-year period of observations are observed at the examinees, who are going in for weightlifting.

In particular, the increase in results (reduction of time) in run on 30 m throughout the entire period of observations takes place, however the relative intensity of gain of results is higher for the first year of observations. For the first year – 3,75%, for the second – 2,86%. The difference of values of intensity of gain of results in run on 30 m by years has a statistically reliable character ($t=7,5$; $p<0,01$).

The size of relative intensity of gain of results in standing long-jumps approximately identical for the entire period of observations (the first year – 8,27%, the second – 8,49%). Distinctions for this selection of examinees are not statistically reliable ($t=0,7$; $p>0,05$).

Results of throw of shot of 3 kg forward from the place two hands increased with high intensity at examinees (the first year – 21,23%, the second – 18,36%; $t=18,3$; $p<0,01$). So, high relative intensity of gain of results of throw reflects, in our opinion, the fast development of muscles of shoulder girdle and upper extremities in this age period.

Multidirectional changes were found in examinees in the analysis of dynamics of size of intensity of gain of results in run on 1000 m: in the first year – the increase in results (reduction of time of run); in the second year – the insignificant deterioration [4; 11; 15].

The conducted research confirmed results of other authors [2; 3] about need of taking the note of trainings on physical indicators of young weight-lifters at the first grade level. Also the data of native [6; 7; 10; 15; 20] and foreign authors [21; 22; 23; 24] are expanded in the directions of increase in level of the most significant indicators of physical qualities of young weight-lifters.

Conclusions

Analyzing the stated material, it is possible to note that physi-

Table 2
Indicators of overall physical fitness of weight-lifters of 10–12 years old at stages of the pedagogical experiment ($M \pm m$), ($n=34$)

Indicators	10 years old	11 years old	12 years old
Run of 30 m (s)	$5,60 \pm 0,12$	$5,42 \pm 0,12$	$5,21 \pm 0,12$
Standing long-jump (sm)	$148,2 \pm 2,7$	$154,3 \pm 2,8$	$163,1 \pm 2,8$
Throw of shot of 3 kg (m)	$4,24 \pm 0,19$	$5,43 \pm 0,19$	$6,89 \pm 0,2$
Run of 1000 m (min)	$5,24 \pm 0,15$	$5,11 \pm 0,15$	$5,08 \pm 0,16$

Table 3
Indicators of general physical efficiency of weight-lifters of 10–12 years old at stages of the pedagogical experiment ($M \pm m$), ($n=34$)

Indicators	10 years old	11 years old	12 years old
Absolute value PWC_{170} ($kgm \cdot min^{-1}$)	$703,2 \pm 7,8$	$780,9 \pm 6,9$	$787,7 \pm 7,3$
Relative value PWC_{170} ($kgm \cdot min^{-1}$ on 1 kg of weight)	$16,7 \pm 0,6$	$15,5 \pm 0,6$	$14,4 \pm 0,6$

cal development, physical fitness and general physical efficiency of modern boys of 10–12 years old, who train in sports school on the majority of indicators, correspond to peers of the ninetieth years. The noted facts demonstrate the delay of processes of deceleration of physical development of modern children.

Also the revealed by us dynamics of indicators of the general physical working capacity testifies about the same. The increase throughout the whole two-year period is established for absolute values of the general physical efficiency of examinees. However the size of relative intensity of gain of absolute values of the general physical working capacity at stages of observations is different: the first year – 10,48%, the second – 0,86% ($t=22,3$; $p<0,01$). In other words, indicators of the general physical working capacity considerably increase for the first year of observations (10–11 years old), and for

the second year (11–12 years old) practically do not change. On the contrary, the decrease in values throughout the period of observations is established for relative sizes of the general physical working capacity. At the same time intensity of decrease in relative values of the general physical working capacity for the first year – 0,96%, for the second – 7,87% ($t=21,4$; $p<0,01$).

The decrease in relative values of the general physical working capacity, which is noted at boys with the deterioration in results in run at distance of 1000 m in total, allow to make the conclusion about the underdevelopment at them the major physical qualities and systems of organism, defining endurance and general physical working capacity. Undoubtedly, the insufficient level of endurance and general physical working capacity reduces adaptation opportunities of boys-weightlifters.

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Self-assessment and level of uneasiness of sportsmen as factors of formation of the interpersonal interaction in the dancing duet

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Purpose: to study features of self-assessment and uneasiness of the sportsmen who are engaged in sports dancing at the stage of preliminary basic preparation.

Material & Methods: analysis of scientific and methodical literature, technique "Studying of self-assessment of the identity of the teenager", technique "Diagnostics of disturbing states at children" (CMAS).

Results: the need of the search of new ways of the effective interpersonal interaction for the dancing duet in sports dances at the stage of preliminary basic preparation is proved theoretically. Psychological characteristics of sportsmen of 10–12 years old on the levels of their self-assessment and uneasiness are submitted.

Conclusions: the research of components of the interpersonal interaction at sportsmen of 10–12 years old, who are engaged in sports dancing, shown that self-assessment of young sportsmen most often corresponds to the overestimated, high or average level. The emotional condition of children of 10–12 years old, who are engaged in sports ballroom dances, is characterized by the increased or high level of uneasiness.

Keywords: sports dances, interpersonal interaction, self-assessment.

Introduction

The modern development of sports dances as sport, their international promoting, the emergence of significant amount of highly skilled sportsmen, the high level of the competition of dancing couples demands more detailed consideration of problem of communicative competence as a lot of its aspects are not almost investigated. Studying of factors, which influence result of a sportsman, is one of key problems of sports science. Preparation of couples cannot spontaneously happen and demands the scientific approach: studying of conditions of sports activity, specific features of dancers, development of diagnostic tools for their assessment, statement of problem of professional selection, clarification of the main conditions of formation of productive couples. Studying of development of communicative competence of sportsmen of ballroom dances at stage of the previous basic preparation is urgent. The establishment of such determinants and features of their manifestation will allow finding the main areas of work of a coach concerning the optimization of process of selection of dancers and completing of sports pairs [2; 3; 6].

The communicative competence of sports dances is necessary as the basic component of successful mental conditioning. Sufficient psychological preparedness and communicative competence of sportsmen provides integrity of training and competitive processes, and also is criterion of compatibility of partners for classes sports ballroom dances [7; 8; 13].

The analysis of scientifically-methodical literature showed that experts in the branch of sports dances note the need of development of communicative competence of dancers for

teenage age [2; 3; 6; 7]. As I. S. Kohn notes, the interpersonal relations at teenage age are under construction on emotional basis. Direct emotional connections and relationship of teenagers begin to be supported with moral assessment of each of participants of communication, these or those qualities of the personality are more deeply realized, but adequacy of perception of the social status in this age group decreases sharply: children who held the safe position in the group, inclined to underestimate it, and, on the contrary, boys and girls who have unsatisfactory indicators, as a rule, consider the situation accepted completely. That is, there is peculiar high-quality reorganization of both the interpersonal relations of boys and girls, and their personal qualities, own idea of itself at teenage age [14].

The research about the interrelation of communicative competence with personal features need special attention to its subject. V. Voronova notes the importance of psychological factor in achievement of the progress, and M. V. Gritsayenko, in turn, notes that the role of communicative competence becomes more and more notable in connection with point of the sports competition and increase in requirements to the level of performance of sportsmen [7; 8; 12]. V. I. Voronova, O. O. Spesvykh emphasize that personal characteristics of the person, namely responsibility, the high level of empathia, belief in the opportunities promote the formation of effective interpersonal interaction. Uneasiness measurement as to property of the personality is especially important as this property in many respects causes behavior of a young sportsman. The functional aspect of research of personal uneasiness allows consideration of it as the system property which is shown at all levels of activity in the sports dancing duet [7; 8]. Uneasiness is shown in change of level of harassments of

the personality, in decrease in self-assessment, determination, confidence, in itself, also personal uneasiness influences motivation of activity in the psychological sphere. Besides, the return connection of uneasiness with such features of the identity of a young sportsman is noted as: social activity, adherence to principles, conscientiousness, aspiration, leadership, determination, independence, emotional firmness, confidence, working capacity. It should be noted that inadequate perception itself by a subject can be the cause of uneasiness at the psychological level, that is this characteristic of the personality is caused by the conflictual structure of self-assessment when two opposite tendencies are at the same time staticized – the need to appreciate itself highly, on the one hand, and feeling of uncertainty – from another [1; 5; 9; 11].

The formation at young sportsmen of high self-assessment, ability to adequately express the emotions and abilities to take the responsibility, can act as guarantee of effective interpersonal interaction in the dancing duet [4; 6; 10].

At present there are not enough algorithms of development of the harmonious relations of partners in sports dance in psychology and pedagogical science therefore and timely studying of features of emotional intelligence of sportsmen and their self-assessment as determinant their productive interpersonal interact in couple seems important, as caused the relevance of our work.

Communication of the research with scientific programs, plans, subjects

The research was conducted according to the thematic plan of the research work of Kharkiv state academy of physical culture for 2016–2018 on the the subject “Modern technologies of diagnostics and means of preservation of psychological health of sportsmen”.

The purpose of the research:

to learn features of self-assessment and uneasiness of sportsmen who are engaged in sports dancing classes at the stage of the previous basic preparation.

According to the purpose such tasks are solved:

- to carry out the theoretical analysis of problem of interpersonal interaction in the sports dancing duets;
- to characterize features of self-assessment of sportsmen of sports dances at the stage of the previous basic preparation;

– to determine the level of personal uneasiness of sportsmen of sports dances at the stage of the previous basic preparation.

Material and Methods of the research

Sportsmen of the age of 10–12 years in number of 60 persons, who are engaged in sports dancing classes at the stage of the previous basic preparation, were investigated. The theoretic-methodological analysis of problem was carried out for foundation of the relevance of the subject. The technique “Studying of self-assessment of the identity of the teenager” used for studying of indicators of self-assessment, for research of uneasiness as property of the identity of young sportsmen – the technique “Diagnostics of disturbing states at children” [15].

Results of the research and their discussion

The first investigation phase of components of interpersonal interaction at sportemen of 10–12 years old, who are engaged in sports dancing classes, had studying of their level of self-assessment. The technique of “Studying of self-assessment of the identity of the teenager” was used for studying of level of self-assessment and subjective estimate by young sportsmen of the characteristics of the personality.

Results of the research of level of self-assessment of children of 10–12 years old, who are engaged in sports dancing classes, are presented in tab. 1.

As shown in tab. 1, the high level of self-assessment was noted in 14 (23,33%) children, from them 6 (18,75%) girls and 8 (28,57%) boys. This result displays the idea of teenagers of the opportunities which are the important factor of personal development of young sportsmen. B. G. Ananyev in the works, which are devoted to studying of the personality, claims that teenagers with high self-assessment realize own importance, as a rule, create around themselves satisfaction aura, they are less dependent on support and approval of people around as they learned to stimulate themselves. They differ in initiative and enterprise, force others to rotate around themselves and derive from it rather big benefit, they are not upset when they are criticized, and try to correct the mistakes. Teenagers with the high level of self-assessment are rather ready to thank for “constructive council”, having been refused in something, they do not perceive it as humiliation of the person, see the reason of that which happened not in itself, and externally, and try to change then external circumstances in the party, favorable for themselves. It is easy for such boys

Table 1
Distribution of children of 10–12 years old who are engaged in sports dancing classes, according to levels of self-assessment

Level of self-assessment	Level of self-assessment					
	Girls (n=32)		Boys (n=28)		Total (n=60)	
	Absolute value	%	Absolute value	%	Absolute value	%
Overestimated	14	43,75	4	14,28	18	30,00
High	6	18,75	8	28,57	14	23,33
Average	8	25,00	7	25,00	15	25,00
Low	4	12,50	9	32,14	13	21,66
Underestimated	0	0	0	0	0	0

and girls to be optimists, they can critically estimate not only the acts, but also acts of people, they which surrounding, they achieve purposes more often and less often lose [1].

The average level of self-assessment took place at 15 (25,00%) young sportsmen, from them: 8 (25,00%) girls and 7 (25,00%) persons – boys. Such teenagers, in general, self-assured, but not completely, quite often can find some indecision, mood swing, and sometimes and unreasonable impotunity, however they are rather persistent in achievement of purposes [1].

The low level of self-assessment took place at 13 (21,66%) participants of the research, from them: 4 (12,50%) girls and 9 (32,14%) boys. I. S. Kohn claims that the low self-assessment (underestimation of itself) testifies to extreme trouble in the development of the personality, and to put with such self-assessment make "risk group". Teenagers with low self-assessment look lost very often, they, as a rule, more passive and less popular among people, they which surrounding. Such boys and girls are excessively sensitive to criticism, considering that it testifies to their low value. But also they are not able to accept compliments – "Well you, I am not like that at all. You, likely, so speak to make to me pleasant". Such teenagers can have baseless scares, uneasy dream and offense on others most of which often is unreasonable, they are not capable to control the emotional impulses and to express them in socially admissible form. It is shown as the lack of responsibility, capriciousness in behavior [14].

18 (30,00%) children estimated themselves at the overestimated level, that is they have unrealistic, noncritical relation to own opportunities. G. Ananyev, I. S. Kohn emphasize that high self-esteem can confirm personal immaturity, inability is correct to estimate results of the activity, to compare itself to others. Such self-assessment can indicate essential curvatures in formation of the personality – "closeness for experience", tolerance to the mistakes, failures, remarks, and manual of adults by estimates of people around [1; 14].

Therefore, self-assessments of children of 10–12 years old who are engaged in sports dancing classes, presented by the following options: overestimated (30,00%), high (23,33%), average (25,00%), low level of self-assessment (21,66%). The underestimated self-assessment level in group of the examined athletes is not revealed.

Studying of the emotional sphere of the identity of children of 10–12 years old, who are engaged in sports dancing classes, namely the level of their personal uneasiness became the following stage of our research. Results of the research of level

of uneasiness of sportsmen, who are engaged in sports dancing classes, are presented in tab. 2.

According to results of the technique "Diagnostics of disturbing states at children", the low level of uneasiness takes place at 3 (5,00%) the examined sportsmen, from them 1 girl (3,13%) and 2 boys (7,14%). Behind the thought of B. G. Ananyev, low uneasiness is feeling of comfort and receiving satisfaction from the life, and for others – work with own complexes. Teenagers who have the low level of uneasiness more accept themselves and other people, positive feelings at social interaction feel, and also to a lesser extent seek to dominate over environment and to avoid problems [1].

The normal level of uneasiness took place in 9 (15,00%) children, 3 (9,38%) from which – girls and 6 (21,42%) – boys. The preservation by the identity of confidence in the forces, lack of nervousness, and in case of mistakes in activity – the adequate relation and aspiration to correct them [1] takes place at the normal level of uneasiness.

A little increased level was noted in 13 (21,67%) children among whom, – 8 (25,00%) girls and 5 (17,85%) – boys; obviously increased level of uneasiness was found among 18 (30,00%) children, 11 (34,37%) from which – girls, and 7 (25,00%) – children. Even the increased level of uneasiness leads to absence at the teenager of confidence in the opportunities, forms difficulties in communication [1].

Obviously increased level of uneasiness was established in 11 (34,37%) girls, and 7 (25,00%) boys that makes 18 (30,00%) teenagers. Girls and boys in whom obviously increased uneasiness level takes place, smaller measure socially adapted, than teenagers with low uneasiness. At the same time disturbing individuals cannot accept themselves and others, to feel emotional discomfort and to seek to control the environment [1; 14].

Very high level of uneasiness creates threat mental health of the teenager and promotes the development of preneurotic states. Except negative impact on health, behavior and productivity of activity, obviously increased uneasiness level adversely affects also quality of social functioning of children of teenage age who are engaged in ballroom dances [1; 9]. By the results of our research, very high level of uneasiness was established in 9 (28,13%) girls and 8 (28,57%) boys that makes 16 (26,67%) persons. Therefore, the emotional condition of children of 10–12 years old, who are engaged in sports ballroom dances, is characterized by the increased or high level of uneasiness, tself-assessment of young aportsmen answers the overestimated, high or average level at the stage of the previous basic preparation.

Table 2
Distribution of children of 10–12 years old who are engaged in sports dancing classes, according to levels of uneasiness

Level of uneasiness	Walls	Girsl (n=32)		Boys (n=28)		Total (n=60)	
		Absolute value	%	Absolute value	%	Absolute value	%
Low	1–2	1	3,13	2	7,14	3	5,00
Normal	3–6	3	9,38	6	21,42	9	15,00
A little increased	7–8	8	25,00	5	17,85	13	21,67
Obviously increased	9	11	34,37	7	25,00	18	30,00
Very high	10	9	28,13	8	28,57	16	26,67

Considering results of the research of features of emotionally personal sphere of sportsmen of 10–12 years old, the main directions of development of their interpersonal interaction, it is possible to see: increase in adequacy of own idea of at young sportsmen and perception of others, development of individual responsibility for achievement of the personal purposes, formations of communicative openness and quality of communication, mastering skills of constructive social interaction [11]. When forming effective interpersonal interaction at children of 10–12 years old, who are engaged in sports dancing classes, it is also necessary to carry out work and with parents of young sportsmen (to carry out explanatory work on formation of adequate self-assessment of teenagers and elementary technician of removal of tension and verbalization of feelings). It is recommend to coaches to control by the main indicators of interpersonal interaction of young sportsmen during a year, for the purpose of selection of effective remedies and methods of influence on these characteristics and, as a result, onto high sports effectiveness.

Conclusions

1. The effective interpersonal interaction in sports dances provides the successful course of communicative process and functioning in the professional dancing environment. The interpersonal interaction of children of 10–12 years old, who are engaged in sports dancing classes, is determined by the created communicative abilities and their emotionally per-

sonal characteristics – the level of self-assessment and level of uneasiness.

2. The research of components of the interpersonal interaction at sportsmen of 10–12 years, who are engaged in sports ballroom dances, showed that the level of their self-assessment is presented by the following options: overestimated (30,00%), high (23,33%), average (25,00%), low level of self-assessment (21,66%). The underestimated self-assessment level in group of the examined athletes is not revealed. Therefore, sportsmen of ballroom dances of 10–12 years old, usually, capable to achieve the objectives and not to give in casual fluctuation of moods. But among such teenagers also children and girls, excessively sensitive to criticism, meet, such sportsmen also make “risk group”.

3. The emotional condition of children of 10–12 years old, who are engaged in sports ballroom dances, is most often characterized by the increased or high level of uneasiness. Teenagers, who have the high level of uneasiness, are adapted smaller measure socially, than sportsmen with low uneasiness.

Prospect of the subsequent researches is in the development of the program of formation of adequate self-assessment of sportsmen of sports dances at the stage of the previous basic preparation, for the purpose of formation of effective interaction in the dancing duet.

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Characteristic of aspects of preparedness of a coach

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Purpose: to define aspects of preparedness of coaches which are necessary for the improvement of the system of training of sportsmen.

Material & Methods: aspects of activity of coaches were decided by means of studying of documentary materials, analysis and synthesis, abstraction, induction and deduction, idealization and generalization.

Results: aspects of preparedness of a coach (pedagogical, medico-biological, organizational and material and technical), and also features of their importance during the work with sportsmen of different age and level of preparedness are presented in the work.

Conclusions: the improvement of the differentiated preparation of coach staffs for the work with sportsmen of different age groups and qualification is the topical issue, which solution will allow increasing the efficiency of training of sportsmen at each stage of the long-term training process, taking into account the highest sports result.

Keywords: coach, aspects of preparedness, pedagogical, medico-biological, organizational, material and technical.

Introduction

The appeared new organizational and administrative conditions of the development of sport in Ukraine, which concern also the activity of coaches, are opened in the Concept of the Nation-wide purposeful social program of the development of physical culture and sport for 2012–2016. They are characterized by the reduction of number of the youth, capable to maintain training loads and the sportsmen of innovative technologies playing sports, influence on result, discrepancy of the existing resource ensuring development of sport in the conditions of modern Ukraine that increases the level of requirements to quality as models of the improvement of creation of the system of training of sportsmen, and three improvement of content of training of coaches on sport.

It is obvious that sports managers of different level, we also carry to them coaches, act as the key factor of improvement of the system of training of sportsmen. Uniqueness of competence of experts in the field of sport consists in the specific width of their professional and important qualities and the parties of professionalism [6–8], from here it is illegal to consider coaches only as experts who are engaged only in planning and holding educational and training classes. Training of sportsmen comes far to the content of trainings and represents the complex process in which have to be coordinated, on the sports base suitable for this purpose and at necessary material and financial security, various nonspecific components (participation of medical personnel, psychologists, specialists in sports food etc.). The main character here is a coach, who is acted as an organizer of the versatile process of preparation, and his competence, as a manager, defines the final sports result considerably [2–4].

The content of training of students does not promote the formation at future coaches of group of competences of a manager, independence and initiative as the defining qualities of a sports teacher and an organizer of sport in higher education

institutions of Ukraine [1; 5]. Nevertheless, obviously, coaches have to possess today not only sufficient knowledge, skills of creation of the educational-training process, but also to have competence for management of people, and also for adoption of reasonable decisions, implementation of the system of encouragement and punishments, anticipation of tendencies of the development of branch and the sphere of sport etc. [2; 4; 9].

Communication of the research with scientific programs, plans and subjects

The research was conducted according to the Consolidating plan of the RW in the sphere of physical culture and sport for 2011–2015 on the subject 2.6 “Theoretic-methodical bases of improvement of the training process and the competitive activity in structure of the long-term training of sportsmen” (number of state registration is 0111U001168).

The objective of the research:

to define the requirements to preparedness of coaches which are necessary for the improvement of the system of training of sportsmen.

Material and Methods of the research

Requirements to the determination of aspects of activity of coaches were defined by means of studying of documentary materials, analysis and generalization.

Results of the research and their discussion

The subject of professional activity of coaches on sport especially sharply rose in the last decades after the beginning of new stage of the intensive development of sport and updating of scientific management in practice of sport.

The system of training of sportsmen, which developed in Ukraine, includes all state and public organizations, which according to regulations and charters on their activity take part in business of the involvement of children and youth to systematic trainings, other important nonspecific actions (accompanying medical control, treatment and recovering from injuries, catering services, pharmacological and psychological support and so forth) for the purpose of the maximum increase in the level of their sports skill. These organizations hold competitions; provide participation of the leading sportsmen, clubs and national teams of the country in competitions of fans of higher level, including the European championships, the world and the Olympic Games, and also in competitions among professional sportsmen [10].

Having executed such fixing, separate [10] system of training of sportsmen, which is directed to every possible increase in their skill from the population classes mass sport ("Sport for everybody") which are not focused on the achievement engaged more and more high rates according to requirements of Sports Classification of Ukraine, on the demonstration of the maximum sports results and establishment of the highest achievements of the country, Europe, the world and the Olympic Games, and are directed to the preservation of level of physical fitness and health.

Results of training of sportsmen form, first of all, the organizations which, usually, carry to venue of management – it is the organizations of for children and youth, reserve sport and elite sport (from among long ago existing, these are CYSS, SCYS-SSR, SHSS, schools of the Olympic reserve, boarding schools of sports profile, school of physical culture, specialized educational institutions, in some cases – the sports sections and teams, which are formed at the successful state enterprises – the general for all of them is the budgetary financing and financing from profits of the enterprises). These are also created new structures (as a rule, sports clubs) which operate on self-sufficiency conditions, using means of parents, sponsors and patrons.

The state and public organizations of the central, regional and local level which assistance to development of children's, youthful sport and elite sport, including the educational institutions providing preparation and professional development of coaches on "Physical culture and sport" enters the subject of management of the system of training of sportsmen. However only one this fixation is not enough, at the level of the organizations, which is carried to the object of management, the process of continuous and purposeful impact on the course of sports preparation, is also carried out that belongs to the management activity, and provided with coaches directly.

It is necessary to make in due time expedient decisions and to realize them in practice for the effective management of training of sportsmen for the coach. Children's coaches and coaches of students' teams have to have good organizing abilities, to be devoted to the business as usually they work not only in the conditions of limited material security, but also in the absence of moral support, is frequent in days off and holidays. Only the coaches, working at the stage of the highest sports skill, as if in something above other colleagues as pay less attention to search and attraction of resources during sports preparation (other experts do it).

Based on given above, under *the improvement of system of*

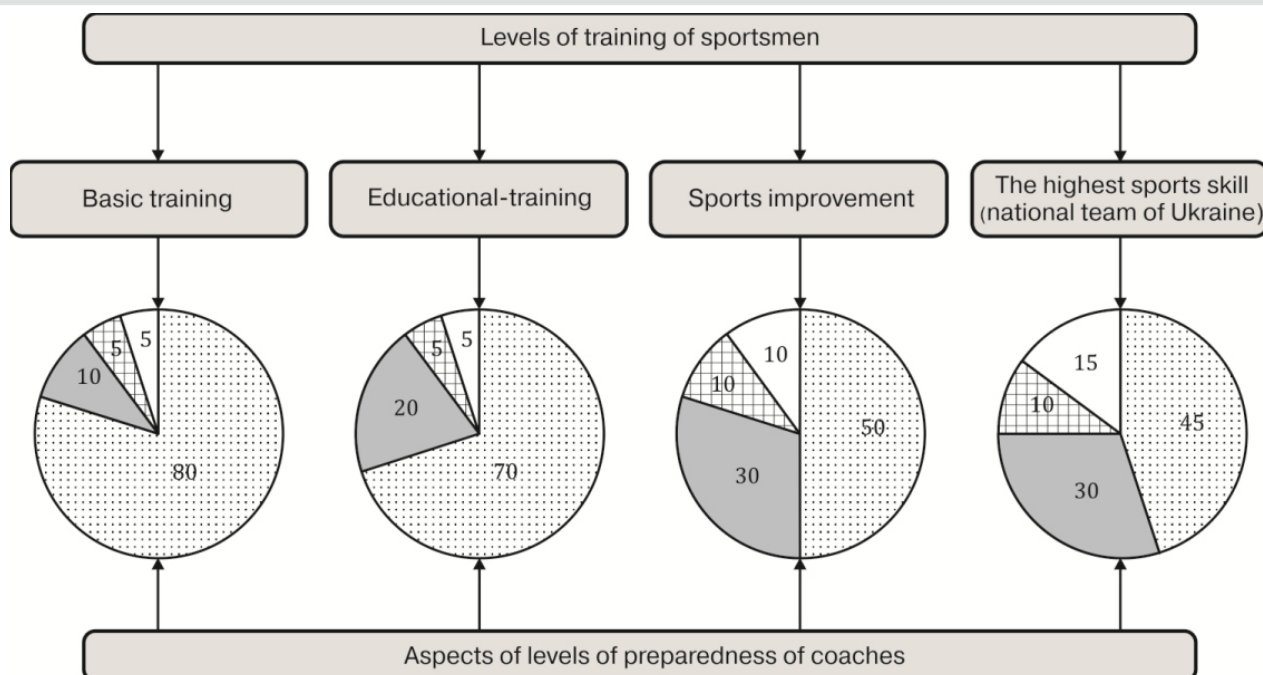
training of sportsmen, it is necessary to understand various scientifically based action, which are carried out on the legislative and regulatory base, held for the purpose of selection of perspective children in the sports plan, and also for the purpose of training of children and youth for the achievement of the maximum results by them. Both employees of the organizations, relating to the highest level of the subject of management (The Supreme Council of Ukraine, the President and the Cabinet of Ukraine, the Ministry of youth and sport of Ukraine, and also other Ministries, providing the acceptance legislative and regulations, governing the relations in the field of sport) and experts of others involved in management of sport of the state and public organizations, including sports national federations and their structures of regional and local levels of management take part in the improvement of the system of training of sportsmen. However, sports coaches are directly involved in the improvement of the system of training of sportsmen as through their administrative decisions are held in practice of sports preparation, those necessary events which provide the growth of skill of sportsmen, the increase in level of their sports results. At the same time the result of their work that will be higher, than the conditions which are created in Ukraine are more favorable for process of sports training of youth.

The work of a coach is compared [9] to the operation of the computer into which the data are entered, reflecting all parties of training of sportsmen, these data are exposed to processing and the appropriate training programs are issued. In this regard the computer (here, a coach) has to be sated with programs which could process all data and give the most effective answer. Therefore, programs have to provide the assimilation of certain knowledge base and the competence demanded in the conditions of uncertainty on the basis of which the analysis is made and effective decisions are made. The limited content of programs either narrows, or does not give at all the chance to make the effective decision.

It is accepted to allocate such levels during training of sportsmen: groups of initial preparation, educational and training, groups of sports improvement and the highest sports skill [3]. Therefore, it is necessary to consider preparation components, different level on the importance, which differs depending on the contingent of sportsmen.

In the most general view the range of administrative influences of a coach includes pedagogical, medicobiological, organizing and material aspects of levels of preparedness (pic. 1) which are various on the importance for separate groups of training of sportsmen.

The pedagogical aspect of activity should be considered as basic from which all others follow. It provides mastering complex of knowledge which allows a coach to carry out the process of formation of various parties of preparedness of sportsmen. It is important for a coach to know and use both all general-didactic methods, and methods of sports preparation during planning macro - meso - microcycles and separate classes; to have knowledge of control of various parties of preparedness and abilities to use its data during management of the educational-training process. It is also important to know the selection criteria and orientation of sportsmen, modeling and forecasting of various components of preparation. The importance of the accounting of extra training and out of competition factors increases with the growth of skill.



Pic. 1. The general structure of preparedness of a coach (in %)

The pedagogical aspect of preparedness of a coach takes the leading place in classes with groups of initial preparation (till 80%) as the primary use of the principles both the general-didactic, and the principles of physical education, which is connected with training in the movements, is required during this period. The specific principles of sports preparation are of great importance (orientation to the highest achievements, profound specialization, and unity of gradualness of increase in loading and tendency to the maximum loads, unity of interrelation and structure of preparedness of a sportsman, etc.) on the subsequent levels of training of sportsmen.

The organizing aspect of activity of a coach includes the complex of the components allowing providing the pedagogical process. Its importance is various at separate stages of the long-term training process. If the factors, forming the identity of a sportsman have the greatest value at the first stages, then more and more valuable to a coach aspects of its organizing activity are on the finishing which provide conditions for high-quality carrying out both the training process, and the whole system of training of sportsmen (they are connected first of all with the work with sponsors, advertizing activity, qualitative stock, equipment, etc.) (pic. 2).

Sports improvement demands the further increasing knowledge of coaches of physiological, biochemical and psychological processes, which are occurred in the sportsman's organism during exercise stresses, and also psychophysiological bases of loading, exhaustion and restoration. Knowledge of these processes allows a coach to plan the training process purposefully, solving specific objectives of trainings.

Thus, preparedness of a coach has various aspects (pedagogical, medicobiological, organizing and material). Their importance is not identical during the different periods of the long-term training process. So, a coach has to have knowledge of creation of the classes, concerning the technique of training in the main movements, education of moral and physical qualities at the initial training of sportsmen. A coach al-

ready should expand knowledge concerning structure, functions, and systems of organism and control of their state for classes with educational and training groups.

The questions which are closely connected with organizing and material aspects of preparedness of a coach, stand more and more sharply during the work of a coach with group of the highest sports skill, and it is, as a rule, national teams of the republic. Coaches of high qualification need the organization of living conditions and conditions of preparation up-to-date, providing with qualitative stock and equipment, etc.

Besides, the level of preparedness of a coach has to allow it to carry out the search of new ways of individualization of training of sportsmen with attraction of modern computer technologies.

So, the improvement of the differentiated preparation of coaches for the work with various age and qualification levels of sportsmen, including the organizing aspect which is marked out with us as one of the most important, is the topical issue which solution will allow to increase the efficiency of training of sportsmen at each stage of the long-term training taking into account the end sports result. Training of coaches considerably also defines effectiveness of the whole many-sided process of training of sportsmen.

Conclusions

Considering the above, the improvement of the differentiated preparation of coaches for the work with sportsmen of various age groups and qualification is the topical issue which solution will allow increasing the efficiency of training of sportsmen at each stage of the long-term training process taking into account the highest sports result.

The prospect of further researches provides the detection of features of aspects of preparedness of coaches in different types of sport.

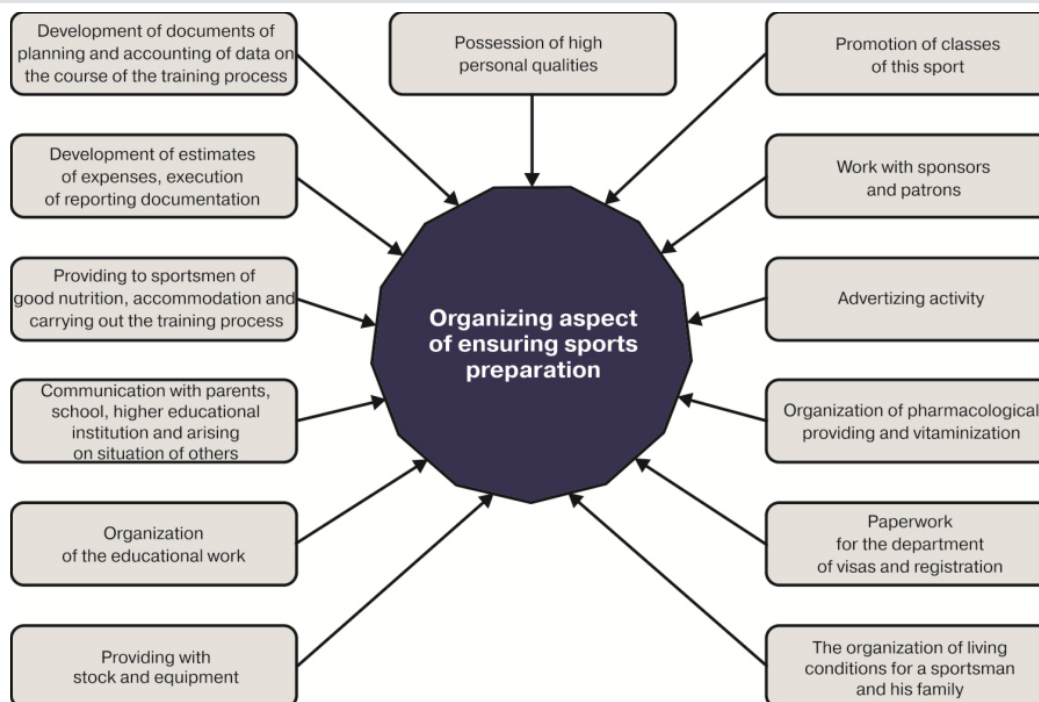


Fig. 2. Organizing aspect of preparedness of a coach on sport

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System resources of physical rehabilitation / physical therapy in musculoskeletal disorders

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Purpose: to determine and analyze the system resources of the physical rehabilitation in the musculoskeletal disorders.

Material & Methods: the resources of subsystems "specialist of physical rehabilitation" and "patient" were analyzed. Literature analysis and system analysis were applied.

Results: the role of resources in the system functioning has been discovered. The distribution, types, contents and links of resources of the system of physical rehabilitation in musculoskeletal disorders have been analyzed. The role of the information resource in the rehabilitation process has been defined. The necessity of coordinating the activities of the attending physician and the specialist of physical rehabilitation in the allocation of resources has been justified. Criteria for evaluating the effectiveness of rehabilitation based on the expended resources have been proposed.

Conclusions: the purpose of physical rehabilitation is achieved by all kinds of resources of specialist of physical rehabilitation and patient. The resource of direct action is information, that specialist of physical rehabilitation receives from the attending physician and/or collects independently when examining the patient.

Keywords: physical rehabilitation, musculoskeletal disorders, system.

Introduction

The interaction of open social systems and, in particular, physical rehabilitation with the external environment consists in that the environment provides resources to the system, and receives from it functioning products. These are material, financial, energy, human, organizational, information resources, which as a result of functioning of the system, turn into the necessary, material, financial or information product for the environment. The system of physical rehabilitation is designed to satisfy requirement of health protection that acts as the environment, and, using its resources, to transfer a patient to condition which cannot be reached by other systems of the environment.

Physical rehabilitation at disorders of the musculoskeletal system works as the closed system only on short (rather general duration of rehabilitation process) interval of time that is without exchange of resources with the environment [1].

Resources are closely connected among themselves. At the same time, their influence on the system is miscellaneous and not always proportional to quantity. Resources can be divided on such that directly influence the system – direct action, and such which have no fast direct influence – mediated action. The assessment of influence of the noted factors significantly depends on the concrete system, the tasks of the research and the researcher's position. The problem is in that to analyze the most essential connections which choice is defined by specific conditions of management of this or that object, or process from the large number of interactions of the system with the external environment [2]. Concerning physical rehabilitation, it should be taken into account that influence of the system resources of the environment in connection with the interpretation of physical rehabilitation as the open social

system process which is the special sort interaction of a specialist in physical rehabilitation (physical rehabilitologist) and a patient.

Physical rehabilitation is the open difficult system as it consists of separate subsystems, such as the specialist in physical rehabilitation, the patient, the purpose of rehabilitation [1; 3].

The purpose of functioning of the system of physical rehabilitation is renewal of motive functions, activity and health of a patient [4]. The purpose is achieved by the realization of rehabilitation potential of the patient. It is the complex of biological and psychophysiological characteristics of individual and also social-surrounded factors which allow realizing in this or that degree its potential abilities [5].

Rehabilitation potential and its realization are connected with resources of which the system of physical rehabilitation disposes. As any other system, physical rehabilitation functions in the conditions of deficiency of resources therefore their effective use is condition of timely realization of rehabilitation potential and achievement of the purpose of rehabilitation.

Studying of resources of the system of physical rehabilitation at disorders of the musculoskeletal system should be considered the scientific problem which needs the decision within the system researches of the rehabilitation process for the purpose of its improvement. The solution of this question opens the way to the solution of other important practical problem – account, replenishment and effective use of resources of physical rehabilitation.

Communication of the research with scientific programs, plans, subjects

The work was performed within the Built plan of the research work in the sphere of physical culture and sport for 2011–2015 on the subject 4.2 “Physical rehabilitation of disabled people with disorders of musculoskeletal system” (the head of the project prof. Vovkanych A. S.) (number of the state registration is 0111U006471).

The purpose of the research:

to define and analyze resources of the system of physical rehabilitation.

Material and Methods of the research

Research methods: analysis of references, system analysis and synthesis.

Results of the research and their discussion

Resources of the system of physical rehabilitation belong to two subsystems – physical rehabilitologist and patient.

Physical rehabilitologist uses own resources and resources of which he disposes for the sake of renewal of motive functions and activity of the patient. All this types of resources, what characteristic of open social systems, except for financial.

The organizational resource is made by the organization of the rehabilitation process in medical-rehabilitation institution. These are features of providing rehabilitation services, their form, for example: individual, group, independent, under supervision. One of the perspective directions of strengthening of the organizational resource should consider the activity of physical rehabilitologist as the part of multidisciplinary crew [6].

The information resource of physical rehabilitologist is information which is transformed to the professional knowledge, which is necessary for effective and safe activity. In view of its importance, the resource needs more detailed consideration.

The term “information” means the message, data on some event, someone’s activity or development of some process which reduces the lack of information on these phenomena. The term connected with other important concepts of the same terminological row namely: “knowledge” and “data”. As a rule, they understand information, which is submitted in the certain forms, which are adequate to possible processes of its processing as data [7].

The information resource is the organized set of the documented information, statements, data and knowledge, which is intended for satisfaction of information needs of a consumer. Data are the basis of information that serves for representation, preservation and information processing. Oral messages, printing and electronic documents, other material data carriers [8] can be its sources. Information on the basis of which it is possible to reach certain conclusions, consider knowledge by means of logical opinions [7].

The proper and pertinent information is called relevant. If the information message is unnecessary the subject for decision-making, then it is information noise which can entail information overload [8].

Information is divided into constant, conditionally constant

and variable by the stability degree. Constant information does not change, conditionally constant remains invariable rather wide interval of time, and variable contains data which are constantly updated for rather short period of time [8].

The general knowledge of etiology, pathogenesis, clinical displays of diseases, are formed on the basis of constant information. Knowledge of techniques and technologies of physical rehabilitation are based on conditionally constant information which changes infrequently. The noted knowledge makes theoretical basis of professional preparedness of physical rehabilitologist and is formed at stages of pre-degree and post-degree preparation. The continuous study happens in the form of advanced training courses, seminars, training, exchange of experience, self-education.

Information on the specific patient, directed to rehabilitation, differs by the stability degree. Physical rehabilitologist receives it from the case history and from the attending physician.

It is necessary to write down such data from the case history:

- passport data;
- date of hospitalization;
- profession;
- main diagnosis (concerns musculoskeletal system), date of establishment, clinical picture (set of displays of disease), complication;
- associated diseases and their complications;
- information on the executed operative measures;
- information on results of the previous rehabilitation.

These data concern constant or conditionally constant information on the motive sphere of the patient, duration and the course of disease, the carried-out treatment and rehabilitation. They are input parameters with which study interaction of physical rehabilitologist and the patient begins.

The following information, necessary for functioning of the system of physical rehabilitation, is the variable character and arrives from the attending physician. Frequency of change depends on the course of disease and the stage medical-rehabilitation process. The variable component of information resource of physical rehabilitologist at disorders of the musculoskeletal system concerns individual restrictions, purposes and time.

Restriction concerning holding rehabilitation actions is imposed by the attending physician, having directed the patient on rehabilitation. He has to provide to rehabilitologist the information about individual contraindication and caution to performance of rehabilitation actions at disorders of the musculoskeletal system. Restrictions mainly concern the range of movements, postural poses, power and functional loadings. Change of the course of disease, clinical manifestations, treatment techniques will entail strengthening, ease, or cancellation of certain restrictions.

Information from the attending physician concerning the purposes of treatment will help physical rehabilitologist to establish the whole rehabilitations which would be coordinated with the treatment purposes, for example: reduction of hypostasis, reduction of pain, elimination of contracture, renewal of power qualities. Coordination of the purposes will promote synergy effect of cooperation of both experts and, as a result, fast re-

newal of health of the patient.

Information concerning time concerns duration of individual application of techniques of conservative treatment of the musculoskeletal system dates of the planned operative measures predicted by the doctor, individual terms of healing, the predicted terms of stay of the patient in medical institution. The noted information will make possible planning of rehabilitation actions and their synchronization with medical.

Physical rehabilitologist has to obtain the main part of information on functional condition of the musculoskeletal system independently, having executed rehabilitation inspection. Information can also arrive from other physical rehabilitologist who worked previously with the patient.

Material means of medical-rehabilitation institution form material resource of physical rehabilitologist. First of all, these are specially equipped rooms (halls, offices) and technical means for transportation of patients within institution (carts, tables, chairs, lifts, elevators). It is expedient to include the following to the list of the rehabilitation equipment for patients with disorders of the musculoskeletal system:

- dumbbells, encumbrance for extremities; expanders, plaits for training of power qualities;
- gym wall bars, sticks, balls of different sizes, for flexibility development;
- parallel bars of variable width and height for vertical adjustment and study of gait;
- traction and safety harnesses;
- mirrors for training of motive control;
- tables for performance of active and passive exercises;
- massage tables, rollers, pillows, supports;
- mats, rugs for exercises on floor;
- supportive applications for movement: carts, walkers, crutches, sticks;
- platforms for training of gait and balance;
- systems of suspended therapy;
- devices and trainers for improvement of mobility, development of force, power and general endurance, functional training.

The list should be added with the equipment and devices for application the pre-shaped physical factors (electric energy, heat, cold, water). They are used for reduction of pain and inflammation, renewal of mobility of tissues, supports of muscle work at violation of innervations at disorders of the musculoskeletal system.

The human resource is closely connected with the organization of rendering of services and stage of rehabilitation. The resource is formed by persons whom physical rehabilitologist involves in the rehabilitation process and to whom delegates part of the powers. Physical rehabilitologist can recruit informal assistants from among volunteers, relatives and the patient's relatives. The listed persons help to carry out the rehabilitation program, to move and insure the patient, to make observation, to control results after obligatory instructing. Duty of physical rehabilitologist is ensuring their effective and safe activity. There are positions of the technician of physical therapy, the assistant and the assistant to the physical therapist in economically developed countries. These persons have special training and according to the functions carry out separate rehabilitation actions [9].

The energy resource can be divided into two components. The first is thermal and electric energy which physical rehabilitologist uses therapeutic agents in quality. The second – muscular energy of the expert which is implemented through manual interaction with the patient, for example:

- inspection of the musculoskeletal system by means of palpation, manual muscular testing, tests, with isometric tension, testing by the passive movement, testing “the final feeling” [10];
- facilitation, inhibition, stimulation at performance by the patient of active exercises;
- passive exercises by means of rehabilitologist;
- massage, post-isometric relaxation;
- movement of the patient;
- insurance of the patient.

Thus, anthropometrical indicators, method of execution of manipulations, physical fitness (flexibility, power qualities, and endurance) are factors which define the energy potential of physical rehabilitologist.

The time resource is connected with rationing of operating time of physical rehabilitologist. This time, during which, the expert prepares for interaction with the patient or directly works with it.

Physical rehabilitologist always works in the conditions of the limited operating time. Planning duration of separate classes and the whole rehabilitation course, it is necessary to take into account the physiologic processes in the patient's organism connected with the disease course, healing, and functional renewal.

The need for the time resource grows at deficiency of all other resources. Increase in duration of rehabilitation can entail developing of secondary diseases and complications with irreversible changes in the musculoskeletal system, such as osteoarthritis, resistant discordant contractures, ankylosis. The risk of invalidization of the patient will grow.

The expert should pay special attention on information and power which are considerably formed by him for the optimum use of the time resource. Information can re-customize very quickly activity of physical rehabilitologist and has to be treated as the factor of the direct action on the system of physical rehabilitation.

The subsystem “patient” owns or disposes of all types of resources: organizational, information, material, financial, human, power, time.

It is possible to carry possibilities of the patient concerning the organization of independent rehabilitation classes to organizational resources. It is possible to carry out them at different stages of rehabilitation. The object depends on stage, for example: medical hospital, residence, rehabilitation and sports institutions, on open space. In all cases such form of rehabilitation in common with the expert of physical rehabilitation has to be planned and controlled. The large role will be played by the previous motive experience of the patient got during the previous rehabilitation and sports activities or physical culture.

Information resource is made by the relevant information, which is necessary for the patient for making decisions on the rehabilitation process. It has to arrive from the doctor and physical rehabilitologist. Information which the patient obtains from other sources, such as patients, popular literature on medical subject, the telecast, Internet often is irrelevant, has the nature of information noise and can negatively influence interaction of the patient and specialist in physical rehabilitation.

Material resources are material means and the equipment which the patient uses for independent classes. It is dumbbells, expanders and plait for training of power qualities, gymnastic sticks for the development of flexibility and elimination of contractures, supportive applications for movement, and platforms for training of gait and balance, house cardiovascular machine for endurance development at disorders of the musculoskeletal system.

Financial resources of the patient are formed of own preservations, financial aid, insurance payments. They can be directed to payment of paid rehabilitation services and acquisition of the equipment for independent classes.

Human resources are persons whom the patient involves in providing the rehabilitation help: assistants, volunteers, relatives and family members, trustees. Physical rehabilitologist can delegate part of competences from performance of the rehabilitation actions connected with renewal of the lost motive functions, movements, insurance, and control to the listed persons. The previous instructing and study of the involved persons for guaranteeing their effective and safe participation in the rehabilitation process has to be indispensable condition.

The energy resource is formed of physical capacities of the patient and is the big and important part of rehabilitation potential at disorders of the musculoskeletal system. It is connected with the work of systems of power supply and endurance. Physical endurance is characterized by times during which the patient can be engaged in physical functioning which level ensures realization of necessary rehabilitation interventions in rehabilitation [5]. Information on the previous motive status can serve as reference point for rough estimate of the energy resource. Speed and volume of reconstruction of energy resource depends on basic disease and its complications, general condition of health and age.

The time resource consists in the choice by the patient of duration of separate classes (under supervision and independent) and the whole rehabilitation course. Time should be treated as the major resource which loss cannot be offset completely. Even the temporary refusal of the patient of rehabilitation classes increases the time of renewal and can entail transition of functional violations of the musculoskeletal system to irreversible structural. As a result, the need for other resources and for the second grows in the first case – purposes and objects of physical rehabilitation will not be achieved.

The patient at the same time is object/subject of medical and rehabilitation processes which can conditionally be divided on the basis of the system analysis. In the first case the direct operating influence is carried out by the attending physician (the operating health protection subsystem), and in the second – physical rehabilitologist (the operating subsystem of physical

rehabilitation).

Mutual influence of subsystems in the course of their functioning happens in the presence of the general restrictions which can be the general resources. Strengthening of activity of one subsystem will entail reduction of the part of resources another and vice versa. Resources can be distributed under the influence of random factors, or for subsystems the compromise solution will be made. In that case, the governing body of the highest level has to make decisions for the benefit of the whole system [2]. Such body acts the attending physician in the medical rehabilitation process who acts in the meta-system of health protection.

Cooperation and interaction of the doctor and physical rehabilitologist consists in the general effective use of system resources, especially the patient's resources. The general resources, which predetermine mutual influence of the meta-system and the studied system, are time and energy in medical and rehabilitation processes.

The resource of energy concerns reserve opportunities of organism of the patient and is shown by the individual reaction to conservative, or expeditious treatment and therapeutic exercise stresses. It is connected with the work of immune system, functional potential of life support systems, adaptation reserve and compensatory opportunities of cardiovascular and respiratory systems. The resource of energy enters the rehabilitation potential of the patient.

The resource of time is closely connected with energy resource. First, it limits the simultaneous or parallel solution of the different purposes of treatment and rehabilitation, forces to define priorities and to plan activity taking into account speed of recovery processes in each case. Secondly, big expenses of physical energy by the patient provide longer periods of renewal and vice versa [1].

Resources are closely connected with the concept "technology". By one of definitions, "technology is means of transformation of resources (materials, raw materials, people, information) in products or services which are previously planned in product or choice" [11]. Therefore, the purpose of physical rehabilitation is achieved by resources by means of rehabilitation technologies, and rehabilitation technologies are means of transformation of resources into the purpose.

Leaning on the role of resources in functioning of systems, it is possible to open the concept "efficiency" in relation to the rehabilitation process at disorders of the musculoskeletal system. It is necessary to consider such physical rehabilitation as effective at which renewal of motive functions, activity and health of the patient, is reached by smaller expenses of resources, first of all, of time. Intermediate criterion of efficiency can be the achievement planned, or the highest level of motive functions and activity at the separate stage of rehabilitation by previously defined resources.

Conclusions

Physical rehabilitation as the open social system uses all types of resources for the achievement of the purpose: organizational, information, financial, material, human, power, time. The system resources belong to physical rehabilitologist and the patient, or are at their order.

Physical rehabilitolog has the greatest influence on the formation of power and information resources. Information which arrives from the attending physician and the patient can re-customize very quickly activity of physical rehabilitolog and has to be treated as the factor of the direct action on the system of physical rehabilitation.

Resources of the patient make the basis of rehabilitation potential.

Energy and time resources of the patient share the attending physician and physical rehabilitolog. It imposes certain restrictions for holding rehabilitation actions and demands accurate cross-disciplinary coordination in which the doctor plays the leading role.

The achievement of the intermediate purposes and the object of physical rehabilitation with smaller expenses of resources, especially time, testify to the efficiency of activity of physical rehabilitolog. The over-expenditure of the time resource increases the need for all others and can entail transition of functional violations of the musculoskeletal system to irreversible structural.

The resources turn into the purpose by means of technologies of physical rehabilitation.

The prospect of the subsequent researches consists in studying of internal communications of the system of physical rehabilitation at disorders of the musculoskeletal system.

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Technology of physical rehabilitation of children with bronchopulmonary diseases in the conditions of hospitalization

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Purpose: the development of technology of physical rehabilitation of children with bronchopulmonary diseases.

Material & Methods: general scientific – analysis, conception and generalization, synthesis, comparison, abstraction.

Results: technology of physical rehabilitation for children with bronchopulmonary diseases (BD), which is directed to the restoration and the development of physiological functions of a child, the prevention of synchronization of sharp processes, the elimination of negative changes in health of a child, the assistance in creation of conditions for adaptation to changes as a result of disease in life situations, is offered.

Conclusions: the program and its activity including basic and variable components is the compound of the offered technology of physical rehabilitation for children with BD in the conditions of hospitalization.

Keywords: technology of physical rehabilitation, bronchopulmonary diseases.

Introduction

Respiratory function consists of set of components, the main of which are: bronchial permeability, diffusive ability, elastic properties of lungs and respiratory muscular function [13]. Therefore violation at one of these stages brings to different bronchopulmonary diseases which can be sharp, recidivating and chronic. The inflammation, in which zone sharp changes of tissue exchange happen, that is caused by damage of tissue and violation of regional blood-groove [24], develops, irrespective of disease etiology on mucous membrane cover. Concerning violation of mucociliary clearance, it occurs both at superfluous, and at insufficient, education of phlegm that results in its stagnation (mucostaz) [3].

When studying mechanisms of influence of the main symptoms of disease on organism of a child, it is revealed that violation of drainage function of bronchial tubes in combination with accumulation of viscous secret causes violation of processes of ventilation of lungs, decrease in local mechanisms of immune protection – mucociliary transport and cough, colonization of bronchial tubes pathogenic microflora accrues, and violations of transport of phlegm leads to support and progression of inflammation and broncho-obstruction that in general creates favorable conditions for the stratification of pathogenic flora and the long course of the inflammatory process [3; 17]. Clinically the extent of violation of permeability of bronchial tubes at different pathology depends on ratio of separate components of broncho-obstruction, existence of genetically caused hyper-reactivity of bronchial tubes, features of factors and inflammation [14].

Analyzing anatomic and physiologic characteristics of breath, it is established that functional swelling of pulmonary tissue (emphysematous lungs) which is connected, as a rule, with bronchial obstruction, causes the increase in resistance of the movement of air on respiratory tracts, discrepancy between ventilation of alveolus air and perfusion by their blood [18]

that needs to be considered when determining the program of physical rehabilitation. The emergence of circulatory inefficiency in most cases has a transitory character at children at pneumonia [11].

Studying the clinical picture of bronchopulmonary diseases (BD), we found out that they include at themselves several clinical syndromes: ignition-intoxication, broncho-lung-pleural, respiratory insufficiency, broncho-obstructive [8; 10; 19]. It is noted about the special role in etiology and pathogenesis of diseases of the respiratory system (RS) of bioskin [16] – the most common form of the organization of activity of microorganisms which protect them from adverse physical, chemical and biological factors for today even more often in scientifically-methodical literature [32; 35]. According to researches of number of authors, they play the part (in synchronization of infection, violation of protective and cleaning mechanisms and so forth) at bronchopulmonary diseases [28; 29; 33].

However, according to scientific literature, antibiotic treatment is inefficient and, for today, it is not recommended for the purpose of prevention of their education [27; 30; 31; 34]. However violation of mucociliary transport promotes developing of sharp and chronic pulmonary pathology [9]. Therefore, Yu. V. Marushko, T. V. Hyshchak note that under these conditions the strategy have the crucial importance, which are directed to the improvement of mucociliary clearance, influence on immune inflammation, integrity renewal of mucous membrane covers, [16] which confirms need of application of physical rehabilitation not only at chronic (as it is noted in the majority of foreign sources), but also at sharp bronchopulmonary diseases.

Communication of the research with scientific programs, plans, subjects

The work is performed on the subject of the Built plan of the research work in the sphere of physical culture and sport for

2011–2015, subject 4.2. “Physical rehabilitation of disabled persons with violation of activity of the musculoskeletal system” (number of the state registration is 0111U006471).

The purpose of the research:

to develop the technology of physical rehabilitation (PR) of children with bronchopulmonary diseases.

Material and Methods of the research

Research methods: general scientific – analysis, understanding and generalization, synthesis, comparison, abstraction.

Results of the research and their discussion

Studying the scientifically-methodical literature concerning the development and approbation of technologies of physical rehabilitation at bronchopulmonary diseases, and PR technology, in general, we found the lack of determination of rather this term [4; 5; 12; 26] and if there was an attempt to give definition, then according to the researches of A. Hertsyk, the described term is treated close according to contents to the term “the program of rehabilitation” [7]. Therefore first of all, it is expedient to pay attention to that which means term “technology” and that is its component.

According to interpretation in the dictionary of the foreign-language words “technology” is considered in two options namely as: “set of knowledge, data about the sequence of separate production operations in the course of production for some reason or other”, and “set of ways of processing or treatment of materials, production of products, carrying out different production operations, and so forth” [20]. Such approach is connected with the fact that technologies are result not only products, but also services. In general the term “technology” has several base-line values, and in narrower sense it is formulated as set of ways, means of the choice, and implementation of the operating process of plural of its possible realization [25].

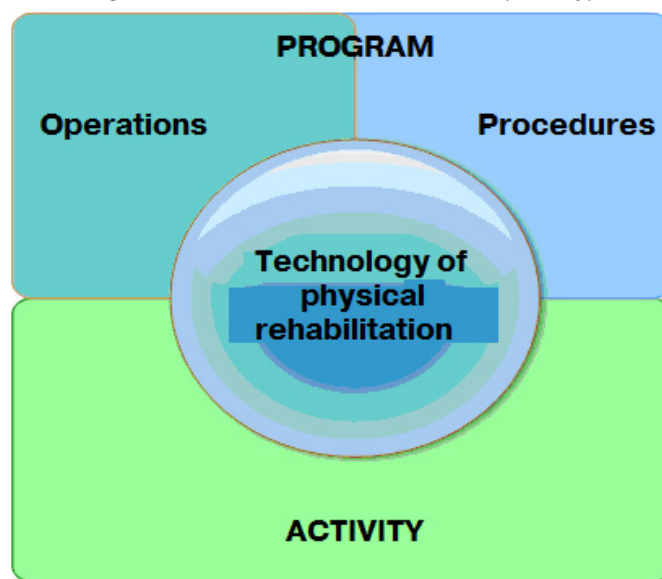
G. K. Bryl and T. V. Besarabova note that the detailed determination of the end result and its exact achievement is considered as the basis in any technology. Therefore their predisposition, definition of final properties of predictable product, means of its creation, purposeful modeling of conditions of their implementation and real functioning of these processes [4] are prerequisites of application of this concept both of productions, and in the social sphere. And A. A. Derkach points that the technology as kind of activity has relative independence in all public spheres where tasks of optimization of some process (education, upbringing, public relations, etc.) are solved [1]. As the initial and end result of technology of physical rehabilitation is the person with certain problems in the state of health – expediently to pay special attention to the determination of social technology which is considered as “algorithm, the procedure of implementation of actions in the different fields of social practice: management, education, research work, art creativity”. And this technology acts in two forms according to this definition in the dictionary of social management: as the program which contains procedures and operations and as activity which is built according to this program” [21].

According to G. K. Bril and T. V. Besarabov, specifics of so-

cial technologies consist in possibility of their adaptation to any conditions as they are capable to modify shortcomings of processes and techniques of technological process, but these technologies are rather difficult by the organization and implementation [4].

Concerning PR technology, that interpretation of this term was proved in the work by A. Hertsyk, proceeding from the fact that rehabilitation is the system process. According to its treatment “the technology of physical rehabilitation is set of methods, means and forms which are used for the achievement of the objectives of the consecutive rehabilitation actions, which are directed to renewal of motive functions, activities and health of the person/patient. Collection of the relevant information, planning of the rehabilitation process, and realization of the planned are such actions” [7].

Studying questions of the term the of technology in general and PR, in particular, we developed the technology of physical rehabilitation of children with BD in the conditions of hospitalization which unites in itself two interconnected components (pic. 1): the program which contains, – the sequence of stages of process (procedure) with the definition of its main components (operation), and the principle of selection of techniques of intervention according to disease symptoms, considering their characteristic, the cause and mechanisms of dysfunction of organism at the child with this disease (activity).



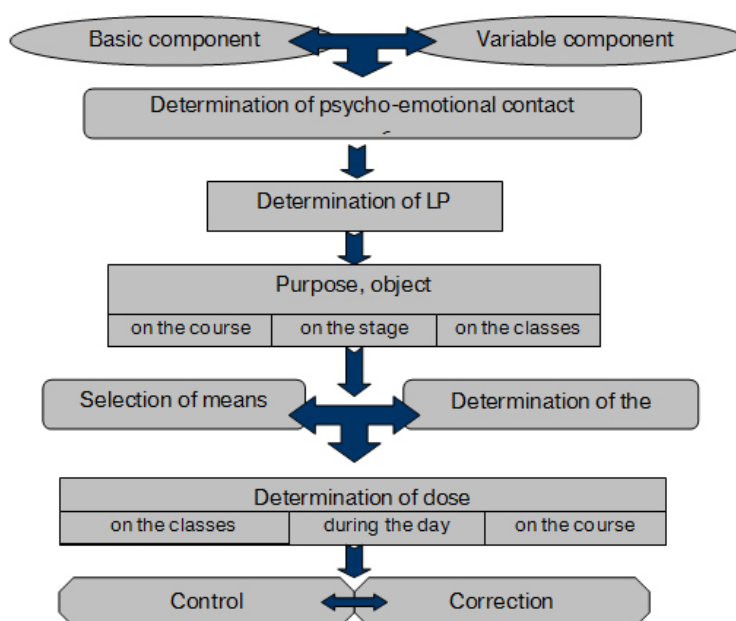
Pic. 1. Technology of physical rehabilitation for children with BD

The theory of functional systems of P. K. Anokhin, added with K. V. Sudakov is the cornerstone of PR technology of children with BD. So, P. K. Anokhin considered functional systems as the dynamic organizations which self-regulate which activity of all compound components promotes receiving vital adapting results for organism [2]. The theory of functional systems allowed considering the normal state of the person as the coordinated interaction of the functional systems of different level making it, which will provide the best for activity of organism homeostasis and adaptation to conditions of dwelling [23]. However the deviation of this or that indicator of the internal environment from the level of normal activity causes difficult dynamic reorganization and reorganization of all other related results of activity of other functional systems [22].

Table 1

Component of technologies of physical rehabilitation of children with bronchopulmonary diseases in the conditions of hospitalization (component of operations)

Purpose of physical rehabilitation of children with BD
<ul style="list-style-type: none"> renewal/improvement/support of functionality of the respiratory system and organism in general
Aims
<ul style="list-style-type: none"> elimination/reduction to bronchospasm; renewal/improvement of drainage function of bronchial tubes; improvement of alveolar ventilation; to teach to own and to direct breath; to increase tolerance of bronchial tubes to exercise stress; to prevent emergence of complications; to reduce the frequency of points, or completely to eliminate them (for chronic diseases); fluidifying of secret and cleaning respiratory tracts/pulmonary tissues/pleural cavity; improvement/renewal of elasticity, mobility pulmonary tissues / thorax; elimination of traces (pleural solderings); to normalize muscular tone of the main/auxiliary respiratory muscles; to constantly control disease symptoms (for chronic diseases); to renew physical activity of the child (according to his age); renewal of nasal breath (if it is necessary); to improve or control bearing; in addition according to the existence of the accompanying pathologies; to teach self-checking during physical rehabilitation classes / physical education
Forms and methods of influence
<ul style="list-style-type: none"> RGG/classes MG / independent classes for day individual / a little group/group
Means
<ul style="list-style-type: none"> treatment by situation (for ventilation improvement; drainage provisions); techniques of respiratory gymnastics (without apparatus/apparatus, sound gymnastics); handling interventions; GDE; exercises of aerobic character massage; hydrotherapeutic procedures; training programs
Orderliness and organization
<ol style="list-style-type: none"> To see component of procedures To avoid: hyperventilations; attack-similar cough; pain. Ratio of components of technology according to the assessment of rehabilitation potential in %: <ul style="list-style-type: none"> low – 90–75/10–25 (basic/variable); average – 70–40/30–60 (basic/variable); high – 60–30/40–70 (basic/variable).



Pic. 2. The schematic image of the compound procedure of the technology of physical rehabilitation of children with bronchopulmonary diseases in the conditions of hospitalization

Table 2

Features of selection of techniques of PR according to the cause of infringement of activity of RS, as the compound technology of physical rehabilitation of children with bronchopulmonary diseases in the conditions of hospitalization

Causes of infringement of activity of RS	Direction of technique of application
Debut of inflammation of slime of covers of respiratory path	On ventilation improvement; on improvement of elasticity of BPS; on creation: AVDS; positive pressure on exhalation
Big viscosity of phlegm	On fluidifying and removal of inflammatory secret; on creation: high-frequency oscillation of thorax; positive pressure on exhalation; increase in TE
Coughing reflex is insufficiently expressed	At ventilation improvement; on creation: high-frequency oscillation of thorax; positive pressure on exhalation; increase in TE
Bronchospasm	On reduction of resistance of the movement of air in respiratory tracts; on creation of conditions of the dosed hypoxia and hypercapnia; on relaxation; creation of conditions of oscillatory fluctuation of air stream directly in bronchial tree; increase in TE and ELBL
Insufficiently deep breath	At ventilation improvement; on improvement of elasticity of BPS; on creation: AVDS; positive pressure on exhalation; increase in TE
Bronkhoraptus	On fluidifying and removal of inflammatory secret; on creation: high-frequency oscillation of thorax; positive pressure on exhalation
Inflammatory and developments of stagnation in lungs	On ventilation improvement; TE; fluidifying and removal of inflammatory secret; on creation: high-frequency oscillation of thorax; positive pressure on exhalation On improvement of ventilation, TE; but according to the mechanism of emergence (obturational/compression)
Atelectasis	On fluidifying and removal of inflammatory secret; on creation: high-frequency oscillation of thorax; positive pressure on exhalation
Fibrosis	On ventilation improvement, on improvement of elasticity of BPS; TE; on creation of AVDS
Emphysema	On reduction of resistance of the movement of air in respiratory tracts; on creation of conditions of the dosed hypoxia and hypercapnia, oscillatory fluctuation of air stream, directly in bronchial tree; increase in TE and ELBL
Formations of abnormal cavities	On ventilation improvement; improvement of elasticity of BPS; TE
Inflammations of visceral and parietal leaves of pleura	On ventilation improvement; improvement of elasticity of LT; on creation: AVDS; positive pressure on exhalation
Pleural perspiration	On improvement: to osmosis; ventilation; elasticity of LT; on creation: high-frequency oscillation of thorax; positive pressure on exhalation; increase in TE and ELBL At ventilation improvement; improvement of elasticity of LT; increase in TE and ELBL
Pneumothorax	On fluidifying and removal of inflammatory secret, on creation: high-frequency oscillation and positive pressure on exhalation in the nasal courses on creation: high-frequency oscillation and reduction of resistance of the movement of air in respiratory tracts
Nasal breath is complicated: as a result of availability of dense slime as a result of hypostasis of slime	On improvement: to osmosis; ventilation; elasticity of LT; on creation: high-frequency oscillation of thorax; positive pressure on exhalation; increase in TE and ELBL At ventilation improvement; improvement of elasticity of LT; increase in TE and ELBL
Deformation of thorax, defect of bearing/thorax	On posture correction according to form of posture / thorax
Cyanosis	On improvement: ventilation and according to the emergence mechanism
Blood circulation violations	According to the emergence mechanism; on improvement of trophic action
Associated diseases	According to symptomatology and the period of disease

Note. RS – respiratory systems; BPS – bronchopulmonary system; AVDS – the additional volume of dead space; PT – pulmonary tissue; TE – thorax excursion; ELBL – excursion lower borders of lungs

The offered by us PR technology of children with BD in the conditions of hospitalization consists of the basic and variable components (pic. 2). The basic component includes means of PR and definition of method of their performance for the purpose of achievement of the objectives, which will be solved in the course of rehabilitation concerning the function of the respiratory system.

The variable component provides the accounting of specific features of the child among which there are results of the assessment of posture and the existence of the accompanying pathologies for the purpose of strengthening of efficiency of influence of PR on the respiratory function of the child and improvement of his posture and functional condition of organism in general. The technology is directed to renewal and

development of physiologic functions of the child, prevention of synchronization of sharp processes, elimination of negative changes in health of the child, assistance in creation of conditions for adaptation to changes as a result of disease in life situations.

This technology includes: the definition of the reason of violations and extent of restriction of function of external breath and other systems of organism (if it is necessary); the assumption of rather morphological and functional renewal of the struck body or system; the clarification of influence of different factors on physical condition of organism of the child in general; the selection of means, definitions of the method of influence proceeding from results of inspection; the prevention of complications, recurrence and synchronization of disease, study

of patients, relatives concerning techniques of physical rehabilitation at BD, self-checking, during PR classes.

PR is carried out gradually. The attention is paid to the establishment of psycho-emotional contact with the child and parents at the first stage of rehabilitation. The examination and the analysis of the obtained information and drawing up the PR individual program are conducted at the second stage. The third stage is the direct intervention (the implementation of the rehabilitation program). The fourth stage – is the control which includes definition of efficiency of PR, its timely correction, according to changes in condition of the patient and drawing up the house rehabilitation program.

As each technology includes: the process of realization of the purpose; the subject which is subject to technological changes; the ways and the methods of influence; the means of technological influence; the orderliness and the organization which opposed to spontaneous processes [25] we adhered to these researches of A. Hertsyk of rather system approach and the basic concepts in physical rehabilitation [8].

Therefore, proceeding from it, the purpose of PR for patients with BD will depend on the data of inspection and sanogenetic opportunities of the child who will define further the purpose, the task of physical rehabilitation of PR, the selection of means, the form and methods of influence of PR, both for course and for each concrete class (tab. 1).

Considering the activity as the component of technologies of physical rehabilitation, we applied the system approach in definition of techniques of PR according to the reasons which break the activity of RS (tab. 2.) at children with BD.

Concerning the duration of PR and dispensing, they are also selected individually for each child, proceeding from the data of inspection, rehabilitation potential and functionality of the child.

Conclusions

The component of the offered technology of physical rehabilitation for children with bronchopulmonary diseases in the conditions of hospitalization is the program and its activity which include the basic and variable components, which are directed to the renewal and the development of physiologic functions of the child, the prevention of synchronization of sharp processes, the elimination of negative changes in his health, the assistance in creation of conditions for adaptation to changes as a result of disease in life situations.

Prospects of the subsequent researches predetermine the foundation and the development of the differential approach to drawing up individual programs of physical rehabilitation for children with bronchopulmonary diseases according to the clinical characteristic and functional condition of the child at the time of intervention.

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Improvement of technical training of sportswomen in rhythmic gymnastics by means of acrobatics at the stage of preliminary basic preparation

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Purpose: to prove experimentally the technique of improvement of technical training of sportswomen in rhythmic gymnastics by means of acrobatics at the stage of preliminary basic preparation.

Material & Methods: the following methods of the research were used: analysis and synthesis of references, pedagogical observations, pedagogical testing, pedagogical experiment, method of expert assessment (qualimetry), methods of mathematical statistics.

Results: the level of technical skill of performance of pre-acrobatic elements by sportswomen of rhythmic gymnastics before carrying out the pedagogical experiment is determined. The dynamics of indicators of the level of technical preparedness of sportswomen of rhythmic gymnastics is defined.

Conclusions: it is established that additional resources of acrobatics influence significantly the level of technical preparedness of sportswomen of rhythmic gymnastics at the stage of preliminary basic preparation.

Keywords: technical training, technical skill, pre-acrobatic elements, acrobatics.

Introduction

Technical skill of sportsmen is one of the important requirements to the program of competition in modern rhythmic gymnastics, where the need for the improvement of method of execution of difficulties of body (jumps, turns, balances) and expressiveness of performance of these movements occurs, as it is possible to increase a competition composition cost due to performance of difficult and "expensive" elements of difficulties of body. Harmony between complexity, composition, performance has to be in rhythmic gymnastics as well as in any difficult coordination sport [1; 2; 4; 6; 7]. The growing competition on rhythmic gymnastics on the international scene provides in competitions that the superiority will be kept for those sportswomen who will be able to combine different and structural complexity in extraordinary compositions with masterly performance and special expressiveness, emotionality, virtuosity [3; 5; 8; 9]. Therefore, today it is necessary the better approach to technical training, which is based on the principles of individualization and the advancing development in constantly changeable conditions, in which rhythmic gymnastics functions, that became the relevance of our research.

Communication of the research with scientific programs, plans, subjects

The research was conducted in the implementation of the complex scientific project of MES of Ukraine for 2015–2017. "Theoretic-methodical bases of formation of culture of physical health at student's youth" (number of the state registration is 0115U0066767).

The purpose of the research:

to prove experimentally the technique of improvement of technical training of sportswomen in rhythmic gymnastics by means of acrobatics at the stage of the previous basic preparation.

Research tasks:

1. To learn the problem of improvement of technical training of sportswomen in rhythmic gymnastics by means of acrobatics at the stage of the previous basic preparation.
2. To prove the efficiency of technique of improvement of technical training of sportswomen in rhythmic gymnastics by means of acrobatics at the stage of the previous basic preparation and to analyze the dynamics of indicators of level of their technical preparedness.

Material and Methods of the research

The researches were conducted from October, 2015 till April, 2016. The following methods of the research were used in the research: analysis and synthesis of references, pedagogical observations, pedagogical testing, pedagogical experiment, method of expert assessment, methods of mathematical statistics. 16 gymnasts are tested at the performance of pre-acrobatic elements before and after the pedagogical experiment.

8 sportswomen of rhythmic gymnastics of 8–9 years old of the control group (CG) and 8 sportswomen of rhythmic gymnastics of 8–9 years old of the experimental group (EG) participated in the researches. The research was conducted for the identification of the level of technical skill of performance of pre-acrobatic elements by sportswomen in rhythmic gymnastics.

Results of the research and their discussion

The pedagogical experiment on the improvement of technical training of gymnasts with use of purposeful complex of acrobatic exercises was made during half a year, from October, 2015 till April, 2016, among sportswomen of rhythmic gymnastics. Classes on acrobatics, which are aimed at the development of technical skill of performance of pre-acrobatic elements, were given three times a week for 6 months in the experimental group which is consisted of 8 sportswomen of 8–9 years old.

Technical training of gymnasts was estimated by the tests, which were pre-acrobatic elements, which join in programs of competitions. The quality of performance of exercises was estimated at all pre-acrobatic elements, in total technical errors of the movement of body were also estimated. The testing was carried out by the group of experts, which consists of coaches of rhythmic gymnastics [10]. The maximum assessment made 10.0 points for correctly executed pre-acrobatic element, and were applied the reduction for technical mis-

takes agrees with international competition regulations.

Protocols of assessments of commission of experts of the first and second testing of pre-acrobatic elements were made. Experts carried out the analysis of results and aggregated the average mark. The average mark on each test pre-acrobatic element was recorded in tables (tab. 1–4). The comparative characteristic of results of tests and the created conclusions were carried out at this stage.

The results of control standards by the level of technical skill of performance of pre-acrobatic elements by sportswomen of rhythmic gymnastics of CG and EG before carrying out the pedagogical experiment are presented lower (tab. 1 and 2).

We carried out and tested the control standards in CG and EG in half a year (tab. 3 and 4).

We compared the results of the performance of the same test pre-acrobatic elements on the end of the experiment with the received results in the control group (CG) of the performance

Table 1

The protocol of assessment of performance of pre-acrobatic elements by sportswomen of rhythmic gymnastics of CG by the beginning of the pedagogical experiment (n=8)

Tests	Sportswomen							
	1	2	3	4	5	6	7	8
Pre-acrobatic element "Turnover aside (Wheel)" (points)	9,20	9,36	9,25	9,21	9,27	9,24	9,17	9,22
Pre-acrobatic element "Spin" (points)	9,55	9,26	9,23	9,17	9,32	9,28	9,24	9,33
Pre-acrobatic element "Fish" (points)	9,21	9,25	9,14	9,22	9,32	9,41	9,43	9,30

Table 2

The protocol of assessment of performance of pre-acrobatic elements by sportswomen of rhythmic gymnastics of EG by the beginning of the pedagogical experiment (n=8)

Tests	Sportswomen							
	1	2	3	4	5	6	7	8
Pre-acrobatic element "Turnover aside (Wheel)" (points)	9,21	9,35	9,21	9,22	9,25	9,21	9,19	9,18
Pre-acrobatic element "Spin" (points)	9,54	9,25	9,23	9,15	9,33	9,27	9,23	9,31
Pre-acrobatic element "Fish" (points)	9,22	9,23	9,13	9,23	9,34	9,39	9,42	9,28

Table 3

The protocol of assessment of performance of pre-acrobatic elements by sportswomen of rhythmic gymnastics of CG after the pedagogical experiment (n=8)

Tests	Sportswomen							
	1	2	3	4	5	6	7	8
Pre-acrobatic element "Turnover aside (Wheel)" (points)	9,33	9,50	9,4	9,29	9,36	9,29	9,25	9,3
Pre-acrobatic element "Spin" (points)	9,6	9,32	9,27	9,23	9,4	9,39	9,36	9,41
Pre-acrobatic element "Fish" (points)	9,27	9,31	9,26	9,3	9,41	9,47	9,51	9,39

Table 4

The protocol of assessment of performance of pre-acrobatic elements by sportswomen of rhythmic gymnastics of EG after application of the experimental technique (n=8)

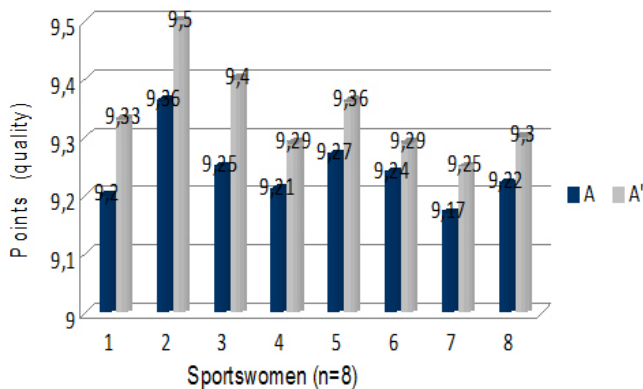
Tests	Sportswomen							
	1	2	3	4	5	6	7	8
Pre-acrobatic element "Turnover aside (Wheel)" (points)	9,64	9,77	9,58	9,44	9,76	9,78	9,66	9,53
Pre-acrobatic element "Spin" (points)	9,77	9,83	9,66	9,52	9,74	9,53	9,57	9,62
Pre-acrobatic element "Fish" (points)	9,6	9,82	9,48	9,42	9,54	9,52	9,76	9,84

of test pre-acrobatic elements before the pedagogical experiment. The comparative characteristics of the performance of test pre-acrobatic elements are submitted by gymnasts of the control group in pic. 1–3.

Methods of mathematical statistics give us the chance to compare the tendency of changes of results of testing in CG (tab. 5).

After the analysis of statistical comparative results of the primary testing with the repeated in the educational-training process of the control group (CG), we can draw conclusion that the level of technical skill of performance of pre-acrobatic elements at gymnasts grew up a little. It is confirmed by the table of comparative results of the primary testing with the repeated (see tab. 5). Using methods of mathematical statistics, we came to such conclusions:

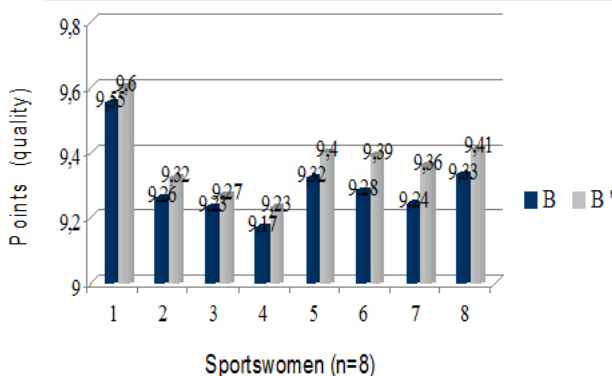
1) the average value of performance of test pre-acrobatic elements at all the group grew slightly;



Pic. 1. The comparative characteristic of performance of pre-acrobatic element "Turnover aside (Wheel)" by gymnasts of CG:

A – performance of pre-acrobatic element "Turnover aside (Wheel)" by sportswomen before the pedagogical experiment;

A' – performance of pre-acrobatic element "Turnover aside (Wheel)" by sportswomen after the pedagogical experiment.



Pic. 2. The comparative characteristic of performance of pre-acrobatic element "Spin" by gymnasts of CG:

B – performance of pre-acrobatic element "Spin" by sportswomen before the pedagogical experiment;

B' – performance of pre-acrobatic element "Spin" by sportswomen after the pedagogical experiment.

2) the indicator of the test "Turnover aside" (Wheel) – changed for 1,1%;

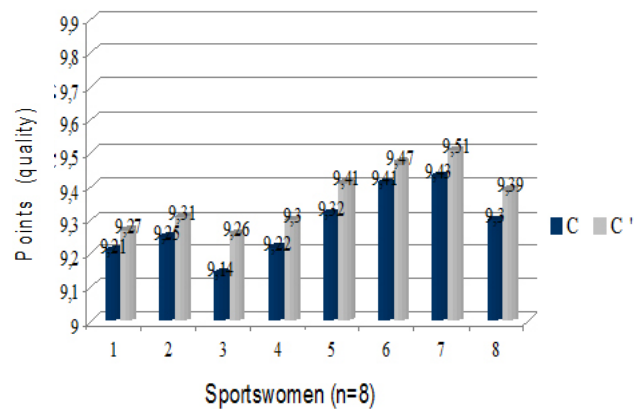
3) the indicator of the test "Spin" – increased by 0,8%;

4) the indicator of the test "Fish" – grew by 0,8%.

The criterion of Student showed that the difference between results of control tests before the experiment and after its termination in indicator of the test "Turnover aside" (Wheel) authentically. In indicators of tests of "Spin" and "Fish" are doubtful. The control group was uniform.

We compared the received results in the experimental group (EG) of performance of test pre-acrobatic elements to the application of the experimental technique with the results of performance of the same test pre-acrobatic elements after the application of the experimental technique. The comparative characteristics of performance of test pre-acrobatic elements are submitted in pic. 4–6.

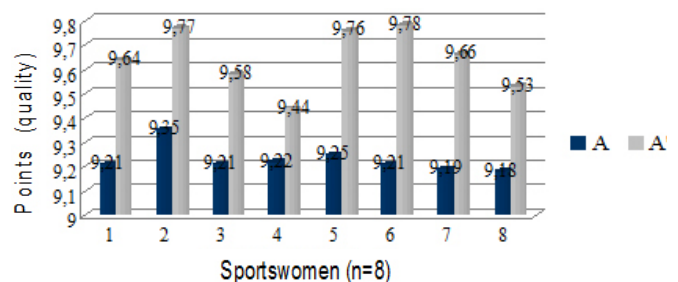
Thus, having applied the experimental technique in the educational-training process of the experimental group (EG), we can draw conclusion that the level of technical skill of performance of pre-acrobatic elements at gymnasts grew up considerably. The table of comparative results of the primary testing with the repeated one testifies to it (tab. 6).



Pic. 3. The comparative characteristic of performance of pre-acrobatic element "Fish" by gymnasts of CG:

C – performance of pre-acrobatic element "Fish" by sportswomen before the pedagogical experiment;

C' – performance of pre-acrobatic element "Fish" by sportswomen after the pedagogical experiment.



Pic. 4. The comparative characteristic of performance of pre-acrobatic element "Turnover aside (Wheel)" by gymnasts of EG:

A – performance of pre-acrobatic element "Turnover aside (Wheel)" by sportswomen before the application of the experimental technique;

A' – performance of pre-acrobatic element "Turnover aside (Wheel)" by sportswomen after the application of the experimental technique.

Table 5

Statistical comparative results of the primary testing with the repeated testing (CG, n=8)

Tests	\bar{X}		σ		m		V%		t	p
	before	after	before	after	before	after	before	after		
“Turnover aside (Wheel)” (points)	9,24	9,34	0,05	0,07	0,02	0,02	0,5	0,7	3,53	<0,05
“Spin” (points)	9,29	9,37	0,11	0,11	0,04	0,04	1,2	1,1	1,41	>0,05
“Fish” (points)	9,28	9,36	0,1	0,09	0,03	0,03	1,1	0,9	1,88	>0,05

Table 6

Statistical comparative results of the primary testing with the repeated testing (EG, n=8)

Tests	\bar{X}		σ		m		V%		t	p
	before	after	before	after	before	after	before	after		
“Turnover aside (Wheel)” (points)	9,23	9,64	0,05	0,12	0,02	0,04	0,5	1,2	9,16	<0,05
“Spin” (points)	9,28	9,65	0,11	0,11	0,04	0,04	1,2	1,1	6,54	<0,05
“Fish” (points)	9,28	9,62	0,09	0,16	0,03	0,06	0,9	1,6	5,06	<0,05

Table 7

Statistics of testing of sportswomen of rhythmic gymnastics of CG and EG before carrying out the experiment (n1=n2=8)

Tests	EG	CG	t	$t_{rp.}$	p
“Turnover aside (Wheel)” (points)	9,23±0,02	9,24±0,02	0,35	2,31	>0,05
“Spin” (points)	9,28±0,04	9,29±0,04	0,17	2,31	>0,05
“Fish” (points)	9,28±0,03	9,28±0,03	0	2,31	>0,05

Table 8

Statistics of testing of sportswomen of rhythmic gymnastics after carrying out the experiment (n1=n2=8)

Tests	EG	CG	t	$t_{rp.}$	p
“Turnover aside (Wheel)” (points)	9,64±0,04	9,34±0,02	6,70	2,31	<0,05
“Spin” (points)	9,65±0,04	9,37±0,04	4,94	2,31	<0,05
“Fish” (points)	9,62±0,06	9,36±0,03	3,87	2,31	<0,05

Using methods of mathematical statistics, we came to such conclusions:

- 1) the average value of performance of test pre-acrobatic elements at the whole group grew;
- 2) the indicator of the test “Turnover aside” (Wheel) – changed for 4,4%;
- 3) the indicator of the test of “Spin” – increased by 3,9%;
- 4) the indicator of the test “Fish” – grew by 3,6%.

The criterion of Student showed that the difference between results of control tests in the experimental group after the experiment and after its termination is reliable.

The dynamics of indicators of the level of technical preparedness of sportswomen of rhythmic gymnastics of the control group CG (n=8), the experimental group EG (n=8), before and after the pedagogical experiment is shown in tables 7 and 8.

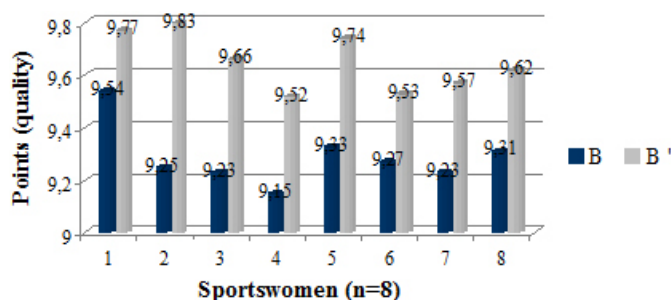
Using methods of mathematical statistics, we can say that:

- difference of average values on the whole experimental group (EG) grew by 3,9%;
- difference of average values at the whole control group (CG) grew by 0,9%.

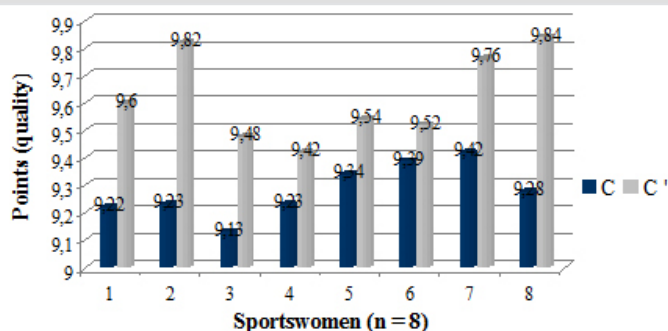
The efficiency of the offered technique of improvement of technical training of sportswomen of rhythmic gymnastics by means of acrobatics in the experimental group at the stage of the previous basic preparation is shown in the difference of differences of average values of the experimental group and the control group of the pedagogical experiment, which makes 3,0%.

Conclusions

1. The analysis of scientifically-methodical literature allowed generalizing and systematizing data on the problem of method of execution of pre-acrobatic elements by sportswomen of rhythmic gymnastics at the stage of the previous basic preparation.



Pic. 5. The comparative characteristic of performance of pre-acrobatic element "Spin" by gymnasts of EG:
B – performance of pre-acrobatic element "Spin" by sportswomen before the application of the experimental technique;
B' – performance of pre-acrobatic element "Spin" by sportswomen after the application of the experimental technique.



Pic. 6. The comparative characteristic of performance of pre-acrobatic element "Fish" by gymnasts of EG:
C – performance of pre-acrobatic element "Fish" by sportswomen before the application of the experimental technique;
C' – performance of pre-acrobatic element "Fish" by sportswomen after the application of the experimental technique.

2. The application of the offered technique of improvement of technical training of sportswomen in rhythmic gymnastics by means of acrobatics worked effectively on technical preparedness of gymnasts. The use of this technique showed the considerable results:

- 1) the average value of performance of test pre-acrobatic elements at the whole group grew;
- 2) the indicator of the test "Turnover aside" (Wheel)– changed for 4,4%;
- 3) the indicator of the test of "Spin" – increased by 3,9%;
- 4) the indicator of the test "Fish" – grew by 3,6%.

The difference of average values on the whole experimental group (EG) grew by 3,9%;

– difference of average values on the whole control group (CG) grew by 0,9%.

The efficiency of the offered technique of improvement of technical training of sportswomen of rhythmic gymnastics by means of acrobatics in the experimental group at the stage of the previous basic preparation is shown in the difference of differences of average values of the experimental group and the control group of the pedagogical experiment, which makes 3,0%.

Prospects of the subsequent researches will be sent to the search for new means and methods of special physical and technical training of sportswomen in rhythmic gymnastics.

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Condition of physical health of pupils of the 7th-8th classes of the comprehensive school

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Purpose: to investigate the level of physical health of pupils of the 7th-8th classes.

Material & Methods: pupils of the 7th-8th classes of the comprehensive school No. 150 of Kharkov participated in the research. The following methods were used: theoretical analysis and generalization of scientific literature, method of express-assessment of physical health, mathematical statistics.

Results: the comparative analysis of the obtained data in age aspect and on gender sign is carried out; the general assessment of the level of physical health of pupils of the 7th-8th classes is defined.

Conclusions: the insignificant prevalence of indicators of the separate components of health of boys over the data of girls and, generally, the reliable improvement of indicators of pupils with age are established; the "average" level of physical health of pupils of the 7th classes and "below the average" level of pupils of the 8th classes are determined.

Keywords: physical health, physical development, pupils of middle classes.

Introduction

The relevance of this direction of the research is explained by the deterioration in situation concerning state of health of the population of Ukraine, and especially student's youth [1; 4; 5; 12; 16].

It is established by the researches that the number of pupils, who have different violations of nervous system, musculoskeletal system, cardiovascular and respiratory system, decrease in sight, and so forth, increases during study at school [7; 8; 11]. Experts consider the main reason of the low level of health of children and teenagers decrease in physical activity [2; 7; 8]. Authors specify that the level of physical activity decreases considerably during the period from 11 till 15 years old. In their opinion – it leads to the decrease in level of physical development, motive preparedness, and, as a result – aggravation of symptoms of health of teenagers [3; 4; 16].

The analysis of scientific literature demonstrates that the volume of physical activity of pupils of middle classes does not answer their biological norm [7]. It is known that sufficient physical activity, systematic physical culture classes are the powerful mean of mobilization of reserve opportunities of organism, increase in intellectual and physical working capacity, and prevention of deviations in the state of health of children [8; 16].

However experts consider that the modern system of physical training in general education educational institutions promotes not enough preservation and promotion of health of pupils [8; 11; 14]. It is necessary to look for new approaches to improvement of physical education for the increase in efficiency of the teaching-educational process in higher educational institutions. Number of researches is devoted to the solution of noted problem [3; 9; 10; 13; 19]. However, the analysis of scientifically-methodical literature demonstrates that the system of constant and dynamic observation on condition of physical health of pupils is not customized at the present

stage yet [8; 17]. There are few scientific works, which are devoted to the determination of the level of physical health of pupils in different regions of Ukraine [4; 6; 16; 18 but other]. In particular, the researches, which are devoted to studying of this question in the Kharkiv region, are revealed not enough. Therefore, the research of the level of physical health of modern pupils of Kharkiv School for the purpose of definition of need of correction of indicators of physical health means of physical culture is timely and urgent.

Communication of the research with scientific programs, plans, subjects

The research is carried out according to the thematic plan of the research work of Kharkiv state academy of physical culture for 2013–2015 on the subject 3.5.29 "Theoretical and applied bases of monitoring of physical development, physical fitness and physical condition of different groups of the population" and the Thematic plan of the research work, for 2016–2020 on the subject "Improvement of process of physical education in educational institutions of different profile" (No. of the state registration is 0115U006754).

The purpose of the research:

to investigate the level of physical health of pupils of the 7–8th classes.

Material and Methods of the research

The research of the level of physical health of pupils of middle classes was conducted on the basis of high comprehensive school No 150 of Kharkiv. Pupils of the 7–8th classes (47 boys and 56 girls) took part in it. The following methods were applied: theoretical analysis and generalization of scientific-literature, method of express-assessment of physical health, which is offered by S. D. Polyakov with coauthors [15], methods of mathematical statistics.

Results of the research and their discussion

The level of physical health of pupils of the 7–8th classes was investigated by the technique of express-assessment, which was developed by S. D. Polyakov with coauthors [15] by five indexes: Quetelet 2; Robinson, Skibinski, Shapovalova and Ruffie. For calculation of indexes were defined: length of body (sm) and body weight (kg), vital capacity of lungs (VCL) (ml), heart rate (HR) (bpm^{-1}), arterial pressure (AP) (mm of mercury), breath holding time, on usual breath (the test of Stange), the functional test of Ruffie – 30 squats for 45 s, the number of raising of trunk in sitting position without hands for 60 s.

The comparison of average values of separate components of health of pupils of the 7–8th classes on gender sign is presented in tab. 1. The analysis of data confirms generally about the insignificant prevalence of results of children over indicators of girls, however these differences are not reliable ($p > 0,05$). The exception are indicators of VCL, raising of trunk in sitting position in 1 minute, HR at rest (P_1) and after renewal (P_3), where the reliable prevalence of results of children over indicators of girls is revealed ($p < 0,05-0,001$).

The aged comparisons of average data of separate components of health of pupils of the 7–8th classes are presented in tab. 2. Comparing indicators in the aged aspect, it is established that results of pupils, improve generally with age and these differences are statistically reliable ($p < 0,05-0,001$). The exception is made by data of HR, VCL, AP_{diast} and breath holding time at children and results of AP_{diast} and breath holding time at girls where the doubtful aged growth of data is defined ($p > 0,05$).

The carried-out analysis of average values of index of Quetelet 2 that characterizes the degree of harmony of physical development and constitution of a body, (tab. 3) found out that 27,8% of boys and 45,5% of girls of the 7th classes and on average 13,0% of pupils of the 8th classes have deficiency of body weight; at pupils of the 7th classes (27,8% of boys; 18,2% of girls) and 8th classes (48,3% boys; 21,7% of girls) constitution of a body are harmonious; harmonious (+) and harmonious constitution of a body are defined at boys of the 7th (5,5%; 13,8%) and 8th classes (27,8%; 20,7%) and respectively at girls of the 7th (3,0%; 21,2%) and 8th classes (17,4%; 43,5%). The corpulent constitution (tab. 3) is noted

Table 1

Comparison of average values of separate components of health of pupils of 13–14 years old on gender sign

Indicators	Boys	Girls	t	p	
	$\bar{X} \pm m$				
13 years old					
Length of body (sm)	1557,22±16,88	1548,48±14,42	0,39	>0,05	
Body weight (kg)	45,33±2,02	44,21±1,68	0,43	>0,05	
HR (bpm^{-1})	83,11±2,99	81,55±2,43	0,41	>0,05	
VCL (ml)	2016,67±65,11	1703,03±63,04	3,46	<0,01	
AP_{syst} (mm of mercury)	113,28±2,24	115,42±1,96	0,72	>0,05	
AP_{diast} (mm of mercury)	73,83±1,76	75,42±1,24	0,74	>0,05	
Breath holding time (s)	30,33±1,00	30,52±0,92	0,13	>0,05	
HR for 15 s (times)	P_1	16,00±0,61	15,36±0,45	0,84	>0,05
	P_2	27,89±1,12	27,15±0,68	0,56	>0,05
	P_3	17,89±0,72	17,79±0,51	0,11	>0,05
Raising of trunk in sitting position in 1 minute (times)	44,56±0,63	41,33±0,57	3,77	<0,001	
14 years old					
Length of body (sm)	1619,66±9,42	1595,65±18,10	1,18	>0,05	
Body weight (kg)	50,97±0,97	48,57±1,04	1,69	>0,05	
HR (bpm^{-1})	88,00±3,10	90,91±3,50	0,62	>0,05	
VCL (ml)	2124,14±71,37	2113,04±75,60	0,11	>0,05	
AP_{syst} (mm of mercury)	120,38±2,16	122,22±2,03	0,62	>0,05	
AP_{diast} (mm of mercury)	77,07±1,71	77,70±1,45	0,28	>0,05	
Breath holding time (s)	32,41±1,85	32,61±2,50	0,06	>0,05	
HR for 15 s (times)	P_1	20,86±1,13	18,09±0,79	2,01	<0,05
	P_2	31,93±1,16	30,78±1,27	0,67	>0,05
	P_3	25,03±1,27	21,61±1,07	2,07	<0,05
Raising of trunk in sitting position in 1 minute (times)	37,41±1,86	37,00±1,23	0,19	>0,05	

Note. P_1 – HR for 15 s at rest, P_2 – HR for the first 15 s of the renewal period after loading, P_3 – HR for the last 15 s of the first minute of renewal.

Table 2

Aged average values of separate components of comparison of health of boys and girls of the 7–8th classes

Indicators	Age		t	p	
	13 years old	14 years old			
	$\bar{X} \pm m$				
Boys					
Length of body (sm)	1557,22±16,88	1619,66±9,42	3,23	<0,001	
Body weight (kg)	45,33±2,02	59,97±0,97	2,51	<0,01	
HR (bpm ⁻¹)	83,11±2,99	88,00±3,10	1,14	>0,05	
VCL (ml)	2016,67±65,11	2124,14±71,37	1,11	>0,05	
AP _{syst} [*] (mm of mercury)	113,28±2,24	120,38±2,16	2,28	<0,05	
AP _{diast} [*] (mm of mercury)	73,83±1,76	77,07±1,71	1,32	>0,05	
Breath holding time (s)	30,33±1,00	32,41±1,85	0,99	>0,05	
HR for 15 s (times)	P ₁	16,00±0,61	20,86±1,13	3,79	<0,001
	P ₂	27,89±1,12	31,93±1,16	2,51	<0,05
	P ₃	17,89±0,72	25,03±1,27	4,89	<0,001
Raising of trunk in sitting position in 1 minute (times)	44,56±0,63	37,41±1,86	3,63	<0,001	
Girls					
Length of body (sm)	1548,48±14,42	1595,65±18,10	2,04	<0,05	
Body weight (kg)	44,21±1,68	48,57±1,04	2,20	<0,05	
HR (bpm ⁻¹)	81,55±2,43	90,91±3,50	2,20	<0,05	
VCL (ml)	1703,03±63,04	2113,04±75,60	4,17	<0,001	
AP _{syst} [*] (mm of mercury)	115,42±1,96	122,22±2,03	2,41	<0,05	
AP _{diast} [*] (mm of mercury)	75,42±1,24	77,70±1,45	1,19	>0,05	
Breath holding time (s)	30,52±0,92	32,61±2,50	0,79	>0,05	
HR for 15 s (times)	P ₁	15,36±0,45	18,09±0,79	2,98	<0,01
	P ₂	27,15±0,68	30,78±1,27	2,51	<0,01
	P ₃	17,79±0,51	21,61±1,07	3,22	<0,01
Raising of trunk in sitting position in 1 minute (times)	41,33±0,57	37,00±1,23	3,18	<0,01	

Note. P₁ – HR for 15 s at rest, P₂ – HR for the first 15 s of the renewal period after loading, P₃ – HR for the last 15 s of the first minute of renewal.

at 11,1% of boys (7th) and 3,4% (8th) classes and at 12,1% of girls (7th) and 4,4% of girls (8th) classes.

Comparing average values of the index of Quetelet 2 with the rating scale, which is presented by S. D. Polyakov with coauthors [15], it is established that data of pupils of the 8th classes and results of boys of the 7th classes answer the assessment 3 points, and indicators of girls of the 7th classes – the assessment 2 points. It demonstrates that pupils of the 7–8th classes have harmonious constitution of a body with deficiency of body weight.

Considering indicators of functional condition of the cardiovascular system of pupils of middle classes (Robinson's index), it is established that boys of the 7th classes (66,8%) and boys of the 8th classes (41,4%) and girls of the 7th and 8th classes have the greatest percent of indicators of "average" level of index of Robinson (51,5%; 43,5%) respectively; boys and girls of the 7th classes (5,5%; 21,2%) – above "average" and boys of the 8th classes (10,3%). The level below "average" of condition of the cardiovascular system is defined at

pupils of the 7th classes (11,1% of boys, 18,2% of girls) and at pupils of the 8th classes (17,2% of boys, 17,4% of girls) and only 5,5% of boys and 3,0% of girls of the 7th classes and pupils of the 8th classes (3,4% of boys and 4,3% of girls) have the "high" level of indicators of this index. Also it is established by researches that 11,1% of boys and 6,1% of girls (the 7th classes) and 27,7% of boys and 34,8% of girls of the 8th classes have violations of regulation of the cardiovascular system. Pupils with the "low" level of indicators of index of Robinson can be carried to the risk group with possible increase or lowering of arterial pressure (tab. 4) [17].

The comparison of average data of index of Robinson with the rating scale, which is presented by S. D. Polyakov with coauthors [15], demonstrates that results of pupils of 13–14 years old answer the assessment 2 points. Thus, it is established that pupils of the 7–8th classes have the level of condition of regulation of the cardiovascular system below "average".

Indicators of index of Skibinski (tab. 5) that characterize functionality of system of breath, firmness of organism to

Table 3

Ratios of indicators of constitution of a body of pupils by the index of Quetelet 2 (%)

Investigated pupils	n	Constitution of a body (points)					
		2 deficiency of body weight	4 harmonious (-)	5 harmonious	3 harmonious (+)	1 corpulent	
7 class	B	18	27,8%	27,8%	27,8%	5,5%	11,1%
	G	33	45,5%	21,2%	18,2%	3,0%	12,1%
8 class	B	29	13,8%	20,7%	48,3%	13,8%	3,4%
	G	23	13,0%	43,5%	21,7%	17,4%	4,4%

Table 4

Level of indicators of regulation of cardiovascular system of pupils of 7–8 classes (Robinson’s index) (%)

Classes	n	Low	Below the average	Average	Above the average	High	
7 class	B	18	11,1%	11,1%	66,8%	5,5%	5,5%
	G	33	6,1%	18,2%	51,5%	21,2%	3,0%
8 class	B	29	27,7%	17,2%	41,4%	10,3%	3,4%
	G	23	34,8%	17,4%	43,5%	0	4,3%

the hypoxic phenomena and strong-willed qualities indicate that the greatest percent (94,4% of boys, 72,7% of girls) the 7th classes and (69,6% of girls and 89,7% of boys) the 8th classes have “low” level; below “average” – pupils of the 7th classes (5,65% of boys, 18,2% of girls) and pupils of the 8th classes (6,9% of boys and 8,7% of girls) respectively. “Average” level of functionality of system of breath, firmness of organism to the hypoxic phenomena and strong-willed qualities is established at girls of the 7–8th classes (9,1%; 21,7%) respectively, and above “average” only at 3,4% of boys of the 8th classes.

Specifies comparison of average values of the index of Skibinski to the rating scale [15], that results of pupils of the 7–8th classes answer the assessment 1 point. It testifies to low functionality of the system of breath of pupils of 13–14 years old.

The analysis of data of the index of Shapovalova, which characterizes specific intensity of physical activity (tab. 6), showed the “high” level of 55,6% of boys and 9,1% of girls of the 7th classes and of 4,3% of girls and 17,2% of boys of

the 8th classes; above “average” – at pupils of the 7th classes (22,2% of boys and 9,1% of girls) and at pupils of the 8th classes (10,3% boys; 4,3% of girls), and “average” – at boys and girls of the 7th classes (22,2%; 66,7%) respectively and at pupils of the 8th classes (48,4% of boys; 8,7% of girls). Also it is certain in 15,1% of girls (the 7th classes) and at pupils of the 8th classes (20,7% of boys; 17,5% of girls) below “average”, and at pupils of the 8th classes (3,4% of boys; 65,2% of girls) “low” level of development of force, rapidity and high-speed endurance of muscles of back and prelum abdominale. It demonstrates that pupils with below “average” and with the “low” level of indicators of the index of Shapovalova are in the risk group with possibility and increase in violations of posture, rachiocampsis, and flatfoot [15; 17].

Comparing average data of the index of Shapovalova with the rating scale, which is offered by S. D. Polyakov with coauthors [15], it is established that results of girls of the 7th classes and data of boys of the 8th classes answer the assessment 3 points, boys of the 7th classes, – the assessment 4 points, and girls of the 8th classes – 1 point. It is possible to note that

Table 5

Level of indicators of the index of Skibinski of pupils of the 7–8th classes (%)

Classes	n	Low	Below the average	Average	Above the average	High
7 class	B	18	94,4%	5,6%	0	0
	G	33	72,7%	18,2%	9,1%	0
8 class	B	29	89,7%	6,9%	0	3,4%
	G	23	69,6%	8,7%	21,7%	0

Table 6

Level of development of force, rapidity and high-speed endurance of muscles of back and prelum abdominale of pupils of the 7–8th classes (index of Shapovalova) (%)

Classes	n	Low	Below the average	Average	Above the average	High
7 class	B	18	0	0	22,2%	55,6%
	G	33	0	15,1%	66,7%	9,1%
8 class	B	29	3,4%	20,7%	48,4%	17,2%
	G	23	65,2%	17,5%	8,7%	4,3%

Table 7

Indicators of index of Ruffie of pupils of the 7–8th classes (%)

Classes	n	Low	Below the average	Average	Above the average	High
7 class	B	18	0	0	33,3%	66,7%
	G	33	0	3,0%	9,1%	84,9%
8 class	B	29	24,1%	27,6%	6,9%	34,5%
	G	23	0	26,1%	13,0%	39,2%

Table 8

The formalized assessment of indicators of physical health of pupils

Classes	Boys	Points	Girls	Points
7 class	Average	16	Average	15
8 class	Below the average	13	Below the average	12

boys of the 7th classes have above “average”, girls of the 7th classes and boys of the 8th classes “average”, and girls of the 8th classes “low” power level of the index of Shapovalova which characterizes specific intensity of physical activity.

Considering average values of index of tolerance to standard exercise stress of Ruffie, it is established that these 66,7% of boys and 84,9% of girls of the 7th classes and pupils of the 8th classes (34,5% boys; 39,2% of girls) are at the “high” level; at pupils of the 7th classes (33,3% boys; 9,1% of girls) and pupils of the 8th classes (6,9% boys; 13,0% of girls) on “above average”, and in 3,0% of girls of the 7th classes and at boys of the 8th classes (6,9% boys; 21,7% of girls) – on “average”. Also it is revealed by researches the level “below average” of indicators of the index of Ruffie at girls of the 7th classes (3,0%) and at pupils of the 8th classes (27,6% boys; 26,1% of girls), and the “low” level of reaction of the cardiovascular system to standard exercise stress is found in 24,8% of boys of the 8th classes (tab. 7). It should be noted that “low” and “below average” assessment of the index of Ruffie testifies to the insufficient level of adaptation reserve of cardiovascular and respiratory system which limits physical capacities of organism of pupils.

Specifies comparison of the obtained average data of the index of Ruffie with the rating scale [15] that indicators of pupils of the 7th classes answer the assessment 4 points, and results of pupils of the 8th classes – the assessment 3 points. Thus, indicators of reaction of the cardiovascular system to standard exercise stress at pupils of the 7th classes answer to the level above “average”, and at pupils of the 8th classes – “average”.

The general analysis of level of physical health of pupils of the 7–8th classes on indicators of indexes of Quetelet 2, Robin-

son, Skibinski, Shapovalova, Ruffie confirms the “average” level of physical health of pupils of the 7th classes and “below average” pupils of the 8th classes (tab. 8).

Conclusions

1. The analysis of average data of separate components of physical health on gender sign, has generally found lack of reliable differences ($p > 0,05$) between results of boys and girls, except for VCL indicators, raising of trunk in sitting position in 1 minute, HR at rest (P_1) and after renewal (P_3) where the reliable prevalence of results of boys over indicators of girls is revealed ($p < 0,05 - 0,001$).

2. The aged comparisons demonstrate that average indicators of pupils improve with age and generally have reliable character ($p < 0,05 - 0,001$). However, the data of AP_{diast} and breath holding time in girls and indicators of HR, VCL, AP_{diast} and breath holding time at boys have no aged reliable differences ($p > 0,05$).

3. The “average” level of physical health of pupils of the 7th classes and “below average” at pupils of the 8th classes are defined by the research. It demonstrates that pupils of the 8th classes are considered almost healthy; however have insufficient adaptation reserves of cardiovascular, respiratory systems, risk to emergence and increase in violations of posture, flatfoot, and need correction of noted deviations by purposeful influence.

Prospect of the subsequent researches in this direction is the development of the programs of the differentiated study, which is directed to the increase in functionality of organism, which will promote preservation and improvement of physical health of pupils of comprehensive educational institutions.

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The analyses of efficiency of a power serve in jump depending on the accuracy of its performance in the competitive activity of volleyball players

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Purpose: to study dependence of indicators of efficiency and quality of a power serve in jump from the increase in accuracy of its performance.

Material & Methods: pedagogical observations, mathematical methods of processing of results.

Results: the comparative analysis of these indicators of the group of volleyball players of series of plays of the superiority of teams of the highest league, which took place before and after the corresponding experiments, connected with use of the offered by the author technique of increase in accuracy of a serve, is carried out. The assessment of statistical reliability of distinctions between results of the comparative analysis of the corresponding indicators of efficiency is executed by means of the criterion of Student.

Conclusions: the reliable changes in values of the corresponding indicators of efficiency of a serve testify to the effectiveness of the offered technique, and consequently, about the correctness of its use during the training process.

Keywords: accuracy, criterion, statistical reliability, quality, experiment, technique.

Introduction

In recent years, the pronounced trend in the development of men's volleyball at the highest achievements is the desire for widespread use of a power serve in jump in the game of teams. Number of volleyball players, who manage this serve perfectly, is growing all the time. Brilliant performers of this technique appeared in many teams. Analysis of the results of games of the most important international competitions showed that this method of serve plays an important role in achieving success in the competitive activity of volleyball teams, because it allows you to win the point immediately after its implementation. However, it should also be noted many mistakes during its performance, which in turn can lead to loss of points, and even defeat of the team [3; 6; 8].

Therefore, one of the decisive factors in raising the level of the game of the team and the success in competitions of various ranks is technical and tactical improvement of a power serve in jump, the purpose of which is associated with the increase in its efficiency and quality. The increase of the accuracy of its performance in a certain area of the playing court plays the important role in addressing of this issue. This can be achieved by paying serious attention to the appropriate correction of technique of performing of a serve during the training process.

We offered the technique to improve the accuracy of the performance of a serve, according to which the relevant experiments were carried out, for the practical realization of this task [3; 6; 9]. We developed practical recommendations to improve the accuracy of a serve in the works [3; 6] on the basis of the results of the analysis of statistical data of the mentioned experiments and findings of pedagogical observations in the course of their implementation. In accordance with the

practice of sports studies, the repeated experiment was carried out, after the selected group of volleyball players within a certain time used our recommendations during the relevant training.

The comparative analysis of the relevant results was carried out, which were obtained in the processing of statistical data of both experiments, to determine the positive effect of the introduction of the proposed method in the practice of the training process [2]. The assessment of statistical significance of differences between the results of this comparative analysis, which was conducted with the help of the criterion of Student, brought the presence of significant positive change at them.

The important task is control from the sight of the positive effect of the impact of the proposed method to the assessment of the effectiveness of the performance of a power serve in jump in the competitive activity of the qualified volleyball players.

Communication of the research with scientific programs, plans, subjects

The study was performed according to the plan of the research work of the chair of Olympic and professional sports, the chair of sports and outdoor games of Kharkiv state academy of physical culture. The direction of the research is executed on the subject of the Consolidating plan of research works in the field of physical culture and sports in 2011–2015 on the direction: "Improvement of the training process in sports" (number of state registration is No 0111U003126), on 2016–2018, on the subject "Psycho-sensory regulation of motor activity of sportsmen of situational kinds of sports."

The purpose of the research:

to learn the dependence of efficiency and quality of a power serve in jump by improving the accuracy of its performance through introduction of the proposed method in practice of the training process.

Material and Methods of the research

The great importance is given to control of the effectiveness of such innovations at improving the training process through the introduction of new programs, methods, new organization of the training mode, and so on. The competitive activity provides the effective control in the ultimate total as the sports result, which is shown in the course of the competition, is one of the main characteristics of the work of the sportsmen. At the same time, as a rule, it is necessary to compare the initial and final group of indicators of the competitive activity. The comparison can be done by assessing the statistical significance of differences in the indicators, which are investigated. The basis of this comparative analysis can include any indicators and characteristics of the competitive activity. Innovation contributes to positive changes in the values of the relevant parameters of the competitive activity in the presence of these significant changes.

Indicators of effectiveness of a power serve in jump of the group of volleyball players, who participated in the experiments, are included in this work, in the basis comparative analysis [3]. These indicators were identified during the analysis of relevant statistical data series of the Ukrainian championship games among teams of the highest league. The corresponding results of the analysis of performance of a serve by volleyball players in five games on the national championship were used as an output for indicators of effectiveness, during preparation of which the proposed method, is not used in the training process (the initial set of indicators). The certain indicators were also identified in the following five games of the Championship (the finite set) after the cycle of training sessions with the use of the noticed method and the experiment repeated.

Calculations of indicators of effectiveness and quality power serves in jump are performed in this work within the framework of the developed by us approach on the basis on the method of V. K. Lisyanskyi, which is based on mathematical processing of statistical data of pedagogical observations of the game [1].

Results of the research and their discussion

Restraining the corresponding results of the work [1; 5], we introduced the indicator of effectiveness of a serve (IES) of a certain player in a separate game, using the following correlation:

$$IES = S / N$$

$$S = \sum_i n_i K_i$$

Where n_i – number of serves that meet the assessment to a specific index i and K_i – the value of specificity factors, $N = \sum_i n_i$ – the total number of serves.

That is, IES determines the combined probability of winning a point in the separate game after the submission of the relevant player and game action of the opposing team.

The values of the introduced by us factors for assessing the quality of a serve α_i , which is made by a certain player in a separate game, were calculated using the following formula:

$$\alpha_i = n_i K_i / S$$

They determine the relative contributions to the appropriate indicator of effectiveness of a serve of each game action with the specific end result, the probability of which is equal to K_i [1].

The analysis of statistical data on the implementation of serves by the group of volleyball players, which is conducted with the help of the developed by us computer program “ServeStat” [5], showed: that the initial set of data includes the total number of serves, which is 273, from which 55 were lost and 5 were won directly after performance of a serve (ace); and the final set – 312, 50 and 15 serves, respectively.

The detailed information on indicator of effectiveness and quality of serves in a concrete match was also provided by means of this program. The example of its report to the relevant request of the individual statistics of individual players in one of the games is presented on pic. 1. The following meanings were used in the report: Quan, Quant mis and IES that meet the number of serves, errors, when it is executed and the values of indicator of effectiveness of a serve for different players, respectively. Values α -factors $\alpha_2, \alpha_3, \alpha_4$, and amounts α_5 and α_6 , ($K_5=K_6=1$), are marked as $\alpha 2, \alpha 3, \alpha 4, \alpha 5 6$, respectively.

Individual player statistics								
Team	Player Number	Count	Tot. count	PEP	a2	a3	a4	a56
Loco Express	5	16	3	0,33	0,45	0,22	0,14	0,19
Loco Express	8	20	3	0,34	0,42	0,33	0,11	0,15
Loco Express	11	16	1	0,37	0,45	0,38	0	0,17
Loco Express	13	14	2	0,32	0,46	0,37	0,16	0

Pic. 1. Report on the individual statistics of power serves in jump

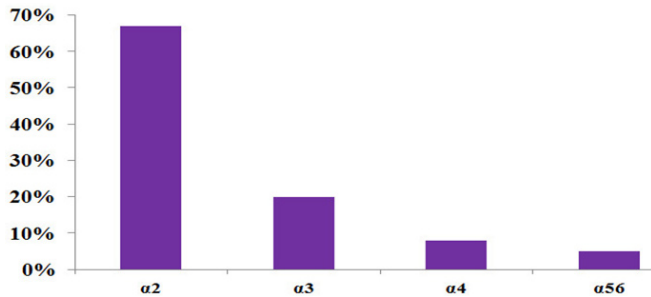
The following results were obtained during carrying out the average analysis of values of IES: for the initial set of indicators in the sample size $n=20$, the arithmetic mean of IES $\bar{X}=0,25$, the standard deviation $\sigma=0,042$; for the finite set (sample size $n=20$) the arithmetic mean of IES $\bar{y}=0,35$, the standard deviation $\sigma=0,019$.

The comparison of IES indicator values was carried out using the statistical significance of the criterion of Student. In the practice of sports studies, this test is used to compare the mean values of parameters [7]. For the value of the t -test with errors representativeness m , which are equal to 0,0096 and 0,0044 for the initial and final samples, respectively, we get $t \approx 9,47$. When the reliability $P=0,95$, which is typically used in sports studies in accordance with the table of Student (see, E.g. [7]) we limit this criterion $t_{lim}=2,02$ volumes for samples, which are indicated higher.

As from the comparison of both criteria it comes up, that $t > t_{lim}$, the difference between the indicators, which were considered statistically significant. This means that the significant paradigm shift is in the initial and final set of indicators. Thus, we can conclude that the proposed method of the improvement of accuracy of performance of a serve proven itself as an ef-

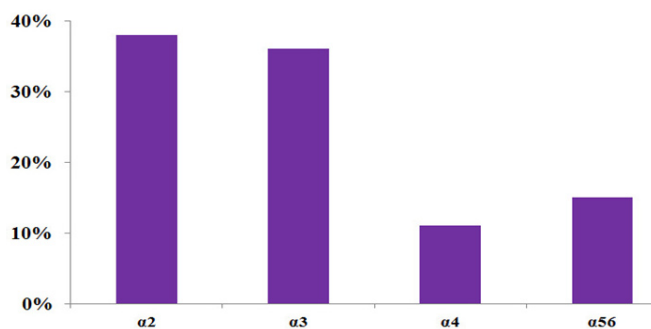
fective innovation.

The average values α -factors that give contribution to the corresponding value of IES of the initial (finite) set of these indicators are showed in pic. 2 and 3.



Pic. 2. Diagram of the quality of a power serve in jump to the original set of statistics

With regard to the assessment of the quality of performance of a serve, the factors α_5 i α_6 , which are connected with the winning of a point immediately after the implementation of a serve, mainly determined its quality. The greater the total contribution of these factors in the value of IES, the better a serve is. We believe the quality of the effective serve should be estimated by the sum of the three factors α_4 , α_5 i α_6 , which are proportional to the values of the highest probability to win the point [1].



Pic. 3. Diagram of the quality of performance of a serve in jump for the final set of statistics

Comparing the results for α -factors that are shown in these pictures, it can be concluded that the serve, which corresponds to the diagram in pic. 3, is much better, as the total contribution of its effectiveness α -factors, α_4 , α_5 i α_6 is much

higher. While as, α_2 -factor makes the main contribution to the efficiency of a serve, which corresponds to the diagram in pic. 2, that is connected with the lowest probability to win the point.

Conclusions

The influence of the proposed methods of the improvement of the accuracy of performance of a serve in jump on one of the main indicators of competitive activity is studied by the author – the indicator of the effectiveness of its implementation. For this purpose, the comparative analysis of these indicators is conducted, which were defined in the experimental group of volleyball players in a series of games of the national championship league teams, which were held for the initial experiment [6] and after the repeated experiments [3], in preparation for which this technique was used. The effect of the test innovations is assessed by the criterion of statistical significance of Student. The observed significant changes in the respective indicators of effectiveness of a serve testify to the effectiveness of the proposed technique, and thus the correctness of its use during the training process. The analysis of statistical data on the implementation of serves also showed that the average indicators of efficiency of a serve increased by 10%, reduced the number of errors when performing multiple serves, and the number of points which are won directly rose noticeably after performance of a serve.

A comparative analysis of the quality of performance of a serve by volleyball players on games before and after the corresponding experiments showed that it is more qualitative in the latter case, because the relative contribution α -factors which are proportional to the highest values of the probability to win the point, and the indicator of effectiveness of a serve is substantially higher. While in the first case, α -factor makes the main contribution to this indicator, which is connected with the lowest probability to win the point.

Prospects for further research. The conducted by us researches of opportunities of the offered technique of increase in accuracy of a power serve in jump from the point of view of positive influence on indicators of efficiency and quality of its performance proved that its use is correct in the course of training of volleyball players for competitions. Interest of use of this technique in the training process in beach volleyball, considering its specific features is interesting of the practical point of view.

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Influence of outdoor games on functional condition of the respiratory system at girls of the younger school age

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Purpose: to study influence of outdoor games on functional condition of the respiratory system of girls of the younger school age in the groups of 6–8 and 9–10 years old.

Material & Methods: the problem of functional condition of external breath at girls of the younger school age (in the age groups of 6–8 and 9–10 years old), who were divided into the control group (CG) in number of 32 persons (CS No. 58) and the experimental (EG) in number of 29 persons (OTEC No. 109) of Zaporozhe, is considered.

Results: it is defined that the studied girls of both groups at the beginning of the research had mainly below average and average levels of functional condition of the system of external breath.

Conclusions: the effective impact of outdoor games on functional condition of the whole organism in general and on the system of external breath, in particular, at girls of the experimental group in comparison with the studied girls of the same age of the control group is proved experimentally. Application of the large number of various outdoor games allowed diversifying the program of training at physical education classes emotionally and physically, than promoted the activation of functions of the whole organism of girls of the younger school age.

Keywords: respiratory system, outdoor games, younger pupils, girls.

Introduction

The problem of health of younger pupils is modern and stands acutely for specialists in various fields: medicine, pedagogy, physiology, school staff, and specialists in physical education, rehabilitologists and so on. Researchers E. Vilchkovsky, O. Dubogay, N. Khomenko [3; 9] noted that one of the crises phenomenon of traditional and author education systems is the gap between physical education and all other forms of educational activities for children of younger school age, the lack of real mechanisms that determine the relationship of cognitive and motor activity in the learning process. The essence of this interaction is the formation of learning system that provides integrated, educational, health, general educational effect, which is the key to optimum mental and physical development of the child, which is currently the most urgent. This approach finds its place in the organization of educational work in the comprehensive school.

Psychologists, educators and psychologists came to the conclusion that individual abilities (thinking, perception, representation) should not be considered in isolation, without the context of the motor development of the child. So, O. Dubogay, B. Pangelov, Frolova, M. Gorbunko believe that the optimal conditions of existence and development of children's abilities during their studies is the joint game activity, socializing with other children, during which the child is not only moving, but also easily keeps in mind all heard in this period [6].

The need in movement is a very strong for the younger pupils. They cannot sit in class immovably. Such need appears especially on breaks. Therefore it is necessary to provide

children with an opportunity to move more. L. Bozhovych, one of the outstanding teachers of the past, pointing to the increased need of younger pupils in the movement, called for organizing the pedagogical process so as to meet the needs of children in motion by introducing it in the framework of meaningful, pedagogically justifiable forms [1].

Outdoor games – one of the complex means of physical education, which has a recreational, training and educational value. T. Krutsevich and M. Koleman considered that the younger school age – is the most favorable time for inclusion of outdoor games in the education process [8; 11].

The change in the authoritarian discipline model of personality-oriented, which is provided that the National doctrine of education development in Ukraine, is the priority of the modern state policy in the development of education in Ukraine. Its essential feature is learning and education of the person with the maximum individualization, creating favorable conditions for self-development and self-identity, meaningful definition of opportunities and life aims, education closer to pressing social needs. The problem of human health, which goes from the plane of the private individual case into the category of socially significant problems, is particularly urgent at the beginning of the third millennium [2; 4].

H. Shchavel, T. Mykhats, Yu. Svystun studied influence of outdoor games on the functionality of children of the secondary school age [10]. The relevance of this study lies in the fact that the information, which would be concerned the study of the effect of outdoor games on the functional state of the respiratory system of the body of girls of the primary school age is insufficient, and it therefore became the subject

of our research.

The purpose of the research:

to learn the impact of outdoor games on the functional state of the respiratory system of girls of the younger school age in the groups of 6–8 and 9–10 years old.

Research tasks:

- to determine the functional state of the respiratory system of the body of girls of the younger school age;
- to evaluate the impact of outdoor games on the functional state of the system of external breathing of girls of the studied groups.

Material and Methods of the research

The following *methods of the research* we used to obtain and analyze the results:

1. Theoretical analysis and compilation of scientific methodical and special literature.
2. Pedagogical experiment.
3. Biomedical research methods and functional tests for the determination of the main indicators of external respiration (HR, spirometry, hypoxia index, index of Skibinskyi, RFS seb).

All received results in the course of the study were processed by methods of mathematical statistics. We determined the arithmetic mean (\bar{X}), the mistake of the arithmetic mean (m) during the experiment. The comparison of groups was performed using the criteria of Student (t) for determining the validity of the discrepancies between indicators in two groups of girls (control and experimental).

Results of the research and their discussion

The research was carried out in two steps: the stated experiment (2011–2013) during which the analysis of literature was carried out and indicators of the system of external breath at children of the younger school age were studied, physical education program at school was studied. At the second stage – the forming experiment, was conducted with girls by the developed technique, which contained the large number of various outdoor games for day and at physical education classes.

Girls of 6–8 and 9–10 years old of the younger school link participated in the research. They were divided into the control group (CG) in number of 32 persons and the experimental group (EG), numbering 29 persons. At the beginning of the experiment researches all girls were subjected to the research by all indicators, which were chosen by us, which display functional condition of the system of external breath (in tables – the beginning of experiment). Further the control group worked according to the usual school program on physical culture at school (3 physical education classes with the modular system of study), and we developed for the experimental group and introduced the program which contained in form, direction, contents, complexity of outdoor games, large number of various physical education classes. Loadings were accurately dosed, the lesson consisted of preparatory, main and final parts with fixing of pulse curve, the attention was paid to external developments of fatigue. Loadings were set wavy for renewal and gradual activation of processes of breath. Active games changed less motive during the classes. It is necessary to notice that loading were chosen according to the principles of the theory of physical education and study at school for girls of the younger school age. The level of physical fitness and developed functional systems of organism at the studied girls was considered in

Table 1

Indicators of the system of external breath at girls of 6–8 and 9–10 years old of control and experimental groups at the beginning of the forming experiment, $\bar{X} \pm m$

Indicators	Girls of 6–8 years old		Girls of 9–10 years old	
	CG	EG	CG	EG
VCL, ml	1781,00±21,73	1823,25±19,5	1781,00±18,95	1823,25±25,53
Tinh, s	40,43±1,40	42,84±1,31	49,01±1,04	46,74±1,36
Texh, s	20,93±0,69	22,69±0,82	23,47±0,79	25,74±1,61
IH, s.u.	0,24±0,01	0,25±0,01	0,30±0,01	0,33±0,02
Isk, s.u.	823,26±31,28	871,90±27,60	1096,01±29,48	1096,92±37,60
RFS seb, s.u.	59,90±1,40	62,30±1,18	62,95±1,21	64,78±1,17

Table 2

Indicators of the system of external breath at girls of the experimental group of 6–8 years old at the beginning and at the end of the forming experiment, $\bar{X} \pm m$

Indicators	Beginning	End	t
VCL, ml	1823,25±19,50	1998,75±23,79	3,38
Tinh, s	42,84±1,31	48,36±1,03	4,44
Texh, s	22,69±0,82	27,63±0,75	7,20
IH, s.u.	0,25±0,01	0,33±0,01	9,90
Isk, s.u.	871,90±27,60	1153,57±32,61	11,25
RFS seb, s.u.	62,30±1,18	71,71±1,36	4,50

selection of games. The main task was not to do much harm to health, and to promote to the development of functional condition of organism in general and especially, the system of external breath.

Our researches leaned on the modern researches of scientists which work with the problem of the research and formation of health of children. L. Deminska and F. Zaynulin note the special concern is caused by the state of health of modern children [5; 7]. Their data of statistics demonstrate that every third child has various deviations at the accession to school in the state of health, and until the end of study – every second.

We decided to investigate the system of external breath at girls of the younger school age in the context of this research.

So, we obtained the data at the stage of the stated experiment which confirm mainly average and below average levels of the functional development of the system of external breath in younger pupils.

The shown data confirm the lack of statistical divergences at the beginning of the research between the groups of different age of the investigated of the control group (CG) and the experimental group (EG), therefore with girls it was possible to conduct the subsequent researches and to compare them among themselves further at the end of the experiment research and to introduce the technique of formation, which was chosen on the basis of application of outdoor games and functional development of the system of external breath in girls of the younger school age.

The data of the given below tables 2 and 3 demonstrate to the fact that the system of external breath is subject to the correction and gives in to the development in a year of methodically correctly selected and systematically applied outdoor games at girls of the experimental group at physical education classes at school.

All studied indicators at girls of the experimental group have got the reliable improvement in comparison with the beginning of the experiment researches that cannot be told about the studied contingent of the control group.

The reliable improvements took place only in indicator of the Index of Skibinskyi in control group. The gain is statistically not reliable and fluctuates ranging from 0,1% to 9,7% on the group of 6–8 years old and at girls of the age category of 9–10 years is ranging from 2,7 to 9,1% in all other studied indicators at girls of the control group.

Results of the research of dynamics of the development of functional condition of the system of external breath at girls of control and experimental groups during the research showed that high-quality and quantitative changes took place in the experimental group on all studied indicators and the difference in indicators varies ranging from 9,2% to 27,7% (tab. 4) in the group of 6–8 years old and from 2,7% to 9,14% at the age of 9–10 years (tab. 5).

The submitted data of tables and the analysis of scientifically methodical literature allow to draw the following conclusions and to define the subsequent course of the scientific-experimental researches and searches.

Conclusions

Results of the conducted researches in control and experimental groups testify to the uniformity of groups and the lack of essential divergences in indicators at the beginning of the experimental research, therefore the subsequent results in changes of their functional condition of the system of external breath had a statistically reliable character. 29,4% of girls of both groups had the low level of functional condition of the system of external breath and below the average of 70,6% of girls of the younger school age of both groups at the beginning of the research.

During the research authentically positive changes in organism of younger pupils took place on all studied indicators at girls of the experimental group that it cannot be testified about the contingent of the control group. Results of changes in indicators are displayed above in tables and their difference is analyzed above. As for RFSseb, the average level in 58,8% was diagnosed at the end of the research in the control group, and 41,2% of girls had RFSseb above the average. Results of divergences of levels of functional state in the age groups 6–8 and 9–10 of years are not considerable.

Only 18,7% of girls had the average level of functional condition of the system of external breath, and other girls – 81,3% had above the average in the experimental group among girls of 6–8 years old. Concerning the age group of 9–10 years, here there were no levels below the average and average, and 93,3% of girls had level above the average, one girl had the high level that has made 6,7% of the investigated at the end of the research in general.

The researches prove that the functional system of external breath is subject to the correction and the development and can work more effectively in organism of younger pupils in one year after introduction of the systematic program of classes

Table 3

Indicators of the system of external breath at girls of the experimental group of 9–10 years old at the beginning and at the end of the forming experiment, $\bar{X} \pm m$

Indicators	Beginning	End	t
VCL, ml	1823,25±25,53	1985,75±35,11	3,74
Tinh, s	46,74±1,36	51,16±0,84	2,76
Texh, s	25,74±1,61	30,03±1,40	2,01
IH, s.u.	0,33±0,02	0,41±0,02	2,99
Isk, s.u.	1096,92±37,60	1393,71±30,38	6,14
RFS seb, s.u.	64,78±1,17	74,30±1,34	5,36

Table 4

Indicators of the system of external breath at girls of 6–8 years old of control and experimental groups at the end of the forming experiment

Indicators	CG, $\bar{X} \pm m$	EG, $\bar{X} \pm m$	t	%
VCL, ml	1829,75±17,72	1998,75±23,79	5,71	9,24
Tinh, s	42,38±1,16	48,36±1,03	3,32	14,11
Texh, s	22,43±0,78	27,63±0,75	4,43	23,18
IH, s.u.	0,26±0,01	0,33±0,01	5,49	26,92
Isk, s.u.	903,29±24,84	1153,57±32,61	6,59	27,71
RFS seb, s.u.	63,26±1,48	71,71±1,36	5,23	13,36

Table 5

Indicators of the system of external breath at girls of 9–10 years old of control and experimental groups at the end of the forming experiment

Indicators	CG, $\bar{X} \pm m$	EG, $\bar{X} \pm m$	t	%
VCL, ml	1829,75±21,21	1985,75±35,11	2,72	8,52
Tinh, s	50,64±0,71	51,16±0,84	3,64	1,03
Texh, s	24,77±0,83	30,03±1,40	5,68	21,24
IH, s.u.	0,32±0,01	0,41±0,02	8,38	28,13
Isk, s.u.	1196,16±20,43	1393,71±30,38	10,12	16,52
RFSseb, s.u.	65,23±1,26	74,30±1,34	5,29	13,90

with the dosed outdoor games during the school day which leads up expediency of use of such type of the increase in physical activity for girls of the younger school age.

It should be noted that physical culture classes at school promote the slight increase, or the stabilization of functional condition of the system of external breath of girls (by results of the research in the control group), but more considerable and statistically reliable improvements in the system of external breath happen in organism of girls of the experimental group thanks to introduction of the systematic, dosed, individually selected and held in the interactive and emotionally charged mode of outdoor games.

The results, which are presented in tables and received during the research according to the level of development of functional condition of the system of external breath at

girls of the younger school age demonstrate the effective influence of outdoor games on functional condition of all organism in general and on the system of external breath in particular at girls of the experimental group, in comparison with the investigated of the same age of the control group. Applications of large number of outdoor games allowed to diversify emotionally and physically the program of study on physical culture, than promote the activation of functions of all organism of girls of the younger school age.

We plan to direct the subsequent researches to studying of the functional system of external breath of boys of this age which will allow to define the expediency of complex application of the chosen program of outdoor games during the school day for the increase in functional condition of the system of external breath of younger pupils of both gender groups at the same time.

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Influence of the level of development of absolute force on indicators of technical preparedness of shot putters at the stage of specialized basic preparation

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The results of the researches of influence of indicators of absolute force on parameters of technical preparedness of the qualified shot putters are presented.

Purpose: *to investigate influence of the level of development of absolute force on indicators of technical preparedness of the qualified shot putters.*

Material & Methods: *analysis and generalization of scientific and methodical literature, pedagogical testing, video filming with the subsequent biomechanical analysis, methods of mathematical statistics. 12 qualified shot putters participated in the research.*

Results: *the high correlation interrelation between the level of development of absolute force and separate indicators of technical preparedness of shot putters is revealed.*

Conclusions: *technical preparedness of shot putters farthest depends on the level of development of absolute muscular strength of legs, chest and hands, in particular, triceps.*

Keywords: *shot putters, absolute force, technical preparedness, stage of specialized basic preparation.*

Introduction

Shot-put demands manifestation of the maximum efforts in short period therefore power abilities take the central place in the course of preparation of shot putters [3; 4; 1]. J. Silvester [8] noted that the result of putting depends on the development of power abilities. Among power abilities and types of forces, which are necessary for shot putters, the leading researchers M. Zaviyera-Koch, H. Stone, B. Poprawski but other, provide advantage to increase in the level of absolute force, considering its main in shot put [2; 7; 9].

J. Larry, W. Wilkins and R. Pavlovic [5; 6; 10] investigated influence of the level of development of absolute force on result and speed of shot-put. They defined that the maximum speed of departure to apparatus is reached due to the powerful dynamic reduction of muscles.

However, despite of the significant amount of the works, which are devoted to power preparation in shot-put, influence of absolute force of separate muscular groups on indicators of technique isn't defined yet, which are urgent, especially at the stage of specialized basic preparation.

Communication of the research with scientific programs, plans, subjects

The research was carried out according to the subject of the scientific research of KhSAPC "Modeling of technical and tactical actions of the qualified sportsmen in swimming and high-speed and power disciplines of track and field athletics" No. of the state registration is O111U000191.

The purpose of the research:

to investigate influence of the level of development of absolute force on indicators of technical preparedness of the qualified shot putters.

Material and Methods of the research

12 shot putters of 15–17 years old which were at the stage of specialized basic preparation, participated in the research. The following methods of the research were used in operating time: analysis and generalization of scientifically methodical literature, pedagogical testing, and video filming with the following biomechanical analysis, methods of mathematical statistics. Video filming was carried out by the high-speed video camera with video with frequency of 1300 shots for second. The biomechanical analysis was carried out by means of the programs Dartfish Connect (Switzerland) and Kinovea (France).

Results of the research and their discussion

The analysis of indicators of the absolute force (tab. 1), showed that the largest level of its development in the studied shot putters is observed in muscles of the lower extremities, muscles of extensors of trunk and muscles of chest and hands, in particular triceps.

Variation coefficients which were in limits of 8,87–9,33% indicate uniformity of the studied indicators and testify to the lack of essential divergences in indicators of the absolute force of shot putters which took participation in the research.

Video filming, which results are presented in table 2, was carried out for determination of technical parameters of movements.

According to table 2 the general time of shot put takes less than a second at sportsmen, who participated in the research and averages 0,958 0,07 s. Comparison of separate indicators of technique of the qualified sportsmen with similar at highly skilled shot putters allowed to establish that only time of jump off and height of departure of shot answered parameters of technique of the last one. All other indicators were lower that, in our opinion, is explained by the insufficient level of preparedness of sportsmen who took participation in the experiment.

Comparison of coefficients of variation of indicators of the absolute force with coefficients of variation of indicators of technical preparedness indicates the smaller uniformity of the last one. Heterogeneity of indicators of the majority of time parameters of technical preparedness is explained by specific features of technique of shot put of each of sportsmen, who participated in the research.

The correlation analysis was carried out by the method of pair correlation of Pearson for definition of the extent of influence of the level of development of absolute force on indicators of technical preparedness of a shot put (tab. 3).

The obtained data confirm the considerable dependence between the general time of shot put and results in bar press, lying ($r=-0,696$). The recorded interrelation indicates that the big absolute force, first of all muscles of chest and hands, in particular triceps, is capable to show the sportsman, the less time he will spend for putting, will more quickly push out a shot.

All studied indicators of the level of development of absolute force of shot putters have rather considerable influence for the time of a jump off, however the highest degree of interrelation is observed between times of a jump off and

results of sit down with bar on shoulders. The coefficient of correlation makes ($r=-0,751$) that specifies on negative by the return interrelation and demonstrates that the more absolute muscular strength of the lower extremities at the sportsman is, the quicker a jump off is carried out.

The moderate interrelation is observed between times of performance of starting and the majority of the studied indicators of the level of development of absolute force, however the studied indicators of the level absolute force had no considerable influence on time of starting.

The weak interrelation which testifies to the lack of influence of level of absolute force for the period of final effort and need of search of other ways of influence on time of final effort was observed between the majority of the tests, which are directed to the determination of absolute force and times of final effort.

The vast majority of the studied indicators of the level of development of absolute force considerably influenced the rolling time, however, the greatest coefficient of correlation was observed between results in breakthrough of bar and times of rolling ($r=-667$). The negative communication says to the return about what the bigger complex level of absolute force is shown by the sportsman; the smaller time is spent on rolling-up performance.

The studied indicators of absolute force had no considerable influence on length of a jump off. The weak degree of interrelation which indicates the need of search of other ways of influence on this indicator of technique was observed between indicators of the level of development of absolute force and length of a jump off.

Results in sit down with bar on shoulders ($r=0,661$) have the greatest influence, on height of release of a shot, among tests for determination of the level of development of absolute force. The obtained data confirm the noticeable degree of

Table 1
Average values of the level of development of absolute force of shot putters at the stage of specialized basic preparation (n=12)

Stat. indicators	Tests					
	Bar press, lying (kg)	Bar press from behind a head, standing (kg)	Squat with a bar (kg)	Dash (kg)	Bending forward with bar (kg)	Deadlift (kg)
\bar{X}	108	47	160	76	54	127
ϵ	5,44	2,20	6,98	4,02	2,45	5,18
V%	8,87	8,34	7,73	9,33	8,06	7,21

Table 2
Average biomechanical values of technique of shot putters (n=12)

Stat. indicators	Time of starting (s)	Time of a jump off (s)	Time of roll-up action (s)	Time of final effort (s)	General time of a push-off (s)	Length of a jump-off (m)	Height of departure of shot (m)	Shot departure angle (degr.)	Result (m)	Shot departure speed, (m/s)
\bar{X}	0,392	0,160	0,142	0,263	0,958	0,83	2,05	43,68	14,37	11,20
ϵ	0,06	0,01	0,03	0,03	0,07	0,06	0,06	1,80	0,24	0,10
V%	25,62	14,10	36,84	20,44	12,66	12,42	5,47	7,27	2,94	1,63

Table 3

Interrelation of indicators of level of absolute force with indicators of technical preparedness of shot putters at the stage of specialized basic preparation (n=12)

Indicator of absolute force	Indicators of technique								
	Time of starting (s)	Time of a jump off (s)	Time of roll-up action (s)	Time of final effort (s)	General time of a push-off (s)	Length of a jump-off (m)	Height of departure of	Shot departure angle (degr.)	Shot departure speed, (m/s)
Bar press, lying (kg)	-0,515	-0,712	-0,574	0,223	-0,696	-0,046	0,551	-0,043	0,735
Bar press from behind a head, standing	-0,008	-0,621	-0,462	-0,116	-0,379	0,148	0,160	-0,224	0,664
Squat with a bar (kg)	-0,414	-0,751	-0,649	0,208	-0,663	-0,227	0,661	0,061	0,701
Dash (kg)	-0,392	-0,680	-0,667	0,321	-0,587	0,017	0,402	-0,232	0,657
Bending forward with bar (kg)	-0,235	-0,651	-0,593	0,176	-0,489	0,043	0,192	-0,310	0,494
Deadlift	-0,335	-0,528	-0,597	0,298	-0,496	0,107	0,324	-0,164	0,482

Note. $R > R_{cr}$ at $R > (0,576)$

interrelation between these indicators and indicate that the bigger level of absolute muscular strength of legs of the sportsman is, the bigger height of departure of a shot.

The level of development has no absolute force of considerable influence on shot departure angle, as well as at length of a jump off and time of final effort.

Rather high degree of interrelation is observed between the speed of departure of shot and results in bar press, lying ($r=0,735$). It indicates that the bigger absolute muscular strength of chest and hands, in particular triceps, the higher speed is got by a shot during departure.

Thus, the level of development of absolute force differently influences separate indicators of technical preparedness of sportsmen who specialize in shot put.

Conclusions

1. The analysis of scientific and methodical literature showed that despite large number of the works, which are devoted to

the development of absolute force in shot put, not enough attention is paid to influence on its indicators of technical preparedness of shot putters.

2. Results of the research demonstrate the great value of indicators of absolute force for shot put. The greatest influence on parameters of technical preparedness of shot putters has the level of absolute muscular strength of legs, chest and hands, in particular triceps.

3. It is necessary to increase the level of absolute muscular strength of legs for the reduction of time of a jump off and increase in height of departure of a shot, it is necessary to increase the complex level of absolute force for the increase in speed of performance of rolling, it is necessary to increase the level of absolute muscular strength of chest and hands, in particular triceps for faster shot put and increase in speed of departure of a shot.

Prospect of the subsequent researches. It is provided to define influence of the level of development of absolute force on special preparedness of shot putters.

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Assessment of influence of the program of physical rehabilitation on results of the six-minute test of walking at children with recurrent bronchitis

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Purpose: to estimate efficiency of the carried out program of physical rehabilitation of children with recurrent bronchitis in the conditions of sanatorium.

Material & Methods: 109 children of the younger school age are examined. The six-minute test of walking was carried out for the research of functional and adaptation opportunities, and the degree of loading is also estimated on the Borg scale. The obtained data were processed by the adequate methods of mathematical statistics.

Results: the improvement of level of the studied indicators at children of the main and control groups is noted after the termination of the course of physical rehabilitation. However, statistically the best dynamics of indicators of length of distance, index of adaptation, index of adaptation of restoration of rhythm and points on the Borg scale are revealed among children of the main groups.

Conclusions: the developed and introduced program of physical rehabilitation was more effective in comparison with the standard one.

Keywords: recurrent bronchitis, six-minute test of walking, the Borg scale, functional state, cardiorespiratory system.

Introduction

It is specified by results of the last statistical researches of the structure of incidence of children that the first place is won by diseases of the respiratory system among which respiratory diseases prevail [6]. Nonspecific inflammations of respiratory tracts, which are followed by frequent repeated episodes, are widespread among children and practically are not prevented, and episodes of diseases are badly treated, as predetermines the relevance of problem [3]. Besides, the role of treatment consists not only in diagnostics and therapy, but also in prevention of these diseases [7].

Communication of the research with scientific programs, plans, subjects

The work is performed according to the scientific subject "The latest technologies in physical rehabilitation, assessment of quality of life of different groups of the population at diseases of internals and systems of organism and musculoskeletal system". Number of the state registration is 0111U001870.

The purpose of the research:

to estimate efficiency of the program of physical rehabilitation of children this is carried out in the conditions of sanatorium with recurrent bronchitis.

Material and Methods of the research

Materials of the work were received during the research on the basis of the sanatorium "Malyatko" (Uzhhorod). The contingent of investigated – 109 children of younger school

age, who are ill with recurrent bronchitis, from them 53 (48,6%) are boys and 56 (51,4%) are girls, aged from 7 up to 9 years, which arrived for performing sanatorium treatment. The middle age made $8,6 \pm 0,62$ ($\bar{x} \pm s$) years.

At implementation of the six-minute test of walking (6-MTW) which is rather widely used also among children [5, 9, 10], distance length indicators in the first and second attempt (D_1, D_2) were registered for calculation of index of adaptation ($IAd = D_2/D_1$); heart rate (HR), systolic and diastolic arterial pressure (SAP and DAP); time of renewal of HR to initial heart rate in the first and second attempt (t_1, t_2) for calculation of index of adaptation of renewal of rhythm ($IAt = t_2/t_1$). Besides, the Borg scale in the modified look was applied to the assessment of feeling of physical efforts and fatigue [4, 8].

Children were distributed on two groups for definition of reliable differences in the state of health according to indicator of index Tiffeneau (IT), namely by the absence (norm, conditional norm of 61 children) or the existence of moderate changes (48 children). In turn each of these groups at passing of the sanatorium therapy were divided into the main and control for the research of features of dynamics of indicators throughout the sanatorium therapy with use of the developed program of rehabilitation. So, children with the moderate decrease in IT got to MG1 (n=23) and CG1 (n=25), and without the essential changes to MG2 (n=32) and CG2 (n=29). The MG1 and CG1 groups did not differ among themselves ($p > 0,05$), MG2 and CG2 also satisfied this condition.

Let's note that children without changes of IT had the best results on indicators of D_2 , IAd and point by the Borg scale at the time of arrival.

Results of the research and their discussion

The sanatorium stage of rehabilitation is important for the maximum renewal of health and use of rehabilitation potential among children [2]. The developed program of physical rehabilitation was introduced in the process of the sanatorium therapy of children of the main groups and went to the main tasks in pediatrics, namely on the improvement of somatic health and quality of life [1], and also included at itself the sparing and sparing-training motive modes and consisted of basic and variable components; was based on the complex of the indicators, which were received in the course of the stating experiment and, in particular, differed from standard in methodical creation and content of remedial gymnastics classes and hydro-kinesiotherapy.

The carried-out analysis of dynamics of indicators which were defined when carrying out 6-MTW, found the existence of changes of number of indicators throughout the sanatorium therapy, which was defined by the comparison of values before and after between the main and control groups, and reliable differences, between results of certain indicators of the main and control groups that was not observed at the time of arrival to the sanatorium.

The reliable differences are established ($p < 0,001$) when comparing lengths of the passable distance in six minutes in the first attempt (D_1) before and after as children ($n=109$) took part in rehabilitation programs which passed in conditions of sanatorium, confirm the statistical growth of this indicator and positive influence of the carried-out therapies on functional condition of the cardiorespiratory system and physical fitness of patients. The indicator D_1 grew more significantly at the same time in the main groups (tab. 1).

So, indicator D_1 of MG1 at children authentically differed from CG1 ($p < 0,01$), and in MG2 from CG2 ($p < 0,01$). The value of indicator D_1 in MG1 after passing of rehabilitation course grew by 47,4 m (12,1%) to 438,70±12,36 m; the gain was a little smaller in CG1 and made 32,4 m (8,3%) to 422,20±15,21. The similar tendency was observed % in groups of children who had no considerable changes of IT at the time of arrival. So, the increase is noted in D_1 in the MG2 group by 47,5 m (12,1%) to 438,75±14,14 m, and in the CG2 group on 32,42 m (8,2%) to 424,66±14,07 m. The reliable differences between the MG1 group (with the available moderate changes of IT) and the group of children of MG2 (without considerable changes in values of index Tiffeneau) are not revealed at the time of extract ($p > 0,05$). Such dynamics of indicator of D_1 indicates big efficiency of the developed program concerning the improvement of condition of the cardiorespiratory system and the general endurance.

The point by the Borg scale that displays the assessment of effort and fatigue from the executed 6-MTW, authentically didn't change at the time of extract ($p > 0,05$) in the general selection of children ($n=109$). However the reliable reduction of the point by the Borg scale is revealed in MG1 ($p < 0,05$). So, the initial result was recorded at the level of 11,52±0,79 points, and 10,96±0,77 points at the repeated inspection. The reliable changes are not established ($p > 0,05$) among children of other groups. So, the following changes before and after the course of recovery treatment respectively were found in CG1, MG2 and CG2: from 11,52±0,92 to 11,44±0,96 points; from 10,91±0,73 to 10,88±0,71 points; from 10,86±0,69 to

11,14±0,64 points.

Considering the lack of reliable differences at inspections both at the time of receipt, and after the passable rehabilitation course, between MG1 and CG2 ($p > 0,05$), CG1 and CG2 ($p > 0,05$) by the results of D_1 , the fact that the received points by the Borg scale when comparing the main groups among themselves and control do not differ attracts attention after passing of physical rehabilitation ($p > 0,05$). Thus, the carried-out treatment promoted the improvement of subjective tolerance of loading at children with the available decrease in IT, as the best point but the Borg scale at children without the essential changes of IT was established authentically ($p < 0,01$) at the time of the first inspection. And it is possible to tell that the developed program in this aspect was more effective considering the reliable decrease in the point of the mentioned above in MG1 and the difference between MG1 and CG1 ($p < 0,01$) by the values D_1 .

Also statistical differences were established ($p < 0,001$) when comparing lengths of the passable distance in the second attempt 6-MTW (D_2) before and after the rehabilitants ($n=109$) executed rehabilitation programs in the conditions of the sanatorium which confirms the statistical general growth of this indicator and the positive influence of both programs on possibilities of the cardiorespiratory system. The indicator D_2 grew more significantly at the same time among children of the main groups that is noted in the table.

In particular, D_2 indicator at children of MG1 authentically differed from CG1 ($p < 0,01$), and in MG2 from CG2 ($p < 0,01$). The value of indicator of D_2 after passing of the rehabilitation course grew by 58,26 m (14,5%) to 459,35±14,48 m among children of MG1; the gain was a little smaller and made 33 m (8,4%) to 428,20±16,00% CG1. The similar dynamics was observed among groups of children who had no considerable changes of IT at the time of receipt. So, the increase in D_2 is noted by 64,53 m (15,8%) to 473,44±9,87 m in the MG2 group, and in the CG2 group on 33,8 m (8,2%) to 444,66±17,62 m. The given dynamics of indicator D_2 indicates the smaller efficiency of the standard program concerning the improvement of condition of the cardiorespiratory system and the general endurance. Besides, found existence of the reliable difference between the MG1 group (with the available moderate changes of IT) and the group of children of MG2 (without considerable changes in values of index Tiffeneau) at the time of extract ($p < 0,01$), and also similar differences in between control groups that indicates the lack of equalizing of groups of children (for IT) by the results of D_2 and after the sanatorium therapy.

The presented results demonstrate that the gradual increase in physical activity of children with recurrent bronchitis can and promote in the future improvement of results of length of distance as children after passing of the course of recovery treatment didn't reach the standard values, which are given in literature for healthy children, though they got closer to them.

Dynamics of changes of IAd developed as follows: reliable differences in comparison with initial results are found only among children of the main groups. So, the growth of IAd from 1,03±0,03 s.u. is recorded in MG1 to 1,05±0,04 s.u. ($p < 0,001$), and in MG2 from 1,05±0,05 s.u. to 1,08±0,03 s.u. ($p < 0,001$) that confirms the big efficiency of the developed

program of rehabilitation. Also the reliable differences were found during the statistical analysis when comparing results of MG1 from CG1 ($p < 0,01$), MG2 from CG2 ($p < 0,01$) at the time of the repeated inspection. These differences also in addition prove advantages of the developed program of physical rehabilitation.

Children with the available moderate changes of IT didn't achieve results of children without considerable changes of index Tiffeneau and at the time of extract from the sanatorium to what the existence of statistical differences between MG1 and MG2 ($p < 0,01$), CG1 and CG2 testifies ($p < 0,05$).

The reliable changes of values of indicator of HR before 6-MTW are not revealed after passing of the sanatorium therapy with application of means of physical rehabilitation both in the general selection, and among groups of children ($p > 0,05$). So, the average value of indicator of HR before 6-MTW made $86,90 \pm 3,73$ bpm⁻¹ at the time of extract at the examined children ($n=109$).

The analysis of heart rate after 6-MTW found the reliable difference between values before and after passing of the sanatorium therapy with application of means of physical rehabilitation in the general selection of children ($p < 0,05$),

though the reduction made $1,2$ bpm⁻¹ to $114,13 \pm 7,12$ bpm⁻¹ that demonstrates the presence of this small reduction of heart rate at the vast majority of children.

When carrying out the analysis of indicators of HR after 6-MTW in groups of children, the reliable differences between results of MG1 and CG1 were not revealed where the indicator respectively made $116,04 \pm 6,23$ bpm⁻¹ and $114,60 \pm 6,60$ bpm⁻¹ ($p > 0,05$), and also MG2 and CG2 where average values made $112,28 \pm 6,71$ bpm⁻¹ and $114,24 \pm 8,42$ bpm⁻¹ ($p > 0,05$).

The value of indicator of HR_Δ, what displays the change of heart rate at the time of the termination 6-MTW in comparison with condition of rest, authentically changed on the termination of the rehabilitation course only in MG2 on $2,5$ bpm⁻¹ also made $25,69 \pm 5,35$ bpm⁻¹ ($p < 0,01$). In other groups indicator HR_Δ didn't experience the reliable changes in comparison with results at the time of receipt ($p > 0,05$). Let's note also that the values received at the time of extract had no statistical differences between MG1 and CG1, MG2 and CG2 ($p > 0,05$).

Indicators of systolic arterial pressure before 6-XTX changed in the general selection ($p < 0,01$) and in all groups of children ($p < 0,05$). The result lowered from $107,34$ $6,46$ mm Hg to $106,44$ $6,54$ mm Hg in the general selection of children,

Average indicators of the six-minute test of walking at children with recurrent bronchitis after the sanatorium therapy

Indicators of the test of the forced vital capacity of lungs	Number of group	MG		CG		p
		\bar{X}	S	\bar{X}	S	
Distance ₁ , m	1	438,70	12,36	422,20	15,21	<0,01
	2	438,75	14,14	424,66	14,07	<0,01
Point by the Borg scale, балів	1	10,96	0,77	11,44	0,96	>0,05
	2	10,88	0,71	11,14	0,64	>0,05
HR before 6-MTW, bpm ⁻¹	1	87,52	3,68	87,48	3,16	>0,05
	2	86,59	4,43	86,24	3,42	>0,05
HR after 6-MTW, bpm ⁻¹	1	116,04	6,23	114,60	6,60	>0,05
	2	112,28	6,71	114,24	8,42	>0,05
HR _Δ , bpm ⁻¹	1	28,52	5,16	27,12	6,37	>0,05
	2	25,69	5,35	28,00	6,93	>0,05
SAP before 6-MTW, mm Hg	1	105,87	7,52	108,08	5,93	>0,05
	2	106,34	6,71	105,59	6,08	>0,05
SAP after 6-MTW, mm Hg	1	112,74	7,55	114,40	4,72	>0,05
	2	112,97	7,36	111,41	7,76	>0,05
SAP _Δ , mm Hg	1	6,87	7,41	6,32	4,83	>0,05
	2	6,63	6,14	5,83	6,74	>0,05
DAP before 6-MTW, mm Hg	1	67,22	6,77	66,84	5,42	>0,05
	2	66,81	6,17	67,59	6,04	>0,05
DAP after 6-MTW, mm Hg	1	69,52	6,91	67,320	5,59	>0,05
	2	67,44	6,52	67,414	7,34	>0,05
DAP _Δ , mm Hg	1	2,30	4,17	0,48	3,4951	>0,05
	2	0,63	3,99	-0,17	4,43	>0,05
Distance ₂ , m	1	459,35	14,48	428,20	16,00	<0,01
	2	473,44	9,87	444,66	17,62	<0,01
IAd, s.u.	1	1,05	0,04	1,02	0,04	<0,01
	2	1,08	0,03	1,05	0,05	<0,01
t ₁ , s	1	34,96	3,02	35,68	3,21	>0,05
	2	34,50	2,85	35,86	3,02	>0,05
t ₂ , s	1	32,61	2,52	35,00	3,85	<0,05
	2	32,25	2,26	35,48	3,79	<0,01
IAt, s.u.	1	0,94	0,06	0,98	0,06	<0,05
	2	0,94	0,06	0,99	0,06	<0,01

the change also had insignificant quantitative character in groups that it is impossible to connect fully by the carried-out programs of rehabilitation. Besides we will note what the reliable differences between MG1 and CG1, MG2 and CG2 groups are not established also at the time of extract from the sanatorium ($p > 0,05$).

The reliable changes which took place throughout stay in the sanatorium only among children of the MG2 group, indicator of SAP after 6-MTW are noted ($p < 0,05$): the average result lowered from $114,13 \pm 6,50$ mm Hg to $112,97 \pm 7,36$ mm Hg. The change had not reliable character in other groups ($p > 0,05$). However, the statistical changes in comparison with results of the first inspection ($p < 0,01$) are also noted in the general selection of children though, as well as changes of SAP before 6-MTW, they had small quantitative character. It is not established the reliable differences when comparing results of MG1 from CG1, MG2 from CG2 at the same time at extract from the sanatorium ($p > 0,05$).

The increase in systolic pressure upon exercise stress was reliable ($p < 0,001$) and for the end of stay in the sanatorium what is displayed in indicator of SAP_{Δ} . However values of SAP_{Δ} didn't experience the reliable changes during the course of physical rehabilitation both basically and in control groups ($p > 0,05$).

The part of indicators of diastolic arterial pressure authentically changed throughout the made experiment, however changes were insufficient for their objective treatment and interpretation. In particular, we will note that the indicator of DAP before 6-MTW authentically grew in the general selection by $1,24$ mm Hg ($p < 0,001$), in MG1 on $1,05$ mm Hg ($p < 0,05$), in MG2 on $1,87$ mm Hg ($p < 0,01$), in CG2 on $0,93$ mm Hg ($p < 0,05$).

Dynamics of average indicators of time of renewal of heart rate after exercise stresses (6-MTW) also had reliable changes before initial throughout the sanatorium therapy. So, the reliable differences of t_1 are registered in MG1 where the duration of indicator decreased on $4,04$ s to $34,96 \pm 3,02$ s ($p < 0,01$), and in CG1 changes had no reliable character – the indicator grew on $1,2$ s to $35,68 \pm 3,21$ s ($p < 0,05$). Among children without the initially registered considerable changes, IT is noted the following: in MG2 reliable reduction of t_1 on $2,75$ s to $34,50 \pm 2,85$ s ($p > 0,01$) is noted, and in CG2 doubtful on $1,9$ s to $35,86 \pm 3,02$ s ($p > 0,05$). Thus, the main groups by the indicator of t_1 had the reliable improvement of results in comparison with previous, but statistically did not differ from control groups ($p > 0,05$).

Dynamics of indicator t_2 during the stay in the sanatorium and passing of programs of rehabilitation was more noticeable. The reliable changes are noted among children of all

groups. The duration of time of t_2 decreased on $10,39$ s to $32,61 \pm 2,52$ s ($p < 0,01$) among MG1 group, and among children of CG1 on $5,64$ s to $35,00 \pm 3,85$ s ($p < 0,01$). Between children without the initially registered considerable changes of IT the following changes are established: the reliable reduction of t_2 on $8,72$ s to $32,25 \pm 2,26$ s ($p < 0,01$) in MG2, and in CG2 on $5,76$ s to $35,48 \pm 3,79$ s is noted ($p < 0,01$). Proceeding from it, it is possible to draw conclusion that, despite of reliability of positive changes in control groups, improvements of adaptation opportunities among children of the main groups were more essential what is confirmed by the available statistical differences between MG1 and CG1 groups ($p < 0,05$), MG2 and CG2 ($p < 0,01$).

Also we will note that t_1 is authentically bigger for t_2 in the main groups, and the reliable difference is absent in the control groups that at the accounting of the established values of these indicators at receipt and dynamics of indicators of D_1 and D_2 indicates the best influence of the developed program on adaptation opportunities and regulation of rhythm of warm reductions.

Changes of indicators of t_1 and t_2 affected also dynamics of the IAt index in groups. Among MG1 group IAt The value decreased from $1,11 \pm 0,04$ s.u. to $0,94 \pm 0,06$ s.u. ($p < 0,01$), and among children of CG1 from $1,10 \pm 0,05$ s.u. to $0,98 \pm 0,06$ s.u. ($p < 0,01$). The following changes are established between children without the initially registered considerable changes of IT: the reliable reduction of IAt from $1,10 \pm 0,05$ s.u. to $0,94 \pm 0,06$ s.u. ($p < 0,01$) is noted in MG2, and in CG2 from $1,09 \pm 0,04$ s.u. to $0,99 \pm 0,06$ s.u. ($p < 0,01$). Considering the reliable differences, which are established between MG1 and CG1 ($p < 0,05$), MG2 and CG2 ($p < 0,01$), it should be noted that the improvement of values of IAt was more essential in the main groups.

Conclusions

Considering the stated, it is possible to draw conclusion that the main studied indicators of the test 6-MTW experienced positive changes in the main and control groups of children with recurrent bronchitis at extract from the sanatorium, however more positive dynamics was noted among children who passed the sanatorium therapy with inclusion of the developed program of physical rehabilitation. In particular, authentically the best changes took place in indicators of the passable distance in both attempts, index of adaptation, index of adaptation of renewal of rhythm which testifies to efficiency of the introduced program of physical rehabilitation.

Prospects of the subsequent researches consist in the research of influence of the conducted course of physical rehabilitation on the respiratory system, posture and quality of life of children.

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Somatic component of risk of the development of vegetative-vascular dysfunction at children of the average and advanced school age

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Purpose: to estimate quantitatively factors of somatic component of risk of the development of vegetative-vascular dysfunction at children of the average and advanced school age.

Material & Methods: 569 children of 14–17 years old are examined in order to the existence of somatopathies, violation of posture, level and harmony of physical development, extent of development of adipopexis, functional indicators of health. Influence of somatic factors on risk of developing of vegetative-vascular dysfunction was revealed by means of the correlation analysis.

Results: the system of assessment and the integrated indicator of action of somatic factors on risk of the development of vegetative-vascular dysfunction are offered. 6,57% of pupils with the low level of probability of risk of developing of vegetative-vascular dysfunction, 24,25% of pupils with the level below the average, 38,36% of children of 14–17 years old with the average level of probability of risk of developing of vegetative-vascular dysfunction, 24,25% of teenagers with the average level of probability, 6,57% of pupils with the high level of probability of risk of developing of vegetative-vascular dysfunction are revealed. The reliable communications between the low level of functionality on the test of Ruffier and the disharmonious physical development ($p < 0,001$), low indicators of power and respiratory indexes ($p < 0,05$) are established statistically.

Conclusions: the children of the group of risk, who need the individual approach at lessons of physical culture, are defined.

Keywords: children, vegetative-vascular dysfunction, physical development, somatic factors.

Introduction

According to the main theses of the Law of Ukraine "About the approval of the Nation-wide program "Zdorovya-2020: the Ukrainian measurement" the urgent world problem is the considerable prevalence of chronic noninfectious diseases on which, according to WHO, suffer 20% of the children's population in XXI century. Chronic somatopathies of organism belong to powerful etiological factors which lead to the development of the vegetative-vascular dysfunction (VVD) at children (N. A. Belokon and M. Kuberger, 1987, V. G. Maydannik, 1998, 2013, O. M. Vein, 2000).

The formation of psychological frustration (including vegetative dystonias) against the background of the available not only expressed, but also compensated and subcompensated violations of internals was shown in the researches of N. K. Bogolepov (1949-1978) and his pupils and followers (Yu. S. Martynov, 1964–1978; E. V. Malkova, 1969; L. S. Yegorova, 1970; L. G. Yerokhina, 1974; L. O. Badalyan, 1975; I. A. Suchkova, 1977; Yu. I. Koshelyev, 1976 and others).

According to A. M. Vein, somatic diseases are one of the important etiological components of the development of VVD which contains in classification of vegetative dystonias of the author [2]. The role of somatopathies in the development of VVD is displayed in the working scheme of pathogenesis of vegetative dysfunctions at children that includes among the acquired factors: chronic diseases and centers of infection, hormonal dysfunction, diseases of the central nervous

system, and so forth (N. A. Belokon and M. Kuberger, 1987, V. G. Maydannik, 1998).

The scientific research of the last years found the reliable connection quantities of chronic somatopathies with severity of vegetative violations (A. Yu. Shutkova, 2008), the interconnections between the development of vegetative-vascular dysfunction and the level of physical development (L. N. Volkova, 2005), the features of vegetative dystonia at teenagers with disharmonious physical development are investigated (V. A. Pavlova, 2009).

Influence of somatic factors on the development of VVD is described the most widely in the works of V. G. Maydannik. So, they carry to the main factors which cause the development of vegetative dystonia: 1) hereditarily-constitutional features of activity of the autonomic nervous system (ANS) (autosomno-dominant mode of inheritance); 2) adverse course of pregnancy and childbirth that leads to violation of ripening of cellular structures of the super-segmentary apparatus, natal trauma of CNS and cervical department of backbone (hypertensive-hydrocephalic syndrome, vertebral-basilar insufficiency); 3) disease of endocrine glands (thyroid gland, adrenal and sexual glands); 4) endocrine reorganization of organism (often vegetative dysfunction is most brightly shown during active hormonal reorganizations, for example, during sexual ripening); 5) organic damages of brain (trauma, tumor, violation of brain blood circulation, – strokes); 6) defeat of CNS infections, intoxications, operative measures; 7) sharp and chronic infectious and somatopathies, infection centers (tonsillitis, caries of teeth, sinusitis, and so forth); 8) other

reasons of development of vegetative dysfunction (scoliosis, cervical osteochondrosis, violation of mineral exchange in organism (especially Ca and Mg); operative measures and anesthesia; excess body weight) [4].

Thus, total influence of somatic factors on the child's organism in certain period forms somatic component of risk of development of VSD. In literature remains to VSD which are insufficiently opened question of quantitative assessment of negative impact of somatic factors on the child's organism in the context of risk of development.

Communication of the research with scientific programs, plans, subjects

The research is executed according to subject of the RW of the chair of medico-biological fundamentals of physical culture educational of Educational-scientific institute of physical culture of A. S. Makarenko Sumy state pedagogical university "Physiologo-hygienic maintenance of healthcare activity of institutions of education" (number of the state registration – 0113U004662).

The purpose of the research:

to estimate quantitatively factors of somatic component of risk of the development of vegetative-vascular dysfunction at children of the average and advanced school age.

Research tasks:

- 1) to define the structure of somatic component of risk of the development of VVD at teenagers of 14–17 years old;
- 2) to offer the system of estimation and integrated indicator of action of somatic factors on risk of emergence of VVD;
- 3) to make the analysis of results of the research by means of quantitative assessment of factors of somatic component of risk of the development of vegetative-vascular dysfunction.

Material and Methods of the research

The somatic indicators which can influence the development of VVD at children of 14–17 years old were selected on the basis of the analysis of scientifically-methodical sources. Indicators of incidence of 569 pupils of 14–17 years old of Sumy were received by the method of copying of the data from medical documentation. The tendency to VVD was defined by the questionnaire of O. M. Vein [2]. The health of children was estimated by means of specially developed questionnaire. The existence of violation of posture in the sagittal and frontal planes was defined by the humeral index:

$$HI = \frac{WSh}{HA} \cdot 100\%$$

and by the index of vertical rachiocampsis:

$$VR = \frac{LS}{RS} \cdot 100\%$$

The regional tables of physical development of children were used for the assessment of level and harmony of physical development [6]. Thickness of hypodermic fatty fold on stomach was determined by kaliperometry. The respiratory index was counted by the formula:

$$I_R = \frac{\text{Vital capacity of lungs (VCL)}}{BW}$$

VCL was measured by means of spirometer.

The power index was defined by the formula:

$$I_p = \frac{\text{Force of the right (left) hand}}{BW}$$

Force of hand was measured by means of hand dynamometer, and the greatest indicator for the right or left hand was undertook in calculations. Levels of respiratory and power indexes were defined by the technique of G. L. Apanasenko. The adaptation potential of the child was counted by the index of functional changes (IFC) [3]. The scored system of estimation of action of somatic factors was used for the quantitative assessment of somatic component of risk of the development of VVD. The statistical data processing, which was received during the research, was carried out by means of the application program "STATISTIKA".

Results of the research and their discussion

The structure of somatic component of risk of the development of VVD, which is based on the etiological approach, is defined on the basis of the analysis of scientific literature (pic. 1).

We developed the system of numerical score of somatic risk factors of the development of VVD for the quantitative assessment of somatic component of risk of the development of vegetative-vascular dysfunction at children of the average and advanced school age (tab. 1). The assessment of somatic risk factors was carried out by the 5-pointed scale depending on the existence and degree of negative impact of factor: 1 – the negative impact of factor is least expressed or is absent, 2 – the negative impact of factor, 3 – the influence of negative factor of average intensity, 4 – the expressed influence of negative factor is poorly expressed, 5 – the negative impact of factor is most expressed.

By means of the mathematical procedure of rationing of physical quantity [1] we will carry out rationing of indicators so that the condition was satisfied:

$0 < P_i^N \leq 1$, then the normalized value will decide on the help of the following expression:

$$P_i^N = \frac{1}{P_i}$$

where P_i^N – the normalized indicator of somatic factor of risk of the emergence of VVD at teenagers of 14–17 years old;
 P_i – the point of somatic factor of risk of the emergence of VVD at teenagers of 14–17 years old is got on the system of numerical score.

We suggest counting the integrated indicator of somatic component of risk of the emergence of VVD by the following formula:

$$II_{sr} = \frac{\sum P_i^N}{\sum P_{i\ opt}} = \frac{\sum P_i^N}{n}$$

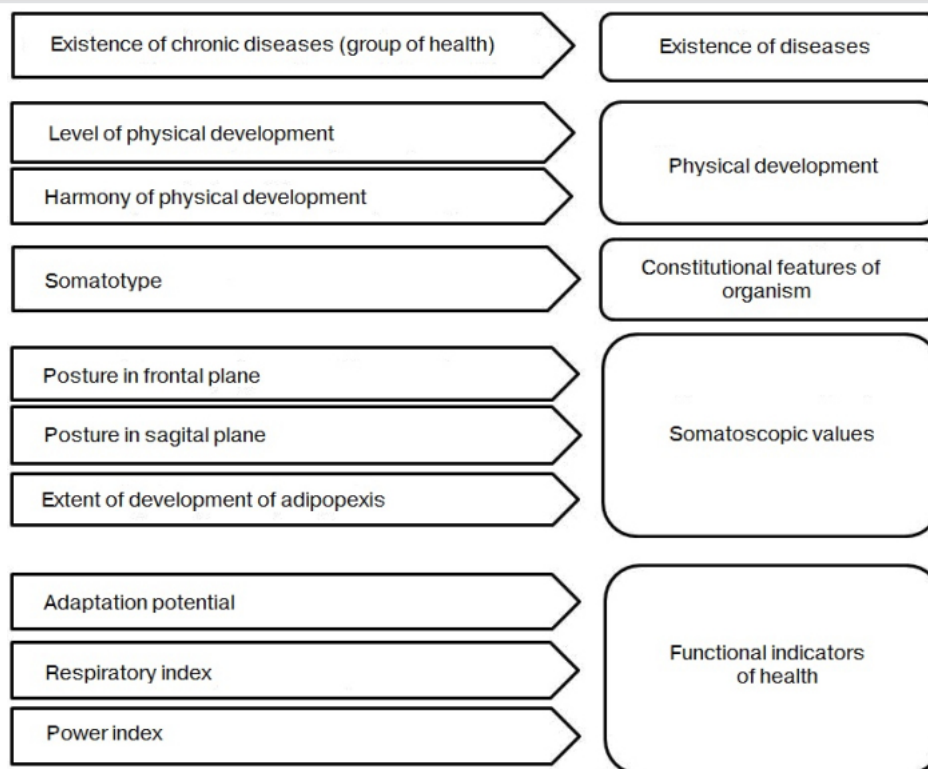
where II_{sr} – integrated indicator of somatic risk of the emergence of VVD;

P_i^N – the normalized indicator of somatic factor of risk of the emergence of VVD at teenagers of 14–17 years old;

$P_{i\ opt}$ – the optimum value of somatic factor by the system of numerical score, ($P_{i\ opt} = 1$);

n – quantity of somatic factors.

We suggest carrying out the assessment of level of probability



Pic. 1. Structure of somatic component of risk of the development of VVD

Table 1
System of numerical score of somatic risk factors of development of VSD

Somatic component of risk	Point				
	1	2	3	4	5
Group of health	1	2	3	4	5
Humeral index	90–100%	86–89,9%	83–85,9%	80–82,9%	≤79,9%
Index of vertical rachiocampsis	90–110%	89,0–89,9% or 110,1–111,0%	88,0–88,9% or 111,1–112,0%	87,0–87,9% or 112,1–113,0%	≤86,9% or ≥113,1%
Thickness of hypodermic fatty fold on stomach	2–3cm	3,1–3,5 sm or 1,7–1,9 sm	3,6–4,0 sm or 1,4–1,6 sm	4,1–4,5 sm or 1,1–1,3 sm	≥4,6 sm or ≤1 sm
Level of physical development	Average		Below the average Above the average		Low High Very high
Harmony of physical development	Harmonious physical development				Disharmonious physical development of excess body weight or deficient body weight
Somatotype	Normosthenic				Adynamic Hypersthenic
Adaptation potential	Satisfactory adaptation		Voltage adjustment mechanisms	Poor adaptation	Disruption adaptation
Power index	Average Above the average High		Below the average		Low
Respiratory index	Average Above the average High		Below the average		Low

of risk of emergence of VVD on the scale which is developed according to the law of normal distribution (tab. 2).

Using I_{sr} during the research, children with such levels of probability of risk of the emergence of VVD are found: 6,57% of pupils – low, 24,25% of pupils – below the average, 38,36% of children – average, 24,25% of teenagers – above the average, 6,57% of pupils – the high level of probability. The age distribution of children of 14–17 years old by the level of probability of risk of the emergence of VVD demonstrates that the largest specific weight of the from above average and high by levels of probability of risk of the emergence of VVD under the influence of somatic factors is observed teenagers at the age of 14 years old (pic. 2).

Studying of the state of health of pupils of 14–17 years old found 39,19% of children who were carried to the 1st group of health, 52,37% – to the 2nd group of health, 8,26% – to the 3rd group of health and 0,18% – to the 4th group of health.

The correlation analysis of groups of health of children of 14–17 years old demonstrates that the more chronic diseases children had, the more often they felt bad mood ($r=0,13$, $p<0,01$) and irritability ($r=0,10$, $p<0,05$), had the lowest self-assessment of health ($r=0,19$, $p<0,001$), had the highest points by the questionnaire of O. M. Vein ($r=0,13$, $p<0,01$).

Indicators of the existence of vegetative dystonia by the questionnaire of O. M. Vein was correlated with the existence of diseases of the cardiovascular system (CVS) ($r=0,12$, $p<0,05$), gastrointestinal tract diseases ($r=0,12$, $p<0,05$), diseases of the nervous system ($r=0,15$, $p<0,01$).

Studying of the structure of incidence according to the medical documentation found a big percent (19,86%) of children with orthopedic diseases which are consequence of inactive lifestyle of children. The analysis of indicators of the humeral index (HI) demonstrates that 78,01% of teenagers of 14–17 years old have a correct posture in the frontal plane, 15,98% of children have kiphotic posture with % HI=86-89,9 indicators, kiphonic changes with HI=83–85,9 value of % are in 3,95% of pupils, in 1,88% of teenagers of HI=80–82,9 of % and in 0,19% of children of HI makes less than 79,9%.

The correlation analysis didn't find the direct correlation link between indicators of index of vertical rachiocampsis (VR) and humeral index and indicators of the existence of vegetative dystonia by the questionnaire of O. M. Vein. However, the statistically reliable connections between indicators of the existence of scoliotic posture by the VR index and the low level of physical development ($r=-0,13$, $p<0,05$), and also the adynamic constitution are found ($r=-0,13$, $p<0,05$). The analysis of data found the direct correlation connection

between indicators of scoliotic posture by the HI index and the presence of cardiovascular diseases at children ($p<0,01$).

In recent years even more often scientists state the growing number of children with excess weight [6; 9; 10]. We revealed 67,50% of teenagers with harmonious physical development, 8,80% of children with disharmonious physical development with deficiency of body weight, 23,70% of pupils – with disharmonious physical development with a lot of body weight during the research of harmony of physical development. The direct correlation link with the low level of functionality of the cardiovascular system (CVS) by the test of Ruffier had the disharmonious physical development ($r=0,18$, $p<0,001$). The aberration of indicators of systolic ($r=0,17$, $p<0,001$) and diastolic arterial pressure ($r=0,15$, $p<0,05$), adaptation potential ($r=0,19$, $p<0,001$) were more often observed at teenagers with the disharmonious physical development.

As a result of kaliperometry it is established that than the more the size of fatty fold on stomach exceeds norm, especially the kiphonic posture at the child is expressed ($r=0,11$, $p<0,05$) and the more the physical development of the child is disharmonious ($r=0,44$, $p<0,001$). Thus, excess fatty tissue testifies to weakness of muscles of stomach which can lead to the development of kiphonic posture. The more developed fatty fold had the direct correlation connection from hypersthenic somatotype. The deviation of fatty fold from norm correlates with imbalance of nice and parasympathetic departments of VVD by the index of Kerdo ($r=0,19$, $p<0,001$).

It is scientifically proved what somatotype defines features of the development of organism. These researches demonstrate that adynamic and hypersthenic somatotypes had the direct correlation connection with low and high levels of physical development according to ($r=0,10$, $p<0,05$), with the disharmonious physical development with deficiency and surplus of body weight according to ($r=0,46$, $p<0,001$), with the worst indicators of adaptation potential ($r=0,16$, $p<0,01$), with the aberration of indicators of systolic arterial pressure ($r=0,13$, $p<0,01$), with the lowest indicators of functionality of CVS by the test of Ruffier ($r=0,19$, $p<0,001$).

The analysis of indicators of physical development found the main specific weight of children (66,19%) with the average level of physical development, 22,66% of pupils with the level of physical development above the average, 5,04% of pupils with the high level of physical development, 5,04% of teenagers with the level of physical development below the average, 1,07% of children with the low level of physical development. The correlation analysis testifies, the level of physical development of the child is lower, the more scoliotic posture is expressed by the VR index ($r=-0,12$, $p<0,05$), the group of health is worse ($r=-0,16$, $p<0,01$), the more often

Table 2

Scale of probability of risk of emergence of VVD

Points	Characteristics of the level of probability
0,859–1	Low
0,734–0,858	Below the average
0,608–0,733	Average
0,483–0,607	Above the average
0–0,482	High

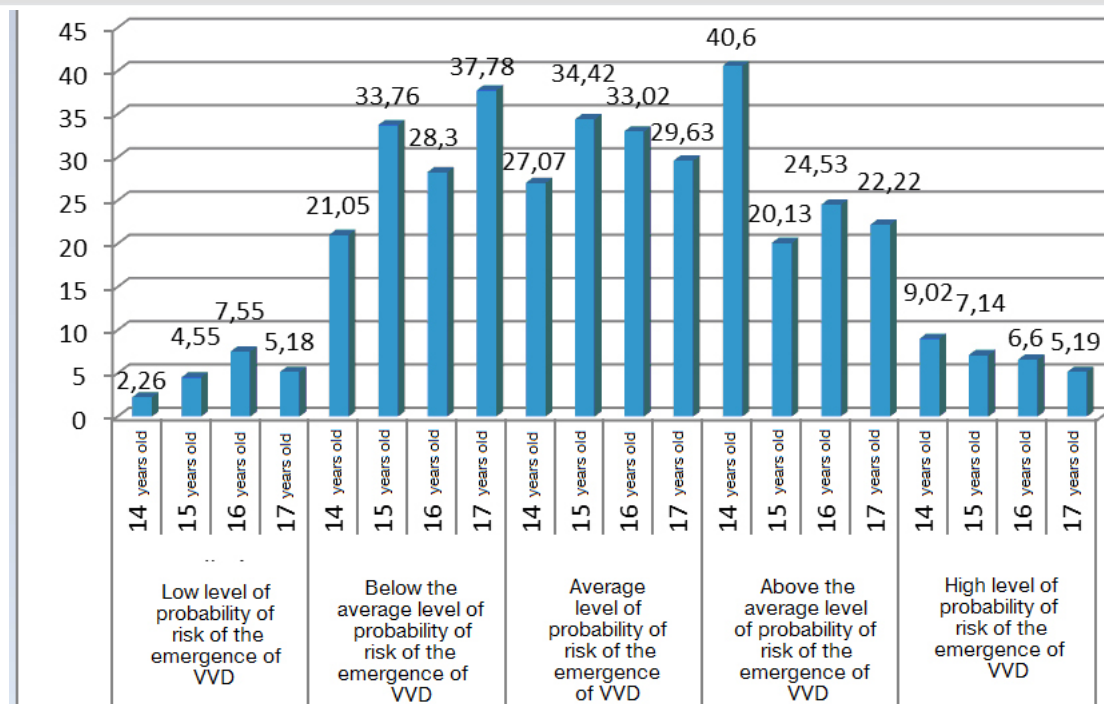


Fig. 2. Distribution of children of 14–17 years old by the level of probability of somatic risk of the emergence of VVD (%)

such orthopedic diseases children had ($r=-0,13$, $p<0,05$). Low or high rates of physical development correlated with aberrations of indicators of diastolic arterial pressure ($r=0,15$, $p<0,01$).

The available and informative express method of assessment of the state of health of children is calculation of size of index of functional changes (IFC) which gives the chance to determine the level of adaptation opportunities of organism [3]. Using IFC formula, 12,29% of teenagers of 14–17 years old which had satisfactory adaptation, 63,31% of children with tension of adaptable mechanisms, 21,05% of pupils with unsatisfactory adaptation, and also 3,35% of pupils with adaptation failure are revealed during the research. Children who had satisfactory adaptation for IFC, had the highest indicators respiratory ($r=0,18$, $p<0,001$) and power indexes ($r=0,10$, $p<0,05$), functionality of CVS, by the test of Ruffier ($r=0,26$, $p<0,001$).

One of the mechanisms of development of vegetative (cardiovascular) frustration, according to O. M. Vein, is respiratory dysfunction [2]. According to the research, 14,42% of children with the high level of respiratory index are revealed, 23,03% of pupils with the level of respiratory index above the average, 17,60% of pupils with the average level, 14,05% of teenagers with level below the average, and also 30,90% of children with the low level of respiratory index. Low indicators of respiratory index had the direct correlation connection with the low level of functionality CVS by the index of Ruffier ($r=0,13$, $p<0,05$).

It is well-known that the sufficient level of development of power qualities of muscles promotes the best blood circulation after vessels. 17,80% of children with the high level of power index, 17,60% of pupils with the level of power index above the average, 14,42% of pupils with the average level,

24,34% of teenagers with the level of power index below the average, 25,84% of children with the low level of power index are revealed during the research. The correlation analysis demonstrates that the indicators of power index were higher, the less the hypodermic fatty fold on stomach was ($r=-0,21$, $p<0,001$), the less often such orthopedic diseases children had ($r=-0,12$, $p<0,05$). The low indicators of power index correlated with the low level of functionality CVS by the index of Ruffier ($r=0,12$, $p<0,05$).

Conclusions

The analysis of references confirms the need of improvement of monitoring of children with somatic pathology. The quantitative assessment of somatic indicators of risk of the development of VVD and the integrated indicator of somatic risk of the emergence of VVD were developed for this purpose. 6,57% of pupils with the low level of probability of risk of the emergence of VVD, 24,25% of pupils – with the level below the average, 38,36% of persons of 14–17 years old – with the average level of probability of risk of the emergence of VVD, 24,25% of teenagers – with the level of probability above the average, 6,57% of pupils – with the high level of probability of risk of the emergence of VVD are revealed. It is established during the research that the largest specific weight of children with the level above the average and high level of probability of somatic risk of the emergence of VVD is observed at the age of 14 years old.

The data, which were received during the research, demonstrate what children with the low and high levels of physical development, with the existence of scoliotic posture, chronic diseases, diseases of the cardiovascular system and gastrointestinal tract, low indicators of respiratory and power indexes, disharmonious physical development,

with unsatisfactory adaptation potential, adynamic and hypersthenic somatotype are in risk group of the development of vegetative-vascular dysfunction and need individual approach at lessons of physical culture.

Prospect of the subsequent researches in this direction is the development of individual approach to children of risk group of the development of vegetative-vascular dysfunction at lessons of physical education.

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Renditions of national teams on wrestling on the World Cup of 2016

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Purpose: to carry out the analysis of renditions of national teams on wrestling on the World Cup of 2016.

Material & Methods: the analysis of 328 fights of highly skilled wrestlers is carried out.

Results: it is determined that the advantage of the strongest wrestlers consists in successful and stable use of technical-tactical actions near other factors during a duel meet and ability to impose to the rival the style of conducting a fight.

Conclusions: it is established that the offensive actions prevail as a part of the competitive technique, the fight is conducted constantly at high speed, and the techniques are carried out after the previous preparation, and in case the sportsman is sure that the technique will be executed.

Keywords: competitive actions, national teams, effectiveness, wrestling.

Introduction

Every year the fight for prize-winning places escalates at the international on wrestling competitions, the leader constantly changes, both at sportsmen, and at member countries [6; 14]. It is connected with constantly increasing competition on the basis of introduction of achievements of science and technique in the training process and improvement of technique of training of sportsmen [8; 9; 12; 16].

The policy of the International Olympic Committee is oriented on the increase in staginess of competitions, and unentertaining sports are excluded from the Olympic program. So, the question of wrestling exception of the Olympic program as unentertaining sport was brought up after the Olympic Games of 2012 in London.

Therefore, the International federation of wrestling (UWW) against the purpose to increase staginess of duel meets carried out the number of changes in competition rules [5], and actions in support of wrestling as Olympic sport took place in many countries.

In September, 2013 at meeting of the IOC the decision was made to leave wrestling in the program of the Olympic Games 2020, 2024.

Analyzing the tendency of the development of wrestling in recent years, most of experts agree that for the development of wrestling, including as the element of the program of the Olympic Games, it is necessary to make effort for the increase in effectiveness of wrestling duels at preservation of high intensity of fight throughout the whole fight [2; 11; 14; 18].

The level of the technical and tactical actions (TTA) of a sportsman mainly defines his success in a duel meet [1; 4; 7; 15]. At the same time the analysis of the competitive activity

of highly skilled wrestlers and the strongest national teams of the world is urgent [3; 10; 13; 17].

One of the prestigious team competitions on wrestling is the World Cup in which the strongest national teams of the World take part, who took 1–8 places in the last World Cup.

Communication of the research with scientific programs, plans, subjects

The work is performed according to the plan of the RW of Kharkov state academy of physical culture.

The purpose of the research:

to carry out the analysis of results of performance of national teams on wrestling on the World Cup of 2016.

Research problems:

- to define the features of the competitive activity of wrestlers of high qualification on the World Cup of 2016;
- to establish the degree of efficiency of competitive actions of wrestlers from the different countries on the World Cup of 2016.

Material and Methods of the research

Research methods: analysis of scientific and methodical literature, pedagogical observation, analysis of protocols and video records of competitive activity of wrestlers.

Results of the research and their discussion

We made pedagogical observations of the competitive activity of sportsmen -wrestlers of high qualification. Wrestling competitions were the object of observation: World Cup (WC)

of 2016. 328 fights of f wrestlers are analyzed. The results of performance of national teams on two types of wrestling are given in the tables 1–4. In the comparative analysis of skill were considered: quality of victories and defeats; indicators (the points and techniques which were taking place in a fight).

The World Cup on free-style wrestling took place in Los Angeles (USA). The first place was won by the team of Iran which won 22 victories from 30 carried-out a fight (tab. 1).

The advantage of the Iranian and American wrestlers is noticeable (on 7 meetings) among victories on “touche” and purely by points. The Indian sportsmen are more often than others lost on points (10 duel meets), and the Turkish wrestlers – on “touche” (3 fights) (tab. 2).

The World Cup on Greco-Roman wrestling took place in Shiraz (Iran). The analysis of table 3 allowed establishing that the first place was won by the national team of Iran in Greco-Roman wrestling which carried out 32 duel meets and won 30 victories.

The Iranian wrestlers – 12 meetings have victories on “touche” and purely on points most of all. The German, Ukrainian wrestlers lost more often than others on points and on “touche” (9 fights).

The analysis of WC-2016 shows that along with other factors, the advantage of the strongest wrestlers consists in successful and stable use of simple technical and tactical actions during a duel meet and ability to impose to the rival the style of conducting a fight.

Conclusions

The analysis of competitive actions on the World Cup of 2016 allowed establishing that offensive actions prevail as a part of competitive technique, the fight is conducted constantly at high speed, and techniques are carried out after the previous preparation and in case a sportsman is sure that a technique will be executed.

High-class wrestlers have a high effectiveness of performance of a technique throughout the whole fight (within two periods).

Tactical preparation is of great importance when carrying out technical actions. It is very important in the course of wrestling to create or find ability in difficult, rapidly changing situation of wrestling duel favorable dynamic situations for carrying out the attacking and counterattacking actions.

It is defined that the national team of Iran in the World Cup of 2016 won the first place in free-style wrestling and Greco-

Table 1
Results of duel meets between teams in free-style wrestling

Nº	National teams	Results of meets				Final*	Won / Lost	Place
Group A								
1	Russia	6:2	6:2	4:4	–	3:5	19/13	2
2	Georgia	7:1	4:4	–	4:4	4:4	19/13	3
3	Mongolia	6:2	–	4:4	2:6	3:5	15/17	6
4	Turkey	–	2:6	1:7	2:6	3:5	8/24	8
Group B								
5	Iran	8:0	4:4	5:3	–	5:3	22/10	1
6	Azerbaijan	7:1	0:8	–	3:5	5:3	15/17	5
7	USA	7:1	–	8:0	4:4	4:4	23/9	4
8	India	–	1:7	1:7	0:8	5:3	7/25	7

Note. * – Finals: India-Turkey (for 7–8 places); Mongolia-Azerbaijan (for 5–6 places); Georgia-USA (for 3–4 places); Russia-Iran (for 1–2 places).

Table 2
Distribution of duel meets according to result in free-style wrestling

Place	National teams	Quantity of fights	Number of victories			Number of defeats		
			T	PP	P	T	PP	P
1	Russia	30	1	5	11	–	1	12
2	Georgia	30	2	3	12	–	6	7
3	Mongolia	30	2	1	10	–	7	10
4	Turky	22	–	2	4	3	5	8
5	Iran	30	–	7	13	–	–	10
6	Azerbaijan	29	–	4	9	1	4	11
7	USA	30	–	7	14	1	1	7
8	India	21	–	1	4	–	10	6

Note. T – “touche”, PP – purely on points, P – on points.

Table 3

Results of duel meets between teams in Greco-Roman wrestling

Nº	National teams	Results of meets				Final	Won / Lost	Place
Group A								
1	Russia	7:1	7:1	7:1	–	0:8	21/11	2
2	Belarus	3:5	6:2	–	1:7	4:4	20/12	5
3	Germany	3:5	–	2:6	1:7	3:5	15/16	8
4	Kazakhstan	–	5:3	5:3	1:7	4:4	21/11	4
Group B								
5	Azerbaijan	5:3	1:7	3:5	–	4:4	13/19	6
6	Turkey	6:2	1:7	–	5:3	4:4	16/16	3
7	Iran	8:0	–	7:1	7:1	8:0	30/2	1
8	Ukraine	–	0:8	2:6	3:5	5:3	10/22	7

Note. * – Finals: Ukraine-Germany (for 7–8 places); Kazakhstan-Turkey (for 5–6 places); Belarus-Azerbaijan (for 3–4 places); Russia-Iran (for 1–2 places).

Table 4

Distribution of duel meets according to the result in Greco-Roman wrestling

Place	National teams	Quantity of fights	Number of victories			Number of defeats		
			T	PP	P	T	PP	P
1	Russia	32	1	6	14	1	–	10
2	Belarus	32	1	3	10	–	8	10
3	Germany	32	–	3	6	1	8	14
4	Kazakhstan	32	1	5	9	1	6	10
5	Azerbaijan	32	–	3	10	1	4	14
6	Turkey	32	2	4	10	–	5	11
7	Iran	32	1	11	18	–	–	2
8	Ukraine	32	–	3	7	2	7	13

Note. T – “touche”, PP – purely on points, P – on points.

Roman wrestling. The team of Russia got the second places in two types of wrestling. The third place was taken by the national teams of Georgia (free-style wrestling) and Turkey (Greco-Roman wrestling).

Further researches will be directed to drawing up model characteristics of technical and tactical preparedness of highly skilled wrestlers of the Greek-Roman and freestyle styles.

Conflict of interests. The author declares that there is no conflict of interests.

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Appropriate norms of physical development of student's youth

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Purpose: the determination of proper norms of physical development of student's youth.

Material & Methods: the following indicators were used for the assessment of physical development of students: body weight, length of body standing, vital capacity of lungs. Index of body weight and vital index were defined on their basis. The selective method was used for the establishment of borders of the confidential interval.

Results: the assessment of ratio of weight and length of body at students and students, who participated in the research, showed that it is in norm limits, and the size of vital index is lower than norm.

Conclusions: results of the carried-out analysis showed that the level of physical development of students of NLA and KhHPA meets the established standards and the relevant data which are submitted in special literature. The borders of the confidential interval are established for indicators of physical development of students on the basis of the obtained data which characterize the general population.

Keywords: physical education of students, physical development, body weight, body length, vital capacity of lungs, confidential interval, variability, general population.

Introduction

The practical organization of physical education of student's youth is regulated by the Provision on the organization of physical training and mass sport in higher educational institutions [6]. It follows from it that the key tasks of the system of physical education, which functions in HEI, is providing at student's youth of the appropriate level of development of physical qualities, motor abilities, working capacity, functional and morphological opportunities of organism. It is important to have the objective data on the valid and appropriate level of physical development of students for their decision. This problem is rather widely presented in scientifically-methodical literature. So, for example, the annual changes of indicators of physical development and physical fitness of students depending on the level of their physical activity are analyzed in the research of F. Volochyi, M. Vasilkiv [4] that gave them the chance to formulate conclusion about the negative tendency in physical development of students, who are engaged on "The program on physical education for higher educational institutions". According to data of M. M. Bobyriova [2], there is big percent of those who have unsatisfactory state of health, the low level of physical development, excess body weight among student's youth. The analysis, which is carried-out by G. V. Vlasov [3], showed that 7,8% have excess body weight, and 9,6% – deficiency of body weight among the examined students. There are 11,9% of the examined have excess weight, and 13,3% – deficiency of body weight among students. It is shown that 52% have deviation from the developed standards of physical development in the research of N. M. Balamutova and V. V. Brusnyk [1] during which length and body weight, circle of thorax were measured and ratios between them were defined at 1300 students-young men of National University "Yaroslav Mudryi National Law Academy of Ukraine". Analyzing body weight index at students of National aviation university, L. V. Yasko [10] showed that 38%

of young men and 48% of girls have insufficient body weight, and excess body weight is noted in 21% of young men and 7% of girls. The provided data confirm need of carrying out additional researches of the problem of physical development of student's youth.

Communication of the research with scientific programs, plans, subjects

The research is executed within the implementation of the scientific project MES of Ukraine "Theoretic-methodical principles of formation of culture of physical health at student's youth" (number of the state registration: 0115U006767).

The purpose of the research:

the determination of proper norms of physical development of student's youth.

Research tasks:

1. To estimate the level of physical development of students of NLA and KhHPA.
2. To set limits of confidential interval for parameters which characterize physical development of students of the general population through the sample indicators.

Material and Methods of the research

The following indicators, which are received from materials of medical reviews, were used for assessment of physical development of students: 1) body weight, 2) body length, standing (height), 3) the vital capacity of lungs. On their basis were defined: 1) body weight index (index of Quetelet) = body weight is divided into the body length, which is expressed in

square meters ($\text{kg} \cdot \text{m}^{-2}$) (the size of this index in normal is ranging from $18,5 \text{ kg} \cdot \text{m}^{-2}$ to $24,9 \text{ kg} \cdot \text{m}^{-2}$), 2) The vital index = $\text{VCL}/\text{Body weight} (\text{ml} \cdot \text{kg}^{-1})$ (if this indicator is less than $60 \text{ ml} \cdot \text{kg}^{-1}$ at men, and it is less than $50 \text{ ml} \cdot \text{kg}^{-1}$ at women, it can testify to insufficient VCL or to excess body weight).

The selective method, which essence consists in assessment of statistical parameters of the general population through sample indicators, was used for the establishment of limits of the confidential interval. They are set by such inequality for the average arithmetic population to limit of the confidential interval: $\bar{X}_{\text{sel.}} - t \cdot m \leq \bar{X}_{\text{gen.}} \leq \bar{X}_{\text{sel.}} + t \cdot m$, where $\bar{X}_{\text{sel.}}$ – the sample arithmetic average; $m = \sigma / \sqrt{N}$ – representativeness mistake; t – the size of the normalized deviation which is determined by the level of confidential reliability (P) at $P=95\%$, $t=1,96$ [8]. Materials of rather physical development of students of KhHPA are partially provided by T. S. Bondar.

Results of the research and their discussion

The key element is obtaining objective data on the valid and appropriate level of their physical development and physical fitness in the course of improvement of the existing system of physical training of student's youth. It is the important scientific and practical problem, for this time the Resolution of the Cabinet of Ukraine "About the state tests and standards of assessment of physical fitness of the population of Ukraine" lost action (The resolution CM No. 992 from 05.11.2008) which complicates the determination of appropriate level of physical development and physical fitness of students, and there are certain divergences that complicates the process of carrying out the comparative analysis in the data, which are presented in modern scientific works. So, for example, it is visible from materials of tab. 1, in which the submitted data on physical development of students, who study at Daniil Galytskyi Lviv

national medical university (LNMU), A. S. Makarenko Sumy state pedagogical university (SSPU), Ivan Pulyuya Ternopil national technical university (TNTU) that the difference in absolute average values of length of body of students makes $3,9 \text{ sm}$ ($178,3-74,4=3,9 \text{ sm}$), and body weights – $4,3 \text{ kg}$ ($68,6-64,3=4,3 \text{ kg}$). If to consider the level of variability of these indicators (the lower limit of interval of variability on length of body makes $172,0 \text{ sm}$, on the body weight of $58,1 \text{ kg}$, and the top respectively $184,6 \text{ sm}$ and $75,5 \text{ kg}$), then the divergence in sizes of intervals of variability significantly increases, respectively $12,6 \text{ sm}$ and $17,4 \text{ kg}$. At the same time it is necessary to consider that interval $\bar{X} \pm \sigma$ includes at itself only $64,26\%$ of values of sample. If to choose interval to which 95% of values of sample get and it is defined as $\bar{X} \pm 3\sigma$, the limit of variability of selective sign will extend even more. In this case, for example, the lower limit on length of body will make $178,3-18,9=159,4 \text{ sm}$, and the top – $197,2 \text{ sm}$. The similar dependence is shown also in body weight size.

The marked-out feature is traced also in estimates of level of physical development of students who study in data of HEI. So, the interval of variability of indicator of the average-grouped length of body at students has the size of $1,2 \text{ sm}$ ($167,0-165,8=1,2 \text{ sm}$), and body weight indicator – $3,7 \text{ kg}$ ($58,6-54,9=3,7 \text{ kg}$). If to consider sizes of group variations (the lower limit of interval of variability of growth makes $166,6-5,7=160,9 \text{ sm}$, body weight $54,9-6,3=48,6 \text{ kg}$, and the top respectively $166,6+5,7=172,3 \text{ sm}$ and $54,9+6,3=61,2 \text{ kg}$), then the size of interval of variability of these indicators considerably increases, it makes respectively $11,4 \text{ sm}$ and $12,6 \text{ kg}$. The noted divergences testify to need of carrying out the additional research. Its results are shown in table 2 in which indicators of physical development of students, who study in NLA and KhHPA, are presented. They demonstrate that the average-grouped indicator of length of body makes

Table 1

Level of physical development of students of different HEI of Ukraine

Nº	Indicators of physical development	A. Khokhla [9]	I. Saluk [7]	O. Ushkalenko [5]
Boys				
1	Body length (sm)	178,3±6,3	176,6±0,3	174,4±2,0
2	Body weight (kg)	66,8±8,7	68,6±0,4	64,3±2,2
Girls				
1	Body length (sm)	166,6±5,7	165,8±0,7	167,0±1,7
2	Body weight (kg)	54,9±6,3	58,6±0,8	56,9±2,0

Table 2

Indicator of physical development of students of NYuU and HGPA

HEI	Quantity of students (n)	Height (sm)		Body weight (kg)		VCL (l)		Index of Quetelet ($\text{kg} \cdot \text{m}^{-2}$)	Vital index ($\text{ml} \cdot \text{kg}^{-1}$)
		\bar{X}	σ	\bar{X}	σ	\bar{X}	σ	\bar{X}	\bar{X}
Boys									
NLA	n=201	178,8	6,5	74,2	11,2	3,9	0,56	23,3 (nor.)	52,6
KhHPA	n=79	175,4	7,3	70,4	8,6	3,7	0,51	22,9 (nor.)	52,5
Girls									
NLA	n=140	167,3	5,6	56,9	7,7	2,8	0,47	20,6 (nor.)	49,2
KhHPA	n=166	164,1	0,6	56,9	0,3	2,6	0,10	21,1 (nor.)	45,7

respectively 178,8±6,5 sm and 175,4±7,3 sm, and body weight – 74,2±11,2 kg and 70,4±8,6 kg at children. The interval of variability of these indicators in general coincides with data, the above-stated (see tab. 1), and despite of the fact that the absolute average-grouped body weight indicators at students of NLA and KhHPA are a little higher. The similar regularity is shown also in the size assessment of the average-grouped indicators of length and body weight at students of NLA and KhHPA which make respectively height – 167,3±5,6 and 164,1±0,6, body weight – 56,9±7,7 and 56,9±0,3. If to estimate ratio of body weight and length of body (index of Quetelet) at students and students of NLA and KhHPA, who participated in the research, then it is possible to claim that this indicator is in norm limits (norm 18,5–24,9). Results of the conducted researches demonstrate also that the size of vital index at them is lower than norm (tab. 1). As the ratio of body weight and length of body is in norm limits at students, who participated in researches, this fact can demonstrate that they have insufficient size of VCL that is caused by the insufficient level of exercise stresses.

Results of the carried-out analysis showed that limits of variability of absolute average-grouped indicators of length and body weight at students of LNMU, SSPU, TNTU, and also NLA and KhHPA significantly do not differ. The received results allow to set limits of the confidential interval for the general population indicators on the basis of statistics of sample what is represented by students of NLA, that is to establish with the set reliability (it is accepted for problems of physical culture that P =95%) the appropriate level of physical development of students of HEI. Leaving the statistics, which are presented in table 2, for the selection of male students of NLA $m_{\text{height}}=0,457$, $m_{\text{body weight}}=0,788$, and for female students,

respectively, $m_{\text{height}}=0,747$ and $m_{\text{body weight}}=0,652$. Therefore, proceeding from the obtained data, with reliability of 95%, it is possible to claim that the general population indicator which characterizes length of body of students (boys) will be in limits $177,9 \text{ sm} \leq \bar{X}_{\text{gen. height}} \leq 179,7 \text{ sm}$, and body weight indicator within $72,6 \text{ kg} \leq \bar{X}_{\text{gen. body weight}} \leq 75,7 \text{ kg}$. The average values of length and body weight of the general population for female students will be in such limits: body length – $165,8 \text{ sm} \leq \bar{X}_{\text{gen. height}} \leq 168,76 \text{ sm}$, and body weight – $55,62 \text{ kg} \leq \bar{X}_{\text{gen. body weight}} \leq 58,8 \text{ kg}$.

Conclusions

1. Results of the carried-out analysis showed that the level of physical development of students of NLA and KhHPA satisfies to the established norms and the relevant data, which are submitted in special literature.

2. Proceeding from the obtained data, with reliability of 95%, it is possible to claim that the general population indicator which characterizes length of body of students (boys) will be in limits $177,9 \text{ sm} \leq \bar{X}_{\text{gen. height}} \leq 179,7 \text{ sm}$, and body weight indicator within $72,6 \text{ kg} \leq \bar{X}_{\text{gen. body weight}} \leq 75,7 \text{ kg}$. The average values of length and body weight of the general population for female students will be in such limits: body length – $165,8 \text{ sm} \leq \bar{X}_{\text{gen. height}} \leq 168,76 \text{ sm}$, and body weight – $55,62 \text{ kg} \leq \bar{X}_{\text{gen. body weight}} \leq 58,8 \text{ kg}$.

Prospects of the subsequent investigations. The analysis of physical fitness of student's youth and establishment of limits of the confidential interval for the corresponding indicators of the general population through the sample indicators is planned in the subsequent.

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Efficiency of the technique of the training process of highly skilled bodybuilders of the mesomorphic type of constitution in the competitive period

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Purpose: foundation of efficiency of the technique of the training process of highly skilled bodybuilders in the competitive period.

Material & Methods: 16 highly skilled bodybuilders of 22–30 years old participated in the research, the average body weight of sportsmen makes 87 ± 2 – 102 ± 2 kg, which are included in the structure of the national team of Ukraine on bodybuilding. Methods: method of the theoretical analysis and generalization of literature, pedagogical observation, pedagogical experiment, method of mathematical statistics.

Results: the comparative characteristic of the most often used techniques of the training process in bodybuilding is provided. The effective technique for highly skilled bodybuilders of the mesomorphic type of constitution, depending on the initial uniform of a sportsman at the beginning of the competitive period of training is developed and proved. Dependence of change of body weight of a bodybuilder on the training process is directed.

Conclusions: on the effective training method, depending on microcycle of trainings in the competitive period precompetitive and competitive mesocycles (selection and main competitions), is offered the basis of the conducted research.

Keywords: structurization of training, bodybuilding, training process, qualified bodybuilder, optimum technique, microcycle.

Introduction

New kinds of sport for the state began to be in rather great demand at youth and mature sportsmen from the beginning of the 90th years in Ukraine. First of all concerning weightlifting, these are such types as: powerlifting and bodybuilding. Considering that the native theoretical and practical training base on these types is only at the development stage, the subject of this article for native sport is rather urgent.

One of the major problems in training of sportsmen-bodybuilders in Ukraine to competitions is adaptation of foreign classical techniques to native realities and achievement thus of good results.

The system of training of highly skilled sportsmen in bodybuilding is based on the optimum constructed training process in total with food and restoration as the factors, providing necessary conditions for the increase in muscle bulk and the decrease in percent of subcutaneous fat.

Therefore, the technique of training process of highly skilled bodybuilders of the mesomorphic type of constitution in the competitive period of year cycle of preparation was developed [1; 4].

There are very few evidence-based training techniques of training of highly skilled bodybuilders in the competitive period in domestic sport. Thus, coaches and sportsmen should gain the practical experience by trials and mistakes [10; 11].

The competitive period lasts 8–12 weeks in training of

highly skilled bodybuilders. During this period highly skilled sportsmen of various categories try to reduce as much as possible quantity of hypodermic fatty layer and hypodermic water through training with optimum burdening, trying to obtain thus definition and separation of muscles. At the end of each microcycle the uniform of a sportsman is estimated by a coach and the anthropometry is measured, amendments are introduced in the training process and the plan of food [6; 7; 16–18].

Such domestic experts in the field of physical culture and sport as V. M. Platonov, L. S. Dvorkin, A. I. Stetsenko, B. I. Sheyko, V. G. Oleshko, O. I. Kamayev, D. A. Beskorovaynyi, V. V. Usichenko [4–10] dealt with this problem. Their research was based on the experience of such foreign experts in area as Joe Weider, Ben Weider, E. Connors, T. Kimber, M. McCormick [2; 3; 8].

Communication of the research with scientific programs, plans, subjects

The scientific research is executed on the subject of the Consolidating plan of the research works in the sphere of physical culture and sport for 2011–2015 3.7 “Methodological and organizational and methodical bases of determination of individual norm of physical condition of the person” (number of the state registration is 0111U000192).

The purpose of the research:

to prove efficiency of the technique of training process of highly skilled bodybuilders of the mesomorphic type of

constitution in the competitive period.

Material and Methods of the research

Members of the national team of Ukraine participated in this research. 16 bodybuilders from whom 4 masters of sports of international class, 12 – MSU, at the age of 22–30 years, the average body weight of sportsmen makes $87 \pm 2 - 102 \pm 2$ of kg were involved in the experiment. Participants were distributed on sports qualification on two groups, control and experimental groups. Participants of the experiment of the control group trained 5 times a week, and participants of the experimental group trained 5–6 times a week.

Research methods: method of the theoretical analysis and generalization of literature, pedagogical observation, pedagogical experiment, methods of mathematical statistics.

Results of the research and their discussion

Two options of the training technique, which differed in loading and volume of training routines, rest and other components, were used in the conducted researches in the training process of highly skilled bodybuilders. The assessment was carried out by means of diaries of training in which the quantity and volumes of training work were specified.

The efficiency of preparation was estimated on anthropometrical indicators, by means of the method of expert evaluations, which provided information on implementation of instructions of a coach, dynamics of power indicators and on endurance, and also subjective qualities (health, mood, desire to train, etc.).

Sportsmen of the control group trained within 12 weeks with big percentage burdening, and sportsmen of the experimental group used average loadings with the emphasis on eccentric loading of muscles (tab. 1, 2). The test weighing of participants of the experiment of both groups, and also anthropometrical measurements was carried out before the experiment. The device the body weight analyzer (scales TANITA BC-545, made in Japan) and centimetric tape (tab. 3, 4) were used for carrying out weighing.

The difference of the competitive period from the preparatory period consists in smoother transition from one training microcycle to another, and also in increase in number of repetitions and attempts for better separation and definition of muscles (tab. 1). We used methods of increase in intensity, such as supersets, drop sets, and also huge sets for the solution of these tasks. The increase in trainings, reduction of gaps between training days plays the large role in preparation at this stage. The exercise performance time, both on positive phases, and on negative phases, and the most important

Table 1
Contents of the training program depending on lot of burdening in the competitive period of highly skilled bodybuilders of the mesomorphic type of constitution of control and experimental groups

Indicators of training load and classification of muscular groups	Mesocycles					
	Competitive		Control- preparatory		Competitive	
	CG	EG	CG	EG	CG	EG
Loading range percentage of maximum.	70–80	55–70	60 – 80	30–60	80–70	70–30
Number of training days	6	6	5	6	6	6
Number of repetitions	12–15	18–20	10–12	12–18	12–15	15–25
Number of attempts	4	4	5–6	5–6	5–6	6–8
Exercise performance time (s)						
Positive phase (movement up)	1	0,5	1	0,5	1	0,5
Negative phase (movement down)	1,2	0,5	1,2	0,5	1	0,5
Pauses between repetitions, s	0,8	–	0,8		0,5	-
Rest between attempts (min)						
In general exercises	1,8	1	2–2,5	1–1,2	1,5	1
In the forming exercises	1	0,6–0,7	1,5	50	1	30–50
Time of rest between loads of muscle groups (days)						
Hips	5	3	5	3	4	3
Back	4	3	5	3–5	4	3–5
Thorax	3	4	3	4	3	4
Deltoid muscle	4	5	4	5	4	5
Biceps	2	3	2	3	2	3
Three-headed muscle	3	4	3	4	3	4
Forearms	2	2	6	5	6	5
Three-headed muscle of shin	4	3	6	3	6	3
Oblique and direct muscles of stomach	2	1	3	1	3	1
Neck	2	1	0	2	0	2

Table 2

The total volume of the training work, which is performed by highly skilled bodybuilders of the mesomorphic type of constitution of control and experimental groups in the competitive period

Group of muscles	Volume, NRB		Volume, thousands kg	
	CG	EC	CG	EC
General exercises on:				
Muscles of belt of upper extremities	715	845	76,96	81,25
Muscles of hands	1014	1170	99,515	111,358
Thorax muscles	756,6	952	114,725	125,32
Back muscles	1273	1,53	215,93	236,717
Muscles of hip and shin	2,036	2,34	312,731	397,404
In total	5,794	6,83	819,861	952,049
Forming exercises on:				
Muscles of belt of upper extremities	2,015	2,12	143,442	181,376
Muscles of hands	1066	1255	75,725	84,994
Thorax muscles	676	819	82,771	84,994
Back muscles	1,346	1,78	136,955	153,504
Muscles of hip and shin	4,779	5,34	656,825	699,062
Stomach muscles direct and slanting	11,51	12	–	–
In total	21,39	23,3	1095,72	1203,93

Note. NRB – the number of raising of bar.

also significantly decreased, pauses between repetitions decreased in underwater microcycle up to 0,5 seconds, and there was no rest between repetitions at all in the competitive microcycle. Thus, we created optimum conditions for bodybuilders of high qualification of the mesomorphic type of constitution.

Distinctive characteristics of this period is the small percentage application of small burdening, making in the first competitive mesocycle at the end of which elimination competitions, – CG of-70-80%, loading made 55–70% in EG; in the precompetitive mesocycle – EG – 30–50%, in CG – 60–80%; and in the second competitive mesocycle in EG makes 70–30%, in CG – 80–70%, thus, in EG more attention is paid to study of muscles, but not raising of weight that is the most important at this stage.

It follows from table 2 that bodybuilders of the experimental group trained with average burdening from the maximum loads, the control group trained with small amount of repetitions, but with high intensity that in precompetitive mesocycle is not recommended and threatens with overtraining as sportsmen prepare for competitions and reduce amount of carbohydrates at this stage. So, much attention is paid to muscles of hip and shin in the competitive period – the number of raising of bar (NRB) for three microcycles makes in EG – 2,341 rises, in CG – 2,036 mainly at the expense of muscles of hands, thorax and back which are almost identical (650–732 raising of bar, in 62,500–96,400 kilograms). Despite it, the main role is played by the forming exercises in this period which were different and on NRB, and the counted kilograms therefore the most large number of raising of bar was at the expense of direct and oblique muscles of stomach and made in EG – 9,220 NRB and in CG – 8,850 NRB. Total amount in general exercises of NRB makes: in EG – 6,830 and in CG – 5,790; and in the forming exercises: in EG – 23,300 and in CG – 21,390 NRB. Thus, CG used more power program of preparation and small amount

of NRB with big burdening, EG used more static program of preparation and used large number of NRB at the expense of what the volume of kilograms was high. Use of such operating mode allowed sportsmen to be restored and exhaustion of muscle fibers owing to power training was optimum for the subsequent super-compensation.

Total amount in the counted kilograms in general exercises in EG makes 952,049, in CG – 819,862, performing the forming exercises; total amount makes in EG – 1203,930 kilograms, in CG – 1095,720. Thus, sportsmen of the experimental group trained at this stage with the average number of kilograms that was optimum, and paid much attention to muscles of stomach and muscles of legs as after the preparatory period, which proceeded 28 microcycles, the large increase of fatty layer on muscles of stomach and hips was. Sportsmen of CG paid more attention to general exercises and power indicators, than the forming exercises.

Measurements of anthropometrical indicators of bodybuilders were made before the experiment. It follows from tab. 3 that coefficients of variation of all main anthropometrical indicators, separately for control and experimental groups, practically did not exceed the general initial level.

The anthropometrical examination was conducted before the beginning and at the end of the competitive period (tab. 3, 4).

So, the distinctions are not considerable at the beginning of the competitive period of preparation: in body weight (control – 91,63 kg, experimental – 92,00 kg; $P > 0,05$); waist circles (respectively 78,72 sm, 80,31 sm; $P > 0,05$); hip circles (respectively 77,42 sm, 78,12 sm; $P > 0,05$); neck circles (respectively 40,67 sm, 40,93 sm; $P > 0,05$); thorax on breath (respectively 108,45 sm, 115,88 sm; $P > 0,05$) and on exhalation (respectively 103,22 sm, 105,08 sm; $P > 0,05$) and shins (respectively 39,53 sm, 40,29 sm; $P > 0,05$).

Table 3

Average values of anthropometrical data of highly skilled bodybuilders of the mesomorphic type of constitution of control and experimental groups at the beginning of the competitive period (n1=n2=8)

Indicators	CG		EG		t	P
	$\bar{X}_1 \pm m_1$	V, %	$\bar{X}_2 \pm m_2$	V, %		
Body weight, kg	92,25±3,67	10,69	91,63±3,96	12,05	0,02	>0,05
Circle of neck, sm	40,67±1,23	8,44	40,93±1,16	9,14	0,12	>0,05
Circle of thorax (breath), sm	108,45±1,8	4,8	115,88±2,54	6,48	1,03	>0,05
Circle of thorax (exhalation), sm	103,22±1,81	5,32	105,08±2,21	6,19	0,52	>0,05
Circle of biceps, sm	42,14±1,8	13,05	43,56±1,55	10,50	0,48	>0,05
Circle of waist, sm	78,72±2,29	8,58	80,31±2,4	9,03	0,38	>0,05
Circle of hip, sm	77,42±1,74	6,46	78,12±1,8	6,79	0,23	>0,05
Circle of shin, sm	39,53±1,28	9,55	40,29±1,38	10,11	0,33	>0,05
Circle of forearm, sm	36,58±1,29	10,42	38,38±1,81	13,92	0,66	>0,05

Table 4

Average values of reduction of anthropometrical data of highly skilled bodybuilders of the mesomorphic type of constitution of control and experimental groups at the end of the competitive period (n1=n2=8)

Indicators	CGG	EG	T	P
	$\bar{X}_1 \pm m_1$	$\bar{X}_2 \pm m_2$		
Body weight, kg	11,11±1,0	4,75±0,3	5,14	<0,01
Circle of neck, sm	3,8±0,4	1,9±0,2	3,67	<0,01
Circle of thorax (breath), sm	4,9±0,4	2,0±0,3	4,5	<0,01
Circle of thorax (exhalation), sm	4,9±0,4	2,3±0,2	5,79	<0,01
Circle of biceps, sm	3,1±0,5	1,7±0,3	2,07	>0,05
Circle of waist, sm	4,6±0,4	2,5±0,2	3,95	<0,01
Circle of hip, sm	4,1±0,3	2,3±0,2	3,64	<0,01
Circle of shin, sm	2,3±0,2	1,4±0,2	3,01	<0,05
Circle of forearm, sm	0,2±0,1	0,8±0,3	1,52	>0,05

Coefficients of variation of all main anthropometrical indicators, separately for control and experimental groups, practically did not exceed the general initial level. For example, it made V=10,69% for the mass of the control group, for the experimental group – V=12,05%. Respectively, coefficients of variation made the following values for control and experimental groups: circle of hips of V=6,46%, V=6,79%; waist circle – V=8,58%, V=9,03%; biceps circle – V=13,05%, V=10,5%.

So, the probability of distinctions were confirmed at the end of the competitive period of preparation: in body weight (control – 11,11 kg, experimental – 4,75 kg; P<0,01); waist circles (respectively 4,6 sm, 2,5 sm; P<0,01); hip circles (respectively 4,1 sm, 2,3 sm; P<0,05); neck circles (respectively 3,8 sm, 1,9 cm; P<0,01); thorax on breath (respectively 4,9 sm, 2,0 sm; P<0,01) and on exhalation (respectively 4,9 sm, 2,3 sm; P<0,01) and shins (respectively 2,3 sm, 1,4 sm; P<0,05).

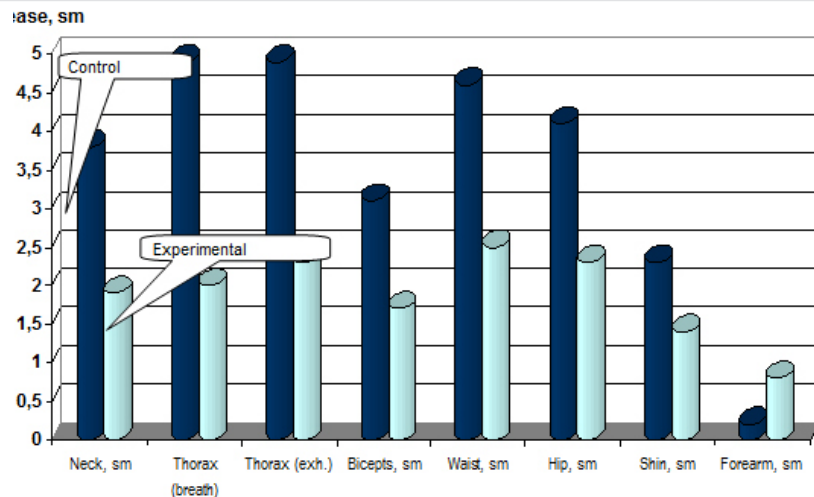
Conclusions

Thus, efficiency of the technique of the training process of highly skilled bodybuilders of the mesomorphic type of constitution was proved. The result allows considering

that the effect was more expressed in EG, and the level of preparedness can be estimated as optimum. The dynamics of loading in this group significantly reduces the probability of formation of adverse displacements of functional condition of sportsmen (overstrain, overtraining, injuries), allows to reach the necessary level of sportswear without overstrain of adaptation and compensatory mechanisms. Concerning the creation of training process, the training method in EG promotes burning of fatty layer and hypodermic water more (on body weight indicators (t=5,14; p<0,001), thorax circles on breath (t=4,5; p<0,001) and exhalation (t=5,79; p<0,001), waists (t=3,95; p<0,001), hips (t=3,64; P<0,01) and shins (t=3,01; p<0,05)).

The offered training method for highly skilled bodybuilders of the mesomorphic type of constitution in the competitive period can be recommended for training of sportsmen, at the observance of requirements of sports and medical control, ensuring effective and high-quality restoration in the transition period.

Further researches have to include the development and foundation of the training process of highly skilled bodybuilders of the mesomorphic type of constitution in the transition period.



Pic. 1. The comparative diagram of the gain of anthropometrical data of highly skilled bodybuilders of the mesomorphic constitution of control and experimental groups in the competitive period

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Anti-doping and sex-control in kind of sport triathlon

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Purpose: to analyze the basic provisions of the World Anti-Doping Code, that regulates activity of the Agency on fight against the use of dope in the world sport.

Material & Methods: studying and generalization of special literature on the problem of use of pharmacological substances in sport, analysis of the procedure of carrying out anti-doping and sex-control in triathlon.

Results: the groups of the pharmacological substances, which are forbidden to application in sport, are considered; the order of holding procedures anti-doping and sex-control, and also the sanction, which are used concerning triathletes in case of the positive result of doping test, are shown.

Conclusions: Pharmacological substances are forbidden to use and entered in the special list by the World Anti-Doping Agency, which promote the improvement of sports results, at the same time the procedure of anti-doping control and the sanction, which are used concerning sportsmen at the confirmation of the fact of application to dope, are severely regulated by the Code, and also sex-control is carried out in addition in doubtful cases at absence of the certificate at triathletes.

Keywords: triathlete, World Anti-Doping Agency, the World Anti-Doping Code, dope, special substances, positive result of test, disqualification.

Introduction

The World Anti-Doping Agency (WADA) was founded on November 10, 1999. Now Craig Collins Reedy is its president, John Fahey was his predecessor.

The World Anti-Doping Code drafted by WADA and approved in March, 2003 at the conference in Copenhagen (150 pages) is the main normative document, regulating the activity of the Agency on fight against use of dope in the world sport [9]. Also rights and sportsman's duties are stipulated in it during the procedure of anti-doping control. The international and national anti-doping organizations and the agencies are obliged to adhere to provisions of the code because it is the part of the World anti-doping program.

The medical commission of WADA develops and makes the list of the substances and methods, which are forbidden to application in sport. This list is annually supplemented and specified on the basis of the results of the researches and other scientific data.

The executive committee of WADA approves "The forbidden list" at the annual September meeting. After the official registration it is published on the website of WADA by the 1th of October and comes into force from the 1th of January of the new year [8; 12].

"The list of the forbidden substances and methods" includes also substances and methods which are forbidden to use both in competitive, and in out of competition periods as they are capable to improve physical shape on the upcoming sporting events or can mask use of those substances and methods which are forbidden only during the competitive period. According to the recommendation of the International federation, "The list of the forbidden substances and methods"

can be expanded by WADA for a concrete sport. The forbidden substances and methods can be included either in the general category of "List", or in any special [8].

WADA develop the program of monitoring of the substances which are not entering "The list of the forbidden substances and methods", but abuses of which need to be monitored also after consultations with the interested parties. The list of such substances is announced (the substances, which are included in the program of monitoring are not forbidden) before each testing procedure. Laboratories inform periodically WADA on the recorded cases of their use both in competitive, so in out of competition periods. Similar reports do not contain the additional data concerning concrete tests. At least once a year the agency provides the statistical information on use of these substances to the International federations and the National anti-doping organizations. Besides, WADA is responsible for nondisclosure of information on the sportsmen, using such substances, as their application is not violation of anti-doping rules [1; 8; 12].

Out-of-limit mobilization and excessive use of energy sources in organism of a sportsman lie at the heart of application of drug-induced means (dope), improving sports results in cyclic sports on endurance [6].

However, the questions, concerning use of the forbidden pharmacological medicines, special substances, anti-doping and sex control, and also applied to sanction triathletes at the positive result of examination are far not completely studied.

Communication of the research with scientific programs, plans, subjects

The research is executed according to the Plan of the RW of Kharkov state academy of physical culture.

The purpose of the research:

to analyze the basic provisions of the World Anti-Doping Code regulating the activity of WADA.

Research problems:

1. To consider the groups of the pharmacological medicines, which are forbidden to application in sport.
2. To open the order of holding procedure of anti-doping control in triathlon.
3. To show the specifics of the sanctions, which are applied to triathletes at the positive result of doping-test.
4. To disclose the content of selective carrying out sex-control in continuous triathlon.

Material and Methods of the research

- 1) studying and synthesis of data literary and Internet-sources for the assessment of the degree of study of problem and allocation of the key provisions which are the cornerstone of the developed WADA of the World Anti-Doping Code;
- 2) analysis of the procedure of carrying out anti-doping and sex-control in sports on endurance.

Results of the research and their discussion

Because during passing of the combined super-marathon distance, triathletes should overcome enormous loadings, some sportsmen have temptation of use just before start and during participation in competitions of the forbidden pharmacological medicines, promoting the improvement of sports results [2; 4; 8].

However doping has an adverse effect on the state of health of a sportsman as the excessive stimulation causes out-of-limit mobilization and excessive use of energy sources in organism. At the same time conditions for the development of various serious pathological conditions are created as the increase in working capacity by means of stimulators reduces (in some cases removes) the protective mechanism of self-preservation of a person [1; 6; 15].

The following groups of pharmacological substances concern to the forbidden:

- 1) anabolic steroids;
- 2) analeptic;
- 3) anesthetics;
- 4) drugs;
- 5) psychomotor stimulators;
- 6) sympathomimetic amines;
- 7) stimulators of the central nervous system.

However no forbidden drug-induced medicines will replace to correctly constructed training process [5; 7; 11].

Also reception of cordials and drops against cold (containing ephedrine) is forbidden just before start in spite of the fact that the same medicines are used by doctors for the treatment of heart failure, overstrain, cold. It is not recommended to apply adrenaline as haemostatic in the course of the competitions.

The list with the review of the main changes (the forbidden earlier method "Oxygen transfer strengthening" is resolved

now) is published for more objective control of non-use during the competitive and out of competition periods of the forbidden substances and methods on the official site of Federation of triathlon of Ukraine [13; 14].

So, four stimulators were included in addition in "The forbidden list": benfluoreks, prenylamine, methylhexanamine, and also pseudoephedrine (application was not forbidden in sport since 2003) again carried by Executive committee of WADA owing to results of the five-year program of monitoring, to this category as a specific stimulator with the threshold level of concentration in urine of 150 mkg/ml [8].

Anti-doping control in triathlon. The system of selection of the sportsmen, who are subject to anti-doping control, are told participants, coaches and representatives of teams before the competitions [3; 10; 13; 14]. This procedure is undergone, as a rule, by winners and prize-winners of competitions, and also the sportsmen, which are determined by the lot. The specified persons together with the representative of judiciary board and a coach go to premises of the medical commission, where they are registered, on the end of passing of distance.

Then, a triathlete accompanied by the medic passes to the adjacent room, where fills the provided sterile capacity with urine (it quite often happens that sportsman have problems with delivery of urine for the analysis of doping control samples as they lose a lot of liquid together with then that they have nothing to fill the capacity provided by the medical board during passing of the track of super-marathon). Further, acidity of urine is defined by litmus paper in the presence of official representatives, then they spill it in two bottles, which are marked by identical encoded numbers close them and seal up. One bottle is sent to laboratory, and another remains in medical commission on case of the repeated examination.

Data of a sportsman, at whom sample is taken, and also surnames of accompanying persons, are entered in the registration card. Date and time of capture of the analysis, volume and acidity of urine, the encoded number of bottles are put down. Respect for all formalities is validated by signatures of attendees [1; 6; 8].

Methods of thin-layer and gas chromatography, spectroscopy, etc. are used (new are developed constantly) in the chemical-toxicological laboratory in the analysis of urine (also the availability of dope can be determined objectively by blood tests and a sportsman's saliva) on availability of the substances, which are carried to dope. Accuracy of researches is so big that allows to find easily even the minimum doses of the pharmacological substances, which are forbidden to application (specified in the articles of the World Anti-Doping Code), such as:

Art. 51. STIMULATORS:

adrafinil, Amphetamine, amifenazol, amphetamine, amphetamine, benzfetamine, bromantane, carphedon, katin (test is considered positive for katin, if contents it in urine more than 5 micrograms on milliliter), clobenzorex, cocaine, dimethylamphetaminum, ephedrine, methylephedrine (test is considered positive for ephedrine and methylephedrine, if the content in urine more than 10 micrograms on milliliter), Etilefrinum, ethylamphetamine, fencamfamine, phenethyllean, fenfluramine, fenproporex, furfenorex, mefenorex,

Methylamphetaminum, Methyleneoxyamphetamine, MDMA, methylphenidate, modafinit, Nikethamidum, Fenfluramine, parahydroxyamphetamine, pemoline, Phendimetrazine, Fenmetrazinum, phentermine, selegilinum, strychnine and other substances with the similar structure or the similar pharmacological effect [8; 9].

Art. 52. DRUGS:

buprenorphine, Dextromoramidum, diamorphine (heroin), hydromorphine, methadone, morphine, oxycodone, oxymorphone, pentazocine, pethidine [8; 9].

Art. 53. CANNABIOIDS:

marijuana, hashish [8, 9].

Art. 54. ANABOLIC AGENTS

1. Anabolic androgenic steroids:

a) anabolic androgenic steroids of exogenous action ("exogenous" means substances in this section which cannot be produced by organism):

androstadienon, bolasteron, boldenone, clostebol, danazolom, adjay chlordehydromethyltestoster, delta 1-Androstenum-3,17-dion, drostanolone, fluoxymesterone, formebolon, gestrinone, 4-hydroxytestosterone, 4-hydroxy-19-nortestosteron, mesterololum, metandienonum, methenobosoms, Metandriolum, methyltestosterone, mibolerone, Nandrololum, 19-norandrostendiol, 19-norandrostendion, norbolethone, norethandrolone, oksabolon, oxandrolone, oxymesteronum, oxymetholone, quinolone, stanozolol, stenbolone, delta 1-dihydrotestosterone, trenbolone and substances with the similar chemical structure or the pharmacological properties;

b) endogenous ("endogenous" means substances in this section which can be produced by organism), anabolic, androgenic steroids:

androstendioli, androstenedione, DHEA, dihydrotestosterone, testosterone and substances similar to them (it means "substance which turns out at modification or change of the chemical structure of other substance, but with the same pharmacological effect").

2. Other anabolic agents:

clenbuterol, zeranol [8; 9].

Art. 55. PEPTIDE HORMONES.

The following peptide hormones, including their mimetics, analogs and contributing factors are forbidden:

- 1) erythropoietin (ERO);
- 2) hormone of growth (hGH) and insulinoid factor of growth (IGF-1);
- 3) HCG – is forbidden only for men;
- 4) hypophysial and synthetic gonadotrophins – are forbidden only for men;
- 5) insulin;
- 6) corticotrophins, etc. [8; 9].

The head of a team within 24 hours can demand (official

request) from the chief expert in anti-doping control of conducting the repeated examination, when obtaining the written conclusion of laboratory about the positive result at a sportsman (use of the forbidden pharmacological medicines is established).

The counter-examination is carried out by other group of experts, at the same time there can be representatives of a team and a checking. If the result of the second examination is also positive, then the protests will not be accepted anymore and a sportsman will be disqualified, and his result will be cancelled [1; 6].

According to the paragraph 2.1.2 of the article 2 "Violations of Anti-doping Rules" of the World Anti-Doping Code ... the detection of any amount of the forbidden substance, its metabolite or marker in the sample taken at a sportsman is considered violation of anti-doping rules ... [9].

The first time a triathlete is disqualified for 2 years, and in case of dope detection further – for life.

Its result is considered final at not identification in urine the counter-examination of the forbidden substances (dope).

Also in paragraph 2.1.3 of article stated above it is told: "As exceptions of the general rule in "The list of the forbidden substances and methods" the special criteria for detection of the forbidden substances, which can appear in organism, can be established endogenously".

If the forbidden substance can be produced in the natural way in a sportsman's organism from the specified list, the test will surely contain the forbidden substances which concentration or their metabolites deviates from usually available in organism and does not correspond to its usual endogenous development. The test will not be considered positive if a sportsman provides proofs that concentration of the forbidden substance or its metabolites can be caused it by pathological or physiological state. In all cases (at any concentration) the laboratory reports about the adverse result of the analysis if, based on the reliable method, it can prove that availability of the forbidden substance has a exogenous character [9].

In case the result of the laboratory research is not final, and there is no concentration turning usual endogenous development of organism, then the relevant anti-doping organization makes further investigation if there are serious reasons to believe that there was the fact of use of the forbidden substance [1; 9].

The special substances included in "The list of the forbidden substances and methods", which use can be considered as inadvertent, in view of their general availability or doubtfulness of their influence on sports results, are defined specially in the World Anti-Doping Code in the paragraph 10.3 of the article 10. If it is established that a sportsman used this substance not for the purpose of the improvement of the results, then one of the following punishments is applied to him:

- the first violation: minimum –prevention, maximum – 1 year of disqualification;
- second violation: two years of disqualification;
- third violation: lifelong disqualification.

Nevertheless, each sportsman (or his representative) has to have opportunity before the disqualification comes into force, to provide justifications for the reduction of its term or cancellation [9].

Sex-control in triathlon. Along with the anti-doping control at responsible competitions (championships, superiority, European cups and the world, the Olympic Games) in doubtful cases for female-triathletes (in the absence of the certificate) also sex-control, i.e. definition of their sex is entered.

After the special researches of epithelial cells of mucous membrane of mouth (undertakes scrape in cheek) allowing to find the sexual chromatin containing characteristic chromatin lump (inherent only in female persons), the relevant medical commission issues to the sportswoman the certificate valid for all the time of its sports activity.

The males who are revealed as a result of sex-control (they are declared for participation in competitions on triathlon as females), and also the sportsmen who were not on anti-doping and sex-control, act from competitions and are disqualified [1; 6].

Note. The legendary American bicycle racer, the seven-time winner of "Tour de France" (extent of cycling race of 3642 km, begins on July 3 in Rotterdam (Netherlands) and comes to the end with the finish on July 25 in Paris) Lance Armstrong, who come to cycling on triathlon, where also in due time was the champion, didn't undergo anti-doping control, was disqualified and deprived of all received awards, having finished his sports career disgracefully.

Conclusions

It is possible to draw the following conclusions on the basis of the conducted research:

1. The groups of the pharmacological substances causing out-of-limit mobilization and excessive use of energy sources in organism, which promote the improvement of sports results, but create conditions for the development of heavy violations of the state of health owing to decrease in the protective mechanism of self-preservation of the person, are forbidden to application in sport by the World Anti-Doping Agency.

2. The procedure of anti-doping control is carried out concerning winners and prize-winners of significant competitions, and also sportsmen, which were determined by lot and includes registration of the sportsman, delivery of necessary portion of urine by it, definition of its acidity, division of test into two bottles, marking, sealing up and sending one sample to the laboratory for identification of existence or lack of dope in it.

3. The main type of the sanctions, which are applied to triathletes at the confirmed positive result of doping test, is disqualification, which can have duration, various on time (of 1 year to lifelong) depending on the premeditation or inadvertency of the use of the forbidden substances and the existence of similar violations in the previous sports career of the sportsman.

4. Sex-control is carried out for the definition of their sex in doubtful cases at responsible competitions in triathlon at the absence at female persons of the certificate.

Prospects of further researches. The subsequent researches will be directed to the assessment of the elicited facts of application of the forbidden pharmacological substances by triathletes and studying of the key questions, which are devoted to sport, free from dope.

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