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CONTENT

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Improvement of sports preparedness of young taekwondists

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Purpose: *to prove the directions of improvement of sports preparedness of young taekwondists for the purpose of improvement of results of their competitive activity and technical-tactical skill.*

Material & Methods: *the following methods are used during the research: theoretical analysis and synthesis of scientific and methodical references; pedagogical supervision, poll of 19 leading experts and experts on taekwondo and 24 young taekwondists, questioning; analysis of video records of competitive activity of young taekwondists; method of tests; method of expert evaluations; pedagogical experiment; timekeeping; modeling.*

Results: *it is proved that the directing activity of a coach gains the exclusive value for the improvement of sports skill and the increase of efficiency of the training process of young taekwondists, on the one hand, and, on the other hand – the use of the correcting information at the purposeful self-checking of taekwondists; negative tendencies in the modern training process of young taekwondists are defined.*

Conclusions: *the use of complex of the specialized trainers and the method of a circuit training allows teaching quite really young taekwondists attacking and defensive actions, promotes the essential improvement of sports preparedness of young taekwondists; the assessment procedure of sports preparedness of young taekwondists has to consider elements of the productive and often applied technical actions in competitive duel meets.*

Keywords: *taekwondo, taekwondist, trainings, competitive technique, specialized trainers.*

Introduction

The analysis of competitive activity of young taekwondists demonstrates that it take place in constantly changeable conditions, at deficiency of time and need to make the decision in the conditions of counteraction of the opponent [2, p. 30]. Young taekwondists in duel meets use basic methods more often several times, than all others. The analysis of such researches indicates the need at the corresponding stage of sports preparation to improve the basic technique taekwondo and to introduce the corresponding amendments in programs of development and improvement of special physical training of taekwondists. The achievement of the maximum indicators of competitive activity is directly connected with the total amount of training loads which reached critical values for today [3, p. 45]. The last forces coaches and sportsmen to look for more effective ways of preparation. At the initial stages of long-term preparation the sports result is defined by perfection of movements which make the basis of technical technique of taekwondo [7, p. 56]. Being based on results of the scientific research, it is possible to claim that the progress of performance of young taekwondists at competitions, generally depends on ability technically correctly to perform rather simple attacking and defensive operations, from ability quickly and in due time to move and consider distance to the rival.

The modern level of sporting achievements in taekwondo demands the purposeful organization of long-term training of young sportsmen, the search of more and more effective organizational forms, means and methods of educational and training work, and also control of level of preparedness as the instrument of management and planning of the training process. Our research was based on the works of K. V. Ananchenko, 2014 [1]; N. V. Boychenko, 2015 [2]; S. V. Pavlov, 2006 [5]; S. L. Pakulin, 2015 [6]; A. S. Rovnyi, 2004 [7] and other scientists. The analysis of scientific literature found the insufficient development of problem of improvement of the training process of taekwondists, taking into account the level of their preparation [9]. The relevance of our research is explained by the increase in requirements what are presented to the level of technical-tactical and physical fitness in modern taekwondo and shortcomings of the operating technology of assessment of preparedness of young sportsmen.

Speed of performance of techniques constantly grows in modern taekwondo, their efficiency due to use of different preparatory actions increases, are developed new technical-tactical connections that allow to win victory, change competition rules [4, p. 69]. Therefore the scientific perspective of improvement of sports preparedness of young taekwondists is very urgent, needs special researches.

Communication of the research with scientific programs, plans, subjects

The research is executed according to the Built plan of the research works of Kharkiv state academy of physical culture for 2011–2015 on the subject “Individualization of the training process of the qualified wrestlers”.

The purpose of the research:

to prove the directions of improvement of sports preparedness of young taekwondists for the purpose of improvement

of results of their competitive activity and technical-tactical skill.

Material and Methods of the research

The following methods are used during the research: theoretical analysis and synthesis of scientifically-methodical references; pedagogical observations, polls, 19 leading experts and experts on taekwondo and 24 young taekwondists, questioning; the analysis of video records on the competitive activity of young taekwondists; method of tests; method of expert evaluations; pedagogical experiment; timekeeping; modeling.

Results of the research and their discussion

Thanks to influence on all behavior of young taekwondists of sharp emotional experiences, the objective complexity are created in the system of long-term preparation of taekwondists (K. V. Ananchenko, 2014 [1]). Tactical skill of a sportsman grows together with age from one training to another for years of regular trainings as there are a lot of trainings by the loadings and conditions are equated to conditions of competitions. Holding trainings by the equivalence often exceeds tension of competitive activity. It was established in a number of researches that the higher class of skill of a sportsman is, the higher the rate of his cerebration is. Perception speed, processing of information which arrives the action choice in reply in many respects depend on specifics of sport, where imaginary search of possible actions in reply, both in defense, and in attack enters first of all. A sportsman should count mentally possible options and to choose from them the most expedient in the shortest periods. Quality of decisions, which are made depends on experience of the person, therefore possibility of the choice of the decision, its speed and efficiency, are not equivalent at a boy-beginner, who just began to be engaged in taekwondo, and the mature master who devoted to this type of single combat several years.

Tactical preparation or the solution of technical-tactical tasks is one of the main problems in the system of preparation of taekwondo. The fast assessment of situation and adoption only of the correct decision is required from a sportsman. All this occurs in the conditions of rigid counteraction of the rival who wishes to use the slightest delay for carrying out counterreception. At the same time very strict requirements are presented to mentality of a sportsman for which satisfaction the whole complex of special psychophysiological qualities where perceptual, psychomotor, intellectual and other qualities enter is necessary. Mental firmness – reliability of functioning of all systems in the conditions of deficiency of time is one of the main.

One of major factors that exerts serious impact on preparation of a taekwondist, is ability not only to comprehend deeply, but also to quickly switch the attention from one venue to another, to find interconnection in these venues and to make logically justified decision according to situation which quickly changes.

The work on improvement of tactical thinking ranks high among means and methods of preparation of young taekwondists, in our opinion. Of course, the solution of quickly tactical tasks in single combats in general and in taekwondo, in particular, by the specifics considerably differs from variety of options in sports. However tactical preparation in taekwondo has the specific features which need to be improved from the first years of training of wrestling.

Use of complex of the specialized trainers and method of circular training allows to teach completely really a young taekwondist to the attacking and defensive actions – quickly, effectively and without injuries. The most effective is use of training devices by the method of circular training at study to the attacking actions. The technique of improvement of the attacking actions is calculated on use of trainers in the mode of high-speed and power endurance, for stabilization of parameters of the main physical action [9].

The number of negative tendencies is observed in the modern training process of young taekwondists:

1. The training process practically does not consider results of control of sports preparedness at different stages of annual training cycle.
2. The lack of the only thought among specialists in the question of development of means and methods of increase in efficiency of performance in the course of competitive activity.
3. The insufficient clearness of the purposes and tasks for each stage of preparation of young taekwondists.
4. The separation of techniques of assessment and to control of preparedness for competitive activity.
5. the weak interconnection between results of control and process of optimization of preparedness of young taekwondists.

In our opinion, the assessment procedure of sports preparedness of young taekwondists has to consider elements of productive and often usable technical actions in competitive duel meets. As a result of the analysis of modern competitive activity of taekwondists, it was revealed by us that sportsmen carry out the essential number of kicks in sparring generally by four technical actions – they are "pit-chagi", "dvid-chagi", "dolio-chagi" and "nerio-chagi". They make more than 86,3% of total of the blows estimated by referees in the surveyed by us 127 duel meets.

These kicks are used by taekwondists generally in all attacking and counterattacking actions as is the most productive in competitive duel meets. It is explained by the insufficient level of technical, tactical and mental conditioning of young taekwondists, the low level of modeling of competitive activity.

We made 8 weeks experiment within the main pedagogical experiment for the purpose of definition of efficiency of modeling of competitive activity of taekwondists by means of interval running loadings and throws of a dummy. Performance of enough big volumes of uniform cross run (to 60 km for week in the first part of the experiment and to 40 km in the second) was characteristic feature of training of taekwondists of the control group (CG). The reliable increase in indicators of endurance according to all three tests (method of execution of kicks was registered by hands and legs, maneuvering method of execution, complexity of technique) (at the same time reliability of differences ($p<0,05$), at the same time as at representatives of CG only one indicator in uniform run on 3000 m is raised at the end of the experiment at sportsmen of EG. During the comparison of final data, EG yielded the reliable highest results, than control, in run on 3000 m ($p<0,05$), in the test with performance of kicks and the running test ($p<0,05$).

It demonstrates that ability to resist to fatigue during performance of interval high-intensity loadings considerably grew at sportsmen of EG as a result of modeling of motive activity.

Indicators of competitive activity of taekwondists of EG and CG before and after the experiment are provided in tab. 1. Sportsmen of both groups participated in the championship of the Kharkiv region at the end of the experiment. The activity of maintaining duel meet, what reliable decrease in number of the real attacks and increase in interval of the attack testifies to, reduced at representatives of CG ($p<0,05$). Against the background of increase in number of the estimated attacks ($p<0,05$) and increases in efficiency of the attack ($p<0,05$), reduced efficiency of defense ($p<0,05$). Besides, the number of the won collisions with considerable advantage and the number of preventions decreased, but reliable changes are not defined.

The analysis of results of competitive activity of sportsmen of EG demonstrates that they observe the growth of all indicators ($p<0,05$), but at the same time the number of preventions didn't change. In general it is possible to state the following: modeling of motive activity of wrestlers against the help of sprinting and performance of kicks in the interval mode promotes the increase in opportunity to resist to fatigue during performance of uneven intensive loadings [8, p. 118] that in turn is positively displayed on the efficiency of their competitive activity.

The fundamental difference of technique of study, which is offered from traditional, is that taekwondists fulfilled the new mode of motive activity in couples with use of the trainer "Tulub" and the computer program "Attack" from the very beginning by the time of achievement of the planned result on trainings. The correction of characteristics of the shock movement and biodynamic indicators of the kick was carried out selectively with emphasis for work of shoulder girdle and pelvis. The main results of the experiment (tab. 2) demonstrate that the qualitative party of the educational-training process raised considerably, time for preparation was reduced, the operational thinking of sportsmen and the technique of the attacking actions in taekwondo improved.

The permanent growth of number of competitions demands from the sportsman of the considerable development of special physical qualities and competent tactical skills of maintaining duel meet. The high importance of mental conditioning at each stage of study is caused by the special importance of the attitude of the young taekwondist towards results of performance at competitions of any level.

Conclusions

1. The scientific perspective of improvement of sports preparedness of young taekwondists needs special researches. The relevance of the conducted research grows also in the connection with modernization of mechanisms of assessment of actions of young taekwondists during duel meets and the lack programmatically-standard materials which allow estimating the level of their sports preparedness. Studying of mechanisms of control and assessment in the system of sports training of young taekwondists is of great importance as the foundation for sports skill is laid in the course of development of basic bases of technique and the main motor

Table 1

Indicators of competitive activity of young taekwondists of EG and CG before and after the experiment

Indicators	CG		EG	
	Before the experiment	After the experiment	Before the experiment	After the experiment
Number of the real attacks	6,03±0,08	5,52±0,087	5,6±0,12	6,4+0,1
The number of the estimated attacks	2,4±0,11	2,5±0,09	2,6±0,06	3,7±0,09
Attack interval (s)	54,5±0,75	55,8±0,94	37,5±0,8	49,1±0,9
Efficiency of the attack (%)	39,8±0,9	45,3±1,1	46,4±1,1	57,8+1,3
Efficiency of defense (%)	46,4±1,0	43,1±0,9	41,3±1,0	65,6+1,2
Number of flawless victories	3,12±0,1	3,0±0,12	3,12±0,11	5,38±0,13
Number of preventions	1,3±0,04	1,2±0,03	1,6±0,05	1,2+0,057

Table 2

The main of result of the experiment

Group	Statistics	Time of performance of a kick without rotation, s	Time of performance of a kick with rotation, s	Kick speed without rotation, $m \cdot s^{-1}$	Kick speed with rotation, $m \cdot s^{-1}$	Force of the shock movement without rotation, kG	Force of the shock movement with rotation, kG
CG	$\bar{X}$±m	1,68±0,12	1,43±0,29	1,60±0,32	1,62±0,27	68±4	81±5
EG	$\bar{X}$±m	1,15±0,04	0,77±0,15	2,41±0,25	3,35±0,44	77±5	94±6
	Growth	0,53	0,66	0,81	1,73	9	13
	t_{Cr}	13,75 p<0,05	7,2 p<0,05	6,13 p<0,05	12 p<0,05	4,7 p<0,05	3,2 p<0,05

Note. *Coefficient at n=12, f=2,07 by the t-criterion of Student.*

abilities are formed. In modern practice test standards are the main tool of technology of control and assessment in taekwondo, however now they have no due scientific and metrological justification as the only approach to the importance of different types of preparation concerning the level of sports qualification of young taekwondists is not developed.

2. Use of complex of the specialized trainers and method of circular training allows to teach completely really young taekwondists to the attacking and defensive actions, promotes the essential improvement of sports preparedness of young taekwondists.

3. The assessment procedure of sports preparedness of young taekwondists has to consider elements of productive and often usable technical actions in competitive duel meets.

Prospects of the subsequent researches in this direction

In the next time perspective researches concerning the development of algorithm of the integrated assesment of sports preparedness of young taekwondists, which considers mistakes, which are made at the demonstration of elements of method of execution of kicks and tactics of maintaining duel meet, and allows to carry out the assessment of preparedness for the competitive activity more objectively.

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Improving the level of physical development and functional preparedness athletes in sports dancing on the stage of specialized basic training means step aerobics

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Purpose: *make analyze the impact of the step aerobics on the indicators of physical development and functional preparedness of athletes in Dance Sport on the stage of specialized basic training.*

Material & Methods: *20 athletes (10 sport duets) aged 14–15 years were divided into two groups: control (CG) and experimental (EG). To achieve the objectives we used methods: theoretical - analysis and synthesis data of scientific and methodological literature; pedagogical methods: pedagogical observation; pedagogical testing; medical and biological methods: anthropometry, functional methods of research; methods of mathematical statistics.*

Results: *after the implementation of a training process means step aerobics significantly improved indicators of cardiorespiratory system of athletes in Dance Sport.*

Conclusions: *materials research to assess allow us to estimate the extent of influence of step aerobics on indicators of physical development and functional preparedness athletes in Dance Sport on the stage of specialized basic training.*

Keywords: *athletes 14–15 years, Dance Sport, physical development, functional preparedness, step aerobics.*

Introduction

At this stage of development sport dancing there is stiff competition sports duets in the world [2; 8]. Competitive activity in Dance Sport requires multiple performance intensive and difficult at the same time coordination exercise during of performance the five competitive dance programs in the final session [5; 9]. Sometimes victory in the competition depends on how effective sports duet can perform the final part of their programs in the final round [1; 3; 4; 7].

Increased requirements that currently apply to sports preparedness of athletes in Dance Sport and limited literature of this subject make it necessary to find new approaches to choice means of functional training of athletes at the stage of specialized basic training.

The purpose of the research:

the influence of step aerobics on indicators of physical development and functional preparedness athletes in Dance Sport on the stage of specialized basic training.

Research objectives:

1. Make analyze the literature on functional training of athletes in Dance Sport.

2. Identify the level of physical development and functional preparedness athletes in Dance Sport on the stage of specialized basic training.

3. Experimentally verify the impact of the step aerobics on indicators of physical development and functional preparedness athletes in Dance Sport on the stage of specialized basic training.

Material and Methods of the research

In the experiment took part 20 athletes (10 sports duets) aged 14–15 years who were divided into two groups: control (CG) and experimental (EG), for 5 sports duets in each. To achieve the objectives we used methods: theoretical – analysis and synthesis of scientific and methodological literature; pedagogical methods: pedagogical observation; pedagogical testing; medical and biological methods: anthropometry, functional methods of research; methods of mathematical statistics.

Results of the research and their discussion

At the beginning of the study, we have tested the girls and boys who are engaged in Dance Sport on the stage of specialized basic training. We evaluated indicators of physical development, a system of external breathing, parameters and cardiovascular system. The test results are shown in table 1.

Study anthropometric indicators in boys showed the following: the length of the body, muscle strength indicators on the results of carpal dynamometry match to the normal age, body weight below age norms; girls – the length of the body, muscle strength indicators on the results of carpal dynamometry and body weight – below age norms.

Table 1

Indicators of physical development and functional preparedness athletes at the start of the experiment (n=20)

№	Benchmarks		$\bar{X}$±m	S_x	CV,%
1	Body length, sm	girls	162,7±1,36	4,1	2,6
		boys	173,4±1,51	4,4	2,9
2	Body mass, kg	girls	48,93±1,47	4,40	8,9
		boys	56,55±2,71	8,14	14,3
3	Carpal dynamometry, kg	girls	22,65±0,75	2,25	9,9
		boys	38,30±1,40	4,21	11,9
4	Step test, st/un.	girls	63,4±1,5	4,4	17,1
		boys	65,7±1,4	3,3	19,6
5	VC, liters	girls	2910±60	170	28,6
		boys	3400±45	165	26
6	Stange, s	girls	44,2±1,6	2,9	20
		boys	55,3±1,8	3,1	18
7	Gincha, s	girls	29,6±1,2	3,5	10,4
		boys	33,9±1,3	2,9	14,1
8	RR, cycle/min	girls	19,4±0,6	1,6	8,2
		boys	19,1±0,9	1,4	7,6
9	Pulse, beats/min	girls	80,4±0,9	2,1	12
		boys	78,1±1,3	3,2	15,7

In indicators of cardiovascular system boys and girls have the following results:

The boys at the beginning of pedagogical experiment have average of group result of step test 65,7±3,3 st/un. This indicates that the boys at the beginning of the experiment have average indicator of operability. For individual characteristics 83% have average indicator, 17% has below the average indicator.

When assessing operability of girls have got average of group result of step test 63,4±4,4 st/un. This indicates that girls at the beginning of the experiment have below average indicator operability. For the individual characteristics: 66% have average indicator, 34% below the average indicator.

Heart rate of boys equal 78,1±3,2 beats/min; girls 80,4±2,1 beats/min, and point to normality indicator for children of this age. For the individual characteristics: 74% of girls have indicators which match to the norm, and 24% have higher than normal rates. In boys: 82% have indicator of norm and 18% have indicator above norm.

Also important in assessing the functional systems are indicators of external breathing.

In indicators of VC the girls have estimate below average 2910±170 liters. and require further development of this functional system. The boys have estimated the average level 3400±165 liters.

Testing determined that the absolute difference between the indicators of boys and girls is 490 ml.

The value of RR 19,4±1,6 (girls), 19,1±1,4 (boys) in girls and boys shows On the development of respiratory function in there. It is above adequate for children of this age.

According to the tests of holding breath following results:

In the sample Stange the average results of the girls were 44,2±2,9 s, the average results of the boys were 55,3±3,1 s.

Averages indicators in the sample Gincha, the girls were 29,6±3,5 s, boys were 33,9±2,9 s.

The values of parameters in functional tests Stange and Gincha boys and girls match age norm.

For coefficient of variation of dancers in the CG and the EG observed uniformity parameters in six tests (body length, body mass, carpal dynamometry test Gincha, RR, pulse) CV from 2,6% to 15,7%. In three tests (step test, VC, pulse) indicators of the average degree of uniformity, CV from 17,1% to 28,6%.

In order to improve functional training athletes in Dance Sport we proposed to introduce in the training process of dancers step aerobics means. On the basis indicators of physical development and operational functional readiness of athletes has been correction training loaded.

The control group continued training process as usual. In the process of training the experimental group at the end of the main part exercise classes added step aerobics: basic steps were performed with increasing amplitude and emphasis on correct technique movements. At that movements connected in simple combination or followed one another on the basis of a linear progression [6; 10]. We have not used turns and difficult moving around of the step platform. Load regulated so that the indicator of heart rate fluctuated within the target zone of moderate power. After the introduction of this method we conducted a retest. The results are shown in table 2.

Changes in body length and body mass indicators are not reliable in both groups studied athletes ($p>0,05$). According to indicators of height in girls in CG increase was 1,4%, in EG was 1,2%. And in boys increase was: in CG 1,7%, and EG 1,6%. According to indicators of body mass in girls increase was 1,2% in CG and EG was 1,3%. In boys increase was: in CG

1,8%, in EG 1,9% (p>0,05).

Increase in indicators carpal dynamometry was: girls CG, 4,8%, boys, 2%; in EG: girls 10,5%, boys 9,9%.

After the introduction of methods with means step aerobics results Harvard step test have a positive trend. In EG group of girls increase was 8,7%, of boys 9,3%; in CG also discovered a positive trend: the result of girls increased on 3,4%, of boys 2,7%. In EG differences in results are significant at p<0,01 in boys and girls. In CG changes were not significant at p>0,05.

Dynamics of indicators of VC next: CG girls increase 4,3%, boys 2,3% (p>0,05). In EG parameters vital capacity increased, the increase amounted to 9,1% girls, 7,2% boys (p<0,05).

It's positive changed indicators of breath on inhalation and exhalation in both groups, but in group witch was engaged in the experimental method, indicators were better than in group which was engaged in the traditional method. So growth indicators in the sample Stange in CG were: girls 7%, boys 4,5% (p>0,05). In this figure increased EG: girls 9,5% to 9,3% of boys. In EG this significant changes at p<0,05.

In the sample Gincha in CG increase was: girls 7,8%, boys 6,5% (p>0,05). In experimental group the figure increased: girls 12%, boys 11,9%. In EG changes were significant at p<0,05.

In testing of respiratory rate growth indicators in CG were: girls 2,3%, boys 2,7 (p>0,05). In experimental group, the figure increased: girls 11,9%, boys 15,2%. In EG changes were significant at p<0,05.

The analysis of heart rate control group of athletes indicates little change: the girls increase was 2,3%, boys 1,3%. In experimental group, there have been more significant changes: boys result increased on 4,8%, girls on 5,5%. Pulse rates of boys and girls of EG during the experiment have reliable differences (p<0,05), it's indicating of a significant shift and increase adaptive capacity of the organism boys and girls experimental group.

Conclusions

1. After analyzing the scientific and methodological literature we found that today in Dance Sport no scientifically based program of functional preparation athletes during long-term training. There are only a few studies on the different stages of long-term training. Not detected and use mean of step aerobics to improve the level of physical development and functional preparedness athletes.

2. The level of physical development and functional preparedness athletes at the stage of specialized basic training have this assessment: indicators of body length, body mass and carpal dynamometry are within the norm; operability indicators are below average; pulse parameters correspond to the norm for athletes of this age; VC indicators have evaluation below average; indicators tests at samples Stange and Gincha match age norm; RR below normal.

3. During the period of pedagogical experiment detected the positive impact of the step aerobics on indicators of physical development and functional preparedness athletes in Dance Sport on the stage of specialized basic training. Indicators of physical development were no significant changes, but have positive dynamics. According to indicators of body length girls in CG increase was 1,4% in EG 1,2%. And increase boys CG was 1,7%, and EG 1,6% (p>0,05). According to indicators of body mass girls increase were: in CG 1,2% and in EG 1,3%. The boys increase was: in CG 1,8%, in EG 1,9% (p>0,05). Increase of indicators carpal dynamometry in CG were: 4,8% girls, 2% boys; in EG girls 10,5% and boys 9,9%.

4. After the introduction of experimental methods there

Table 2

Comparative analysis of physical development and functional preparedness of athletes at the end of the experiment (n=20)

№	Benchmarks		Athletes before		CG after		t, t_{tabl}=2,086	p	EG after		t, t_{tabl}=2,086	p
			$\bar{X}$	m	$\bar{X}$	m			$\bar{X}$	m		
1	Body length, sm	girls	162,7	1,36	163,3	1,4	**–0,36**	>0,05	163,5	1,22	**–0,50**	>0,05
		boys	173,4	1,51	175,2	1,7	**–1,00**	>0,05	176,6	1,67	**–1,79**	>0,05
2	Body mass, kg	girls	48,93	1,47	48,2	1,2	**0,45**	>0,05	46,4	1,27	**1,53**	>0,05
		boys	56,55	2,71	55,2	1,8	**0,64**	>0,05	55,9	1,89	**0,30**	>0,05
3	Carpal dynamometry, kg	girls	22,65	0,75	23,8	0,9	**–0,90**	>0,05	25,3	0,46	**–2,41**	<0,05
		boys	38,3	1,4	39,4	1,5	**–0,65**	>0,05	42,2	0,9	**–2,57**	<0,05
4	Step test, st/un.	girls	63,4	1,5	64,9	1,4	**–0,88**	>0,05	69,4	1,7	**–3,35**	<0,01
		boys	65,7	1,4	67,5	1,3	**–1,10**	>0,05	72,4	1,6	**–3,86**	<0,01
5	VC, liters	girls	2910	60	3040	57	**–1,20**	>0,05	3200	64	**–2,60**	<0,05
		boys	3400	45	3480	50	**–0,82**	>0,05	3623	46	**–2,30**	<0,05
6	Stange, s	girls	44,2	1,6	47,5	1,7	**–1,82**	>0,05	48,8	1,4	**–2,66**	<0,05
		boys	55,3	1,8	57,8	1,6	**–1,36**	>0,05	60,3	1,7	**–2,67**	<0,05
7	Gincha, s.	girls	29,6	1,2	32,4	1,3	**–1,77**	>0,05	33,5	1,3	**–2,47**	<0,05
		boys	33,9	1,3	36,2	1,4	**–1,40**	>0,05	38,1	1,5	**–2,51**	<0,05
8	RR, cycle/min	girls	19,4	0,6	19	0,7	**0,35**	>0,05	17,1	0,5	**2,19**	<0,05
		boys	19,1	0,9	18,6	0,8	**0,38**	>0,05	16,2	0,8	**2,22**	<0,05
9	Pulse, beats/min	girls	80,4	0,9	78,2	0,8	**1,69**	>0,05	76,8	0,7	**2,85**	<0,05
		boys	78,1	1,3	77,1	1,4	**0,61**	>0,05	74,4	0,9	**2,49**	<0,05

have been more significant changes of functional preparedness in EG at $p<0,05$ and $p<0,01$ and in CG not significant at $p>0,05$.

The prospects for further research. Further research will be aimed at improving the functional preparedness of athletes in Dance Sport on the next stage long-term preparation by including in the training process special means sports aerobics aimed at developing cardiovascular and respiratory systems.

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Technique of the biomechanical analysis of execution of upward jump piked

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Purpose*: the biomechanical analysis of execution of upward jump piked.*

Material & Methods: *the following methods of the research were used: theoretical analysis and synthesis of data of special scientific and methodical literature; photographing, video filming, biomechanical computer analysis, pedagogical observation. Students (n=8) of the chair of national choreography of the department of choreographic art of Kiev national university of culture and art took part in carrying out the biomechanical analysis of execution of upward jump piked.*

Results: *the biomechanical analysis of execution of upward jump piked is carried out, the kinematic characteristics (way, speed, acceleration, effort) of the general center of weight (GCW) and center of weight (CW) of biolinks of body of the executor are received (feet, shins, hips, shoulder, forearm, hands). Biokinematic models (phases) are constructed. Power characteristics are defined – mechanical work and kinetic energy of links of legs and hands at execution of upward jump piked.*

Conclusions: *it is established that the technique of execution of upward jump piked considerably influences the level of technical training of the qualified sportsmen in gymnastics (sports), in aerobic gymnastics (aerobics), diving and dancing sports.*

Keywords: *biomechanical analysis, technical training, upward jump piked, a sportsman (an executor).*

Introduction

The development of modern dancing sports, gymnastics, and jumps in water causes the need of constant improvement of all parties of training of the qualified sportsmen, including technical. Traditional methods of technical training in these sports do not meet modern requirements of skill level of sportsmen [2; 9; 10; 21].

The analysis of scientifically-methodical literature confirms perspective in training of coaches-choreographers of the directions of choreography (national, classical, modern), and also in the theory and practice of many sports (artistic and aerobics gymnastics (aerobics), diving, acrobatic rock'n'roll but other). This analysis also confirms the lack of researches, in which influence of the biomechanical analysis of basic movements on improvement of technical training of the qualified sportsmen, was considered.

Communication of the research with scientific programs, plans, subjects

The research was conducted in implementation of the complex scientific project 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:

the analysis of biomechanical characteristics of the performance of upward jump piked.

Research tasks:

1. To define perspective of technical training of the qualified sportsmen of dancing sports, gymnastics, jumps in water.

2. To define biomechanical characteristics of the performance of upward jump piked.

Material and Methods of the research

Methods of the research became: theoretical analysis and synthesis of data of special scientifically-methodical literature; photographing, video filming, biomechanical computer analysis, pedagogical observation.

Students (n=8) of the chair of national choreography of the faculty of choreographic art of Kiev national university of culture and art took part in carrying out the biomechanical analysis of performance of upward jump piked. Video filming, on the basis of which have received time-lapse performance of upward jump piked , was used in our researches. The essence of video filming was that knowing the frequency of shots (the accelerated shooting – 59 shots/s) and passing of way of the general center of mass of bio-links (foot, shin, hip, shoulder, forearm, hand) (in time from 1–3–5.... shots etc.) necessary characteristics were calculated: trajectory, speed, acceleration, effort.

The mathematical model of creation of trajectory of the center of weight (CW) of links of leg is used in the work: feet, shins, hips; arms: shoulder, forearm, hand [2; 8].
1. Creation of segment of passing of CW of body links:
Lex. – length of body of the executor;
l(r) –linear size of link of body.

$$l(r) = \frac{l_{CW\ body\ links} \times L_{ex.(linear)}}{L_{ex.(photogram)}}, \quad (1)$$

where l_{CW} – reference point size on the photogram;
Lex. (executor) – real linear size of reference point;
l(r) – real linear size of CW of body links.

2. Definition of the way *S* passing body links in the area of segment:

$$S = \frac{\pi r n}{180}, \quad (2)$$

where π – 3,14;
r –radius of CW of body links (segment);
n –angle of passing of CW of body links in the area of segment.

3. Determination of speed of movement of CW of body links on time (V_F):

$$V_k = \frac{S}{t} \quad (3)$$

4. Definition of acceleration of movement of CW of body links:

$$\alpha = \frac{V^2}{r} \quad (4)$$

5. Definition of acceleration of linear movement of CW of body links:

$$\alpha = \frac{V_1 - V_0}{t};\ \alpha = \frac{V_2 - V_1}{t};\ \alpha = \frac{V_3 - V_2}{t} \quad (5)$$

6. Definition the effort (*F*) made for CW of body links in time (in shot):

$$F = m(\alpha - g), \quad (6)$$

where m mass of link of body;
a – acceleration of movement of CW of body links;
g = 9,8 m·s^{-2}.

The size *dF/d*j is used in the work – difference of value of effort, which is attached to the body GCW in the following shots to previous, which were divided into difference of bending-extension of knee-joint of the sportsman (executor) [3].

Results of the research and their discussion

The creation of performance of upward jump piked has the sequence: running start, jumping on support (floor), take-off, unsupported movement (flight), landing. We carried out the biomechanical analysis of performance of upward jump piked in take-off phases, unsupported movement (flight).

The certain phases of performance of upward jump piked by us on the basis of its biomechanical analysis (tab. 1).

It is established that the spending time for performance of upward jump piked equals 0,63 s. From them:

1) 0,27 s – the general actions of body links: swing movements of hands, actions of links of legs (take-off from support-floor) for removal of GCW of body in the unsupported movement;

2) 0,03 s – the vertical unsupported movement of all body links;

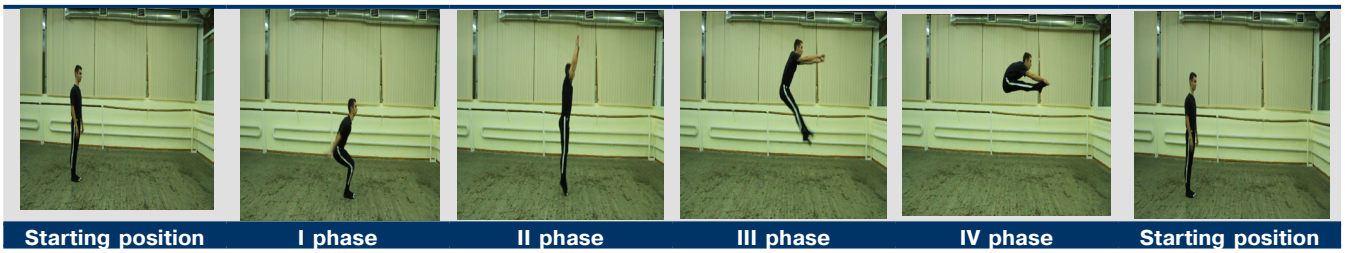
3) 0,33 s – links of legs and hands on segment performed by upward jump piked.

We defined the biomechanical kinematic characteristics of links of hands, legs at take-off from optimum pose and their actions in the unsupported movement when performing upward jump piked for the solution of tasks of the research: way, speed, acceleration, effort (pic. 2–13).

Take-off by legs from support is followed by swing movements of hands which give kinetic energy for acceleration of GCW of body of breakaway from support and increase efficiency of knee stretching.
In figures 2–5 biomechanical characteristics of the movement of CW of links of hands are provided when performing upward jump piked.

The data of biomechanical characteristics of the movement of CW of links of arms when performing upward jump piked (t – 0,238 s):

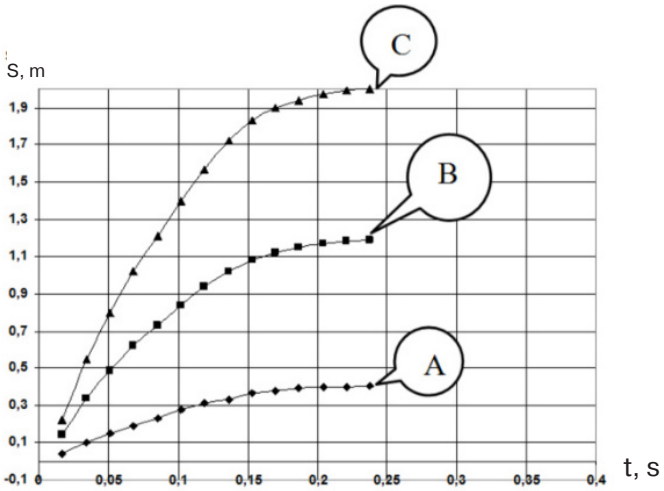
S: shoulder – 0,4 m; forearm – 1,19 m; hand – 2,04 m.
V: shoulder – 0,96 m·s^{-1}; forearm – 3,12 m·s^{-1}; hand – 4,83 m·s^{-1}.



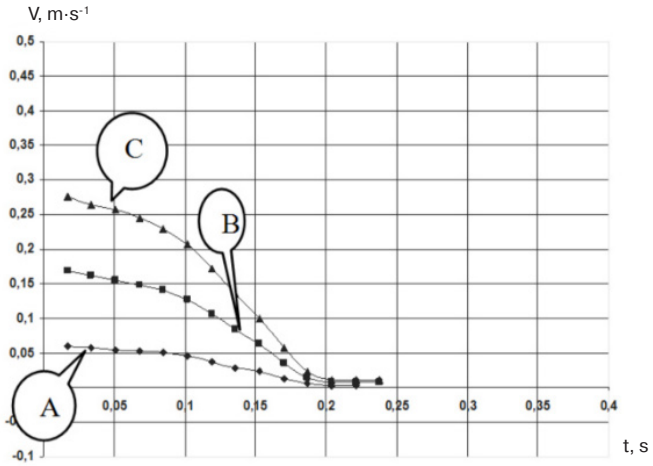
Pic. 1. The main phases of performance of upward jump piked

Table 1
Phases of performance of upward jump piked

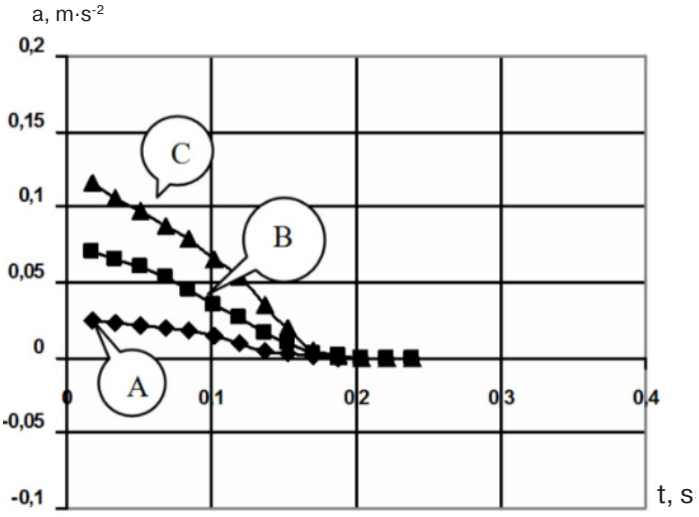
Phase	Characteristic	Time of performance, s
I	The optimum pose to start performance of upward jump piked	0–0,63
II	Outlet in the unsupported movement	
III	Performance of upward jump piked	
IV	The maximum height of body in unsupported movement when performing upward jump piked	



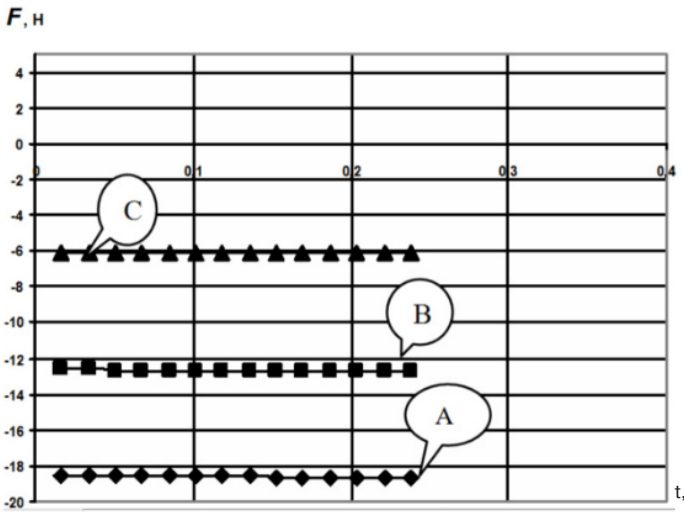
Pic. 2. Schedule of way (*S*) of CW of links of arms



Pic. 3. Speed (*V*) of CW of links of arms

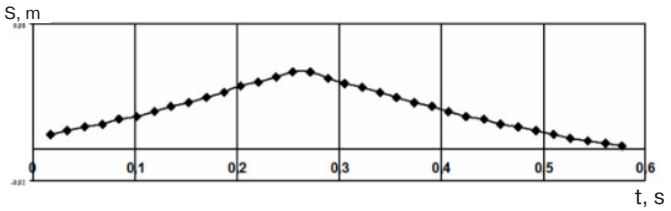


Pic. 4. Acceleration (*a*) of CW of links of arms

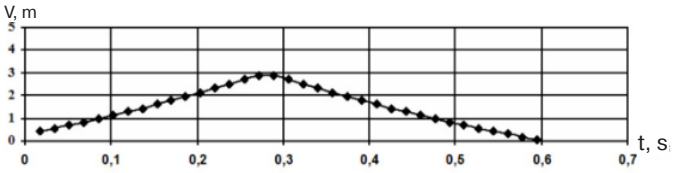


Pic. 5. Effort (*F*) is made for CW of links of arms

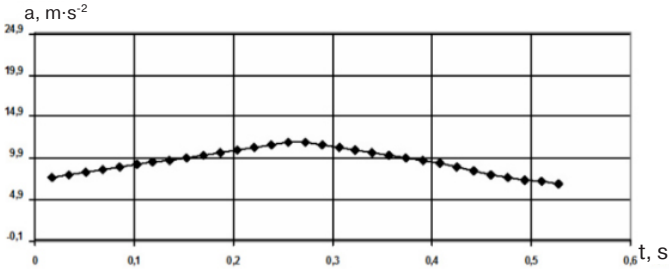
Note: *A – trajectory of the movement, speed, acceleration, effort of CW of* ***shoulder;*** *B – trajectory of the movement, speed, acceleration, effort of CW of* ***forearm;*** *C – trajectory of the movement, speed, acceleration, effort of CW of* ***hand****.*



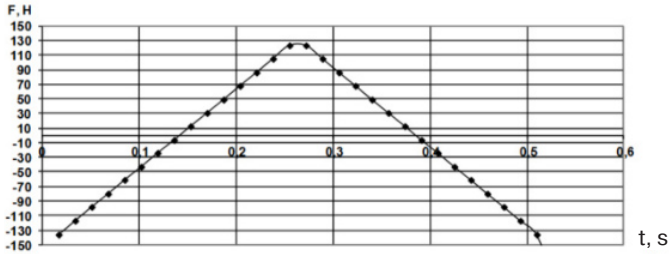
Pic. 6. The schedule of trajectory of way (*S*) of GCW of body when performing upward jump piked



Pic. 7. The speed (*V*) of GCW of body when performing upward jump piked



Pic. 8. Acceleration (*a*) of GCW of body when performing upward jump piked



Pic. 9. The effort (*F*) made for GCW of body when performing upward jump piked

a: shoulder – 6,4 m·s^{-2}; forearm – 24,3 m·s^{-2}; hand – 35,3 m·s^{-2}.
F: shoulder – –6,4 H; forearm – –18,8 H; hand – –15,8 H.
In phase of take-off, leg stretching distances of GCW of body of the sportsman (executor) from the place of support (pic. 6–9)

Take-off in jump from support provides acceleration of GCW of body of the sportsman (executor) and moves him in the direction of the unsupported movement.

The optimum pose of the beginning of take-off of legs (extension of knee-joints – 84°) is defined out of which the sportsman brings body in the unsupported movement.

The biomechanical kinematic characteristics of GCW of the sportsman's body when performing upward jump piked:

Way ***(S)*** of GCW of body of the sportsman – 0,75 m:

– in phase of take-off of legs from support – 0,33 m,
– in the vertical unsupported movement – 0,09 m,
– in the unsupported movement of performance of upward jump piked – 0,33 m.

Average speed ***(V)*** of GCW of body of the sportsman – 1,54 m·s^{-1}.
Average acceleration ***(a)*** of GCW of body of the sportsman – 9,8 m·s^{-2}.
Average effort ***(F)*** of GCW of body of the sportsman – 12,33 H.
Joint actions of links of body of the sportsman in the phase of take-off and the vertical unsupported movement gave opportunity of performance of upward jump piked in the unsupported movement (the III–IV phases; pic. 10–13).

We have numerical value of effort of CW of links of legs with the sign minus on the schedule (pic. 13). It indicates that the counteraction of force of attraction is directed towards effort of CW of links of legs [1]. The growth of efforts **(F)** of the center of mass of **foot** and the center of mass of **shin** differs by the direction from growth of effort **(F)** of the center of mass of **hip.**

The average data of biomechanical characteristics of the movement CW of links of legs when performing upward jump piked in the unsupported movement up:

S: hip – 0,18 m; shin – 0,6 m; foot – 0,92 m.
V: hip – 1,03 m·s^{-1}.; shin – 3,29 m·s^{-1}; foot – 5,1 m·s^{-1}.
a: hip – 5,79 m·s^{-2}.; shin –18,03 m·s^{-2}; foot – 28,06 m·s^{-2}.
F: hip – –68,5 H; shin – 48,6 H; foot – 44,3 H.

On the basis of the received kinematic characteristic,s we defined power characteristics of links of legs and hands – mechanical work ($A = \int_0^s F_s dS$) and kinetic energy ($E_k = \frac{mV^2}{2}$) [1] when performing upward jump piked in the unsupported movement up.

Mechanical work of swing actions of hands of the sportsman when performing upward jump piked equals: *A shoulder* – –2,56 J; *A forearm* – –22,37 J; *A hands* – –32,23 J.

Kinetic energy of links of hands performed by upward jump piked to the top point up equals: *E shoulder* – 0,87 J; *E forearms* - 6,33 J; *E hands* – 23,32 J.

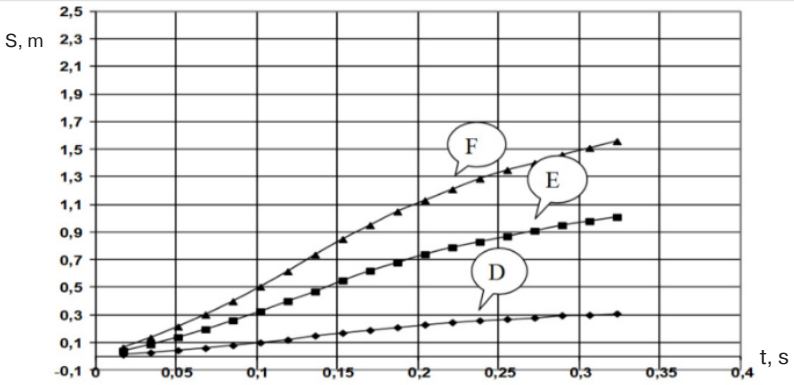
Mechanical work of links of legs of the sportsman in take-off phase from support when performing upward jump piked equals: *A* – 149,5 J.

Kinetic energy of links of legs in take-off phase from support equals: *E* – 74,7 J.

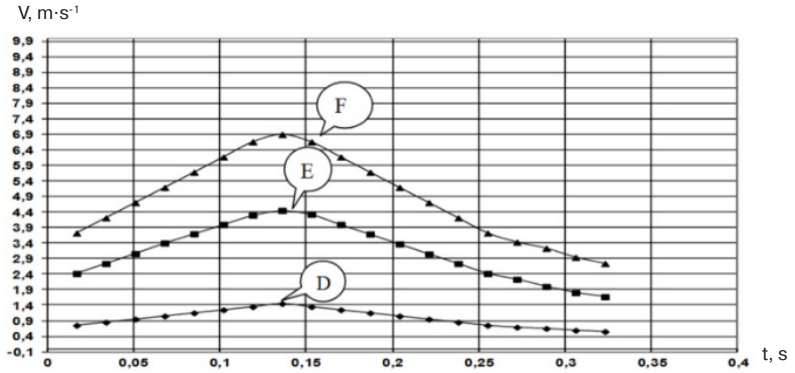
Mechanical work of removal of links of legs to the top point equals: *A feet* – 65,6 J; *A shins* – 55,5 J; *A hips* – 21,78 J.
Kinetic energy of links of legs performed by upward jump piked to the top point equals: *E feet* – 32,77 J; *E shins* of – 34 J; *E hips* – 8,02 J.

By results of the research, we can claim that power characteristics of performance of upward jump piked have such values:

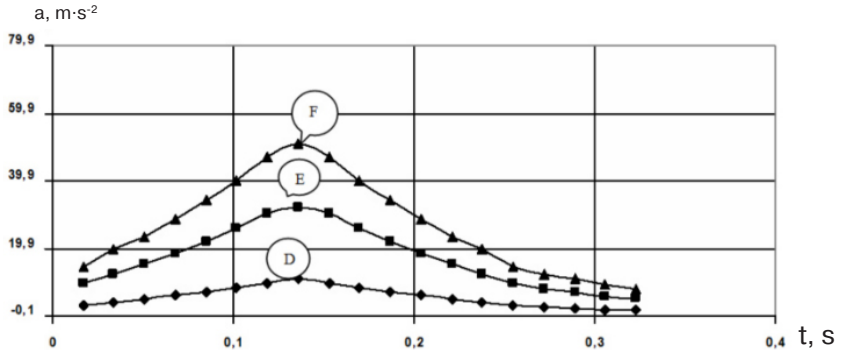
– mechanical work – 349,16 J;



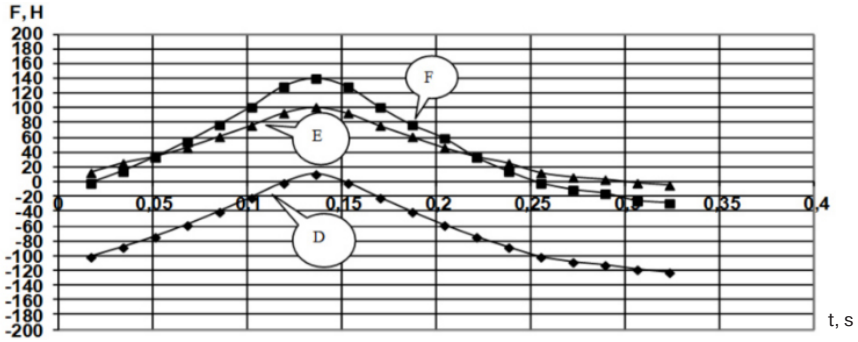
Pic. 10. **The schedule of trajectory of way *(S)* of CW of links of legs when performing upward jump piked in the unsupported movement:**



Pic. 11. **The schedule of speed *(V)* CW of links of legs performed by upward jump piked in the unsupported movement**



Pic. 12. **The schedule of acceleration (*a*) CW of links of legs performed by upward jump piked in the unsupported movement**



Pic. 13. **The schedule of efforts (*F*) of CW of links of legs performed by upward jump piked in the unsupported movement up**

Note: *D – trajectory of the movement, speed, acceleration, effort of CW of* ***hip****; E – trajectory of the movement, speed, acceleration, effort of CW* ***shins****; F – trajectory of the movement, speed, acceleration, effort of CW of* ***foot****.*

– kinetic energy – 180,01 J.

1 Dz ≈ 0,238846 calories (1 calorie = 4,184 Dz) [1].

The received researches by data demonstrate that the sportsman (executor) spends 83,45 kcal. (time of performance 0,63s) on performance of upward jump piked.
Power consumptions of internal friction of the musculoskeletal system of the sportsman (executor) and expense of radiation of thermal energy of body of the executor to the environment are not considered in the calculation [1; 5].

Conclusions

The biomechanical analysis of performance of upward jump piked gives the creative approach to the technique of development of the difficult elements, movements joint with kinds of jumps in dancing sports, gymnastics, jumps in water which will allow more effectively and rationally, with smaller physical expenses to improve technical training of the qualified sportsmen (executors).

Prospects of the subsequent researches have to be in the search of ways of application of fundamentals of biomechanics in this direction with introduction of methodical recommendations and writing of grants.

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Criteria of evaluation of indicators of speed of movements at young men in rowing

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Purpose: *to develop criteria of evaluation of indicators and components of physical quality of speed.*

Material & Methods: *young men, who specialize in rowing, that differ on age and sports qualification, were examined. sensorimotor reactions to sound and light irritants were investigated, and rate, time and speed of one movement, frequency of movements were defined by the developed by us technique of measurement of effect of training action. The process of testing models typical conditions of training and competitive activity and estimates performance of task.*

Results: *criteria of the assessment are developed for young men of different age and sports qualification, who go in for rowing on the basis of the conducted complex researches of indicators of physical quality of speed and elements making it (rate, time and speed of one movement, frequency of movements). The offered technique of researches allows studying force and mobility of nervous processes, functional endurance and psychomotor efficiency of sportsmen.*

Conclusions: *the developed criteria of evaluation of physical quality of speed allow finding specific psychophysiological features of organism of the sportsman, which will give the chance to introduce amendments in the improvement of high-speed abilities and to operate the training process effectively.*

Keywords: *speed, time and speed of one movement, frequency of movements, time of sensorimotor reactions to sound and light irritants.*

Introduction

High-speed characteristics of movements and actions unite the term – speed which characterizes ability of a person to make actions in the interval of time, minimum for these conditions, that is, it is specific ability to the emergency motive reactions and high speed of the movements, which are carried out in the absence of the considerable external resistance, difficult coordination of muscle work and not demanding big energy expenditure [3; 15].

The physiological mechanism of physical quality of speed is caused first of all by high-speed characteristics of nervous processes, is multipurpose property of the central nervous system and the peripheral neuromuscular apparatus, which are shown in speed of simple and difficult motive reactions, speed of the single movement, speed of the difficult (multiarticulate) movement, which is connected with change of postural pose in space or with switching from one action to another, the frequency of the movements [9; 10]. Still the sufficient level of high-speed and power preparedness of the motive apparatus, power of anaerobic systems of power providing, and also perfection of movement skills of the performed exercises and operations are necessary for their effective manifestation, except specific characteristics of nervous processes [1; 6].

High-speed abilities (visual, acoustical, tactile) are determined by speed of simple reaction – by time interval from the moment of emergence of signal until the start of motion.

Speed of reaction is characterized by the emergence of excitement in the receptor, participating in perception of signal, pass of the excitement in the central nervous system; the transition of alarm information on nervous ways, its analysis, the formation and carrying out the efferent signal from the central nervous system to muscle; the excitement of muscle and emergence of the activity mechanism in it. The maximum frequency of movements depends on the speed of transition of the motive nervous centers from condition of excitement in condition of braking and back, i. e. on the level of lability of nervous processes [4; 7].

The possibility of increase in speed in locomotory cyclic acts is limited. The increase in speed of movements is reached not only by impact on actually high-speed abilities, but also other way – through education of power and high-speed and power abilities, high-speed endurance, improvement of technique of the movements in the course of the sports training, etc., i. e. by means of the improvement of those factors on which manifestation of these or those qualities of speed significantly depends [3; 8].

The range of mutual transfer of high-speed abilities is limited, as the low frequency of movements can be at good reaction to signal; ability to carry out with high speed starting stride in

sprinting does not guarantee high remote speed yet and vice versa. The direct positive transfer of speed takes place only in the movements which have similar semantic and programming parties, and also motive structure of [7; 11].

Speed of performance of complete physical actions – movements, changes of postural pose, attacks and defence in duel etc. has the greatest value in professional activity and sport. The maximum speed of movements, which a person can show, depends not only on high-speed characteristics of his nervous processes and speed of motive reaction, but also on other abilities: dynamic (high-speed) force, flexibility, coordination, level of proficiency in technique of the carried-out movements. Therefore high-speed abilities are difficult complex motive quality [5; 10].

The purpose of the research:

to develop criteria of evaluation of indicators and components of physical quality of speed.

Material and Methods of the research

The young men, pupils of school of physical culture and students of higher education institutions, specializing in rowing at the age of 15–16 years (the first group of 25 people, 2 and 1 sports categories) and 17–18 years old were examined (the second group of 27 people, from them 20 first-rank sportsmen and candidates of the master of sports, and 7 who have the second sports category). Sensomotor reactions to sound and light irritants were investigated, and also speed, time and speed of one movement, frequency of movements, which were studied in three periods of the test (the first – 15 s, the second – 60 s, the third – 15 s), were determined by the technique of measurement of effect of the training action developed by us and were registered in the automatic mode. The process of testing models typical conditions of training and competitive activity and estimates performance of the task. The detailed technique of the research is published in "Slobozans`kij naukovo-sportivnij visnik" 2015, No. 4(48), – P. 19–25 [2].

Results of the research and their discussion

Results of researches are presented in tab. 1. The measurement of effect of the training action at sportsmen of 15–16 years old, specializing in rowing, showed that the rate of movements was observed from 22 to 29 movements, on average – 25,20±0,62 movements in the first period of the test; in the second period – from 22,25 to 33,75 movements, on average – 27,8±1,02 movements; in the third period – from 24 to 33 movements, on average – 29,8±0,80 movements; totally on three periods – from 22,5 to 32,8 movements, on average – 27,7±0,91 movements. The rate of movements in the second period increased by 10,3%, in the third period – for 18,3% in comparison with the first period.

Time of one movement in the first period of the research fluctuated from 0,681 s to 0,517 s, on average – 0,595 s; in the second – from 0,674 s to 0,445 s, on average – 0,539 s; in the third – from 0,625 s to 0,454 s, on average – 0,503 s; totally on three periods from 0,667 s to 0,456 s, on average – 0,541 s. The time of one movement decreased in the second period by 10,4%, in the third period – for 18,3% in comparison with the first period.

Speed of one movement in the first period of the test was ranging from 0,441 $m \cdot s^{-1}$ to 0,580 $m \cdot s^{-1}$, on average – 0,504 $m \cdot s^{-1}$; in the second period – from 0,445 $m \cdot s^{-1}$ to 0,674 $m \cdot s^{-1}$, on average – 0,556 $m \cdot s^{-1}$; in the third – from 0,480 $m \cdot s^{-1}$ to 0,661 $m \cdot s^{-1}$, on average – 0,596 $m \cdot s^{-1}$; totally on three periods from 0,449 $m \cdot s^{-1}$ to 0,657 $m \cdot s^{-1}$, on average – 0,554 $m \cdot s^{-1}$. When comparing with the first period the speed of one movement increased in the second period by 10,32%, in the third – for 18,25%.

Frequency of movements at measurement of effect of the training action changed in the first period from 1,46 Hz to 1,93 Hz, on average it was equal 1,68 Hz; in the second period – from 1,48 Hz to 2,25 Hz, on average – 1,85 Hz; in the third – from 1,60 Hz to 2,20 Hz, on average – 1,98 Hz, totally on three periods – from 1,50 Hz to 2,18 Hz, on average – 1,84 Hz. The smallest frequency of movements was noted in the first period, in the second increased by 10,12%, in the third – for 17,86%.

When determining effect of the training action at young men at the age of 15–16 years, who are going in for rowing, it was noted that speed was more on total indicator, than in the first period, for 9,9% and practically same in the second period (distinction of 0,3%), however in the third period speed exceeded total size for 7,6%, on the maximum indicator was more, than in the first period, for 13% and less in the second – for 2,9% and in the third on – 0,6%. Time of one movement on total size was less, than in the first period, for 10%, practically same as in the second period (distinction of 0,3%), however it was 7,5% more in the third period. Speed of one movement on three periods was more, than in the first period, for 9,9%, practically same, as in the second period (distinction of 0,4%), and less, than in the third period, for 7,6%. Frequency of movements totally on three periods of the test was more, than in the first period, for 9,5%, it is slightly less, than in the second period – for 0,5% and it is much less in comparison with the third period – for 7,6%.

Time research of sensorimotor reactions was conducted on sound and light irritants. Time of reaction to sound corresponded to 0,187±0,029 $m \cdot s^{-1}$, the best result – 0,182 s, deviation from average size for 2,75% and the worst – 0,200 s, deviation from the average size of 6,95%; time of reaction to light – 0,195±0,07 s at the minimum time 0,179 s and maximum 0,202 s, fluctuations from average size respectively 8,93% and 3,59%.

Sportsmen of 17–18 years old, specializing in rowing, the rate of movements in the first period made 24 to 32 movements, on average – 26,5±0,99 movements, in the second period – from 24 to 32,25 movements, on average – 28,07±1,02 movements; in the third period – from 23 to 42 movements, on average – 31,6±2,35 movements, totally on three periods – from 23,8 to 35 movements, on average – 28,3±1,26 movements in the test of measurement of effect of the training action. The increase in rate of movements on average for 5,92%, in the third – for 19,24% was noted in comparison with the first period, in the second.

Time of one movement in the first period was on average 0,566 s at fluctuations from 0,468 s to 0,625 s; in the second period – 0,534 s (from 0,465 s to 0,625 s); in the third pe-

Table 1
Indicators of physical quality of speed (young man, rowing)

Indicators			Age							
			15–16 years old				17–18 years old			
			Rate (number of movements)	Time (s)	Speed ($m \cdot s^{-1}$)	Friquency (Hz)	Rate (number of movements)	Time (s)	Speed ($m \cdot s^{-1}$)	Friquency (Hz)
Effect of the training action	1-st period	M±m	25,20±0,62	0,595	0,504	1,68	26,5±0,99	0,566	0,530	1,76
		M_{max}	29	0,517	0,580	1,93	32	0,468	0,641	2,13
		M_{min}	22	0,681	0,441	1,46	24	0,625	0,480	1,60
	2-nd period	M±m	111,2±4,07 (27,8±1,02)	0,539	0,556	1,85	112,3±4,10 (28,07±1,02)	0,534	0,561	1,87
		M_{max}	135 (33,75)	0,445	0,674	2,25	129 (32,25)	0,465	0,645	2,15
		M_{min}	89 (22,25)	0,674	0,445	1,48	96 (24)	0,625	0,480	1,60
	3-rd period	M±m	29,8±0,80	0,503	0,596	1,98	31,6±2,35	0,474	0,632	2,11
		M_{max}	33	0,454	0,661	2,20	42	0,357	0,840	2,80
		M_{min}	24	0,625	0,480	1,60	23	0,652	0,460	1,53
	Totally	M±m	166±5,49 (27,7±0,91)	0,541	0,554	1,84	170,0±7,56 (28,3±1,26)	0,529	0,567	1,89
		M_{max}	197 (32,8)	0,456	0,657	2,18	210 (35)	0,428	0,701	2,33
		M_{min}	135 (22,5)	0,667	0,449	1,50	143 (23,8)	0,629	0,476	1,59

Time of sensorimotor reaction				
	Sound (s)	Light (s)	Sound (s)	Light (s)
M±m	0,187±0,029	0,195±0,07	0,166±0,005	0,188±0,005
M_{max}	0,200	0,202	0,203	0,223
M_{min}	0,182	0,179	0,146	0,164

Note. *The data are specified in brackets, which are provided to the uniform temporary indicator 15 s, in particular, 111,2:4=27,8 movements.*

riod – 0,474 s (from 0,357 s to 0,652 s); totally on average – 0,529 s at distinction from 0,428 s to 0,629 s. The reduction of time of one movement by 5,99%, in the third for 19,41% was observed in comparison with the first period, in the second period.

Speed of one movement in the first period changed from 480 $m \cdot s^{-1}$ to 0,641 $m \cdot s^{-1}$, on average it was 0,530 $m \cdot s^{-1}$; in the second period – from 0,480 $m \cdot s^{-1}$ to 0,645 $m \cdot s^{-1}$, on average – 0,561 $m \cdot s^{-1}$; in the third period – from 0,460 m s^{-1} to 0,840 $m \cdot s^{-1}$, on average – 0,632 $m \cdot s^{-1}$; totally – from 0,476 $m \cdot s^{-1}$ to 0,701 $m \cdot s^{-1}$, on average – 0,567 $m \cdot s^{-1}$. The speed of one movement increased in the second period by 5,85%, in the third – for 19,25% in comparison with the first period.

Frequency of movements in the first period on average equaled 1,76 Hz, the minimum indicator of 1,60 Hz, maximum 2,13 Hz; in the second period – 1,87 Hz (from 1,60 Hz to 2,15 Hz); in the third period – 2,11 Hz (from 1,53 Hz to 2,80 Hz); totally – 1,89 Hz (from 1,59 Hz to 2,33 Hz). In comparison with the first period the frequency of movements increased in the second period by 6,25%; in the third – for 19,89%.

Time of sensorimotor reactions to sound irritant equaled 0,166±0,005 s at the best size 0,146 s that made the difference 0,02 s or 13,69% and the worst indicator 0,203 (respectively 0,037 s or 22,29%); on light irritant – 0,188±0,005 s, at the minimum size 0,164 s that it is better than average value on 0,024 s or 14,63%, at the maximum size 0,223 s (it is less than average value on 0,035 s or 18,62%).

On total indicator in entire three periods of the test of the young man of 17–18 years old, going in for rowing, maintained on average rather high rate of movements which is 6,8% more, than in the first period, and practically same in the second period, and in the third period of the test characterizing possibilities of organism after long work to make the finishing jerk, speed was more average size for 11,7%. At the sportsman who showed the best result – totally 35 movements, the same tendency – 9,4% more than movements, than in the first period is defined, is 8,5% more, than in the second, and in the third speed was above total size for 20%. The minimum indicator of speed was identical in the entire periods of the test, that is the sportsman worked at the small quantity of movements evenly.

Time of one movement totally equaled 0,529 s that is 7% less, than in the first period, and for 0,95% it is, less, than in the second, there was more average size for 11,6% in the third period. When comparing indicator by the best result (0,428 s) the same tendency was noted, time decreased in comparison with the first period by 9,3%, with the second – for 8,6%. On the minimum indicator time of one movement was identical in the first and second periods of the test 4,3% more in the third period.

Speed of one movement totally equaled 0,567 $m \cdot s^{-1}$ that is 6,9% higher, than in the first period, and for 1% – in the second, and in the third period speed was 11,5% less. At the spoersman who showed the best result the same tendency remained: speed of one movement was 0,701 $m \cdot s^{-1}$ that is 9,3% more, than in the first period, and for 8,7%, than in the second, and in the third period speed was 19,8% less. The minimum indicator of speed of one movement corresponded to 0,476 $m \cdot s^{-1}$ and practically did not change during testing – was 0,8% less in the first and in the second the periods, and in the third period speed increased by 3,5%.

Frequency of movements on three periods of the test on average equaled 1,89 Hz and was more, than in the first period for 7,3% and in the second for 1%, in the third period the frequency of movements was the biggest and exceeded total size for 11,6%. The maximum indicator of frequency of movements – 2,33 Hz was more, than in the first period, for 9,3% and in the second – for 8,3%, in the third period there was the highest frequency of movements which exceeded average size for 20,2%. The minimum result equaled 1,59 Hz and practically did not change, in the first and second periods was 0,6% more and in the third period – is 3,9% less.

Criteria for evaluation of physical of quality of speed were developed and components of its elements (tab. 2) on the basis of the conducted researches.

The comparative analysis of results of the research shows that the average time of sensorimotor reaction to sound at sportsmen of 17–18 years old is 12,6% better, than at the age of 15–16 years, and on the minimum time – for 24,6%, the maximum time differs for 1,5%; the average time of sensorimotor reaction to light is also best of all in the senior group, than in younger, for 3,7%, on the minimum time – for 9,1%, for the maximum time – for 10,3%.

The rate of movements in 17–18 years old was more, than in 15–16 years, time of one movement is less, the speed and frequency of movements are higher on average for 4,8–5,1%; on the maximum indicator speed and speed increased, time of one movement decreased, the frequency of movements increased on average by 10,3–10,5%; on the minimum indicator speed and speed were more, time of the single movement is less, frequency is higher on average for 8,8–9,6% at the research of effect of the training action in the first period of the test.

The rate of movements was more, time of one movement – is less, the speed and frequency of movements – above on average for 1% in the second period of the test which characterizes long hard work in the senior age group in comparison with younger. The rate of movements was more, time of one movement – is less, the speed and frequency of movements – above on average for 4,5–4,7% on the maximum indicator in 15–16 years old. The speed was higher, time of one movement – is less, the speed and frequency of movements – are more on average for 7,8–8,1% on the minimum indicator in the senior group.

The rate of movements was higher, time of one movement – is 6,1% less, the speed and frequency of movements – are more on average on 6,0–6,5%%; on the maximum indicator speed – above, time of one movement – is less, the speed of one movement and frequency of movements – is more on average for 27,0–27,3%; and on the minimum indicator in the second group speed was less, time of one movement – is more, the speed and frequency of movements – are less on average for 4,3–4,5% in the third period of the research of effect of the training action in the second group (17–18 years old) in comparison with the first group (15–16 years old).

When comparing indicators of speed of both groups on three periods of the test, the following results were received: young

Table 2

Criteria for evaluation of physical quality of speed (young man, rowing)

Indicators		Assessment	Age							
			15–16 years old				17–18 years old			
			Rate (number of movements)	Time (s)	Speed ($m \cdot s^{-1}$)	Friquency (Hz)	Rate (number of movements)	Time (s)	Speed ($m \cdot s^{-1}$)	Friquency (Hz)
Effect of the training action	1-st period	satisfactorily	20–23	0,750–0,650	0,400–0,460	1,33–1,59	21–24	0,714–0,625	0,420–0,480	1,40–1,66
		good	24–27	0,649–0,550	0,461–0,545	1,60–1,86	25–28	0,624–0,536	0,481–0,560	1,67–1,92
		excellently	28–31	0,549–0,480	0,546–0,625	1,87–2,07	29–32	0,535–0,469	0,561–0,640	1,93–2,13
	2-nd period	satisfactorily	80–96 (20–24)*	0,750–0,620	0,400–0,480	1,33–1,60	88–100 (22–25)	0,680–0,600	0,441–0,500	1,47–1,67
		good	97–112 (24,25–28)	0,619–0,535	0,481–0,560	1,61–1,87	101–117 (25,25–29,25)	0,599–0,513	0,501–0,584	1,68–1,95
		excellently	113–130 (28,25–32,5)	0,534–0,465	0,561–0,645	1,88–2,17	118–134 (29,5–33,5)	0,512–0,448	0,585–0,669	1,96–2,23
	3-rd period	satisfactorily	21–24	0,715–0,620	0,420–0,484	1,40–1,60	23–26	0,652–0,576	0,460–0,521	1,53–1,73
		good	25–28	0,619–0,535	0,485–0,560	1,61–1,87	27–30	0,575–0,500	0,522–0,600	1,74–2,00
		excellently	29–32	0,534–0,465	0,561–0,645	1,88–2,13	31–34	0,499–0,441	0,601–0,680	2,01–2,27
	Totally	satisfactorily	121–145 (20,2–24,1)	0,740–0,620	0,405–0,484	1,34–1,61	132–150 (22–25)	0,681–0,600	0,441–0,500	1,47–1,67
		good	146–169 (24,3–28,2)	0,619–0,530	0,485–0,566	1,62–1,88	151–175 (25,2–29,2)	0,599–0,514	0,501–0,584	1,68–1,94
		excellently	170–193 (28,3–32,1)	0,529–0,466	0,567–0,643	1,89–2,14	176–200 (29,3–33,3)	0,513–0,450	0,585–0,667	1,95–2,22

Time of sensorimotor reaction				
Assessment	Sound (s)	Light (s)	Sound (s)	Light (s)
satisfactorily	0,207–0,195	0,205–0,190	0,198–0,176	0,197–0,182
good	0,194–0,182	0,189–0,174	0,175–0,163	0,181–0,166
excellently	0,181–0,169	0,173–0,158	0,162–0,150	0,165–0,150

Note. *The data are specified in brackets, which are provided to the uniform temporary indicator 15 s, 80:4=20 movements*

men of 17–18 years had speed more, than at sportsmen at the age of 15–16 years, time of one movement – is less, the speed of one movement and frequency of movements – above on average for 2,3–2,7%; by the best result speed is more, time of one movement – is less, the speed of one movement and frequency of movements – above on average for 6,5–6,9%; by the minimum result speed – is more, time of one movement – is less, the speed of one movement and frequency of movements – above on average for 5,9–6%.

According to the conducted researches and the received indicators defining physical quality of speed and also developed by criteria of the characteristic of this quality and the components of its elements, the assessment was given to psychophysiological features of condition of sportsmen.

In group of young men of 15–16 years old who are going in for rowing, the time of sensorimotor reactions to sound irritant on average corresponds to assessment "good", the best result – "good", the worst – is "satisfactorily", only on 0,007 s above lower bound of this assessment, i. e. is almost "unsatisfactory"; on light irritant – on average assessment "good", the best result –"good", the worst – is "satisfactorily", only 0,003 s separates from assessment – "unsatisfactorily".

At measurement of effect of the training action in the first period speed, time and speed of one movement, frequency of movements were defined by assessment "good", the best result – is "excellent", the worst – is "satisfactorily"; in the second period – "good" with approach tendency to assessment "excellently", the best result – is more than assessment "excellently", the worst – in average parameters of assessment "good"; in the third period – is "excellently", the best result is higher than parameters "excellently", the worst – on border of estimates "good" and "good" (distinction – one movement in speed indicator, 0,006 s time of one movement, 0,006 $m \cdot s^{-1}$ about the speed of one movement, 0,01 Hz the frequency of movements or 0,62–1,04%); totally –"good", the best result – is slightly more than assessment "excellently", the worst – is in average parameters of assessment "good".

The time of sensorimotor reactions to sound irritant corresponds on average to assessment "good", the best result – is 0,004 more from assessment parameters "excellently", the worst – is 0,005 less from assessment limits "good"; on light irritant – is "satisfactorily", the best result – is "excellently", the worst – is 0,026 less from assessment parameters "good" in the group of sportsmen of 17–18 years old.

At measurement of effect of the training action in the first period speed, time and speed of one movement, frequency of movements are characterized by assessment "good", the best result – the upper bounds of assessment "excellently", the worst – is "satisfactorily" on border of parameters of assessment "good"; in the second period –"good", the best result – is "excellently", the worst – is "satisfactorily"; in the third period – average mark "excellently", the best result – is higher than the parameters "excellently" on speed on 8 movements, time of one movement is less on 0,084 s, the speed of one movement is more on 0,16 $m \cdot s^{-1}$, the frequency of movements is 0,53 Hz higher or 23,35–23,53%, the worst indicator – on the lower bound of assessment "good"; totally on average – "good", the best result – is higher than the parameters "excellently" on all indicators for 4,95–5,4%, the worst – is "satisfactorily".

Elementary forms of manifestation of high-speed abilities can be in various combinations to other physical qualities and technical actions that characterizes complex manifestation of high-speed abilities in motive activity. The greatest value has the speed of performance of complete physical actions. However this speed only indirectly characterizes speed.

In our researches ability as soon as possible to gain the maximum speed was defined in the first period of the test of measurement of effect of the training action for start push or starting speed; in the second period ability as long as possible to keep the reached maximum speed was investigated on remote speed; in the third period high-speed endurance was studied.

One of the manifestations of physical quality of speed is the reaction speed which is of great importance in sport. The outcome of wrestling often depends on timely and rational reaction of the sportsman to changes in competitive situation or performance of starting action. Speed of reactions gives in to improvement by means of special exercises.
When performing hard muscular work at well trained people shortening of time of simple motive reaction and increase in excitability of the central nervous system and the neuromuscular apparatus, than at less trained is observed.

Conclusions

On the basis of the conducted complex researches of indicators of physical quality of speed and components of its elements (speed, time and the speed of one movement, frequency of movements), the criteria of their evaluation are developed for young men of the different age and sports qualification who are going in for rowing.
The offered technique of researches allows to study force and mobility of nervous processes, functional endurance and psychomotor efficiency of sportsmen.

The developed criteria for evaluation of physical quality of speed allow revealing specific psychophysiological features of organism of the sportsman that will give the chance to introduce amendments in improvement of high-speed abilities and to operate the training process effectively.

Prospects of further researches

Studying of morphofunctional and psychophysiological indicators of young sportsmen for creation of the effective technique of selection in rowing sports is planned.

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Dependence of sports results on data of physical development, morphofunctional and special power preparedness of weight-lifters at the stage of initial preparation

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Purpose: *the establishment of nature of the interrelation between sports results of weight-lifters and level of their special physical and morphofunctional preparedness.*

Material & Methods: *48 sportsmen of group of initial preparation of the first year of training were involved to the experiment. The research was conducted on the basis of the chair of weightlifting and boxing of Kharkov state academy of physical culture and CYSS "HTZ".*

Results: *the correlation between indicators of morphofunctional, high-speed and power and special (competitive) preparedness of weight-lifters is revealed at the stage of initial preparation. The conducted research shows that the result of competitive exercises of the sportsmen, specializing in weightlifting at the stage of initial preparation, depends on power and high-speed and power preparedness.*

Conclusions: *it is established that the correlation between results of competitive exercises and jumps uphill from the place, in length from the place, run on 30 m can demonstrate the interrelation of power and high-speed and power preparedness of the sportsmen, specializing in weightlifting at the stage of initial preparation.*

Keywords: *sports result, morphofunctional preparedness, initial preparation, competitive exercises, high-speed and power preparedness.*

Introduction

Studying of dependence of results of competitive exercises on the level of morphofunctional and special physical preparedness of weight-lifters is the important condition of creation of the program of effective training of sportsmen at the initial stage. Number of researches is devoted to the identification of interrelations between indicators of physical development, preparedness of sportsmen, and sports result in different strength sports. V. M. Platonov, A. N. Vorobyov, I. T. Lisakovsky, V. G. Oleshko investigated the correlation dependence between morphological features, high-speed and power qualities and sports-technical indicators in different strength sports, in particular, in weightlifting [8; 1; 6]. Results of researches showed that jump height up from the place increased moderately increases in sports skill and had average reliable communication with length of body and legs, press, burst, jerk and squat with bar on breast and shoulders. Authors recommend outleap from the place as the test at selection for weightlifting trainings on the basis of the obtained data. The reliable correlation of biomechanical parameters of the movement of apparatus with the level of development of motor abilities, power and high-speed and power parameters at rise of weights with indicator of high-speed and power qualities in weight-lifters of high qualification when performing classical exercises is found in the researches of O. Dovgich, V. Yu. Dzhim, R. A. Roman [3; 4; 11]. L. S. Dvorkin, V. A. Romanenko established the existence of interrelations between exercises of weightlifting and means of overall physical fitness [2; 11]. The author recommends to use exercises "bendings of hands in emphasis, lying" and "trunk raising from situation, lying on back" as auxiliary for the increase in level of force in exercises of weight-lifters. The research of dependence of sports result on data of physical development, functional condition of cardiovascular and respiratory systems of organism and special power preparedness of weight-lifters at the stage of initial preparation is conducted in this work.

Communication of the research with scientific programs, plans, subjects

The scientific research is executed on the subject of the Built plan of the research work in the sphere of physical culture and sport for 2011–2015 3.7 "Methodological and organizationally-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:

the establishment of nature of interrelation the between sports result of young weight-lifters and level of their special physical and morphofunctional preparedness.

Material and Methods of the research

The experimental research of nature of the interrelation between sports result, data of physical development, functional condition of organism of weight-lifters is carried out on the basis of the chair of weightlifting and boxing of Kharkiv state

academy of physical culture and CYSS "HTZ". 48 sportsmen of the group of initial preparation of the first year of study were involved to the experiment. The program of researches included the complex of methods of the research according to the methodological approach in solution and the put tasks: analysis of scientifically-methodical literature, method of anthropometry and research of condition of cardiovascular system, pedagogical experiment and methods of mathematical statistics.

Results of the research and their discussion

Data of physical development, functional condition of cardiovascular and respiratory systems of organism, special and power preparedness of weight-lifters, in the stated experiment are provided in the table. The analysis of sizes of massogrowth indicators, sizes of grasp and length of different links of body of sportsmen confirms the relative uniformity of the vast majority of the studied indicators in the group. Changeability of variation row for the sizes of length of body of weight-lifters was insignificant.

The variation coefficient on indicator of length of body equaled 3,89%, body length, sitting – 4,02%, the lower extremity – 4,15%, upper extremity – 4,5%, width of shoulders – 6,04%, cross diameter of thorax – 8,36%. The extent of value to coefficient of variation were higher for the grasp sizes. So, the variation on thorax grasp indicators at rest made 4,58% to thorax grasp (exhalation) – 4,95%, to thorax grasp (breath) of 4,59%, shoulder – 6,19%, hip – 7,29%. It is noted the highest coefficient of variation for indicator of body weight of sportsmen – 8,48%.

Sportsmen of the studied group have average value of HR, apparently from the table, equaled 65,32 bpm^{-1}. Sizes of standard square deviation and coefficient of variation made 6,22 bpm^{-1} and 9,52%. It is established that APs of sportsmen of the studied group at rest was in optimum zone, average value made 121,25±1,64 mm of mercury. For APd average value in the group is brought closer to the lower limit limit of the aged norm – 80,35±1,98 mm of mercury. Results of the submaximum test of Valunda-Shestrand testify to the sufficient level of physical efficiency of sportsmen of the studied group. Sizes of average square deviation and coefficient of variation by the size PWC170 made 48,12 $kgm \cdot min^{-1}$ and 13,87%. Average PWC170 value equaled 1343,10±48,12 $kgm \cdot min^{-1}$ that exceeded the norms determined for healthy unexercised children. Average sizes of MOC made in absolute expression and calculation on kilogram of body weight respectively 3979,10±0,126,59 $ml \cdot min^{-1}$ and 59,80±2,95 $ml \cdot kg^{-1} \cdot min^{-1}$, 12-minute Cooper's test – 2448,34±75,98 m also characterized the sufficient level of aerobic endurance. Indicators of VCL of sportsmen made 3,90±0,16 l and were in norm limits for healthy children. Sizes of average square deviation and to variation coefficient by this indicator were equal 0,60 l and 15,38%. The vital index of weight-lifters at the stage of the stating experiment made 57,60±0,78 $ml \cdot kg^{-1}$. Such VI values answer the average level of physical health. Frequency of breath of sportsmen was in norm limits for healthy children and averaged 13,47±0,55 times the coefficient of variation made 15,96%. The considerable variability of results was observed on indicators of tests of Stange and Genchi. Average values of the noted indicators made 48,67±2,69 times and 30,17±2,30 times, variation coefficients – 21,30% and 29,50% respectively. Thus, physiologic state of cardiovascular and respiratory systems of organism of sportsmen of the studied group satisfactory, sizes of the studied indicators were in limits of norm and characterized the sufficient level of physical working capacity [6].

The average result in standing long-jump made 157,96±1,57 sm; the coefficient of variation equaled 6,91%. In jump on certain height the average result made 35,38±0,37 sm, variation coefficient, – 7,30%. Average results in exercises which characterize power abilities, namely pulling up and bending extension of hands in emphasis, lying, equaled 8,60±0,25 times and 32,46±0,58 times; coefficients of variation equaled 19,73% and 12,49% respectively. The insignificant variability of results was noted for indicators, which characterize the speed and dexterity. The variation coefficient by run indicator on 30 m was 5,19%; shuttle run – 3,34%. The insignificant variability of the following results was noted for indicators, which characterize endurance, variation coefficient on trunk raising indicators – 9,19%, respectively jumps on jump rope on 2 legs – 6,46%.

The correlation analysis is carried out for the establishment of dependence of sports result from morphofunctional of indicators and level of special physical preparedness of sportsmen. It is established that all indicators correlate among themselves, but the degree of these interrelations is different. The interrelation between result of classical burst of both length and body weight was found (r=0,70; r=0,85), grasps of hip (r=0,66), thorax, on breath, exhalation, breath holding (r=0,69; r=0,67;). The training of weight-lifters promotes the expansion of thorax, increase in volume of the muscles involved in work which is confirmed by correlation coefficients between the noted indicators. The interrelation of result of squat and grasp of hip can demonstrate that it is necessary to work on increase in mass of muscles of hip for the achievement of the best result in this exercise.

The interrelation that is revealed between classical burst and indicators of the maximum absorption of oxygen and PWC170 (r=0,45 and r=0,57), can explain with increase in indicators of aerobic endurance and level of physical operability of organism which happen in the course of sports preparation. The return interrelation between results in classical burst and run on is noted 30 (r=–0,63) which can be explained with the fact that when performing to classical burst and run on 30 m different types of muscular fibers are involved. Retractive fibers are attracted quickly in classical burst, in run – slowly retractive. As when performing competitive exercises quickly retractive muscular fibers are involved in weightlifting to work, their part in muscles of legs is increased and the sportsman cannot perform physical activity long time, as it appears in negative value of coefficient of correlation between these indicators.

The correlation between results in classical burst and long jumps and on certain height is found (r=0,43; r=0,67) which can demonstrate the interrelation of power and high-speed and power preparedness of weight-lifters at the stage of initial preparation.

The interrelation with length and body weight (r=0,65; r=0,80), thorax grasps on breath, to exhalation (r=0,74; r=0,72), and also to pullings up in hang on cross-piece (r=0,40), to bendings extensions of hands, in emphasis, lying (r=0,51) is found for result in classical jerk. When performing classical jerk and exercises of bending extension of hands on bars are involved

Indicators of sizes of grasp and length, conditions of cardiovascular and respiratory systems, testings of special physical qualities and competitive exercises of weight-lifters of the studied group (n=48)

Indicators	$\bar{X}$±m	V,%
The sizes of grasp and length		
Body length, sm	143,73±0,81	3,89
Body weight, kg	40,92±0,50	8,48
Body length, sitting, sm	76,04±0,44	4,02
Length of the lower extremity, sm	67,69±0,41	4,15
Length of upper extremity, sm	61,40±0,39	4,35
Width of shoulders, sm,	41,75±0,36	6,04
Thorax grasp at rest, sm	73,10±0,48	4,58
Thorax grasp (exhalation), sm	70,50±0,50	4,95
Thorax grasp (breath), sm	75,92±0,50	4,59
Grasp of shoulder, sm,	24,20±0,22	6,19
Grasp of hip, sm	47,88±0,50	7,29
Cross diameter of thorax, sm	28,15±0,34	8,36
Condition of cardiovascular and respiratory systems		
HR at rest (bpm^{-1})	65,32±1,33	9,52
APs at rest (mm of mercury)	121,25±1,64	5,27
APd at rest (mm of mercury)	80,35±1,98	8,53
PWC170, $kgm \cdot min^{-1}$	1343,10±48,12	13,87
PWC/kg, $kgm \cdot min^{-1} \cdot kg^{-1}$	20,21±1,07	21,82
MOC, $ml \cdot min^{-1}$	3979,10±126,59	12,32
MOC/kg, $ml \cdot min^{-1} \cdot kg^{-1}$	59,80±2,95	19,12
Cooper's test, m	2448,34±75,98	11,74
Vital capacity of lungs, l	3,90±0,16	15,38
Vital index, $ml \cdot kg^{-1}$	57,60±0,78	5,32
Breath frequency, for 1 min	13,47±0,55	5,96
Breath holding on breath, s	48,67±2,69	21,30
Breath holding on exhalation, s	30,17±2,30	29,50
Indicators of testings of special physical qualities		
Run 30 m, s	6,19±0,05	5,19
Shuttle run of 3x10 m, s	8,60±0,04	3,34
Standing broad jump up, sm	35,38±0,37	7,30
Standing long-jump, sm	157,96±1,58	6,91
Trunk raisings, number of times on min	41,69±0,55	9,19
Bending and extension of hands in emphasis, times	32,46±0,58	12,49
Pulling up on horizontal bar, times	8,60±0,25	19,73
Jumps on jump rope on 2 legs, times	86,23±0,80	6,46
Indicators of competitive exercises		
Classical burst, kg	19,24±0,45	16,04
Classical jerk, kg	26,73±0,41	10,56
Sum of double-event, kg	45,97±0,76	11,42
Squats on shoulders, kg	43,65±0,72	11,45
Burst draft, kg	31,86±0,44	9,55
Jerk draft, kg	44,36±0,55	8,57

the same groups of muscles, in particular, deltoid, tricepses. The vast majority of sportsmen in weightlifting, when performing jerk, use the technique, at which exercise is performed with different receptions [7]. The muscle work, when using this method of execution of jerk, is brought very closer to muscle work in exercise of bending extension of hands in emphasis, lying, that is confirmed by the correlation interrelation between these exercises.

The correlation with thorax grasps on breath, exhalation is noted for result in burst draft (r=0,55; r=0,60). The interrelation between result of the noted exercise and PWC170 and MOC, vital capacity of lungs is found during power trainings (r=0,57; r=0,55; r=0,42 respectively). In our research the correlation between result of burst draft and long jump (r=0,52), which can demonstrate the interrelation of power and high-speed and power preparedness of sportsmen, who specialize in weightlifting, at the stage of initial preparation, is found.

It is established that the most significant morphological indicators for ensuring high sports result in competitive exercises weight-lifters have length of the lower extremities, upper extremities, grasps of breast, hip [4]. Results of the correlation analysis, which is carried out by us, confirm the data obtained in the research of Dvorkin (1992), to which it is shown that (from r=0,6 to r=0,9) the following indicators have high correlation interrelation with the level of achievements in competitive exercises of weight-lifters: with classical burst – length, body weight, grasp of breast, hip, length of the lower extremity, length of upper extremity. With classical jerk – body weight, grasp of shoulder, breast, length of upper extremity, length of the lower extremity, width of shoulders [5].

Conclusions

It is established that the most significant morphological indicators for ensuring high sports result in competitive exercises at weight-lifters are hip grasp, grasp of muscles of shoulder, breast grasps.

The found correlation between results of competitive exercises and standing broad jump up, standing long-jump, run on 30 m that can demonstrate the interrelation of power and high-speed and power preparedness of sportsmen who specialize in weightlifting at the stage of initial preparation.

The subsequent researches will be directed to the identification of structure of preparedness of weight-lifters at the stage of initial preparation.

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Methodical features of physical rehabilitation of sportsmen with intra articulate injuries of ankle joint at the out-patient stage

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Purpose: *the analysis of modern approaches to application of means and forms of physical rehabilitation of sportsmen with intra articulate injuries of ankle joint at the out-patient stage.*

Material & Methods: *the analysis of urgent special references on the problem of treatment and rehabilitation at intra articulate injuries of ankle joint.*

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

Conclusions: *the connected application of east bath and special techniques of east massage for rehabilitation of sportsmen with intra articulate injuries of ankle joint at the out-patient stage in special literature is described not enough that in turn demands the additional practical researches among methods of non-drug therapy.*

Keywords: *physical rehabilitation, intra articulate injuries of ankle joint, out-patient stage of treatment, procedure hydrobathing.*

Introduction

The most effective physical rehabilitation of sportsmen of game sports, in particular, basketball players and volleyball players, having damages and diseases of ankle joint, is intended to return sports working capacity them perhaps more fully. The ankle joint is difficult compound joint of human body, bears considerable loading, especially in sport and, therefore, it is often subject to traumatic damages [14; 16]. Complexity of anatomical structure, vulnerability soft tissues lead to the fact that the mechanical durability of its elements is insufficient at systematically high loads and frequent traumatic influences [20]. The main contingent of patients with injuries of ankle joint – people of efficient age, in particular, sportsmen.

According to data of N. L. Ankin (2002), injuries and fractures – 30–40% and to 12% among all pathology of the musculoskeletal system prevail in the characteristic of damages among injuries of ankle joint [2].

Damages of the ligamentous -capsular apparatus of ankle joint on prevalence make up to 15% among all injuries of joints. Intra articulate fractures of ankle joint make 1,5–4,0% among all fractures of bones of skeleton and 5–7% of all intra articulate changes [3; 7; 21]. Most of victims with such damages need prolonged treatment.

The review of the scientific research on the analysis of the statistical data studying character and localization of traumatic damages of the musculoskeletal system of sportsmen to game sports, in particular, in basketball and volleyball, shows that there is ankle joint, to which share about 15–20% of all pathology fall, in the zone of great risk in the system of musculoskeletal system [9; 13; 22].

Unfortunately, the combined injuries of ligaments, articulate bag and articulate cartilage, which significantly differ from the isolated damages, are rather frequent, representing the special type of pathology demanding prolonged treatment and special rehabilitation in practice of sport, and at the same time considerable on the necessary volume of treatment and possible consequences [14].

Recently, arthroscopic operations at injuries of ankle joint gain ground [8; 15]. At the same time physical rehabilitation of sportsmen after such operations, especially at the combined injuries of ligaments and cartilage, is not presented more exhaustively by effective techniques. Due to this current situation, the development and scientific foundation of the comprehensive program of physical rehabilitation of the sportsmen, having injuries of ankle joint, is urgent for sports medicine and rehabilitation for today certainly.

Physical rehabilitation of sportsmen with intra articulate injuries of ankle joint at the out-patient stage with the differentiated application of various means and methods is the important stage which is logically finishing the whole cycle of treatment. The duration of the period of physical rehabilitation at injuries of area of ankle joint according to number of authors makes from 4 weeks till 6 months, and in some cases up to several years [4; 6; 17].

According to most of authors, the underestimation of importance of the rehabilitation actions directed to the restoration of function of the injured extremity in the entire periods of treatment and enough effective programs of physical rehabili-

tation of the sportsmen, who have especially transferred operative measure results lack of the integrated methodological approach to this problem in practice in results, when function of ankle joint, is restored in full only at 50–60% of victims, and disability reaches 1,2–5,5%. Both long terms of postoperative treatment and rather high percent of unsatisfactory functional results testify to it [1; 2; 12; 24].

Communication of the research with scientific programs, plans, subjects

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

The purpose of the research:

to define modern methodical features of the differentiated application of nonconventional means of physical rehabilitation for sportsmen with intra articulate injuries of ankle joint at the out-patient stage of treatment.

Material and Methods of the research

Methodical features of physical rehabilitation of sportsmen with intra articulate injuries of ankle joint at the out-patient stage became clear on the basis of the analysis of modern references on sports medicine, traumatology, and physical rehabilitation.

Results of the research and their discussion

The out-patient stage is considered as one of the sportsmen conducting in the landmark system of physical rehabilitation thanks to possibility of the broad combined application of traditional and nonconventional medical procedures now. As the main tasks, facing the mentioned stage, for sportsmen with intra articulate injuries of ankle joint and their consequences are considered: maximum restoration of volumes of functioning of ankle joint, return of athletic and coordination ability of the sportsman in respect of high-quality restoration of special movement skills of technique of sport, remission fixing, increase in immune and nonspecific resilience of organism, stimulation of mechanisms of adaptation, restoration in full sports working capacity etc.

The improvement of rehabilitation actions at the out-patient stage of treatment is perspective way of improvement of quality of treatment and obtaining effective results of physical rehabilitation of sportsmen with intra articulate injuries of ankle joint, and also the prevention of consequences of similar injuries for health and sports career of the sportsman [14; 23].

The concrete methods of nonconventional medicine and physical rehabilitation used in programs of rehabilitation of sportsmen with intra articulate injuries of ankle joint at the out-patient stage of treatment are still rather not allocated and in literature are discussed often fragmentary [8; 12; 15].

Similar programs of physical rehabilitation are developed by some authors, but often with insufficient or selective application of nonconventional methods which role at stages of physical rehabilitation is estimated insufficiently. Meanwhile, the specific weight of nonconventional methods of non-drug therapy (reflexotherapy, phytotherapy, reflexotherapy, hydrobathing technologies, manual therapy, kinesiotherapy) in world practice significantly increases in physical rehabilitation and makes in some researches up to 70–80% [17; 19; 22].

Scientific assessment of role and efficiency of traditional and nonconventional means and methods of physical rehabilitation in programs of treatment of sportsmen with the injured joints is among the most important and professionally significant problems of sports medicine.

According to number of authors, the traditional means and methods of physical rehabilitation of victims with consequences of intra articulate injuries of ankle joint applied in evidence-based complex with nonconventional methods effectively warn complications and restore functions of the damaged bodies [13; 14; 19; 21].

It is possible to tell with confidence that the program of physical rehabilitation with the combined application of traditional and nonconventional methods of treatment in the system of physical rehabilitation of sportsmen with intra articulate injuries of ankle joint in the conditions of the versatile rehabilitation center at the out-patient stage can significantly increase efficiency of recovery of health of victims and reduce terms of their return to sports career.

Filling of programs of physical rehabilitation for sportsmen at the out-patient stage decides on intra articulate injuries of ankle joint by the accounting of extent of restoration of functions and provides use of generally blandly-training and training motive modes in the work of the versatile rehabilitation center.

Authors recommend options of the combined action of two or three nonconventional methods consistently or at the same time that considerably increases efficiency of physical rehabilitation, as the program of physical rehabilitation included in individual programs of treatment of sportsmen with intra articulate injuries of ankle joint.

The combination of the traditional and nonconventional methods of treatment included in individual rehabilitation programs of sportsmen with intra articulate injuries of ankle joint at the out-patient stage, their volume, structure and contents have to be defined by the clinical profile, stage and form of pathological process in organism. At the same time security of patients with techniques on the basis of non-drug methods of treatment can make more than 40%, and the highest security with nonconventional methods of treatment is applied more often at injuries of the extremities which are followed by injury of nerves (70%). The combination of several traditional and nonconventional methods of treatment is recommended that considerably increases efficiency of medical rehabilitation by drawing up the program of physical rehabilitation of sportsmen with intra articulate injuries of ankle joint in the conditions of the versatile rehabilitation center [22; 26].

It is suggested to consider the following by drawing up the program of rehabilitation of athletes with intra articulate injuries of ankle joint at out-patient stage of treatment traumatologists [8; 13; 21]: general condition of the patient, his psychological status; condition of bone tissue (degree of expressiveness of bone callosity, osteoporosis) and correctness of

union of bone fragments; character of the applied immobilization (plaster bandage, skeletal traction, osteosynthesis) and immobilization duration; condition of skin, sinews, ligamentous-copular apparatus, muscular tissue, vessels and nerves; the existence of damages of nervous trunks and vessels accompanying bone trauma; the existence and expressiveness of post-traumatic contractures.

As a result of studying of references, on the problem of physical rehabilitation of persons with intra articulate injuries of ankle joint, detailed consideration of questions of etiology, pathogenesis, the clinical and phasic course of traumatic disease, mechanisms of medical action of physical exercises, we defined features of formation of programs of physical rehabilitation. Similar programs provide appointment to the patient of the corresponding motive mode, the MPC complexes, procedures of massage and physiotherapeutic procedures [16; 24; 26].

Also, authors [5; 8; 13] consider that the post-traumatic period is clinically characterized by the restoration of anatomic integrity of bone (the process of consolidation of bone fragments comes to the end, the wound is epithelized). However, despite of the restoration of anatomic integrity, the obvious dysfunction of extremity is observed (muscular atrophy, rigidity in joints, cicatricial contractures, etc.), this period proceeds till the formation of secondary bone callosity.

The integral part of the educational-training process practically at all stages of training of sportsmen of game sports are massage and hydro-bathing procedures. Therefore sportsmen, as a rule, during sports career have sufficient experience of use of bathing procedures, as a rule, of the Finnish sauna and some other types of hyper thermal procedures [19; 26].

The sportsmen of the state of Lebanon, participating in our dissertation research, have long-term experience of use of techniques of hygienic soaring in ethnic east bath, the organism of these sportsmen since the childhood is better adapted to procedures of east bath. Therefore, we choose application of this bath and east massage as nonconventional methods of physical rehabilitation of volleyball players and football players with intra articulate injuries of ankle joint.

According to number of researchers [18; 19; 26], it is possible to use hydro-bathing procedures especially effectively in combination with classical or ethnic east massage. The hyper thermal procedure of east bath and east massage as method of restoration, hardening, prevention of diseases and typical injuries has the great practical value for sportsmen of game sports. Combination of procedures of bath and massage, according to number of authors [19; 25], it can be used for the purpose of acceleration of restoration of volume of mobility of ankle joint, optimization of reparative processes in connecting and bone tissue, and also preparation of muscles, joints and organism in general to the increasing exercise stresses of the out-patient stage of treatment.

The significant increase in blood-groove in vessels promotes the acceleration of metabolic exchange in organism that leads to the acceleration of recovery and reparative reactions. The bathing procedure allows for a short time and in large numbers to bring infiltrate out of tissues. Bathing procedures, promoting increase in volume of the necessary substances coming to tissues and some "sterilization" of skin wounds allow to accelerate healing of injuries, bruises, changes, stretching, absorption of hematomas.

Application of the bathing procedure allows bringing actively out of organism infiltrate, products of exchange and toxins without application of medicines and allows reducing the rehabilitation period after injuries, and also allows shifting focus of improving and medical procedures from the medicamentous to the physiotherapeutic area [18].

In the general opinion of authors, the poll about possibility of application of the bathing procedure to sick sportsmen after diseases and injuries is solved the doctor. This question is especially important for high-class players as the long absence of loads leads to detraining. Together with the doctor, rehabilitologist creates the program of complex physical rehabilitation and defines the correct mode of stay in east bath, orientation of techniques and volume of impact of east massage. At the same time it is necessary to consider that the wrong mode of the bathing procedure or the wrong dispensing of the massage procedure can break the medical process and worsen the state of health of the sportsman. There is restriction in the purpose of east bath at associated diseases of cardiovascular and nervous systems. It is connected with rather volume impact on organism of the hydro-bathing hyper thermal procedure that at not rather thought over purpose of these means in the program of physical rehabilitation can lead to deterioration in health [19; 25; 26].

Everything told results in need of the further theoretical development, the clinical approbation and the subsequent evidential description of efficiency of combination of traditional and nonconventional means and methods of physical rehabilitation, in particular the combined application of east bath and techniques of east massage for rehabilitation of sportsmen with intra articulate injuries of ankle joint at the out-patient stage of treatment.

Conclusions

1. The combined application of the traditional and nonconventional means and methods of treatment used in programs of physical rehabilitation of sportsmen at the out-patient stage in special literature available to us are discussed with intra articulate injuries of ankle joint rather fragmentary, at the same time role of such nonconventional means as ethnic types of massage and hydro-bathing procedures, it is in our opinion studied obviously insufficiently.

2. The standard techniques of MPC, massage and physiotherapeutic treatment remain the fixed non-drug assets of physical rehabilitation of sportsmen with intra articulate injuries of ankle joint at the out-patient stage in the conditions of the versatile rehabilitation center today.

3. As a result of the analysis of modern programs of physical rehabilitation for treatment of patients with intra articulate injuries of ankle joint at out-patient stage, it is defined that efficiency of application of nonconventional methods in physical rehabilitation, in particular the combined application of east bath and techniques of east massage, is studied not enough for today and demands additional practical researches.

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

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Influence of training loads on psychophysiological indicators of handball players in different phases of the menstrual cycle

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Purpose: *to carry out the analysis of results of the research of influence of training loads on psychophysiological indicators of handball players to different phases of the menstrual cycle.*

Material & Methods: *the researches were conducted on the basis of the Zaporizhia handball women's teams of superleague (16 women of 16–19 years old); research methods: analysis of references, questioning, psychophysiological methods of the research, integrated assessment of functional state and methods of mathematical statistics.*

Results: *results of own researches of functional and mental states, and also changes of effectiveness ratio of game actions at handball players of high qualification are presented to different phases of the menstrual cycle.*

Conclusions: *the received results demonstrate that the best conditions for manifestation of functionality of organism of the studied sportswomen are the post-ovulatory phase of the menstrual cycle. The next period, in which handball players can carry out exercise stresses of a little smaller power, is the post-menstrual phase.*

Keywords: *handball players, phases of menstrual cycle, psychophysiological condition, efficiency of game actions.*

Introduction

The problem of training of women-sportswomen acquires the big relevance as features of influence of loadings of different volume and intensity on the woman's organism are not always considered in their training process at the present stage of the development of sport. In particular, such biological feature as the ovarian-menstrual cycle (OMC) is not considered [14].

Most of researchers incline to thought of what the accounting of power of exercise stresses at sportswomen in different phases of the menstrual cycle is necessary [2; 8–10 13; 14; 16], but in practice, especially in game team sports, it becomes seldom.

The search of researches, in which scientists would consider the question of influence of training and competitive activity on features of the course of phases OMC at handball players, allows noting the insignificant number of such works.

So, the attempt is made to find possibilities of improvement of management of women's handball team at the expense of the accounting of specific features the ovarian-menstrual cycle in the research of A. G. Amkhanitskyi [1]. The author considers that completing of teams of handball players with similar length of the ovarian-menstrual will provide to the cycle simplification of management of such team.

L. G. Bukhtyi [3] investigated effectiveness of training activity of handball players depending on feature of the course of the menstrual cycle of sportswomen.

Professor V. Ya. Ignatyeva [4; 5] carried out the deep analysis of features of application of exercise stresses in different phases of the menstrual cycle. The author recommends to apply exercise stresses with differentiation them on the volume, intensity, and on duration. And she recommends to carry out the greatest intensity of loading in the post-ovulatory phase of the menstrual cycle of handball players.

Thus, it is possible to note that features of realization of integrated preparation in women's teams taking into account specific features of organism demand the additional scientific foundation in the research, which is specially devoted to this problem.

Communication of the research with scientific programs, plans, subjects

The subject of article is developed according to the Built plan of the research work in the sphere of physical culture and sport for 2014–2019 of the Ministry of Ukraine for family, youth and sport 2.4.12.1п, on the subject "Optimization of educational-training and competitive activity in sports", number of the state registration is No. 0114U002659.

The purpose of the research:

to carry out the analysis of results of theresearch of influence of training loads on psychophysiological indicators of handball players to different phases of the menstrual cycle.

Material and Methods of the research

The researches were conducted on the basis of the Zaporizhia handball women's teams of the superleague. 16 women of 16–19 years old participated in the experiment.

Research methods: analysis of references, questioning, psychophysiological methods of theresearch, integrated asses-

ment of functional state and methods of mathematical statistics.

Results of the research and their discussion

The important biological feature of the woman are theexistence of menstrual function which is shown the cyclic. This function is the most expressed biological mechanism, and its recurrence is caused by recurrence of fluctuations of the processes in the reproductive system of the woman, which are connected with realization of genital function, important for organism, which involves all other systems of organism in vigorous activity: nervous, cardiovascular, mental, etc. [12].

Experts in clinical gynecology allocate seven phases the ovarian-menstrual cycle [16]. However in sports practice such division is not convenient as each of phases lasts about 3 days that cannot almost be considered during the training or competitive process. In our research we used classification of L. G. Shakhlinoy [16] in which the menstrual cycle is divided into five phases: I phase – menstrual (the 1–6th days); II phase – post-menstrual (the 7–12th days); III phase – ovulatory (the 13–15th days); IV phase – post-ovarian (the 16–24th days); V phase – premenstrual (the 25–28th days). These five phases are available in each cycle irrespective of its duration.

The individual approach to each sportswoman needs its knowledge not only from positions of its opportunities before the game or transferring of the maximum exercise stresses, knowledge of each pupil and as persons, with features of manifestation of its qualities, traits of character, temperament, emotionally-strong-willed sphere has not the smaller importance. This part of work of the coach has to be carried out in the course of mental conditioning of sportswomen.
We used the technique of G. Ayzenko for studying of mental conditions of female handball players of the superleague [11].

The obtained data allow to be convinced of the essential change of extent of manifestation of mental states at handball players throughout the menstrual cycle (tab. 1).

So, the significant increase in indicators which find mental states is noted in the first phase of cycle (menstrual). Uneasiness (13,7 points) is shown in the greatest measure. The high level of uneasiness is followed by the mental tension, concern, nervousness. It is considered that the considerable uneasiness causes violation of attention, coordination of movements that, certainly, is negative factor for sports activity (see tab. 1).

Increase in level of manifestation of rigidity (12,6 points) in this phase means that difficulties in implementation of the program of the actions are for this person. In other words, this opposite condition of mobility which is so important in the course of game activity in handball.

Frustration during training also grows in the menstrual phase (12,4 points). Person avoids difficulties, he increases fear of failures, fear to be traumatized in such state during this period.

And, for the end, aggression in this phase is expressed at least (12,1 points). During this period irritability, unevenness increases at sportswomen, but in the following phases of the menstrual cycle the level of aggression exceeds this indicator.

The analysis of change of extent of manifestation of the called mental states in different phases of menstrual cycle of handball players demonstrates that the lowest indicators (except aggression) were observed in the second (post-menstrual) and the fourth (post-ovulatory) phases. And values of mental states, which are studied, is treated as raising of opportunity to performance difficult and considerable by intensity and volume of exercise stresses in the form of activization of psychological functions of sportswomen.

The high level of aggression of sportswomen in these phases can be explained with need of this mental state for effective playing handball. Possibly, this irreplaceable quality of the personality which is formed at players throughout long-term trainings.

The increase in extent of manifestation of mental states, which are defined in ovulatory and premenstrual phases, means that their psychological sphere is overstrained, and high extent of manifestation of mental states leads to decrease in coordination communications in regulation of psychological processes that negatively affects physical efficiency of sportswomen.

Such conclusion can be confirmed with adequate change of effectiveness ratio of game actions.

In table 1 is shown that effectiveness ratio of game actions is the greatest in post-menstrual (0,31 mind. odes.) and post-ovulatory phases (0,45 mind. odes.), that is in what extent of manifestation of mental states which are defined was low. To

Table 1

Indicators of diagnostics of mental conditions of handball players in different phases of the menstrual cycle (n=16)

The measured states	Phases of the menstrual cycle				
	1	2	3	4	5
Uneasiness, points	13,7±1,14	8,1±0,64	15,8±1,08	5,8±0,45	19,3±1,64
Frustration, points	12,4±0,96	9,0±0,83	13,2±0,86	7,7±0,66	15,4±2,36*
Aggression, points	12,1±2,02	15,2±1,84*	13,7±1,17	19,0±0,78	13,2±15,2
Rigidity, points	12,6±1,10	6,6±0,53	11,9±0,88	8,2±0,60	17,9±1,56*
Effectiveness ratio of game actions, mind. odes.	0,24±0,041	0,31±0,052	0,21±0,029	0,45±0,051	0,20±0,037

Notes: *1 – menstrual; 2 – post-menstrual; 3 – ovulatory; 4 – post-ovulatory; 5 – premenstrual; * – p<0,05.*

Table 2

Indicator of complex express assessment of functional condition of handball players in different phases of the menstrual cycle (n=16)

Indicators	Phases of the menstrual cycle				
	1	2	3	4	5
HR, bpm^{-1}	90,5±3,45	82,7±2,17	88,4±4,03	81,2±3,14•	92,8±3,21
SAP, mil.mer.col.	118,6±12,07	116,0±11,12	118,4±12,14	115,3±10,32	120,1±9,96
DAP, mil.mer.col.	74,4±4,16	72,8±4,07	73,6±3,73	70,6±3,86	73,9±3,14
TBHbr, s	56,2±5,03	61,0±3,17	55,8±3,21	62,5±3,32	54,7±3,08
TBHex, s	37,9±3,16	44,0±5,79	40,1±1,68	45,3±3,18•	36,0±2,77
SVB, ml	70,44±4,45	72,7±4,38	73,12±5,08	75,38±7,18	70,3±3,64
MVB, l·min^{-1}	6,32±6,07	6,62±4,44	6,16±3,39	6,85±6,08	6,07±4,03
CI, l·min^{-1}·m^2	3,02±0,77	3,44±0,84	3,11±0,37	3,90±0,40	3,01±0,31
GPR, dyn·s·sm^2	1101,1±20,11	1130,5±18,43	1112,7±17,41	1145,8±16,02	1106,6±15,86
HV, ml	800,3±11,01	807,6±10,76	803,1±10,31	809,2±10,46	800,1±10,79
IRob, m. od.	110,2±4,83	97,8±4,08	106,8±5,17	96,9±3,88	112,2±4,22
CPB, m. od.	4120,5±23,16	4078,5±22,06	4129,8±20,74▪	4037,6±21,33	4020,0±22,38
DSAP, mil.mer.col.	2,3±0,17	2,0±0,29	2,4±0,16	2,0±0,18•	2,6±0,11
DDAP, mil.mer.col.	–3,1±0,20	–3,0±0,16	–3,4±0,13	–3,0±0,17•	–3,6±0,16
IH, m. od.	0,27±0,06	0,33±0,03**	0,30±0,04	0,44±0,04•	0,26±0,04
ISk, m. od.	1455,6±10,72*	1645,7±12,34**,▲	1443,6±12,41▪	1732,4±11,72•	1333,7±11,80
LFS, m. od.	51,92±3,45	58,32±4,38	52,20±4,76	61,23±7,33	50,06±5,02
LFCe, m. od.	26,32±2,18	29,24±2,33	26,11±2,46	34,47±2,36•	25,83±2,28

Notes: *reliable differences between cycle phases: * – 1–2; ▲ – 2–3; ▪ – 3–4; • – 4–5; ** – 2–4; HR – heart rate; SAP – systolic arterial pressure; DAP – diastolic arterial pressure; TBHbr – time of breath holding on breath; TBHex – time of breath holding on exhalation; SVB –systolic volume of blood; MVB – minute volume of blood; CI – cardiac index; GPR – the general peripheral resilience; HV – heart volume; IRob – Robinson's index; CPB – coefficient of profitability of blood circulation; DSAP – deviation of systolic arterial pressure; DDAP – deviation of diastolic arterial pressure; IH – index of hypoxia; ISk – Skibinsky's index; LFS – the level of functional state of CVS; LFCe – the level of functional condition of system of external breath.*

the contrary, the growth of extent of manifestation of negative mental states (except aggression) was followed by the decrease to effectiveness ratio of game actions: in menstrual (0,21 mind. odes.), ovulatory (0,24 mind. odes.) and premenstrual (0,20 mind. odes.) phases.

In the subsequent research we carried out the integrated assesment of functional condition of handball players [15] who trained taking into account features of physiologic changes in their organism in different phases of the menstrual cycle. The obtained data are presented in tab. 2.

As testify the data of this table, the measured indicators change depending on phases of the menstrual cycle of handball players.

Indicators of cardiovascular system and blood circulation changed in the greatest measure. So, for example, such indicators as minute volume of blood and cardiac index, the smallest in premenstrual phase, and the greatest – in post-ovulatory. At the same time the change of indicator on 0,78 mm·min^{-1}, and in the second – on 0,89 mm·min^{-1} is observed in the first case.

Especially indicative changes of regulatory components. So, index of Robinson, which characterizes quality of regulation of work of cardiovascular system in menstrual and premenstrual phases is the greatest, – 110,2 and 112,2 mind. odes., and the smallest in p post-ovulatory and post-menstrual phases, respectively equals 96,9 and 97,8 mind. odes. Interpretation of the results, which are received by index of Robinson, which we applied in the research, allows to note that the less this indicator is, the more perfect the mechanism of functional regulation of the cardiovascular system of the person is. That is, it functions best of all in these two phases. Similarly, the coefficient of profitability of blood circulation changes also by phases of the menstrual cycle: profitability of blood circulation is the best in post-ovulatory and post-menstrual phases.

The objective confirmation of positive changes in organism of handball players in these phases of the menstrual cycle are changes of index of Skibinsky, which is used for assessment of functional condition of cardio-respiratory system. In this case, on the contrary, the more the indicator is, the more effectively functions of cardio-respiratory system is. The obtained data demonstrate that the smallest indicators in premenstrual, ovulatory and menstrual cycle phases (1333,7; 1443,6 and 1455,6 $\frac{ml \cdot s}{b \cdot min}$). The best indicators of index of Skibinsky are again in post-ovulatory 1732,4 $\frac{ml \cdot s}{b \cdot min}$ and post-menstrual 1645,7 $\frac{ml \cdot s}{b \cdot min}$ phases.

It should be noted that Skibinsky's index, except the noted, allows estimating also thde resistance of organism to hypoxia and strong-willed qualities of the person. In other words, the cardio-respiratory system best of all adapts to exercise

Table 3

Indicators of endurance, working capacity and power supply of organism of handball players in different phases of the menstrual cycle (n=16)

Indicators	Phases of the menstrual cycle				
	1	2	3	4	5
PLB1, kgm·min^{-1}	78,4±4,75	83,1±3,30	78,6±3,24	88,4±4,07•	75,1±3,44
PLB2, kgm·min^{-1}	108,5±6,30	115,7±6,43	101,2±5,86▪	119,8±6,84•	100,0±5,33
$NumA_1$, times	25	25	25	25	25
$NumA_2$, times	35	35	35	35	35
HR1, bpm^{-1}	166,3±9,17	160,1±8,86	168,4±9,02	158,6±8,45	170,1±7,86
HR2, bpm^{-1}	177,4±7,16	170,6±7,42	178,2±7,33	169,6±7,07	179,8±7,30
aPWC170, kgm·min^{-1}	628,7±20,3	636,8±21,1	625,8±20,5▪	641,7±21,6•	625,0±22,0
rPWC170, kgm·min^{-1}kg^{-1}	8,64±0,78	10,28±0,96	9,02±0,57	11,55±0,83	8,52±0,70
aMCO, l·min^{-1}	2458,8±103,4	2510,07±107,2	2403,02±108,0	2620,2±111,2	2400,1±105,3
rMCO, ml·kg·min^{-1}	34,22±5,03	38,45±4,86	35,12±5,47	39,78±6,42	34,01±4,88
ALACp, w·kg	4,28±0,58	5,96±0,60	4,73±0,61▪	6,37±0,52•	4,01±0,49
ALACc, %	19,33,5±5,03	23,07±5,77	18,96±4,91	24,48±4,37	17,46±3,34
LACp, w·kg	1,75±0,31	1,89±0,27	1,68±0,32	2,34±0,28	1,70±0,17
LACc, s. u.	10,35±0,64	11,56±0,70	10,61±0,63▪	13,50±0,82•	10,07±0,77
PANO, %	45,88±3,45	48,87±4,57	46,13±6,20	49,43±5,33	45,10±6,11
HR_{PANO}, bpm^{-1}	93,2±6,08	88,6±6,18	94,4±9,02	87,2±8,76	95,3±8,81
GMC, s. u.	104,41±11,04	116,53±12,02	105,13±12,14	119,06±12,32	104,22±11,55
LFP, s. u.	10,24±1,15	12,38±1,03	10,88±0,95	13,27±1,07	10,01±2,03
GE, points	7,45±1,01	9,58±0,75	7,92±0,84▪	11,46±0,85•	7,00±0,50
HE, points	9,30±0,51*	14,40±0,60▲	10,01±0,65▪	16,25±0,71•	8,96±0,58
HPE, points	3,25±0,24	3,61±0,30	3,48±0,22▪	4,33±0,31•	3,10±0,20
PSP, s. u.	19,85±3,04	21,47±2,66	20,11±2,55	23,60±2,49	19,02±1,88
RO, points	8,82±0,86	9,41±0,76	9,0±0,90	9,83±0,94	8,52±0,62

Notes: *reliable differences between cycle phases: * – 1–2; ▲ – 2–3; ▪ – 3–4; • – 4–5; PLB1 – the power of the 1st loading on the bicycle ergometer No. 1; PLB2 – the power of the 2nd loading on the bicycle ergometer No. 2; $NumA_1$ – the number of ascensions on step at the first loading No. 1; $NumA_2$ – the number of ascensions on step at the second loading No. 2; HR1 – heart rate after the first loading; HR2 – heart rate after the second loading; aPWC170 – absolute power; rPWC170– relative power; aMCO – absolute maximum consumption of oxygen; rMCO – relative maximum consumption of oxygen; ALACp – alactate power; ALACc – alaktate capacity; LACp – lactate power; LACc – lactate capacity; PANO – threshold of anaerobic exchange; HR_{PANO} – heart rate at threshold of anaerobic exchange; GMC – the general metabolic capacity; LFP – the level of functional preparedness; GE – the general endurance; HE – high-speed endurance; HPE – high-speed and power endurance; PSP – profitability of system of power supply; RO – reserve opportunities.*

stresses in post-ovulatory and post-menstrual phases of the menstrual cycle.

Direct confirmation of the best opportunities of sportswomen in these phases is definition of endurance, working capacity and power supply which results are presented in tab. 3.

These of tables 3 give the chance to be convinced available accurate dependence of functional condition of handball players on phase of their menstrual cycle. So, for example, had power of the first and second loadings on the bicycle ergometer was the greatest post-ovulatory – 88,4 kgm·min^{-1} and 119,8 kgm·min^{-1} and in post-menstrual phases 83,1 kgm·min^{-1} and 115 kgm·min^{-1}.

It is important that the heart rate was the smallest at the bigger power of loadings in these phases of cycle, that is heart worked economically.

The analysis of absolute and relative power also convinces available dependences of their level on phase of the menstrual cycle of sportswomen.

Essential changes in different phases of the menstrual cycle happen at handball players with lactat and alactat power and capacity. Both at enrichment by blood oxygen, and at impoverishment by its oxygen the power and capacity the best in post-ovulatory phase, slightly worst they in post-menstrual cycle phase.

Important is also the level of functional preparedness of sportswomen in different phases of cycle. Definition of these indicators has given the chance to be convinced, as they are the best in the mentioned phases of the menstrual cycle and the worst in premenstrual and menstrual phases. The same regularity in manifestation of functional indicators of sportswomen can be observed also after diagnostics of high-speed

and power and general endurance.

Profitability of system of power supply has low indicators in menstrual and premenstrual phases of cycle. It means that the organism of handball players in these phases of cycle is much worse provided with energy and profitability of this process in these phases is low. At the same time these indicators are the best in post-ovulatory and post-menstrual phases.

Significant indicator is also the level of reserve opportunities of sportswomen: the bigger it is, increasingly they have ability to manifestation of the maximum opportunities, especially in extreme conditions of competitions. As the obtained data testify, reserve opportunities of handball players have the largest level in post-ovulatory (9,83 mind. odes.), and after it – in post-menstrual (9,41 mind. odes.) cycle phases.

Conclusions

The received results convince available the best conditions of manifestation of functionality of organism of the studied sportswomen in post-ovulatory phase of the menstrual cycle. The next period, in which handball players owe the objective opportunity to carry out exercise stresses of a little smaller power, is post-menstrual phase.

Prospects of the subsequent researches. The perspective direction of implementation of the obtained data is thre creation of training process with programming of individual load of handball players in different phases of the menstrual cycle.

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The creation of programs of physical rehabilitation/therapy in musculoskeletal disorders

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Purpose: *to reveal the structure of planning in physical rehabilitation/therapy and to analyze the peculiarities of the creation of rehabilitation programs in the musculoskeletal disorders.*

Material & Methods: *the structure of planning was determined and analyzed as a functional subsystem of physical rehabilitation/therapy. Literature analysis, system analysis and synthesis, methods of analogies, abstraction and generalization were applied.*

Results: *the concept of "program" in physical rehabilitation has been analyzed. The need has been justified and the method of creating programs of physical rehabilitation/therapy, taking into account the source and target levels of motor functions and the availability of system resources, has been given. Definition of "program of physical rehabilitation/therapy" has been proposed. Components of programs of physical rehabilitation / therapy in musculoskeletal disorders have been identified.*

Conclusions: *planning is a functional subsystem of the physical rehabilitation/therapy. The purpose of planning is creating a program. Planning consists of the following functional subsystems of the second level: prognostication, goal setting, creating of an intervention technology, creating of a control technology and writing of a program. The program of physical rehabilitation/therapy is a plan of transformation of system resources into the goals and the purpose of physical rehabilitation/therapy using intervention and control technologies.*

Keywords: *physical therapy, movement disorders, planning, resources, program, goals, technology.*

Introduction

The question of planning of the process of physical rehabilitation constantly appears at scientists of the branch. The researches continue which are devoted to the creation of programs of physical rehabilitation at different nosology [1–5]. The attention to the mentioned problem is predetermined that inaccuracies and mistakes, when planning call into question efficiency of the whole rehabilitation process, can entail the loss of health and the patient's invalidization. At the same time the detailed recommendations from the creation of programs and definition of the concept "program of physical rehabilitation" are not succeeded to find in special scientifically-methodical literature.

The practicing specialists in physical rehabilitation also have to be ready to the solution of the questions, which are connected with rehabilitation programs. The marked-out experts can be appointed to the instructor's position on physical therapy. According to duty regulations, there is drawing up recommendations from improving systems and programs and modification to them among tasks and duties of the instructor [6].

Reforming of physical rehabilitation in Ukraine in modern international not medical specialty "physical therapy", introduction of specialty "physical therapist" on the code 2229.2 in the Qualifier of professions of Ukraine induce to pay attention to features of activity of physical therapists in the aspect of planning of rehabilitation actions.

It is noted that "physiotherapists (physical therapists) estimate, plan and realize rehabilitation programs for improvement or renewal of motive functions of the person" in the description of professional activity of the specialty "physical therapist" of the International standard classification of professions of ISCO-08 (group 2264). It is worth allocating such, which are connected with creation and implementation of rehabilitation programs, from between the tasks of professional activity:

- establishment of purposes of treatment with patients and development of medical programs for reduction of physical pain, strengthening of muscles, improvement of cardiothoracic, cardiovascular and respiratory functions, renewal of mobility of joints, improvements of balance and coordination of movements;
- development, implementation and monitoring of programs and procedures, with use of therapeutic properties of physical exercises, heat, cold, massage, manipulations, hydrotherapies, electrotherapies, ultra-violet and infrared light, and ultrasound in treatment of patients;
- development and deployment of programs of observation and prevention of the basic physical diseases and frustration [7].

Thus, planning of physical rehabilitation appears the urgent scientific and practical problem.

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 on the subject "Theoretic-methodical bases of physical rehabilitation of disabled persons with violation of activity of musculoskeletal system and respiratory system", which is approved in 19.04.2016

at the meeting No. 8 of the academic council of LSUPC (the head, prof. A. S. Vovkanych).

The purpose of the research:

to reveal the structure of planning in physical rehabilitation / therapy and to analyze features of the creation of rehabilitation programs at violations of activity of the musculoskeletal system.

Material and Methods of the research

Research methods: analysis of references, system analysis and synthesis, methods of analogies, abstraction and generalization.

Results of the research and their discussion

The concept "program of physical rehabilitation" is used with definitions "complex", "typical", "individual", "problem-oriented" in special scientifically-methodical literature.

The term "program" means "in advance deliberate plan of any activity, work", and "complex" – that, "which covers group of objects, phenomena, actions, properties" [8].

The determination of the term "the comprehensive program of physical rehabilitation" was not succeeded to find. It is used as the synonym of the concept "complex rehabilitation" or "complex physical rehabilitation" in special cases. Also it is noted that the program of medical rehabilitation has to be complex, and the recovery treatment needs to be performed by the group of experts: doctor, psychologist, instructor of MPC, or rehabilitology [5; 9]. It is possible to draw conclusion that complex rehabilitation is the simultaneous implementation of different types of rehabilitation by the corresponding experts.

Researchers often understand the use of several means and methods as the term "comprehensive program of physical rehabilitation" [3; 4; 10; 11]. In that case there is need to establish whether the program of physical rehabilitation be "not complex" can and be based on application of only one mean or method? It was not succeeded to find the answer to this question in special literature.

One of the interpretations of the term "program" which is of interest in the context of the research is such: "set of the interconnected projects..., and also the complex of the organizational changes, which are united by common purposes and directed to the achievement of concrete ... benefits" [12]. In this definition the project is the conceived action plan; plan, intention [8]. Therefore, the complexity should be considered as one of the characteristics of the program, and the term "comprehensive program of physical rehabilitation" does not seem correct.

Typical programs of physical rehabilitation were created as average plans with orientation, first of all, to the main clinical diagnosis and the period of rehabilitation. The purpose of their development – scientific foundation of rehabilitation actions for educational and practical requirements. Unfortunately, some scientists prove the efficiency of new author's programs in comparison with the existing "standard", "classical" without analysis of contents of the last [1–3].

It would be mistake to consider the improvement of typical programs in the way to creation of ready "recipes" on rehabilitation at concrete nosological forms for studying by students-rehabilitologists, whether the ideal tool for effective influence on the patient in real clinical conditions. The reason – diversity of violations at the identical clinical diagnosis and stage of rehabilitation.

According to modern model of rehabilitation, activity physical rehabilitologist/therapist goes for reduction, elimination and prevention of development of violations which result from complications of the basic and accompanying diagnoses [13].

The size of violations is always individual and depends on many factors: mechanogenesis of trauma, pathogenetic factors, age, heredity, general state of health. The rehabilitation profile of persons with the identical clinical diagnosis differs. It does not deny the fact that identical violations happen at patients to the different clinical diagnosis.

The rehabilitation profile of the patient is formed by such indicators:

- the previous functional condition and level of independence before disease (trauma);
- the urgent functional restrictions and degree of their expressiveness: ability to self-service, independent movement, study, work, orientation, communication, monitoring the behavior;
- the psychoemotional status and motivation concerning participation in the rehabilitation program [14].

The listed individual factors are also influence on variability of dynamics of violations under the influence of rehabilitation actions.

Other problem, which scientists solve during the creation of the typical program, is the prediction of typical purposeful level of physical rehabilitation. The only way to define it – to average data of certain contingent of patients. But such purpose only approximately can meet individual needs and rehabilitation profile of the patient even at rather short stage of rehabilitation [1].

Expediency of establishment of typical purposeful level on long interval of time (several weeks or months) at violations of the musculoskeletal system it seems debatable [2]. The implementation of rehabilitation actions is influenced by individual terms of healing of soft tissues, consolidations of fractures of bones and cartilages, implantation of transplants. The attending physician formulates individual contraindication and caution to physical rehabilitation / therapy with their account. Physical rehabilitologist has to take this information into account when holding all actions with the patient [15].

Certain scientists created the author's program with a view to achievement of purposes and called it problem-oriented. According to scientists "means, forms and methods of physical rehabilitation most of which effectively will help to solve task reached strictly individually and to achieve goal" [16]. It comes up from the quoted that classes were actually given not by one, and different programs.

It is easy to create the typical program, having defined aver-

age values from individual programs, which are the object of the scientific research. Much more difficult task appears at experts experts on places: how was the typical program created from individual, in view of diversity of violations? The scientific research on this problem is not enough [17]. Scientists, as a rule, do not offer concrete ways of adaptation of author's programs to individual needs of patients and are limited to the general recommendations. The answer to the question remains open: what and how it is possible "individualize" not to be beyond the typical author's program?

Studying of different aspects of the process of physical rehabilitation and, in particular, questions of planning, it is expedient to carry out on the basis of the system approach. It treats general scientific methodology and allows investigating big and difficult objects (systems) fully as only whole with the coordinated functioning of all elements and parts. The system approach can be applied to any object of the scientific research [18].

The improvement of system of physical rehabilitation has to be based on understanding of features of its structure and functioning, which can be found by means of morphologically/topologically, functional and information descriptions.
It is established on the basis of the morphological description that physical rehabilitation consists of such subsystems as the patient, the specialist in physical rehabilitation and the purpose of physical rehabilitation. It is the part of metasystem (supersystem) of healthcare, which forms its environment [15].

The functional description allows to considering physical rehabilitation as the system of rehabilitation actions, the majority from which are in common carried out by physical rehabilitologis and the patient. The need of the separate functional description of physical rehabilitation does not contradict to modern understanding of the role of multidisciplinary team in medical – rehabilitation process [19].

Studying of foreign experience showed that the American Association of physical therapy allocates five components in clinical activity physical therapist:

1. Inspection or review (examination).
2. Estimation (evaluation).
3. Diagnostics of violations (diagnosis).
4. Forecasting (prognosis).
5. Intervention (intervention) [20].

It is necessary to understand of influence physical rehabilitologist/therapist on motive functions and activity of the patient by means and methods of physical rehabilitation/therapy as the term "intervention".

The listed components of clinical activity are considered as the sequence, but not system of processes and therefore their purposes are accurately not defined. For example, estimation and diagnostics are divided, and such components as planning and control, separately not certain. Five similar components are allocated in the new edition grants and it is noted that forecasting covers planning [21].

The opposite example is SOAP ("soap" from English) – the format which is suggested to be used for the organization of work with the patient and maintaining medical documentation. The abbreviation is allocated four components of activity by the first letters: collecting subjective information (Subjective), collecting objective information (Objective), estimation (Assessment), planning (Plan) [22]. In this case forecasting separately is not considered.

It is worth allocating four main functional subsystems with own purpose in physical rehabilitation / therapy:

• inspection, purpose, – to define motive and functional violations;
• planning, purpose – creation of the program of physical rehabilitation/therapy;
• intervention, purpose – implementation of the program of physical rehabilitation/therapy;
• control; purpose – support of functioning of system of physical rehabilitation.

The consecutive achievement of the purposes of subsystems in the end result provides the achievement of goals of functioning of the system of physical rehabilitation – renewal of motive functions, activity and health of the patient.
Investigating the subsystem of "planning", it is possible to compose it on number of functional subsystems of the second level:

1. Forecasting.
2. Statement of the purposes of intervention.
3. Formation of technology of intervention.
4. Formation of technology of control.
5. Written execution of the program of physical rehabilitation/therapy.

Let's consider each of the listed subsystems.

1. Forecasting.

Having analyzed the results of inspection, physical rehabilitologist/therapist has to describe motive and functional violations and predict possibilities of their elimination.

The purpose of the first subsystem of "forecasting" is the formulation of the individual purpose of physical rehabilitation, for example: to resume professional activity, to return to classes of concrete sport, to reach certain level of independence.

The determination of the term "forecast" allows connecting the establishment of the purpose with "forecasting". It comes from Greek "prognosis" and means "prediction on the basis of the available data directly, character and features of development and *termination* (allocation of the author) of the phenomena and processes in the nature and society" [8].

Forecasting covers the bigger period, than the plan, and precedes its drawing up. At the heart of scientific forecasting, as well as planning, the scientific prediction lies. Unlike plans forecasts do not contain concrete tasks [23].

In the Order of the Ministry of health protection "About the approval of Instruction about the establishment of groups of disability" of 05.09.2011 No. 561 is told that "rehabilitation forecast – predictable probability of realization of rehabilitation potential and predictable level of integration of disabled people into society which is defined not only by the level and

the maintenance of rehabilitation potential, but also real opportunities of application, for its realization of modern rehabilitation technologies, means and methods" [24].

The interpretation of the concept "forecast of physical rehabilitation" of special literature did not manage to be found.
The rehabilitation forecast in physical therapy is determination of level of the greatest possible improvement of functions of the patient and time, necessary, for achievement of this level. The forecast also may contain prediction of levels of improvement during the different periods during the course of physical therapy. The favorable forecast is the basis for rehabilitation intervention [25]. On analogies, the forecast of physical rehabilitation is predictable level of renewal of motive functions and activity of the patient for certain period under the influence of actions of physical rehabilitation.

As it was noted above, the rehabilitation forecast is closely connected with rehabilitation by potential – complex of biological and psychophysiological characteristics of individual, and also social-surrounding factors which allow realizing in this or that degree its potential abilities [14]. By other, very similar definition – it is complex biological, psychophysiological and social characteristics of the person, and also factors of the social- psychophysiological environment who allow realizing its potential opportunities to rehabilitation [24].

Rehabilitation potential and its realization are connected with resources of which the system of physical rehabilitation disposes [26]. As any other system, physical rehabilitation functions in the conditions of limit of resources. Therefore, forecasting can be considered as estimation of the system resources, which are necessary for achievement of goals. Such method of formation of initial position for development of the plan is called resource (by opportunities) [27].
By the definition of the researchers, the term "purpose of system of rehabilitation" consists in achievement in the corresponding time resistant, optimum to sanogenetic opportunities of renewal of the broken functions of individual, its adaptation, to the environment and participation in social life with the social functions [14] with changed in connection with disease.

Full renewal of motive functions and activity to the previous level is the main, but not the only option of the purpose of physical rehabilitation. Its difference from such spheres as physical education, education, industrial production where the purpose of activity is excess of initial level consists in it. The purpose of physical rehabilitation is renewal of the broken motive functions and activity according to sanogenetic opportunities of the person.

If it does not seem possible completely to resume the previous level of functions, then it is necessary to define another, which will be considered as accessible. Therefore, the purpose can be planned in different way:

- full renewal of the lost functions;
- support of functions at the certain level;
- delay of loss of functions (at irreversible changes);
- formation of compensations (at irreversible changes) [28].

In the listed cases, the forecast should be considered as positive, that it will allow to continue planning, having formulated the individual purpose and the goals of physical rehabilitation. Such method of planning is called purposeful (by requirements) [27].

If physical rehabilitologist considers that the intervention will not yield positive results, then he discusses the conclusions with the attending physician and the patient and behind their consent can stop the subsequent rehabilitation.

2. Statement of the purposes of intervention.

The purpose of this functional subsystem of the second level coincides with the name.

It is necessary to define the purposes of intervention by decomposition of the purpose. They are purpose elements, have to submit to it and answer unambiguously question: what have we made for its achievement? The goals indicate ways of achievement of purposes [28].

The purpose is divided into shortly – and long-term in physical rehabilitation/therapy. The last demand over three weeks for achievement [29].

The achievement of the purposes can consistently be planned when achievement of one purpose becomes the key to another. For example, the patient will hold the affected lower extremity over floor surface to lean on the affected leg without ability during certain time forcedly. If such loading is contraindicated, then studies of gait and gait with crutches with transferring of weight only through intact lower extremity will become impossible.

Short-term purposes can be also planned in parallel. Their simultaneous successful achievement will open way for the achievement of bigger long-term goal which plays unifying role. Simultaneous preparation of the upper and lower extremities, and also systems of power supply of the patient for study of gait with crutches is example. If to begin such work previously (for example when the patient still is on skeletal endurance), then the terms of rehabilitation will considerably be reduced.

Scientists and practicians recommend applying SMART format for correct statement of the purposes in different fields of activity and, in particular, physical therapy [30–33].

It is expedient to apply such option of definition of the purposes and its treatment in physical rehabilitation/therapy:

- Specific;
- Measurable;
- Attainable, achievable;
- Relevant;
- Time-bound [34].

"Specific" of the purpose consists in the accurate and clear formulation which does not allow different treatment participants of the rehabilitation process. Especially it concerns the patient. Such can be examples of inconcrete statement of the purposes:

- to liquidate pain in backbone of the patient with osteochondrosis;
- to teach to go without supportive applications of the patient after skeletal injury of the lower extremities;

• to return the patient to soccer classes after plasticity of forward crossed sheaf.

In the first case the patient can understand achievement of goals as the lack of sensations of pain without any communication with duration and intensity of loadings. At the same time experts know well that physical overworks (static or dynamic) cause pain in structures of backbone of all persons without exception.

Quality of walk (normal or pathological) and environment (surface equal or inclined; with architectural barriers or without them; in the room or outside) are not defined in the second case. It allows different interpretation of progress of rehabilitation by the expert and patient.

The third example of inexact statement of the purpose can be treated as the beginning of individual trainings with ball or as the moment of return to full competitive activity which needs significantly the highest level of physical functions.
All given examples have common feature: the purposeful functional level of the patient is accurately not outlined at them.

In order to avoid misunderstanding, physical rehabilitologist has to work thus:

• to establish the purpose together with the patient taking into account his requirements and wishes;
• to formulate the purpose as much as possible concrete and unambiguous;
• it is obligatory to be convinced that the patient understands the purpose essence.

Concreteness of the purpose provides its identity.

The purpose can be considered concrete if it contains the answer to the question “what needs to be made?”.

It needs to be described in figures or quality indicators for “measurable” of the purpose in rehabilitation:

• pain – points (visual analog scale of pain);
• range of movement in joint – degrees;
• muscular strength – newton, kilograms or points, on MMT (manual muscular testing);
• speed of movement of body – meters in second;
• angular speed in joint – radians in second;
• segment grasp – centimeters;
• indicators of functional tests – points.

Without measurability it is difficult to estimate advance in achievement and to define the moment of achievement of goals. The purpose can be considered measurable if it contains the answer to the question “how many?”.
“Attainable, Achievable” of the purpose is connected with the rehabilitation forecast. It should be considered in two aspects: theoretical and practical.

Factors which will influence “attainable, achievable” are rehabilitation resources as open social system: material, financial, power, human, organizational, information. They belong to two subsystems: to rehabilitolog and patient. It is also necessary to take external influences (influence of the environment and metasystem) which can both strengthen in attention, and to weaken resource base of rehabilitation.

The theoretical possibility of achievement of goals is the answer to the question: it is possible in general, isn’t it? The answer is based on basis of the medical forecast and depends on the clinical diagnosis, duration of disease, its course and efficiency previous, and medical rehabilitation actions. It is information which comes to system of physical rehabilitation from the attending physician. The theoretical aspect of reach is also defined by opportunities of modern technologies of physical rehabilitation and resources of which the therapist disposes physical rehabilitologist/therapist.

The practical possibility of achievement of goals is the answer to the question: will the particular person be able to achieve the purposes, won’t he? Therefore the practical aspect of reach concerns more resources of the patient and his rehabilitation potential [26].

The criterion of “relevant” consists in coordination of the purposes with strategic purposes of medical-rehabilitation process and their subordination of the rehabilitation purpose.

The specialist in physical rehabilitation has to understand accurately value of each established purpose for fast and full renewal of functions of the patient. If the achievement of purpose will not raise achievement of goals of rehabilitation, then such purpose cannot be considered corresponding. And, opposite: achievement by advantage for functioning is brought to each answering purpose and brings closer the rehabilitation purpose. The understanding of compliance whole motivates the patient.

Discrepancy of the purpose of the goal and to strategic purposes of rehabilitation sprays resources, increases duration of rehabilitation and reduces its efficiency.

The purpose is considered corresponding if allows to answer the question” in what way does the achievement of goal bring closer the rehabilitation purpose?”.

The criterion “time-bound” concerns time as resource of rehabilitation and provides establishment of concrete terms of achievement, or hour framework. Excess of limit of time demonstrates not achievement of goal. Thereof, there will be number of problems, which worsen the rehabilitation forecast:

• need for resources grows;
• violations, which at the beginning of rehabilitation were functional, can turn into irreversible structural changes and the definite purpose will become inaccessible;
• the patient is discouraged.

The purpose is considered certain in time if contains the answer to the question “when it will be reached?”.

The purposes of rehabilitation have different hierarchy. Being based on the International qualifier of functions (ICF) of their establishment, it is possible at the level of function, structure, activity, participation.

The purposes of different hierarchy can be united in “tree of purposes” in physical rehabilitation, as well as in other kinds of activity. This graphic display on interrelation and subordination of the purposes, distributions of mission and the purpose on goals, local goal, tasks and separate actions. The purpose of the highest level is reference point, basis for development

(decomposition) of the purposes of the lowest level at the creation of "tree of purposes". The purposes of the lowest level are ways of achievement of goals of the highest level and have to be presented so that their set predetermined achievement of the initial purpose [35].

3. Formation of technology of intervention.

It is necessary to understand the set of methods, means and forms which are used for achievement of the purposes of the consecutive rehabilitation actions, which are directed to renewal of motive functions, activities and health of the person/patient [36] as the term "technology of physical rehabilitation". Therefore, the purpose of the noted functional subsystem of the second level – to select combination of means, methods, intervention forms with the corresponding individual loading.

It is necessary to carry such to fixed assets and methods of physical rehabilitation at violations of activity of musculoskeletal system:

- physical therapeutic exercises (remedial gymnastics);
- functional training (training of motive skills);
- treatment by situation;
- massage;
- postisometrica relaxation;
- preformed physical factors.

The main forms of carrying out rehabilitation are individual classes under the supervision of the expert and independent in the hospital period. Individual, independent and, rarer, group classes are hold in the post-hospital period.

At the choice of means it is necessary to be guided, first of all, by criteria of safety and comparative efficiency for reduction of such widespread violations of musculoskeletal system as:

- pain;
- muscle weakness;
- decrease in muscle endurance;
- limited range of the movement;
- hyper mobility of joints;
- violation of posture;
- imbalance of length and force of muscles [37].

They surely consider interaction of means and their individual figurative.

Advantage at the choice in hospital and post-hospital periods should be given to active medical physical exercises. From all means they best of all promote renewal of motive functions; have no restrictions on application course duration; can at the same time mother special and general influence; do the patient independent. Physical exercises apply according to the all-didactic and specific principles of physical education.

Means and methods, which provide passive participation of the patient, are most widely applied in the hospital period. They reduce pain, hypostases, promote healing, normalize tone of muscles, improve mobility and thus help effective application of active physical exercises. Among them the special place is taken by passive therapeutic physical exercises, where the movement is carried out by external forces, for example: gravitation, CPM machine (continuous passive motion machine), physical rehabilitologist.

Dispensing of the general exercise stress is the finishing step in formation of technology of intervention. It has to answer rehabilitation profile and endurance of the patient. In rehabilitation physical endurance is characterized by times during which the patient can be engaged in physical functioning which level ensures realization of necessary rehabilitation interventions [14]. The size of influence depends on different factors:

- quantity of the chosen means;
- combination of methods and forms;
- quantity, frequency, duration of separate classes and procedures.

4. Formation of technology of control.

The subsystem purpose – to select terms, methods and control means.

The program has to provide staged and total types of control. It is planned in the form of the reduced inspection on separate classes or part of classes at violations of activity of musculoskeletal system. Terms of control are connected with the planned achievement of the purposes. Operating and current control do not need planning. Physical rehabilitologist/therapist carries out them with frequency which answers clinical profile of the patient and dynamics of improvement of its state.

Methods and control means are observation, poll, review, anthropometry, performance of active and passive movements, goniometry, articulate game, manual to muscle testing, isometric tension of muscles, dynamometry, palpation, pain scale, functional tests.

5. Written execution of the individual program of physical rehabilitation/therapy.

The subsystem purpose – to finish creation of the program.

The standard form of medical-rehabilitation institution can be developed and used for written registration. All program provisions should be discussed with the patient, to bring necessary corrections and methodical instructions and in common to approve them.

The program has to contain such main groups of information:

- program purpose/goal:
- long-term purposes;
- short-term purposes;
- means and methods of intervention;
- quantity, frequency, duration of classes and procedures;
- carrying out forms;
- methodical instructions;
- means and control methods;
- terms of staged and total control;
- marks about performance.

Thus, the program of physical rehabilitation is plan of transformation of system resources into the goals and the purpose of physical rehabilitation by means of technologies of intervention and control.
In medical rehabilitation, according to recommendations of WHO, two periods are allocated: hospital and post-hospital.

In the hospital period, when it is necessary to liquidate or to reduce activity of pathological processes, physical rehabilitation has to submit to medical interventions. The way of its introduction can be such:

1. Creation of clinical protocols where physical rehabilitation/therapy will be to the component providing medical care to the patient.

2. Definition of basic provisions of implementation of actions of physical rehabilitation/therapy: inspections, planning, intervention and control.

3. Adaptation of protocols by experts-methodologists to conditions of separate medical-rehabilitation institution.

4. Inspection of the patient by physical rehabilitologist/therapist on the basis of the clinical protocol.

5. Creation of the individual program by physical rehabilitologist/therapist behind results of primary inspection and forecasting.

In the post-hospital period, when reduction and mitigation of consequences of disease in polyclinic or house conditions continues, the program of physical rehabilitation/therapy can separately be created or as component of the comprehensive program of rehabilitation.

Conclusions

There is no only image of structure of planning in physical rehabilitation/therapy among experts. It is necessary to resolve this problem on the basis of the system approach.

«Planning» is one of functional subsystems of physical rehabilitation/therapy. The planning purpose – creation of the program.

Drawing up typical programs of physical rehabilitation/therapy at violations of activity of musculoskeletal system on the basis of the clinical diagnosis becomes complicated diversity of violations by which the diagnosis is followed. Inspection of the patient by physical rehabilitologist/therapist for determination of initial level of motive functions has to precede that planning.

Planning consists of such functional subsystems of the second level:

1. Forecasting; the subsystem purpose – to establish the individual purpose of physical rehabilitation/therapy (purposeful level of motive functions).

2. Statement of purposes of intervention; the purpose – to establish long-and short-term purposes of different hierarchy.

3. Formation of technology of intervention; the purpose – to select methods, means, forms of intervention and their dispensing.

4. Formation of technology of control; the purpose – to select terms, methods and control means;

5. Written execution of the program; the purpose – to finish creation of the individual program.
The program of physical rehabilitation/therapy is plan of transformation of system resources into the goals and the purpose of physical rehabilitation by means of technologies of intervention and control. It is created taking into account conditions of realization and has to contain such main groups of information:

- purpose and goals;
- means and methods of intervention;
- quantity, frequency, duration of classes and procedures;
- carrying out forms;
- methodical instructions;
- terms, methods and control means;
- marks about performance.

The prospect of the subsequent researches consists in the development of clinical protocols of medical care at the musculoskeletal system diseases where physical rehabilitation/therapy will be the component.

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Appropriate standards of physical fitness of students

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Purpose*: to establish the due norms and estimates of the level of development of physical fitness of students.*

Material & Methods: *the assessment of physical fitness of students (young men) was carried out on the basis of the results, which are shown by them in tests: standing long-jump, run of 60 meters, run of 1000 meters, pull ups on a horizontal bar, trunk bending forward from sitting position, and shuttle run of 4x9 m. The selective method was used for the establishment of borders of the confidential interval.*

Results: *results of the carried-out analysis showed that the level of physical fitness of students of NLA corresponds to the data, which are submitted in special literature.*

Conclusions: *borders of the confidential interval for indicators of physical fitness of students of the general population, and also due standards and estimates of the level of development of their physical fitness are established on the basis of the received results.*

Keywords: *physical education, physical fitness, confidential interval, variability, general population, statistical norms.*

Introduction

The level of physical health of student's youth as results of the analysis of special literature testify [1; 3; 4; 13], significantly depends on the volume of their motor activity, which is defined generally by the efficiency of training on physical education within the educational process, which is developed in higher educational institutions of Ukraine [5; 12; 17 and others]. It means that the appropriate level of physical health of students is provided generally at the expense of the correct organization of classes in the course of practical realization of the discipline "Physical education". The level of development at students of physical fitness, which is characterized in the basis by the level of development at them physical qualities, is the objective consequence of this process (endurance, force, speed, dexterity, flexibility). In this connection there is the requirement of determination of appropriate standards of physical fitness of students as one of the basic elements of management of the educational-training process. The solution of such task for this time has the important practical value, the Resolution of the Cabinet of Ukraine "About the state tests and standards of assessment of physical fitness of the population of Ukraine" has lost action [7], and the new mechanism of annual estimation of physical fitness of the population of the country takes root, since 2017 [8].

Communication of the research with scientific programs, subjects, plans

The research is executed within the implementation of the scientific project of the 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 appropriate standards of physical fitness of student's youth (young men).

Research tasks:

1. To determine the level of physical fitness of students (young men).
2. To set limits of the confidential interval for indicators of physical fitness of students of population (young men).
3. To establish the appropriate standards and estimates of the level of development of motive qualities at students.

Material and Methods of the research

The following tests were used for the assessment of physical fitness of students (young men). High-speed and power preparedness of students was estimated on the basis of test results "standing long-jump". The level of development of speed at them was estimated by test results "run of 60 meters", endurance – by the results, shown in run on distance of 1000 m, forces – by the results, shown in the test "pulling up on a horizontal bar" (number of times), flexibility – by the results, shown in the test "trunk bending forward from situation, sitting" (sm), dexterity – at the results shown in the test "shuttle run of 4x9 m» (s). The criterion of Student was used for the comparison of average values two sample. The selective method, which essence consists in the assessment of statistical parameters of population through sample indicators, was used for the establishment of limits of confidential interval. For average arithmetic population to limit of confidential interval are set by such inequality $\bar{X}_{sel.} - tm \leq \bar{X}_{gen.} \leq \bar{X}_{sel.} + tm$, where

$\bar{X}_{sel.}$ – average arithmetic selective population; $m=\sigma/\sqrt{N}$ – representativeness error; t – the size of the normalized deviation, which is determined by the level of confidential reliability (R) at P=95%, t=1,96 [6; 11]. Students of Kharkiv National law university of Yaroslav the Wise (NLU), and Municipal institution "Kharkiv Humanitarianly Pedagogical Academy" of the Kharkiv regional council (KhHPA) participated in the research. Materials of rather physical fitness of students of KhHPA are partially provided by T. S. Bondar.

Results of the research and their discussion

Results of the assessment of level of physical fitness of students (young men) of NLU and KhHPA are presented in the table 1. As the received materials concerning the level of development of high-speed and power preparedness, which was estimated by the results, shown in the test "standing long-jump" testify, students of NLU authentically do not differ from students of KhHPA. If to compare the value of the average-grouped, shown by students of NLU (228,2 sm) and KhHPA (233,7 sm) to the results presented in special literature, then the corresponding intervals of variability in general coincide. For example, in the dissertation research of O. Tserkovnaya [14], the minimum value of interval of variability in this type of testing makes 216,3 sm, and maximum – 245,5 sm. The obtained data also coincide with the results, which are presented in the article of I. Saluk [9], in which the variability interval in this test makes 229,9±1,7 sm. As show the research materials, students of KhHPA in comparison with results of students of NLU have shown authentically the best results only in the test "run on 60 m", respectively 8,5±0,7 s and 8,99±1,37 s. At the same time it is necessary to take the fact that same-signal interval of variation of results of testing of students of KhHPA into account (the minimum value 7,78 s, and maximum – 9,2 s) is completely absorbed by interval of variation of the results, shown by students of NLU (the minimum value 7,62 s, and maximum – 10,36 s). On the level of the development of endurance, which was estimated by results of run on 1000 m, students of these higher education institutions statistically do not differ. They have shown such average-grouped results: NLU – 3,4 min, and KhHPA – 3,36 min. Similar regularity is found out also as a result of comparison of indicators of the development of power preparedness of these students HEI, that s average-grouped results in the test "pulling up on a horizontal bar" at students of KhHPA (11,4 times) are slightly higher than at students of NLU (10,97 times). Let's note that the interval of variability of the results shown by students of these HEI in this test coincides with the data of I. Saluk [9] (9,2±0,43 times) and R. Cherkashin [15] (8,39±0,07 times). On the average-grouped level of development of flexibility students of NLU (13,7 sm) statistically do not differ from students of KhHPA (12,6 sm). Practically the same results in this type of testing (namely 10,3 sm) are presented in the work O. Cherepovetskaya [16], and also in already mentioned article of I. Saluk [9] (10,9±0,14 sm). Results of the research have also shown that on the level of development of dexterity which was estimated by results of shuttle run students of NLU and KhHPA statistically do not differ. They have shown average-grouped results, respectively 9,3 s and 9,4 s. Let's note that the obtained data on the level of development at students of dexterity in general coincide with the data provided, for example, in the dissertation researches O. Tserkovnaya [14] (9,79±0,13), and L. Dolzhenko [2] (9,1–8,9), and also in the article of I. Saluk [9] (10,0±0,05).

The analysis of level of physical fitness of students (young men) of NLU is carried out above, taking into account the relevant data of special literature and results presented in table 1, shows that this selection represents population objectively. It means that it is possible to set limits of confidential interval for general average, and also to establish the relevant appropriate standards for assessment of the level of development of motive qualities at students on the basis of the obtained statistical data. The limits of confidential interval for average value of population of students (young men) set on the basis of selective method, presented in the table 2. They demonstrate to what with reliability of 95% can be claimed that according to each test, which is used for assessment of level of physical

Table 1

Indicators of physical fitness of students (young men) of NLU and KhHPA

№	NLU			KhHPA			$T_{count.}$	$T_{gr.}$
	$\bar{X}$	σ	m	$\bar{X}$	σ	m		
1	**High-speed and power preparedness (standing long-jump, sm) (n_{NLU} = 182; n_{KhHPA} = 46)**							
	228,15	21,7	1,61	233,7	20,65	3,04	1,618	<1,9759
2	**Level of the development of speed (run on 60 m, s) (n_{NLU} = 146; n_{KhHPA}=70)**							
	8,99	1,37	0,114	8,5	0,717	0,085	3,67	>1,97
3	**Level of the development of endurance (run on 1000 m, min, s) (n_{NLU} = 136; n_{KhHPA}=70)**							
	3,4	0,77	0,066	3,36	0,69	0,082	0,4	<1,97
4	**Level of the development of force (pulling up on a horizontal bar) (number of times) (n_{NLU} = 180; n_{KhHPA}= 49)**							
	10,97	4,64	0,346	11,44	3,36	0,48	0,81	<1,97
5	**Level of the development of flexibility (trunk bending forward from situation, sitting, sm) (n_{NLU}=167; n_{KhHPA}=52)**							
	13,7	5,4	0,41	12,66	3,36	0,734	1,3	<1,97
6	**Level of the development of dexterity (shuttle run of 4x9 m, s) (n_{NLU}=21; n_{KhHPA}=21)**							
	9,30	0,253	0,055	9,37	0,44	0,097	0,63	<2,021

fitness of students average value of each other sample, will be get in the definition thus of limit.

Appropriate standards and estimates of the level of development of motive qualities. Proceeding from the fact that the sample is described by average value which characterizes the level of development of the studied sign, and variability indicator, which displays influence on the studied sign of random factors, it is possible to enter statistically proved standard rating scales. For this purpose it is possible to use Z-scale in which as scale serves the standard deviation [10]. In this scale it is possible to take interval for the average level of development of the studied sign $X \pm \sigma$, to which getting 68,26% of all values. It is natural that the result, which exceeds the top limit of this interval, can be estimated as high (provided that increase in its size is estimated as the positive direction of development of sign). Getting to this interval 15,7% of all values. If the result is less than lower limit of interval which characterizes the average level of development of the studied sign (here getting 15,7% of values), then it needs to be estimated as the low level of development (provided that reduction of its size is estimated as the negative direction of development of sign). Appropriate norms of development of motive qualities on the basis of statistics of sample of students of NLU presented in tab. 3, are defined thus. For example, the average-group value of test results «standing long-jump» at students of NLU equals 228,15 sm, and standard deviation – 21,7 sm. Proceeding from these data, the minimum value of interval to which getting 68,26% of all values, will equal ($\bar{X}-\sigma$)=228,15–21,7=206,4 (sm), and maximum ($\bar{X}+\sigma$)=228,15+21,7=249,8 (sm). If the result, which is received during the testing of the specific student, getting to this interval, then the level of development at it high-speed and power preparedness is estimated as average. If the result is shown them in this test surpasses the maximum value of the interval allocated above, then the level of its high-speed and power preparedness is estimated as high if the ostentatious result is less than minimum value of the allocated interval – as low.

Conclusions

1. Results of the assessment of level of physical fitness of students of NLU and their comparison with the similar indicators of students of KhHPA and the relevant literary data demonstrate that the selection of students of NLU represents students of population objectively, that is, it is typical which displays real condition of physical fitness of students of the country. It means that the limits of confidential interval set on the basis of the obtained statistical data, and also the relevant appropriate standards and estimates of the level of develop-

Table 2

Limit of confidential intervals of indicators of physical fitness of students (young men), established for population on the basis of the data obtained in the course of the researches, conducted with participation of students of NLU

№	Tests for assessment of development of physical qualities	Limits of confidential interval for average value of population P=95%, t=1,96
1	Standing long-jump, sm	$225,3 \le \bar{X}_{gen.} \le 231,6$
2	Run on 60 m, s	$8,76 \le \bar{X}_{gen.} \le 9,21$
3	Run on 1000 m, min, s	$3,27 \le \bar{X}_{gen.} \le 3,53$
4	Pulling up on a horizontal bar (number of times)	$10,29 \le \bar{X}_{gen.} \le 11,65$
5	Trunk bending forward from situation, sitting, sm	$13,02 \le \bar{X}_{gen.} \le 14,38$
6	Shuttle run of 4x9 m, s	$9,19 \le \bar{X}_{gen.} \le 9,41$

Table 3

Appropriate standards of development of physical qualities at students (young men)

№	Motor qualities and kinds of testing	Level of development	Assessment intervals
1	High-speed and power preparedness (standing long-jump, sm)	High	more than 249,8 sm
		Average	from 206,4 sm to 249,8 sm
		Low	less than 206,4 sm
2	Speed (run on 60 m, s)	High	less than 7,62 s
		Average	from 7,62 s to 10,36 s
		Low	more than 10,36 s
3	Endurance (run on 1000 m, min)	High	less than 2,64 min
		Average	from 2,64 min. to 4,18 min
		Low	more than 4,18 min
4	Force (pulling up on a horizontal bar, number of times)	High	more than 15,6 times
		Average	from 6,33 times to 15,6 times
		Low	less than 6,33 times
5	Flexibility (trunk bending forward from situation, sitting, sm)	High	more than 19,1 sm
		Average	from 8,3 sm to 19,1 sm
		Low	less than 8,3 sm
6	Dexterity (shuttle run of 4x9 m, s)	High	less than 9,05 s
		Average	from 9,05 s to 9,55 s
		Low	more than 9,55 s

ment of motive qualities at students, have a reliable character.

2. Appropriate statistical standards and estimates of the level of development of motive qualities at students are established, it is possible to use in quality reference points for planning of exercise stresses what they receive in the course of development of the discipline «Physical education».

3. The technique of determination of appropriate statistical norms and estimates of level of physical fitness of student's youth, which is presented in the research, can be used in the course of annual estimation of physical fitness of the population of the country for the establishment of the relevant appropriate standards.

Prospects of the subsequent investigations. The analysis of level of physical fitness of students and establishment of the corresponding limits of confidential interval for population indicators, which characterize physical fitness, through sample indicators, is planned in the subsequent.

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The entering results of formation of valeological competence of future teachers in the course of physical education

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Purpose: *the research consists in development, justification and experimental check of theoretical-methodical bases of formation of valeological competence of the process of physical education of students of pedagogical higher educational institutions.*

Material & Methods: *the level of formation of valeological competence of future teachers in the course of physical education was determined by averaging of estimates by each experimental indicator during the skilled-experimental work. 497 students from 1 till 5 courses, 35 university graduates, working as teachers at schools of Vinnitsa, and 17 teachers of higher education institutions were involved in the forming experiment.*

Results: *the low level of formation of valeological competence of future teachers in the course of physical education in all skilled groups, participating in the pedagogical experiment, creates the objective need of introduction of the developed experimental model of formation valeological competence of future teachers in the course of physical education and complex of reasonable pedagogical conditions.*

Conclusions: *the carried-out entering test showed the similarity of experimental groups in the section of respondents on levels of formation of valeological competence, allows to consider output parameters leveled and to begin implementation of the chosen plan of experiment.*

Keywords: *future teacher, physical culture, pedagogical model, valueology, results of experiment, competence.*

Introduction

The experimental research of the put scientific problem consisted in check in practice of conceptual approaches and model of formation of valeological competence of future teachers in the course of physical education. The pedagogical experiment was aimed at approbation of the developed model of formation of valeological competence of future teachers in the course of physical education, including its main structural components; contents, which is expressed in set of educational programs and modules, didactic system of formation of valeological competence of future teachers in the course of physical education, criteria and conditions of effective realization of model of formation of valeological competence of future teachers in the course of physical education. The program of skilled-experimental work included three consecutive stages: stated, forming and appraisal-correcting.

Communication of the research with scientific programs, plans, subjects

The work is the component of complex scientific research of the chair of pedagogies of Kotsiubynskyi Vinnytsia State Pedagogical University name "Theoretic-methodical bases of pedagogical training of future teachers" (No. 0101U007274).

The purpose of the research:

developing, justification and experimental check, theoretic-methodical principles of formation of valeological competence of process of physical education of students of pedagogical higher educational institutions.

Material and Methods of the research

Participants. The forming stage of the experiment was carried out on the basis of Kotsiubynskyi Vinnytsia State Pedagogical University, Berdyansk state pedagogical university, V. Gnatyuk Ternopil national pedagogical university, Khmelnytskyi national university. 497 students from 1 on 5 courses, 35 university graduates, who work as teachers at schools of Vinnytsia, and 17 teachers of HEI were involved in the forming experiment.

Organization of the research. The forming stage of the pedagogical experiment was directed to the detection of nature of dynamics (positive, negative, stable) in heating-up period of valeological competence of future teachers in the course of physical education in the conditions of approbation of contents and mechanisms of realization of conceptual model, and also justification of technologies of diagnostics and development of valeological competence of future teachers.

Content of experimental activity in the course of the forming experiment included:

1. Developing, approbation and introduction in study of the competence-oriented educational programs within the realization of conceptual model of formation of valeological com-

petence of future teachers in the course of physical education.

2. Creation of valeological-professional educational space, which is pedagogical technology of enrichment and expansion of creative potential of educational opportunities, independently choosing and mastering, which the student projects his own individual educational space (educational design taking into account valeological aspect of professional activity). This task found the successful solution through the organization of activity of section of students' scientific society on the basis of Mikhail Kotsyubinsky Vinnytsia state pedagogical university. Results of individual design by students of valeological and professional educational space diagnostic were proved and correlated to stages of integration of valeological and professional education: acculturation, coadaptation and synergy, future teachers presented to models of formation of valeological competence in the course of physical education.

3. Control diagnostics of parameters of formation of valeological competence of future teachers in the course of physical education.

Statistical analysis. The level of formation of valeological competence of future teachers in the course of physical training was defined by averaging of estimates by each experimental indicator during the skilled-experimental work. Such scale was applied for this purpose: critical level of formation of the studied indicator was estimated at 0–0,5 points, low – at 0,75–1 points, average, – at 1,25–1,5 points, and high – at 1,75–2 points. Let's notice that all noted indicators accepted equal value which did not demand introduction of the weighing coefficients for formation of valeological competence of future teachers in the course of physical education.

Therefore, the general formula of definition of value of formation of valeological competence of future teachers in the course of physical education looks so:

$$C_{vc} = \frac{A_1 + A_2 + A_3 + A_4}{4} \qquad (1)$$

where C_{VC} – change, which is necessary for calculation of measure of formation of valeological competence of future teachers in the course of physical education;
A_1 – estimation by knowledge indicator which make valeological competence of future teachers in the course of physical education;

Table 1

Level scale of assessment of measure of formation of valeological competence of future teachers in the course of physical education

The sum of estimates on indicators (A_1+A_2+A_3+A_4)	Meaning C_{VC}	Name of level
0	0	
1	0,25	critical
2	0,5	
3	0,75	low
4	1	
5	1,25	average
6	1,5	
7	1,75	high

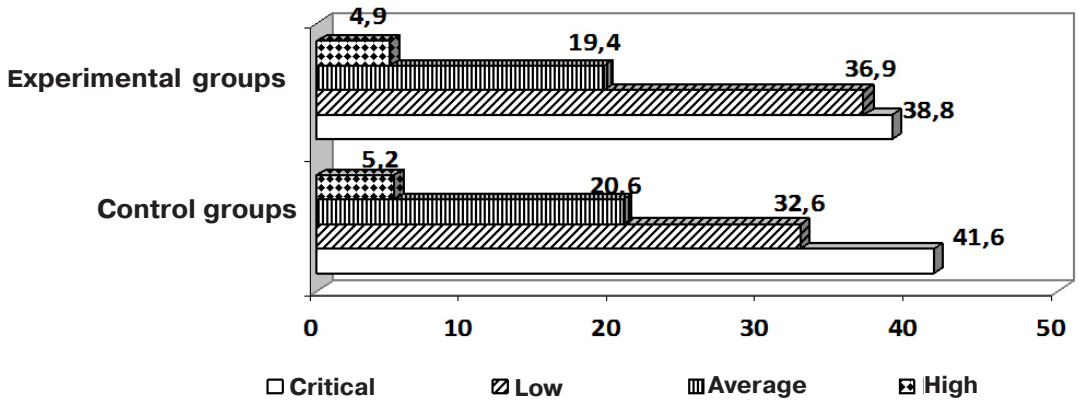
A_2 – estimation by ability indicator which make valeological competence of future teachers in the course of physical education;
A_3 – estimation by indicator of professionally-significant personal qualities which are included in structure of valeological competence of future teachers in the course of physical education;
A_4 – estimation by indicator of the valuable orientations included in structure of valeological competence of future teachers in the course of physical education.

Let's note that size C_{VC} is calculated by the formula (1) for any respondent who participates in the experiment. Depending on C_{VC}, the respondent is appropriated one of four levels of formation of valeological competence on the developed scale (tab. 1) in the course of the dissertation research.

Results of the research and their discussion

Results of the entrance test of all skilled groups are presented in tab. 2. Let's note that estimation was carried out by the group of experts with use of the appropriate diagnostic device, which was given earlier.

Let's note that assessment was carried out by the group of experts with application of the formula (1) of averaging of estimates on the data, which were provided earlier in tab. 2 (tab. 3).



Pic. 1. Results of the entrance test concerning formation of valeological competence of future teachers in the course of physical education in the skilled groups

Table 2

Result of the entrance test according to formation of valeological competence of future teachers in the course of physical education

Group	N-ber of stud.	Indicator	Levels							
			critical		low		average		high	
			abs.	%	abs.	%	abs.	%	abs.	%
EG-1	95	A_1 – knowledge	41	43,2	32	33,6	17	17,9	5	5,3
		A_2 – ability	40	42,1	34	35,8	18	18,9	3	3,2
		A_3 – professionally-significant personal qualities	39	41,1	29	30,5	21	22,1	6	6,3
		A_4 – valuable orientations	37	39,0	33	34,7	23	24,2	2	2,1
EG-2	99	A_1 – knowledge	44	44,4	28	28,3	20	20,2	7	7,1
		A_2 – ability	38	38,4	34	34,3	22	22,2	5	5,1
		A_3 – professionally-significant personal qualities	42	42,4	29	29,3	21	21,2	7	7,1
		A_4 – valuable orientations	46	46,4	28	28,3	19	19,2	6	6,1
EG-3	97	A_1 – knowledge	43	44,3	32	33,0	18	18,6	4	4,1
		A_2 – ability	39	40,2	36	37,1	17	17,5	5	5,2
		A_3 – professionally-significant personal qualities	37	38,2	36	37,1	21	21,6	3	3,1
		A_4 – valuable orientations	40	41,2	27	27,8	23	23,7	7	7,3
CG-1	101	A_1 – knowledge	40	39,6	37	36,6	17	16,8	7	7,0
		A_2 – ability	38	37,6	36	35,6	19	18,8	8	8,0
		A_3 – professionally-significant personal qualities	41	40,6	34	33,7	21	20,8	5	4,9
		A_4 – valuable orientations	39	38,6	35	34,6	23	22,8	4	4,0
CG-2	105	A_1 – knowledge	38	36,2	40	38,1	21	20,0	6	5,7
		A_2 – ability	41	39,0	37	35,2	22	21,0	5	4,8
		A_3 – professionally-significant personal qualities	39	37,1	45	42,9	18	17,1	3	2,9
		A_4 – valuable orientations	40	38,1	42	40,0	19	18,1	4	3,8

Table 3

Future teachers average result of the entrance test according to formation of valeological competence in the course of physical education

Group	Number of students	Levels							
		critical		low		average		high	
		abs.	%	abs.	%	abs.	%	abs.	%
EG-1	95	39	41,1	32	33,7	20	21,0	4	4,2
EG-2	99	42	42,4	30	30,3	21	21,2	6	6,1
EG-3	97	40	41,2	33	34,0	19	19,6	5	5,2
Together EC	291	121	41,6	95	32,6	60	20,6	15	5,2
CG-1	101	40	39,6	35	34,7	20	19,8	6	5,9
CG-2	105	40	38,1	41	39,1	20	19,0	4	3,8
Together CG	206	80	38,8	76	36,9	40	19,4	10	4,9

We will display total results for implementation of comparison in skilled groups (tab. 4).

Results of the entrance test in the skilled groups are represented graphically in pic. 1.

Results of the entrance test testified that most of respondents have critical (41,6%) and low (32,6%) levels of valeological competence (that makes about 74% of all set of respondents) by the beginning of the pedagogical experiment. This circumstance confirms need of the solution of the put problem, and especially it is staticized that these results are received at respondents, who have consciously chosen the direction of pedagogics, where the valeological direction is one of the basic components of professional study, and orientation to valeological values – fundamental factor of successful professional activity. Similar situation developed with each of indicators of valeological competence: 44% of respondents – have critical and 31,6% of respondents – low levels of formation of knowledge; 40,2% of respondents – critical and 35,7% – low levels of abilities; 40,6% of respondents – have critical and 32,3% – low levels of professionally significant personal qualities; 42,2% of respondents – have critical and 30,3% – low level valuable orientations.

Thus, results of the entrance cut testified the low level of formation of valeological competence of future teachers in the course of physical education, which confirms need of the solution of the put problem by introduction of the developed by us model of formation of valeological competence of future teachers in the course of physical education and complex of the formulated pedagogical conditions.

Before displaying process of introduction of model of formation of valeological competence of future teachers in the course of physical education and pedagogical conditions, feasible check, whether on the business skilled groups with the distributions of respondents noted above by levels of for-

Table 4

Result of the entrance test on total data of formation of valeological competence of future teachers in the course of physical education in control and experimental groups

Group	Number of respondents	Levels							
		critical		low		average		high	
		abs.	%	abs.	%	abs.	%	abs.	%
Experimental groups: EG-1, EG-2, EG-3	291	121	41,6	95	32,6	60	20,6	15	5,2
Control groups: CG-1, CG-2	206	80	38,8	76	36,9	40	19,4	10	4,9

Table 5

Values of criterion χ^2 K. Pearson on the entrance test

Groups	The obtained meaning	Critical meaning of changeable χ^2 K. Pearson by the levels of significance	
		0,01	0,05
CG-1 and EG-1	0,364		
CG-1 and EG-2	0,438		
CG-1 and EG-3	0,095		
CG-2 and EG-1	0,624		
CG-2 and EG-2	0,003	11,345	7,815
CG-2 and EG-3	0,686		
CG-1 and EG-2	0,518		
CG-1 and EG-3	0,144		
CG-2 and EG-3	0,362		

mation of valeological competence are elected, have no statistically significant divergences and can be considered as similar by the contingent.

The comparison of the level of development of valeological competence of future teachers in the course of physical training in experimental (EG-1, EG-2, EG-3) and control (CG-1, CG-2) groups by criterion was carried out for the purpose of statistical experiment of data of pedagogical experiment χ^2 K. Pearson, which empirical value was calculated by the formula:

$$\chi^2_{empir.} = N \cdot M \cdot \sum_{i=1}^{L} \frac{\left(\frac{n_i}{N} - \frac{m_i}{M}\right)^2}{n_i + m_i} \quad (2)$$

where N and M – the number of respondents of experimental and control groups;
n_i, m_i – the number of respondents of experimental and control groups who have shown i-level of knowledge;
L – the number of the allocated levels.

Criterion χ^2 K. Pearson give the chance to check zero hypothesis H_0 of reliability of coincidence of motivation in experimental and control groups.

The assumption is accepted for "zero hypothesis" H_0 that distribution of respondents by the levels of formation of valeological competence of the skilled groups, which participate in the stated pedagogical experiment, is identical. By the terms that empirical value of variables χ^2 during the paired comparison of the skilled groups turn out less than tabular, the hypothesis is considered as proved. These uses of criterion χ^2 K. Pearson are displayed in tab. 5.

As use of criterion χ^2 K. Pearson testified, at significance value $\alpha=0,01$ and $\alpha=0,05$ and numbers of degrees of liberty of variation $v=k-1$, where k – quantity of estimates, $v=4-1=3$ by the table "Critical values of criterion χ^2 for the levels of the statistical importance $\alpha \leq 0,05$ and $\alpha \leq 0,01$ at different quantity of degrees of liberty", received $\chi^2_{crit}(\alpha=0.01)=11,345$, $\chi^2_{crit}(\alpha=0.01)=7,815$.

There are no statistically essential divergences in formation of valeological competence (therefore "the zero hypothesis" H_0 is proved) between the experimental groups, which participate in the pedagogical experiment, as all experimental values below of the tabular. That gives the grounds to use the plan of the research, which was chosen earlier and to explain correctly the results, which were received during the pedagogical experiment.

Conclusions

The carried-out entrance test testified:

– the low level of formation of valeological competence of future teachers in the course of physical education in all skilled groups, who participate in the pedagogical experiment, which approves objective need of introduction of the developed experimental model of formation of valeological competence of future teachers in the course of physical education and complex of reasonable pedagogical conditions;

– the viability of the experimental groups in division of respondents by the levels of formation of valeological competence which allows considering initial parameters equaled and becomimg implementation of the chosen plan of the experiment.

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Application of means of health-improving fitness for correction of weight of girls of the senior school age

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Purpose*: to carry out the theoretical analysis of the problem of application of health-improving fitness for the correction of weight of girls of the senior school age.*

Material & Methods: *analysis and synthesis of data of scientific and methodical literature.*

Results: *it is established that the problem of excess weight at girls of the senior school age is one of the most urgent in modern science. The reasons of obesity of teenagers are defined and the main directions of the solution of this problem are characterized.*

Conclusions: *it is defined that application of means of health-improving fitness promotes the correction of weight at girls of the senior school age. It causes the necessity of development and deployment of innovative technology of correction of weight at girls of the senior school age on the basis of primary use of means of health-improving fitness.*

Keywords: *girls of the senior school age, health-improving fitness, correction of weight, obesity, innovative sports-health-improving technologies, fitness program.*

Introduction

According to scientists, in recent years, the problem of excess weight of girls of the senior school age is extremely urgent and needs the effective decision. Excess weight leads to the decrease in working capacity, senilism and risk of death at the young age, emergence of number of diseases (hypertensive and ischemic heart troubles, atherosclerosis, diabetes mellitus, stroke, dyskinesia of gall bladder, cholelithiasis, chronic cholecystitis, infertility, backbone osteochondrosis, exchange and dystrophic polyarthritises, some types of cancer but other) [5; 7; 12]. Also obesity belongs to one of the most widespread chronic non-infectious diseases in the world [6; 11].

The analysis of the last researches and publications concerning the problem of the scientific article certifies that scientists focus the main attention on application of means of physical rehabilitation for correction of weight of teenagers [6], formation of healthy lifestyle at pupils with excess weight [11], and also optimization of physical condition of pupils, students and persons of the mature age, means of health-improving fitness and athletic gymnastics [10; 11; 13; 14], step aerobics [15], rhythmical gymnastics [16], fitness-aerobics [19]. Also we find the scientific works, which are devoted to the research of influence of health-improving fitness on the level of physical fitness of pupils of the senior classes [9], motivation of teenagers to physical culture classes [3; 9], psychophysiological sphere of women [15] and their functional preparedness [18], and also on correction of weight of women during the period of post-menopause [20].

At the same time the problem of correction of weight of girls of the senior school age in scientific literature is covered not fully, as confirms the relevance of our research.

Communication of the research with scientific programs, plans, subjects

The research is executed according to the plan of research work of the chair of the theory and technique of physical culture of A. S. Makarenko Sumy state pedagogical university for 2016–2020 according to the subject "Theoretical and methodical bases of sports formation of different segments of the population" (number of the state registration is 0116U000900).

The purpose of the research:

to determine the current state of the research of problem of application of health-improving fitness classes for correction of weight of girls of the senior school age.

Material and Methods of the research

Research methods: theoretical analysis and synthesis of data of scientifically-methodical literature.

Results of the research and their discussion

Scientists call non-compliance with healthy lifestyle, low culture of food (including the use of instant artificial products with chemical impurity), low motor activity, lack of information on culture of health, violation of hormonal system at young men as a result of the use of alcoholic beverages [1; 5], unseemly conditions of education and dwelling in families, eases of medical support of educational institutions [7], irregular shape of carrying out leisure [17] among the reasons of excess weight and obesity of children and young. Therefore, the basic in the course of correction of body weight is formation of healthy lifestyle, which includes increase in physical activity, change of stereotypes of food and refusal from addictions [12].

I. Zharova and L. Kravchuk note that the initial stage of obesity is recorded at teenagers of the pubertal period. The research-

er notes that girls most intensively add in body weight at 12–13 years old, and boys – at 11–13 and 14–15 years old [6]. It gives the grounds to predict the excess weight of body and obesity in the next years of life. Conclusions of O. Palladina that early correction of excess weight of body is the key to health at the adult age [12] are important in this context.

Scientists pay the considerable attention to development of interactive technologies in the course of physical education of the senior pupils and possibility of their use for correction of weight. I. Zharova offered the technology of physical rehabilitation of teenagers with primary obesity which is based on application:

– kinesiotherapy with application of systematic physical exercises in the form of morning hygienic exercises, remedial gymnastics, the dosed walking, hydro-kinesiotherapy;
– massage; natural and artificial factors of the nature (climatotherapy, balneal and hydroprocedures);
– mechanotherapies; dietotherapy; orthopedic actions [6].

O. Palladina notes that it is necessary to create Schools of healthy nutrition or School of healthy way of life, which according to the researcher, are expedient for opening on the basis of children's policlinics or schools for the purpose of correction of weight of pupils. Also the researcher notes that it is pertinent to give lectures for parents about healthy food, to give in playful way classes with children, to organize meetings in the course of which parents and children could share difficulties and progress, and also own ways of transition to new diet within Schools of healthy nutrition [12].

O. Moroz offered algorithm of technological processes of correction of body weight which provides:

1) assessment of indicators of body weight and definition of character and extent of their violations;

2) statement of tasks and definition of strategy of correction of weight and to structure of body taking into account option of the found violations;

3) development and embodiment of the program of actions for correction of the found violations with the subsequent assessment of its efficiency and repetition of the whole process at first [11].

Also the researcher pays attention that the daily performance of hygienic gymnastics, optimization of the mode and food allowance, and also action, on improvement of control of emotional state are provided near specially-directed trainings of the program of correction.

At the same time scientists consider health-improving fitness as one of the most effective remedies of correction of weight, carrying this type of gymnastics to the most popular types of recreational classes [9; 21] and means of non-drug weight reduction [12]. At the same time correction of body weight is important criterion of efficiency of programs of fitness [12]. At the same time scientists [9; 12] note that the coordinated actions of school, teacher of physical culture, pupils and parents are of great importance in heating-up period of interest of pupils in systematic fitness classes. Scientists call positive influence of classes and increase in condition of their physical fitness as motive for activation by fitness classes at teenagers.

The definition of fitness for our research, which is offered by O. Kornosenk, who considers this sport as different forms of physical culture, which have the standard, improving and sports focus, which is based on use of wide complex of physical exercises, is expedient: aerobics, shaping, dancing movements, elements of gymnastics, martial arts, psychotraining which are carried out in the hall, pool, whether on the open areas, in all age groups of the population [8].

As V. Krendelev marks out, the main (basic) movements of fitness are different types of walking (added, with raising of knees), skip jumps and jumps, leg swing, squat, lunges. Use of these exercises in different combinations in combination with movements, turns, different movements of hands is provided by availability, variety and high emotional background of classes. Sets of exercises are under construction by the method of blocks and not less than 8-10 times are carried out [9]. At the same time Yu. Belyak notes that the main emphasis in functional training on classes is placed by fitness on ability to carry out the movements with optimum range, showing the necessary level of power opportunities, keeping dynamic balance in conditions, which constantly change in connection with influence of the external forces operating on body at change of its situation [2, p. 4].

Also Yu. Belyak marks out methodical features of programs of health-improving fitness:

1. Variety and interchangeability. Means of health-improving fitness are various by the biomechanical structure, orientation and contents.

2. Possibility of accurate regulation of loadings. All means of health-improving fitness are easily dosed thanks to determination of number of their repetitions, tempo of execution, range of movements and other characteristics.

3. Ability to transformation for the purpose of differentiation of loadings. The possibility of modification of nature of performance of exercises, their speed, range, speed, change of starting position, allows to simplify or complicate their technique without essential change of contents.

4. Ensuring selective influence on organism. Despite of all-improving nature of exercises, it should be noted that each of them has the purposeful direction which is expressed in overwhelming influence on this or that muscular group, development of certain system of organism or physical quality.

5. Possibility of the simultaneous solution of wide range of improving tasks. Exercises of health-improving fitness attract the big massif of muscles in work, are carried out in the different planes and demand simultaneous manifestation of several physical qualities.

6. High degree of innovation and emotionality. Fitness industry is characterized by the existence of well-developed competitive environment in which producers of services of fitness combat for the consumer [2, p. 5].

By conclusions of O. Moroz, application of means of health-improving fitness in programs of correction of weight and to structure of body consist in "application as aerobic loadings which mobilize organism energy consumption directly during their performance which promotes reduction fatty body weight

components, and aerobic and anaerobic loadings power and high-speed and power to character what components considerably influence increase in size muscular, increasing intensity of the main exchange during the post-training period" [11, p. 143]. At the same time M. Gorobey notes expediency of such aerobic types of physical activity as walking, swimming, dances, tennis, etc. [5].
N. Georgiyeva [3] considers that inclusion to the maintenance of lessons of physical culture of exercises of fitness-system Pilates (safe set of exercises without shock loading what allows stretching and strengthening the main muscular groups, without forgetting at the same time and about smaller weak muscles, promotes removal of loading from waist and shoulder girdle) will promote the general improvement, prevention of diseases, correction of level of physical development and functional condition of the main physiologic systems of the pupil. Therefore, the researcher offers to the maintenance of lessons of physical education at school, including exercises, which will allow receiving knowledge and to make ability to lead to the balanced condition of muscle-flexors and extensors, to determine individual physiologic levels of ranges of movements for ability to possess own body. Also the researcher notes that inclusion to the maintenance of lessons of exercises on static yoga and corporally focused therapy, which provide active and passive breathing exercises, promote the development of ability to relax through concentration of attention. It provides inclusion of diaphragmatic breath which positively influences normalization of work endocrine and central nervous systems.

The researches of V. Biletskaya and V. Semenenko [14] are directed to the development and deployment of fitness-programs (aerobics, swimming and aqua-aerobics) in the process of physical education of children of the middle school age. Aerobics classes, by the conclusions of researchers, are aimed at the development of aerobic endurance, coordination, power abilities and flexibility. The main purpose of swimming – preservation and promotion of health, development of physical, mental qualities and motor abilities of pupils; increase in level of their physical fitness, formation of knowledge, skills of healthy lifestyle, respect for personal hygiene, training of organism, prevention of traumatism. The term "aqua-aerobics" is understood as possibility of use of combination of exercises of various orientation: games in water, options of applied and sports swimming and recreational and entertaining exercises from new nonconventional forms of physical activity. Scientists developed and introduced variable modules from the noted sports in thr teaching-educational process of comprehensive educational institutions, which provided theoretical and general-physical training.

N. Goncharova, L. Denisova and V. Usichenko consider the question of use of modern information technologies in the sphere of health-improving fitness. In particular, the researchers note expediency of application of the computer program for the organization of independent classes on health-improving fitness "Yourself Fitness" (Respondesign in.). Classes is carried out in the form of video lesson with the virtual coach. Also the researchers note possibilities of application of the computer program Exlib (Norsk Video Digitech AS) what is the electronic diary of the training process. There is software product of four main sections –diary, program, reports and library. It is also possible to apply the computer programs Open Fitness to independent fitness classes; "Fitness Center" (developed by O. Guboreva), "Fitball training" (developed by O. Lyadska). Such computer programs are possible for work of fitness-clubs for application: "Universe-Fitnes" and "Universe-Tennis", "Metalink Fitness Manager", "Metalink Water Complex", "Metalink Playground" which are directed to administrative support of activity of fitness-club. At the same time the researchers note that achievements of introduction of information technologies have the fragmentary character in Ukraine [4]. Fitness technologies of new century were enriched with programs which in foreign literature are integrated under the term "mined body", – "clever body". They are yoga, Pilates, taizi-tsyuan [2].

Also the scientists [4] note that ensuring automation of management of the enterprises, which specialize in this sphere, is one of the directions of application of computer programs in the sphere of health-improving fitness. Thus, use of information technologies gives the chance to solve wide range of the questions connected with work, the analysis of activity of the enterprise, to carry out process of planning of follow-up activity.

Also the considerable interest for our research is attracted by the perspective directions of realization of information technologies in the sphere of health-improving fitness, which are defined by N. Goncharova, L. Denisova and V. Usichenk, namely:

– granting opportunity to each person to receive knowledge of methods and construction means of improving classes, bases of healthy lifestyle, in form, evident and available to perception (videos, drawings, schemes);
– creation of conditions for ensuring computer and information literacy of people who go in for fitness;
– creation of system is information the advisory websites for information communication with leading experts and trainers [4, p. 165].

As it was noted by us above, the question of application of health-improving fitness as to means of correction of weight senior pupils is not reflected for today in scientific literature. Therefore, we consider that use of interactive technologies in the course of physical education of senior pupils and possibilities of their use for correction of weight consists in need:

– definition of motivational priorities for development of the fitness-program for correction of weight of girls of the senior school age;
– determination of level of somatic health of girls;
– determination of level of physical development of girls and development of scales qualifiers for assessment of indicators of weight and to structure of body of senior pupils for the purpose of selection of optimum exercise stresses;
– developments of innovative technology of correction of weight at girls of the senior school age on the basis of overwhelming use of means of health-improving fitness (video lessons with the virtual coach and selection of food allowance together with the nutritionist).

Conclusions

1. The problem of correction of weight of girls of the senior school age is the problem of the urgent and low-studied in the system physical culture and sport. The analysis of scientific literature allows to note that fitness, which is considered by us as one of forms of physical culture, which has the consider-

able improving and sports potential, is one of effective remedies of correction of weight.

2. Modern fitness is characterized by application of wide range of rehabilitation programs, attraction and diversifies innovative, recreational technologies, individualization of computer fitness-programs. Health-improving fitness contributes to normalization of physical development of the personality, harmonizes exercise stresses and food, reduces risk level of emergence and the subsequent development of different diseases.

3. Application of fitness for correction of weight of girls of the senior school age predetermines need of definition of its most effective directions, improvements of forms of the organization of classes and effective selection of means and methods of physical education.

We see **prospects of the subsequent researches** in foundation of innovative technology of correction of weight at girls of the senior school age on the basis of overwhelming use of means of health-improving fitness.

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Assessment of biological age and "quantity of health" of judoists-veterans at the exit stage from elite sport

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Purpose: *the assessment of biological age and "quantity of health" of judoists-veterans that allows estimating the level of functionality of their organism at the exit stage from elite sport and to construct correctly their training and competitive processes.*

Material & Methods: *the systemic-functional approach is applied. The biological age and "quantity of health" of judoists-veterans decided with the help of tests. The group of 28 men and 19 women – judoists-veterans is tested for this purpose.*

Results: *it is proved that the research of biological age of veterans of judo at the exit stage from elite sport, continuing systematic trainings, is of great importance for sports medicine, physical therapy, gerontology, neurology, and also for professional selection in respect of age rationing of intellectual and exercise stresses, assessment of influence of the motive mode on the rate of aging; the carried-out tests allowed to estimate "quantity of health" of judoists-veterans, giving the idea of the level of functionality of their organism.*

Conclusions: *it is proved that judo classes, the correct and positive image of life positively influence health of judoists-veterans.*

Keywords: *biological age, passport age, judo, judoist-veteran, quantity of health, training activity, sport.*

Introduction

The problem of active longevity of the person is constantly under the close attention of scientists and practical men. Works of the last years in the branch of gerontology showed that aging is difficult biological process and begins long before old age and is caused by deep morphological, functional and biochemical transformations. The scientific problem of determination of biological age and "quantity of health" of judoists-veterans is actualized [7].

In recent years such characteristic as biological age (BA) is included in scientific publications on problems of training of sportsmen in the list of indicators, significant for individualization. However it should be noted that BA is seldom used in quality criterion of management of sports preparation though different authors point to its importance in this urgent quality [9, p. 56]. The research of biological age of judoists-veterans at the exit stage from elite sport, who continue systematic trainings, is of great importance for sports medicine, physical therapy, gerontology, neurology, and also for professional selection in respect of aged rationing of intellectual and exercise stresses, assessment of influence of the motive mode, on rate of aging.

The great value is given to determination of biological age at the moment in sport, medicine, in particular, in sports medicine, physical therapy, rehabilitology, pediatrics, gerontology. The works of L. M. Belozerova [2], F. Bulyer [3], V. P. Voitenko [4], Z. G. Nuretdinov [5], E. G. Petrenko [8], V. B. Polyakova are devoted to the determination of biological age [9]. Number of works is devoted to value of studying of the biological age and methods of its assessment in sport, however, they more concern problems of children's and youthful age. Not enough attention is paid by the research of biological age of mature sportsmen and veterans of judo in modern scientific literature.

Communication of the research with scientific programs, plans, subjects

The research is executed according to the Built plan of the research works of Kharkiv state academy of physical culture for 2011–2015 on the subject "Individualization of the training process of the qualified wrestlers".

The purpose of the research:

the assessment of biological age and "quantity of life" of judoists-veterans which allows estimating the level of functionality of organism at the exit stage from elite sport and gives opportunity to construct their subsequent training and competitive processes. Research tasks: to analyze results of testing of group of judoists-veterans; to prove that the subsequent classes of judo, correct and positive image of life positively influence on their health, promote progress of their competitive activity.

Material and Methods of the research

Such methods were applied when carrying out the research: generalization of literary and documentary sources; theoreti-

cal analysis; poll (questioning, conversation, interview); expert assessment and self-assessment; studying of indicators of biological age and "quantity of life" of judoists-veterans; self-determination of indicators of biological age; statistical analysis of materials of the research. We defined biological age of "quantity of life" of judoists-veterans by tests of Cooper, Abalakov, tests of Stange, Genchi, Bondarevsky, Ruffier. We tested the group of 28 men and 19 women – judoists-veterans of Federation of judo of the Kharkiv region by the standard tables, which are calculated separately for men and for women for this purpose at first. We choose time for testing of judoists-veterans in the morning, before breakfast. When testing, we applied: stop watch, centimeter, device for measurement of pressure, ruler, and methods of mathematical statistics.

Results of the research and their discussion

Since 1994, veterans of sport of Ukraine are constant participants of World Games of masters, the World Cups and Europe [6]. Since 2011, according to the information reference of Council of veterans of physical culture and sport, annually 700–800 leading sportsmen-veterans participate in the international competitions, where they receive many awards [1, p. 103]. Effective training of the sportsmen combines in itself physical, tactical, theoretical, moral and strong-willed aspects [7]. It is continuously improved by opening and use of new regularities and requirements. It promotes the subsequent growth of sports results of judoists-veterans. Considering the significant amount of sports competitions, both on internal, and on international, the arena, uncommon achievements of certain veterans of the Ukrainian sport and in separate types of veteran sport, in domestic scientifically-methodical literature has not enough corresponding scientific maintenance of development of the movement of veterans of sport and its different aspects. They concern separate scientific problems of development of the movement of veterans of sport. At the same time the general questions of role and the place of the movement of veterans of sport in the history and theories of domestic science in branches of physical culture, positive influence of veteran sport on human body are almost not investigated.

We used such tests for determination of biological age of judoists-veterans: systolic blood pressure; diastolic blood pressure; pulse after rise at rate of 80 steps for minute; pulse in 2 minutes after rise at rate of 80 steps for minute; Cooper's test. Its value was defined in minutes after overcoming 2400 meters on the flat area very much by fast pace or run; test of Stange; test of Genchi; Bondarevsky's test; Abalakov's test; Ruffier test; index of Robinson (I_{ROB}). Tests allowed us to estimate also "quantity of life" of judoists-veterans which gives idea of the level of functionality of their organism.

Results of our researches showed that indicators of female judoists are 9,7% lower recorded at men in the standard table. Having collected all necessary information about groups of 28 men and 19 women – judoists-veterans of Federation of judo of the Kharkiv region, we have calculated real (settlement) biological age for each aged category, having made results of tests and having divided the sum into their quantity (18 – for men, 17 – for female judoists). We have received results: the biological age at men on average for 5,4 years, and for women on 4,8 years is smaller than actual real.

Quantity of life (Q_L) was defined by division of the norm corresponding to growth (standard tabular value), – S, by the received result – R:

$$Q=S/R\cdot 100\ (\%). \qquad (1)$$

The norm, which is corresponding actual age, makes 100%.

If the indicator is worse than norm, then there is value less than 100% at division of two figures. For example, a male judoist at the age of 40 years has pulse, which is made not 116 blows for minute after rise on the 4th floor, as it has to be normal (100%), and 109 blows that makes 96,7% of norm (116–120). Let's say pulse in 2 minutes, after rise, has made not 100 blows for minute, and 104 that answers 106,4% of norm and, by the way, is indicator for 35-year age.
From phylogenesis position, the development of organism is determined by the difficult mechanism of change of the moments of development through consecutive interaction of chain of biochemical reactions [10, p. 55]. BA is certain milestone in ontogenesis of the person, separating sites of special specificity what we have designated for "zone of biological development" (ZBD). Through originality of structure of genome of expansion of the moments of development by terms and intensity of passing of sites of ontogenesis has especially individual character, defining speed and rhythm of developments of the sportsman. Different norm of reaction from bodies and body tissues, being shown by differences of the individual answer to incentives of the internal and external environment, is reflected respectively and different training effect.

We recommend for use the simpler technique of definition of BA of the judoist-veteran. Formulas, below-mentioned, allow to carry out rather precisely to the judoist-veteran of determination of the biological (true) age. The biological age of men (BA_M) and women (BA_W) is calculated by us by such formulas.

$$BA_M = 26{,}985 + 0{,}215APS - 0{,}149\,BHB - 0{,}151SB + 0{,}723\,SHA, \qquad (2)$$

where BHB (breath holding duration after deep breath) is measured three times with interval of 5 minutes by means of stop watch. The largest size of BHB, which is measured in seconds, is considered.

SB – static balancing. It is defined when standing the examinee on the left leg, without footwear, eyes are closed, hands are lowered along trunk. This indicator needs to be measured without the previous training. Duration of SB is measured three times by means of stop watch with interval of 5 minutes. The best result is considered. SB is measured in seconds;

SHA – subjective health assessment. It is carried out by means of the questionnaire which includes 29 questions. It is measured in points.

$$BA_W = -1{,}463 + 0{,}415AP_p - 0{,}140SB + 0{,}248BW + 0{,}694SHA, \qquad (3)$$

where AP_P (pulse arterial pressure). It is so called the difference between AP_S (systolic arterial pressure) and AP_D (diastolic arterial pressure). AP_P is measured in mil.of mer;
BW – body weight. It is decided on the help of weights. Weighing is carried out in light clothes, in the morning, without footwear. It is measured in kilograms.

SHA – subjective health assessment was carried out by us by means of the questionnaire which includes 28 questions.

Such answers are may be on question 28 in the questionnaire: "good", "satisfactory", "bad" and "very bad". One of two last answers was considered as adverse.

The total of adverse answers is counted after answers to question of the questionnaire (it can fluctuate from 0 to 28). The number of adverse answers, which is expressed by figure from 0 to 28, enters formula for definition of BA, instead of letters SHA, which stand in formula.

Any judoist-veteran will be able independently to define the biological age by the formulas.

Only rather prepared people were tested by Cooper's test for power endurance during our research. About 10 people in each age group were examined (5 – men who do not play sports regularly, 5 – judoists-veterans who play sports regularly). We began preparatory trainings of men, who do not play sports regularly, with walking, which gradually accelerates, then watch of walking with run, and then races. Physical fitness was defined by means of 12-minute to Cooper's test and only in 6 weeks of systematic classes during, which every time the distance not less than 1,5 kilometers was overcome.

Results of the 12-minute running test of Cooper for men are provided in tab. 1.

Further we have carried out the 12-minute test of swimming of Cooper. It estimates condition of physical fitness of organism on the basis of distance (in meters) which the person is capable to swim in 12 minutes. Style of swimming at execution of the test is – any. During testing, breaks for rest during, which the stop watch continued to count 12 minutes, became. The more breaks were, the test results were worse. Results of the 12-minute running test of Cooper have shown the essential advantage of judoists-veterans. Results the 12-minute test of swimming of Cooper for men have also found the essential advantage of judoists-veterans (tab. 2).

The main indicators of biological age at men of advanced years and judoists-veterans are provided in tab. 3.

The data of the table 3 demonstrate that indicators of biological age are much better at judoists-veterans, than at men of advanced years.

Conclusions

1. The assessment of biological age and «quantity of life» of judoists-veterans gives idea of the level of functionality of their

Table 1

Results of the 12-minute running test of Cooper for men (distance, km)

Age	Results			Preparedness assessment	
	Men of the corresponding age	Judoists-veterans	Deviation	Men of the corresponding age	Judoists-veterans
30–34 (n=9)	2,26	3,09	+0,83	satisfactory	excellent
35–39 (n=7)	1,89	2,91	+1,02	satisfactory	excellent
40–44 (n=6)	1,57	2,63	+1,06	bad	good
45–49 (n=6)	1,43	2,51	+1,08	bad	good
50–54 (n=5)	1,21	2,18	+0,97	very bad	good

Table 2

Result 12-minute to the test of swimming of Cooper for men (distance, m)

Age	Results			Preparedness assessment	
	Men of the corresponding age	Judoists-veterans	Deviation	Men of the corresponding age	Judoists-veterans
30–34 (n=9)	465	634	+169	satisfactory	excellent
35–39 (n=7)	432	576	+144	satisfactory	good
40–44 (n=6)	352	523	+171	bad	good
45–49 (n=6)	327	511	+184	bad	good
50–54 (n=5)	268	487	+219	very bad	good

Table 3

The main indicator of biological age at men of advanced years and judoists-veterans

Indicators	Men of the corresponding age (n=34)	Judoists-veterans (n=34)	Reliability of differences
Test of Cooper, km	1,57±0,12	2,21±0,19	<0,05
Test of Stange, s	43,8±2,7	62,4±5,2	<0,05
Test of Genchi, s	6,4±0,4	11,6±0,6	<0,05
Bondarevsky's test, s	16,3±1,2	20,7±1,4	<0,05
Index of Ruffier-Dickson, s.u.	13,7±1,3	14,8±1,4	<0,01
Static balancing, s	6,2±0,5	9,3±0,7	<0,05
SHA (subjective health assessment), points	14,2±1,4	9,3±0,9	<0,05

organism at exit stage from elite sport. It gives opportunity to construct training and competitive processes of judoists-veterans.

2. We generalized results of testing of group of judoists-veterans. Having translated all received results of tests as a percentage in relation to norm, we have removed arithmetic average of these indicators. It also became «quantity of life» of judoists-veterans. It was 4,2–11,7% higher than norm by all age groups both at men, and at women.

3. It is proved that judo classes, the correct and positive image of life positively influence on health of judoists-veterans; promote the progress of their competitive activity. Data of our researches for 2009–2015 demonstrate that other effective remedies of development of functional reserves and decrease in biological age, except judo, is swimming (though 2–3 times for week); run (though 20 minutes for day or 40 minutes every other day); in the winter – skiing and skates, in the summer – riding by bicycle, rowing, work in kitchen garden; all the year round – gymnastics (if to carry out it with elementary apparatuses, the improving effect doubles); sports; accelerated walking. It is also necessary to note that, despite of the existence of shortcomings of development of veteran and amateur judo in Ukraine, it should be noted the achievement of this category of sportsmen on the world scene. So, the Ukrainian sportsmen took prizes (in the aged categories) in the European championship, in the World Cup Ion judo only in 2011–2015. The obtained during the research data prove that judo classes, the correct and positive image of life positively influence on health of judoists-veterans, promote effectiveness of competitive activity.

4. The discrepancy to necessary scientifically-methodical requirements of the existing system of development of veteran judo, lack of model of development of veteran judo in Ukraine does such scientific perspective urgent.

Prospects of the subsequent researches. It is necessary to finish efficiency of mental conditioning on optimization of mental conditions of judoists-veterans due to: application of means of psychophysiological training, application of means of positive emotional influence in game method, techniques of muscle relaxation, acquaintance with questions of self-control of the mental state.

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Characteristics of goal attacks games team qualifications

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Purpose: *of this paper is to determine quantitative and qualitative indices of the resultive attacking actions in the games of teams-participants of World Championship 2014.*

Material & Methods: *analysis of the scientific-methodical literature, registration of technique-tactic action, methods of mathematical statistics. Research of the competitive action was realized with the teams-participants of World Championship 2014.*

Results: *the article represents the indices characterized goal attacks in the fames of World Championship 2014.*

Conclusions: *according to the research it was determined that in case during attack since the moment of possession of the ball the team mares 6–7 and more passes and expends more than 9 seconds the probability to score the goal comes to minimum.*

Keywords: *ball passes, tackling, interceptions, standard position, quick attack, positional attack.*

Introduction

The solution of the problem of increase in efficiency of the attacking actions in football first of all assumes studying of features of creation of attacking play by the leading teams of the world [3; 6; 7; 10]. Data, which characterize performance of the final phase of the attacking actions by the national teams by the teams, participating in the competitions of the World Cup, are of special interest.

Researches of many experts are devoted to the analysis of the attacking actions of teams of different qualification [3; 5: 7; 8; 9; 13].

So, it is appeared, as those teams which won, and those which lost, almost identical time owned a ball by the comparison of average time during which teams-participants of the World Cup of 1998 owned a ball [3] to results of matches. Therefore, authors see [3] no reason to say that time of ball owning can reflect how the team will finish a match – will win, will draw or will lose.

Besides, according to experts [3], the increase in duration of time of ball owning in a game is not that necessary condition which leads to large number of the scored goals.

Authors have already considered duration of the goal attacks, beginning with game and with standard provisions [2] and probability of goal, when performing eleven-meter, penalty, free and corner kicks, face-offs of a ball from the sideline in earlier conducted researches [1; 4; 11].

The efficiency of the attacks which began after tackle and interception of a ball at the rival was considered in other work [11]. It is established that the probability of a goal and appointment of penalty as a result of carrying out the attacks, which began in attack zone, is about 3 times higher in comparison with those cases when the attacks began in the center zone and the zone of defense.

The probability of a goal and appointment of penalty after the attacks, beginning with input of ball in game from penalty and free kicks by performance of pass from the center zone or from the zone of defense of the team kicking ball in ball into play is insignificant and makes only 0,6–0,7%. If the attacks began in the attack zone, then the probability of a goal and appointment of penalty is already several times higher (about 3,5%).

The efficiency of the attacks, beginning with face-off of a ball from the sideline in general is exclusive small. It should be noted that the further from gate of the rival such attacks began, the probability of a goal and appointment of penalty as a result of their carrying out is less. The probability of a goal and appointment of penalty after the attacks beginning with face-off of a ball in the center zone, almost twice, and after the attacks beginning in the defense zone is nearly 3 times lower in comparison with those cases when the attacks began in the zone not further of 35 m from the goal line of the defending team.

The analysis of games of teams of high qualification showed that from each hundred attacks, beginning in the defense zone after tackle or interception of a ball at the rival by field players or the goalkeeper, one comes to the end with a goal or purpose of a penalty kick [11], and time of passing of the goal attacks, beginning "with game" at distance from 80 m and more from the goal line of the defending team varies from 10 to 25 s [2; 12].

The purpose of the research: to define quantitative and quality indicators of the productive attacking actions in games of teams-participants of the World Cup of 2014.

Material and Methods of the research

Research methods: analysis of scientific and methodical literature, registration of technical-tactical actions, methods of mathematical statistics. Competitive activity of teams-participants of the World Cup of 2014 was investigated.

Results of the research and their discussion

It is visible from the table 1 that teams-participants of the World Cup of 2014 began 67 attacks from 171 goal attacks in the center zone of the football field (39,2%), 63 attacks – in the attack zone (36,8%), 41 attacks – in the defense zone (24,0%).

Table 1
The number of the goal attacks, beginning in different zones of the football field

Zones of the football field	Number	%
The defense zone	41	24,0
The center zone	67	39,2
The attack zone	63	36,8
Total	171	100,0

Data of the table 2 demonstrate that half of the goal attacks began teams in the central part of the field in games of the World Cup of 2014 (53,2%), it is slightly less on the left goalpost (27,5%).

Table 2
The number of the goal attacks, beginning on different goalposts of the football field

Goalpost of the football field	Number	%
Right	33	19,3
Left	47	27,5
Central part of the field	91	53,2
Total	171	100,0

In football the attack can begin with face-offs of ball from the sideline after stop of a game or exit of a ball out of borders of the field as with mastering ball field players or the goalkeeper as a result of tackle and interception of a ball at the rival (with game), and with input of a ball in game from corner kicks, penalty and free kicks (with standard provisions).

The analysis of games of teams-participants of the WC-2014 showed (tab. 3) that most of all goal attacks began after the draw of standard provisions (45,0%).

Table 3
The number of the goal attacks, beginning by the goalkeeper after single combat, tackle and interception of a ball and from standard provisions

TTA	Number	%
By the goalkeeper	8	4,7
After tackle of a ball	35	20,5
After interception of a ball	47	27,5
After single combat	4	2,3
After standard provisions	77	45,0
Total	171	100,0

27,5% of the goal attacks began after interception of a ball, after tackle of a ball – 20,5%, after single combat – 2,3%. In turn, goalkeepers began only 8 attacks from 171 goal attacks (4,7%).
Options of the goal attacks, which began with game and with standard provisions, are presented in the table 4.

Table 4
The number of the goal attacks, beginning with standard provisions

Goal attack	Number	%
The direct stroke from penalty spot	12	7,0
The direct stroke from penalty kick	3	1,7
The draw of goal kick	2	1,2
The draw of penalty or free kick	20	11,7
Face-off of ball from the sideline	15	8,8
The draw of corner kick	25	14,6
From a play	94	55,0
Total	171	100,0

Results of the table demonstrate that the direct stroke from penalty spot scored 12 goals (7,0%), and direct stroke from penalty kick 3 goals (1,7%).

Thus, 2 goals (1,2%) – after the draw of goal kick, after the draw of penalty or free kick – 20 heads (11,7%), after face-off of ball from the sideline – 15 (8,8%), after the draw of corner kick – 25 were scored (14,6%).

The analysis of the productive attacks demonstrates (tab. 5) what 51,5% of goals from 171 goals were scored after the quick attacks and 48,5% – after the position attacks.

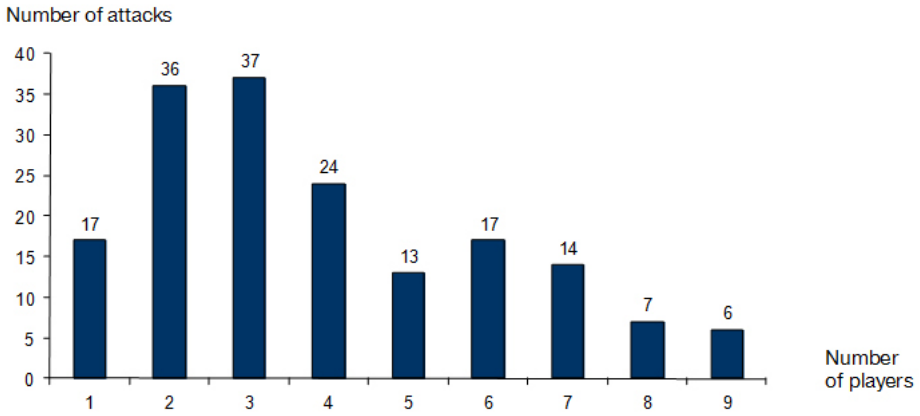
Table 5
Quantity of quick and position goal attacks

Goal attack	Number	%
Quick attack (3–5 passes, 7–9 seconds)	88	51,5
Position attack (6 passes and more, 10–22 seconds)	83	48,5
Total	171	100,0

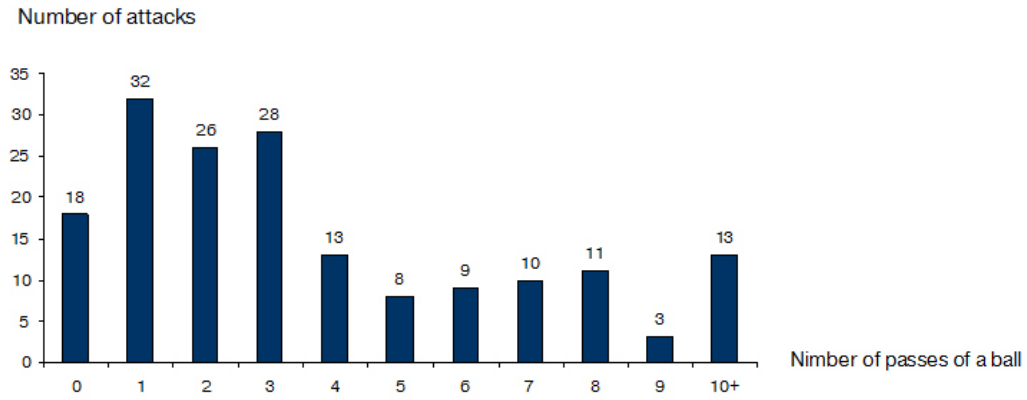
As a result of the carried-out analysis it was established that from 1 to 9 football players took part in the goal attacks of teams-participants of the WC-2014 (pic. 1). 3 more often (37 times) and 2 (36 times) football players participated in the productive attacks.

The analysis of competitive activity of teams in the games WC-2014 testifies (pic. 2) that more often in the goal attacks commands were executed 1 (32 attacks), 2 (26 attacks) and 3 (28 attacks) passes.

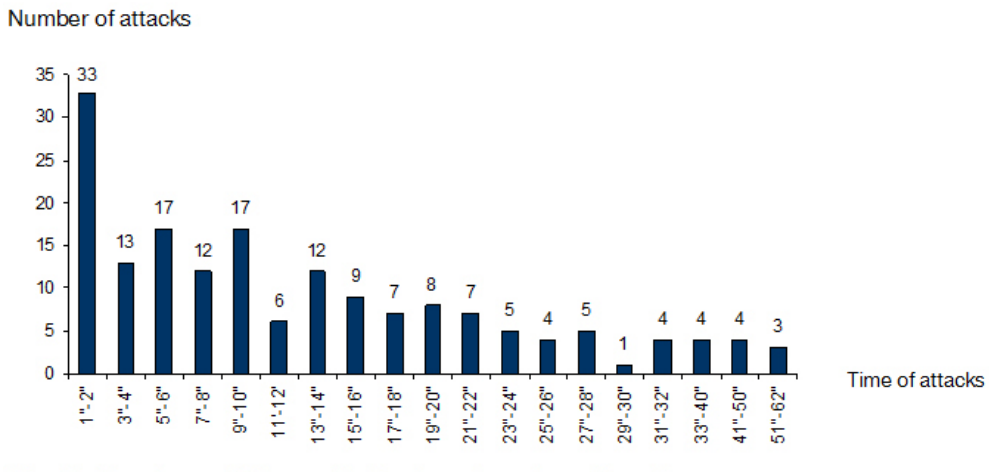
This situation is confirmed early by the conducted researches [3] in which it is noted that if the team does 6–7 and more passes at the development of the attack from the moment of mastering a ball, the probability to score a goal is minimized. Therefore at meetings of rivals, approximately equal on class, even very notable superiority of one of teams in time of ball owning does not guarantee it automatically that valid advantage which defines advantage in football match – advantage in number of the scored goals.



Pic. 1. Ratio of the goal attacks with various number of players



Pic. 2. Ratio of the goal attacks with various number of passes



Pic. 3. Number of the goal attacks of various duration

Duration of the goal attacks in the games WC-2014 varied from 1–2 to 62 seconds (pic. 3). As a result of the conducted research it was established that 33 goals were scored after the quick attacks, lasting 1–2 seconds. Together with it, it is visible from the figure 3 that with the probability of goal significantly decreases with the increase in time of carrying out the attacking actions.

Therefore, it is possible to say that the attacks with long draw of a ball in principle do not give advantage expressed in goals in games of teams of high qualification. And if the team really controls a ball, then it is rather possible to say not about its superiority, and that players are not able to carry out the productive attack at present. It can be connected with the fact that the rival managed to construct massive defense, or with the fact that the quick transition from defense to the attack is not fulfilled in the team.

Conclusions

1. Teams-participants of the World Cup of 2014 began 67 attacks from 171 goal attacks in the center zone of the football

field, 63 attacks – in the attack zone, 41 attacks – in the defense zone.

2. The analysis of games of teams-participants of the WC-2014 showed that the goalkeeper organized 4,7% of the goal attacks, 20,5% of the goal attacks began after tackle of a ball, 27,5% – after interception of a ball, 2,3% – after single combat, 45,0% – after the draw of standard provisions.

3. The analysis of the productive attacks demonstrates what 51,5% of goals from 171 goals were scored after the quick attacks and 48,5% – after the position attacks.

4. Results of the conducted research allow to say that the concept of creation of game directed to the achievement of advantage over the rival in time of control of ball is not repaid.

5. It is favorable to team to begin the attacking actions after tackle or interception of a ball at the rival in the attack zone, to players to earn more than penalty and free kicks in the attack zone from the point of view of increase in probability to the score goal.

Prospects of further researches. Further researches will be devoted to studying of the attacking actions of teams in games of the European championship of 2016.

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Conditions and need of creation of Club of sports volunteering

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Purpose: *the identification of prerequisites of creation of Club of sports volunteering.*

Material & Methods: *250 residents of Kharkiv participated in the research. The analysis of references and documents, poll (questioning), methods of mathematical data processing were used.*

Results: *the social need for training of sport volunteers is defined on the basis of the data obtained as a result of the poll. The project of public organization «Club of sport volunteers» is developed.*

Conclusions: *the results of the research demonstrate that there is need for creation of the permanent organization for training of sport volunteers today. The creation of public organization «Club of sports volunteering» will give the chance orderly and systematically to carry out training of sport volunteers thanks to the development and deployment of the permanent program of preparation, will promote the expansion of knowledge and experience of sports volunteer activity due to application and their fixing in practice, development and support of the sports volunteer movement.*

Keywords: *volunteer, sports volunteer activity, Club of sports volunteering, School of sport volunteers.*

Introduction

Recently the activation of the volunteer movement, which becomes particularly important, usually, during the crisis periods of social being, is observed, promoting removal of social tension by support of the most unfortunate categories of the population, "filling" of shortcomings of social policy, distribution of humanistic and altruistic moods in the society in Ukraine [3].

The sports volunteer actively develops near the development of social volunteer activity. The most mass example of involvement of volunteers in Ukraine to holding sporting events took place for "Euro-2012" at which 5,5 thousand volunteer assistants worked. Today it is difficult to present the international sports competitions, such as Student Games, tournaments, championships, Olympic Games, Paralympic and Deaflympics without accurate organizational structure, where the special part is assigned to the volunteer movement.

Having analyzed theoretical and practical completions concerning volunteer, one may say, that modern researchers in the works paid much attention to the social volunteer movement (I. Zvyeryeva (2004), T. Lyakh (2009), A. Kapska (2002)), separate organizational aspects, bases of management of activity of volunteers were the subject of studying of O. Bezpalko (2006), N. Zaveryko (2004), some questions of the volunteer movement in the sphere of physical culture and sport are taken up in scientific works of A. Bondar (2015), I. Kohut (2010), V. Levkiv (2013), I. Petrenko (2014).

The analysis of the scientific research and publications of rather volunteer activity allows claiming that the problem of the organization of sports volunteer movement remains insufficiently studied hitherto, that caused the choice of the subject of the research.

Communication of the research with scientific programs, plans, subjects

The research is executed according to the Thematic plan of the research work of Kharkiv state academy of physical culture for 2016–2018 on the subject 1.5. "Methodological bases of strategic development of the sphere of physical culture and sport in the region" (the state registration number is 0113U004615), and also within the implementation of the fundamental scientific project for 2015–2017. "Theoretic-methodological bases of development of Non-Olympic sport" (number of the state registration is 0115U002372, sub-themes "Organizationally-administrative, economic and humanitarian bases of development of Non-Olympic sport in Ukraine", number of state registration is 0115U006861C).

The purpose of the research:

the identification of prerequisites of creation of club of sports volunteer.

Research tasks:

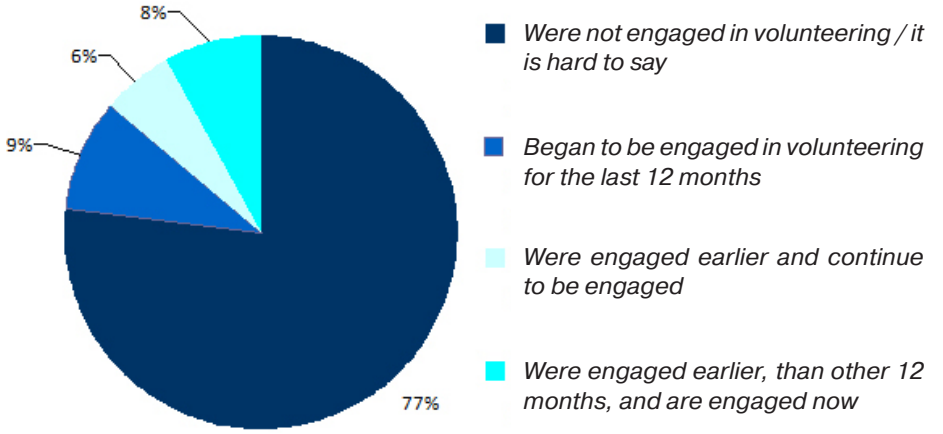
1. To define the social need for training of sport volunteers.
2. To develop the project of public organization "Club of sports volunteer".

Material and Methods of the research

Research methods: analysis of references and documents; polls (questioning), methods of mathematical data processing.

Results of the research and their discussion

The volunteer movement in Ukraine develops actively. If in 2011, by the estimates of the UN, only 3–4 percent had vol-



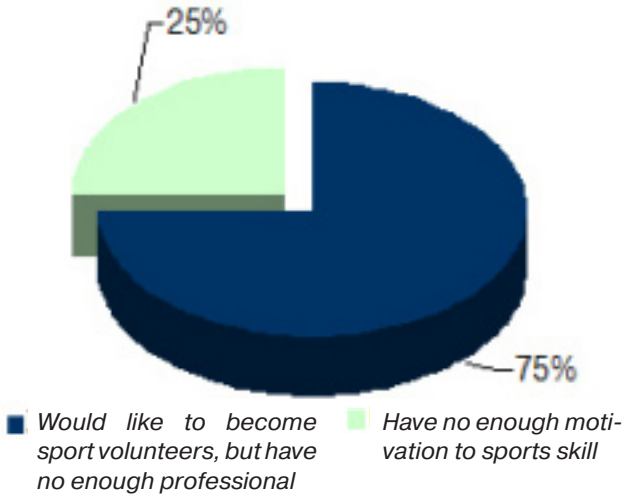
Pic. 1. The number of those, who are engaged in the volunteer activity in Ukraine

unteer experience, then by the research of the company Gfk Ukraine (which specializes in carrying out market researches across the whole territory of Ukraine) in November, 2014 23% of Ukrainians from what 9% began to be engaged volunteer during the period since November, 2013 had such experience already. More than a half of Ukrainians (62%) recognizes the role of volunteers in political changes, and 81% inclined to consider the volunteer movement of obligatory component of the civil society (pic. 1) [8].

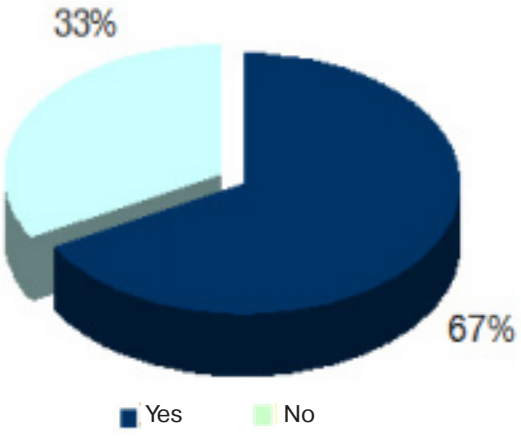
Recently, the sports volunteer develops actively near the social volunteer movement [2; 5]. The international competitions of the highest rank, which turned into sports shows long ago, are held and attract millions of fans, the number of volunteer assistants on whom is found by tens, and sometimes and hundreds of thousands annually in the different countries of the world. In particular, about 50 thousand volunteers were attracted at the Games of the Olympic Games in 2000 and 2004, in 2008 – about 100 thousand volunteers, in Vancouver in 2010 as volunteers there were 18 thousand 160 people, at the same time 20% of volunteers arrived from other regions of Canada or from abroad, at the Games of the Olympic Games in London in 2012 – over 75 thousand volunteers [4]. According to Organizing committee of Rio-2016, on the XXXI Summer Olympic Games in which 10 899 sportsmen from 206 countries of the world participated about 70 000 volunteers were attracted, at the same time applications arrived in number of 242 757 thousand from representatives of 192 countries of the world. The number of volunteer assistants who served the Olympic Games – 45 000 people, and Paralympic games – 25 000 people [10].

In Ukraine more than 4000 actions and competitions are planned carrying out according to "The unitary planned schedule of recreational and sporting events for 2016" the Ministry of youth and sport [9]. Among them from the most significant, which became already traditional that took place at active participation of sport volunteers in Kharkiv, it is possible to note: the III Kharkiv International Marathon, the 11th "Bicycle day – 2016", the II Festival on ballroom dances "Kharkiv waltz", the 31st International track and field athletics marathon "Release", the 3rd sports fair "Kharkiv – the sports capital", the 2-day Festival of run "STRONG RUN 2016" but other [6; 7].

We conducted survey of the ordinary citizens, who are directly



Pic. 2. Interest of the population concerning their participation as sport volunteers



Pic. 3. The number of the respondents, who are ready to undergo study as sport volunteers

present, when holding these actions and not indifferent to sports life of the city to find out interest of the population concerning their participation in preparation, the organization and holding sports and mass actions of different level, as sport volunteers. Results of poll are given in pic. 2.

It is visible from pic. 2 that the greatest number of respondents – 75% answered that they would like to become sport volunteers, but have no enough professional competences, that is practical experience, abilities and knowledge at the solution of the put tasks, at the same time insufficiently motivated themselves considered by 25% of respondents.

For the question "Whether they are ready to undergo study concerning preparation them as sport volunteers, aren't they?" most of respondents – 67% answered "yes" (pic. 3).

The above demonstrates that the need for creation of the organization what would unite all fans to be sport volunteers and in which study, theoretical and practical preparation would be carried out them for activation of the work in this direction, is imminent.

The similar experience of purposeful training of sport volunteers has been already. So, training of sport volunteers for carrying out the final part of the European championship of 2012 on football in Kharkiv was carried out on the basis of school of volunteers "Trust" since January, 2012 [1]. But, unfortunately, it had a disposable character.

Therefore, today there is no constantly functioning organization which would be engaged in systematic training of sport volunteers. We suggest creating such public organization under the name "Club of sports volunteer" (farther Club) within which to found structural unit which will carry out study of sport volunteers – "School of sport volunteers" (farther School).

The importance and need of creation of the Club is that participation in the sports volunteer movement helps to create active and conscious living position, to cultivate sense of patriotism in younger generation, to create civil culture. Itself sports volunteer, in turn, will help to promote public awareness of healthy lifestyle among young people.

Main tasks to the Club:

– study to skills of volunteer activity;
– development and deployment of the permanent program of training of sport volunteers;
– expansion of knowledge and experience of sports volunteer activity due to application and their fixing in practice;
– creation and continuous development of structure of databases for use by volunteers, charitable organizations on the basis of the website;
– development and support of the movement of sports volunteer;
– education of resistant interest in volunteer activity. Duration of the program of study is – 3 months.

It is planned that the *Program of preparation* at School will turn on at itself the following blocks: "The motivational block", Creation of team, "Leadership", "Legal bases of volunteer activity", "Communication psychology", "Rules of sports refereeing".

The clubman can be any person, irrespective of age, education, religion, sex or other circumstances, which wishes to undergo theoretical and practical study in "School of sport volunteers" for development of leadership skills, self-realization, increase in own self-assessment and to take part in support, organization and holding sporting events.

Involvement of candidates for transfer for the Club will be carried out through carrying out informational-explaining work among youth in higher educational institutions, schools, colleges, and among the population of Kharkiv.

Selection in internal asset will be passing according to "formal criteria" in the form of interview. Formal selection criteria can be the following: age, education; experience in public work; results of public work; aspiration of the candidate to self-improvement, development of the skills.

To become the clubman, it is necessary to write the application of the established sample then "The personal book of the sport volunteer", in which information on participation in actions, will be entered will be issued.

Work format: theoretical study will happen by holding lectures, trainings, seminars with involvement of leading experts of the branch of physical culture and sport; practical study: participation in recreational and sporting events, which are held in Kharkiv within the calendar year according to plans-calendars of partners.

Governing bodies (board members) of the Club will be engaged in creating favorable conditions and selection of candidates for transfer. Their activity will be defined by the following functions:

– information (provides responsibility for timely obtaining necessary information by volunteers);
– organizational (provides carrying out system work according to internal schedules of work);
– communicative (providing and support of the favorable psychological atmosphere among volunteers, structing of the command relations);
– administrative (control);

Forms of encouragement of activists:

1. Rewarding of the best sport volunteers with special diplomas and breast badges;
2. Publications of information on the best sport volunteers in mass media;
3. Publicizing of activity of the Club in Internet space (blogs, Twitter, Instagram, Facebook etc.).

Upon the termination of study at "School of sport volunteers", certificates of the international sample, which will allow volunteers to take part in the international volunteer programs and projects, to take part in preparation and competitions and actions of different level not only in Ukraine, but also beyond its limits, will be issued.

The expected results.

Creation of the Club of sports volunteer will promote:

– to the creation of base for the organization and the subsequent development of the sports volunteer movement;
– to the increase in the valuable relation to healthy lifestyle through volunteer activity, culture of communication in the society;
– to the development of social activity of youth;
– to the active involvement of the population to physical culture and sport;

– to the cooperation with the international volunteer organizations;
– to the economy of financial means on holding sports and mass actions.

Predictable partners of the Club: The department for family, youth and sport of the Kharkiv city council, Management of youth and sport of the Kharkiv regional public administration, Kharkiv regional higher school of physical culture and sport, All-Ukrainian public organization "Poruch".

Thus, the creation of "Club of sports volunteer", will give the chance to coordinate actions of organizers of sports and mass actions and persons interested to join holding these actions of sport volunteers which will have special theoretical and practical preparation.

Conclusions

1. Results of the research demonstrate that today there is need for creation of the permanent organization on training of sport volunteers. So, 75% of the interviewed citizens would like to become sport volunteers, but have no enough professional competences, that is practical experience, abilities and knowledge at the solution of the put tasks, at the same time 67% of respondents are ready to undergo study as sport volunteers.

2. Creation of public organization «Club of sports volunteer» will give the chance not only to involve everyone in the volunteer movement, but also is organized and to carry out training of sport volunteers systematically thanks to the development and deployment of the permanent program of preparation, will promote the expansion of knowledge and experience of sports volunteer activity due to the application and their fixing in practice, to the development and support of the sports volunteer movement.

Prospects of the subsequent researches consist in the disclosure of directions of activities of "Club sports volunteer".

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Improvement of special training of weight-lifters by means of various groove machines in the preparatory period at the stage of preliminary basic preparation

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Purpose: *to improve special training of heavyweights of 14–16 years old by means of various groove machines in the preparatory period at the stage of preliminary basic preparation.*

Material & Methods: *30 young weight-lifters at the age of 14–16 years were involved to the experiment; all of them had II and III sports categories.*

Results: *it is revealed that sportsmen of the experimental group, who used nonconventional methods of training on special groove machines such as medicine ball, Sandbag, rubber tube, with the general training loads of classical technique of trainings, which has made 779 raising of the bar, equal to 90 tons, improved power indicators in the sum of double-event on 16,5 kg after the experiment, and also set own records unlike the control group, which trained by the traditional technique and used the loading volume, which has made 910 raising of the bar and 111 tons, and has improved power results on 7,2 kg.*

Conclusions: *it is established that use of these machines promotes more effective development of high-speed-power and power qualities and consequently, leads to the growth of sports results in weightlifting.*

Keywords: *training of young weight-lifters, preparatory period, nonconventional methods, high-speed and power preparation, sports results.*

Introduction

The modern system of preparation needs the constant improvement of technical preparedness of sportsmen-weight-lifters which is directed to the realization of effective technical actions of young weight-lifters in the conditions of preparation for competitive activity. Strengthening of the competition at competitions demands from coaches and sportsmen of the search of new ways of increase in effectiveness of competitive activity [11].

Weight-lift exercises are very difficult by the technique of performance because the lifts of extreme weight is connected with the maximum muscle tension of trunk and extremities, quick change of the mode of their work, and, above all – preservation of balance in basic phases of the movement of young sportsmen. The method of execution of weight-lift exercises is also influenced by the constitution and typological features of the structure of organism of young weight-lifters [8; 4].

Now exercises of dynamic character, mainly with big encumbrances are mainly used for the development of force in weightlifting. As shown in researches of the famous scientists (Yu. V. Verkhoshanskyi, 2013; Yu. I. Gryshin, 2011; L. S. Dvorkin, 2006), the sportsman carries out draft weighing 130–140 kg at a jerk of 120 kg. In this case the big encumbrance provides the increase in muscular strength generally, but does not promote the development of ability to their quick reduction.

It is considered to be that we increase the power potential of muscles, which is necessary for the development of high speed of the movement by means of big encumbrances. But, as researches of the famous domestic scientists of N. A. Laputin, 2004; A. S. Medvedev, 1980; V. G. Oleshko, 2011 show, working muscles do not manage to show at most power opportunities in explosive phases to a jerk and snatch (blasting and snatch from breast). It demonstrates that high-speed and power preparation is necessary for the weight-lifter for the achievement of the highest sports results.

It should be noted that the problem of high-speed and power and power training of young weight-lifters is insufficiently reflected in scientifically-methodical literature, as caused the relevance of the chosen research subject.

It is established by many researchers that the development of high-speed and power and power qualities is most effectively carried out at teenage age up to 14 years [5; 7; 6; 13; 14]. On the basis of the experimental data, V. S. Filin (1970) the following conclusions are drawn: the used means and methods of development of high-speed and power qualities at young sportsmen are represented highly-effective at the stage of initial preparation.

The development of high-speed and power and power abilities of the weightlifter begins with mastering the technique of performance of weight-lift exercises. For this purpose, it is necessary to achieve accuracy, profitability of the movements executed at first at slow speed and then – in maximum. The problem of increase in its weight at preservation of speed and accuracy of performance of exercises became in the process of mastering the technique of lifts of a bar [6].

Communication of the research with scientific programs, plans, subjects

The scientific research is executed on the subject of the Built

plan of the research work in the sphere of physical culture and sport for 2011–2015 on the subject 3.7 "Methodological and organizationally-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:

the improvement of special training of young weight-lifters of 14 years old by means of different groove machines in the preparatory period.

Material and Methods of the research

Organization of the research: young pupils of sports School "HTZ" participated in this research. 30 young weight-lifters of 14 years old were involved to the experiment, all of them had II and III sports categories. Participants were distributed on sports qualification on two groups – control and experimental. Participants of the experiment trained 4 times for week.

The experiment was made on the educational-training base MI CCYSS "HTZ".

Research methods: the program of researches included complex of methods of research according to the methodological approach in solution and the put tasks: analysis of scientifically-methodical literature, definition of special physical fitness by means of pedagogical testing of young weight-lifters, pedagogical experiment and methods of mathematical statistics.

Results of the research and their discussion

The experiment was organized according to the traditional scheme for the control group, and the experimental group trained with use of different special groove machines, such as: medicine ball (medical ball), Sandbag (bag with sand) and rubber tube (rubber plait). All tested competed at control competitions (their results were taken by us for the initial level of sports skill) before the experiment (tab. 1). Results of competitions were considered as the main criterion of efficiency of experimental training.

All sportsmen trained according to the classical scheme before the beginning of experiment to which only traditional competitive exercises and special auxiliary exercises belonged.

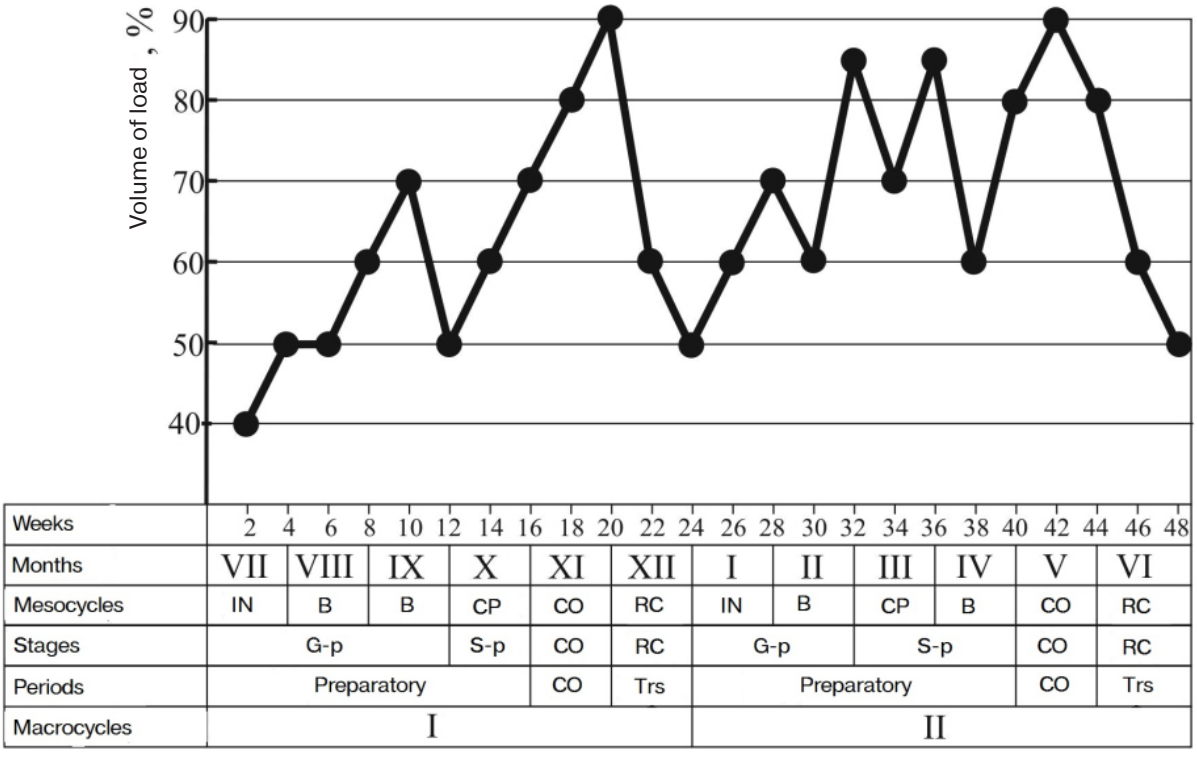
The control group trained by the standard technique, the volume of load made 910 lifts of bar (NLB) and 111 tones.

The total amount of work was reduced due to squats with a bar on shoulders and made 779 lifts of a bar, 90th tone in the experimental group. The difference of the training program of the experimental group was in use of different special groove machines, such as:

Medicine Ball Clean – soft, big and pillow-similar ball which weight varies from 1,8–12,7 kg.

Sandbag (bag with sand) – big oblong bag with handles in the middle of which as encumbrance use sacks with sand. The weight of bag can fluctuate from 2 to 60 kg.

Rubber tube (rubber plait) – this simple apparatus for training muscles of body can be used practically by all people, irrespective of their physical fitness. All devices were used during the preparatory period which consisted of four mesocycles: involving, and two basic and control-preparatory, as it is visible in pic. 1.



Pic. 1. Two-cyclic creation of the training process of young weight-lifters of the experimental group on the previously-basic stage

Table 1

Distribution of volume of load – in NLB, in percentages of different groups of exercises during the preparatory period for sportsmen of the experimental group

Group exercises	Load in mesocycle			
	Involving	Basic	Basic	Control-preparatory
Main load				
Jerk classical (%)	5	30	35	30
Jerk in medium crouch (%)	10	30	40	20
Snatch classical (%)	10	20	30	40
Snatch from stands (from behind the head) (%)	10	30	40	20
Lifts of a bar on breast in medium crouch (%)	15	30	40	15
Jerk draft (%)	10	30	30	30
Snatch draft (%)	10	30	30	30
Squats with a bar on shoulders (breast) (%)	20	35	40	5
Pressed load (%)	30	30	30	10
Auxiliary load				
Medicine ball (%)	20	35	35	10
Sandbag (%)	20	35	40	5
Rubber tube (%)	20	30	30	10
NLB on mesocycles (times)	756	806	951	775

Note. *NLB – the number of lifts of a bar.*

Features of training process of experimental group were that during four mesocycles: involving, and two basic and control-preparatory was small load special exercises and at the expense of auxiliary load, we executed the necessary volume of the general NLB, as it is visible in tab. 1.

The example of the training process of the experimental group in basic mesocycle, impact microcycle of the preparatory period.

No. 1

1. Press by jerk grip from behind the head + squat (3 presses + 2 squats) x 3 (A.L.);
2. Jerk in medium crouch 60% x 6, 70% x 4, (80% x 2) x 2;
3. Jerk draft 90% x 4, (100% x 2) x 4;
4. Jerk leaves (70% x 2) x 2, (80% x 2) x 2;
5. Squat with a bar on breast 55% x 4, (75% x 3) x 4;
6. Exercises with medicine ball 15 times x 5;
7. Exercises with rubber tube 12 times x 6.

No. 2

1. Jerk in medium crouch from starting position signature stamp is lower than knees 65% x 4, (75% x 2) x 2;
2. Jerk classical (80% x 2) x 2, (90% x 1) x 4;
3. Jerk draft from starting position signature stamp is lower than knees (90% x 3) x 3, (100% x 2) x 3;
4. Squat on shoulders 60% x 4, (80% x 4) x 3;
5. Incline with a bar on straight legs 4 incl. x 3 times (A. L.);
6. Jumps with a bar up from starting position signature stamp are higher than knees, jerk grip 50% weight from jerk classical, 4 jumps x 4 times (A. L.);
7. Exercises with rubber tube of 12 times x 6;
8. Exercises with sandbag 15 x 5.

No. 3

1. Lifts of a bar on breast from starting position signature stamp are lower than knees (70% x 4) x 3;
2. Snatch classical (80% x 2) x 4;
3. Snatch from stands 80% x 2, (90% x 2) x 3;
4. Snatch drafts of starting position signature stamp are lower than knees (80% x 4) x 4;
5. Squat with a bar on shoulders 60% x 3, 80% x 3, (90% x 3) x 2;
6. Exercises with medicine ball 15 times x 5;
7. Exercises with rubber tube 12 times x 6.

No. 4

1. Press jerk grip from behind the head + squat (3 presses + 2 squats) x 3 (A. L.);
2. Jerk leaves 70% x 2, 80% x 2, (90% x 2) x 3;
3. Incline with bar on straight legs 4 incl. x 4 times (A. L.);
4. Exercises with medicine ball 15times x 5;
5. Exercises with rubber tube 12 times x 6;
6. Exercises with sandbag 15 x 5.

We developed complexes of additional load by means of different special groove machines, such as: medicine ball (medical ball), sandbag (bag with sand) and rubber tube (rubber plait) give the specific training effect directed to physiologic mechanisms which are responsible for the speed and power of inclusion of muscles in work also by means of the complexes developed by us sportsmen of the experimental group increased power indicators, high-speed and power and indicators of endurance.

Results of the experiment were expressed:

The divergences are doubtful at the beginning of the preparatory period: in jerk classical (control – 47,5 kg, experimental – 48,5 kg; P>0,05); snatch classical (respectively – 67,1 kg, 67,5 kg; P>0,05); the sum of lifts (respectively – 114,6 kg, 116,0 kg; P>0,05); squat with a bar (respectively – 90,1 kg, 88,7 kg; P>0,05); bench press (respectively – 56,1 kg, 60,1 kg; P>0,05) and class draft (respectively – 96,5 kg, 99,9 kg; P<0,05).

Coefficients of variation of all main indicators of special exercises separately for control and experimental groups practically did not exceed the general initial level at the beginning of the experiment. For example, it made V=13,7% for jerk classical of the control group, for the experimental – V=14,0%. Respectively, coefficients of variation made the following values for control and experimental groups: snatch of classical V=9,4%, V=7,7%; sum of lifts– V=11,0%, V=9,8%; squat with

Table 2

Average value of results of competitive and specially-preparatory exercises of weight-lifters of control and experimental groups at the beginning of the preparatory period (n1=n2=15)

Indicators	CG		EG		*T*	*P*
	$\bar{X}_1 \pm m_1$	V,%	$\bar{X}_2 \pm m_2$	V,%		
Jerk classical, kg	47,5±1,7	13,7	48,5±1,8	14,0	0,4	>0,05
Snatch classical, kg	67,1±1,6	9,4	67,5±1,3	7,7	0,2	>0,05
Sum of lifts, kg	114,6±3,3	11,0	116,0±2,9	9,8	0,3	>0,05
Squat with a bar, kg	90,1±1,8	7,5	88,7±1,2	5,4	0,7	>0,05
Bench press, kg	56,1±1,8	12,6	60,1±1,5	9,8	1,7	>0,05
Class draft, kg	96,5±2,1	8,6	99,9±1,9	7,6	1,2	>0,05

Table 3

Average value of gain of results of competitive and specially-preparatory exercises of weight-lifters of control and experimental groups at the end of the preparatory period (n1=n2=15)

Indicators	CG	EG	*T*	*P*
	$\bar{X}_1 \pm m_1$	$\bar{X}_2 \pm m_2$	2,5	<0,05
Jerk classical, kg	50,5±1,7	56,5±1,6	2,2	<0,05
Snatch classical, kg	71,3±1,7	76,0±1,3	2,5	<0,05
Sum of lifts, kg	121,8±3,3	132,5±2,7	2,5	<0,05
Squat with a bar, kg	99,8±1,6	105,3±1,5	2,5	<0,05
Bench press, kg	61,0±1,8	67,1±1,4	2,5	<0,05
Class draft, kg	106,3±1,9	118,2±1,8	4,6	<0,05

a bar – V=90,1%, V=88,7%; bench press – V=12,6%, V=9,8% and class draft – V=8,6%, V=7,6%.

Sportsmen of the experimental group showed the highest results unlike control which trained by the technique accepted in general at the end of the preparatory period. And 10 of them set personal records in the sum of lifts and in separate specially-training exercises (tab. 3)

So, the difference between indicators was reliable at the end of the preparatory period: jerk classical (control – 50,5 kg, experimental – 56,5 kg (t=2,5; p<0,05); snatch classical (respectively – 71,3 kg, 76,0 kg (t=2,5; p<0,05); sum of lifts (respectively – 121,1 kg, 132,5 kg (t=2,5; p<0,05); squat with a bar (respectively – 99,8 kg, 105,3 kg (t=2,5; p<0,05); bench press (respectively – 61,0 kg, 67,1 kg (t=2,5; p<0,05) and class draft (respectively – 106,3 kg, 118,2 kg (t=4,6; p<0,05).

Conclusions

Therefore, it is possible to draw conclusion that use of devices by the experimental group (medicine ball, sandbag, rubber tube) promotes the development of high-speed and power and power qualities and consequently, leads to the growth of sports results in weightlifting. The difference between indicators was reliable at the experimental group at the end of the preparatory period: in jerk classical (t=2,5; P<0,05); snatch classical (t=2,5; P<0,05); sum of lifts (t=2,5; P<0,05); squat with a bar (t=2,5; P<0,05); bench press (t=2,5; P<0,05) and class draft (t=4,6; P<0,05).

The subsequent researches are planned to be directed to development and foundation of training process of weightlifters in the competitive period of preparation.

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The technique of control and analysis of changes of heart rate of wrestlers under the influence of exercise stresses with use of the computer application

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Purpose: *to develop the software application for mobile computing devices, allowing increasing the quality of registration and the analysis of changes of HR in single combats.*

Material & Methods: *theoretical analysis and generalization of scientific and methodical literature, method of computer programming.*

Results: *the computer software application is developed, allowing carrying out registration and the subsequent analysis of HR during trainings or separate training loads of various orientation. Results, which allowed optimizing the procedure of the analysis of training loads in single combats, were received during the approbation of this application.*

Conclusions: *the analysis of dynamics of change of HR and perception of loading by the sportsman is the objective corrective action of load of the sportsman's organism. The algorithm of the procedure of definition of HR after loading is developed and the contents of the analysis of the obtained data in the software application are selected. The software application for registration and the analysis of training load in single combats with use of mobile computing devices is developed and approved.*

Keywords: *heart rate, intensity zones, software computer application, mobile application, metabolic costs, single combats.*

Introduction

The important part of the analysis of training loads of sportsmen is the accounting of their intensity. Today one of the available methods of assessment of reaction of organism to intensity of load is heart rate (HR) [3; 7; 13].

Now the continuous registration of HR is used by means of monitors of warm rhythm for control of functional condition of the sportsman [4; 5; 6]. The large number of computer programs, which allow carrying out the analysis of the values of HR rather informatively, which are received by means of such devices, is developed. Such approach has many advantages and proved the efficiency in many sports. Unfortunately, it cannot be used in full in single combats, in type of specifics of training and competitive activity, which are in direct and rigid contact with the rival that can damage expensive measuring equipment, and use of sensors of control of HR during rest between loads cannot always be quick [2; 9; 11]. All this confirms the relevance of search simple and enough reliable innovative methods and control devices of change of HR in single combats.

The purpose of the research:

to develop the software computer application for mobile devices allowing increasing quality of registration and the analysis of changes of HR in single combats.

Research problems:

1. To analyze data of special methodical literature concerning the technique of control and the analysis of changes of HR in single combats.

2. To develop algorithm of definition of HR after load and to select contents of the analysis of the obtained data in software application.

3. To develop and approve computer software application which can be used in single combats.

Material and Methods of the research

The following methods are used for the solution of purposes: theoretical analysis and generalization of scientific and methodical literature, method of computer programming.

Results of the research and their discussion

On the basis of studying of special literature, it is established that five zones of intensity of indicators of HR, which are peculiar both for amateur sportsmen, and for the qualified sportsmen, are allocated in modern classification of training and competitive loads [11; 12]. These physiological borders and pedagogical criteria are widely widespread in the training practice (tab. 1, 2).

The optimum range of motor activity for amateur sportsmen generally is determined by the method Karvonen. Borders of this range are approximately between value of pulse in quiet state and MHR (maximum heart rate) is able. The aimed zone of pulse is ranging from 50% to 80% of MHR and is chosen

Table 1
Size of HR according to intensity zones for amateur sportsmen

Intensity zones	% from max. HR
Zone of easy activity	50–60%
Aerobic zone	60–70%
Aerobic and anaerobic zone	70–80%
Anaerobic zone	80–90%
Maximum load	90–100%

Table 2
Size of HR according to intensity zones for qualified sportsmen

№	Intensity zones	HR
1	Aerobic recovery zone	till 145 bpm^{-1}
2	Aerobic developing zone	till 175 bpm^{-1}
3	Aerobic and anaerobic zone	till 185 bpm^{-1}
4	Anaerobic and glycolytic zone	more than 185 bpm^{-1}
5	Anaerobic-alactate zone	work of the maximum power to 20 s

depending on individual distinctions in physical condition of the person [1; 8].

Indicators of the maximum heart rate (MHR) at sportsmen absolutely different also are depending on sex, age, degree of fitness and many other factors. It is possible to define individual value of the maximum heart rate only after passing of special tests on the corresponding equipment and under the leadership of skilled experts [14, 15].

The special formula appeared: 220 – age in 1970 thanks to William Haskell and Samuil Fox for the situation «here and now».

The scientific article in the Journal of the American College of Cardiology magazine on the subject: Age-predicted maximal heart rate revisited, in which it is offered to use for indirect determination of maximum permissible size of pulse formula HR_{max}= 208 – (0,7 x age, in years) is published in 2001 by the scientific Hirofumi Tanaka, PHD, Kevin D. Monahan, MS, Douglas R. Seals, PHD. It was developed on the basis of the researches, which were conducted with the participation of several thousand people, and at the moment this formula is standard by sports physiologists.

The algorithm of registration and the analysis of HR in single combats (pic. 1) are developed by results of the theoretical analysis and practical coach's experience in single combats.

This algorithm became the basis for development of the computer application for mobile devices which allows to register HR and to carry out the preliminary analysis of the received values.

Appeal of mobile devices (tablets, smartphones) consists first of all in their portability, in good technical characteristics and simplicity of communication with the user. Use of the special software on these devices increases quality and speed of the carried-out tasks [2; 10].

At the beginning of work of mobile application it is necessary to choose sports qualification, in the tab "Introduction information" – surname, name of the sportsman, age, sex, body weight, and also orientation of training load.

It is also necessary to choose the mode of measurement of HR. The mobile application offers two options of measurement of HR:

1. "The fixed mode of measurement of HR", assumes the choice of the fixed time interval of measurement of HR from 1 min. to 10 min., depending on duration of training load and its orientation;

2. "Any mode of measurement of HR", gives opportunity to measure HR right after performance of training load.

It will be offered to enter reference value of HR (if the pulsator is used and the training load does not assume contact with the rival) or to measure reference value of HR after entrance to the necessary mode of measurement of HR.

The rather widespread technique among computer applications which use the touch screen "Touch Screen" is used for measurement of HR. The expert fixes the sportsman's HR (palpation on radial or carotid arteries) and reproduces pulse rate, concerning the device screen. The program defines time intervals (demonstration of result requires not less than 7 contacts) and counts arithmetic average, the greatest and smallest interval are not considered.

The analysis of the received data of HR is made by the program in warm-up, when performing of the offered load, at restoration after load and assumes demonstration of percentage ratio of stay of the sportsman in each zone of intensity of load, average, maximum and minimum value of pulse. Also the application gives opportunity to evident demonstration of volume and dynamics of load with use of schedules and charts.

Results of researches in this mobile application can be kept in the database, are exported directly from the application to any text editor, to social networks "Facebook" or "Twitter".

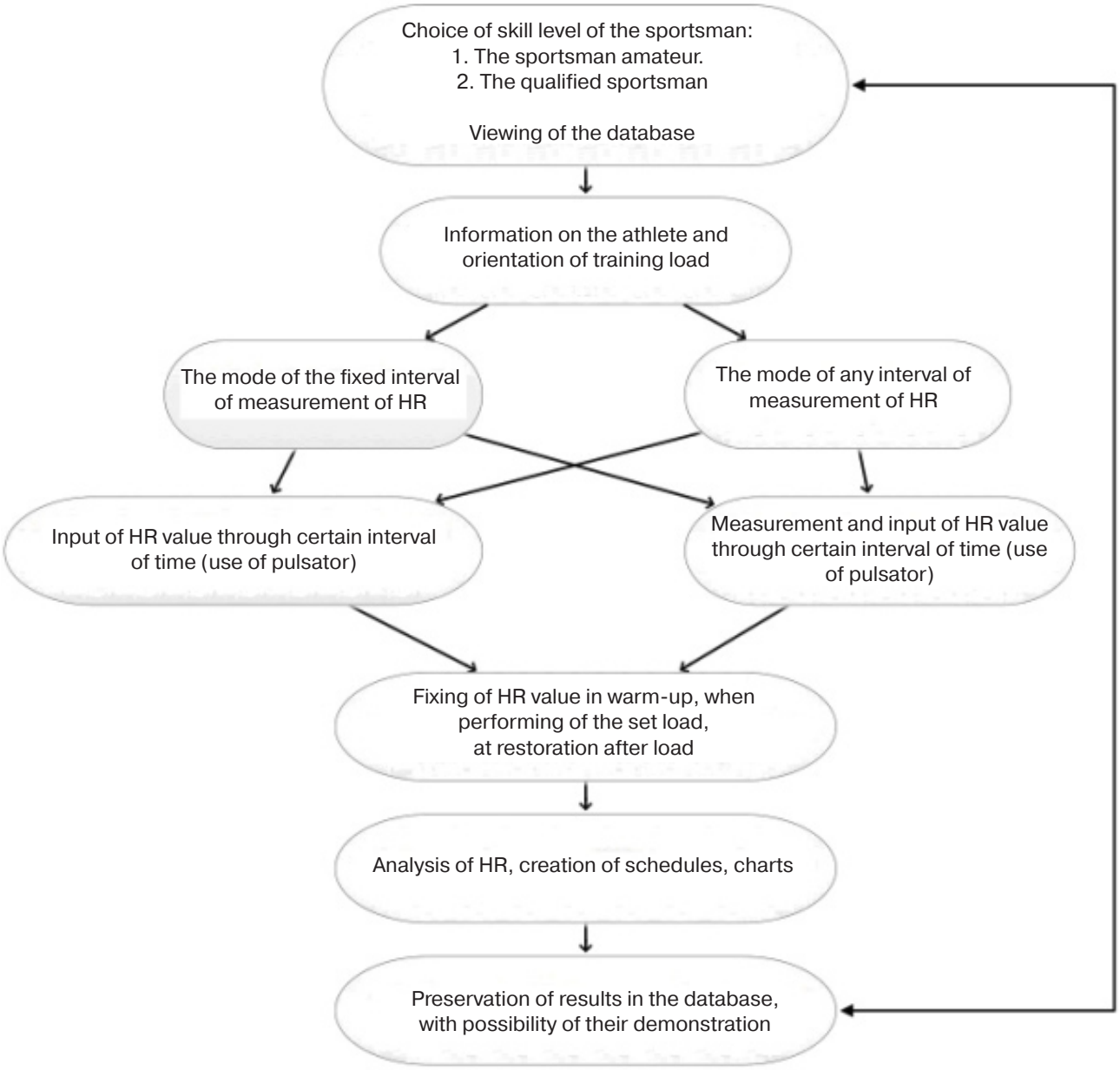
The results, which are presented in this mobile application, and also perception of load by the sportsman, will allow the coach to estimate more objectively reaction of organism of the sportsman to the executed training load and to quickly correct training process.

This software application is developed for use in mobile devices, under control of iOS (iPhone, iPad) and calculated first of all for coaches, sportsmen, students and teachers of specialized higher education institutions in their professional and scientific activity.

Conclusions

1. The analysis of dynamics of change of HR and perception of load by the sportsman is objective corrective action of load of the sportsman's organism.

2. The algorithm of the procedure of definition of HR after load is developed and the contents of the analysis of the obtained



Pic. 1. Algorithm of work of mobile application

Pic. 2. Mode of input of values of HR

data in software application are selected.

3. The software application for registration and the analysis of training load in single combats with use of mobile devices is developed and approved.

Prospects of further researches. Further researches are connected with possibility of more detailed analysis of reaction of organism of the sportsman to training loads with use of modern computer technologies.

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Directions of improvement of training of young wrestlers of freestyle

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Purpose: *to prove the directions of improvement of training of young wrestlers of freestyle for the purpose of improvement of results of their competitive activity and sports skill.*

Material & Methods: *methods are used during the research: analysis and synthesis of data of scientific and methodical literature; pedagogical observations; poll (conversation, questioning); analysis of competitive activity of young wrestlers of freestyle; testing of physical fitness; pedagogical experiment; methods of mathematic-statistical processing of results of researches.*

Results: *it is proved that the improvement of technical-tactical training of young wrestlers of freestyle is required; the main problems in this process are defined.*

Conclusions: *the technique of training of young wrestlers of freestyle is proved and the expediency of its use for quick adoption of optimal technical-tactical solutions by them in the conditions of competitive activity is proved. Concrete ways of tactical preparation for each action and various combinations of basic actions are offered to include in the program of CYSS for freestyle wrestling.*

Keywords: *free-style wrestling, technique, technical-tactical decision, competitive activity, algorithm.*

Introduction

Theoretic-methodological basis of the research are modern publications of the leading scientists, who deal with issues of the theory and technique of physical culture and sport: L. D. Aysuyev [1], S. V. Latyshev [3], S. L. Pakulin [4], Yu. M. Rogov [5] but other. However the problem of the improvement of training of young wrestlers of free-style taking into account modern requirements of competitive activity and the search of means and methods of formation of effective arsenal of competitive variable technical-tactical actions of young wrestlers are not enough considered in modern scientific publications. It caused the choice of the subject and need of carrying out separate research by us.

Communication of the research with scientific programs, plans, subjects

The research is executed according to the Built plan of the research works of Kharkiv state academy of physical culture for 2011–2015 on the subject "Individualization of the training process of the qualified wrestlers".

The purpose of the research: to prove the directions of improvement of training of young wrestlers of free-style for the purpose of the improvement of results of their competitive activity and sports skill.

Material and Methods of the research

The following methods are used during the research: analysis and synthesis of data of scientifically-methodical literature; pedagogical observations; poll (conversation, questioning); analysis of competitive activity of young wrestlers of free-style; testing of physical fitness; pedagogical experiment; methods of mathematic-statistical processing of results of researches.

Results of the research and their discussion

The tendency of decrease in effectiveness of activity of part of young wrestlers of free-style in intense conditions of responsible competitions was found during the carried out by us questioning of sportsmen and coaches. It turned out that more than 54,6 percent from 37 interviewed young wrestlers acted in the first collision of the championship of Ukraine below the opportunities. The first signs of tension, nervousness, are connected with future competitions, appear at young wrestlers of free-style after the announcement of team lineup that is in 10–15 days before the competitions.

The experimental researches of dynamics of conditions of young wrestlers before competitions demonstrate the increase in comparison with activation background on tremor ($p<0,05$), and also increase in mood ($p<0,05$) and deterioration in physical health ($p<0,001$) after the notice of wrestlers on participation in future competitions. Increase in vegetative activation by the heart rate (HR) and reduction of desire to fight were also close to the level of reliability. The statistically significant increase in vegetative activation for HR ($p<0,05$), and also close increase in the central activation to reliability level on tremor, deterioration in physical health and mood was revealed in situation on the eve of the competitions. The sharp increase in HR ($p<0,001$) and deterioration in health ($p<0,001$) took place after the announcement of results of the draw. Besides, the tendency to increase in vegetative activation on electro-skin resistance (ESR) appeared. We recorded sharp strengthening of activation on all indicators ($p<0,01$

and p<0,001) and decrease in desire to fight (p<0,05) before collisions at young wrestlers. Increase in activation in combination with deterioration in subjective experiences allowed to estimate condition of young wrestlers in precompetitive and pre-starting situations as inadequate. Its signs answered emotional tension (S. K. Bagadirova, 2014–2015; L. D. Gissen, 2010; Is. P. Ilyin, 2009; A. M. Pyevnyeva, 2011; O. O. Prokhorov, 2010; A. V. Rodionov, 2010; V. M. Smolentseva, 2012).

HR indicators, tremor and self-assessments of health [8] were the most sensitive indicators of condition of young wrestlers.

Comparison of indicators of competitive activity of young wrestlers of free-style with training data showed statistically significant increase in technical activity in competitions for 35,2% (p<0,05) and close decrease in efficiency of tactical-technical actions to reliability level by 24,9%.

Shifts of indicators of state in precompetitive and pre-starting situations had 12 statistically significant correlations with indicators of measure of decrease in efficiency of tactical-technical actions in competitive collisions. And five more coefficients were close to the reliable level. The essence of results of the correlation analysis is in the following. It was characteristic for young wrestlers of free-style that have to a lesser extent reduced efficiency of tactical-technical actions in competitive collisions: positive shifts of desire to fight in all situations (p<0,05), the big accuracy of differentiation at "notice", after draw (p<0,01) and before collisions (p<0,01), smaller activation of the autonomic nervous system on the eve of the competitions (p<0,05), after draw (p<0,05) and before collisions (p<0,05), the highest central activation on tremor before collisions (p<0,01) and tendency to the bigger level of self-assessment of mood after draw and before collisions are more expressed.

Wrestlers had more adequate shifts of key parameters of activity, whose condition in precompetitive situations was characterized by less expressed vegetative activation on HR and ESR, preservation or increase in accuracy of power differentiation and subjective experiences in competitive collisions [9]. Conditionality of changes of activity from states grows in pre-starting situations [1, p. 202]. Adequate shifts of activity and efficiency of tactical-technical actions had young wrestlers of free-style, whose condition after the announcement of results of draw, differed in the smaller growth of vegetative activation, the bigger accuracy of differentiation and the highest indicators of subjective experiences, moods, desires to fight [9]. Adequate shifts of state before collisions were characterized by less expressed vegetative activation, big level of excitement of the central nervous system on tremor, the bigger accuracy of differentiation and the highest level of subjective experiences.

Shifts of indicators of accuracy of differentiation of effort, HR, ESR, tremor, and self-assessments of desire to fight had the greatest number of correlations with external criterion.

Results of the correlation analysis between indicators of states and properties of nervous system showed the existence of essential individual conditionality of the first in all analyzed situations. Indicators of force of nervous system had the greatest number of significant correlations. ESR indicators (12 correlations), HR (8), tremor, errors of differentiation, self-assessment of activity (9), self-assessment of health (7) had the greatest number of communications from state indicators. The greatest psychophysiological conditionality of states took place on the eve of the competitions (13 correlations), after draw and before collisions (on 8) and a little smaller – at the notice on inclusion in team (4). The sense of the found conditionality consists in the following. Young wrestlers of free-style against big level of nervous system had the power the smaller level of vegetative activation in all precompetitive and pre-starting situations, the bigger level of the central activation on tremor before collisions. Besides, the highest level of force of nervous system caused the highest indicators of self-assessment and especially health self-assessment practically in all situations, and before collisions also more expressed desire to fight.

Researches showed that at the young wrestlers differentiated by the level of force of nervous system, change of state at stage of direct preparation for participation in competitions occur unequally [10]. This circumstance demands strictly the individual approach to the selection of means and methods of management of the sportsmen.

The need of improvement of technique of study of young wrestlers of freestyle [7] grows in modern dynamic conditions. It is caused by the natural development of free-style wrestling both in Ukraine, and in the world. Based on studying of competitive activity of the leading wrestlers of free-style, we tried to finish the close interrelation between the initial study and the highest sports skill, thereby having proved organic interrelations between them in the research.

The traditional technique of study of young wrestlers of free-style is directed to the development of techniques with their gradual inclusion in fight. It should be noted that the due attention is not paid to studying of main elements of fight now (stands, distances, movements, clutches, ways of release from clutches, stamping, maneuvering, pushes, bursts, hooks but other). Poll of coaches found out that the development of these actions by wrestlers happens in the course of educational duels in itself. And results of the research of competitive activity of wrestlers show need of the primary studying of these operations as they make the basis of conducting fight in a duel.

The discrepancy between need of mastering bases of maintaining single combat and inefficiency of the solution of this problem traditional technique of study is observed. In our opinion, the solution of this problem is possible on the basis of application of private technique with use of game method of study. Using it, the coach can fill gap between strictly regulated method of study and competition, carrying out consistently study of young wrestlers of free-style both technique, and tactics. The game method of study gets the increasing distribution in free-style wrestling. It is necessary to use specialized outdoor games more actively in free-style wrestling for training of young wrestlers. Results of our research show, that they are rather effective both concerning direct influence on physical and technical-tactical fitness of young wrestlers of free-style, and concerning preservation of high rate of gain of the main indicators of their competitive activity. The game orientation of classes creates conditions for quick assimilation of main elements of free-style wrestling and basic actions. At the same time games attract keen interest of children, increase their activity, emotionality, force independently, to approach creatively the solution of motive tasks. It is indisputable that

thereby they promote formation of physical and mental qualities at young wrestlers of free-style.
Indicators of special physical fitness of young wrestlers of free-style to use of game method of study by means of specialized outdoor games for the development of variable movement skills in young wrestlers of free-style are given in the table 1.

Indicators of special physical fitness of young wrestlers of free-style after the experiment are given in tab. 2.

Dynamics of indicators of special physical fitness of young wrestlers of free-style is observed during the experiment which is characterized by data of tab. 3.

The analysis of the results of research, which are presented in tab. 3, confirms the following reliable differences on indicators of special physical fitness between groups of wrestlers. The best dynamics of indicators of special physical fitness of young wrestlers of free-style of the experimental group, where acceleration of performance of running around the chairman of 10 times on 1,29, is observed with fall overs from emphasis the head in carpet on "wrestler's bridge" and in the opposite direction – on 1,29 s, exercises "pass at legs" – on 0,23 s, running added steps around hands of 10 times on 0,16 s. It testifies to the best high-speed opportunities of reconstruction of special skills young wrestlers of free-style of the experimental group.
The technique and tactics in free-style wrestling are exclusively various, and the variety them constantly grows [6]. The development of technique and tactics of free-style wrestling is caused by the unrelenting sports competition on the international scene, change of competition rules [2]. At the same time, as conducted by us survey found, 11 leading experts on free-style wrestling of the Kharkiv region, technique, in combination with tactics is basis of sports skill of the wrestler whereas other parties of preparation play supporting role in relation to it resultant component of activity.

Conclusions

1. The use of technique of preparation, which is aimed at quick adoption of optimal technical and tactical solutions in the conditions of competitive activity, significantly improves sports results, develops mental capacities of young wrestlers of free-style. The private technique of study which consists of the system of tasks, problems and methodical instructions, which cornerstone performance of special exercises, elements, phases, parts of technique and their combinational actions in general is, by means of which optimum conditions for the correct assimilation of basic actions of free-style wrestling are created gets at the development of technical elements of free-style wrestling and basic actions of young wrestlers of importance. Basic elements of free-style wrestling are the basic provisions of wrestlers in stand and parterre, distance between rivals, ways of movements, directions of maneuverings, clutches, emphasis, pushes, bursts and releases from them, performance of basic technique, protection and counter-technique, use of tactical training, combinations.

2. The successful formation of motive function of young wrestlers of free-style in many respects depends on study method to fight elements. The choice of methods and methodical receptions is defined by the concrete pedagogical task, features of maintenance of training material, age and level of prepared-

Table 1

Indicators of special physical fitness of young wrestlers before the experiment

Indicators	EG (n=11)	CG (n=11)
Fall overs from emphasis the head in carpet on "wrestler's bridge" and in the opposite direction 10 times, s	23,81+0,13	24,05+0,15*
Exercise "pass at legs", s	25,21+0,92	25,74+1,21
Running around the head of 10 times, s	26,68+0,31	25,79+0,29*
Running added steps around hands of 10 times, s	22,17+1,19	23,01+1,27*

Note. ** – p<0,05 at sportsmen of CG in comparison with wrestlers of EG.*

Table 2

Indicator of special physical fitness of young wrestlers of free-style after the experiment

Indicators	EG(n=11)	CG (n=11)
Fall overs from emphasis the head in carpet on "wrestler's bridge" and in the opposite direction 10 times, s	22,76+0,14	24,11+0,17*
Exercise "pass at legs", s	24,98+0,87	25,34+1,14
Running around the head of 10 times, s	25,39+0,35	25,68+0,27*
Running added steps around hands of 10 times, s	22,01+1,22	22,57+1,13*

Note. ******* *– p<0,05 at sportsmen of CG in comparison with wrestlers of EG.*

Table 3

Dynamics of indicators of special physical fitness of young wrestlers of free-style during the experiment

Indicators	EG (n=11)	CG (n=11)
Fall overs from emphasis the head in carpet on "wrestler's bridge" and in the opposite direction 10 times, s	–1,05	0,02
Exercise "pass at legs", s	–0,23	–0,07
Running around the head of 10 times, s	–1,29	–0,02
Running added steps around hands of 10 times, s	–0,16	–0,14

ness of young wrestlers of free-style. It is possible to allocate methods of ensuring presentation and methods of use of the word in the form of the leadership in the educational process and the direct communication of the coach with young wrestlers of free-style. The exercise method is applied to mastering main elements of fight and basic actions. The choice and application by the coach of the optimum method significantly accelerates the process of studying of technique and tactics by young wrestlers in the conditions of the dynamic development of free-style wrestling as Olympic sport, promotes the improvement of effectiveness of competitive activity.

3. It is easier for coach to find mistakes in its structure in the analysis of the attacking operation which is performed by the pupil. Such approach allows optimizing the study process, thereby increasing management efficiency of it. It is easier for the coach to control the different parties of their preparation at the same time in the analysis of all indicators which gives the chance to divide young wrestlers of free-style on more and less perspective by ability to assimilation of training material.

4. The ability of the young wrestlers of free-style against honor to get out of the situations, which arise during a duel, increases with increase in number of ways of tactical preparation of the attacking action. At the same time the analysis of programs of CYSS on free-style wrestling demonstrates that it is necessary to include concrete ways of tactical preparation for each action and different combinations of basic actions in them. Study technique questions to technique at the initial stages are still a little investigated. The condition of this problem was revealed us during questionnaire of the leading coaches of the Kharkiv region. So, it is not known to what techniques, defense and counter- techniques, it is necessary to teach for year in what sequence, how many techniques, how many time it is necessary to repeat technique which is studied, in one classes how many times to carry out it to assimilation that it was possible to apply in educational collisions and, the main thing, in the conditions of competitions of young wrestlers of free-style.

5. Indicators of overall physical fitness in comparison with indicators before the experiment are improved after application of the author's program on improvement of physical training of young wrestlers on extent half a year, wrestlers who entered into the experimental group. Time of performance of exercises was reliable less ($p<0,05$), than at wrestlers of the control group by the author's technique. Sportsmen, who entered into the control group of comparison, have not found the significant improvement of indicators of special physical fitness. The proved expediency of use of the author's technique of study of young wrestlers to variable technique of free-style wrestling against the help of specialized outdoor games for the development of variable movement skills at young wrestlers of free-style.

Prospects of the subsequent researches in this direction – the improvement of technique of study of young wrestlers to technique of fight taking into account modern requirements of competitive activity.

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Development of Non-Olympic sports in Kharkov region during the existence of the Ukrainian SSR

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Purpose: *the attempt to investigate the history of formation of Non-Olympic sports in our region is made on the basis of the analysis of number of archival documents and materials of periodicals.*

Material & Methods: *the analysis and generalization of the sourced base on the matter.*

Results: *features of the development of the sports branch during the entire period of the existence of the Ukrainian SSR are analyzed.*

Conclusions: *it is established that the development of Non-Olympic sports of the Soviet period began in the 20th of the XX century. Chess and checkers, military-sports kinds (in the conditions of militarization of the country in the 30th of the XX century) and different types of single combats became the most mass among Non-Olympic sports in the region. The level of training of sportsmen of Kharkov was such high that they made the basis of national teams of the Ukrainian SSR, and also were the part of national teams of the Soviet Union.*

Keywords: *Non-Olympic sports, mass sports, military-applied sports.*

Introduction

Sport is one of the leading fields of activity of the person what is designed to form number of psychophysical qualities of citizens of Ukraine, irrespective of age, sex and physical capacities in modern conditions. Near classical and initial kinds of sports the special place is taken by its Non-Olympic versions. Despite of lack of their recognition by the world sports organizations, both in Ukraine, and beyond its limits, they become rather popular every year. Strangely enough, but in this area the modern Ukrainian state has a uncommon experience, origin of the separate directions of Non-Olympic sports began during the interwar period. Despite of certain degree of amateurism, Non-Olympic sports over the years won the admirers more and more whom the Soviet ideology turned into peculiar reserve of Olympic teams, which presented to the USSR at the international competitions. At the same time the formation and development of Non-Olympic sports in USSR was the evidence of intensive sports construction, that there was sport designed to form "the builder of the bright future", for which was one of platforms of demonstration of corporal perfection and number of physical qualities of representatives of the first-ever socialist state.

The historiography from this perspective is presented mostly by books what sports societies and federations released on the occasion of different memorials and anniversaries. The short historical review of development of this sport or the sports organization held, and also the most outstanding sporting achievements were published at them [1]. The chronological review of development of Non-Olympic sports on the Kharkiv region is presented in the monograph Yu. Grot and M. Oliynik [11–13]. However this multi-volume is devoted, mostly, to the description of victories of the Kharkiv sportsmen and almost does not pay attention to questions of reorganization of separate sports in our region. The Kiev researcher Yu. Tymoshenko uses widely data on Non-Olympic sports. However its monograph is limited to chronological framework of the 20th – the 40th of XX cent.; the facts have to illustrate reorganization of all sports branch of the Ukrainian USSR, but not its certain regions [18]. The considerable part of materials is stirred on pages of the local press. The people, who informed in this perspective, were authors of such articles: sports journalists and sports functionaries of our region [14; 16]. Problems of development of sport were often discussed in these publications; the results of previous years were summed up. All this allows making complete the situation of development of this branch.

Authors prepared the row of scientific development, which is devoted to the single question of development of the sports sphere within the research project "Theoretic-methodological characteristics of development of Non-Olympic sports" [17].

Communication of the research with scientific programs, plans, subjects

The work is performed within the research project "Theoretic-methodological characteristics of development of Non-Olympic sports", number of the state registration is 0115U002372.

The purpose of the research:

to characterize comprehensively the process of reorganization and development of Non-Olympic sports on the Kharkiv region throughout the whole Soviet period of the history of Ukraine.

Material and Methods of the research

The spring base of the research is made by documents which are stored in the State archive of the Kharkiv region, the Cen-

tral state archive of public reunification of Ukraine and the periodic press. Official documents are submitted in funds of the Committee on affairs of physical culture and sport at the Executive committee of the Kharkiv regional council of deputies of workers (P-5756), Council of the union of sports societies (P-5757), the Kharkiv regional executive committee (P-3858), the Kharkiv district executive committee of councils of working, country and Red Army deputies (P-845) but other. Resolutions of the committee on physical culture and sport of the USSR, statistical data on development of the branch in the areas, any results of sports competitions, reports on work of volunteer sports societies and so forth are stored here. Articles about sports competitions, about problems of development of separate sports, interview with outstanding sportsmen were systematically published on pages of the local newspapers "Chervonyi prapor", "Leninska zmina", "Slobidskyi kray", "Sotsialistychna Kharksvshchina", "Vechirniy Kharkiv".

Results of the research and their discussion

Gorodki, kettlebell sport (at that time it was not divided with weightlifting), motorcycle sport, chess, checkers and acrobatics can be considered as pioneers among Non-Olympic sports on the Kharkiv region. The Kharkiv provincial council on physical culture had data about 61 chess-checker clubs, in which there were 1480 chess players and 693 draught-players, on the beginning of 1926. [7, sh. 14].

Checkers and chess became one of the most mass sports in the area through branching of network of their circles. Pupils of the Kharkiv chess school in different years became prize-winners of republican, allied and international competitions. For example, fifteen-year-old M. Steinberg, the first of young chess players of the USSR won European cup among juniors in 1967 in the Dutch Groningen.

The beginning of reorganization of the military and sports sphere which gradually began to be associated with protection of the fatherland, but not with sport on the end of the 20th, the XX cent. The Bolshevik ideology provided the formation of the closed military society, where each of its members was ready not only to protect the Homeland from the hostile capitalist environment, but also to rise by protection of any unfortunate people, that is to export socialist revolution out of borders of the USSR. The Kharkiv region before the war was one of the leaders of military and sports preparation what results of military and technical examination of 1936 testify to: 266 178 members of the Komsomol passed successfully examinations from twenty three types of preparation. Kiev (364 859) (296 183) and Donbas areas were only ahead it [15, sh. 20–27]. The idea of combination of sports and military component of physical training gained the considerable popularity among the Soviet youth with introduction in 1931–1932 of the all-Union sports complex "Prepared for work and defense" (known as the complex PWD). Multi-discipline event of PWD became urgent again due to the escalation of opposition of the capitalist and socialist countries in the 60th – the first half of the 80th of the XX cent.

Tourism and mountain climbing begin to develop actively in the late twenties. The Soviet power positioned tourism as the most "valuable means of ideological and political and physical education, improving and active recreation" [10, sh. 1]. Sports functionaries noted that tourism promotes) hardening of organism, endurance acquisition, formation of skills of orientation and movement on any area. "Tourism, sports fishing and other improving actions captured 292 thousand persons according to the Kharkiv regional executive committee, the state for 1971. 20 houses of the hunter and fishing, 156 improving sports centers and 98 tourist bases" were used for carrying out this work [9, sh. 11].

The national dam, the Russian hockey (field hockey), Rugby, sailing, scuba diving, and sports orientation extends beginning from the 1960th, on the Kharkiv region. Security of the Kharkiv region with water resources allowed creating extensive network of yacht-clubs. 15 sport-clubs on sailing, each of which totaled more than one hundred visitors was affected in the middle in 1987 on the Kharkiv region. Only one yacht-club of the plant named after Malyshev "Frigat" trained 800 sportsmen for the period from 1965 for 1985 [14].

Sports clubs which represented sports, new for the Soviet person, begin to appear in the 1980th with the approach of "Perestroika", opening of "iron curtain" and change of negative attitude to all western in Kharkiv: martial arts, baseball, water skis, windsurfing, American football, athleticism, bodybuilding, skateboarding, sports bridge, renju, and others.

Different types of single combats received the greatest favor among Kharkiv citizens. The karate club at Kharkiv state university under the leadership of Luyis Karvakhal was one of the first cells of martial arts. Its visitors studied the mixed types of single combats in the context of development of skills of self-defense. Enthusiasts continued to do the chosen sport mostly illegally after prohibition of martial arts in 1981. So, such sections masked under groups of gymnastics of wushu or athleticism or existed with illegal status in Kharkiv in the first years of reorganization. The club of oriental martial arts which became the center of their development in our city was created only in 1989 on the basis of sports complex of the city committee on physical culture and sport. It was created by representatives of karate, wushu, taekwondo and hand-to-hand fighting.

Any competitions were arenas of sports actions: any separate sports competitions within the sports contest of the people of the USSR, sports contest of the Ukrainian SSR, regional and club sports contests, and also the sporting events which are devoted to days of health and remarkable social and political events.

In the conditions of formation of the informal case of professionals, beginning from the 70th of the XX cent., the Kharkiv athletes always made the basis of national teams of the Ukrainian SSR repeatedly supported the national team of the Soviet Union.

Sports institutions mostly were localized in the city and the regional centers. If 31720 persons were engaged in auto-motorcycle sport, gorodki, hunting, tourism and mountain climbing, chess and checkers for January 1 in 1940 in Kharkiv, then in 34 districts of the area is three times less – 9953 persons [4, sh. 1–4]. Functionaries called the absence of sports instructors and stock as the reasons of such state of affairs sports.

Difficulties, with which sports enthusiasts faced during a day of the so-called "the developed socialism" in the village, which are brightly illustrated in the report of the chairmen of Volunteer sports society "Kolos" M. Baky to the vice-chairman of

council of ministers of USSR N. T. Kalchenko of May 11, 1975: "... Most collective farms, state farms and organizations of the republic, have even no simplest constructions for the organization of classes on physical culture and sport. One stadium is the share of 40 collectives of physical culture or of 90 villages and of 2,6 thousand working at the village; one gym – on 53 villages and 14 thousand working. More than 200 rural regional centers have no stadiums, and 133 stadiums which are constructed in regional centers due to cooperation of means with a total cost of 11,5 million rub, actually have no owner, from year to year collapse... for the last 3 years *(1973–1975. Author's note)* the debt of the organizations which hold society makes 2 million 770 thousand rub". [2, sh. 11]. Let's notice that the 70-80th of the 20th century consider the optimum years for the development of sport, when both the state, and the subjects of housekeeping, spent solid funds for reorganization of sports infrastructure of the republic.

The management of bodies of physical culture and sport constantly acted as the USSR as "the poor relative", eliciting money for reorganization of sports infrastructure at the prosperous branch ministries during the whole existence of Ukrainian. So, the Committee on physical culture and sport at Council of ministers of the USSR sent to sketch about sports constructions of the Nikopol inter-collective-farm sports club "Kolos" after the publication the written appeal to the different ministries with request to learn and introduce this experience in the newspaper "Pravda" of June 23 in 1980 the [3, sh. 144]. However business executives, being guided by self-preservation instinct, well understood that it hardly should be responsible for bad providing sports collectives, and here for workers it is necessary to be responsible for non-performance of operational performance or plans of capital construction of housing by all severity of the law.

The attention was paid to one and all sports in the Soviet Ukraine. It is confirmed by official documents of the sports organizations. For example, the resolution of committee of physical culture and sport at council of ministers of the USSR of February 26 in 1969 "About introduction of new only All-Union sports classification for 1962–1972" through decay of requirements of rather sports results entered new to all existing sports in the Soviet Union without their division into different categories [5, sh. 1–124]. However, the Soviet sports functionaries allocated mass (popular) types of sport. Chess and checkers are set off to them near football, volleyball, and track and field athletics. Tourism traditionally contacted the recreational sphere. Allocation of the Olympic sports from others in archival documents is traced from 1969.

Sports clubs were organized at the enterprises and institutions, sports clubs which could exist as independently, and to be the part of Volunteer sports societies (VSS). In 1939 the following VSS worked in the area: Avtomotor, "Bolshevik", "Berevisnyk", "Skhid", "Dynamo", "Zdorovya", "Znannya", "KIM", "Kolos", "Chervona zirka", "Lokomotyv", "Metalist", "Blyskavka", "Mukomol", "Kharchovyk", "Spartak", "Budivelnyk", "Temp", "Vrozhay". They represented amateur-sportsmen, who worked in different spheres of the national economy and united by the branch principles. So, VSS "Petrel" which united members of labor unions of the state trade and public catering, communication, consumer cooperation in 1951, presented members of student's labor unions in the 60–80th of the 20th century. The submission of VSS "Dynamo" (law-enforcement bodies), "Lokomotyv" (The southern railroad) were invariable. The quantity of VSS changed constantly during the second half of the XX cent.

There were gradually certain activities of sports societies. For example, VSS "Dynamo" a little strong teams in such sports as sambo, sports orientation, multi-discipline event PWD, gorodki; VSS "Spartak" – checkers, trampolining, modern pentathlon, rugby; VSS "Avangard" took the leading positions in training of climbers, acrobatics, hockey with ball.

Specialists of All-Union volunteer society of assistance of army, aircraft and fleet famous to the ordinary citizen as VSCAAF went in for military and applied and technical sports (plane, model aircraft, parachute, glider, automobile, motorcycle, radio sport, sea, shipping-model, and auto-model). For example, the Kharkiv organization contained 34 regional and city committees with 3989 primary organizations and 1 000 099 members of society in 1968 [8, sh. 35].
The network of the educational organizations worked for the purpose of development of military-applied sports among members of society: Kharkiv, Kupyansk, Chuguyev, Balakliya automobile clubs (automotorcycle sport), Sea club (sea sport), air-sports club (parachutists, glider pilots, and pilots-sportsmen), club of office dog breeding (animal trainer, instructors of guard dogs). 21 also worked regional sports-technical club in Kharkov areas in 1968. 18576 drivers, 20728 motorcyclists for the sports sphere, armed forces and the national economy of the republic trained their efforts since January in 1966 till July in 1968 [8, sh. 36]. The fact says that the team aviation and sports club of VSCAAF (V. Barkov, V. Surayev) became the world champion on model aircraft sport about quality of training of sportsmen in 1976.

VSCAAF acted as the competitor of the Kharkiv regional automotor club which had less extensive network of clubs; however quality of work of the last was very high. Such data confirm it: sportsmen of club established 20 automobile and 3rd motorcycle records of the USSR, and also 22 (cars) and 44 (motor) records that made 87% of total auto-motor-records on the Ukrainian USSR. Here Kharkiv citizens V. K. Nikitin, T. G. Popov, Ye. O. Lorent but other were marked out during 1951 [6, sh. 5].

The sports movement, since first years of establishment of the Bolshevist power, acted as the way to emancipation of the woman. The greatest club, which worked in the city at the beginning of the 20th of the XX century – "Society of physical culture of Balabanov", totaled 430 persons of who third was made by women [16, p. 23]. The number of female persons who did Non-Olympic sports only grew in the subsequent. The greatest percent of girls and women was among visitors of such sports clubs as acrobatics, tourism, chess and checkers. Women were presented as well in other sports. So, 534 women went in for auto-motorcycle sport in January 1 in 1940 in Kharkiv that made 16% of total of sportsmen [4, sh. 1–4]. Also one of the strongest Ukrainian hockey (field hockey) teams – the women's team "Avianinstitut" was considered in the 1970th in the early eighties.

Conclusions

Therefore, functionaries did not distribute sport on Olympic and Non-Olympic sports throughout the long period the Soviet sports. The utilitarian purpose of sport consisted in preparation of large number of the young people, who are capable to

protect the country from attack of any enemy. Because of it, such much attention was paid to the development of military-applied sports. Also it was considered as means of ideological education of the Soviet citizens. Regardless to the importance of sport for the Soviet society, the sports sphere constantly felt shortage of funds for the development. Checker and chess became the most mass among Non-Olympic sports, in view of branching of the network of club and the number of their visitors. The attention to different types of single combats considerably grew during the reorganization under the influence of the so-called «western trends». The level of training of sportsmen was extremely high that allowed our countrymen to compete regularly at allied and world competitions.

The subsequent researches need to be aimed at the development of separate kinds of Non-Olympic sports on the Kharkov region both during the existence of the Ukrainian SSR, and at the time of the existence of independent Ukraine.

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Development of specific coordination abilities and vestibular stability in the course of physical training of cadets of National Academyof the National Guard of Ukraine

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Purpose: *to develop and to check experimentally ways of increase in specific coordination abilities of cadets of NANGU.*

Material & Methods: *analysis and synthesis of references, pedagogical observations, testing, test of Yarotskyi; pedagogical experiment; modeling. Cadets of 2 and 3 courses of NANGU participated in the research.*

Results: *the specific coordination abilities, which are shown at cadets of NANGU in the course of the solution of motive problems of military-applied orientation, are defined; the technique of definition of vestibular stability and assessment of its results on data of the test of Yarotskyi is mastered; the efficiency of experimental training of method of vestibular stability of cadets of NANGU is developed and defined.*

Conclusions: *the expediency of introduction in the educational process on physical training of cadets of NANGU of experimental training of method of vestibular stability is proved.*

Keywords: *specific coordination abilities, vestibular stability, cadet, physical training, teaching.*

Introduction

The present time demands training of the highly professional experts of National Guard of Ukraine, who are capable for effective implementation of orders of command, therefore the development of specific coordination abilities in the course of physical training of cadets of NANGU plays the important role. Physical training occupies one of the leading positions in the educational process of NANGU. The main task of the educational-training process in NANGU is the development in cadets of physical qualities of specific orientation. Considering features of the professional activity of future officers of National Guard of Ukraine, it is considered necessary the improvement at cadets of specific coordination abilities whom treat time sense, attention, sensor-motor reactions, fast and dexterous movements.

The purpose of the research:

to develop and to check experimentally ways of increase in specific coordination abilities of cadets of NANGU.

Material and Methods of the research

Research methods: analysis and synthesis of references, pedagogical observation, testing, test of Yarotskyi; pedagogical experiment; modeling. Cadets of 2 and 3 courses of NANGU participated in the research.

Results of the research and their discussion

The research was based on the works of A. P. Efremov but other, 2008 [4]; V. L. Botyayev, 2012 [1]; R. H. Dyeushev, 2012 [3]; Ye. Ye. Vityutnev, K. Yu. Chernishenko 2013 [2]; A. S. Rovnyi but other, 2014, 2015 [6; 7]; V. M. Platonov, 2010 [5] and other scientists. The analysis of scientific literature found the insufficient extent of the development of problem of development of specific coordination abilities in the course of physical training of cadets which demands the separate scientific research. It also defined the relevance of the article.

The coordinated functioning of tissues, bodies and systems of bodies, at their joint activity in organism as coordination in physiology it is understood at the same time and consistently [8]. The leading role in manifestation of coordination belongs to the central nervous system which accumulates information on state and changes in tissues and bodies at action both external, and internal environments. Thanks to innervations, the central nervous system is capable to provide interrelation between all parts of body and on this basis the coordinated activity of organism in general. At the same time it provides as the simultaneous, that is coordinated activity of bodies and tissues at every moment, and consecutive coordination. The role of mechanisms of coordination of motive functions and mechanisms of coordination of vegetative functions during the solution of different motive tasks can significantly differ. At the solution of one motive tasks, the important mechanisms of coordination of mainly motive function of the person, at the solution of others – mainly vegetative, at the solution of the third – both motive, and vegetative functions. In the first case coordination of processes is formed and improved, which proceed in mechanisms of innervations of muscles by means of which the motive task is solved. It is noted [8, p. 32] that the person can have essential vegetative changes at the pronounced emotional states at the solution of motive tasks. The role of mechanisms of coordination of

vegetative functions rises if the motive task is solved with the participation of large number of large muscles. At the same time cures of motive tasks, that is physical actions, differ with the performance duration, work power, and also constancy, or variability of conditions of their performance. At the solution of motive tasks, vegetative functions of organism provide activity of the corresponding muscles. Therefore, coordination of activity of organism is understood as the interrelation of motive and vegetative functions.

Experts allocate and consider coordination of movements as general characteristic of course of the movement in time and space (motive aspect), and coordination abilities – as internal determinants of coordination of movements, or its quick aspect. At the same time the general, specific and special coordination abilities differ [9]. Specific coordination abilities characterize properties which determine preparedness of the person for optimum control similar by origin and sense by the movements, and also to their regulation. Special coordination abilities concern to groups of complete purposeful physical actions, uniform by psychophysiological mechanisms, which are systematized by the growing complexity. The set of special and specific coordination abilities is called the general coordination abilities.

To the most important specific coordination abilities are treat: abilities to the accuracy of reconstruction, differentiation, measuring off and assessment of spatial, time and power parameters of movements; to balance, rhythm, quick response, orientation in space, quick reorganization of motive activity, and also to any relaxation of muscles, vestibular firmness, communication or connection.

Definition of specific coordination abilities which are shown by cadets of NANGU at the solution of motive tasks of the military-applied orientation their purposeful development allows to increase efficiency of the process of physical training of future officers.

Dysfunction of vestibular sensory system of the person leads to loss of ability to be guided in space as a result of violation of visual and acoustical perception, loss of tactile sensitivity. Vestibular frustration is observed at the military personnel of National Guard of Ukraine during the implementation of orders what are connected with vibration danger.
Vestibular frustrations are quite often so strongly expressed that the person loses working capacity for long time, and in certain cases becomes completely not professional suitable.

One of the fixed assets of prevention of vestibular dysfunction among cadets of NANGU is training of vestibular firmness – vestibular gymnastics which includes different exercises on the movements of eyes, head, and also trainings of coordination abilities.

The training of vestibular firmness by means of special exercises promotes the decrease in percent of future officers who suffer from vestibular frustration.

The high level of coordination abilities allows the cadet to seize quickly new movement skills; it is rational to use the available stock of skills and motive qualities – force, speed, and flexibility, to show necessary variability of movements according to concrete situations of professional activity. Coordination abilities are shown in the expedient choice of physical actions on arsenal of the skills mastered by the cadet. Therefore, it is natural that the level of their manifestation depends on motive preparedness of the cadet, quantity and complexity of the mastered skills, and also efficiency, course of mental processes, which cause effective management of the movements. The bigger quantity, variety and complexity of the mastered skills is, the quicker and more effectively adapts the cadet to unexpected conditions, solves new motive tasks that react more adequately according to requirements of situation, which arises. Speed and efficiency of the solution of motive tasks, in turn, increase motive stock of the cadet. Together with it, coordination abilities are in many respects caused by efficiency of the cadet in processing of information, which arrives from the external environment. Specific requirements to coordination abilities and activity of analyzers represent exercises in the conditions of confidants to fighting (on obstacle course, in field conditions, at passing physical training, in the conditions of execution of alerts) as features of work in these conditions complicate process of control and management of the movements. Information, which is obtained from analyzers, allows the cadet of NANGU to perceive precisely the smallest details of movements, provides their analysis and necessary correction. Special impact is exerted by specialized perceptions on coordination abilities of the cadet – space sense, water obstacle; fighting vehicle by which level of development in many respects the speed of management of the movements is defined.

Simple coordination and rotary tests with overstimulation of vestibular receptors are used for research and assessment of condition of vestibular firmness.

The simplest test is the test of professor V. Ya. Yarotskyi among rotary tests.

The examinee carries out the circular (rotary) movements by the head in one side with speed of 2 rotations in 1 second. On time during which the surveyed is able to execute this test, keeping balance, judge firmness of vestibular analyzer. Unexercised people keep balance on average during 28 s, sportsmen – to 90 s and more.

The reaction is estimated on trunk deviation degree aside and existence of vegetative symptoms: pale persons, increase of pulse, perspiration, nausea, but other.

Safeguarding is provided when performing this test.

Cadets of the 2 and 3 courses of NANGU participated in the research. 3 groups were created: one experimental group (EG) which was engaged by the experimental training method of vestibular firmness, two control groups (CG-1 and CG-2) which were engaged by the standard technique. The experimental work was carried out within 4 months (from February to May in 2015) on physical training classes.

The training method of vestibular firmness included trainings of vestibular gymnastics, complex relays in which were used: run in the different ways, movement on limited support, throws over forward-back, and jumps with turns on 180° and 360°. Cadets were also recommended for the independent performance complexes of vestibular gymnastics.

The definition of condition of vestibular firmness of cadets was carried out at the beginning and at the end of the experiment.

The analysis of results of the first investigation phase allowed allocating conditionally the 3rd levels of vestibular firmness of students:

– high (H) – more than 32 s;
– average (A) – 26 – 31 s;
– low (L) –25 s and less.

The percentage ratio of levels of vestibular firmness of cadets of NANGU at the beginning and at the end of the experiment is presented in the table 1.

Dynamics of change of distribution of cadets by levels of vestibular firmness before and after the experiment is presented in tab. 2.

The essential growth of number of cadets with the high level of vestibular firmness – from 12 to 22 persons was observed, the number of cadets with the average level of vestibular firmness grew by 7 persons and, respectively, the number of cadets with the low level of vestibular firmness decreased by 17 persons at the end of experiment.
The distribution of specific weight of cadets of three groups by levels of vestibular firmness before and after the experiment is presented in tab. 3.

The number of cadets with the high level of vestibular firmness (26,09%) considerably increased in the experimental group after carrying out the experiment. The number of cadets with the average level of vestibular firmness increased on 8,70% and the number of cadets with the low level of vestibular firmness decreased on 34,78%. The last indicator is significantly lower, than in control groups where decrease makes 20,83% and 17,39% respectively.

T-criterion of Student was used for the definition of the statistical importance of differences. The carried-out calculations indicate reliability of differences in indicators in all groups of cadets who participated in the research.

The analysis of results of testing showed advantages of experimental training method of vestibular firmness of cadets of NANGU in comparison with traditional.

Conclusions

1. The analysis of references showed that problems of vestibular firmness and development of specific coordination abilities of the military personnel in general and the cadets of NANGU, in particular, are studied insufficiently.

2. The main features of the exercises directed to the improvement of coordination abilities is complexity, not traditional character, novelty, possibility of various and unexpected solutions of motive tasks. It is possible to diversify performance of habitual physical actions due to introduction of unusual first positions, variability of dynamic, time and spatial characteristics of movements, creation of unexpected situations by change of places of classes and conditions of their carrying out, use of training devices, and the special equipment.

3. The developed training method of vestibular firmness of

Table 1

Distribution of cadets by levels of vestibular firmness before and after the experiment (the number of persons)

Group	Before the experiment			After the experiment			Deviation (+;–)		
	L	A	H	L	A	H	L	A	H
CG-1	13	6	5	8	9	7	–5	3	2
CG-2	12	8	3	8	10	5	–4	2	2
EG	11	8	4	3	10	10	–8	2	6
Total	36	22	12	19	29	22	–17	7	10

Table 2

Rates of gain of number of cadets by levels of vestibular firmness after the experiment in comparison with data before the beginning of the experiment, %

Group	Rates of gain		
	L	A	H
CG-1	–38,46	50,00	40,00
CG-2	–33,33	25,00	66,67
EG	–72,73	25,00	150,00

Table 3

Distribution of cadets behind levels of vestibular firmness to and after the experiment (specific weight of %)

Group	Before the experiment			After the experiment			Deviation (+;–)		
	L	A	H	L	A	H	L	A	H
CG-1	54,17	25,00	20,83	33,33	37,50	29,17	-20,83	12,50	8,33
CG-2	52,17	34,78	13,04	34,78	43,48	21,74	-17,39	8,70	8,70
EG	47,83	34,78	17,39	13,04	43,48	43,48	-34,78	8,70	26,09

cadets of NANGU allows to model the system and to solve the main tasks to development of coordination abilities:

– effective development of specific coordination means (preservation of balance, orientation in space, rational muscular relaxation);
– rational development and use of applied motive potential;
– improvement of functional condition of analyzers of cadets;
– increase in vestibular firmness of cadets to adverse factors;
– disclosure of the hidden reserves and permanent preservation of the received skills throughout long time.

Prospects of the subsequent researches in this direction. Studying of influence of vestibular firmness of cadets of NANGU on accuracy of their shooting from different provisions is provided.

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Improvement of technique of a jerk of the qualified sportswomen in weightlifting

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Purpose: *the improvement of technical preparedness of the qualified female weight-lifters taking into account the group model characteristics of technique of a jerk.*

Material & Methods: *analysis and synthesis of data of scientific and methodical literature, pedagogical experiment, method of mathematical statistics.*

Results: *the revealed shortcomings of technique of the execution of a jerk of the qualified female weight-lifters were, considering the group model characteristics of technique of a jerk of the first group of weight categories. Complexes of compensatory exercises were offered for the purpose of correction.*

Conclusions: *the performance of complexes of the compensatory exercises, which are directed to the improvement of competitive exercise of a jerk of bar, allowed to increase the number of successfully executed raising of bar, for 10,3–19,8%, according to initial indicators of number of rises, and also to receive positive shifts in motive structure of a jerk of bar.*

Keywords: *technical preparedness, weightlifting, modeling, jerk, female weight-lifter.*

Introduction

The system of motor actions of the sportsman, which is directed to the achievement of sports result, is treated as technique and it differs in the specialization characteristic for the sake of appearances of sport [10; 19]. Shortcomings, which arise during studying of technique of competitive exercises, do not allow realizing fully individual opportunities of the sportsman during the competitive activity [3; 4].

Recently modeling of biomechanical parameters of technique of the best athletes of the world taking into account typological features of their organism received the wide use in connection with emergence of the latest computer technologies in elite sport. This problem was investigated by experts in track and field athletics, swimming, oar-sport, sports games [2–4; 6; 10]. Such researches were also conducted in weightlifting [1; 5; 7; 8; 9; 11].

Weightlifting belongs to sports with the maximum manifestation of power qualities, and was considered as especially man's sport recently. But women also debuted in 2000 at the Olympic Games in Sydney in this sport. The modern system of preparation of female weight-lifters provides the constant improvement of the technical skill, which is directed to the realization of effective technical-tactical actions in the conditions of competitive activity.

The number of works is devoted to the question of assessment of technique in weightlifting [1; 5; 7; 8; 11; 13]. At the same time we established that the vast majority of scientific works study the question of improvement of method of execution of heavy athletics exercises of sportsmen.

It is revealed that authors studied the first competitive exercise – jerk in researches on problems of female weightlifting [8]. Some scientists, in view of viability of phase structure of method of execution, studied the technique of jerk and the first technique of jerk-lifting on breast [1].

We consider, the question of technical preparedness of women in weightlifting remains still insufficiently studied, namely we didn't find researches, which would concern studying of technical preparedness of women in bar jerk, depending on conditions of violations of structural components of technique.

Communication of the research with scientific programs, plans, subjects

The research was conducted according to the plan RW DSIPCS in the branch of physical culture and sport for 2011–2015 of the Ministry of education and science of Ukraine on the subject 2.6: "Theoretic-methodical principles of improvement of the training process and competitive activity in the structure of long-term training of sportsmen", the number of state registration is 0111U001168 and for 2016–2020 on the subject: "Theoretic-methodical principles of improvement of the training process and competitive activity in the structure of long-term training of sportsmen", the number of state registration is 0116U003007.

The purpose of the research:

to define the efficiency of practical use of the group model characteristics of technique of jerk of the qualified female weight-lifters in the educational-training process.

Material and Methods of the research

The consecutive pedagogical experiment, in which participated 9 qualified female weight-lifters of the age from 17 to 19 years, I group of weight categories was made (weight categories to 48 kg, to 53 kg, to 58 kg).

Research methods: analysis and synthesis of data of scientifically-methodical literature, pedagogical experiment, method of mathematical statistics.

Results of the research and their discussion

The analysis of competitive activity of the qualified sportswomen at the international and All-Ukrainian competitions of 2013–2015 shows that over 45,0% of competitive attempts in jerk, which executed female weight-lifter with a bar of the sub-maximum and maximum weight weren't completed because of the made different technical mistakes. The greatest number the made mistakes by sportswomen (from 33,0 to 47,0% of cases) concerns violations of kinematic structure of the movement of bar in lifting it from breast that indicates the relevance of definition of the reasons, which lead to it [12].

On the basis of the obtained data, we have offered the group model characteristics of technique of jerk by the biomechanical characteristics of structure of the movement of bar which influence the progress of realization of sports result (tab. 1).

The consecutive pedagogical experiment, which duration was two mesocycles, is made for definition of efficiency of practical use of the group model characteristics: specially-preparatory and precompetitive, with conducting two control tests of sportswomen at the beginning and at the end of the experiment. The complex control of biomechanical characteristics of technique of jerk of bar was carried out by means of video filming and with use of the video computer program "Weightlifting analyzer 3.0" (production Germany).

The initial indicators of technique of each sportswoman in bar jerk, which was carried out by sportswomen in the "control" zone of intensity with encumbrance of 92-100% of maximum were defined at the beginning of specially-preparatory mesocycle of preparation. Shortcomings of technique of motor actions, indicators, which do not answer model characteristics, and also those, which were recorded during unsuccessful performance of attempt were found. But it was defined on what biomechanical structure of the movement of bar (kinematic or dynamic) these are not successfully performed motor actions influence. We offered compensatory exercises (tab. 2), which carried out sportswomen, depending on the made by them mistakes, during the studied period, two times for week during the training process in the lead-in, involving, shock, competitive microcycles, for the purpose of elimination of shortcomings of technique of jerk.

The creation of resistant interrelation and interdependence of structure of motor actions of sportswomen with bar and the level of development of their high-speed and power qualities was one of the important conditions in usage time of compensatory exercises for correction of technique of jerk of bar of female weight-lifters.

Compensatory exercises significantly influenced the technique of jerk during performance of such motor actions by female weight-lifters:

– starting position of the sportswoman;
– application of the maximum efforts in phase structure of the movement;
– dispensing of range of vertical movement of bar;
– dispensing of speed of bar in different phases of structure of the movement.

For example: sportswomen, who had technique shortcomings, which display violation of dynamic structure of the movement of bar before performance of each following lifting, had to apply more or less muscular efforts in two main phases of exercise – the previous crouch stand or phase of the reference.

Exercises, which promoted the reference of apparatus to the planned height, were used for correction of the movement of bar:

1) S. p. Bar on shoulders, deadlifting of different weight up by identical range (for 25, 50 or 75% to the movement);
2) S. p. Bar on shoulders, deadlifting of one weight up but by different range (for 25, 50 or 75% to the movement);
3) S. p. Bar on shoulders, deadlifting of different weight up (75, 85, 90 and 95% of maximum) for identical range;
4) S. p. Deadlifting of identical weight up by the defined previously ranges of movement (25, 50 or 75% of maximum);

The sportswoman also used methodical technique, which demanded switching off of the visual analyzer from bar range of movement by imposing of bandage on eyes of female weightlifter during correction of motor actions (kinematic and dynamic characteristics of technique of jerk). Activation of work of vestibular analyzer of the sportswoman, and also muscular and articulate feeling was result of it.

Therefore, the subsequent improvement of method of execution of jerk of bar at the qualified female weight-lifters was

Table 1

Average-group model characteristics of technique of jerk of bar at female weight-lifters of the first group of weight categories

Control indicator	$\bar{X}$	±S
Power of the movement of bar (m·v), kg·m·s^{-1}	1,76	0,01
Range of movement of bar in phase of the previous crouch stand (h*mm)*,%	12,2	0,14
Absolute height of movement of bar in phase of the reference($h_{max1)}$, sm	22,6	0,14
Relative height of movement of bar in phase of the reference ($h_{max2)}$, %	14,4	0,10
Maximum speed of movement of bar (v*pp*), m·s^{-1}	1,71	0,009
Maximum force of jerk of bar (F*pp*),%	183,2	0,86
The relations of range of movement of bar at the time of achievement of the maximum speed to the absolute height of its departure ($h_{Vmax.}/h_{max}$), %	63,1	1,24

Table 2

Program of compensatory exercises for correction of technique of jerk of bar

Mistake	Methods	Dosing		Instructional guidelines
		Number of lifting	Zone of intensity, %	
Curvature of trajectory of the movement in deadlifting from breast	S.p. Bar on breasts, performance of the previous crouch stand – pause – starting position	12–16	60–75	Control of the movement of trunk and apparatus precisely behind vertical
The insufficient force of the reference of bar up from breast	Bar jerk from starting position bar on shoulders behind the head	12–20	50–70	Crouch stand on average speed, phase of power – quickly
Finish pressing out of bar by one or two hands	Bar on breasts, jerk with medium crouch "Svung" press from breast + fixing above 4–5 s	12–16	40–50	Depth of medium crouch, as during performance of jerk
Lack of fixing after jerk	Squats with bar on breast	6–8	80–85	Concentration on change of operating mode of muscles of legs without pause
Impossibility to rise from the provision of crouch stand	Bar on breasts, performance of the previous crouch stand – pause – starting position	4–6	90–110	Rate of the movement – down slowly, up quickly, hands in one situation

Table 3

Changes biomechanical characteristics of technique of jerk of bar at female weight-lifters of the first group of weight categories

Control indicator	Value of indicators of technique					
	before the experiment		after the experiment		size of changes	
	$\bar{X}$	±S	$\bar{X}$	±S	t	p
Power of the movement of bar (m·v), kg·m·s^{-1}	1,66	0,02	1,78	0,02	t=4,3	(p<0,05)
Range of movement of bar in phase of the previous crouch stand h*mm)*,%	13,2	0,2	12,6	0,1	t=2,7	(p<0,05)
Absolute height of movement of bar in phase of the reference ($h_{max1)}$, sm	21,4	0,3	22,3	0,2	t=2,5	(p<0,05)
Relative height of movement of bar in phase of the reference ($h_{max2)}$, %	14,9	0,09	14,5	0,07	t=3,6	(p<0,05)
Maximum speed of movement of bar (v*pp*), m·s^{-1}	1,62	0,007	1,68	0,009	t=5,5	(p<0,05)
Maximum force of jerk of bar (F*pp*),%	174,3	1,1	178,8	1,0	t=3,0	(p<0,05)
The relations of range of movement of bar at the time of achievement of the maximum speed to the absolute height of its departure ($h_{Vmax.}/h_{max}$), %	67,3	1,2	63,4	1,3	t=2,2	(p<0,05)

carried out also due to the stabilization and automation of their motive skills with the simultaneous improvement muscular and articulate feeling.

Indicators of technical preparedness in bar jerk, which were recorded at sportswomen at the end of the pedagogical experiment, showed the positive improvement of the motor actions of the qualified female weight-lifters during the executed attempts, which were carried out in the "control" zone of intensity (tab. 3).

Biodynamic characteristics of technique of jerk of bar – the power of the movement (m·*v*) changed towards the improvement – for 7,2% (p<0,05), indicators of range of movement of bar in phase of the previous crouch stand were also optimized – the improvement made 4,5% (from 13,2% to 12,6%). Indicators of absolute and relative height of movement of bar also authentically improved – for 4,2 and 3,0% (p<0,05) respectively. The maximum speed of movement of bar also grew by 3,7% (p<0,05), as well as the maximum force of jerk of apparatus – for 2,6% (p<0,05). The last indicator of technique of jerk of bar also changed towards the improvement, it decreased – by 5,8% (p<0,05).

Therefore, the big half of control biomechanical indicators of technique of jerk were stabilized or improved by the results of influence of compensatory exercises on kinematic and dynamic structure of the movement of bar of the qualified sportswomen. It, on the first, allowed to optimize the range of vertical movement to apparatus of the qualified female weight-lifters, and secondly, to reduce time of switching of operating modes of muscles from appeasable to overcoming what indicators of the maximum force of jerk of bar testify to.

Conclusions

Biomechanical characteristics of technique of jerk of bar which were recorded at the beginning and at the end of the pedagogical experiment showed what the improvement of kinematic and biodynamic characteristics of the movement to

apparatus made 2,6–7,2% ($p<0,05$) from reference values at female weight-lifters of the first group of weight categories, the range of movement of bar in phase of the previous crouch stand was stabilized (11,8–12,6% in relation to body length).

The correction of technical mistakes of sportswomen in bar jerk, by means of group model characteristics of technique of jerk and compensatory exercises allowed to increase the number of successfully executed deadlifting for 19,8% according to initial indicators of quantity of lifting, and also to receive positive shifts in motive structure of jerk of bar.

All this allowed sportswomen to bring closer biomechanical characteristics of technique of jerk of bar to model sizes, and it promoted the increase in sports result during the test of sportswomen whereas to their mass-growth indicators significantly did not change.

Prospects of the subsequent researches will be directed to the search for methods and means of improvement of technical training of female weight-lifters both in snatch, and in jerk depending on qualification and weight categories.

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The marketing analysis of competitiveness of fitness-clubs in Kharkiv

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Purpose: *to carry out the marketing analysis of competitiveness of fitness-clubs of Kharkov.*

Material & Methods: *analysis of references and documents, organizational analysis, system analysis, methods of the marketing analysis (SWOT-analysis), methods of mathematical data processing. The research was conducted on the basis of 13 fitness-clubs of Kharkov. Administrators acted as respondents – 15 persons; those who are engaged in fitness-clubs – 50 persons.*

Results: *opportunities and threats of the external environment of fitness-clubs of Kharkov are defined on the basis of the carried-out marketing analysis, satisfaction of Kharkov citizens with activity of fitness-clubs of the city from providing recreational services is found.*

Conclusions: *the carried-out analysis of marketing activity of fitness-clubs of Kharkov gave the chance to find possible threats from competitors: the rate of inflation in the country, the appearance of new competitors, the change of level of the income of the population, the increase in mortality of the population, the change of attachments of the population.*

Keywords: *marketing, competitiveness, fitness-clubs.*

Introduction

Recently it is possible to hear even more often the concept "fitness-industry", designating the field of activity, which includes production of recreational services in mass media. As estimates of analysts testify, fitness-industry takes the second place in the world (after high technologies) on rates of development and Ukraine still significantly concedes to the USA and Europe though on number of offers of recreational services, growth rates of the domestic market increase promptly.

However the fierce market competition forces the sports organizations, rendering these services to investigate constantly market condition and needs of the consumers at all variety of supply and demand in the market of services in the recreational sphere. The feature of market condition is considered, the competitive circle and activity of competitors is analyzed, and also weaknesses of the sports organization are estimated strong at the creation of competitive strategy. It causes need of application of marketing for this area.

The analysis of the scientific research in this direction showed that theoretic-methodical aspects of marketing activity of the organizations in the sphere of physical culture and sport are widely disclosed in literature [1; 3; 7; 10]. Also the questions concerning application of marketing in the organization and holding sports and mass actions [2], pricings of sports services [4], stimulations of consumption of recreational services [5] are not deprived of attention of scientists.

Communication of the research with scientific programs, plans, subjects

This research was carried out within the implementation of the fundamental scientific project for 2015–2017. "Theoretic-methodical bases of development of Non-Olympic sport" (number of the state registration is 0115U002372), the number of sub-theme "Organizational-administrative, economic and humanitarian bases of the development of Non-Olympic sport in Ukraine" (0115U006861C).

The purpose of the research:

to carry out the marketing analysis of competitiveness of fitness-clubs of Kharkov.

The following *tasks* were solved in the process of achievement of purposes:

1. To define opportunities and threats of the external environment of fitness-clubs of Kharkov.
2. To reveal satisfaction of Kharkov citizens with activities of fitness-clubs of the city for providing recreational services.

Material and Methods of the research

The following methods of the research were used in the research: analysis of references and documents, organizational analysis, system analysis, methods of the marketing analysis (SWOT-analysis), methods of mathematical data processing. The research was conducted on the basis of 13 fitness-clubs of Kharkov. As respondents administrators acted – 15 persons, engaged in fitness-clubs – 50 persons.

Results of the research and their discussion

Today there are many concepts used for the definition of the organizations providing recreational services. These are "sports-health-improving club", "fitness-club" or "fitness-

center", "recreational complex", etc. The market of sports-health-improving services is presented by 145 such fitness-clubs in Kharkov. The competition in the market of recreational services increases promptly along with the intensive development of fitness-industry.

According to data of the research of R. A. Fatkhutdinov [11], the competition is rivalry on any segment of the market between the separate organizations/ which are interested in achievement of the same purpose. Such purpose, as a rule, is maximizing profit at the expense of gain of preferences of the consumer. To the main types of the competition are related: functional competition; specific competition; subject competition; price competition. To types of competitors are concerned: direct competitors; commodity competitors; implicit competitors [4; 10].

The competitive strategy represents the economic actions, which are aimed at the providing growth of realization at the established price of the delivered recreational services [6].

The carried-out analysis of functioning of fitness-clubs in modern market conditions showed that they, as well as any organization, are characterized by the marketing environment. It is known that the macro-environment is, first, the source of providing with resources, necessary for maintenance of their internal potential at the optimum level for achievement of the purposes, and, secondly, it is set of the factors influencing their activity. The microenvironment is the source of "vital force" of fitness-club and includes the potential which gives it the chance to exist and survive. The microenvironment is presented by the process of formation of necessary resources and their transformations into services, and also the subsequent renewal of resources [3; 7].

The market researches, including the competitive analysis of the market of recreational services, and also studying of consumers and assessment of demand of the provided services in the market are organized within the marketing activity [8; 9]. As a result of such researches we defined opportunities and threats of the external environment of fitness-clubs of Kharkov (tab. 1). It is visible by results of the conducted research that indicators which gained less than 60 points are threats for the development and implementation of the concept of marketing, and indicators which gained 60 and more points – possibilities of the marketing environment.

The research conducted by us among Kharkov citizens – consumers of recreational services of fitness-clubs of the city assumed the detection of satisfaction with their activities for 4 indicators:

– price of recreational services;
– professionalism of personnel;
– comfort in club;
– work with consumers of services.

The assessment of these indicators was carried out by assignment of certain number of points to each fitness-club on the scale from 1 to 10 according to levels: 1–4 points (low), 5–7 points (average), 8–10 points (high).

The indicator «price on recreational services» was considered in the complex of various characteristics during the research. The main of them are concerned: variety and quality of the main (various forms of motor activity) and accompanying (physiotherapeutic procedures, recommendations about food and lifestyle, inspection of functional preparedness of the engaged, cosmetic procedures etc.) services; features of the contingent of engaged – belonging to one or various social groups, age and sexual features; type of the subscription etc.

So, for example, the price policy of the largest fitness-clubs of the city, such as "Tetra", "Unifekht" is focused on the solvent client, where fee is carried out according to club cards of various type ("All inclusive", "Premium", "Standart", "Corporate", "Kids") for the long period.

As showed our research, most of the interviewed Kharkov citizens (68%) consider that the price of recreational services in fitness-clubs of Kharkov corresponds to the offered services and the conditions created in them as 10 of 13 fitness-clubs received on this indicator of assessment of the average level. Other 32% –noted the high level, i.e. consider the prices of recreational services overestimated. Such estimates received 3 fitness-clubs of the city: "Sport center "KhPI", "Malibu" and "Pheromon". Any of respondents didn't give mark of the low level. Above told characterizes satisfaction of the fitness-clubs of the city of Kharkov which are going in for price policy.

On the second indicator – «professionalism of personnel», estimates of respondents were distributed as follows: 6% noted

Table 1

Assessment of opportunities and threats of activity of fitness-clubs, according to poll of administration (n=15)

№	Assessment indicators	Amount	$\bar{X}\pm m$	%
1.	Development of new sport	64	4,26±0,23	60,0
2.	Expansion of the range of FSU	60	4,00±0,84	80,0
3.	Legislative changes	62	4,13±0,34	70,6
4.	Improvement of quality of granting FSU	70	4,66±0,34	62,6
5.	Appearance of new competitors	34	2,26±0,37	80,0
6.	The rate of inflation in the country	26	1,73±0,28	88,6
7.	Increase in death rate	16	1,07±0,06	72,3
8.	Change of preferences of the population	54	3,60±0,30	72,0
9.	Change of level of the income of the population	44	2,93±0,34	79,6
	$\sum_{i=1}^{n} x_{i\,max} = 75$	$\sum_{i=1}^{n} x_{i\,min} = 15$		

low, 72% – average and 22% – high levels. If to consider distribution of estimates of respondents on clubs, then only two ("Pheromon" and "Lokomotiv"), according to respondents, have high professionalism of personnel. Respondents estimated the level of professionalism of most clubs (10) among which consumers our research was conducted as average. The low level of professionalism of personnel respondents noted only in one fitness-club ("Sport center of «KhPI"). It should be noted that professionalism of personnel in many respects influences quality of the provided recreational services and is the important characteristic of activity which has to be strategic reference point of each fitness-club, in particular network.

Assessment of the comfort, which is created in fitness-club, is also the integral indicator of consumer satisfaction with recreational services. As results of the research showed, infrastructure providing, and also the accompanying services provided additional, the conditions created for classes, condition of material resources etc. of fitness-clubs "Pheromon", "Kulturist", "Tetra", "Malibu" are at the high level (32% of respondents). At the same time clubs "Sport center "KhPI" and "Aphrodita", according to poll (13%), have the low level of comfort. Other 7 clubs ("Unifekht", "XADO GYM", "Planeta plus", "Lokomotiv", "Stimul", "Rekord", "Forma T"), according to their consumers (55%), have the average level of comfort).

Poll showed (32% of respondents) that only 3 fitness-clubs ("Tetra", "Pheromon" and "Malibu") carry out the work with consumers of services at the high level. According to 24% of respondents, this indicator corresponds to the average level in 3 fitness-clubs ("Kulturist", "XADO GYM" and "Lokomotiv"). Nearly a half of respondents (44%) noted the low level of work with consumers of services in such fitness-clubs as «Sport center "KhPI", "Planeta plus", "Aphrodita", "Stimul", "Rekord", «and "Forma T". It testifies to the undeveloped system of work with clients who have to provide the complex of special offers, instruments of information influence and the control device of level of satisfaction of the consumer with services (pic. 1).

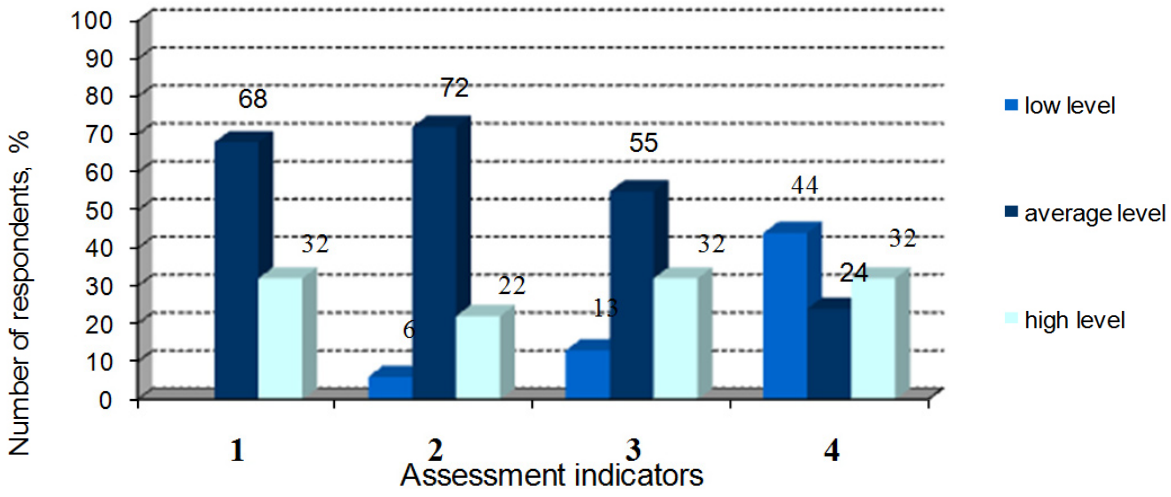
If to consider results of the conducted by us poll in total on all 4 indicators, then most of the interviewed Kharkov citizens estimate activity of fitness-clubs on average and on high levels. The highest estimates of consumers received fitness-clubs "Pheromon" and "Malibu". These fitness-clubs have the wide network in the city and are the chief leaders among fitness-clubs. Thanks to the wide network of fitness-clubs, these organizations are capable to offset possible financial losses of one fitness-clubs by the successful work of others. The network works as the uniform organization, that is has the system strategy, economic reference points, and unlike single fitness-club, has almost maximum coverage of the local market. Therefore these clubs need to develop each of the available resources in the context of development.

Conclusions

1. The carried-out analysis of marketing activity of fitness-clubs of Kharkov gave the chance to reveal possible threats from competitors: the rate of inflation in the country (88,6%); appearance of new competitors (80,0%); change of level of the income of the population (79,6%); increase in mortality of the population (72,3%); change of preferences of the population (72,0%). Respondents carried to the main opportunities of competitiveness of fitness-club: expansion of the range of sports services (80,0%); legislative changes (70,6%); improvement of quality of the provided sports services (62,6%); development of new sport (60,0%).

2. The satisfaction of Kharkov citizens – consumers of recreational services, is revealed by activities of fitness-clubs of the city for 4 indicators. According to 68% of respondents, the price of recreational services corresponds to the offered services and the created conditions. The average level of professionalism of personnel was noted by 72% of respondents. According to Kharkov citizens, assessment of high (32%) and average of levels (55%) is deserved by the comfort created in clubs of the city. However 44% of respondents noted the low level of work of fitness-clubs with consumers of services.

Prospects of further researches consist in the definition of effective marketing strategy of fitness-clubs of Kharkov.



Pic. 1. Consumer assessment of activities of 13 fitness-clubs of Kharkov for providing recreational services in indicators:

1 – price of recreational services; 2 – professionalism of personnel; 3 – comfort in club; 4 – work with consumers of services.

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