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CONTENTS

PERFECTION OF PRIMARY CHILDREN'S SELECTION FOR SPORT GYMNASTIC TRAINING IN KURDISTAN

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Abstract. *Purpose:* to find ways of perfection of primary children's selection for sport gymnastic training in Kurdistan. *Material:* questioning of specialized physical culture HEEs' students in Ukraine and Kurdistan (n=120, n=120). Physical condition and physical qualities of 7 years' age boys of Ukraine and Kurdistan (n=56, n=52) were assessed. *Results:* only 10 Kurdistan students had opportunity to start specialized sport trainings by recommendations of professional coach. Ineffective influence of mass media in involvement of youth in sport trainings was noted. Physical condition level of children corresponds to standards. In most of motor tests Ukrainian children showed better results that their peers from Kurdistan. *Conclusions:* in Ukraine 42% of children join sports practicing owing to parents' wish. In Kurdistan 25% of children join sports practicing by recommendations of physical culture teachers. The next by importance factor is example of peers (21% and 33%). In nine from twelve motor tests Kurdistan children yield to their Ukrainian peers. In 20 meters' run and in shuttle run results of Kurdistan children are better. Confident distinctions were found in quantity of chin ups in lying position.
Key words: physical condition, physical fitness, gymnasts, boys, students, indices, Ukraine, Kurdistan.

Introduction

Reformations in autonomous Kurd republic (Iraq) regards physical education and sports as the most important mean of children's and youth's health strengthening, As involvement of them in healthy life style and creation of conditions for opening embedded by nature child's individual abilities [17, 19, 23, 26]. Leading specialists in physical culture and sports think that selection of children for practicing any kind of sports is a system of organizational-methodic measures of complex character. This system includes pedagogic, social, psychological and medical-biological methods of research. On the base of their application children's bents and abilities for functioning in sports are detected [3, 6, 7, 9, and 10].

In specialized children's sport schools of Ukraine the process of preparation of masters of sports in sport gymnastic takes from five to seven years. High complexity of modern competition programs in sport gymnastic is possible only as result of careful professional selection of trainees. It actualizes demand in studying of problem of children's selection for practicing this kind of sports [8, 18, and 21]. System of sport gymnastic in Kurdistan republic is now at the stage of formation. In our previous works we determined that specialists in physical culture and sports of Kurdistan consider the existing system of children's selection for sport gymnastic practicing in Kurdistan to be ineffective. They also point at absence of common, reliable tests and scientific recommendations on their usage [1, 30].

Specialists in sport gymnastic [4, 5, 22] think that in the process of gymnasts' training it is necessary to control health condition of trainees, consider dynamic of their physical condition indicators, abilities for mastering technique the chosen kind of sports. Primary selection consists of two stages: preliminary and main. This stage determines suitability of novices for sport gymnastic training. At preliminary stage external characteristics of trainees are assessed, their bents and abilities are tested [6, 7].

The problem of national Arabian physical education was elucidated in works of well-known Arabian scientists. They found [2, 15, and 27], that formation of sport training system is influenced by many factors: historical traditions, preaching religion, social and cultural values, demographic characteristics. In this context we shall regard involvement of seven years' age boys in sport gymnastic training in Kurdistan.

Purpose, tasks of the work, material and methods

The purpose of the research: is to find ways of perfection of primary children's selection for sport gymnastic training in Kurdistan.

Hypothesis: studying and implementation of children's selection for sport gymnastic training in Ukraine will facilitate preparation of highly qualified gymnasts in Kurdistan.

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The tasks of the research: 1) to analyze trends in children's and adolescents' involvement in sports practicing in Ukraine and Kurdistan; 2) to conduct comparative analysis of physical condition and motor fitness levels of seven years' age Ukrainian and Kurdistan boys.

Material and methods of research: we carried out questioning of physical culture institute in Koya town (autonomous republic Kurdistan, Iraq) and students of physical culture academy in Kharkov (Ukraine). In total 120 persons from every HEE participated in the questioning. The questioning was used for analyzing of wide spectrum of reasons, which facilitate children's and adolescents' involvement in sports practicing [2, 13, and 25]. The questionnaire offered ready answers, opening of different reasons for starting sport practicing. Uniformity of answers was conditioned by possibility of choosing of only one answer among all. For assessment of confidentiality of answers percent difference (Ukrainian and Kurdistan) we used method of study of parts' significance [11].

Coefficient z was calculated by formula:

$$z = \frac{|v_1 - v_2|}{\sigma},$$

Where v_1, v_2 – percent results of two samples,

$$\sigma = \sqrt{v(1-v)\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}, \quad v = \frac{v_1 n_1 + v_2 n_2}{n_1 + n_2}.$$

Critical values of z: for $p=0.05$ z_{cr}=1.96; for $p=0.01$ z_{cr}=2.58.

For comparative analysis of physical conditions and physical fitness of Ukrainian and Kurdistan boys we tested 56 and 52 boys respectively. With the help of different indices we determined type of body composition. Kettle's index was calculated as relation of child's body mass to square body length (in meters). Erisman's index was calculated as difference of chest circumference and half of height indicator. Brugsh's index was found by calculation of chest circumference relation to body height. The following physical qualities were assessed: strength, quickness, flexibility, dexterity, speed-power abilities, and Ruffle's index [3, 4, 12, and 20].

Results of the research

It was determined that in Ukraine 17% of physical culture academy students started their sport practicing by proposition of coach. In Kurdistan only 8% of physical culture institute students started their sports practicing after proposition of coach. The highest differences between reasons of children's involvement in sports practicing were found in offers of physical culture teachers and parents' wishes ($P<0.01$).

Not high amount (n=10.8%) of physical culture institute (Koya) had opportunity to start specialized sports trainings by recommendations of professional coach. It is explained by the fact that at present system of sports training is in phase of active formation in Kurdistan [1, 29].

Great number of sportsmen started sports practicing by offer of physical culture teacher (25%). It is explained by specific features of children's leisure organization in Kurdistan. For example, in summer vacations (from May 15th to September 15th) all, who wish, can visit centers of children's creativity. In these centers trainings in all kinds of arts are conducted (painting, music, dances and etc.) as well as sports trainings. All lessons are free of charge and 400-500 children visit these centers simultaneously. Sports trainings are conducted by coaches and physical culture teachers [16, 23].

In Ukraine high percentage (42%) of children join sport circles' trainings basing on their wishes and possibilities. It should be noted that in system of children's and adolescents' physical education in Ukraine and Kurdistan too little competitions are conducted (8% and 11%). Mass media also pay little attention to involvement of youth in sports practicing (4% and 8%), (see table1).

Table1. Reasons, which facilitate starting of sports practicing by specialized HEEs students of Ukraine and Kurdistan

№	Variants of answers	Results, % Ukrainian students n=120	Kurdistan students n= 120	Confidentiality Z	P
1.	Offer of coach	17	8	1.95	P>0.05
2.	Offer of physical culture teacher	8	25	**3.46**	**P<0.01**
3.	Parents' wish	42	14	**4.75**	**P<0.01**
4.	Example of peers	21	33	**2.18**	P<0.05
5.	Participation in sport competitions	8	11	0.66	P>0.05
6.	Mass media means (TV, internet and etc.)	4	8	1.33	P>0.05

It is of common knowledge that body sizes and proportions are of substantial prognostic significance and influence on efficiency of sport functioning in different kinds of sports. We analyzed morphological functional characteristics of 7 years' age boys of Ukraine and Kurdistan. Mean values of body mass and body length did not differ confidentially and correspond to international standards of world health protection organization (WHPO) [4, 5, 6, and 14]. However, mean results of Ukrainian boys are higher than indicators of their Kurdistan peers. Less anthropometric indicators of Kurdistan children correspond to requirements of sport gymnastic. Body composition type of children was determined visually and with the help of indices of Kettle, Erisman and Brugsh. It should be noted that by indices of Erisman and Brugsh the received results of Ukrainian and Kurdistan boys yield to standards (see table 2).

Table 2. Morphological functional indicators of 7 years' age Ukrainian and Kurdistan boys

№	Parameters	Results Ukraine, n=56		Kurdistan, n=52		Standards	Student's criterion ($t_{кр}$-2.0)
		$\overline{X}$	V	$\overline{X}$	V		
1	Body mass	26.79	17	24.5	16	20-26.4[2] 21.1-24	0.25
2	Body length, cm	126.03	5	120.0	4	116.4-127.0[3] 117.5-123.5	0.07
3	Chest circumference, cm	62.2	6	60.4	10	59 – 62.5	0.09
4	Kettle's index, kg/ m^2	16.6	11	17.01	12	15.0 – 18.5	0.15
5	Erisman's index, cm	-0.95	10	0.4	13	+2 +4	0.12
6	Index of Brugsh,%	49	9	50.3	10	53-63	0.06

Testing of boys' physical fitness was conducted in compliance with normative on general physical fitness of primary (first-second years) training by academic program for children's sport schools of Ukraine [12, 24].

By mean values of pressing ups in lying position Kurdistan boys yield to their Ukrainian peers (6 times and 5 times). In this test the highest variation coefficients were 96% and 93%, minimal quantity – 1 time and maximal – 23 times. However, mean indicators of hanging on bent arms were high in both groups and exceed normative (12.4 sec. and 12.6 sec.). Ten Kurdistan boys could not fulfill chin ups in lying position. Mean result of this test of Ukrainian children was 10 times. It corresponds to normative. This test was difficult for the tested in respect to coordination (V – 92%; V – 55%), (see table 3).

[2] WHOP standards
[3] WHOP standards

Table 3. Physical fitness level of 7 years' age boys from Ukraine and Kurdistan

№	Parameters	Results Ukraine, n=56		Kurdistan, n=52		Normative	Student's criterion ($t_{кр}$-2,0)
		$\overline{X}$	V	$\overline{X}$	V		
1	Pressing ups in lying position, times	6.5	96	5.4	93	7-15	0.78
2	Hanging on bent arms, sec.	12.4	52	12.6	54	9-11	0.23
3	Chin ups in lying position, times	10.2	55	2.0	92	8-16	**2.15**
4	Torso rising in sitting position during 1 minute, times	24.0	20	16.05	36	22-30	1.03
5	Long jump from the spot, cm	121.0	14	103.56	18	100-110	0.27
6	High jump from the spot, cm	18.2	43	17.27	37	22-30	0.23
7	20 meters' run, sec.	5.5	8	5.33	34	4,6-4,3	0.06
8	Shuttle run 4X9 m, sec.	15.6	10	14.14	26	14,8-13,6	0.37
9	Legs' rising up to 90˚ angle in hanging position, times	9.2	73	8.81	60	3-6	0.49
10	Forward bending in sitting position, cm	3.5	42	3.3	79	1-4	0.79
11	Bridge, points	3.6	13	3.2	17	4-5	0.19
12	Ruffiet's index, conv. un.	12.5	18	11.75	19	6-16	0.05

In fulfillment of torso rising in sitting position during one minute Kurdistan boys showed mean result 16 times (below average). Long jump from the spot was executed by both groups of children at rather high level (121 cm and 103.56 cm). In high jump from the spot the results were below normative. When fulfilling this test children faced coordination difficulties. Kurdistan children fulfilled shuttle run better than their Ukrainian peers (14.14 sec. and 15.6 sec.). In test for flexibility Kurdistan boys showed results a little lower that Ukrainian. Cardio-vascular system was tested with Ruffiet's test. The received mean values of Ruffiet's index (12.5 conv.un. and 11.75 conv.un.) correspond to standard for this age. Individual results of children were in the range from 7.2 conv.un. to 15.2 conv.un. They also correspond to standard.

Thus, morphological-functional characteristics of seven years' age Kurdistan and Ukrainian boys do not differ substantially. Mean height-weight indicators of Kurdistan children were a little less but it is more suitable for sport gymnastic. Indices of children's physical condition (indices of Brugsh and Erisman) were lower than standard. Cardio vascular system's condition by Ruffiet's index also was normal. In nine from twelve motor tests Kurdistan boys yield to their Ukrainian peers. In shuttle run and in 20 meters' run results of Kurdistan children were better.

We registered some better mean motor tests' results of Ukrainian children. It would be correct to think that children of both tested groups do not differ significantly by physical condition and motor fitness (t gr.-2.0; $P>0.05$). Only in one test (chin ups in lying position differences were confident: t -2.15; $P<0.05$.

Discussion

The received results confirm literature data about influence of certain social organization on system of sport trainings and sport selection [1, 7, 8]. Abdulvahid D.N. [2], Ahmad M. K [22] point at common character of physical culture laws' functioning in different countries.

Results of questioning, conducted by us, confirm validity of studying of common mechanisms of youth's involvement in healthy life style through sports' practicing. In further works we shall consider Kurdistan family traditions and demographic characteristics [26, 27].

Our work confirms the data of Tair R.X. M.M. [26] and Xabdul Salam M.M [30] about physical condition of Kurdistan children in respect to normative, worked out for sport gymnastic departments of Ukrainian children sport school [13]. Results of the research permitted to speak about absence of confident distinctions in physical condition and physical fitness of Ukrainian and Kurdistan 7 years' age boys. It gives ground for further application of Ukrainian system of children's primary selection for sport gymnastic in Kurdistan.

Conclusions

1. The highest quantity of Ukrainian children (42%) starts sports practicing owing to parents' wish. In Kurdistan the highest quantity of children (25%) starts sports practicing by recommendation of physical culture teachers. Second by significance for Ukrainian and Kurdistan children was peers' example (21% and 33%).

2. Mean indicators of Ukrainian and Kurdistan 7 years' age boys' physical condition correspond to standard. There were no confident differences by anthropometric data between the tested groups of children.

3. In tests for motor fitness seven years' age Ukrainian and Kurdistan boys showed the following results: pressing ups in lying position – 6 times and 5 times; hanging on bent arms – 12 sec.; chin ups in lying position – 10 times and 2 times; torso rising in sitting position during 1 minute – 24 times and 16 times; long jump from the spot - 121 cm and 103 cm; 20 meter' run – 5 sec.; shuttle run – 16 sec. and 14 sec.; legs' rising in hanging position – 9 times; Forward bending in sitting position – 3 cm; gymnastic bridge – 3 points.

Both tested groups do not confidently differ by indicators of tests for motor fitness. Exclusion was quantity of chin ups in lying position: t -2.15; $P<0.05$.

The prospects of further researches imply perfection of children's primary selection process for sport gymnastic practicing in Kurdistan at the account of existing Ukrainian methodic of sport selection.

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Conflict of interests

The author declares that there is no conflict of interests.

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CHANGE OF BODY COMPOSITION IN PROCESS OF POWER CONDITIONAL TRAINING

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Abstract. *Purpose:* to work out recommendations on choosing of exercises for power conditional trainees, considering decrease of fat mass percentage as the purpose. *Methods:* analysis of changes of body composition of trainees, practicing different kinds of conditional power training. *Results:* the data about influence of different physical loads on thickness of subcutaneous fat in different parts of body have been generalized. Recommendations on choosing of exercises for power conditional trainees for body composition improving have been presented. It was found that fat loss occurs quicker in upper part of body (subcutaneous and visceral). This is observed with increasing of motor functioning and reducing calories of eating. When training any separate muscular group changes of subcutaneous fat take place not compulsory in body parts, in which the trained group is located. *Conclusions:* it is purposeful to mainly use basic (multi-joint) exercises in power conditional training.
Key words: strength, training, composition, conditional, body, eating, weight.

Introduction

Popularity of conditional training with application of power exercises is constantly growing; its arsenal of means and methods increases. In structure of different age contingents' motivation the factor of figure improvement (change of body composition, reduction of fat mass, increase of muscular mass) constantly takes the second place after factor "health" [1, 4, 6].

For significant part of trainees the purpose of training is "removal of fat from problem zones". Until recent time the principle of fitness theory that it is impossible to remove subcutaneous fat selectively, fulfilling exercises for separate parts of body had been considered generally accepted [5, 7]. In some researches, devoted to influence of local specific exercises on composition of all body and separate its parts tissues scientists received contradictory results. Some researchers think that exercise can result in local mobilization of subcutaneous fat [2, 13, 17]. In other experiments no changes were found [9, 10, 15]. Contradictions in results can be conditioned by methodology, used in the mentioned researches.

Thus, absence of single opinion on one of key question of fitness theory conditioned our choice of the subject of the research.

Purpose, tasks of the work, material and methods

The purpose of the research is to work out recommendations on choosing exercise and main load parameters for power conditional trainees for them to reduce percentage of body fat mass.

Results of the research

Fulfillment of physical exercises (aerobic of power orientation) can result in differentiated loss of fat tissue in different body parts. Some researches showed that with physical load fat loss is higher in abdomen [15] or on arms [16] in comparison with tight zone. It witnesses about possibility of fat reserves' usage in different body ports under physical load. Alongside with it, the question about possibility of local physical exercises' influence on fat tissue in corresponding body parts is still open for discussion.

Some researches indirectly refute fat spot reduction. It is illustrated by examples with tennis players. Tennis players have different loads on right and left arms owing to specificity of this kind of sports. Researchers measured circumferential sizes and subcutaneous fat thickness in zone of shoulder and forearm. They did not find statistically significant differences between left and right arms [9].

In the research by Krotkiewski et al. [11] it was described that ten women without any health problems fulfilled exercises for one leg. It resulted in significant increment of muscular mass in the trained leg. In other leg increment of muscular mass was much less. Thickness of subcutaneous fat (SF) reduced. In trained leg thickness of muscles increased. In not trained leg thickness of subcutaneous fat (SF) did not change. For checking up of the received data two biopsies of muscles at each thigh was made. The researchers registered insignificant reduction of fat cells' mass (–7% from 0.6 ± 0,07 mkg to 0.56 ± 0.05 mkg) and (–26% from 0.42 6 ± 0,07 mkg to 0.31 6 ± 0.08 mkg) in trained

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leg. They also registered increase (+ 11% from 0.54 ± 0.03 mkg to 0.60 ± 0.03 mkg) and (+ 7% from 0.46 ± 0.08 mkg to 0.49 ± 0.08 mkg) in not trained leg. Reduction of subcutaneous fat thickness was conditioned by geometric factors (pressure of increased muscles, which are under it). The conclusion of the researchers: correlation of muscular and fat components of human thigh to large extent depends on thigh muscles' functioning. Local power exercises can hardly be used for spot reduction of fat reserves above trained muscle [11]. Bente Stallknecht et al. [20] notes possibility of speculations with conclusions and statistic error in processing of biopsy data. Besides, we can not understand reasons of insignificant increase of fat cells' mass with unchanged thickness of SF in not trained leg. It is quite probable that all measures were conducted just after load and reflect to large extent urgent training effect. Such changes are manifestations of long adaptation. It would be logical to assume that lipolysis increase in SF under load can result in super compensation of fat content in recreation period.

It should also be noted that from practical point of view the final result (reduction of SF thickness) is of great significance, but not the reasons of its reductions. Alongside with it, we can assume that geometric factors resulted in reduction of SF on thighs.

The research by Stallknecht B. et al. is also interesting. Ten healthy men fulfilled leg unbending at 25% of maximal load (Wmax) during 30 minutes. Between exercises the men had 30 minutes' restв течение. Then they fulfilled 55% Wmax during 120 minutes by other leg. After it they fulfilled 85% Wmax during 30 minutes again by first leg and again had 30 minutes' rest. Blood circulation in thigh SF was assessed by Xe133 blurring (radio-active marker). Lipolysis was calculated by interstitial and arterial concentration of glycerin and blood circulation velocity. In all cases blood circulation and lipolysis were higher in SF adhering working muscle. Thus, specific exercises can cause spot lipolysis in fat tissue [20].

Lipolysis is a process of fat splitting into fat acids under impact of lipase. This term is used for disruption of bio-chemical process at cell level. It should be noted that increase of lipolysis under load in certain parts of SF does not prevent from but stimulates its deposit in recreation period.

Fat burning is not defined as concept in literature and other sources. That is why we offer the following definition (coming from context, in which it is used the most often): fat burning is a process of relatively stable in time reduction of fat tissue's mass and volume. In such meaning fat burning can be registered only in the course of durable experiment and only by final result of it. Term "spot reduction" relates to local loss of fat, resulted from impact of physical exercises on certain body parts [10].

In the researches by Ramírez-Campillo et al.[18]they studied influence of exercises for local muscular endurance training on general and regional body composition (correlation of fat, muscular and bone tissues). Seven men and four women (of 23 ± 1years' age) trained stronger leg during 12 weeks with 3 trainings every week. Every training consisted of one attempt (960-1200 repetitions – legs' pressing) with load 10–30% from maximal weight (single maximum). Before and after experiment body mass, bone mass, mineral density of bone tissue, muscular mass, and fat were registered in percents. Energy value of diet was registered with the help of questionnaire of eating. Al level of the whole body, body and bone masses, mineral density of bones, muscular mass and body fat percentage did not change. Nevertheless, body fat mass reduced by 5.1% (before experiment: 13.5 ± 6.3 kg, after experiment 12.8 ± 5.4 kg, $p<0.05$), percentage of body fat reduced by 0.9 (from 21.74 ± 10.7 to 20.88 ± 9.1). Substantial changes of body, muscular and fat masses were not observed. Confident ($p<0.05$) reduction of fat mass was registered in upper limbs and torso (10.2 and 6.9%, accordingly, $p<0.05$). Reduction of fat mass in upper limbs and torso was much higher ($p<0.05$), than in both legs. No substantial changes were registered in energy taking from food before and after experiment (2646 ± 444 kcal per day and 2677 ± 617 kcal per day accordingly). So the program was effective for reduction of fat mass. But this reduction was not localized in the trained part of body [18].

In the research by Singh Prachi et al. [19] 23tested (15 men and 8 women of age 30 ± 6 years) with normal body mass (BMI 23.6 ± 3.9) gained 3.1 ± 2.1 kg of fat during 8 weeks. In the next 8 weeks they lost 2.4 ± 1.7 kg of fat due to correction of calorie value of eating. SF and visceral fat increment in upper part of body were completely removed after 8 weeks of hypo calorific eating. SF in lower body parts did not return to initial values. It was found that in lower body parts increase of adipocytes' quantity in first 8 weeks of hyper calorific eating was not removed. SF adipocytes in upper body parts and visceral fat turned to initial sizes and quantity.

Discussion

In most of researches isolated exercises were used, effectiveness of which were lower than of basic or structural ones [8, 14]. Choice of exercises was conditioned by the tasks of the research and corresponded to the chosen tactic. Impossibility to get rid of subcutaneous fat locally can be explained by two reasons:

1. Contribution of fat oxidation to muscles functioning energy supply is extremely little [3, 12]. Actually only main metabolism can be supplied by fat oxidation [12].
2. Lipolysis increase [20] is only initial link of fat utilization as source of energy. More durable and energetically effective fat oxidation in Krebs's cycle has not been researched.

Our research confirms recommendations of NSCA, ACSM about purposefulness of prevailing usage of basic (multi-joint) exercises in power conditional training.

Conclusions

When training any muscular group SF changes do not take place compulsory in body parts, which are located near trained muscles. Experimental researches of recent years refute possibility of SF thickness spot reduction in trained parts of body. Higher fat mass reduction in upper limbs and torso in comparison with lower limbs [16] are explained by researches of Singh Prachi et al. [19]. This phenomenon shall be considered when programming trainings. Especially it is important for those, who train the so-called A-like figure.

Strengthening of blood circulation and lipolysis in SF (adherent to working muscle) [17] may be make purposeful exercises of local character before durable aerobic loads. But this hypothesis requires experimental approval.

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Conflict of interests

The author declares that there is no conflict of interests.

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CHARACTERISTIC OF PEDAGOGIC TECHNIQUES OF PERSISTENCE NURTURE IN SPORTSMEN WITH DEFECTS OF MENTAL FUNCTIONING IN PROCESS OF EMOTIONAL-WILL TRAINING

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Abstract. *Purpose:* to characterize pedagogic techniques of persistence nurture of sportsmen with defects of mental functioning in process of emotional-will training and test their effectiveness. *Material:* 11 swimmers (functional class S–14) with defects of mental development (light form of mental deficiency) were involved in the research. Ability for persistence was diagnosed in test 4×50 meters by free style. *Results:* in sportsmen with defects of mental functioning persistence is restricted by degree of supreme psychic functions' affections and depend on combination of psychological-pedagogic factors of influence. We characterized specific features of adapted pedagogic techniques for persistence nurture in such sportsmen. It was found that one of conditions of high sport results' achievement was maximal manifestation of willpower by sportsman. *Conclusions:* persons with mental deficiency are characterized by inability for regulation of own behavior. It proves that it is necessary to apply correctly directed methods, means and pedagogic techniques in process of emotional-will training of the sportsmen. Effectiveness of the offered pedagogic techniques was proved by test 4×50 meters (free style) ($p<0.05$).
Key words: willpower, persistence, swimmers, mental deficiency.

Introduction

Numerous researches in field of theory and methodic of physical education and sport training [11, 14–16, 19] point that necessary condition for high sport results' achievement is many years' continuous and persistent training. It requires sportsman's maximal manifestation of willpower. Scientists proved that willpower is closely connected with mental and emotional processes and is a single unit with them [1, 18, and 22]. Emotional-will training of sportsmen is one of components of general psychic training, which is realized in process of training and competition functioning [7, 20, 23].

However, planning of emotional-will training of swimmers with mental deficiency and persistence nurture shall be realized with consideration of peculiarities of their psychic development (low ability for will regulation of own behavior, dependence on situation and own affectivity, inability to overcome obstacles and to resist the least temptation, resulted from weakness of will, insufficient initiative, suggestiveness, social motives) [2, 4–5]. Training and competition functioning of sportsmen with defects of mental development is restricted by degree of supreme psychic functions' affections. It depends on combination of psychological-pedagogic and social factors of influence; on correcting training and education orientation [3, 6, 8, and 13]. Methods, means and techniques of emotional-will training of healthy sportsmen can not be applied in unchanged form for training of sportsmen with mental deficiency [2, 9, and 24]. That is why we think that it is necessary to determine peculiarities of application of persistence training pedagogic techniques for sportsmen with defects of mental development, considering level of their psycho-physical condition.

Purpose, tasks of the work, material and methods

The purpose of the research is to characterize pedagogic techniques of persistence nurture of sportsmen with defects of mental functioning in process of emotional-will training and test their effectiveness.

The methods of the research: theoretical analysis and generalization of literature data; pedagogic experiment; pedagogic observation and testing (test with repeated loads (test 4×50 m); methods of mathematical statistic (Student's t – criterion for small sample).

11 swimmers (functional class S–14) with defects of mental development (light form of mental deficiency) were involved in the research. Qualification level of participants: 1 candidate master of sports, 4 swimmers of 1st sport degree, 6 swimmers with 2nd sport degree. The research was conducted on bases of Poltava, Kirovograd, Mykolayiv rehabilitation-sports schools for disabled, during swimming trainings.

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Results of the researches

Persistence is one of main willpower of a sportsman and is characterized by continuous and active strive for set target, by overcoming of difficulties and temporary failures [7, 14]. At competitions his quality results in high efficiency and workability in conditions of progressing fatigue and connected with it physiological changes in organism. Persistence nurture envisages regular training, patient and multiple repetitions of monotonous exercises [1, 22].

Considering deficiency of supreme psychic functions of swimmers with defects of mental development, social underdevelopment of their personalities, we think to be purposeful to offer a number of pedagogic techniques. They can be regarded as traditional for training of healthy sportsmen. They also can be regarded as special, correctly directed for persistence nurture of sportsmen with defects of mental functioning (see fig.1.).

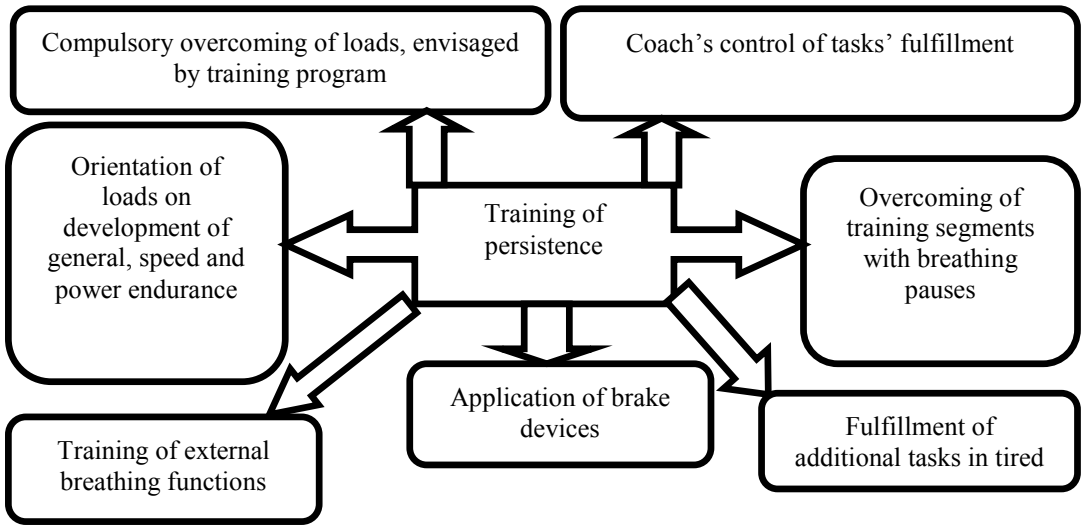

Fig.1. Pedagogic techniques of persistence training

Let us regard more specifically the presented pedagogic techniques for persistence nurture in sportsmen with defects of mental development.

In particular it is necessary to consider low ability of such sportsmen for willpower mobilization. It means difficulty of *compulsory overcoming of training loads.* Such requirements are rather difficult for these sportsmen. Sometimes, such requirements can become nearly unrealistic without special stimulation and motivation of sportsmen.

Compulsory condition of pedagogic control over training process is *coach's control of fulfillment of training tasks* [17]. It should be noted that in process of educational measures' realization coach always orient on formation of sportsmen's abilities for self-control. However, in our case we should considered sportsmen's low ability for concentration and distribution of attention as well as their insufficient understanding of tasks, In work with sportsmen of such nosology systemic control from the side of coach is especially important.

Considering proved effectiveness of application of reference signals we considered to be purposeful:

In work with swimmers, who have defects of mental functioning to use the offered by the author [3] methodic technique of control and operative correction of swimming process. This technique depends on intensity of work and requirements of definite training. This methodic technique ensures:

1) "attraction" of swimmers' attention to control over swimming technique or intensity of training segment's overcoming;

2) Current correction of technical mistakes in fulfillment of training task;

3) Positive stimulation of persistence. Its aim is support of its conscious manifestation, which can be transformed in strive for fulfillment of training task in compliance with received instruction;

4) In case if there is no signs of persistence reference sensor signals are usedy. They shall point at negative coach's assessment of training task' fulfillment by sportsman.

As per the data of O. V. Talitskaya [10] adolescents with mental defects have not rhythmic shallow breathing, inability to control breathing and coordinate it with movements. It forced us to include *special breathing exercises* in content of training. Fulfillment of breathing exercises on land and in water facilitates formation of swimmers' ability to arbitrarily stop breathing, control duration of inhale and exhale, to rationally combine phases of breathing cycle with movements.

For healthy swimmers application of great quantity of breathing exercises is not purposeful. However, for swimmers with mental defects we used breathing exercises, recommended by O. Ye. Talitskaya [10]. Such exercises are fulfilled in warming up on land: deep slow breathing through nostrils; deep inhale and long exhale; imitation of candle's extinguishing (exhale through rolled in pipe lips); blowing off of dandelion; sniffing of flower.

Breathing exercises included the following exercises: to get water in palms and make deep inhale; then blow off water from palms; make inhale, blow at water (like on hot tea); blowing on water and by it move ping pong ball; exhale in water, gradually putting lips and face in water, then dip head in water; make 5 exhales in water near board; gradually increase quantity of exhales in water up to 10 times; breathing exercises by pairs. Fulfillment of such exercises also requires persistence from sportsmen. It facilitates ability for control over vegetative functions in combination with rational motor functioning. Application of play method in process of fulfillment of such exercises facilitated emotional coloring, increase of interest. All these in general ensured creation of favorable conditions for persistence manifestation.

Execution of most of training tasks (except tasks for quickness and explosive power) was connected with demand *in overcoming of fatigue with the help of will power mobilization.* Modern system of swimmers' training envisages domination of tasks for training of special aerobic endurance –loads great by scope and moderate by intensity. We used the data of interviewing and questioning of coaches of swimmers with mental defects. Besides, we considered results of own psychological-pedagogic observations. It permitted to find ability of sportsmen with mental deficiency for effective fulfillment of training tasks for aerobic endurance against the background of progressing fatigue: distortion of rational structure of movements; reduction of tasks' intensity, including complete refusal of further work; substantial reduction or complete loss of ability for concentration of attention; domination of inhibition processes in central nervous system (CNS). In some cases we found absence of typical reactions to most of irritators (visual, sound and tactile). It proves that fulfillment of additional tasks against the background of fatigue is an important and necessary mean of formation of willpower mobilization ability as well as development of sportsmen's with mental deficiency persistence. However, they require clear definition of admissible fatigue border for such sportsmen. This border is always lower than for healthy peers. It can ensure prevention from possible CNS disorders, which can appear as a result of high bent to exhaustion of cortex processes.

Fulfillment of training tasks for retention of breathing conditions appearance of oxygen debt. It is accompanied by subjective negative feelings, connected with hypoxia. Fulfillment of work in hypoxia conditions requires sportsmen's manifestation of willpower. Application of such training tasks was in conditions of strict control over sportsmen's psychic and functional state. First attempts envisaged passing minimal segments with retention of breathing (3–4x12–15 meters). Increase of quantity of repetitions and length of segment (for hypoxia training) was realized only after sportsman organism's adaptation to earlier loads.

Application of brake devices envisaged fulfillment of tasks of different duration and intensity – from moderate to sub-maximal. Training tasks in conditions of increased resistance influence on development of power endurance and speed-power qualities. They pre-condition demand in manifestation of persistence for successful fulfillment of tasks in complicated conditions. Such tasks also stipulate increased control of movements' rational structure in compliance with technique of definite swimming style. Endurance is the back side of fatigue. Its development is ensured only in conditions of conscious overcoming of fatigue with mobilized willpower. Orientation of training tasks on training of general, speed and power endurance (if fulfilled properly) ensures gradual formation of sportsmen's ability for volitional regulation of functioning and manifestation of persistence. In trainings we paid attention to swimming technique: rational structure of movements; rhythm; correspondence of time for maximal muscular efforts in phase of push off; we assessed ability for concentration of attention and external signs of emotions.

Alongside withy it, cultivation of swimmers' persistence was achieved by usage of the following sport training methods: visual (coach shows exercises), verbal (coach's orders and instructions) and practical (continuous method

in conditions of uniform, progressing, regressing and variable work, method of exercise with interval with application of rigid rest), methods of motivation and methods of assessment.

Effectiveness of the offered pedagogic techniques was proved by statistically confident ($p<0.05$; $t_{temp}=7.0$; $t_{cr.}=2.45$) changes of level of swimmers' ability for willpower manifestation. It was found by results of specific training exercises' execution with rather high intensity and efficiency in conditions of progressing fatigue (test 4×50 m, free style). (fig.2).

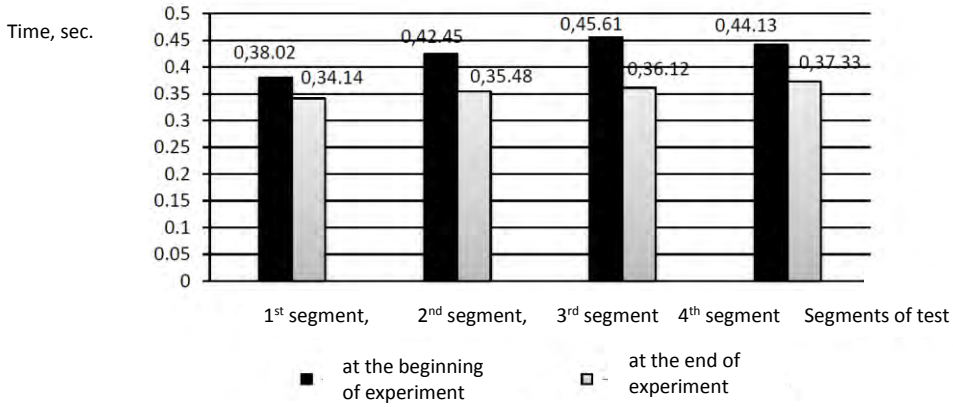

Fig.2. Dynamic of stabilization of results of segments' swimming in test 4×50 meters

The procedure of this test shall be worked out on the base of the following principles:

- Loads shall be specific not only for this kind of sports (but for definite kind of exercise – distance);
- Loads shall be fulfilled with maximal intensity;
- Lads shall be fulfilled repeatedly with optimal by duration rest intervals and quantity of repetitions.

So, relative stabilization of presented results points at increase of persistence level's manifestation in fulfillment of highly intensive exercises in conditions of progressing fatigue with the help of test 4×50 m, free style. It will influence on competition results. вільним стилем.

Discussion

The conducted researches confirm opinion of authors7, 12, 14–16], that intensity of willpower is connected with degree of obstacles' complexity and with significance of actions as well as with attitude to actions and forcing strength of motives. V.A. Ivannikov [7], Frank Halisch, Julius Kuhl [14] point at direct interconnection between willpower manifestation and level of will power: the more stable willpower manifestation are , the higher is will power (in typical situations, requiring willpower: fatigue, overcoming physiologically conditioned difficulties, mental functioning if obstacles are present).

In process of pedagogic observation over trainings of sportsmen with mental defects we received data, which supplement scientific information [5, 13, 17, 24] about low sportsmen's understanding of motives and aims of sport activity. This fact undoubtedly influences on persistence in fulfillment of training tasks. Indicators of test segments' swimming 4×50 m at the beginning of experiment confirmed inability of swimmers with mental deficiency for mobilization of willpower for effective fulfillment of training task in conditions of progressing fatigue.

Unfortunately, in Ukraine in contrast to other countries the quantity of swimmers with defects of mental development constantly decreases. The offered pedagogic techniques of persistence nurture can be modified and used in process of this nosology sportsmen's emotional-will training in other kinds of sports (i.e. light athletic).

Conclusions

1. One of conditions of high sport results' achievement is maximal manifestation of will power. Volitional activity of sportsmen is conditioned by specificity of kind of sports and determined by peculiar symptoms' complex of multilevel individual features of personality. Persons with mental deficiency are characterized by inability for regulation of own behavior. This fact proves demand in application of correctly oriented methods, means and pedagogic techniques in emotional-will training of such sportsmen.

2. In training of persistence of swimmers with mental deficiency we offered to use the following adapted pedagogic techniques: compulsory overcoming of loads, envisaged by training program; coach's control over tasks' fulfillment; passing of training segments with retention of breathing; training of external breathing functions; application of braking devices; fulfillment of additional tasks in tired state. Effectiveness of the offered pedagogic techniques has been proved by test 4×50 m, free style ($p<0.05$).

In the future we plan to continue studying of problem of psychological training of sportsmen with defects of psycho-physical development.

Conflict of interests

The author declares that there is no conflict of interests.

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PHYSICAL FUNCTIONING AND LIFE STYLE OF 50-65 YEARS' AGE HEE TEACHERS

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Abstract. *Purpose:* to study life style of 50-65 years' age university teachers depending on their physical functioning and its connection with behavior habits. *Material:* questioning of 150 respondents was fulfilled by specially prepared questionnaire. Anthropometric testing was conducted. *Results:* it was found that most of the questioned spend time watching TV or reading and pay very little attention to physical functioning. We also found that most of respondents deal with household chores but want to do something outdoors (practice public activity). There is a trend to avoid smoking among them. Only 5.0% are cigarette smokers. The rest have never smoked or gave up smoking more than 10 years ago. Among the partners of the questioned there are a lot of smokers (16.2%). Most of the questioned have friends and relatives, who can help to achieve the highest level of physical functioning. 18.9% of partners of the questioned regularly practice sports. Some useful for health habits are observed in life situations of all respondents. *Conclusions:* the received data witness about purposefulness of seeking of effective ways of pre retirement age HEE teachers' involvement in active recreational functioning. We have also found that there are time reserves for this purpose.

Key words: teacher, age groups, physical functioning, healthy life style.

Introduction

Teachers of elderly age are of especial interest for specialists in the field of physical recreation. They are the most experienced part of teachers' staff at HEEs. Unfortunately their somatic health is rather poor. The level of their recreational functioning is influenced by their life style. Healthy life style is one of components of physical recreation of different age people and depends on life style.

As per the data of different authors healthy life style (HLS) significantly influences on life span of different age people [1, 2, 5, 19, 20, and 24]. It can be described as certain compromise between choice, conditions and opportunities. It is general philosophy of life; attitudes and behavior, which concern separate persons and population in the whole. Main element of HLS is behavior directed on ensuring of high life quality. HLS main elements can be determined through kinds of functioning, which directly or indirectly influence on human health or mind [8, 13, 21, 22, and 24]. Such element of behavior can be leading ones for health. In such case they can be described (like life style) as those, which facilitate health. Or like those, which do harm for health. In this case they are called negative or dangerous for health [7, 9, and 15].

Behavior habits, facilitating health, can become negative, if we stop to observe them. An on the contrary, resistance to harmful habits means favorable for health behavior. Favorable for health life style is necessary for its improvement. It shall be concentrated on positive habits and avoiding of harmful actions [5, 9, and 10]. Not observing of HLS increase risk of diseases, nowadays intrinsic to all civilization and described as "diseases by choice" [8, 9].

It has been proved that for prophylaxis of such diseases influence of positive for health behavior, in combination with reduction of harmful habits, is very important [7, 11, 13, and 23]. Numerous researches showed that risk of death from angina reduces by 65% in case of increased physical functioning with simultaneous giving up smoking. Giving up smoking is an important factor in prophylaxis of diseases, caused by civilization. The same concerns alcohol. Negative influence of alcohol (as toxic substance) is manifested in ruining of most of organism's organs and systems. Besides, addiction renders devastating influence on person's social portrait [3, 10].

Thus, in modern (holistic) paradigm of health life style plays quite important role [6, 12]. Connection between life style and health is undoubted. It is necessary to more propagate useful habits, influencing on health positively. It should be underlined that physical functioning, combined with correct eating is an important component of HLS [2, 8, 14, 15]. Choosing certain habits and behavior people choose their own life: good, healthy, full of achievements and realized dreams or "unforgivable disability" [1, 16, 24].

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Purpose, tasks of the work, material and methods

The purpose of the work is to study life style of 50-65 years' age university teachers depending on their physical functioning and its connection with behavior habits.

The methods and organization of the research: for questioning of 150 respondents we worked out special questionnaire. We also conducted anthropometric testing, by results of which we calculated body mass index (BVI) for every gender-age group. All results were processed by methods of parametric statistic.

Results of the research

Among 150 teachers of 50-65 years' age there were 62.0% of women and 48.0% of men (see table 1). Women's mean age was 62.1 years and of men – 61.2 years. As on the moment of questioning women received pensions, in average, for 5.6 years and men – for 2.5 years. The data of body lengths and body masses are given in table 2. For women BVI was 26.4 that points at excess of weight. With it, with age these values have trend to increasing. BVI of men showed correct body weight.

Table 1. Mean age and time of being retired depending on respondents' sex.

Indicator	Sex	$\overline{X}$ ±S_x	Cv,%
Age	Women	62,2±2,34	7,3
	men	61,3±2,25	5,4
Period of being retired	women	5,5±0,33	4,8
	men	2,5±0,11	8,5

Table 2. Anthropometric indicators and body mass indices, depending on sex of respondents

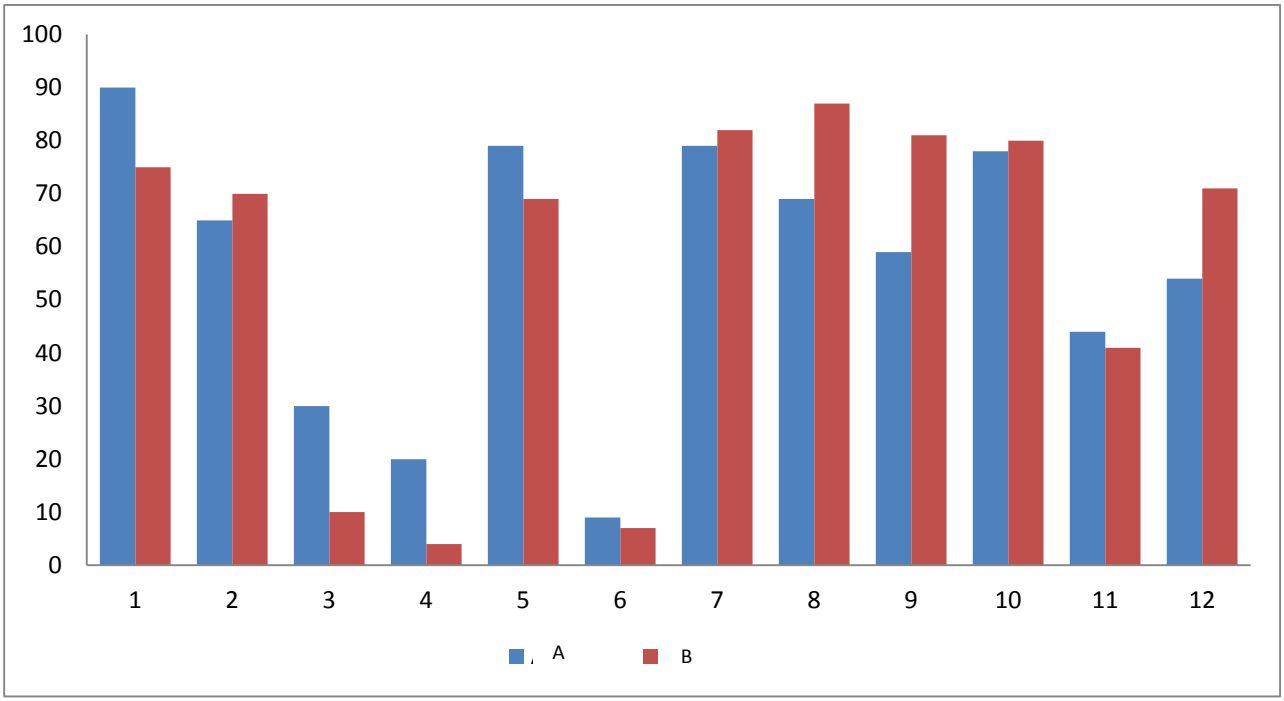
Indicator	Sex	$\overline{X}$ ±S_x	Cv,%
Body mass, kg	women	79,2±2,44	7,1
	men	91,3±3,01	8,4
Body length, cm	women	159,9±4,33	9,3
	men	173,7±4,15	5,8
BVI	women	39,2±0,47	5,3
	men	29,9±2,11	6,5

Table 3. Marital status of respondents, depending on sex

Indicator	Sex	n	%	Cv,%
Married	women	15	9,9	8,4
	men	24	16,5	5,9
Widowers	women	6	4,1	10,4
	men	2	1,4	1,5
Divorced	women	21	14,2	5,2
	men	27	17,8	7,2
Live separately	women	11	8,7	5,7
	men	26	18,1	5,7
Single	women	11	8,7	7,4
	men	6	4,1	3,4

Among other characteristics we took in consideration marital status, details of which are given in table 3. Questioning results show that 60% of women were married. Indicator of women-widows was 16.2% that was connected with longer life span of women. Among men 62.5% were married and 37.5% - single.

%



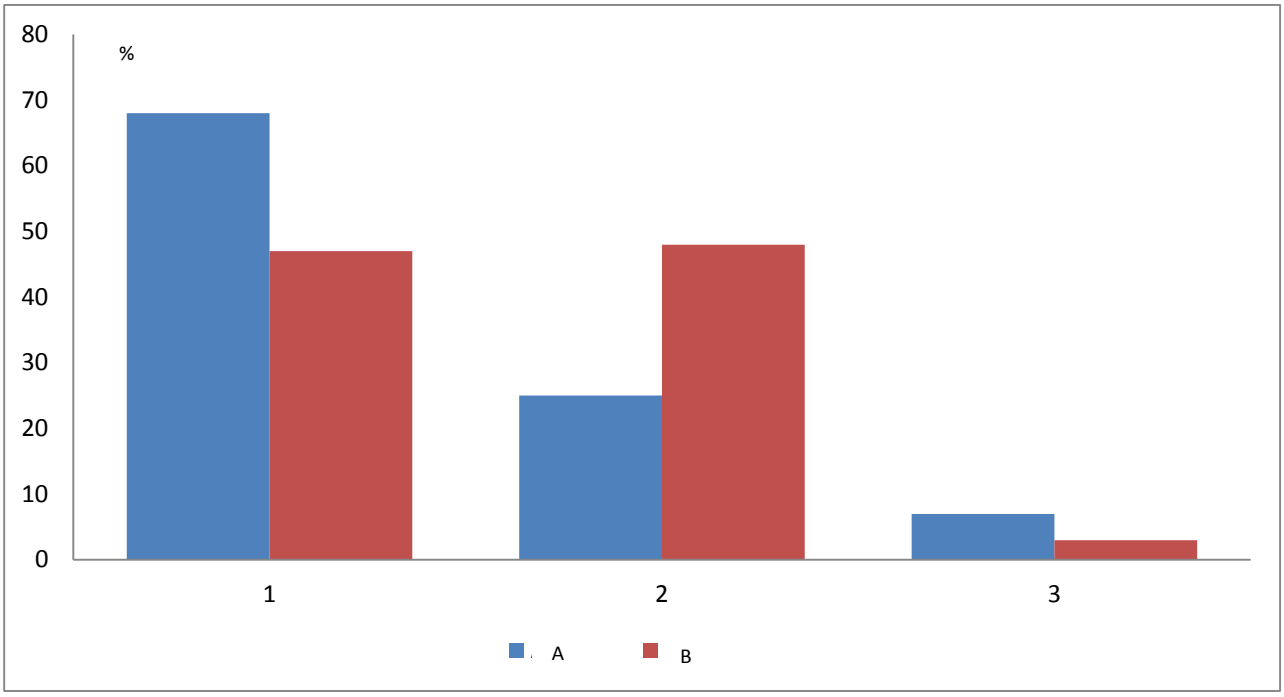
A – women; B – men.

Fig.1. Aims, which respondents of 50-65 years old want to achieve in free time: 1 – rest to forgive about problems; 2 – communication with other people; 3 – entertainment; 4 – earning money; 5 – outdoor walks; 6 – competitions, victories; 7 – feeling of independence; 8 –moral self-feeling; 9 – better physical self-feeling; 10 – physical exercises; 11 – learning of new; 12 – better appearance, control of weight.

The first question was about aim, which the questioned wanted to achieve in heir free time (see fig.1). For women the aim was to relax and forget about problems (90%). The aim to feel independence and general health improvement also take high positions (80%). For 75% of women third place was taken by better physical and mental self-feeling. For most of women competitions and entertainment were not important at all. For 90% of men the most important was mental self-feeling. However we noticed some discrepancies in men's and women's aims. Some aims were not important for women. However the most unimportant aims were the same in both groups while the most important – different. For all groups the most important aims were: feeling of independence (83.8%) and better physical and mental self-feeling (respectively 75% and 83,8%).

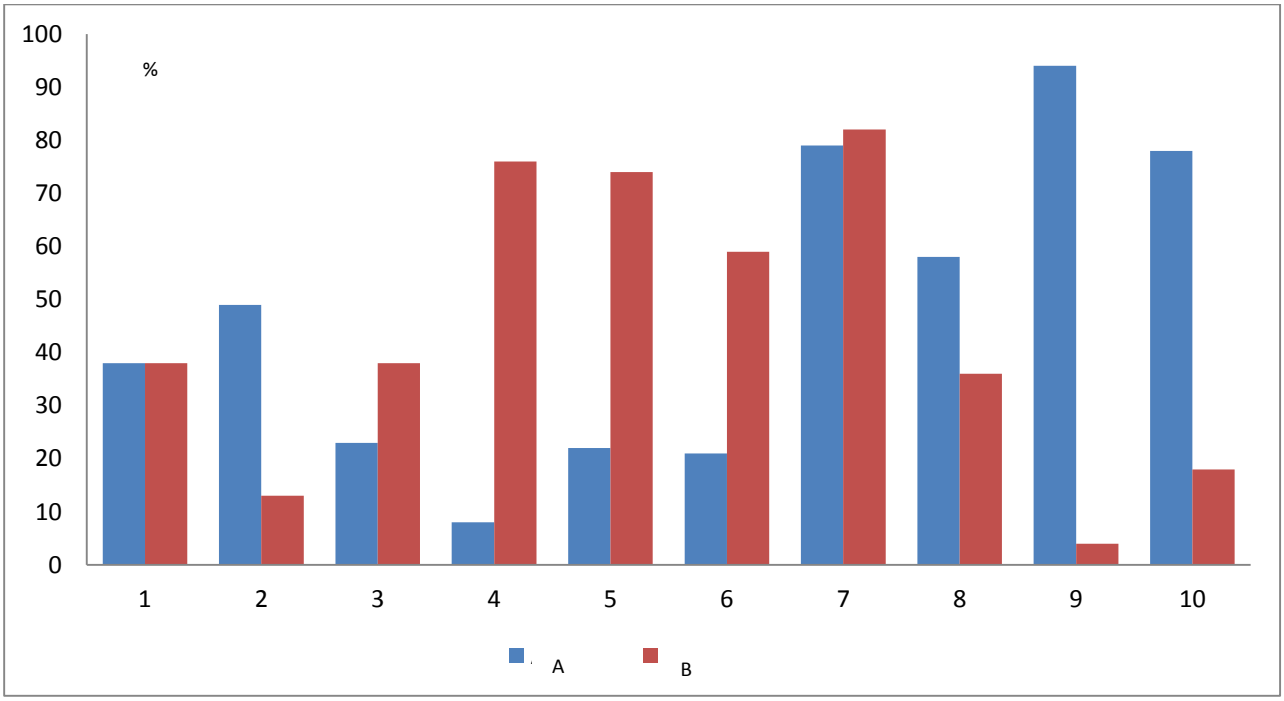
We also considered bent to smoking in groups of different sex (see fig.2). In both groups prevails people, who never smoked. Only little percentage of the questioned smokes minimum one pack a day. The most of those, who gave up smoking, is among men.

Most (72%) of respondents pointed that they do not practice any kind of recreation. However 28% practice regularly adapted for their age kind of sports. Among men this percentage is the highest (32.5%), and among women – the lowest – 12.9%. Many of the questioned answered that they do not have any partner. In this case the lowest frequency (14.3%) belongs to men of 60-65 years' age. For women this percentage was 30%.



A – women; B – men.

Fig.2. Attitude of 50-65 years' age respondents to cigarette smoking: 1 – never smoked; 2 – gave up smoking; 3 – smoke minimum one pack a day.



A – women; B – men.

Fig.3. Time, spent by respondents for different kinds of activity: 1 – watching TV; 2 – reading; 3 –hobby; 4 – visiting of relatives; 5 – visiting of friends; 6 – cultural measures; 7 – volunteer organization and control of physical trainings; 8 – religious communities; 9 – volunteer organizations; 10 –miscellaneous. .

One of questions was about public activity during week (see fig.3). Most of women participate in volunteer organizations or religious communities. Women of this group devoted their time to reading or watching TV. However they did not sacrifice their hobby. The most often they spent 1-2 hours during week for visiting their parents (50%).

For visiting friends 1-2 hours (65%) were spent. Some of them (not very many) participated in organization and administrating of volunteer physical trainings (35%).

This group also spends much time for reading and watching TV. In this group the quantity of those, who attend religious communities, increased. Time for work in volunteer organization did not change as well as time for physical trainings. The group of men significantly distinguished by above mentioned indicators. Men devote much time to reading and watching TV. At the same time they spend much more time for their hobby. Men are not interested in organization of physical trainings and do not attend religious communities or volunteer organizations. Only 19% pointed other ways of spending of their time (in particular care of grandchildren).

Discussion

The received in our research data confirm acute character of motor functioning problem in respect to elderly age teachers [1, 2, 4, 8], of ways of physical recreation means for organization of trainings with such difficult contingent of people [7, 10, 11, 13] and correction of their life style [14, 15, 16-18, 25].

Providing of elderly age people with free choice of motor functioning kind, consideration of their motives, demands , interests and life plans will change for the better elderly age people's attitude to physical culture and own health. It will result in activation of health related recreational functioning.

Life quality is a dynamic existence, which is changed in time under influence of internal and external factors. The strongest correlation with sense of life quality was demonstrated by factors, which are components of psycho-somatic sphere: joy of life, feeling of sense of life, feeling of strength and energy for active motor day regime; overcoming of unfavorable emotions; concentration of attention; satisfaction from healthy life style practicing.

In the whole, assessment of satisfaction from life quality, felt by elderly age people, can not be put in simple frames. It is of dualistic character: objective and subjective. For determination of it, it is important to know opinion of the tested.

Conclusions:

1. Most of the questioned spend time watching TV or reading books and pay little attention to physical functioning. It is general tendency of all respondents. Their most important aims to be achieved in free time also coincide.

2. Manu of the questioned said that they have household chores but want to spend time outdoors (to deal with public activity). There is a trend to not smoking. Only 5% of the questioned were cigarette smokers. The rest never smoked or gave up smoking more than 10 years ago. Among partners of the questioned the quantity of cigarette smokers is significant (16.2%).

3. Most of the questioned have friends and relatives, who can help in achievement of the highest physical functioning level. But only 18.9% of partners of the questioned practice sports regularly.

4. Some useful for health habits are observed in life styles of all respondents. In the whole the received data witness about purposefulness of seeking of effective ways of pre retired age HEE teachers' involvement in active recreational functioning. Besides, the conducted research showed availability of suitable for it time reserves.

Conflict of interests

The author declares that there is no conflict of interests.

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PURPOSEFULNESS OF EARLY APPLICATION OF PHYSICAL REHABILITATION MEANS FOR IMPROVEMENT OF EXTERNAL RESPIRATION SYSTEM FUNCTIONAL STATE OF WOMEN WITH POST MASTECTOMIES SYNDROM

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Abstract. *Purpose:* to determine purposefulness of early application of physical rehabilitation means for improvement of external respiration system functional state of women with post mastectomies syndrome. *Material:* in the research 135 women with post mastectomies syndrome, who endured radical mastectomy by Madden, participated. Women of main groups were trained in compliance with appropriate programs during one year. Effectiveness of trainings was controlled after half of year. Admission to trainings was given by oncologist. Patients of these groups belonged to third clinical group. At the beginning of dispensary period the groups were equal by all indicators of external system function. *Results:* it was found that early rehabilitation is more effective exclusively for indicators of bronchial patency. Complex, personality oriented program included: aqua-fitness; conditional swimming; health related aerobic and Pilates. It was found that after half year training advantages of early physical rehabilitation were noticed only in indicators of forced exhale volume at first second. *Conclusions:* we stated importance of early rehabilitation trainings of women with post mastectomies syndrome.
Key words: external respiration, women, spirography, post mastectomies syndrome.

Introduction

Modern tendency of breast cancer dynamic witnesses about rising importance of this malignant tumor's localization for women [7, 8, 16, 20]. Constant perfection of breast cancer treatment facilitates prolongation of women's life span. However, it does not exclude side effects of therapy [5, 13, 14, 15, 19].

Advanced researches prove purposefulness of early diagnosis and correction of complications from side of muscular skeletal apparatus, cardio-vascular and nervous systems for their removal in due time and improvement of women's life quality [11, 12, 17, 18]. However, prevailing orientation on medical component of rehabilitation, development of modern schemas of medical provisioning, implementation of reconstructive-plastic operations do not pay sufficient attention to physical rehabilitation of patients with post mastectomies syndrome (in particular to improvement of external respiration system's functioning).

The above said undoubtedly witnesses about importance of working out, conduct and determination of usefulness of timely rehabilitation measures. The purpose of the mentioned measures is improvement of external respiration system indicators in women with post mastectomies syndrome.

Purpose, tasks of the work, material and methods

The purpose of the research is to determine purposefulness of early application of physical rehabilitation means for improvement of external respiration system functional state of women with post mastectomies syndrome.

Material and methods of the research: theoretical analysis of scientific research literature data, spirography, methods of mathematical statistic. Indicators of external respiration system's functioning were assessed with spirograph СМП-21/01-«Р-Д», produced by "Monitor". By spirogram the following indicators were assessed: vital capacity of lungs (VCL); forced vital capacity (FVC); volume of forced exhale per 1 second (VFE_1); peak volume quickness (PVQ); instant volume quickness at moment of exhaling 25% of FVC (IVQ_{25}); instant volume quickness at moment of exhaling 50% of FVC (IVQ_{50}); maximal lungs' ventilation (MLV); minute volume of breathing (MVB); reserve volume of inhale (RVinh); reserve volume of exhale (RV exh).

The researches were conducted on the base of Zaporozhye regional oncology dispenser. In the research 135 women with post mastectomies syndrome participated (50 patients were on inpatient and dispensary rehabilitation stages, 85 – only on dispensary). Average age of the tested was 60.27±0.79 years. At inpatient stage women were divided into two groups: main group (n=25) and comparison group (n=25). At dispensary stage they were divided into first main group (n=45) and second main group (n=40). The groups were completed in compliance with wishes of the

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patients and their motivations for training by personality oriented physical rehabilitation program. Before dividing into groups all women were consulted about specificities of training in every group.

The first complex, personality oriented program [4] included: aqua-fitness (aqua-motion), aqua building, aqua stretching), conditional swimming; health related aerobic (first main group and main group); conditional swimming and pilates (group [3] – second main group and comparison group).

Women of main groups trained as per appropriate programs during one year. Effectiveness of trainings was controlled after every half of year. Admission to trainings was given by oncologist. Patients of these groups belonged to third clinical group. At the beginning of trainings all groups were equal by all indicators of external respiration system functioning.

Results of the research

Detail analysis of vital capacity of lungs after 6 months' trainings showed: in 56% of MG women indicators were normal, in 32% - conventionally normal, in 12% a little reduced. In MG1 patients they were: accordingly in 47, 35, 13%, and in MG2 - in 50, 28, 22%, in comparison group (CG) – in 28, 36 та 24%. Indicators of peak volume quickness were normal and conventionally normal in 32% of MG patients; a little reduced – in 24% of the tested. In MG1 patients this indicators was accordingly 42, 22, 16%, in MG2 women - 18, 30%, in CG– 12, 48 and 8%.

Independent indicators of FVC (after one year's training) were normal in 80% of MG patients, in 88% – of MG1, in 78% – of MG2 and in 32% of CG, conventionally normal – in 20, 18, 22 and 44% of women accordingly. Detail analysis of PVQ showed that in 44% of MG women it was normal, in 52% – conventionally normal; in CG patients it was accordingly 20 and 16%.

After half year's trainings advantages of early rehabilitation trainings (see table 1) were registered only by indicators of forced exhale volume in first second. This indicators was by 140 ml ($p<0.05$) higher in women of MG1, comparing with women of MG. At the same time, after one year trainings confident differences between these groups were observed by indicators of forced vital capacity of lungs, volume of forced exhale in first second, instant volume quickness at level of 50% FVC, reserve exhale volume, minute breathing volume in favor of MG. By indicators of reserve inhale volume and maximal lungs' ventilation confident differences were in favor of MG1.

Table 1. Comparison of indicators of women with post mastectomies syndrome at dispensary stage of rehabilitation

Indicator, units of measurements		6 months				12 months			
		MG$_1$ (n=45)	MG (n=25)	CG (n=25)	MG$_2$ (n=40)	MG$_1$ (n=45)	MG (n=25)	CG (n=25)	ОГ$_2$ (n=40)
VCL, l	A	2,77±0,05	2,90±0,09	2,62±0,05	2,61±0,04	2,95±0,04	2,79±0,05	2,79±0,05	2,73±0,03
	B	89,42±1,83	89,60±3,00	80,40±1,74	84,02±1,50	95,86±1,58	96,52±3,03	85,88±2,24	88,30±1,60
FVCL, l	A	2,68±0,03	2,58±0,08	2,43±0,03	2,59±0,03º₀	2,81±0,03	2,97±0,06*	2,58±0,03	2,64±0,02
	B	91,44±1,39	84,00±3,13	78,80±1,54	88,40±1,48 ººº	96,62±1,38	97,16±2,44	84,04±1,71	90,50±1,42
VFE$_1$, l	A	2,56±0,04	2,42±0,05*	2,38±0,03	2,28±0,05	2,62±0,02	2,84±0,05**	2,43±0,03	2,38±0,04
	B	105,95±1,94	95,12±2,95**	92,76±1,87	93,90±2,42	109,75±1,77	112,08±2,45	95,28±2,23	98,67±2,17
PVQ, l/sec	A	4,43±0,14	4,67±0,20	4,39±0,09	3,43±0,11ººº	4,82±0,13	5,18±0,16	4,14±0,14	3,79±0,13
	B	76,60±2,40	78,20±3,64	73,04±1,67	59,22±1,95 ººº	83,88±2,21	87,08±2,99	69,16±2,54	65,72±2,30
IVQ$_{25}$, l/sec	A	4,05±0,12	4,31±0,16	4,17±0,09	3,26±0,10ºº	4,44±0,10	4,71±0,14	3,67±0,12	3,51±0,12
	B	79,42±2,22	81,40±3,50	78,40±1,79	64,00±2,14 ººº	88,06±2,12	89,24±3,03	69,28±2,53	69,17±2,54
IVQ $_{50}$, l/sec	A	4,00±0,14	4,08±0,17	3,95±0,10	2,91±0,10ºº	3,97±0,07	4,65±0,12***	3,85±0,15º	3,38±0,11

Indicator, units of measurements		6 months				12 months			
		MG$_1$ (n=45)	MG (n=25)	CG (n=25)	MG$_2$ (n=40)	MG$_1$ (n=45)	MG (n=25)	CG (n=25)	ОГ$_2$ (n=40)
MVB l/min	B	112,17±3,77	110,12±4,72	104,72±3,07	81,60±2,86 ººº	113,75±2,72	125,12±4,39 *	103,00±4,44	95,60±3,22
	A	7,97±0,20	7,28±0,46	8,96±0,49	7,15±0,26 ºº	7,29±0,36	6,28±0,35 *	6,93±0,25	6,94±0,25
RVinh, l		1,27±0,04	1,19±0,06	0,90±0,06	1,28±0,04 ººº	1,56±0,06	0,98±0,06 ***	1,01±0,06	1,15±0,07
RVexh, l		0,86±0,05	0,91±0,09	0,76±0,05	0,77±0,05	0,97±0,06	1,25±0,11 *	0,96±0,08	1,01±0,10
MVB, l/min		68,37±2,54	76,44±4,02	68,28±2,35	62,63±2,60	86,38±3,00	75,55±2,24 **	68,98±3,85	68,46±1,96

Notes: * – p<0.05, ** – p<0.01*** – p<0.001 when comparing MG and MG; º – p<0.05, ºº – p<0.01, ººº – p<0,001 when comparing MG$_2$ and CG. VCL – vital capacity of lungs; FVCL – forced vital capacity of lungs; FVE $_1$ –volume of forced exhale per 1 second; PVQ – peak volume quickness; IVQ $_{25}$ instant volume quickness at exhale with IVQ 25%; IVQ $_{50}$ instant volume quickness at exhale with IVQ 50%; MVL – maximal ventilation of lungs; MVB – minute volume of breathing; RV inh – reserve volume of inhale; RV exh – reserve volume of exhale. A – actual; B - % from proper value.

After 6 months' trainings of physical rehabilitation in MG2 patients the following indicators were confidently better (comparing with CG): forced vital capacity of lungs (by 0.16 l, p<0.01), minute breathing volume (by 1.81 l/min, p<0.01) and reserve volume of inhale (by 0.38 l, p<0.001). At the same time in CG the following indicators were better confidently: peak, instant and volume quickness at level of 25 and 50% of FVC. After one year only actual indicator of instant volume quickness at level of 50% of FVC was higher by 0.47 l/sec (p<0.05) in CG patients. At the same time in MG2 women relative indicator of forced vital capacity was higher (by 6.46%, p<0.05) than in CG.

Discussion

The obtained results confirm scientific data of the following authors: K. M. Cavanaugh, 2011 [9], M. L. Kwan, B. Sternfeld, I. J. Ergas et al., 2012 [10], N. L. Stout, J. M. Binkley, K. H. Schmitz et al. [6], C. Arving, I. Thormodsen, G. Brekke et al. 2013 [11], S.R. Lu, R.B. Hong, W. Chou, P.C. Hsiao, 2015 [18] about significance of early rehabilitation training of women with post mastectomies syndrome. Our data supplement results of researches of S.G. Bygaytsov (2003 [2]) and O.A. Bas (2011 [1]) about quantitative and qualitative disorders of external respiration of this nosology women on different rehabilitation stages.

Thus, the problem of determination of lasting results of the worked out personality-oriented physical rehabilitation programs for women with post mastectomies syndrome is rather important.

Conclusions

The worked out and tested personality-oriented physical rehabilitation programs for women with post mastectomies syndrome facilitate improvement of functional state of external respiration system. As per results of year control it was registered that early rehabilitation is most effective exclusively for improvement of bronchial patency indicators: in MG forced vital capacity of lungs improved as well as forced exhale per one second and instant volume quickness of reserve and minute breathing volume in comparison with MG$_1$. Reserve volume of inhale and maximal lungs' ventilation were confidently better in MG$_1$. In CG indicators of instant volume quickness at level of FVCL 50% was higher by 0.47 l/sec (p<0.05) comparing with MG$_2$.

The prospects of further researches imply determination of purposefulness of early personality-oriented physical rehabilitation programs directed on improvement of cardio-vascular system of women with post mastectomies syndrome.

Conflict of interests

The authors declare that there is no conflict of interests.

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CONCEPTUAL PRINCIPLES OF FENCING DEVELOPMENT IN CHILDREN'S SPORTS SCHOOLS IN UKRAINE

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Abstract. *Purpose:* to work out conceptual principles for successful and dynamic development of fencing in children's sports schools in Ukraine. *Material:* the researches were conducted on material of children's sports school Dynamo in Kiev. In this work we used SWOT analysis – method of strategic planning, which implies determination of external and internal factors of organization and their dividing into four categories: strengths (strong sides), weaknesses (weak sides), opportunities and threats. For determination of experts' opinion concordance in SWOT analysis we used concordance coefficient. *Results:* we worked out conception of fencing development in children's sports schools in Ukraine in modern conditions. The specificity of this conception implies determination of strategic approaches to further fencing progressing in children's sports schools in Ukraine. The conception can serve as bench mark for development and realization of program documents in sphere of fencing progressing or its different branches. *Conclusions:* we have worked out conception of fencing progressing in children's sports schools in Ukraine, which is based on achievements and traditions of fencing in Ukraine and in the world. Its development is based on systemic analysis of internal and external factors, which influence on development of fencing in sports schools and on choice of its progressing strategy in new social economical conditions.
Key words: conception, sports schools, fencing, development.

Introduction

Main subjects in sphere of physical culture and sports, on which development of different kinds of sports in general and fencing in particular are based, are: children's sports schools (CSS), specialized children's sports schools of Olympic reserve (SCSSOR, Olympic reserve colleges (ORC) and other organizations.

The problems of development of kinds of sports in modern conditions in Ukraine are elucidated in scientific works of O.V. Borysova [4], D. I. Golod [5], I. S. Pavliuk [9], M. V. Tereshchuk [15] et al., which study separate components of this problem. Some aspects of sports schools' functioning in Ukraine are described in works by V.M. Platonov, [10], I. I. Prykhodko [11], G.M. Putiatina [12], N.V. Sereda [13], S.O. Stadnyk [14], O. A. Shynkaruk [18] et al. In spite of omni-directional character of these works the problem of sports' development in Ukrainian sports schools has yet been unsolved.

Especially urgent is the problem of searching of effective ways of kinds of sports' development, which is rather promising from the point of view of winning medals at Olympic Games (V.M. Platonov [10]). Fencing also belongs to such kinds of sports in Ukraine.

Analysis of fencing progress in Ukrainian sports schools showed a number of problems concerning legal-normative regulation of material-technical, financial, scientific-methodic and personnel provisioning; problems of organizational-administrative character (O. Driukov [7]). These data witness that sports schools in Ukraine require working out of conception of fencing development for long term perspective. This process can be considered to be sufficiently formed or typical and creative one (Law of Ukraine "On state targeted programs", dt. March 18, 2004: http://www.rada.gov.ua; Decree of Cabinet of Ministers of Ukraine № 106 dt. January 31st, 2007 "On approval of working out and realization procedure of state targeted programs": http://www.rada.gov.ua). Development of conception of sports' kind for long-term perspective is a complex of scientific-research and project operations, based on strategic methods of analysis and planning (N.L. Babets [2], N.V. Uvarova [16]).

At the same time, scientific conception of effective strategy building for kinds of sports' development, which would base on methodology of SWOT analysis or other strategy analysis methodic with quantitative assessment of internal and external mediums and which would permit to find strong and weak sides, is practically absent. Besides it would also permit to assess potential opportunities and threats as well as to systemize all available information for taking reasonable decisions concerning development of a kind of sports.

Thus, this problem has not been studied sufficiently; it is an urgent one and requires further studying.

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Purpose, tasks of the work, material and methods

The purpose of the work is to work out conceptual principles for successful an dynamic fencing progress in Ukrainian sports schools.

Material and methods: the research was conducted on materials of CSS "Dynamo" in Kiev. Analysis of literature and Internet data permitted to collect and systemize material, characterizing approaches to strategic analysis of different kinds of sports' development.

SWOT- analysis permitted to determine strong and weak sides in CSSs' functioning, potential external threats and favorable opportunities as well as their assessment.

For determination of experts' opinion concordance in SWOT analysis we used concordance coefficient. Its value permits to make conclusions about degree of experts' opinions and confidence of heir assessments. Experts' opinions about ranging of weak and strong sides of internal medium, opportunities and threats of external medium were in concordance ($W \geq W_{gr.}$).

Results of the research

For determination of basic elements of fencing progress in children's sports schools in Ukraine we fulfilled SWOT- analysis on materials of CSS "Dynamo" in Kiev [8].

The fulfilled SWOT- analysis on materials of CSS "Dynamo" in Kiev resulted in quantitative assessment of factors, which influence on development of sports in this organization. Strong sides of CSS, concerning their actual potentials, are: high qualification of coaches, demand of city and country combined teams in sports school pupils, image of sport school.

Strong sides are the best protection from low level of legal support of fencing development in our state:

- Favorable opportunities for CSSs (providing proper use of strong sides) can facilitate development of personnel potential, governmental supports of fencing development in the country, appearing of new scientific-methodic technologies in sportsmen's training. Though they are vulnerable because existing weak sides of these opportunities;
- Weak sides of CSSs are high dependence on budget financing, low salary and quick wear out of sport equipment. All these are complicated by threat of low legal support of fencing progressing in the state and reducing of budget financing.

Thus, the conducted SWOT-analysis provided general picture of situation in CSSs and permitted to substantiate conception of fencing progressing in children's sports schools for the nearest years.

Specificity of the conception implies determination of strategic approaches, principles and opportunities of sports schools, in which human potential, coaches and sportsmen are the basic initial data.

The conception admits the following its structure: setting of problem, analysis of this problem's appearing, purpose of the conception, ways and means of the problem's solution, terms of conception's fulfillment, expected results, determination of effectiveness, assessment of financial, material-technical and labor resources, required for conception's fulfillment.

The problem of fencing development in sports schools in Ukraine

In sports schools, fencing has long traditions of its development and certain potentials: presence of strong sportsmen and experienced coaches. In spite of substantial achievements of Ukrainian fencers – sports schools' pupils at international level, development of fencing is still unsatisfactory in our country. In particular: general quantity of pupils decreases; budget financing is extremely insufficient; material-technical base does not correspond to world standards; low level of elucidation of fencing values as effective and accessible mean of physical education in mass media, imperfectness of management, legal and economic mechanism of governmental policy in sphere of physical culture and sports [7].

Thus, modern status of fencing in sports schools in Ukraine requires solution of a number of problems. It concerns perfection of management principles of fencing progressing in the country, training and advanced training of coaches, upgrading of material-technical base, improvement of scientific-methodic and medical provisioning of sport work, perfection of forms and methods of propaganda of fencing values as effective and accessible mean of physical education, and so on.

Analysis of reasons of this problem's appearing and substantiation of demand in its solution by targeted program method

The main reasons of present fencing status in Ukrainian sports schools are the following:

- Low level of legal support of fencing development in the country;
- Insufficient financial and material-technical provisioning of functioning sports schools;
- High dependence on budget financing;
- Absence of effective scientific-methodic provisioning of sportsmen's training;
- Low prestige level of coaches' work;
- Low salary of coaches;
- Forced emigration of talented coaches and promising sportsmen in foreign countries;
- Insufficient marketing functioning.

The purpose of the conception is creation of conditions for successful and dynamic development of fencing in children's sports schools.

Ways and means of the problem's solution, terms of the conception's fulfillment

The conception of development has been created for five years' execution. For this purpose the following measures are required:

- Protection and development of fencing traditions in the country;
- Improvement of legal-normative base of sports schools' functioning;
- Creation of effective training system for sport reserve;
- Implementation of innovative approaches to personnel, scientific-methodic, informational and medical provisioning of fencing development;
- Improvement of methodic and material-0technical base of fencing;
- Facilitating of reasonable gender policy;
- Creation and implementation of typical programs of sportsmen's training by kinds of arms, which would meet advanced international experience of fencing training;
- Expansion of extra budget financing;
- Improvement of marketing functioning.

Expected results of the conception's fulfillment and determination of its effectiveness

Conception's realization within program frames will permit:

- Improve image of fencing, its attractiveness for children and youth;
- Perfect pedagogic, material-technical, management, scientific-methodic base for further fencing progress in sports schools;
- Perfect training quality of sport reserve for combined teams of Ukraine;
- Ensure constant influx of sport reserve to combined teams of Ukraine;
- Implement modern technologies and scientific-methodic developments in fencing training;
- To form youth's patriotic world vision and active life position.

Assessment of financial, material-technical and labor resources, required for execution of the conception

Financial provisioning shall be ensured at the account of governmental and local budgets, other sources, which are not prohibited by legislation.

Control over conception's execution shall be dual: by founders (external) and by sports school administration (internal).

For objective assessment of the worked out conception we conducted experts' questioning. As experts we invited 15 competent specialists in fencing: headmasters of sports schools, leading coaches and administrators. Calculation of concordance coefficient showed N = 88, that points at sufficiently high level of experts' opinions concordance. The materials of questioning are given in table 1. The results showed that all experts (100%) positively assessed the conception. The experts noted that content of all conception's parts is accessible and clear. Most of experts (88.2%) noted high level of its quality; other (11.8%) assessed it as average.

High experts' assessment of conception's quality permits for us to conclude that is has high practical significance. Such conception can serve as targeted bench mark for development and realization of program documents in sphere of fencing and in its different branches.

Table 1. Experts' assessment of fencing in sports schools of Ukraine (n = 15)

Question	Sum	%	Rating
Your opinion about conception of fencing progress in Ukrainian sports schools			
Positively	15	100	1
Its difficult to answer	0	0	–
Negatively	0	0	–
Accessibility of information in all parts of conception			
Content is accessible and clear	15	100	1
Its difficult to answer	0	0	–
Content is not clear	0	0	–
Your opinion about conception's quality			
High	13	88.6	1
Average	2	13.4	2
Low	0	0	–
Its difficult to answer	0	0	–

Discussion

Demand in conception of fencing progressing in Ukrainian sports schools is conditioned by modern state of elite sports. Such state puts forward new, higher requirements to organizational, methodic, material-technical provisioning of certain kind of sports. Demand in development of the conception is also conditioned by increasing of fencing popularity in the world.

Results of our researches comply with the data of O.V. Borysova [4], D.I. Golod [5], I.S. Pavliuk [9], M.V. Tereshchuk [15]), that effectiveness of any kind of sports' formation and development is determined by complex of interconnected factors: governmental support, traditions, personnel provisioning, international cooperation, development of infrastructure, social-economical accessibility, show character and other.

On the base of earlier received scientific-methodic data we found that as on to day one of the most popular tool of strategic analysis and planning of different objects is SWOT- analysis (M. Ansoff [1], G.Ya. Goldstein [6], D. Hassy [17], Beloborodko A. Et al. [19], Can C. Et al. [20], Ghinolfi D.et al. [21], Glass J.R. et al. [22], Jaber J.O. et al. [23]). Our results supplemented the opinion of L.V. Balabanova [3], that SWOT- analysis is universal method of strategic analysis and it can be applied to any organizations for building strategy in different branches of functioning. We also supplemented and expanded the existing works about strategic analysis and planning of objects on the base of SWOT-analysis methodology for building of effective strategy of different kinds of sports' development.

We received the data on resource provisioning of fencing progressing in Ukrainian sports schools and quantitative assessment of fencing development under influence of both internal and external mediums. These data are very important for taking reasonable decisions on fencing progress in Ukrainian sports schools in modern conditions. We received new knowledge, which permit to form and scientifically substantiate conceptual principles for successful and dynamic development of fencing in Ukrainian sports schools.

Conclusions

We have developed conception of fencing progressing in sports schools of Ukraine, which is based on achievements and traditions of fencing in Ukraine and in the world. It is based on systemic analysis of internal and external factors, which influence on fencing development in children's sports schools and on choice of strategy in new social-economical conditions.

The prospects of further researches in this direction imply working out of State targeted social program of fencing development in our country.

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Conflict of interests

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DETERMINATION OF SPORTSMEN'S INDIVIDUAL CHARACTERISTICS WITH THE HELP OF MATHEMATICAL SIMULATION AND METHODS OF MULTI-DIMENSIONAL ANALYSIS

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Abstract. *Purpose:* to create the most general mathematical models for determination of sportsmen's individual motor abilities' characteristics and individual features of qualified judo wrestlers' fighting style. *Material:* in the research 22 sportsmen – judo wrestlers of average weight categories (60-81 kg) participated. *Results:* model, on the base of which it becomes possible to determine individual characteristics of sportsmen, has been found. With the help of factorial 4 main factors analysis of judo wrestlers' complex fitness have been marked out. Cluster analysis of judo wrestlers' testing indicators showed that all tested sportsmen could be divided in 3 groups (clusters). *Conclusions:* the received results witness about effectiveness of mathematical simulation methods, as well as methods of factorial and cluster analysis for determination of individual fighting styles of elite judo wrestlers. In their practical work coaches should apply principles of mathematical simulation for determination of individual features of fighting styles and work out methodic of judo wrestlers' individual training.
Key words: judo, style, fight, mathematical model, individualization.

Introduction

At present, the problem of individual approach to sportsmen's training process has been acquiring more and more importance [1; 9; 10; 17; 21; 24]. It is connected with becoming more complex conditions of sport wrestling as well as with reducing of quantity of trainees in groups of primary training and restriction of sport selection possibilities [13; 14; 27; 30; 31; 33]. Besides, main problem of elite sports is impossibility to increase infinitely scope and intensity of training loads. It points at demand in searching new ways of training process's perfection [35; 36]. Одним из таких путей является индивидуализация процесса подготовки в спорте [3; 4; 5; 6; 7; 10; 39].

In different kinds of sports authors distinguish different styles of sport fighting. In martial arts they are [1; 8; 9]:

- Variable fighting style;
- Sportsmen of fast style during long time;
- Power fighting style;

In sport games sportsmen are classified by functions. For example, in basketball they are: "center players", "wingers", and "backs" [3; 4; 36]. In volleyball players are: "forwards of the first rate", "tying runs", "libero" [4; 6; 10]. In cyclic kinds of sports authors distinguish sportsmen with prevailing speed-power qualities, sportsmen with prevailing endurance and sportsmen with better coordination [36].

In sport physiology [23; 26; 29; 32; 34; 38] there is physiological substantiation of sportsmen's individual characteristics. For example sportsmen with prevailing speed-power qualities have more white muscle fibers in muscles' composition. Sportsmen with prevailing endurance have more red muscle fibers [11; 22; 38].

However, as on to day general principles of sportsmen's classification, by individual characteristics of certain qualities' prevalence, has not been worked out.

Purpose, tasks of the work, material and methods

The purpose of the work is *Цель работы* – to create the most general mathematical models for determination of sportsmen's individual motor abilities' characteristics and individual features of qualified judo wrestlers' fighting style.

The methods of the research: analysis of literature sources, methods of determination of sportsmen's functional state (method of variation pulse metering, determination of aerobic workability by treadmill testing), psycho-physiological methods (time of simple response to sound, time of visual motor response of choice, error in reproduction of time intervals), methods of determination of physical condition and physical fitness, determination of

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vestibular stability, methods of mathematical statistic with application of factorial and cluster analysis.

Indicators of variation pulse metering were registered automatically with the help of special device Cardiolab.

In treadmill testing, for registration of functional potentials we used loads of constant value during 3 minutes with speed of track - 8 km.p.h^{-1}. We registered heart beats rate (HBR) after every 10 sec. of work and HBR of restoration to initial level, also after every 10 sec. [6; 8; 9].

Psycho-physiological characteristics were determined with the help of computerized tests [6].

Sportsman's height and body mass were determined as indicators of physical condition. Physical fitness indicators were determined by hand's strength (dynamometry), back strength and high jump from the spot (contact platform).

Vestibular stability was determined with the help of Barany mechanical armchair. Rotation of arm chair was ensured by hand during 20 sec at speed of 2 r.p.sec. $^{-1}$. After every 2 sec. we registered HBR with the help of monitor of continuous heart beats rate registration «Polar». HBR was also registered after rotation during 10 sec., after every 2 sec. and after 90 sec. on completing the work. In the research 22 sportsmen – judo wrestlers of average weight categories (60-81 kg) participated [8; 9].

Results of the research

Mathematical substantiation of interconnection of different sport wrestling styles' formation, considering prevalence of different physical qualities and anthropometric indicators:

According to data of leading specialists in theory and practice of sports [39; 40], mathematical models, based on fundamental laws of physics and mathematics (i.e. borrowed from fundamental sciences) are the most purposeful and versatile. In this connection it is important to search universal mathematical models for determination of sportsmen's individual characteristics.

The conducted analysis of possible manifestation of physical qualities' individual characteristics resulted in determination of the most versatile model of main physical qualities manifestations' interconnection, on the base of which it became possible to determine individual characteristics of sportsmen.

General quantity of work and energy resources can be expressed as follows:

$$A = F \times V \times t \quad (3),$$

Where, A –work, F – force, V – velocity, t – time.

Then general quantity of energy resources can be expressed:

$$A = F \times V \times t \quad (4).$$

Now we apply this formula to tasks of sport training. With equal A (i.e. equal possibility to fulfill external work and general quantity of energy resources) work can be fulfilled mainly at the account of force (F) increase with reducing of velocity (V) and general time of work (t). In this case sportsman will incline to "judo wrestlers of power fighting style": to work of power character. The work can also be fulfilled at the account of increase of velocity (V) with other parameters' reduction. In this case sportsman will have more expressed speed parameters. The work can be ensured by prevalence of power and speed (F×V): power of load and reduction of time for work's fulfillment (t). In this case sportsman will have more expressed speed-power qualities.

The work can also be fulfilled at the account of increasing of general time for its fulfillment (t) with reduction of its power (F×V). In this case sportsman will manifest prevalence of endurance.

Besides, work can be executed at the account of uniform manifestation of all indicators and optimal regulation of these indicators' manifestation in required scope and in required moment of time. In this case sportsman will have expressed coordination abilities.

Naturally, with increasing of fitness level total increase of energy potential occurs as well as increase of potentially possible quantity of executed external work (A). However, individual bents to manifestation and development of different motor abilities are maintained with any energy potential level.

Let us regard possibilities of practical application of this model for determination of sportsmen's individual types and prospects for training process individual planning.

According to the above delivered main physical laws and received by us earlier data, we can determine how sportsmen belong to the mentioned above groups.

According to formula (4) A = F×V×t and received earlier [4; 6; 7; 36] results we can conclude that in *martial arts* [1; 8; 9]: "judo wrestlers of power style" is an evident prevalence of strength indicator (F) and power endurance (F×t); "judo wrestlers of speed fighting style during long time" – prevalence of velocity (V) and speed endurance (V×t); "judo wrestlers of variable fighting style" – prevalence of coordination abilities, i.e. ability of nervous system for regulation of indicators optimal correlation in product (F×V×t).

Physical-mathematic laws of bio-mechanical and physiological parameters' changes in connection with changes of body linear sizes:

One of aspects of theoretical conception of sport training individualization in situational kinds of sports is influence of body length on absolute and relative indicators of different physical qualities.

There are strict mathematical laws of interconnection between body linear sizes and absolute and relative values of strength, oxygen consumption and other physiological and bio-mechanical values [2; 15; 16; 17].

These laws determine indicators of absolute and relative values of physiological and bio-mechanical parameters and influence on human way of life, level of human motor functioning. It is conditioned by dependence of metabolism on body linear sizes and mass. It determines laws of sportsmen's individual distinctions, which shall be taken in consideration in individual planning of loads, and recreational means, diet and way of sportsman's life.

Application of methods of multi-dimensional analysis for determination ofjudo wrestlers' individual fighting styles:

From the point of bio-mechanical and physiological laws theoretical substantiation of individual characteristics shows that it is necessary to apply effective methods of determination of sportsmen's individual abilities. Methods of multi-dimensional analysis: factorial analysis, cluster analysis, combined application of these two methods are rather effective. Combination of factorial and cluster analysis is quick and effective for determination of individual tactic manners of elite judo wrestlers' fighting styles.

At first stage of our research we determined general and individual factorial structures of elite judo wrestlers' fitness. Also we determined their individual fighting styles (cluster analysis). For this purpose we analyzed indicators of complex testing of judo wrestlers, which included the data about psycho-physiological potentials, physical condition and physical fitness. In factorial analysis we excluded indicators, which obviously correlated between each other (in total we selected 15 indicators for factorial analysis) (see table 1).

With the help of factorial analysis (principle component method) we marked out 4 main factors by Cattle's "method scree". For characteristic of every factor we analyzed all of indicators, composing it. First factor (28.6% from total dispersion) (see table 1) included the following indicators: HBR for 2 sec. during rotation on Barany's armchair (r=0.95); HBR on 90th sec. of restoration after standard load on treadmill (r=0.94); HBR just after rotation on Barany's armchair (r=0.93); mean value of HBR (r=0.95); HBR after 10 sec. after rotation on Barany's armchair (r=0.88), HBR in rest (r=0.68).

It should be noted that first factor included indicators vegetative balance level from side of central nervous system (CNS). For example increase of HBR in rest, mean HBR in heart rate, HBR at the beginning and just after rotation on Barany's armchair show activation of sympathetic sector of vegetative nervous system. On the one hand HBR increase in response to rotation witnesses about adequate reaction of vestibular apparatus to rotation, which is accompanied by activation of sympathetic sector of vegetative nervous system. On the other hand, increase of HBR in rest and mean HBR values witness about activation of sympathetic sector of vegetative nervous system. It can reflect insufficient level of sportsmen's functional fitness. However, in our case increase of HBR in rest can be regarded also as quick switching on of muscular energy supply systems in response to start of testing. In this case testing is perceived as irritator, to which organism responds as to muscular work.

So quick switching on of energy supply systems, quick entering the state of "combat readiness" (even with testing in rest state) witness about adequate regulation of vegetative balance by CNS and about high responsiveness of sympathetic sector of vegetative nervous system. Basing on the above delivered the first factor was named "Sympatheticotonia".

Table 1. Rotated matrix of testing indicators' components of elite judo wrestlers (n=22)

Description of indicators	Factor №, contribution in total dispersion			
	1	2	3	4
	28,6%	28,5%	9,4%	9,2%
HBR during rotation on Barany's armchair, bpm $^{-1}$	0,95			
HBR at 90 sec. after rotation on Barany's armchair, bpm $^{-1}$	0,94			
HBR just after rotation on Barany's armchair, bpm $^{-1}$	0,93			
HBR at 10 sec. after during rotation on Barany's armchair, bpm $^{-1}$	0,88			
HBR in rest, bpm $^{-1}$	0,68			
Age, year		-0,92		
Body mass, kg		0,85		
Strength of hand, kg		0,81		
Back power, kg		0,72		
Body length, cm		0,68		
Time of simple response to sound, m.sec.			0,94	
Height of jump, cm			-0,75	
Reproduction of 1 sec. time intervals, error, m.sec.			0,74	
Coefficient of variations in heart rate, m.sec.				0,96
Time of choice reaction, m.sec.				0,64

Second factor (28.5% from total dispersion) included the following indicators: age (r=-0.92), body mass (r=0.85), strength of hand (r=0.81), power of back (r=0.72), body length (r=0.68) (see table 1). It is easy to notice that indicators of the second factor reflect to larger extent level of power abilities, absolute power. Exclusion is indicator of age, which is in second factor with negative correlation coefficient. It can be explained by the fact that younger sportsmen turned out to be stronger. Basing on the received data we named second factor "Strength".

Third factor (9.4% from total dispersion) included the following indicators: mean value of response to sound time (r=0.94), qualification (r=0.80), height of jump (r=-0.75), reproduction of 1 sec. time intervals (r=0.74) (see table 1). Indicators of third factor characterize quickness of reaction and explosive power. However, these indicators entered the factor with sigh, opposite to positive characteristic of these qualities. In this connection we characterized this factor as opposite to development of explosive power and reaction's quickness. Such quality is endurance. In wrestling it is special endurance or speed endurance. That is why third factor was named "Speed endurance".

Forth factor (9.2% from total dispersion) consisted only of two indicators: coefficient of variations in heart rate (r=0.96) and mean value of time of choice response (r=0.64). From the received data we can see that with increasing of activity of para-sympathetic sector of vegetative nervous system quickness of choice reaction slows. It is natural reflection of ability for organism's general relaxation. In this connection the forth factor was named "para-sympatheticotonia".

As we can see in table 1 the highest contributions in total dispersion are made by first and second factors. It is logical to conclude that the most significant in elite judo wrestlers' fitness structure are indicators of nervous system's responsiveness. They reflect in sympatheticotonia and indicators of power abilities. Less significant (though rather important) are indicators of speed endurance and ability to relax. These indicators are expressed in para-sympatheticotonia.

Further we found individual factorial structure of sportsmen's fitness and for this purpose we determined percentage of every factor of each sportsman (see table 2).

In table 1 we can see that in all sportsmen there is different expressiveness of different factors, in spite of practically equal qualification and weight category. It witnesses about presence of substantial individual distinctions that should be manifested in different fighting styles and demand in usage of individual training programs for elite judo wrestlers.

For determination of individual fighting styles we conducted cluster analysis of sportsmen's testing indicators, results of which were comparable with individual factorial values.

Table 2. Examples of individual factors' expressiveness in structure of elite judo wrestlers' fitness (%) and belonging to cluster in cluster analysis (conventional number)

Sportsmen, conventional number	Factor 1– sympatheticotonia	Factor 2 – strength	Factor 3 – speed endurance	Factor 4 –para-sympatheticotonia	Cluster, conventional number
1	88,89	22,22	11,11	22,22	1
2	77,78	11,11	100	77,78	2
3	66,67	33,33	33,33	33,33	2
4	33,33	77,78	88,89	11,11	3
5	55,56	88,89	55,56	44,44	3
6	22,22	44,44	66,67	55,56	2
7	100	100	77,78	66,67	1
8	11,11	55,56	22,22	88,89	3
9	44,44	66,67	44,44	100	3

Cluster analysis of testing indicators of judo wrestlers showed that all tested are distributed into 3 groups (clusters) (see table 2, fig.1). Clusters were determined by degree of sportsmen's "similarity" as per indicator of complex testing (see fig.1).

As we can see in diagram (see fig.1) first cluster included sportsmen №№ 1 and 7, second - №№ 2,3,6 and third cluster included sportsmen №№ 5,6,9,4,1.

For characterizing of sportsmen of every cluster we analyzed individual factorial models of sportsmen (see table 2). We found that in first cluster sportsmen (1 and 7) the first factor was the most expressed. They have high responsiveness of nervous system, especially sympathetic sector of vegetative nervous system. Besides, they have moderately expressed second factor (see table 2, fig.2).

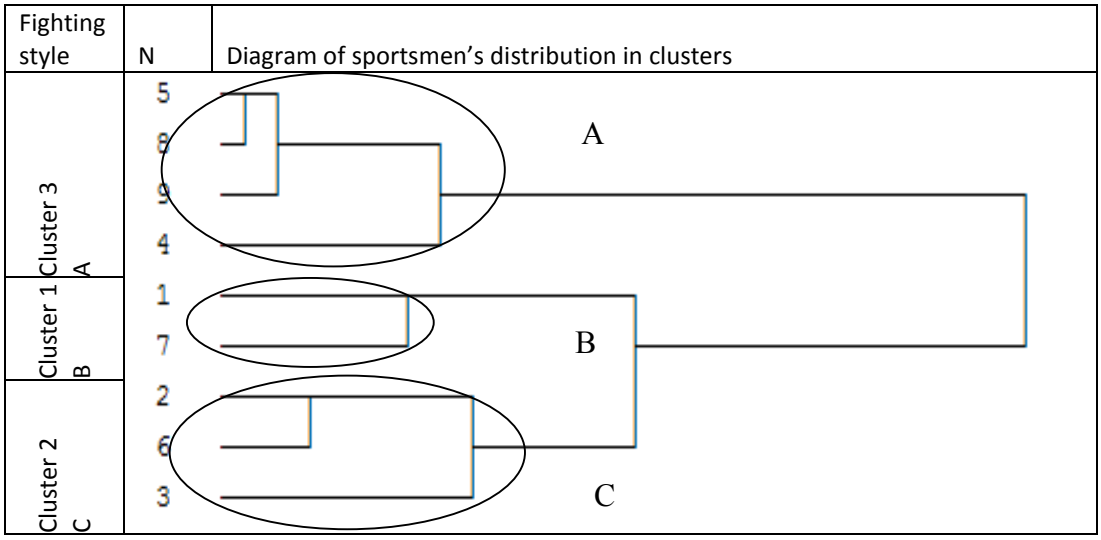

Fig. 1. Diagram of elite judo wrestlers' distribution in clusters (9 sportsmen were taken as examples): A – judo wrestlers of power fighting style; B – judo wrestlers of variable fighting style; C – judo wrestlers of speed (quick) during long time fighting style; N – number of sportsman.

Sportsmen of second cluster have third factor as the most expressed (factor, characterizing special or speed endurance, see table 2, fig. 2) in combination with activity of para-sympathetic sector of vegetative nervous system (with forth factor, see table 2, fig. 2).The sportsmen of third cluster have prevalence of second factor ("strength") in combination with development of third or forth factors (see table 2, fig.2). According to factors, prevailing in sportsmen of every cluster, the formed judo wrestlers' groups were characterized as «B» (1st cluster), «C» (2nd cluster) and «A» (3rd cluster).

1 2

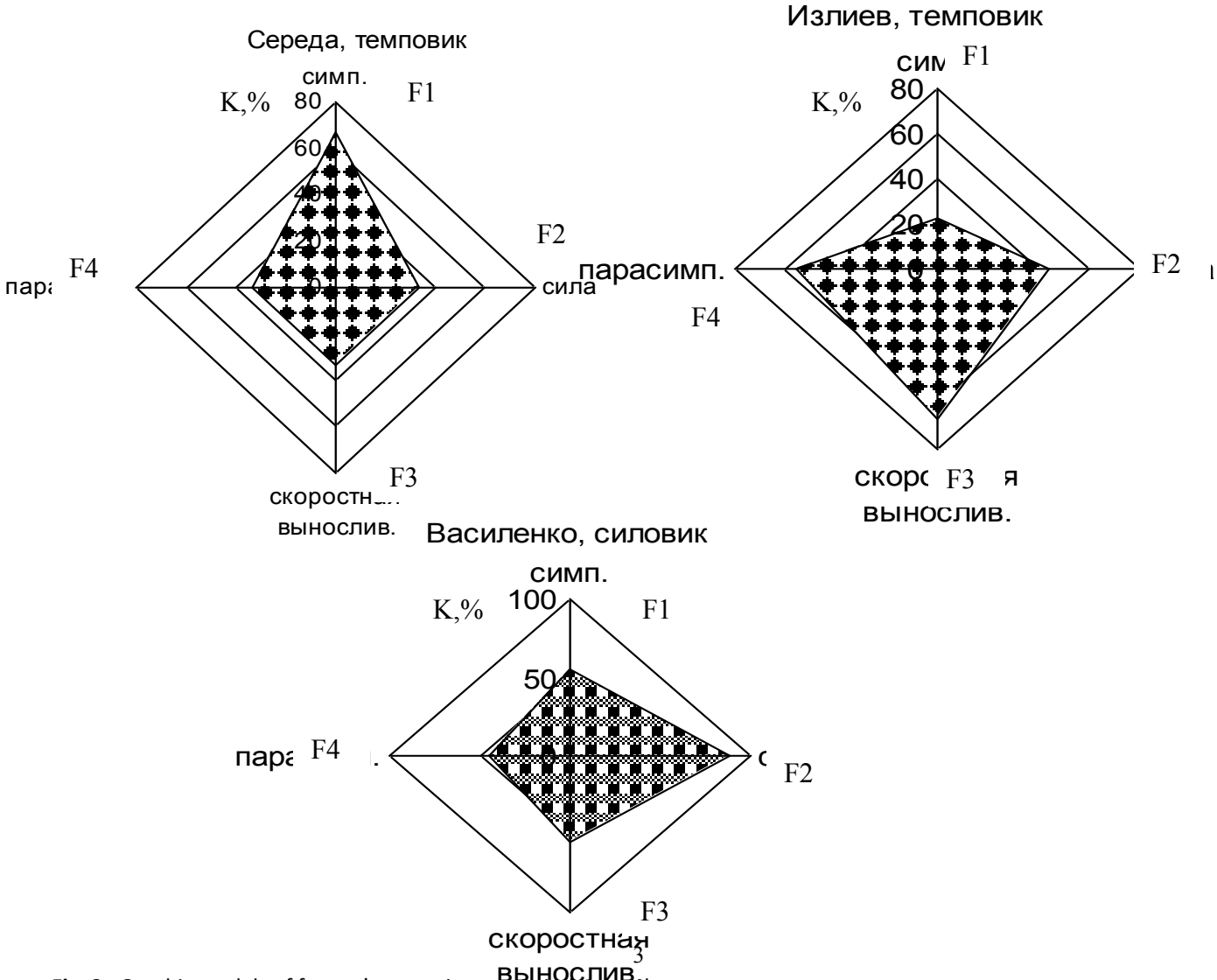

Fig. 2. Graphic models of factors' expressiveness in judo wrestlers:
F1 –factor 1, "Sympatheticotonia"; F2 – factor 2– "Strength"; F3 – factor 3 – "Speed endurance"; F4 – factor 4, "Para-sympatheticotonia"; K – individual expressiveness of factor, %;
1 – Judo wrestlers - B»; 2 – judo wrestlers - «C»; 3 – judo wrestlers - «A»

Discussion

The authors regarded problems of bio-mechanical conditioning of individual distinctions in the light of biological distinction of live organisms with different body sizes [17; 19; 20; 24]. Surely, it is impossible to extrapolate these laws on human being. However, existing of such laws determined individual distinctions of people with different anthropometric parameters.

Nevertheless, the presented in the work theoretical principles and experimental data are confirmed by researches of many authors [1; 36; 39]. Results of these researches show that with increasing of body length all relative values of indicators of vitally important functions reduce. It is reflected in indicator of physiological and pedagogic testing, indicators of visual-motor reaction and general endurance of tall sportsmen [1, 4; 5; 6; 7].

Basing on above mentioned principles we can explain the fact of presence of individual distinction of people with different anthropometric parameters as follows: with increasing of linear body size time of reaction increases as well as time of muscle's contraction and relaxing. It results in reduction of movements' frequency, in slowing of metabolism. It leaves its mark on the following: specificities of temper (typological properties of nervous system) and "comfort" mode of person's life; speed of recreation and time for super-compensation's manifestation. It results in demand in individual approach to construction of training process (quantity of exercises' repetitions, building of

micro-cycles and meso-cycles, value and character of loads and rest).

Our researches are also in concordance with the works, devoted to interconnection of strength, quickness and endurance. These physical properties are in opposite correlations and condition manifestation of sportsmen's individual characteristics, in respect to specificity of sport specialization and competition functioning [12; 37].

In our work we have offered application of multi-dimensional analysis method for determination of individual fighting styles at competitions. Methods of multi dimensional analysis are often used for combining of testing indicators in groups as per their correlations (factorial analysis). Besides, for combining of tested in groups we used cluster and discriminant analysis. For example, in works [4; 5; 6; 7] algorithms for determination of sportsmen's individual characteristics in game kinds of sports, which determine their roles, and possible interaction in training functioning are rendered.

However, the offered in this work algorithm for determination of individual fighting styles of elite judo wrestlers, is quite a novelty. From this point of view the conducted research opens new prospects of studying laws of formation and manifestation of sportsmen's individual features.

Conclusions

1. Results of mathematical simulation of different physical qualities' interconnection permit to make the following conclusions: quantity of sportsman's energy resources (amount of executed external work) can be expressed by formula. This formula reflects: proportionality of the executed work to product of force, velocity and time of the work's fulfillment; individual peculiarities of possibility of sportsmen's motor qualities development in different kinds of sports (as prevalence of one or several co-factors); in every kind of sports sportsmen can be divided into groups, differ by correlation of co-factors.

2. Mathematical simulation of changes of functional potentials' absolute and relative indicators witnesses about existence of strict mathematical dependences. These dependences explain change of physiological and bio-mechanical indicators with changing of sportsmen's anthropometric parameters.

3. With the help of factorial analysis by principle component method we marked out 4 main factors: the first (28,6%) was named "sympatheticotonia"; the second (28,5%) – "Strength"; the third factor (9.4%) was "Speed endurance" and the forth (9.2%) was named para-sympatheticotonia".

4. We have found individual factorial structure of sportsmen's fitness. Cluster analysis of judo wrestlers' testing indicators showed that all tested are divided in three groups (clusters). According to prevailing factors the sportsmen of every cluster were characterized as: «B» (1st cluster), «C» (2nd cluster), «A» (3rd cluster).

5. The received results witness about effectiveness of mathematical simulation methods, factorial and cluster analysis, applied for determination of individual fighting styles of elite judo wrestlers. Principles of mathematical simulations shall be used in judo coaches' practical work for determination of individual fighting styles and for working out of judo wrestlers individual training programs.

Conflict of interests

The authors declare that there is no conflict of interests.

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GENDER FEATURES OF SELF-DESCRIPTION OF SCHOOLCHILDREN'S PHYSICAL CONDITION

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Abstract. *Purpose:* to study age and gender features of schoolchildren's attitude to their physical "self". *Material:* in the research pupils of 5-11 forms (n=365) participated. They were: 177 boys and 188 girls. Individual profile of personality's physical "self" was studied. For this purpose test-questionnaire was used and self description of physical condition. *Results:* it was found that self assessment of schoolchildren's physical condition was too high. It was in average 80–85% from maximal indicator. It was also found that by all indicators sportsmen had higher self-esteem. For development of boys and girls' individual abilities and bents, overcoming of gender-role stereotypes it is necessary to have knowledge about sex and gender specificities of schoolchildren's physical development as well as about their influence on self esteem and formation of physical qualities. *Conclusions:* we showed that it was possible to correct physical education curriculum and its implementation in educational process.
Key words: schoolchildren, gender, self description of physical condition, physical education, boys, girls.

Introduction

At present study and understanding of gender problems take one first places in different scientific branches. Analysis of documents, scientific observations, materials of sociological questionings permit to say that modern state of physical culture demonstrates contradictory picture in sphere of gender equality in physical education in Ukrainian physical education system. At present there is a problem of typical for physical culture instructors command pedagogic administrating (sometimes destructive forms of interaction with pupils) not correspondence to demands of modern humanistic-oriented system of physical education [3].

Recent years there have been being conducted a lot of researches, devoted to perfection of physical education content [6, 7, 9, 12, 13]. One of such problems, in specialists' opinion, is reduction of interest to traditional forms of physical culture. In particular, in our previous works we underlined low level of pupils' motivation for physical culture and sports, absence of opportunities of training forms' choice, discontent of traditional physical culture forms [8, 14, 15]. Studying of motivation for physical exercises' practicing and place of personal physical culture in value hierarchy of modern youth were in works by O. Marchenko (2009, 2010); G. Gonchar (2011); O. Rymar, O. Kutsenko (2011); S. Korol (2012) et al. Influence of social factors, which condition formation of children's and adolescents' interest to physical culture and sports trainings are described in works by I. Omelyanenko (1999), N. Sinkevych (2000), G. Bezverkhnia (2004), A. Moskaliova (2005). We think that at present stage of scientific researches, in context of physical culture reformation it is necessary to pay attention to youth's age and gender characteristics for formation of motivation for physical culture and sports practicing. Rather important is gender aspect of axiological paradigm: as on to day it is impossible to identify physical culture values only with masculine ones. The latter is stereotype thinking and makes impossible modern humanistic-oriented physical education system [29, 33]. However, among available scientific materials we did not find works, which would elucidate gender characteristics of value orientations' formation as well as formation of motivations, schoolchildren's demands in sphere of physical culture and sports. Results of gender strategies in educational space are short-term and sometimes unexpected. Inveterate ideas about gender roles do not correspond to economic, political and social demands of society. Modern epoch conditions demand in re-understanding of traditional approach to schoolchildren's physical education for searching of optimal approaches and overcoming of gender determined social deformations. It is quite urgent for Ukrainian present life. Idea of appearance and physical qualities includes knowledge about own constitution, body sizes, physical condition, physical gender distinctions (D. Fidlander, 1995). Settings for attitude to own body are formed on the base of existing in society culture. They are mastered by a child through estimation and statements of surrounding people [4]. Thus, we can say that among factors, influencing on self-regulation, one of the most important places belongs to physical "self". Content of physical "self" (like "Self" in general) changes in the process of personality's individual progress. Image of body

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is formed in ontogeny, depending on motor experience, on assessments of surrounding people, on social-cultural standards and on general "self" conception [2].

E. Erikson notes that physical qualities of adolescents, which are the basis of physical "self", are possible assumption about formation of its identity and "self" conception in general [22, 23]. M. O. Mdivany (1991) writes that physical "self" has own structure and content [8]. But in connection with formation of boys and girls' sex-role stereotypes, physical "self" can partially change. The existing status of the problem's solution; its importance for organization of schoolchildren's physical education's differentiation justify importance of this topic for scientific research.

Purpose, tasks of the work, material and methods

The purpose of the research is to study age and gender features of schoolchildren's attitude to their physical "self" and influence of physical "self" indicators on their self-esteem.

We studied: schoolchildren's attitude to own physical "self"; gender distinctions in different age boys and girls' understanding of own physical condition; individual profile of personality's physical self. We used test-questionnaire by Ye.V. Bochenkova "Self-description of physical condition", which is a modified version of well known methodic by A. M. Prykhozhan [4].

The questionnaire contains 70 statements, which relate to sphere of human physical development. The questionnaire determines 10 indicators of physical condition and indicator of general self assessment. They are: health, coordination of movements, physical functioning, structure of body, sport bents, physical "self", appearance, strength, endurance, self esteem.

In the research pupils of 5-11 forms (n=365) participated. They were: 177 boys and 188 girls. From all respondents, 38 practice definite kind of sports (swimming, basketball, athletic, wrestling, thae-quan do). Other schoolchildren attend ordinary physical culture lessons and do not practice sports additionally.

Assessment of results was fulfilled by correlating of the received results with generally accepted standards of personality's self assessment.

In compliance with these standards we used self esteem scale by the following indicators:

- Very high level (too high)– 75–100% from maximal quantity of points;
- High self-esteem– 60–74% from maximal quantity of points;
- Average level– 45–59% from maximal quantity of points;
- Low self-esteem – less than 45% from maximal quantity of points.

Results of the research

In table 1 we give results of self description of our respondents' physical condition. (See table 1).

By our data practically by all scales mean digital values of 10-12 years' boys and girls differ rather substantially. Boys assessed their condition higher than girls by some indicators. But by such indicators as "sport abilities" and "physical activity" 5 form girls assessed themselves higher than boys. Such result can be explained by girls' wish to practice professionally the chosen kind of ports and to win competitions. It should be considered that sport classes were researched. We saw that in average boys and girls' results were from 70% to 85% from maximal points. It witnesses about too high self assessment of own physical fitness. Separate analysis of results by 11 scales of self description shows that boys self assessment was higher by many indicators than the girls' one. It concerns also such indicators as "body slimness" and "appearance".

Table 1. Mean values of indicators of questionnaire "Self description of physical condition" (% from maximal quantity of points)

№	Groups of respondents	Sex	Quantity of respondents	Health	Movements' coordination	Physical activity	Body slimness	Sport abilities	General physical "self"	Appearance	Strength	flexibility	Endurance	Self esteem
1	5 form	b	n=15	86,11	89,81	81,30	97,04	81,67	87,78	74,07	79,44	85,00	81,67	86,53
		д	n=28	74,70	83,93	89,58	85,71	84,52	82,14	71,43	73,81	83,53	92,66	83,11
2	6 form	b	n=23	83,24	81,52	76,09	88,89	81,52	81,64	75,97	74,88	76,45	78,02	84,51
		g	n=17	76,96	81,05	73,53	83,99	72,71	82,03	70,10	65,36	67,48	58,50	79,41
3	7 form	b	n=15	81,81	76,11	73,89	73,89	73,15	81,67	79,26	73,52	72,78	80,00	80,69
		g	n=12	81,08	80,79	71,30	81,94	71,76	85,19	85,42	75,93	71,53	64,58	87,85
4	8 form	b	n=22	86,84	90,66	83,59	94,95	88,89	92,93	90,15	90,91	83,21	87,12	84,75
		g	n=21	77,08	70,37	67,86	71,69	62,04	74,47	69,58	67,33	69,05	57,94	75,20
5	9 form	b	n=38	80,43	83,48	77,41	91,08	76,17	81,07	80,04	78,80	72,51	80,26	81,14
		g	n=26	75,72	78,85	78,95	78,63	74,25	77,24	79,59	68,70	70,73	67,74	82,85
6	10	b	n=12	76,91	74,31	79,40	84,72	69,21	68,98	73,61	66,67	62,50	62,27	78,30
	form	g	n=15	78,33	70,37	52,78	78,33	57,04	72,04	77,59	54,26	68,89	40,74	83,89
7	11	b	n=25	80,42	86,89	77,22	89,33	76,67	78,44	76,33	78,11	73,00	74,22	81,75
	form	g	n=30	80,83	82,69	72,78	76,39	70,37	72,59	77,78	68,24	69,63	59,26	83,13
8	SHG	g	n=35	79,40	68,10	52,54	82,54	60,24	78,49	83,65	65,40	63,97	49,92	86,55
9	AG	b	n=16	85,42	93,75	87,85	75,69	83,33	80,56	77,78	91,32	76,74	78,82	85,42
10	T	b	n=11	83,14	77,27	79,29	80,30	74,75	78,79	71,97	73,99	75,51	74,75	78,60
		g	n=4	80,21	90,28	83,33	79,86	75,69	79,17	81,94	65,97	84,72	80,56	87,50

Notes: SHG – special health group, AG athletic gymnastic, T – Thae quan do, b – boys, g – girls.

The highest indicator of 10-12 year old boys was by scale "Coordination of movements"– 90.7% from maximal. Other marks: "body slimness"– 96.7%, "health"– 87.8%. They were evident too high self assessment of physical qualities, which determine physical "self" of adolescent. The lowest indicators were by scale "appearance" (72%) and "strength"– 75.6% (from maximal indicator). 10–12 years' girls related the highest points to scale "endurance" (92% from maximal indicator), "physical activity" (89.3% from maximal indicator) and "slimness" (86.5%). The lowest indicators girls marked in scales "flexibility"– 67.4% and "strength"–65.3%.

Further we shall analyze the results of questionnaire "Self description of physical condition", which we obtained in testing of 13-15 years age boys and girls. Comparison of results by 8 scales (from 11 proposed scales) showed that 7 form girls assessed their physical abilities higher than boys. Their highest indicators were by scale "strength"– 90.9%, "appearance"– 89.5% (from maximal points). The lowest indicators were marked by scales "physical activity"– 71. 3% (from maximal points) and "sport abilities"– 73.7% (from maximal points). We again see evidently too high self esteem of 7 form girls and very low level of physical activity and too low self assessment of their sport abilities.

13–15 year old boys with age had subjectively better attitude to own structure. It is confirmed by the fact that indicators by scale "body slimness" – 94.9% (from maximal points) and "general physical "self"–92.9% (from maximal points) were the highest as well assessment of their strength, which unrealistically for this age, increased and became – 90.9% (from maximal points).

Concerning indicators by scale "strength", we have the following picture: gender distinction in this physical quality's self assessment in favor of boys can be explained by existing in society ideas, that strength is purely male quality. Increase of boys' points by this scale can be result of increasing of constitutional-physiological difference between boys and girls. But it is sooner a result of influence of sex-role stereotypes on adolescents' self assessment.

It is interesting that by scale "general physical "self" boys' indicator is also too high (85.1% – 92.9% from maximal points). With it the lowest indicators of physical self were by scales "sport abilities" and "physical activity".

General level of senior pupils' (15-16 years' age) self assessment becomes more realistic than the same of junior schoolchildren. The boys' self assessment of own constitution subjectively is the highest. Girls have more demanding approach to self assessment of their constitution and have lower points. It can be explained by more realistic self assessment. Practically equal percentage boys and girls have in assessment of "health" (76–80% from maximal indicator). "Physical activity" was assessed equally low by girls and boys. Self assessment by scales "strength" and "endurance" was higher in boys. But "appearance" was higher assessed by 10-11 form girls than by boys.

In our research we also compared indicators of physical condition self description of boys, who practice and do not practice sports. The received results witness, that by all indicators sportsmen have higher self esteem. Comparison of girls' results (those, who practice and do not practice sports) showed that by all indicators self assessment is higher in girls, who practice sports. Analysis of self assessment indicators and percents from maximal points permitted to find results of general self assessment of our respondents' physical condition (see tables 2, 3).

Table 2. General self assessment of physical condition (boys)

Respondents' group	General quantity of respondents	Too high		High		Average		Low	
		Quantity	%	Quantity	%	Quantity	%	Quantity	%
5 form	(n=15)	6	40,00	9	60,00	-	-	-	-
6 form	(n=23)	2	8,70	19	82,61	2	8,70	-	-
7 form	(n=15)	1	6,67	10	66,67	4	26,67	-	-
8 form	(n=22)	11	50,00	11	50,00	-	-	-	-
9 клас	(n=38)	10	26,32	18	47,37	10	26,32	-	-
10 form	(n=12)	-	-	7	58,33	4	33,33	1	8,33
11 form	(n=25)	5	20,00	15	60,00	5	20,00	-	-
Athletic gymnastic	(n=16)	6	37,50	8	50,00	2	12,50	-	-
Thae-quan do	(n=11)	3	27,27	6	54,55	1	9,09	1	9,09

Table 3. General self assessment of physical condition (girls)

Respondents' group	General quantity of respondents	Too high		High		Average		Low	
		Quantity	%	Quantity	%	Quantity	%	Quantity	%
5 form	(n=28)	9	32,14	12	42,86	7	25,00	-	-
6 form	(n=17)	3	17,65	7	41,18	7	41,18	-	-
7 form	(n=12)	2	16,67	7	58,33	3	25,00	-	-
8 form	(n=21)	3	14,29	8	38,10	8	38,10	2	9,52
9 клас	(n=26)	4	15,38	12	46,15	8	30,77	2	7,69
10 form	(n=15)	-	-	3	20,00	11	73,33	1	6,67
11 form	(n=30)	1	3,33	16	53,33	13	43,33	-	-
Special health group	(n=35)	-	-	20	57,14	15	42,86	-	-
Thae-quan do	(n=4)	1	25,00	2	50,00	1	25,00	-	-

Boys of average school age have inadequate high and too high general self assessment of own physical condition. The girls of this age have lower level of general physical condition self assessment. If to compare boys-sportsmen with boys not sportsmen we see that general level of sportsmen's self assessment if much higher.

Comparing self assessment levels of boys and girls we can say that senior school age girls have more objective attitude to self description of own physical "self". In answers of our respondents (both boys and girls) the highest indicators were in scales "self esteem", "appearance", and "health". The lowest indicators were in scale "endurance".

In the whole we can state that with age self assessment of schoolchildren's physical condition becomes more differentiated. Especially it is noticed in senior school age girls. Boys also have changes but insignificant.

Discussion

Results of our research of age and gender features of schoolchildren's attitude to their physical "self" coincide with results of scientific research of Ye.V. Bochenkova [4]. She also studied self assessment of boys and girls. By her results boys' self assessment of their physical abilities was higher than girls. But general self assessment of girls was too high. General level of all respondents' self assessment in researches by Ye.V. Bochenkova was too high. In study of age peculiarities of physical condition's self description it was noted that junior school age girls (10-12 years' age) indicators of self description was higher, comparing with indicators of senior school age girls (15-17 years' age) in 8 indicators from 11. With it general self assessment of boys was higher that girls'. Such results coincide with data, received by Ye.P. Ilyin. The author notes that senior pupils – boys in the whole are more content with their appearance and assess it higher than girls [5].

V.P. Sytnikov also writes that boys assessed their body characteristics much higher than girls. They give great value to their physical "self" [20]. But such scientists as M.Yu. Stepanova and D.A. Federiakin affirm by results of their study of junior schoolchildren's self description that self assessment and level of demands have no gender distinctions in junior school age. They also write that children's physical development weakly influence on self assessment in 7-10 years' age. It contradicts the results of our previous researches.

Conclusions

It was found that self assessment of schoolchildren's physical condition is of too high character. It is in average 80–85% from maximal indicator. Results of our research witness that schoolchildren's physical condition's self description has gender and age peculiarities. Results of our research prove that with age girls' self assessment becomes more differentiated. But analyzing research materials we found influence of sex-role stereotypes' influence on our respondents' self assessment of their physical "self". We can affirm that for development of boys and girls' individual abilities and bents, for overcoming of sex-role stereotypes it is necessary to have knowledge of sex and gender peculiarities of schoolchildren's growth as well as about their influence on self assessment and formation of physical qualities. In our research we also compared indicators of physical condition's self description of sportsmen and not sportsmen. It was found that by all questionnaire indicators self assessment of sportsmen and sportswomen are higher than indicators of boys and girls, who do not practice sports.

Results of our research will permit to correct physical education curriculum and implement it in educational process. Our further researches will be devoted to study of gender characteristics and interconnection of boys' and girls' self assessment with objective indicators of physical qualities' development. For more detail analysis of schoolchildren's physical condition's self description it is planned to study correlations between indicators of boys and girls' physical condition's self description and determination of age and gender distinctions.

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Conflict of interests

The authors declare that there is no conflict of interests.

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CRITERIA OF ASSESSMENT OF SHORT TRACK RUNNERS' PROSPECTS AS MEAN OF PROMISING SPORTSMEN LOSSES' PREVENTION AT SELECTION STAGE

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Abstract. *Purpose:* to offer main criteria for assessment of short track runners' prospects. Material: 8 sportsmen of short track Ukrainian national team participated in the research. Influence of training means' volume on result, shown on competition distance, was determined. Both organism's functional and reserve potentials were assessed with the help of computer program D&K-test. *Results:* we have determined priority of functional indicators in selection of short track runners and for assessment of their prospects. Sportsman's potentials shall be assessed on the base of functional fitness indicators, analysis of competition practice and training process data of pervious stage of sport perfection. *Conclusions:* individualization of training process, considering physiological characteristics of definite sportsman, will permit to completely open the embedded potential. Absence of sportsman's progress with prominent functional system's characteristics points at demand in correction of training program for his sportsman.
Key words: assessment, prospects, short-track, sport selection.

Introduction

The main target of elite sports is achievement of maximal result in the chosen kind of motor functioning. One of the most characteristic trends of modern sport science is strive to transform sportsmen's training in controlled process. In this connection applied aspects of management and complex systems' analysis laws are developed. Specialists note [1, 4, 9, 10, 14, 22, 28], that clear ideas about structure of competition functioning and its components serve as a basis for working out of appropriate model characteristics and diagnosis systems for selection, control and management. Application of such approach is a positive factor in achievement of the highest result [10, 13, and 22].

Modern results in short tracking are on so high level that for their achievement it is necessary to have ideal run technique and complex of unique combination of morphological functional characteristics. It means that sport selection permits to find most promising sportsmen in due time. Then, in process of many years' sport perfection it is possible to prepare world class sportsmen and outstanding athletes [10, 12, 14, and 34].

Realization of sport selection takes place on the base of programs and test standards [12, 23]. As a rule, with assessment of sportsmen's prospects main attention of a coach is paid to quantitative changes of competition functioning's or test indicators. In most cases prospects of a sportsman are assessed on the base of visible changes. With it, the most informative indicators (medical-biological testing) about sportsmen's potentials are used minimally. In most cases this information is used by coaches not systemically, for controlling of sportsman's current health. In such cases promising sportsmen can be paid no attention to. Main reasons of this phenomenon are the following:

– Incorrect interpretation of data of medical-biological testing;

– Not compliance of training programs to sportsman's genotype;

– Absence of information about effectiveness of training tasks for definite sportsman;

– Coach's incompetence about physiological processes, which take place in sportsman's organism and their connection with results;

– Outdated information about training process;

Specialists [6, 12, 13, 15, 25, and 29] elucidated quite completely main selection criteria. However, information about priority indicators of sportsman's potentials assessment is described fragmentary. The presence of more complete information can permit for a coach to complexly assess potential of every sportsman.

It pre determined importance of our research. Solution of this problem will permit to make process of sportsmen's selection and their results' prognostication more clear and to avoid loss of promising sportsmen.

Purpose, tasks of the work, material and methods

Hypothesis: determination of main indicators of sportsmen prospects' assessment will permit to assess their potential at higher level and minimize the loss of promising sportsmen.

The purpose of the research is to offer main criteria for short track sportsmen prospects' assessment.

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Material and methods:

1) Theoretical analysis and generalization of scientific and methodic literature were used in the process of the problem's studying, in setting the purpose of the research and in discussion of the received results.

2) Qualitative analysis and automated multi-parametric control of training loads in short track permitted to receive information about content and orientation of short trackers' training as well as to receive qualitative data about volumes of training means by groups and types.

3) Imitational modeling permitted to analyze physiological processes in short-tracker's organism during running distance.

4) Assessment of organism's functional and reserve potentials with the help of computer program D&K-test – permitted to register changes of functional potentials' indicators.

5) Analysis of multiple regression indicators permitted to find inter influence of results at different competition distances as well as influence of different groups of means on sportsmen's results. For determination of possible combinations of training loads we regarded the best models of multiple regressions. The best models have low values of erected in the square mean, low values of Mallows's Cp- criterion (close to number of coefficients in model, including constant) and high corrected determination coefficients.

6) Methods of logical analysis.

Results of the research

Analysis of training process data and competition results showed that partial indicators of training load influence differently on generalized and individual dynamic of sport results (see tables 1-2). To ensure comprehensive training of sportsmen for different competition distances (to make the "versatile persons", who successfully perform in all programs) is rather difficult task. Sport achievements on all short track competition distances are determined to the largest extent by combined influence of volume of anaerobic a-lactate, anaerobic glycolytic and mixed works (r^2= 81.9–95.8%). With it for many sportsmen influence of aerobic work volume turned out to be significant.

Table 1. Influence of cyclic loads of different physiological orientation on averaged and individual sport results' dynamic of leading short trackers of Ukraine in 2000–2006 (r^2,%)

Orientation of training loads	**Competition distances**											
	500 m				**1000 m**				**1500 m**			
	M	**«Ya.E.»**	**«Ch.V.»**	**«G.V.»**	**M**	**«Ya.E.»**	**«Ch.V.»**	**«G.V.»**	**M**	**«Ya.E.»**	**«Ch.V.»**	**«G.V.»**
AN a-lactate (A)	34.4	20.0	20.0	20.0	20.0	20.0	20.0	34.2	**32.3**	20.0	**22.7**	20.0
AN glycolytic (B)	37.6	20.0	20.0	29.2	20.0	41.4	20.0	45.1	20.0	20.0	20.0	20.0
Aerobic - anaerobic (C)	22.6	20.0	20.0	20.0	20.0	27.2	20.0	28.3	20.0	20.0	20.0	20.0
Aerobic (D)	**40.9**	**38.8**	**28.9**	**43.9**	20.0	**46.4**	20.0	**46.1**	20.0	20.0	20.0	20.0
ABC	**93.4**	60.0	60.0	**95.6**	**90.4**	60.0	64.3	**95.8**	**81.9**	**84.1**	78.6	**86.0**
ABD	60.0	98.8	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	**80.8**	60.0
ACD	60.0	**99.3**	62.3	60.0	60.0	60.0	60.0	60.0	60.0	60.0	78.7	60.0
BCD	70.1	96.1	**63.5**	85.8	73.4	60.0	**93.3**	79.2	60.0	60.0	60.0	67.4
Total: ABCD	96.1	99.9	80.0	95.9	98.2	80.0	99.9	99.9	94.2	87.2	81.1	93.4

Notes: in bold type indicators with highest determination coefficients (r2) are shown.
Legend: A, B, C, D – registered indicators (kinds of loads) and their combinations from three and four variables; M – mean data of eight sportsmen for six years; «Ya.E.», «Ch.V.», «G.V.» – individual data of three team's leaders for recent 6 years.

Table 2. Influence of a-cyclic loads' main kinds on averaged and individual dynamic of leading Ukrainian short trackers' sport results in 2000–2006 (r^2,%)

Orientation of training loads	**Competition distances**											
	500 m				**1000 m**				**1500 m**			
	M	«Ya.E.»	«Ch.V.»	«G.V.»	M	«Ya.E.»	«Ch.V.»	«G.V.»	M	«Ya.E.»	«Ch.V.»	«G.V.»
AN a-lactate (A)	41.3	20.0	**37.1**	41.4	20.0	**71.8**	20.0	37.3	20.0	20.0	21.9	20.0
AN glycolytic (B)	58.8	20.0	20.0	35.0	25.9	34.5	20.0	**59.2**	40.6	20.0	20.0	20.1
Aerobic - anaerobic (C)	**63.9**	20.0	20.0	**41.7**	**62.5**	20.0	**40.4**	56.5	**78.5**	**69.4**	**25.8**	**66.4**
Aerobic (D)	21.2	**28.8**	20.0	20.0	20.0	38.4	20.0	20.0	20.0	20.0	20.0	20.0
ABC	94.6	84.3	**93.8**	84.5	68.9	77.0	60.0	82.6	79.6	77.4	60.0	**81.9**
ABD	79.9	93.5	60.0	69.1	70.1	**99.3**	60.0	89.9	**90.8**	88.1	**67.0**	60.0
ACD	**96.2**	**97.0**	70.8	**87.4**	76.4	87.7	60.0	86.2	81.3	87.7	60.0	78.3
BCD	90.4	75.6	60.0	74.6	**81.6**	63.2	60.0	**94.0**	89.7	**89.9**	60.0	72.0
Total: ABCD	96.5	97.2	97.9	87.4	81.7	99.9	80.0	94.2	95.7	98.6	80.0	82.0
Technique (imitation) (A)	20.0	**98.2**	**68.2**	35.8	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Coordination) (B)	72.7	21.0	56.5	**86.6**	67.8	20.0	64.0	61.5	40.4	24.7	20.0	88.1
Dexterity (in game) (C)	**78.4**	20.0	36.0	81.5	**86.6**	20.0	**73.7**	**69.5**	**67.2**	**56.7**	20.0	**99.7**
Flexibility (D)	20.0	26.1	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
ABC	78.8	**99.4**	82.8	**90.1**	89.3	69.2	77.9	69.5	82.6	95.4	**96.8**	99.7
ABD	75.5	99.0	**97.2**	88.0	72.9	60.0	85.8	63.0	60.0	60.0	60.0	90.8
ACD	79.3	98.6	95.4	88.9	93.8	60.0	**91.0**	**70.7**	79.3	65.4	60.0	**99.8**
BCD	**79.5**	60.0	67.0	88.2	**95.6**	**82.7**	77.9	70.5	**84.0**	**98.9**	94.0	**99.8**
Total: ABCD	80.0	99.4	100.0	90.1	96.2	83.3	92.2	80.0	87.0	98.9	99.5	99.8

Legend: see table 1.

Just by this reason we registered so substantial distinctions in individual regression models, which reflect degree of influence of one and the same volumes of differently oriented training loads on sportsmen's group.

Analysis of interconnections between fulfilled volumes of load and results of functional testing [5, 8] witness about demand in individual selection of means specifically for every sportsman (see table 3). For example, usage of glycolytically oriented training exercise will not always cause desirable result in all sportsmen's group. It is confirmed by found interconnection between volumes of training means and testing data and supplements the data of specialists [2, 4, 7, 8]

Table 3. Influence of cyclic differently physiologically oriented loads on individual dynamic of S.A. Kugayevskiy's functional potentials in 2000–2006 (r^2,%)

Orientation of loads	Indicators of capacity			Indicators of power			Indicators of efficiency		
	ANA MC	AMC	TMC	PCPh	PGL	PAE	W TANM	HBR at TANM	dGTF
AN a-lactate (A)	20.0	28.1	49.1	20.0	56.4	50.1	48.5	52.5	48.8
AN glycolytic (B)	28.9	49.8	**70.2**	20.0	58.6	**56.0**	48.5	**58.7**	38.0
Aerobic - anaerobic (C)	**38.9**	**55.3**	49.7	20.0	**68.7**	48.3	**66.8**	55.1	**49.4**
Aerobic (D)	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
AB	40.0	51.2	70.2	40.0	62.5	58.1	52.6	60.9	49.1
AC	**52.7**	**63.0**	52.4	40.0	68.8	52.2	67.2	57.2	52.1
AD	40.0	40.0	70.3	40.0	65.4	**59.1**	56.6	**63.0**	**59.4**
BC	42.1	55.3	**79.1**	**48.4**	69.2	56.3	**73.8**	58.9	52.3
BD	40.0	55.9	71.8	40.0	58.8	56.1	48.6	58.7	40.0
CD	43.7	57.0	54.7	40.0	**69.6**	48.8	68.1	56.1	50.6
ABC	60.0	63.0	**81.9**	60.0	69.4	**60.4**	74.1	61.0	60.0
ABD	81.2	**83.0**	74.2	60.0	65.7	60.2	60.0	**63.8**	**65.0**
ACD	**87.5**	78.6	70.4	60.0	71.2	60.0	68.1	63.5	60.0
BCD	60.0	60.0	79.2	**67.0**	**71.5**	60.0	**81.1**	60.0	60.0
Total: ABCD	92.5	87.3	83.2	98.7	80.0	80.0	84.7	80.0	80.0

Notes: 1. the data were received on the base of six examinations during year.
2. In bold type indicators with highest determination coefficients (r2) are shown. (r2).
Legend: A, B, C, D – registered indicators (kinds of loads) and their combinations from three and four variables; MC – anaerobic metabolic capacity; AMC – aerobic metabolic capacity; TMC – total metabolic capacity; PCPh power of creatine-phosphate energy supply source; PGL - power of glycolytic energy supply source; PAE – power of aerobic energy supply source; TANM – threshold of anaerobic metabolism; HBR – heart beats rate; threshold of anaerobic metabolism; W TANM – efficiency; HBR at TANM – effectiveness criterion in case of aerobic energy supply source; dGTF – general energy fund.

Specificity of competition short track functioning conditions existence of difference in structure of training loads. Besides, it is necessary to consider individual response to differently oriented loads. On the base of this it is possible to conclude that assessment of sportsman's prospects shall be realized in complex way. First of all – it shall be on the base of medical-biological control data, detected individual characteristics of a sportsman and analysis of training loads.

Discussion

Short track competition distances are considered to relate to zone of sub-maximal power. According to data of G.M. Panov [23] high achievements in all-round depend on level of aerobic and anaerobic energetic potentials, speed-power fitness and technical skillfulness. Factor of short tracker's specific abilities, which condition effective workability in unusual position, is also rather important [7, 12, 19, and 23]. When passing distance sportsman expends energy for fulfillment elements of technique, overcoming air resistance, friction and inertia on turns. Minimization of energy expenditure is possible at the account of optimal run technique and reasonable tactic. Every of the mentioned actions, providing their correct usage, gives increment of kinetic energy and prevent from loss of speed. The listed

above elements can be regarded as external characteristics of sportsman's model. But during realization of external characteristics in sportsman's organism physiological processes, ensuring their existence, take place.

Short track run technique's more detail analysis with the help of "imitational simulation" [3, 11, 12, 15, 16, 21] gives information about processes, which take place in organism during run. It permits to conclude that for this type of motor functioning mainly static-dynamic mode of muscular work is characteristic (maintaining of skater's posture and pushing). Such position gradually results in muscular blood circulation's disorders. During passing 1–2.5 rounds (9 – 20 sec.) in active muscular fibers sportsman expends reserves of andesine tri-phosphate (ATP) and creatine phosphate (CrPh). Then, power of these muscular fibers drops to 50% from maximum. Energy supply occurs at the account of aerobic and anaerobic glycolysis. Lactic acid accumulates and causes local fatigue. In process of passing distance new motor units (muscular fibers) start working for maintaining required posture and fulfillment technical actions. The also expend ATP and CrPh during 10-20 seconds. Power drops and is maintained only at the account of anaerobic glycolysis; local fatigue increases. Thus, in passing of distance organism has to successively recruit new motor units and more activate working muscles. Further increment of external power dictates involvement more high threshold motor units, which innerve glycolytic muscular fibers. Dynamic balance is broken. It is followed by further increase of lung ventilation, HBR and oxygen consumption. On achieving of lung ventilation and HBR extreme values oxygen consumption stabilizes and then starts to reduce. High level of VO_2Max permits to avoid reduction of distance speed, which is possible owing to change of technique's dynamic stereotype and muscular fatigue.

With the help of "imitation simulation" we can conclude that result of sportsman is combination of indicators of functional fitness and high level of technical skillfulness. With it these sides of sportsman's fitness are closely interconnected. Technical mistakes in sportsman's run limit his maximal speed. Besides, for avoiding technical mistakes sportsman shall apply additional efforts for realization technical elements and it causes too early fatigue. Proper physical fitness and high level of functional fitness permit for sportsman to master optimal dynamic stereotype of run technique as well as to endure local fatigue without reduction of speed at distance. High level of run technique permits for sportsman to maintain maximal speed during long time. In this case functional fitness, with equal technical skillfulness of sportsmen, is the determining factor for achievement of positive result in competition.

Predisposition and development of organism's appropriate systems is the basis for further perfection. These data are confirmed by authors [12, 15, 16, 24, 26, 29, 31, 32], who write that development of organism's systems can not be infinite. For example, value of maximal oxygen consumption depends on the level of binding, transportation and oxygen usage system [12, 20, and 32]. As a result of training influence there happens increase of this systems functioning effectiveness. It should be noted that maximal increment for 6-10 year of training by individual training programs reaches only +20% [12, 20]. It also confirms the data that sportsmen must have certain predisposition for certain orientation of training influence, In case of absence of potentials for this orientation adaptation to increased training load can result in pathological changes. As a result there appears sportsman's inability to endure training and competition loads.

Basing on the above said we can conclude that main criterion for sportsman's potential assessment is assessment of his functional potentials. It means that it is purposeful to seek and select genetically gifted individuals, who have complex of proper indicators of organism's proper indicators even at initial stage of training (D Junioren).

When selecting children it is necessary to consider that most of morphological functional indicators as well as functional fitness indicators are inherited (see table 4). That is why at this stage coach's main attention shall be paid to children, whose parents were sportsmen in the past and specialized in kinds of sports for endurance [14, 25, 29, and 34].

Table 4. Inheritance of morphological-functional and functional fitness indicators

Property	**Inheritance**
Functional fitness	
Maximal oxygen consumption (VO_2Max)	Significant
Size of heart	Significant
Systolic volume	High
Content of muscular tissue	Significant
Muscular oxidation potential	Significant
Oxidation of lipid substrates	High

Mobilization of lipids	High
Morphological functional properties	
Length of body, upper and lower limbs	High
Length of torso, forearm and arm	High
Width of shoulders and pelvis	Significant
Body mass	Significant
Correlation of quickly contracting (QC) and slowly contracting (SC) muscular fibers	High
Anaerobic efficiency	Significant
Aerobic efficiency	Significant

With it at primary selection coach shall assess more critically progressing of one disciples' group in comparison with other, because it is rather difficult to recognize promising sportsmen among 8-11 years' age children by this property. At this stage of many years training technical elements are only embedded and the group of trainees is rather heterogeneous; that is why it would be incorrect to prognosticate future results only on the base of competition results and results of current testing. In the course of further sport perfection development of appropriate functional indicators will happen on the base of detected morphological functional properties (see fig. 1).

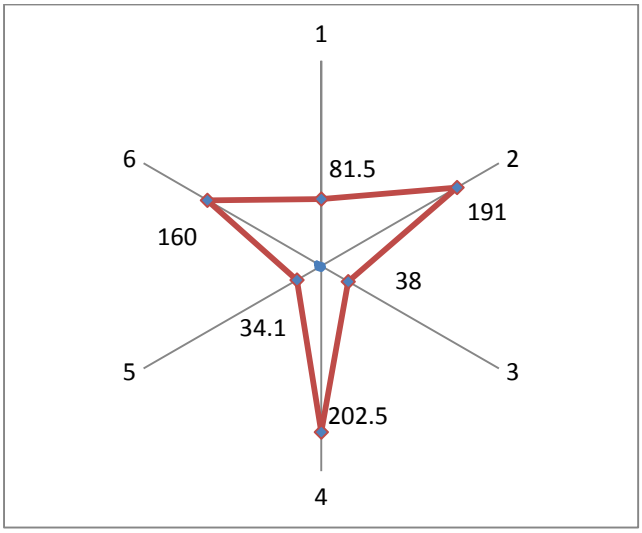

Fig.1. Averaged model of cardio-vascular and respiratory systems' indicators of elite sportsmen, specialized in kinds of sports, connected with endurance [12, 13].
1. MOC, ml*min*kg-1; 2. HBR in 1 min; 3. Minute volume of blood, l; 4. Stroke blood volume, ml; 5. Oxygen pulse, ml*b-1; 6. Lung ventilation, l*min-1

Combination of indicators of organism systems' effectiveness permits to assess with high degree of confidentiality and prognosticate level of one or another sportsman, his predisposition to one or another competition distance. These models are widely used in cyclic kinds of sports. In practice of short trackers' training they have been elucidated insufficiently as the present time.

Sportsman's technical mistakes or retention in achievement of result, with sufficient functional system's potential, is a marker, pointing at ineffectiveness of training program for the sportsman (see tables 1, 2). The conducted researches [7, 9] showed that influence of differently oriented loads on increment of competition distances' results is different for different sportsmen. It means that only individually built training, considering individual physiological characteristics of short tracker, can open embedded potential to the fullest extent. That is why the problem of selection of kinds of functioning and optimal individual loads' correlation, corresponding to functional potentials and abilities of every sportsman, is so important and urgent.

Conclusions

The materials of the research permit to make the following conclusions:

1) Analysis of the set problems permitted to conclude that modern level of biological knowledge about special endurance (main factors and mechanisms of its limiting) permits sufficiently accurately to determine the level of such systems' development for effective sport perfection as well as to create model characteristics, assess sportsmen's prospects, considering specificity of certain kind of sports. However, in practice of short trackers' training this direction is elucidated fragmentary.

2) The process of sportsman's potential assessment shall be realized on the base of functional fitness indicators, analysis of competition and training process data of preceding stage of sport perfection.

3) Individualization of training process, considering individual physiological characteristics of separate sportsman will permit to open embedded potential to the fullest extent.

4) Fragmentary character of data about required level of short trackers' organism's systems for successful competition functioning is a promising direction of further researches on this topic.

Main issues

Application of "imitation simulation" method permits to more reliably analyze the processes, which take place in sportsman's organism at time of technical elements' fulfillment. Assessment of short tracker's prospects shall be based on data of medical biological testing, medical control and only after it – on the base of competition functioning. Absence of sportsman's progress with prominent functional system's characteristics points at demand in correction of training individually for this sportsman.

The prospects of further researches: in process of further researches it is planned to construct averaged models of level of indicators, required for effective performance at every competition distance;

Determination of connection between volumes of differently oriented loads and changes of indicators will permit to more effectively plan training process and achieve required morphological-functional adaptation of organism;

Application of models will permit to more effectively realize sportsmen's selection for short tracking and minimize losses of promising sportsmen.

Conflict of interests

The author declares that there is no conflict of interests.

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SPECIAL SPEED-POWER TRAINING AS THE BASIS OF TECHNICAL SKILLFULNESS IMPROVEMENT IN SPORT AEROBIC

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Abstract. *Purpose:* to theoretically work out and experimentally substantiate effectiveness of authors' methodic of speed-power qualities' training in sport aerobic. *Material:* 20 sportsmen participated in the research: boys and girls of 8-12 years' age. Assessment of speed-power fitness was conducted by results of commonly accepted tests, applied in sport practice. *Results:* we have developed complexes of jump exercises, which envisage varying of conditions of exercises' fulfillment at the account of pushing conditions (jumps in depth, jumps over obstacles and jumps on elevated platforms). When fulfilling jumps in motion the main was achievement of maximal height with fixing of jump's form in flight. *Conclusions:* we offer six complexes of exercises for speed-power training in sport aerobic. These complexes are recommended to be fulfilled at the end of preparatory part of training session during 15–20 minutes.

Key words: aerobic, speed, power, training.

Introduction

As kind of sports, sport aerobic has been formed and constantly improved for many years. Analysis of competition programs and compositions' content of recent years showed that arsenal of this kind of sports contains push ups, pressing ups, turns, splits, waving, and combinations of aerobic choreographic movements [3−5, 11, and 12, 16–20].

Jumps are one of the brightest elements in sport aerobic and, at the same time, one of the most difficult exercises. Ability to correctly fulfill jumps to large extent determines sportsmen's skillfulness. It can be assumed that quantity of jumps in competition compositions can increase and sportsmen's exercises will become more various [1; 9, 13, 14].

High requirements to jumps' fulfillment in sports aerobic dictate demand in working out of appropriate methodic of their perfection. Unfortunately in scientific-methodic literature on sport aerobic there have not been clear recommendations on jumps' improvement. It is usually mentioned that they shall be fulfilled "beautifully", with extreme height and fixing of jump's form in flight. Also, it is noted that sportsmen's physical condition shall be at high level [3−5, 11, 12, 21–25].

Scientific researches have proved [1, 9, 13, 14], that with fulfillment of any complex jump all actions are concentrated in pushing up phase. In this phase sportsman's speed-power qualities are manifested to the fullest extent. Therefore low level of speed-power qualities will retard improvement of jumps' technique. Thus, methodic of training of these qualities in sport aerobic needs careful review and scientific substantiation.

Purpose, tasks of the work, materaials and methods

The purpose of the work is to theoretically work out and experimentally substantiate effectiveness of authors' methodic of speed-power qualities' training in sport aerobic.

The tasks of the research:

1. To work out complexes of jump exercises for training of sportsmen's speed-power qualities (sportsmen's practicing sport aerobic).

2. To experimentally substantiate effectiveness of the offered methodic.

Material and methods of the research: for solution of the set tasks we used complex of research methods: pedagogic methods (analysis and generalization of scientific research literature data, pedagogic observation, pedagogic testing); methods of mathematical statistic.

The researches were conducted on the base of CJSS № 13 in Kharkov. In experimental part 20 sportsmen participated; boys and girls of 8-12 years' age. Pedagogic experiment with participation of two groups of sportsmen (control, n=10; main, n=10) was being carried out during year. Control group was trained by traditional methodic.

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The trainings included jumps from choreographic positions, jumps of different structural groups, skipping. Main group fulfilled work by volume and intensity adequate to work of control group. This work included special jump exercises and techniques, which permitted to purposefully train and improve jump ability by authors' methodic.

We offer sic specially worked out, theoretically substantiated and tested complexes of exercises for speed-power qualities in sport aerobic. These complexes are recommended to be fulfilled at the end of preparatory part of training session, when 15-20 minutes are assigned for jumps.

Complexes №1, №2 and №3 consist of special auxiliary jumps and main jumps of different structural groups.

Special auxiliary jumps are complexes of four-six easy jump combinations. These jumps prepare legs' muscles for definite working mode of different pushes. The main in their fulfillment is condition of the so-called in practice "quick retreat", i.e. very quick strong push off. Every combination shall be repeated two-three times.

Jumps of different structural groups are fulfilled with weight, equal to 3–4% from own weight. Such weight does not violate the structure of main exercise. With it effect of combined interaction of physical and technical fitness is achieved. When fulfilling these jumps the main is achievement of maximal height with fixation of jump form in flight. It can be achieved with the help of visible bench marks. They can be lamps, windows, mirrors, specially drawn lines on walls, suspended subjects and so on.

Complexes №4, №5 and №6 consist of jump exercises of special speed-power orientation. They shall be fulfilled at the end of main part of training session during 15-20 minutes.

The presented complexes stipulate varying of conditions of exercises' fulfillment at the account of changes of push off conditions (jumps in depth, jumps over obstacles and jumps on elevated platforms). Effectiveness of jumps in depth, followed by high jump, was showed in special researches. Jumps in depth were chosen also because they are exercises of special speed-power training. It is connected with the fact that in most cases pushing off in sport aerobic jumps is usually fulfilled after jump or pounce. Effectiveness of jumps over obstacles and on elevated platform also has been proved in many researches. Such jumps facilitate tension of hip and knee joints' extensors and ankle joint's flexors [2, 6, 7, 13, and 14].

Fulfillment of recommended complexes does not increase total time of training, does no change its structure and does not exceed usual quantity of jumps at training. It permits to increase effectiveness of training process.

For assessment of technical fitness dynamic and level we chose the following control exercises:

1. Jump with changing of legs in front
   C832 − (scissors kick) value 0.2 points;
2. From sagittal balance jump in lying position, on hands
   C222 − (sagittal scale airborne to push up) value 0.2 points;
3. Jump with turn by 360°
   C103 − (air turn) value 0.3 points;
   Tuck jump to split
   C273 − (tuck jump to split) value 0.3 points;
4. Pike jump
   C434 − (pike jump) value 0.3 points;
5. Straddle jump
   C553 − (straddle jump) value 0.3 points;
6. Split leap
   C673 − (split leap) value 0.3 points;
   Switch split leap
   C754 − (switch split leap) value 0.4 points;
   7. ½ turn Cossack jump
   C344 − (½ turn Cossack jump) value 0.4 points;
   8. *C645 − ½ turn frontal split jump to frontal split, value 0.5 points;*

The tasks for determination of technical fitness level were selected and composed on the base of sport literature analysis and specificities of sport aerobic [8, 10−12, 15].

Assessment of speed-power fitness was realized by results of commonly accepted tests, applied in sport practice [8, 10, and 15]:

1. Long jump from the spot (cm);
2. High jump from the spot (cm);
3. Squatting during 20 sec. (times);
4. High jumps bending from deep squat during 20 sec. (times);
5. Torso rising in sitting position from lying position during 20 sec. (times);
6. Alternate legs' kicks during 20 sec. (times);
7. Run on the spot during 5 sec. (times);
8. Jumps on one leg during 10 sec. (times);
9. Legs' rising in hanging position during 10 sec. (times);
10. Torso rising from lying position (face downwards) during 10 sec. (times);

Results of research

Testing results showed that realization of authors' methodic influences positively on sportsmen's technical fitness.

During experiment we observed in main group improvement of indicators: "torso rising in sitting position" (increment 14.2%), "run on the spot 5 sec." (increment 13.08%), "alternate legs' kicks" (increment 11.8%), "squatting" (increment 10.41%). Especially it is necessary to stress that dynamic of these indicators' progressing was uniform from the beginning and to the end of experiment by all indicators. It witnesses about correct and effective choice of training means and methods for this kind of sports (see table 1).

Table 1. Changes in speed-power and technical fitness in main and control groups (p <0,05)

№	Tests	Main group (*n*=10)				Control group (*n*=10)			
		ID* ($\overline{X}$ ±m)	FD	abs.	%	ID* ($\overline{X}$ ±m)	FD	abs.	%
Speed-power fitness									
1	Long jump from the spot (cm)	156±0,4	163±0,3	7	4,2	157±0,6	160±0,5	7	4,2
2	High jump from the spot (cm)	22,7±0,8	25,2±0,6	2,5	9,9	23,2±0,9	24,8±0,5	1,6	6,4
3	Squatting for 20 sec. (times)	25,8±0,9	28,8±0,7	3	10,41	25,5±0,7	27,9±0,5	2,4	8,6
4	High jumps bending from deep squat during 20 sec. (times)	18,3±1,1	20,2±0,9	1,9	9,4	18,0±1,4	19,8±1,1	1,8	9,0
5	Torso rising in sitting position from lying position during 20 sec. (times)	15,7±1,5	18,3±1,0	2,6	14.2	15,5±1,8	18,5±1,7	2,0	10,8
6	Alternate legs' kicks during 20 sec. (times)	13,4±0,9	15,2±0,7	1,8	11,8	13,3±0,8	15,0±0,5	1,7	11,3
7	Run on the spot, 5sec. (times)	16,6±0,7	19,1±0,4	2,5	13,08	16,7±0,9	18,9±0,6	2,2	11,6
8	Jumps on one leg during 10 sec. (times)	4,0±1,6	4,6±1,2	0,6	13,8	3,7±1,8	4,0±1,3	0,3	7,5
9	Legs' rising in hanging position during 10 sec. (times)	3,3±1,9	3.6±1,6	0,3	8,3	3,2±1,8	3,4±1,7	0,2	5,8
10	Torso rising from lying position (face downwards) during 10 sec. (times)	12,4±0,9	14,2±0,6	1,8	12,67	12,5±0,8	14,0±0,8	1,5	10,7
Technical fitness									
11	Scissors kick	0,17±1,0	0,19±0,7	0,02	10,5	0,18±1,2	0,2±0,9	0,02	10,0
12	*Sagittal scale airborne to push up* Из	0,17±2,1	0,2±1,9	0,03	10,0	0,14±1.9	0,15±1,8	0,01	6,6
13	Jump with turn by 360°	0,28±1.4	0,29±1.0	0,02	6,6	0,28±1,3	0,29±1,1	0,01	3,44
14	Tuck jump to split	0,26±1.2	0,29±0,8	0,03	10,34	0,25±0,9	0,27±0,7	0,02	7,4
15	Pike jump	0,15±1,1	0,17±1,0	0,02	11,7	0,14±1,6	0,14±1,4	0,00	0,00
16	Pike jump, bending, legs apart (points)	0,18±1,6	0,21±1,2	0,03	14,2	0,15±1,8	0,16±1,5	0,01	6,25

17	Jump in split with push by one leg (points)	0,2±1,0	0,23±0,7	0,03	13,04	0,2±0,9	0,21±0,8	0,01	4,8
18	Switch split leap (points)	0,12±2,1	0,1±1,9	0,01	7,7	0,11±2,2	0,11±2,0	0,00	0,00
19	½ turn Cossack jump (points)	0,3±1,7	0,31±1,5	0,02	6,25	0,3±1,9	0,31±1,6	0,01	3,22
20	½ turn frontal split jump to frontal split (points)	0,2±2,6	0,21±2,3	0,01	4,76	0,2±2,8	0,21±2,5	0,01	4,7

***Notes: ID** – initial data (taken at the beginning of experiment);
FD – final data (taken at the end of experiment);
(abs.) – absolute difference; **(%)** – increment of indicators.

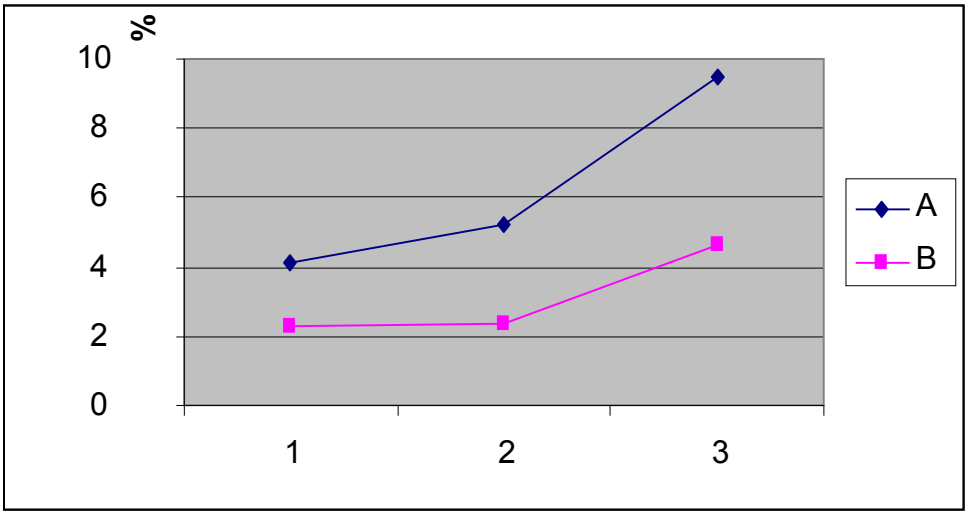

Fig.1. Dynamic of increment of technical fitness indicators in main and control groups: A – main group; B – control group; % – increment in %.

In fig. 1 we give dynamic of trainees' technical fitness indicators (sport aerobic) in main and control groups.

Change of integral indicators by tested technical fitness indicators in two groups' witnesses about positive tendencies in main group sportsmen's technical fitness. By the end of first control testing (after 6 months) increment of technical fitness indicators in main group was: 3.87%, by the end of second half of year – 6.89% and for all period of experiment – 10.76%.

As far as integral indicator in control group concerns it was: 4.64%;' after 6 months of trainings - 2.31% and after second half of year – 2.33%. It witnesses about uniform growth of sportsmanship and insignificant changes in this group, comparing with main group.

Comparing of initial and final data witnesses about effective influence of offered by us experimental methodic on technical fitness indicators of main group sportsmen.

Discussion

Analysis of scientific-methodic literature showed a number of works, devoted to training of speed-power qualities of sportsmen [1, 2, 6, 9, and 13]. Basing on analysis and generalization of our research's results we supplemented and expanded the data of other authors [3−5, 11−14, 26–28] about choosing of means and methods for improvement speed-power qualities as well as about dosing of load in sport aerobic training process.

For the first time we developed complexes of jump exercises for development of sportsmen's speed-power qualities in sport aerobic, which stipulate varying exercises' fulfillment at the accounts of changes of push off conditions. We worked out and experimentally substantiated methodic of speed-power training in sport aerobic, which ensured higher rates of increment of sportsmen's technical fitness.

Conclusion

We developed complexes of jump exercises for development of sportsmen's speed-power qualities in sport aerobic, which stipulate varying exercises' fulfillment at the accounts of changes of push off conditions (jumps in

depth, jumps over obstacles and jumps on elevated platform). Application of these complexes permitted to increase effectiveness of training process and trainees' sportsmanship without increasing of total time of training, without change of its structure and without increasing usual quantity of jumps in training session.

Application of authors' methodic of speed-power training in sport aerobic ensured higher rates of increment of sportsmen's technical fitness.

In the future our researches will be oriented on working out of multi media programs for perfection of jumps' technique in sport aerobic.

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Conflict of interests

The authors declare that there is no conflict of interests.

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SIMULATION OF MORPHOLOGICAL-FUNCTIONAL PROFILES OF ELITE SPORTSMEN, WHO SPECIALIZE IN BREASTSTROKE SWIMMING AT DIFFERENT DISTANCES

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Abstract. *Purpose:* development of morphological functional models of elite sportsmen, specializing in breaststroke swimming at different length distances. *Material:* in the research 25 swimmers –finalists of Championships and Cups of Ukraine in breaststroke at distances of 50, 100 and 200 meters participated. *Results:* it was found that sportsmen's morphological-functional profile has its peculiar features. It was determined that degree of morphological-functional indicators' correlation with sport result depends on change of competition distance length. With increasing of competition distance length the role of vital capacity of lungs' indicators increase as well as body length, shin length, width of hand. In its turn significance of circumferential body sizes, foot width and heart beat rates (in lying position for 10 sec.) reduces. *Conclusions:* determination of sportsman's individual characteristics' correspondence to morphological-functional status can permit to correctly choose distance specialization of swimmer and open his potentials to the fullest.

Key words: breaststroke, sportsmen, distances, morphological-functional characteristics, interconnection, model.

Introduction

Modern level of swimming dictates need in seeking gifted sportsmen, who could be able to achieve world level results. It can be possible only under condition of selection and orientation system's correspondence to min components of competition functioning structure and to swimmers' special fitness. It permits to realize choice of distance length, which would maximally meet individual characteristics of every swimmer [3, 9, 13, 17–21].

Significant role in system of sport orientation is played by morphological functional indicators [2, 4, 7, and 14]. In order to prognosticate correctly future sport achievements of a swimmer it is necessary to assess his potentials, meaning body constitution, functional characteristics and etc.

As many years practice has shown sportsman's not compliance even with only one indicators of model profile forces him to compensate this not compliance at the account of other systems. Such compensation forces organism to be in extreme tension. It, in its turn, results in exhaustion of his reserves and finally in different chronic diseases. In this connection it became obvious that the more individual corresponds to sport model of functioning and the less is level of limiting factors, the higher is reliability of biological system and the longer is sport longevity [7].

In sport swimming (since 70-s of the past century) great attention has been paid to model characteristics with usage of anthropometric data [1]. As a result of multiple researches, in scientific-methodic literature there appeared rather fully worked out models of sportsmen, who perform in different swimming styles [3, 5, 7, 10, 11, 12, 22–25]. Specialists proved that compliance of sportsmen with their genetically determined morphological-functional indicators of definite specialization significantly increases effectiveness of training process and improves sport result [5, 6, 8, 15, 26–29].

As on to day there have been still a number of aspects, requiring careful attention and profound study. For example, there is a demand in more careful research of parameters of sportsmen, specializing in different swimming styles at different distances. Besides, constant growth of sport achievements and changing training methodic require constant correction of earlier developed model characteristics.

Purpose, tasks of the work, material and methods

The purpose is to work out morphological functional models of elite sportsmen, specializing in breaststroke swimming at different length distances

As the main *tasks of the research* we formulated the following:

1. To determine degree of morphological-functional indicators' correlation with sport result in breaststroke swimming at different distances.
2. To work out model morphological-functional characteristics of sportsmen, specializing in breaststroke swimming at 50, 100 and 200 meters' distances.

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The researches were conducted in periods of Championships and Cups of Ukraine in swimming since 2012 to 2015.

In the research swimmers, specializing in breaststroke at distances of 50, 100 and 200 meters participated. Total quantity of the tested was 25 persons. All sportsmen were of high class.

Results of the researches

Analysis of 34 morphological-functional parameters permitted o build model of breaststroke swimmer independently on his distance specialization (see fig.1).

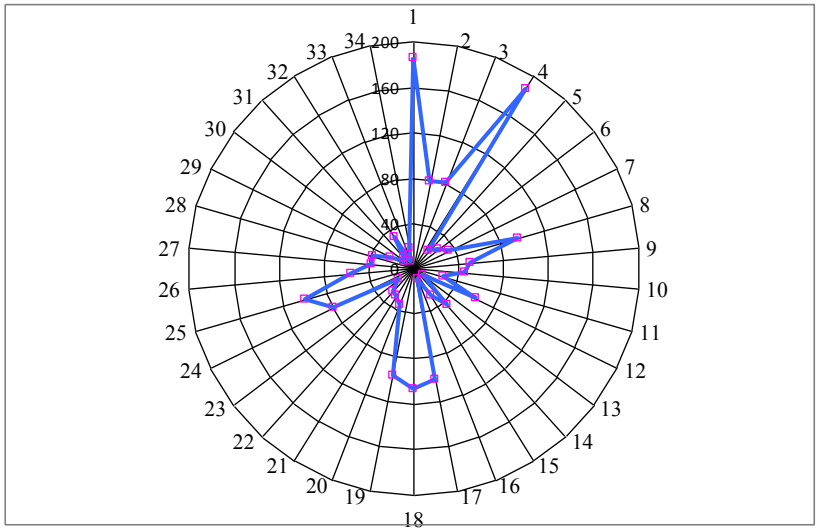

Fig.1. Morphological-functional profile of sportsemn, specializing in breast stroke swimming:
1 – body length (cm), 2 – body weight (kg), 3 – arm's length (cm), 4 – arm span (cm), 5 – hand's length (cm), 6 – length of forearm (cm), 7 – length of shoulder (cm), 8 – length of leg (cm), 9 – length of hip (cm), 10 – length of shin (cm), 11 – length of foot (cm), 12 – torso length (cm), 13 – width of foot (cm), 14 – width of shoulders (cm), 15 – width of pelvis (cm), 16 – width of hand (cm), 17 – circumference of chest in rest (cm), 18 – circumference of chest in inhale (cm), 19 – circumference of chest at exhale (cm), 20 – circumference of tensed arm (cm), 21 – circumference of relaxed arm (cm), 22 – circumference of forearm (cm), 23 – circumference of wrist (cm), 24 – circumference of waist (cm), 25 – circumference of buttocks (cm), 26 – circumference of hip (cm), 27 – circumference of knee (cm), 28 – circumference of shin (cm), 29 – circumference of ankle (cm), 30 – heart beats rate (HBR), in lying position during 10 seconds, (beats), 31 – ЧСС в покое за 10 с (уд), 32 – HBR after load during 10 seconds (beats), 33 – vital capacity of lungs (VCL) (l), 34 – forward bents (cm).

The received morphological-functional profile of sportsmen complies with available literature data [1, 3, 5, and 16]. As we can see in fig.1, higher values of hip and buttocks' circumferences, higher body weight, average circumference of upper limbs are most characteristic for breaststroke swimmers. The sportsmen of this specialization have relatively not long body, have long "dry" shin, long foot and so on.

We put forward a hypothesis that significance of one and the same morphological-functional indicators at 50, 100, and 200 meters' distances is different in breaststroke swimming. We conducted correlation analysis. On the base of the received data we constructed petal diagrams (see figs. 2, 3, 4).

As we see in fig.2, at 50 meters' distance the most important are he following parameters: circumference of relaxed arm (r = 0.91); width of foot (r = 0.84); circumference of buttocks, knee, wrist, forearm, shin and waist ((r is respectively 0.77, 0.73, 0.73, 0.69, 0.64, 0.54); HBR in lying position for 10 sec. 10 c (r = 0.61); length of arm, foot, shoulder (accordingly 0. 58, 0.56, 0.53); width of pelvis (r = 0,56); HBR after load during 10 seconds (r = 0.53).

In its turn at 100 meters' distance for breaststroke the most important parameters are: circumference of forearm, shin, waist and arm (in relaxed state) (r is respectively 0.73, 0.52, 0.52 and 0.46); VCL (r = 0.6); HBR after load during 10 seconds (r = 0.6); width of pelvis (r = 0.5) and width of foot (r = 0.49) (see fig. 3).

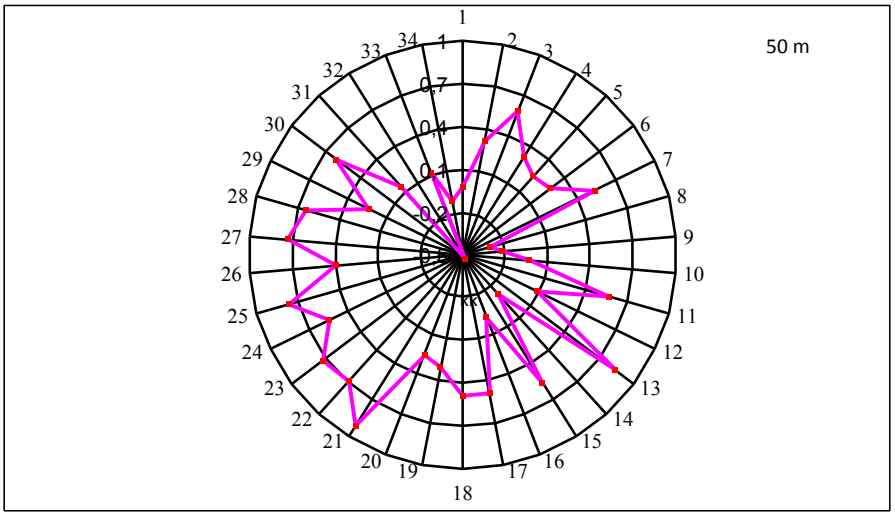

Fig.2. Correlation of elite sportsmen's morphological functional indicators with results of 50 meters' breaststroke: 1 – body length (cm), 2 – body weight (kg), 3 – arm's length (cm), 4 – arm span (cm), 5 – hand's length (cm), 6 – length of forearm (cm), 7 – length of shoulder (cm), 8 – length of leg (cm), 9 – length of hip (cm), 10 – length of shin (cm), 11 – length of foot (cm), 12 – torso length (cm), 13 – width of foot (cm), 14 – width of shoulders (cm), 15 – width of pelvis (cm), 16 – width of hand (cm), 17 – circumference of chest in rest (cm), 18 – circumference of chest in inhale (cm), 19 – circumference of chest at exhale (cm), 20 – circumference of tensed arm (cm), 21 – circumference of relaxed arm (cm), 22 – circumference of forearm (cm), 23 – circumference of wrist (cm), 24 – circumference of waist (cm), 25 – circumference of buttocks (cm), 26 – circumference of hip (cm), 27 – circumference of knee (cm), 28 – circumference of shin (cm), 29 – circumference of ankle (cm), 30 – heart beats rate (HBR), in lying position during 10 seconds, (beats), 31 – ЧСС в покое за 10 с (уд), 32 – HBR after load during 10 seconds (beats), 33 – vital capacity of lungs (VCL) (l), 34 – forward bents (cm).

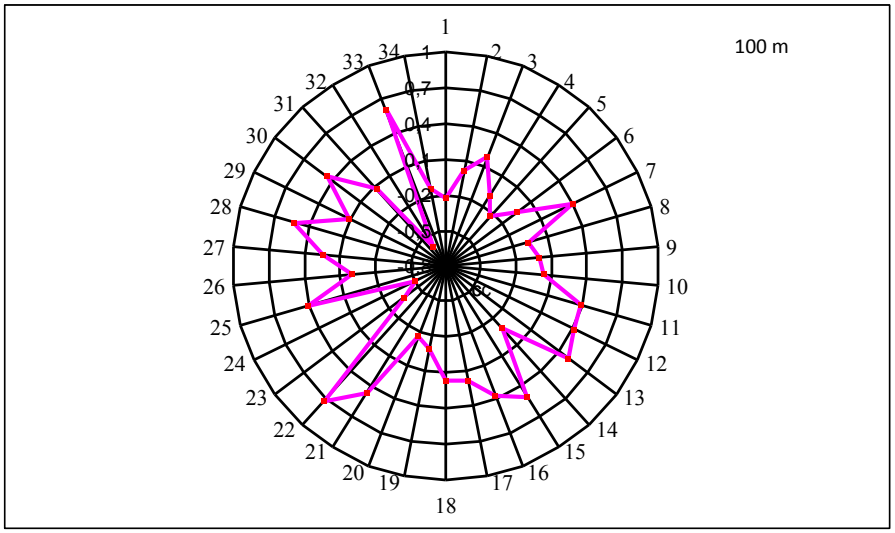

Fig. 3. Correlation of elite sportsmen's morphological functional indicators with results of 100 meters' breaststroke:
1 – body length (cm), 2 – body weight (kg), 3 – arm's length (cm), 4 – arm span (cm), 5 – hand's length (cm), 6 – length of forearm (cm), 7 – length of shoulder (cm), 8 – length of leg (cm), 9 – length of hip (cm), 10 – length of shin (cm), 11 – length of foot (cm), 12 – torso length (cm), 13 – width of foot (cm), 14 – width of shoulders (cm), 15 – width of pelvis (cm), 16 – width of hand (cm), 17 – circumference of chest in rest (cm), 18 – circumference of chest in inhale (cm), 19 – circumference of chest at exhale (cm), 20 – circumference of tensed arm (cm), 21 – circumference of relaxed arm (cm), 22 – circumference of forearm (cm), 23 – circumference of wrist (cm), 24 – circumference of waist (cm), 25 – circumference of buttocks (cm), 26 – circumference of hip (cm), 27 – circumference of knee (cm), 28 – circumference of shin (cm), 29 – circumference of ankle (cm), 30 – heart beats

rate (HBR), in lying position during 10 seconds, (beats), 31 – ЧСС в покое за 10 с (уд), 32 – HBR after load during 10 seconds (beats), 33 – vital capacity of lungs (VCL) (l), 34 – forward bents (cm).

200 meters' results correlate to the fullest extent with the following indicators: VCL (r = 0.87); width of hand (r = 0.64); length of torso, shin, foot, forearm and arm (r is 0.55, 0.54, 0.52, 0.48, and 0.46 respectively); width of foot and pelvis (r = 0.51); circumference of waist (r = 0,5) (see fig. 4).

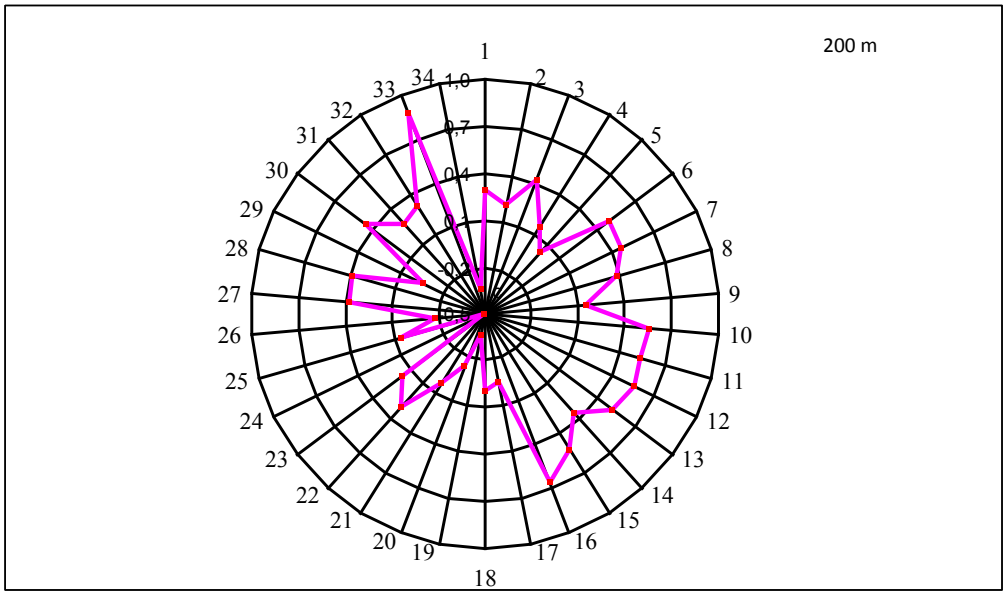

Fig. 4. Correlation of elite sportsmen's morphological functional indicators with results of 200 meters' breaststroke:
1 – body length (cm), 2 – body weight (kg), 3 – arm's length (cm), 4 – arm span (cm), 5 – hand's length (cm), 6 – length of forearm (cm), 7 – length of shoulder (cm), 8 – length of leg (cm), 9 – length of hip (cm), 10 – length of shin (cm), 11 – length of foot (cm), 12 – torso length (cm), 13 – width of foot (cm), 14 – width of shoulders (cm), 15 – width of pelvis (cm), 16 – width of hand (cm), 17 – circumference of chest in rest (cm), 18 – circumference of chest in inhale (cm), 19 – circumference of chest at exhale (cm), 20 – circumference of tensed arm (cm), 21 – circumference of relaxed arm (cm), 22 – circumference of forearm (cm), 23 – circumference of wrist (cm), 24 – circumference of waist (cm), 25 – circumference of buttocks (cm), 26 – circumference of hip (cm), 27 – circumference of knee (cm), 28 – circumference of shin (cm), 29 – circumference of ankle (cm), 30 – heart beats rate (HBR), in lying position during 10 seconds, (beats), 31 – ЧСС в покое за 10 с (уд), 32 – HBR after load during 10 seconds (beats), 33 – vital capacity of lungs (VCL) (l), 34 – forward bents (cm).

Having analyzed the change of the marked indicators' significance, we received the following picture (see table 1).

Table 1. Significance of breaststrokers' morphological functional indicators, depending on competition distance length

№	Indicators	Correlation of parameter with sport result (r)		
		50 m	100 m	200 m
1	Circumference of relaxed arm	0.91	0.46	0.03
2	Foot width	0.84	0.49	0.51
3	Circumference of buttocks	0.77	0.41	0.05
4	Circumference of knee	0.73	0.24	0.37
5	Circumference of waist	0.73	0.36	0.16
6	Circumference of forearm	0.69	0.73	0.30
7	Circumference of shin	0.64	0.52	0.38
8	HBR in lying position for 10 sec.	0.61	0.45	0.44

№	Indicators	Correlation of parameter with sport result (r)		
		50 m	100 m	200 m
9	Arm length	0,.58	0.19	0.41
10	Foot length	0.56	0.38	0.52
11	Width of pelvis	0.56	0.50	0.51
12	Circumference of waist	0.54	0.52	0.50
13	Length of shoulder	0.53	0.38	0.46
14	HBR after load during 10 seconds	0.53	0.60	0.30
15	VCL	0.12	0.60	0.87
16	Torso length	0.08	0.41	0.55
17	Width of hand	0.03	0.37	0.64
18	Shin length	0.03	0.03	0.54
19	Forearm length	0.27	0.05	0.48

As we can see in table 1, all regarded indicators can be conventionally divided into four groups:

1) Parameters, which increase their influence on result with increasing of distance length (VCL, torso length, shin length, width of hand);
2) Indicators, whose role reduces with increasing of distance length (circumference of shoulder, buttocks, wrist, forearm, shin, width of foot, HBR in lying position for 10 sec.);
3) Criteria, influence of which on result does not change with change of distance length (width of pelvis, circumference of waist);
4) Indicators, correlation of which with results of 50, 100 and 200 meters' distance, have waving character (circumference of knee, length of arm, foot, shoulder and forearm, HBR after load during 10 seconds).

Thus, morphological functional profiles of sportsmen – breaststrokers at 50, 100 and 200meters' distances have peculiar features.

On the base of analysis of the received numerical material we worked out model morphological-functional characteristics of breaststroke swimmers, who perform at different distances (see tables 2, 3, 4).

The created model characteristics can serve as bench marks of morphological-functional status, correspondence to which will permit to correctly choose sportsman's distance specialization and open his potentials to the fullest.

Table 2. Model morphological-functional characteristics for 50 meters' breaststrokers

Length of arm (cm)	Length of shoulder (cm)	Length of foot (cm)	Width of foot (cm)	Width of pelvis (cm)	Circumference of relaxed arm (cm)	Circumference of forearm (cm)	Circumference of wrist (cm)	Circumference of waist (cm)	Circumference of buttocks (cm)	Circumference of knee (cm)	Circumference of shin (cm)	HBR in lying position for 10 sec. (beats)	HBR after 10 sec. Load (beats)
81.2	34.5	27.6	10.6	28	30.1	27.2	16.7	78.7	98.5	37.2	37.3	9.9	30.1

Table 3. Model morphological-functional characteristics for 100 meters' breaststrokers

Width of foot (cm)	Width of pelvis (cm)	Circumference of relaxed arm (cm)	Circumference of forearm (cm)	Circumference of waist (cm)	Circumference of shin (cm)	HBR after 10 sec. Load (beats)	VCL (l)
10.6	28.1	29.3	27.4	78	37.2	31.1	6.4

Table 4. Model morphological-functional characteristics for 200 meters' breaststrokers

Length of forearm (cm)	Length of shoulder (cm)	Length of shin (cm)	Length of foot (cm)	Torso length (cm)	Width of foot (cm)	Width of pelvis (cm)	Width of hand (cm)	Circumference of waist (cm	VCL (l)
27.8	34.9	45.2	27.6	61.1	10.9	29	10.8	79.4	6.3

Discussion

Analysis of scientific-methodic literature permitted to come to conclusion that selection and orientation systems shall be based on the whole complex of indicators. Among these indicators important role is played by morphological-functional parameters of sportsmen [1, 4, 5, 7, and 12].

In works by N.Zh. Bulgakova et al., V. Yu. Davydov, V. N. Platonov et al., it is noted that sportsmen of different swimming styles have their peculiar features of morphological-functional development. The conducted by us researches confirm the data about significance of longitudinal and circumferential sizes of body, as well as indicators of functional status for achievement of high results in breaststroke swimming.

The authors of this article have supplemented information about role of morphological-functional indicators, depending on competition distance length for breaststrokers. Besides, we worked out model morphological-functional characteristics, which can help in choosing of sportsmen's distance specialization.

Conclusions:

1. At modern stage of swimming development one of promising direction in perfection of selection and orientation systems is creation of model characteristics of sportsmen, specializing in different swimming styles at different distances.
2. Degree of elite sportsmen's morphological-functional indicators' correlation with sport results at 50, 100, and 200 meters' distances of breaststroke is different. With increase of competition distance length, role of VCL, torso length, shin length, width of wrist indicators also increases. In its turn significance of body circumferential sizes, foot width and HBR in lying position for 10 sec. reduces.
3. Morphological-functional profiles of breaststroke at different distances sportsmen have their own peculiar features.
4. Determination of sportsman individual characteristics' correspondence to morphological-functional status will permit to correctly choose distance specialization of swimmer and to open his potentials to the fullest extent.

The prospects of further researches imply working out of model psycho-physiological and technical-tactic characteristics of breaststroke swimmers, specializing in distances of different length.

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Conflict of interests

The authors declare that there is no conflict of interests.

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ANALYSIS OF VEGETATIVE HOMEOSTASIS STATE OF ELITE HANDBALL PLAYERS

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Abstract. *Purpose:* to study characteristics and dynamic of elite handball players' physiological indicators. *Material:* In experiment elite handball players (n=112, age 18–35 years) participated. For determination of vegetative homeostasis state we analyzed variability of heart rhythm. The researches were conducted in laboratory conditions in rest state, in lying position during 5 minutes. *Results:* it was found that organism's adaptation reactions to training loads go with different tension of regulation systems. At the end of competition period there appears hyper-kinetic syndrome. It witnessed insufficiency of means, which permit to maintain optimal regulation of cardio-vascular system and increase its functional potentials. *Conclusions:* indicators of cardio-vascular system and their dynamic w3itnessed maintaining of high level of handball players' organism hemodynamic provisioning. High level of vegetative homeostasis pointed at certain degree of sportsmen's fitness. Such state is sufficient for preservation of high potential of sympathetic –adrenaline system and overcoming of fatigue processes.
Key words: handball, stage, hemodynamic, variability, heart rhythm, fatigue.

Introduction

Extreme training-competition loads of modern sports result in disordering of organism's homeostasis and in substantial adaptation changes [3]. Considering it, it is important to conduct constant control of sportsman organism's functional state in training process [1]. The problem of its assessment is rather difficult and requires comprehensive examination of all organs and systems [4]. Min functional systems of work provisioning in training-competition process are central and periphery nervous systems, muscular skeletal apparatus. Demand in researches of psycho-physiological, vegetative and physical qualities of handball players and team is rather high. Its realization permits to rationally form and optimize it at different stages [7,11]. At the same time fragmentary character of such researches doe not permit to assess dynamic of changes of sportsmen's functional state to the fullest extent and to correct training process [5,14,20].

Medical biological provisioning of sport functioning is rather important in modern conditions. For assessment of physiological functions' vegetative regulation a number of specialists used method of heart rhythm variability (HRV), which is based on analysis of consequent RR-interval [3, 9]. This method permits to register disorders of neurohumoral balance; participation of sympathetic and para-sympathetic, nervous and humoral links in regulation of heart beats rhythm, degree of centralization of its control [19].

HRV was studied in different game kinds of sports: football [8,11], hockey [15], handball [10], and basketball [16]. All they include recording of telemetry data [18,20], which gives information about heart's response to physical loads. Such loads express great variability of intensity [17]. At the same time it points at energy value of fulfilled exercise [12]. It was found that at the end of competition stage, sportsmen had improvement of vegetative regulation of heart rhythm [13]. It witnesses about accumulation of significant portion of not corrected fatigue, which increases up the end of the mentioned period. All above said served pre-condition for our researches.

Purpose, tasks of the work, material and methods

The purpose of the research was to study characteristics and dynamic of elite handball players' vegetative homeostasis during year macro-cycle. In compliance with this purpose we solved the following *tasks:*

1. Studying of peculiar features and dynamic of cardio vascular system indicators in elite handball players during year macro-cycle.
2. Studying of characteristics and dynamic of elite handball players' vegetative homeostasis during year macro-cycle.

Materials and methods of the research: the research was conducted during year macro-cycle – at the beginning and at the end of preparatory stages; at the beginning and at the end of competition stages. In the research 112 elite handball players – participants of Ukrainian Supreme league (age – 18035 years) took part. For determination

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of vegetative homeostasis we analyzed variability of heart rhythm. The following indicators were calculated: mode (Mo, sec.), mode amplitude (AMo,%), variation range (dRR, m.sec.), standard deviation of full massive of cardio intervals (SDNN, m.sec.), index of regulatory systems' tension (IT, conv.un.). The research was conducted in laboratory conditions, in rest state, in lying position during 5 minutes.

Results of the research

Results of the research at the beginning of preparatory period witness about low and below average indicators of general physical workability and energy supply of organism. Chronotropic function of heart confidently reduced to the end of preparatory period (by 9%, P <0.05). Up to the beginning of competition period it passed to mode of functional sport bradycardia – reduction of heart beats rate (HBR) in comparison with beginning of preparatory period- by 17% (P <0. 01). Further stabilization was observed up to the end of competition period.

We registered 50% handball players, who have high level of myocardium functional activity, 35% – average, 15% – low. Be y level of heart muscle's metabolic reserve we did not receive any indicators. Relative indicator of myocardium's metabolic provisioning was normal in 97% of handball players. Electric cardiographic parameters of heart's functional state (assessed in 4 points by 5-points' scale) pointed at absence of maximal value. We registered single cases of arrhythmia, resulted from disorder of function of automaticity. They prevailed in preparatory period.

Recent time analysis of heart rhythm variability, owing to which we receive information about influence of vegetative nervous system and some humoral and reflex factors on work of heart, has been becoming more and more popular [5,10]. In the conducted research we registered single reduction of handball players' indicators. It pointed at disordering of vegetative nervous and cardio-vascular systems' interactions. The highest indicators of heart rhythm variability were received in most of sportsmen and it characterized higher para-sympathetic tonus. Analysis of heart rhythm variability at the beginning of preparatory period showed at balanced regulatory, vegetative mechanisms and reflects high centralization of heart rhythm regulation processes (see table 1).

Table 1. Indicators of vegetative regulation of elite handball players at different stages of the research (X±m)

Indicators	STAGES BPP	EPP	T bpp-epp, P	BCP	ECP	T bcp - ecp, P	T bpp - bcp, P	T epp-bcp, P	T epp - ecp, P
Mo, m.sec	968,67± 165,84	1052,34± 177,76	0,34 P>0,05	1140,85± 182,45	1080,79± 166,92	0,24 P>0,05	0,70 P>0,05	0,35 P>0,05	0,12 P>0,05
AMo,%	34,45± 3,16	30,18± 2,45	1,07 P>0,05	28,42± 2,28	32,44± 3,26	1,01 P>0,05	1,55 P>0,05	0,53 P>0,05	0,55 P>0,05
SDNN, m.sec	82± 5,55	80±4,63	0,28 P>0,05	78± 5,12	80± 5,67	0,26 P>0,05	0,53 P>0,05	0,29 P>0,05	0,00 P>0,05
dRR, m.sec	348,36± 86,14	336,22± 112,24	0,09 P>0,05	324,64± 106,44	332,47± 128,54	0,05 P>0,05	0,17 P>0,05	0,07 P>0,05	0,02 P>0,05
IT, conv.un.	55,12± 34,86	58,34± 52,92	0,05 P>0,05	64,97± 46,72	60,86± 28,46	0,08 P>0,05	0,17 P>0,05	0,09 P>0,05	0,04 P>0,05

Notes: BPP – beginning of preparatory period; EPP – end of preparatory period; BCP- beginning of competition period; ECP – end of competition period; * – P<0,05; *** – P<0,001

The most probable level (in physiological sense of cardio-vascular system's functioning) of handball players' Mo permitted to assess actual state of regulation systems. Minimal value of indicator was observed at the beginning of preparatory period and maximal – at the end.

Mode amplitude (Амо) reflects stabilizing effect of centralization of heart rhythm control, which is conditioned by degree of activation of vegetative nervous systems's sympathetic sector. It reflects level of rhythm's rigidness. Single increase of AMo witnessed prevalence of sympathetic influences on sinus node and significant rigidness of rhythm.

SDNN is an integral indicator, which characterizes variability of heart rhythm. It depends on influence of vegetative nervous system's sympathetic and para-sympathetic sectors on sinus node. We registered separate cases of maximal upper indicators of norm that pointed at increase of para-sympathetic activity of vegetative nervous system.

In 15% of handball players we registered substantial increase of SDNN that witnessed about increased activity of autonomous regulation circuit. Total effect of vegetative regulation of SDNN blood circulation (reflecting all periodical components of variability of total BCP indicators) also reduced from 82m.sec. to 78 m.sec. Indicator SDNN showed trend to reduction in process of training micro-cycle. For example, at the beginning of preparatory period we received 82±5.55 m.sec.; at the beginning of competition period it was 78±5.12 m.sec.; by the end of competition period we observed insignificant increase of SDNN up to 80±5.67 m.sec.

The same changes at the stages of the research were observed in indicator dRR. At the beginning of preparatory period it was 348.36±86.14 m.sec., at the beginning of competition period – 324.64±106.44 m.sec; at the end of competition period numerical value of dRR was 332.47±128.54 m.sec. Index of tension (IT) gives the fullest picture of tension of central mechanisms of regulation in adaptation to varying influences. It reflects degree of centralization of heart rhythm control. Index of tension showed increasing from stage to stage of macro-cycle up to 65 conv.un.

Discussion

In our researches we confirmed the data, which were analyzed in works by Barbero-Alvarez, Buchheit [8,10]. At first stages of preparatory-competition processes we observed optimization of cardio-vascular system's work. It is reflected in hypotonic orientation of blood pressure dynamic that, partially, is considered in works [1, 6]. Transition to less energy consuming functional sport bradycardia and dynamic of indicators of central blood circulation volume reduced "loading heart by volume", though Kayacan Y. pointed at sympathetic balance with short term load [14]. At the end of competition period there occurs transition to hyper kinetic type of regulation and it was, to some extent, increase of heart chronotropic function's activity and overcoming of fatigue processes [3]. These effects confirmed rather high degree of elite handball players' fitness.

Conclusions:

1. Indicators of cardio-vascular system and their dynamic during all process of the research witnessed maintaining of high level of hemo-dynamic provisioning of elite handball players' organism.
2. High level of vegetative homeostasis pointed at certain level of sportsmen's fitness. Such state is sufficient for preservation of high potential of sympathetic adrenaline system and for overcoming of fatigue processes. The received data witness about demand in seeking of methods and means, which could correct and optimize sportsmen's functional potentials more successfully at competition stage.

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Conflict of interests

The authors declare that there is no conflict of interests.

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PROFESSIONAL SELF-ASSESSMENT OF FUTURE HEALTH BASICS TEACHERS AS PROFESSIONALLY IMPORTANT QUALITY

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Abstract. *Purpose:* to theoretically substantiate and experimentally test professional self-assessment of future health basics teachers as professionally important quality. *Material:* 152 students participated in experiment. *Results:* assessment of images "I am real", "I am student" and I am future professional" is rather high in most of students. The strength of these three images was assessed also approximately equally. But portion of average marks in indicator of image strength is much higher than in indicator of mark. Activity of three images differs a little and has significant quantity of average and high marks. Analysis of three main images' wholeness witnesses that students' self assessment is rather holistic. With it image "I am future professional" is formed on the base of image "I am student". Dynamic of images' self assessment witnesses that increasing of assessment and respect to image "I am future professional" depend on year of studying. Besides, assessment of strength and activity of this image also increases. *Conclusions:* in the process of studying students are oriented on professional formation as well as on formation of professionally important qualities, revelation of potential for self realization in the future. It was found that responsible attitude to professional functioning, future relations with children depend on self-assessment of formation.
Key words: teacher, health basics, professional self-assessment, professional, professional training.

Introduction

One of the most important tasks of modern education is training of high cultural level and mentality conscious personality, who would be able to independently take non standard decisions, to think creatively, flexibly respond to changes and create them by oneself. Formation of professionally important qualities directly depends on theoretical principles of specialists' professional training, which are elucidated in researches of G. Apanasenko [1], V. Gorashchuk [2], M. Gryniova [3], V. Cooks [7], O. Mukheyenko [8] et al. In their works scientists solved problems and specificities of formation of this profile specialist: functional duties of future health basics teachers; responsible attitude to own health and health of surrounding people in all its criteria; teacher's training for formation of pupils' knowledge of health basics and save life activity; complex of ideas and scientific principles, conditioned by conception of healthy life style. But professional self-assessment of future health basics teachers has not been opened completely.

The basis of professional self-assessment research is creation of dynamic and flexible educational environment, which would facilitate acquiring of the mentioned quality.

Purpose, tasks of the work, material and methods

The purpose of the article is to study professional self-assessment of future health basics teachers as professionally important quality.

Results of the research

Studying of self-assessment was conducted with the help of methodic "Personality's differential" [11, pg.236-237], which permits to determine mark, strength and activity of image. For assessment students were offered three images: "I am real", "I am student" and "I am future specialist".

Table 1. Level of self assessment of future health basics teachers through assessment of "I am real" image

Mark	Low	Average	High	χ^2	p
I am real	2	19	79	61.19	<0.0001
I am student	0	27	73	12.65	0.0004
I am future professional	0	18	82	25.81	<0.0001

As we can see self assessment is rather high by all images. With it, it is necessary to note that the highest self assessment reflects students' positive attitude to their professional future.

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Table 2. Wholeness of personality's images of future health basics teachers

Wholeness of images	Low	Average	High	χ^2	p
I and I am student	6	24	69	39.13	<0.0001
I and I am future professional	11	32	56	19	0.0001
I am student and I am future professional	2	23	76	54.42	<0.0001

Results of the researches show that only in 6% of students images I am real and I am student are disconnected and contradict each other. In 24% we did not noted wholeness of images. Most of students (69%) have high coincidence of images I am real and I am student. In images I am real and I am future professional quantity of contradictory cases is higher – 11%, and 32% of full absence of coincidence cases. Only in 56% of cases we registered wholeness of these images. Quantity of contradictions of images I am student and I am future professional – only 2%. It is the lowest indicator. Absence of coincidence of these images was found in 23% of cases. 76% of students have high coincidence of images I am student and I am future specialist.

Thus, role of student is closely connected with role of future professional. "I am real" is relatively less connected with role of future specialist. Judging by it, exactly qualities of student's social role form ideas about professional future.

Comparison of different years' students showed that assessments of "I am real" and "I am student" do not depend on year of study. However, image "I am future professional" has great distinctions, which depend on year of study.

Table 3. Comparison of mark, strength and activity of images of future health basics teachers

	1 year	2 year	3 year	F	p
Mark	4.78	5.04	5.23	7.58	0.0078
Strength	4.49	4.76	4.9	5.59	0.0213
Activity	4.21	4.61	4.52	5.08	0.0278

All three indicators of images' assessment increase from first to third year of study. It witnesses about gradual formation of "future professional" image though strengthening of respect to it, increasing of strength and activity of this image.

Wholeness of images does not depend on year of study. Thus, the process of study influences on assessment of image "I am future professional". But it does not influence on correlation of images.

Discussion

Research of professional self-assessment of future health basics teachers as professionally important quality witnessed, that future teachers would also be responsible to society for correctness of their actions. Results of our researches confirm and supplement the data of O.A. Dubaseniuk [4], N.A. Yermolayeva [5], M.D. Ilyazova [6]. The authors affirm that in period of studying students receive professional information about content and prospects of their profession as well as about forms and conditions of its mastering; state and demands of labor market; requirements and potentials of professional attitude and formation of professional self-assessment. Cognitive searching stage of future health basics teachers' professional self-assessment covers first year of study. It envisages formation of value orientation, motivation of self-cognition, orientation on own activity in professional self-determination; formation of self-assessment skills, self analysis for understanding of own professional orientation; consultations about future professional functioning.

Conclusions

Assessment of images "I am real", "I am student" and "I am future professional" is rather high in most of students. The strength of these three images is also assessed approximately equally. But part of average marks in indicator of strength I much higher than in indicators of assessment. Activity of three images differs a little and has significant quantity of average and high marks. Analysis of wholeness of these three images shows, that students' self-assessment distinguishes by high wholeness. With it image "I am future professional" is formed on the base of image "I am student". Dynamic of image self-assessments witnesses that there is increase of respect to image "I am future professional", depending on year of study. Besides, assessment of strength and activity of this image also increases.

The prospects of further researches imply determination of future health basics teachers' professional formation through professional responsibility and formation of creative thinking as professionally significant qualities.

Conflict of interests

The author confirms that there is no conflict of interests.

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SPECIFIC FEATURES OF COMPETITION FUNCTIONING OF MARTIAL ARTS ELOTE SPORTSMEN

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Abstract. *Purpose:* to study competition functioning of martial arts elite sportsmen. *Material:* we analyzed 33 competition duels, studied specific features of application of 917 technical tactic actions by sportsmen. We used analysis of video-records of competition duels at All-Ukrainian competitions. *Results:* it was found that modern martial arts are very dynamic kinds of sports. Victory is won usually by versatile sportsmen, who can quickly to re-construct in the course of duel and successfully use strike and wrestling techniques. Most of duels are won by points. Most of sportsmen compete in standing position, preferring striking technique: straight punches in head and side kicks in torso. It was also found that when using wrestling techniques in standing position, sportsmen prefer different throws by legs' gripping. When fighting in lying position sportsmen are successful in holding and try to apply painful holds. *Conclusions:* results of our researches, providing observations of below described conditions, can be a basis for correction of training process; for choosing of means and methods for coaches and instructors of professional training in Armed Forces and law enforcement bodies.
Key words: hand combat, duel, martial arts, strikes, throws.

Introduction

Hand combat, at present stage of its development, is a part of professional training in Armed Forces and law enforcement bodies as well as kind of ports, which quickly develops [12, 14, and 19].

Modern hand combat is one of complex kinds of sports. It includes arsenal of many kinds of duels. Hand combat requires objective studying and determination of its specific features and tendencies. Without knowing these specificities and tendencies it is impossible to effectively control training process. If coach has only approximate knowledge of most important properties of modern hand combat development, he will not be able to correctly outline training tasks and formulate requirements to training process [1, 5, and 8].

According to literature sources [6, 16, and 23] effectiveness of training functioning is demonstrated at competitions. Exactly in heavy extreme conditions of competitions weak and strong sides of sportsmen's fitness become visibly. It is known that systemic analysis of sportsmen's competition functioning is an important mean of training process's control [2, 9, 17, 18, 21, 24].

The received in the research information, providing observations of below described conditions, can be a basis for correction of training process; for choosing of means and methods for coaches and instructors of professional training in Armed Forces and law enforcement bodies.

Purpose, tasks of he work, material and methods

The purpose of the work is to study competition functioning of martial arts elite sportsmen.

The tasks of the work: to find main tendencies of competition functioning, to study time characteristics, to determine efficiency, effectiveness and quality of technical tactic actions; to outline possible ways of training process's correction.

In our work we used theoretical analysis and generalization of special scientific-methodic literature, pedagogic observation, talks, generalization of specialists' advanced experience. For determination of competition functioning specific features analysis of video materials form All-Ukrainian martial arts competitions (2012-2015) was used. 33 competition duels of elite sportsmen were analyzed. Specific features of application of 917 technical tactic actions were studied.

Analysis was conducted by the following indicators: duration of duel in standing position and, separately, in lying position; distribution of time; classification by density, quantity, quality and content of technical-tactic actions (TTA).

Results of he researches have been presented in the form of matrix in Excel 2010 and were processed by methods of mathematical statistic with the help of software Statistica 6.

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Results of he researches

In the course of the researches we analyzed 33 duels, in which sportsmen fulfilled 917 TTA. According to rules of competitions, for victory it was necessary to earn more quantity of points, fulfilling different TTA (throws, punches, kicks, holdings and so on).

Analysis of structure of victories showed that great majority of duels 85% were finished by victory by points. Only 15% – were early victories, won as a result of painful or choke techniques or powerful punch (kick) (knockout – inability of opponents to continue duel within not less than 10 seconds). Little quantity of early victories is explained by the fact that winning of "clear" victory in hand combat at competitions of elite level is rather difficult task. But just early victories make competitions spectacular and attract attention of fans.

Analysis of time characteristics of hand combat competition functioning showed that 70% of duel time sportsmen compete in standing position and 30% - in lying position. In standing positions sportsmen fulfill 93% TTA (from total quantity of all TTA). 84% of duel time sportsmen devote to striking techniques and only 16% of time – to wrestling. Low percentage (7%) of TTA in lying position is explained by peculiarities of competition rules. According to rules for TTA fulfillment, for wrestling TTA only 6 seconds are assigned. It is very little for realization of complex wrestling techniques.

Analysis of attacks' frequency (interval of attack – mean time between successful and unsuccessful attacks) showed that these indicators were 4.37 sec. and 11.97 sec. accordingly. It is known that quantity of TTA characterizes density of combat. Thus, modern hand to hand fighting is rather dynamic kind of sports.

But, with high density it should be noted that rather little percentage of TTA, which were successful and were assessed by referees (37%). It witnesses that sportsmen try to fulfill as many as possible TTA at the account of their efficiency.

For winning a victory over opponent it is permitted to use striking and wrestling techniques. Analysis of these techniques' application showed that in 73% of cases sportsmen used different punches and kicks and only in 27% - wrestling techniques. According to rules sportsmen can be held for not more than 5s sec. In our opinion it is too little for wrestling techniques.

Attention should also be paid to quantitative indicator of correlation of punches and kicks. Most often (73%) sportsmen use punches. Low percentage of kicks (27%) can be explained by specificities of hand combat: kicks below belt are not assessed by referees; kicks above belt require quick and accurate execution – any mistake permits for opponent to grip the leg and throw on back (three points mark). Probably this is and explanation of kicks' low efficiency (18%).

Analysis also showed: left arm punches were 51% and right arm - 49%; left leg kicks were 38% and right leg kicks - 62%.

In competition hand to hand duels it is permitted to punch in torso and in head. The received results witness that most of punches (88%) were in opponent's head and only12% - in torso. It is explained by the fact that punches in head are assessed higher than punches in torso. Besides, fulfillment of accurate and powerful punch in head can bring early victory.

Analysis of kicks showed that 24% of them were directed to head, 54% - to torso and 22% to opponent's legs. Low indicators of kicks to head are explained by difficulty of their fulfillment. In case of kicks to legs – it is explained by absence of assessment of such kicks.

Attention should be paid to quantitative indicator of straight, side punches and punches from below correlation in elite sportsmen. The received results witness that in punching most sportsmen try to execute straight punches (53%), suitable for far distance. Insufficient application of side (43%) and from below (4%) punches is connected with manner of fighting at close distance. In most of situations at such distance sportsmen start fulfillment of wrestling techniques. In kicking, sportsmen mostly used side kicks (73%). It is connected with the fact that side kicks can be directed at different parts of body (head, legs and torso). Side kick can cause early victory, providing it is fulfilled correctly. Low indicators of straight (24%) and roundhouse (3%) kicks are results of restriction of fulfillment zone and specificities of these techniques.

Interesting data were obtained in analysis of wrestling techniques. For example 73% of TTA are connected with fulfillment of techniques in standing position. The received results permit to affirm that the most frequent techniques are different throws by gripping opponent with legs - 64%. Other techniques were rarer: throws over hip,

over back from position standing on knees 4%; catches and bends - 2%; cuttings - 5%; other - 14%. Such high percentage of throws by gripping opponent with legs is explained by minimal risk, by relatively simple fulfillment and possibility to earn high points with minimal energy losses for technique.

Analysis of wrestling in lying position proved that the most frequent are: holding (45%), painful (37%) and choking (18%) techniques. Attention should be paid to indicator of holdings' efficiency (57%), which witnesses that sportsmen excellently practice just this TTA.

Discussion

The conducted research significantly expands the data about martial arts sportsmen's competition functioning, which, unfortunately, are presented in scientific-methodic literature rather poorly.

Results of our work confirmed the data of literature sources [7, 10, and 20] that monitoring of competition functioning is an integral part of building of effective training process. Study of competition functioning is always important and methodic of sportsmen's training shall fully comply with requirements of competition functioning [4, 13, 22].

The conducted by us analysis showed that peculiar features of hand to hand combat include direct fighting of opponents, deficit of time for taking decision, a lot of distracting factors, inconvenient manner of refereeing and aggressive behavior of fans. Without knowing these peculiarities and trends it is impossible to effectively control training process.

Pedagogic observations over competition functioning of elite martial arts sportsmen proved that the most effective and frequent TTA are: straight punches in head, side kicks in torso, throws by gripping opponent with legs, holdings and painful techniques. In our opinion application of these techniques is conditioned by Rules of hand combat competitions. This is also opinion of a number of scientists [1, 4]. The authors noted that just rules of competitions influence on qualitative and quantitative indicators of sportsman's competition functioning.

It was found that usually victory is won by versatile sportsmen, who are able to quickly change tactic and successfully combine striking and wrestling techniques.

Materials of the researches, opinion of leading specialists, coaches and experts permit to say that in the nearest years training of elite sportsmen will be oriented on further universalizing of tactic, individual technique and increase of special and general fitness.

Providing correct consideration of peculiarities and trends of competition functioning it is possible to effectively control training process and correct choice of means and methods in professional training of Armed Forces and law enforcement bodies of Ukraine.

Conclusions

1.It was found that modern hand to hand combat is rather dynamic kind of sports. Виявлено, що сучасний рукопашний бій є дуже динамічним видом спорту. Usually victory is won by versatile sportsmen, who are able to quickly change tactic and successfully combine striking and wrestling techniques.

2. Most of duels are won by points. Significant time sportsmen compete in standing position and prefer striking techniques: straight punches in head and side kicks in torso.

3. It was determined that when applying wrestling techniques in standing position, sportsmen prefer throws by gripping opponent with legs. In lying position they prefer holdings and painful techniques.

Conflict of interests

The authors declare that there is no conflict of interests.

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EARLY DIAGNOSIS OF JUNIOR SCHOOL AGE CHILDREN'S POSTURE DISORDERS

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Abstract. *Purpose:* to describe specificities of early diagnosis method for junior school age children's posture disorders. *Material:* in pedagogic experiment 156 junior school age children (boys and girls of 7-10 years' age) participated. All children had no experience of training in sport circles. For determination of uniformity of the tested we fulfilled experts' examination for presence or absence of external signs of posture disorders in frontal plane. The children's examination was conducted by qualified specialists at the beginning and at the end of experiment. For determination of early signs of muscular asymmetry in torso right and left sides of the tested children we used methodic, based on registration of tonic vibration reflex. *Results:* the pupils' examination permitted to form a group of 108 persons, who did not have external signs of posture disorders. It was proved that it would be purposeful to take prophylaxis measures at very early stages of imbalance in muscular system's work. Traditional approach in the form of prophylaxis examination can not give confident information about initial stage of imbalance in muscular system's work in child's organism. *Conclusions:* it was found that imbalance of motor nervous centers reflex excitability on both sides of backbone (if no purposeful prophylaxis measures are taken) can result in muscular tonus asymmetry on right and left sides of torso in lumbar spine area.

Key words: posture disorders, pupils, muscular imbalance, tonic vibration reflex, electric myogram.

Introduction

At present, in Ukraine pathologies' control, diagnosis and accounting in pupils with scoliosis deformations are continuing to be studied and developed. Nevertheless, timely diagnosis, treatment and prophylaxis of posture disorders and scoliosis are important tasks of society and government.

In clinic of patho-bio-mechanical signs of muscular-skeletal apparatus's different symptoms, muscular imbalance takes a special place. Muscular imbalance is a regional disorder of muscular functional tonus-power correlations, which is characterized by shortening of one muscles and relaxation of their anatomic antagonists. All these are accompanied by certain motor stereotype [3].

As per the data of P.K. Anokhin motor stereotypes are based on certain functional correlations, which appear in cortex motor centers on periphery [1]. That is why it is rather important to study functional activity of interconnected muscular groups, which form stereotypes in posture and motor functions [8].

Functional disorders in frontal plane are conditioned by muscular tonus asymmetry on right and left sides of torso. The main reason of local muscular hyper tonus is long lasted static load on muscles with minimal intensity [5-8].

Results of the researches of Ye.I. Aukhadeyev [2] permitted to classify muscular-tonus imbalance symptoms in the following way:

1. General (diffuse) muscular hypotension with increased mobility in all joints, naturally increased backbone physiological bending, narrow chest, X-like legs and arms, flat foots and a number of other features of muscular-skeletal apparatus.

2. Imbalance, concentrated mainly around shoulder girdle in the form of expressed asymmetry of shoulder girdle's shape and sizes as well as mobility of shoulder joints. Slouching back with flat chest and scoliosis bending with primary arc in upper thoracic spine are characteristic features.

3. Imbalance, concentrated mainly in lumbar zone in form of asymmetry of lumbar spine shape and sizes, legs, feet, difference in joints' mobility. In this case scoliosis bending with primary arc in lower thoracic and lumbar spines takes place.

Specialists in medicine and health protection [5, 23-25, 39] do not relate posture disorders to disease. The authors note that with started in due time health related measures this status does not progress and is a reversible process. Nevertheless, posture disorders often become satellite of many chronic diseases, owing to general functional weakness, muscular and ligament systems' imbalance of a child. All these result in reducing of functional

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physiological reserves and weaken effectiveness of organism's adaptation reactions [9, 11-13, 15].

The mentioned above researches do not open to the fullest extent the problem of early diagnosis of junior school age children's posture disorders. That is why demand in continuation of such researches is an urgent problem for pupils.

Purpose, tasks of the work, material and methods

The purpose of the research is to describe specificities of early diagnosis method for junior school age children's posture disorders.

In the research we used registration of surface electric myogram (EMG) of lumbar spine muscles.

For determination of effectiveness of the offered methodic for early diagnosis of children's posture disorders in frontal plane we organized pedagogic experiment.

In pedagogic experiment junior school age children (boys and girls of 7-10 years' age) participated. All children had no experience of training in sport circles. For determination of uniformity of the tested we fulfilled experts' examination for presence or absence of external signs of posture disorders in frontal plane. The children's examination was conducted by qualified specialists at the beginning and at the end of experiment.

Examination of 156 junior pupils permitted to form a group of 108 persons, who did not have external signs of posture disorders. For determination of early signs of muscular asymmetry in torso right and left sides of the tested children we used methodic, based on registration of tonic vibration reflex (TVR).

Reflex activity of appropriate nervous centers was determined by registration of lumbar spine muscles' tonic vibration reflex at level of 2nd lumbar vertebrae. Tonic vibration reflex was registered in relax state of the tested, lying on couch on abdomen.

The research was approved by ethic committee of Chernigov National Pedagogical University, named after T.G. Shevchenko. We also received written consents of parents.

Results of the researches

Considering all above said we concluded that it would be more rational to take prophylaxis measures at very early stages of imbalance in muscular system's work. As per results of M.O. Nosko [6-8], the first stage of formation of not optimal motor stereotype is stage of functional tension. It is conditioned by functionally inadequate (by strength and/or endurance) physical loads (static and/or dynamic) on certain zone of muscular-skeletal apparatus.

Junior school age (7-10 years) meets these conditions to the largest extent. In this period child's backbone endures high static loads (in sitting position). Just in this period deviations in children's posture have character of unstable functional disorders in work of muscular system. It creates favorable conditions for effective conduct of prophylaxis measures by means of health related physical culture.

At the same time traditional approach to registration of posture disorders in the form of prophylaxis examination can not give confident information about initial stage of imbalance in muscular system's work in child's organism. These measures permit to find out already firm reflex connections, visual picture of which is "scoliosis shape of backbone". Further such disease results in serious and irreversible morphological re-constructions of muscular-skeletal apparatus.

In connection with the above said acute demand in method, which would permit to register first signs of imbalance in muscular systems of junior pupils at early stages and to take appropriate prophylaxis measures, exists.

Tonic vibration reflex (TVR) is slowly and smoothly progressing contraction of skeletal muscles, caused by continuous vibration irritation of its tendon [17-19, 22, 29]. TVR is considered to be polysynaptic reflex. Irritation of mechanic-reflex ends by continuous vibration activates motor neurons of the irritated muscle and motor neurons of the neighboring spinal cord segments through the net of plug inter-neurons [31-33, 35-37]. More expressed back muscles' TVR on right or left torso sides witness about increased excitability of reflex centers. Such reflex centers include mobile and plug neurons, which serve these muscles. It witnesses also about decreasing of excitability threshold on one of torso sides [6, 11-13, 16, 20, 21].

Methodic approaches to assessment of tonic vibration reflex data on both sides of backbone implied the following:

1. Analysis of total electric myogram (EMG) permitted to determine:

– difference in latent period of tonic vibration reflex (TVR) progressing on right and left sides of backbone;

– amplitude values of total EMG with simultaneous call of TVR.

The received data were analyzed in the following way. On backbone side with less latent period of TVR progressing and high total EMG amplitude nervous centers' reflex excitability was considered as increased. Accordingly, on the opposite side it was regarded as reduced [30, 34, 38, 40].

2. For more detail assessment electric myogram underwent spectrum computer analysis [26-28]. Spectrum analysis by Furiet's methodic permitted to quantitatively estimate the character of reflex excitability of centers, which innervate skeletal muscles on right and left sides of backbone. During computer aliasing we analyzed:

– maximal peaks of frequency spectrum on right and left sides in the range from 30 Hz to 70 Hz;

Graphs of frequency spectrums of torso right and left sides in the range of high frequencies:

Localization of increased reflex excitability was determined by shift of maximal peak to the side of high frequency indicators (i.e. to the right). Accordingly, lower frequencies were related to the weakened reflex excitability. More expressed EMG power in high frequencies' range (75 Hz and more) on one of the sides permitted to state the presence of reflex excitability imbalance [11-13].

Spectrum analysis permitted to find out that frequency maximal peaks in the range 30 – 70 Hz do not coincide on right and left sides (difference more than 5 Hz). Maximal peak's shift to the left, to the side of high frequency indicators points at increased reflex excitability of left side nervous centers. Spectrum components in the range up to 50 Hz do not differ significantly. In the range from 75 to 150 Hz we registered expressed EMG frequency characteristics on torso left side when initiating TVR. It points at increased reflex excitability of left side of this tested person.

From 108 tested children, who had no visible posture disorders in frontal plane, in 40 children (37%) we did not find early imbalance symptoms of nervous centers reflex excitability on both sides of backbone. In 68 children (63%) we registered differences between tonic vibration reflex (TVR) of right and left sides of torso. Analysis of the obtained data showed that in some children (56 persons – to the right from backbone and 12 persons – to the left) time of skeletal muscles' electrical activity starting in response to mechanical impact on their tendons was shorter than on the opposite side of torso. Difference in time of TVR progressing on both sides of backbone was in the range from 0.4 sec. to 1.0 sec. Voltage characteristics of total electric myogram also were more expressed on right side in one group of the tested and on the left side in other group.

The received data witness that in majority of the tested children (82%) one-side reflex excitability is expressed on the right side from backbone and in 18% - on the left side.

Discussion

In our research we used methodic, based on registration of tonic vibration reflex (TVR). It permits to reveal the character of reflex excitability of appropriate nervous centers on both sides of backbone. Tonic vibration reflex is widely used in experimental and clinical practice for assessment of reflex excitability of motor nervous centers [11-13]. Balance of reflex excitability on both sides of backbone ensures equal level of skeletal muscles' tonic activity, which serve backbone [14]. Researches of other authors showed that with presence of reflex excitability imbalance in appropriate nervous centers asymmetry of muscular tonus is inevitable [11-13]. In its turn stable imbalance of muscular tonus on right and left sides of backbone results in posture disorder in frontal plane [4-6, 10].

It permitted for us to assume that analysis of tonic vibration reflex registration data on both sides of backbone can help to reveal children with bent to posture disorders in frontal plane.

Results of the conducted researches permitted to assume that the found imbalance of reflex excitability on both sides of backbone (in case of absence of purposeful prophylaxis measures) can result in asymmetry of muscular tonus on torso right and left sides in lumbar spine zone. In the future the after effects can cause scoliosis deviations of junior school age children's postures.

Conclusions

Results of pedagogic experiment permit to affirm that early diagnosis method of posture disorders in frontal plane, based on registration of tonic vibration reflex, is an informative because it gives confident information about character of motor centers' functional activity, which innerve symmetric muscles of lumbar spine. In conditions of prophylaxis' absence one-side increased reflex excitability inevitably results in asymmetry of muscular tonus on right and left sides of torso and as after effect – in scoliosis of backbone.

The prospects of further researches imply substantiation of practical recommendations on application of early diagnosis methodic in cases of children's posture disorders in conditions of comprehensive educational

establishment.

Conflict of interests

The author declares that there is no conflict of interests.

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PSYCHO-PHYSICAL PERFECTION OF ECONOMIC SPECIALTIES' GIRL STUDENTS UNDER INFLUENCE OF SPORT-ORIENTED TECHNOLOGY, BASED ON PREVALENCE OF VOLLEYBALL PRACTICING

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Abstract. *Purpose:* to work out content of sport-oriented technology of physical education, based on prevalence of volleyball practicing. *Material:* in the research two experimental (n=25, n=25) and one control (n=25) groups of girl students participated. The content of sport-oriented technology, based on prevalence of volleyball practicing included additionally elements of fitness. студенток. Quickness of mental processes and efficiency of mind operations were assessed with the help of special cards, on which 9 dials with pointers were depicted. The sense of test was: addition of dials' readings in mind; simultaneous calculation of value of scale one division; keeping in memory the previous sum of readings. This task was to be fulfilled for 6 minutes. *Results:* it was found that quickness of mental processes and mind operations as well as operative memory were at level below average. The most expressed positive factor was registered in group in which circle sport trainings were conducted. It was also found that over-fatigue at the end of academic year influences on testing indicators. *Conclusions:* the offered by us sport-oriented technology, based on prevalence of volleyball practicing can be recommended as effective mean of economic specialties girl students' psycho-physical qualities' strengthening.
Key words: girl students, economic specialties, professional-applied physical training, perfection, psycho-physical qualities.

Introduction

Among numerous important problems special place belongs to determination of new ways for students' health strengthening, morbidity and traumatism prophylaxis, healthy life style practicing, proper physical and psychic training for professional functioning [2, 6, 8, 12, and 14]. Technological approach to professional;-applied physical training (PAPT) in higher educational establishments (HEE) shall ensure formation of required psycho-physical qualities, applied knowledge, abilities and skills in the process of education. All these shall help future specialists to quickly adapt to production conditions, increase level of their professional reliability [19].

In some works [3, 11] it is noted that physical education at HEEs shall consist of general physical training and develop and improve main psycho-physical qualities. The most important special physical qualities of future specialists are high coordination of arms' movements, static endurance of torso muscles and high level of special endurance [13]. Such level of qualities shall correspond to professional portrait of economic profile specialists. For them also such important psychic qualities are characteristic: sense of time and space; volume, distribution, re-switching, concentration and stability of attention; operative thinking; operative and long-term memory; emotional stability and restraint.

Some scientists devoted their works to correction of students' physical fitness with the help of different kinds of sports as mean of health strengthening [5, 7, 20–29].

Specialists in physical education see solution of physical education perfection problem by implementation of sport-oriented physical education. Its basis is creative usage of new methodic. It can permit to better solve training and educational tasks, comparing with traditional approaches to organization of physical education in higher educational establishments [1, 9].

The trend to students' health worsening in our country, recent years have been requiring seeking of new forms of physical education perfection in higher educational establishments. Such important issue can not be solved without implementation of new forms and technologies in students' physical education process [4, 10, and 16]. Application of sport-oriented technologies in physical education ensures high quality of physical education that is manifested in rising of physical fitness, improvement of health indicators and psychic stability in stress situations. Positive attitude to physical work helps to overcome significant loads [15, 17]. To increase effectiveness of physical

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education it is recommended to distribute students in sport circles. When building physical education's training process it is necessary to consider students' functional fitness, psycho-physiological potentials and level of physical qualities [18].

So, there is a demand in experimental researches for development and implementation of sport-oriented technology of physical education for economic specialties' girl students. Such technology shall be directed at psycho-physical perfection of students. Its realization is possible in different forms of trainings. All these witness about importance of our research.

Purpose, tasks of the work, material and methods

The purpose of the work is to work out content of sport-oriented technology of physical education, based on prevalence of volleyball practicing and determine its influence on heir psych-physical qualities.

Material: for checking of the worked out technology's effectiveness we formed experimental group (E_1, n = 25), in which trainings by the offered technology practiced as per curriculum, twice a week, on base «UAB NBU». Second experimental group (E_2, n = 25) was also formed on base of «UAB NBU». In this group main forms of training were circle trainings. The content of sport-oriented technology was built on the base of volleyball practicing prevalence with adding of fitness elements. Trainings in this group were also conducted twice a week. In contrast to them control group (C, n = 25) was trained by traditional HEE program (two physical education lessons a week).

The methods of the research: for determination of mental processes' quickness and mind operations' efficiency we chose methodic "arithmetic calculation". The tested were given cards, on which 70 arithmetic tasks were formulated. Girl students were proposed to fulfill simple arithmetic during 10 minutes.

All arithmetic shall be fulfilled by girl students in mind and the received results shall be written down under line.

For studying of girl students' operative memory we used "scale" methodic [23]. For this purpose we used special cards, on which 9 dials with pointers were depicted. Under these dials 10 squares - tasks were drawn. In every square 9 rings and a pointer, which shows sequence of task's fulfillment were depicted. Upper line of rings corresponds to upper dials, central line – to central dials and bottom line – to bottom dials.

The sense of test was: addition of dials' readings in mind; simultaneous calculation of value of scale one division; keeping in memory the previous sum of readings. The received results shall be written down above appropriate square. This task was to be fulfilled for 6 minutes.

Results of the research

We received indicators of psycho-physical qualities of economic specialties' girl students of two HEEs in Sumy. These indicators showed that quickness of mental processes and mind operations as well as operative memory were at level below average and require perfection.

We also studied dynamic of change of important, for professional economists, psychological qualities and psychic states. As we can see in table 1, at the beginning of experiment respondents from group C solved correctly in average 23.84±3.01 tasks. At the end of experiment this indicator worsened by 4.75 %. It was 22.76 ± 2.55 tasks ($p<0.001$). The testing showed that control group girl students showed results at level below average (4 points from 9-possible).

At the beginning of experiment for the set period of time the tested girls in group E_1 gave 24.21±3.09 correct answers. At the end of academic year the quantity of correctly solved tasks increased in average up to 27.33±2.82 ($p<0.001$). This indicator improved by 11.43 %. It witnesses about improvement of mental processes up to average level.

Girl students of group E_2 correctly solved simple arithmetic tasks at the beginning of academic year. Their mean indicator was 24.4±2.52 task. At the end of academic year we stated statistically confident positive changes of this indicator ($p<0.001$). It was 28.64±2.48 correctly fulfilled tasks. Increment was 14.8%. We can state that this indicator also increased up to average level.

Table 1. Dynamic of mental processes' quickness and mind operations' efficiency of economic specialties' girl students in the course of pedagogic experiment (n=74)

Group	N	Before experiment	V (%)	After experiment	V (%)	Increment (%)	p
C	25	30.08±3.96	13.16	28.8±3.34	11.6	–4.44	<0.001
E_1	25	30.84±3.22	10.45	32.44±3.18	9.79	4.93	<0.001
E_2	24	30.58±4	13.08	32.29±3.5	10.82	5.29	<0.001

Methodic of "scale" [23] permitted for us to study specific features of girl students' operative memory. As we can see in table 2, at the beginning of experiment girl students of group C solved tasks in average correctly with result 5.16±0.55 tasks. At the end of experiment their indicator worsened by 5.74%. In average indicator was 4.88±0.6 correctly solved tasks. It can be connected with over-fatigue at the end of academic year in pre-examination period. These data corresponds to level below average.

Indicator of operative memory in group E_1 was at the beginning of academic year in average 5.08±0.41 tasks. At the end of academic year this indicator was 6.88±0.74 (higher by 26.06%). The revived result was statistically confident. As we can see in table 2, in second experimental group, at the beginning of experiment this indicator was within the range of 5.24±0.6 of correctly solved tasks. At the end of experiment this indicator was 7.4±0.5 tasks. We registered statistically confident changes of this indicator ($p<0.001$). Increment was 29.19%.

We found that mental processes' quickness, mind operations' efficiency and operative memory of experimental groups' girl students increased from level below average to average level. In contrast, indicators of control group girl students remained at level below average and were only 4 points.

So, basing on received by us results we can state that there are positive changes in mental processes of experimental groups' members. It witnesses that the offered by us sport-oriented technology positively influences on girl students' thinking processes in average strengthening them by 5%.

Table 2. Dynamic of operative memory indicators of economic specialties' girl students in the course of pedagogic experiment (n=74)

Group	N	Before experiment	V (%)	After experiment	V (%)	Increment (%)	p
C	25	6.84±0.85	12.43	6.52±0.77	11.81	–4.91	<0.01
E_1	24	6.75±0.68	10.01	6.88±0.74	10.78	1.82	>0.05
E_2	25	7±0.82	11.66	7.4±0.5	6.76	5.41	<0.001

Discussion

Results of our researches confirm opinion of other authors about positive influence of circle sport trainings on students' main psycho-physical qualities [3, 11, 13]. In its turn implementation of sport-oriented physical education will permit to better solve training and educational tasks in comparison with traditional approaches to organization of physical education [1, 9].

The conducted researches permit to assume that implementation of sport-oriented physical education technology on the basis of volleyball practicing prevalence will facilitate progressing of such psychic qualities as: mental processes' quickness, mind operations' efficiency and operative memory.

We found that sport-oriented technology positively influenced on quickness of memorizing in both experimental groups. But the most expressed effect was registered in second experimental group, where sport circle trainings were the form of training. It was facilitated by usage of game and competition functioning. Besides, we included fitness exercises in auxiliary block of the worked out by us technology for increasing of professionally important potentials.

Conclusions:

1. Analysis of scientific-methodic literature showed that the existing system of students' physical education is not effective for improvement of physical fitness, health and students' motivation for physical exercises' practicing. It does not ensure graduates professional readiness for production functioning in their future life.

2. Thus, development of sport-oriented technologies is a promising direction of students' physical education; of improvement of their health, physical fitness indicators and students' psycho-physical perfection.

3. The offered by us sport-oriented technology, based on prevalence of volleyball practicing can be recommended as effective mean of psycho-physical qualities' improvement of economic specialties' girl students.

The prospects of further researches imply work on improvement and arranging of control system over application of sport oriented technology in higher educational establishments.

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Conflict of interests

The authors declare that there is no conflict of interests.

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CHANGES IN MOTOR SKILLS OF CHILDREN WHO TRAIN SPORTS SWIMMING AT THE INITIAL STAGE OF SCHOOL EDUCATION (IN ANNUAL TRAINING CYCLE)

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Abstract. *Introduction:* This is an empirical article aiming at defining the changes of motor fitness in children practicing swimming at early stage of training in year-long training cycle. Proper selection of candidates to practice certain sports is a very complex process. One needs to select from the very large population of children, girls and boys, characterized by certain features, including somatic and motor features, which developed in a longstanding process of training, will lead them to become champions. *The purpose of the research:* The purpose of the research was to define the changes of motor fitness in girls' practicing swimming at early stage of training in year-long training cycle. *Material and Methods:* The subjects to the research were 85 girls aged 7 (1st year of primary school), including 36 girls in swimming group and 49 girls in control group. 36 of them belonged to swimmers' group- all girls were members of the Municipal Swimming Club in Szczecin. Control group consisted of 49 girls, who attended the same elementary schools. The examinations were carried out twice in the 2009-2010 academic year. The most reliable and accurate indirect test- EUROFIT Test Battery-was used. *Results*: The research revealed changes in both groups (Sw, C) in terms of all eight tests. Examination II proved statistically significant improvement of results in both groups (Sw, C) in comparison to Examination I. The dynamics of changes in general balance, flexibility, static force, functional force, running agility, was bigger in the girls who practiced swimming. As the speed of movement of upper limb, explosive force and thorax force are concerned; the differences of results in both examinations were similar in both groups (swimming group and control group). Progressive changes in motor fitness of the examined groups are a positive phenomenon in the development of child's young organism. *Conclusions:* Swimming training significantly affected the dynamics of changes in motor fitness of girls at early stage of training, compared with control group (non-swimmers). Regular participation in sports activities (including swimming) positively affects the development of child's motor (physical) fitness.
Keywords: selection, motor fitness, swimming, girls.

Introduction

Current world-class athletes' bodies display specific characteristics, which result from the sports discipline they train. They are of certain age and have certain parameters: somatic, motor and functional. Their size and quality result in the so-called 'champion model' [Kosmol 1997, Karpiński, Opyrchał 2008, Socha 2008, Kolbowicz 2012]. Continuous observation over the years and analysis of characteristics of the best athletes, Olympic Games medalists, help trainers make changes in their training programs in order to achieve the model champion qualities in their trainees [Karpiński Opyrchał 2008].

Knowledge of model parameters (qualities) of world's best athletes is used by trainers during selection of prospective athletes for a given sports discipline, and subsequently at various stages of sports selection. It is advisable to seek future champions based on their specific qualities (including motor skills), which being developed over the years of trainings could lead to championship in sports [Chomiak, Migasiewicz 1998, Cięszczyk 2005, 2008, Opyrchał et al. 2005]. Effects of trainers' work depend largely on a correct selection process for sports swimming, and on professional, multi-step selection at a later stage [Eider 2014].

The purpose of this study was to determine what changes in motor skills occurred in girls who trained sports swimming during a 1-year training cycle.

Material and research methods

Subject group consisted of 85 girls aged 7 (1st grade of elementary school) who attended four elementary schools in Szczecin, Polamd. 36 of them belonged to Swimmers group. All girls were members of the Municipal Swimming Club (MKP) in Szczecin. Before they were selected for swimming classes, the girls did not participate in any systematic swimming training. Control group consisted of 49 girls who attended the same elementary schools. Control group members were selected, based on the age of Swimmers group members, with 3 months' precision; all subjects attended the same grade (1st grade of elementary school). Children from Control group did not participate in any sports/recreation classes. All subjects took part in two examinations (Table 1), carried out in 2009/2010 academic year among 1st graders of Elementary School no. 51, 55, 56 and 62 in Szczecin (five swimming groups and four control groups) 1st examination was conducted in September 2009, immediately after selection of Swimmers and Control groups (1st graders), while 2nd examination took place in June 2010, i.e. at the end of the 1st grade. The analysis included only those children who participated in both examinations.

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Table 1. Number of girls in Swimmers and Control groups during examinations

School	Group	Class number	Study	
			I	II
El. Sch. 51	Sw	1a	9	9
	Sw	1b	8	8
	C	1c	12	12
	C	1d	11	11
El. Sch. 51	Sw	1a	10	10
El. Sch.56	Sw	1a	5	5
	C	1b	11	11
El. Sch. 62	Sw	1a	4	4
El. Sch. 56	C	1c	15	15
Total			85	85

El. Sch.- Elementary School, Sw – Swimmers, C – Control

Physical ability tests were conducted in gyms and preceded by standard warm-up for all children (7-8 minutes). The tests were as simple as possible and required minimal equipment. The most reliable and accurate indirect tests were used [Szopa et al.1998]. Motor skills were assessed with eight tests of the EUROFIT Test Battery [Grabowski, Szopa 1991]:

1. Flamingo Balance Test – general balance – keeping balance while standing on one leg on a beam of certain dimensions.
2. Plate Tapping Test – speed of upper limb movements – touching quickly two purposefully placed plates with the preferred (stronger) hand.
3. Sit-and-Reach Test – flexibility – sitting and reaching forward as far as possible.
4. Standing Broad Jump Test – explosive leg power – broad jump from a standing position.
5. Handgrip Strength Test – static strength – gripping forcefully a dynamometer.
6. Sit-Up Test – torso strength – lying on the back and doing max. number of sit-up within 30 seconds
7. Bent Arm Hang Test – functional strength – total time of maintaining the hang position with bent arms on a bar.
8. 10 x 5m Shuttle Run Test – agility run – running with max. speed and changes of direction.

Research results

Flamingo Balance Test – general balance

In the analyzed groups of girls (Sw, C), average results of the Flamingo Balance Test during Examination I were identical. Examination II, however, revealed statistically better results of girls from the Swimmers group. Examination II proved statistically significant improvement of results in both groups (Sw, C) in comparison to Examination I (Table 2).In the Swimmers group, it was on average 3.4 attempts, while in the control group: 1.9 ($p<0.0001$) (Fig. 1).

Plate Tapping Test – speed of upper limb movements

Swimmers group demonstrated statistically insignificantly better results in Examinations I and II in terms of speed of upper limbs than Control group. Examination II proved statistically significant improvement of results in both groups (Sw, C) in comparison with Examination I (Table 3). In Swimmers group, it was on average 1.3s, while in Control group it was 1.9s ($p<918$) (Fig. 2).

Table 2. Descriptive characteristics of Flamingo Balance Test (general balance) in the Swimmers and Control groups.

	Distribution type	Examination I		Examination II		Examination I vs. Examination II	
		Sw	C	Sw	C	Sw	C
Girls	n	36	49	36	49		
	min - max	5.0-10.0	6.0-9.0	2.0-7.0	3.0-9.0		

	Distribution type	Examination I		Examination II		Examination I vs. Examination II	
		Sw	C	Sw	C	Sw	C
	mean	8.0	8.0	4.0	6.0		
	$\overline{X}$ (SD)	7.7 (1.1)	7.7 (1.1)	4.3 (1.2)	5.8 (1.2)		
	ss	0.960		<0.0001		<0.0001	<0.0001

Sw – Swimmers, C – Control, min – minimum value, max – maximum value, $\overline{X}$ – arithmetic mean, SD – standard deviation, ss – statistical significance

Table 3. Descriptive characteristics of Plate Tapping Test (speed of upper limb movements) results in the Swimmers Group (Sw) and Control group (C).

	Distribution type	Examination I		Examination II		Examination I vs. Examination II	
		Sw	C	Sw	C	Sw	C
Girls	n	36	49	36	49		
	min - max	15.0-31.1	21.6-34.3	14.8-29.5	20.3-32.6		
	mean	27.6	26.9	25.8	25.7		
	$\overline{X}$ (SD)	26.6 (3.7)	27.1 (3.1)	25.3 (3.4)	25.7 (3.0)		
	ss	0.527		0.514		<0.0001	<0.0001

Sw – Swimmers, C – Control, min – minimum value, max – maximum value, $\overline{X}$ – arithmetic mean, SD – standard deviation, ss – statistical significance

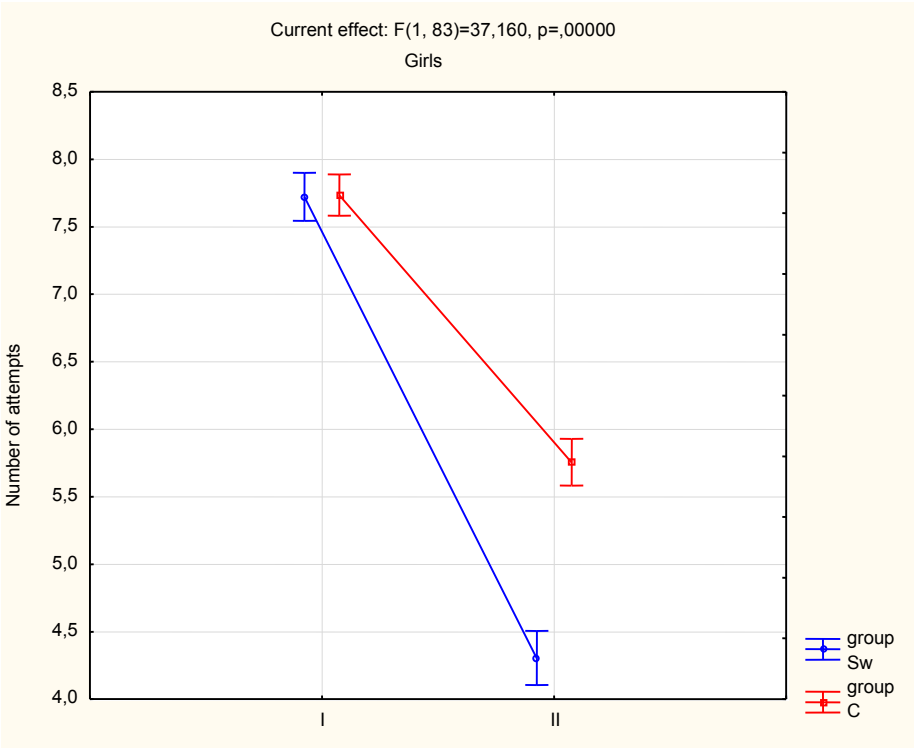

Fig 1. Changes of Flamingo Balance Test (general balance) results in Swimmers (Sw) and Control groups (C)

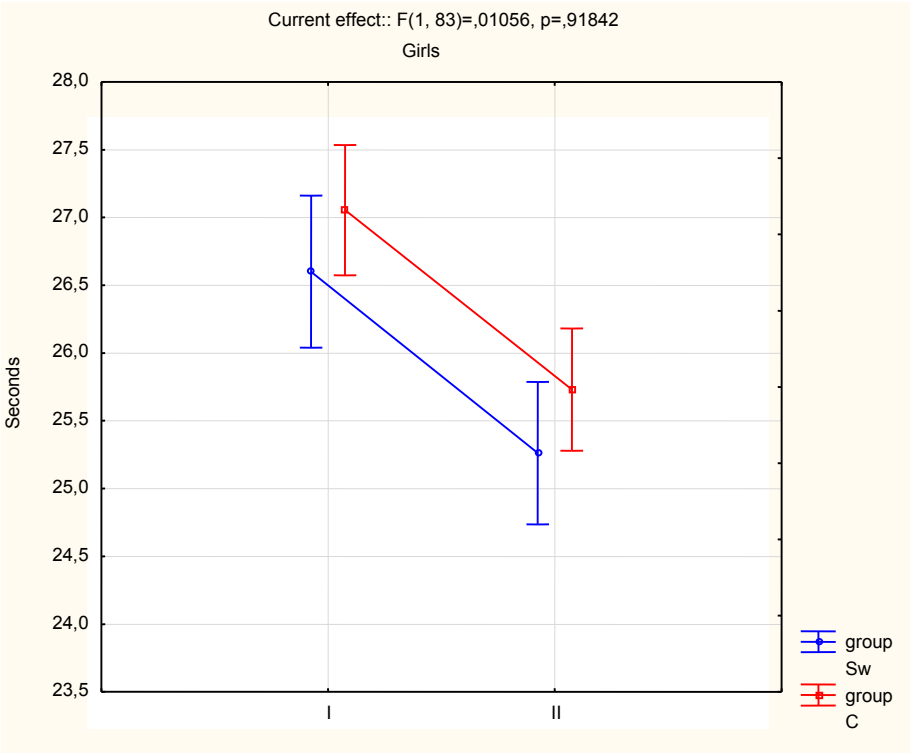

Fig 2. Changes of Plate Tapping Test (speed of upper limb movements) results in the Swimmers group (Sw) and Control group (C)

Table 4. Descriptive characteristics of Sit-and-Reach Test (flexibility) results in Swimmers (Sw) group and Control (C) group

	Distribution type	Examination I		Examination II		Examination I vs. Examination II	
		Sw	C	Sw	C	Sw	C
Girls	n	36	49	36	49		
	min - max	-6.0-14.0	-12.0-13.0	-1.0-17.0	-6.0-16.0		
	mean	3.0	1.0	8.0	4.0		
	$\overline{X}$ (SD)	3.9 (4.7)	-0.5 (5.6)	8.7 (4.0)	3.4 (5.4)		
	ss	0.0002		<0.0001		<0.0001	<0.0001

Sw – Swimmers, C – Control, min – minimum value, max – maximum value, $\overline{X}$ – arithmetic mean, SD – standard deviation, ss – statistical significance

Table 5. Descriptive characteristics of Standing Broad Jump Test (explosive leg power) results in the Swimmers (Sw) group and Control (C) group

	Distribution type	Examination I		Examination II		Examination I vs. Examination II	
		Sw	C	Sw	C	Sw	C
Girls	n	36	49	36			
	min - max	55.0-132.0	52.0-129.5	64.5-146.0	65.5-141.0		
	mean	105.8	94.0	117.5	108.0		

Distribution type	Examination I		Examination II		Examination I vs. Examination II	
	Sw	C	Sw	C	Sw	C
$\overline{X}$ (SD)	105.4 (14.8)	91.4 (16.9)	117.8 (15.7)	106.4 (16.5)		
ss	0.0002		0.002		<0.0001	<0.0001

Sw – Swimmers, C – Control, min – minimum value, max – maximum value, $\overline{X}$ – arithmetic mean, SD – standard deviation, ss – statistical significance

Sit-and-Reach Test – flexibility

Swimmers group displayed statistically significantly better results in Examination I and II in terms of torso flexibility. Examination II proved statistically significant improvement of results in both groups (Sw, C) in comparison with Examination I (Table 4). In the Swimming Group, it was on average 4.8cm, while in the Control group it was 3.9 cm (p=0.007) (Fig. 3).

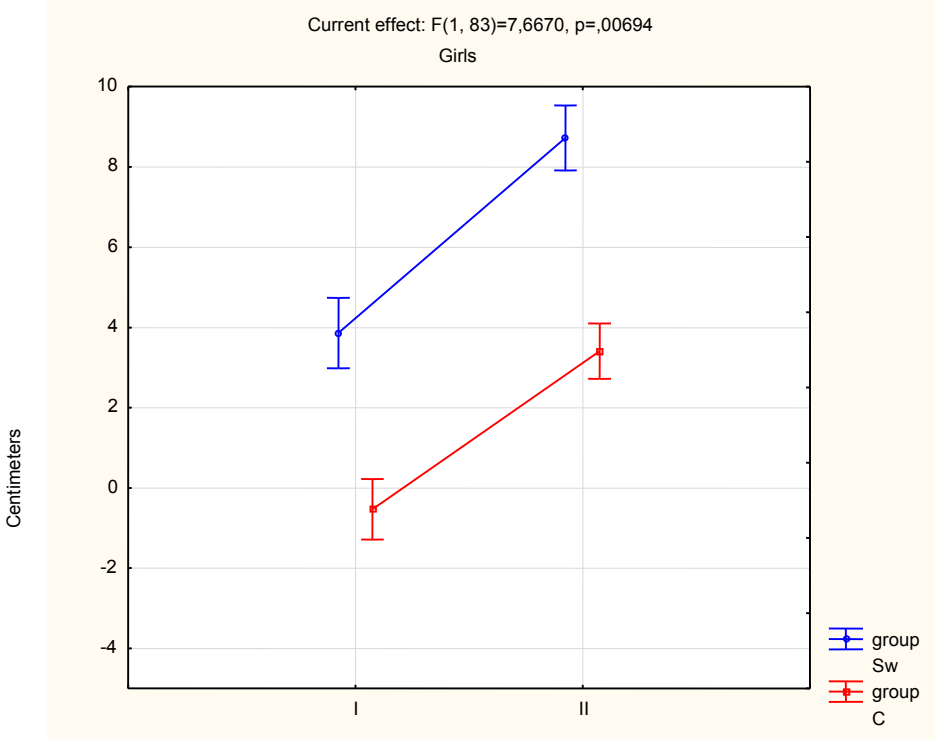

Fig 3. Changes of the Sit-and-Reach Test (flexibility) results in Swimmers (Sw) group and Control (C) group

Standing Broad Jump Test – explosive leg power

Swimmers group displayed statistically significantly better results in Examination I and II in terms of standing broad jumps. Examination II proved statistically significant improvement of results in both groups (Sw, C) in comparison with Examination I (Table 5). In the Swimmers group, it was on average 12.4cm, while in the control group it was 15cm (p=0.123) (Fig. 4).

Handgrip Strength Test – static strength

Swimmers (Sw) group displayed statistically insignificantly worse results in Examination I in terms of handgrip strength, in comparison with Control (C) group. In Examination II, Swimmers group obtained statistically insignificantly better results than their peers from Control group. Examination II proved statistically significant improvement of results in both groups (Sw, C) in comparison with Examination I (Table 6). In Swimmers group it was 1.2 (psi)*, and in Control group it was 0.7 (psi) (p<0.0001) (Fig. 5).

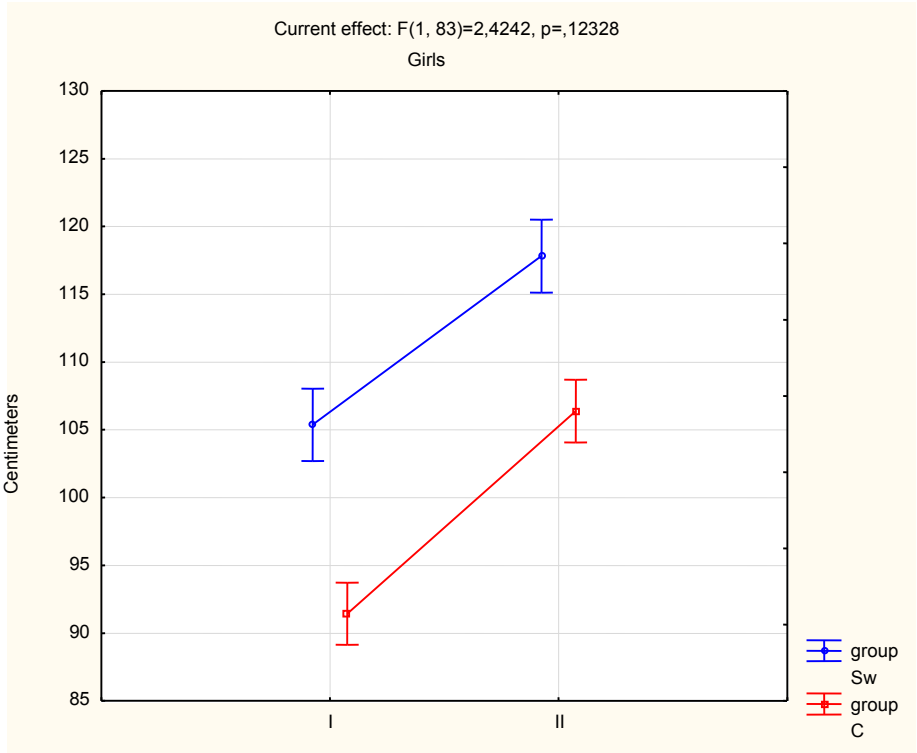

Fig 4. Changes of Standing Broad Jump Test (explosive leg power) results in the Swimmers (Sw) group and Control (C) group

Sit-Up Test – torso strength

Swimmers (Sw) group displayed statistically insignificantly higher results in Examination I in terms of sit-ups, in comparison with Control (C) group. Examination II revealed statistically better results of girls from Swimmers group. Examination II proved statistically significant improvement of results in both groups (Sw, C) in comparison with Examination I (Table 7). In Swimmers group, it was in average 6.5(n), while in Control group it was 5.6(n) (p=0.083) (Fig. 6).

Table 6. Descriptive characteristics of Handgrip Strength Test (static strength) results in the Swimmers (Sw) and Control (C) groups

	Distribution type	Examination I		Examination II		Examination I vs. Examination II	
		Sw	C	Sw	C	Sw	C
Girls	n	36	49	36	49		
	min - max	1.0-4.0	0.5-5.0	2.5-5.0	1.0-5.5		
	mean	2.0	2.5	3.5	3.0		
	$\overline{X}$ (SD)	2.3 (0.9)	2.5 (0.9)	3.5 (0.8)	3.2 (1.0)		
	ss	0.309		0.220		<0.0001	<0.0001

Sw – Swimmers, C – Control, min – minimum value, max – maximum value, $\overline{X}$ – arithmetic mean, SD – standard deviation, ss – statistical significance

Bent Arm Hang Test – functional strength

Swimmers group displayed statistically significantly better results in Examination I and II in terms of bent arm hang. Examination II proved statistically significant improvement of results in both groups (Sw, C) in comparison with Examination I (Table 8). In Swimming Group, it was in average 3.6s, while in control group: 1.9s (p=0.0001) (Fig. 7).

Table 7. Descriptive characteristics of Sit-Up Test (torso strength) results in the Swimmers (Sw) and Control (C) groups

	Distribution type	Examination I		Examination II		Examination I vs. Examination II	
		Sw	C	Sw	C	Sw	C
Girls	n	36	49	36	49		
	min - max	6.0-19.0	1.0-21.0	12.0-28.0	7.0-26.0		
	mean	12.5	11.0	18.5	17.0		
	$\overline{X}$ (SD)	12.3 (3.6)	10.7 (4.6)	18.8 (3.7)	16.3 (4.2)		
	ss	0.078		0.006		<0.0001	<0.0001

Sw – Swimmers, C – Control, min – minimum value, max – maximum value, $\overline{X}$ – arithmetic mean, SD – standard deviation, ss – statistical significance

10 x 5m Shuttle Run Test – agility run

In Examination I, average results of Shuttle Run were statistically insignificantly better in Swimmers group, while in Examination II statistical difference was significant. Examination II proved statistically significant improvement of results in both groups (Sw, C) in comparison with Examination I (Table 9). In Swimmers group, it was in average 2.7s, while in Control group it was 2.0s (p=0.036) (Fig. 8).

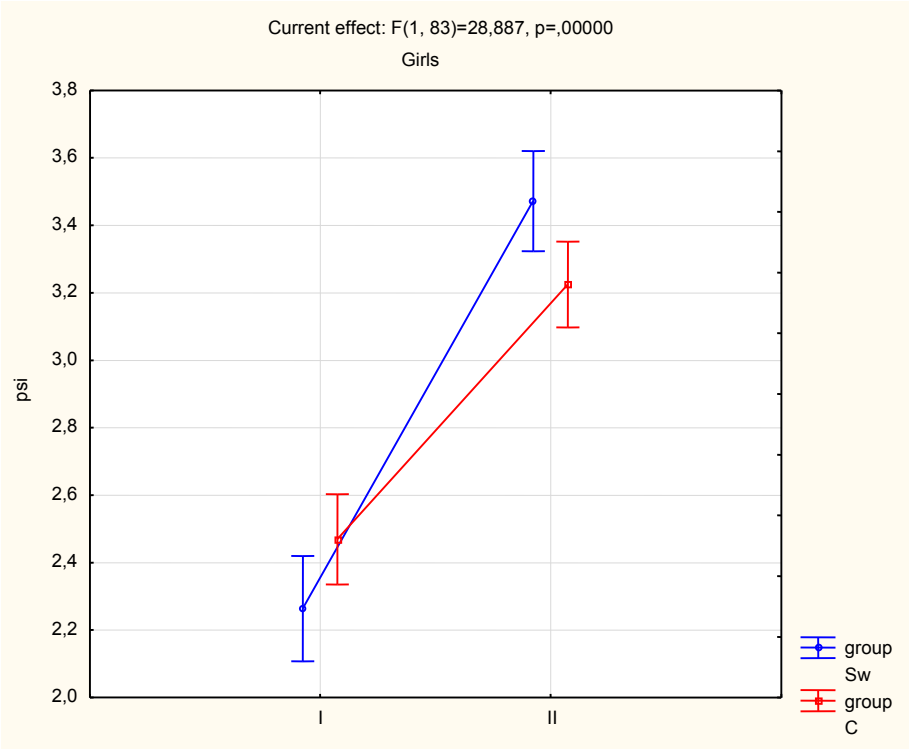

Fig 5. Changes of Handgrip Strength Test (static strength) results in the Swimmers (Sw) and Control (C) groups

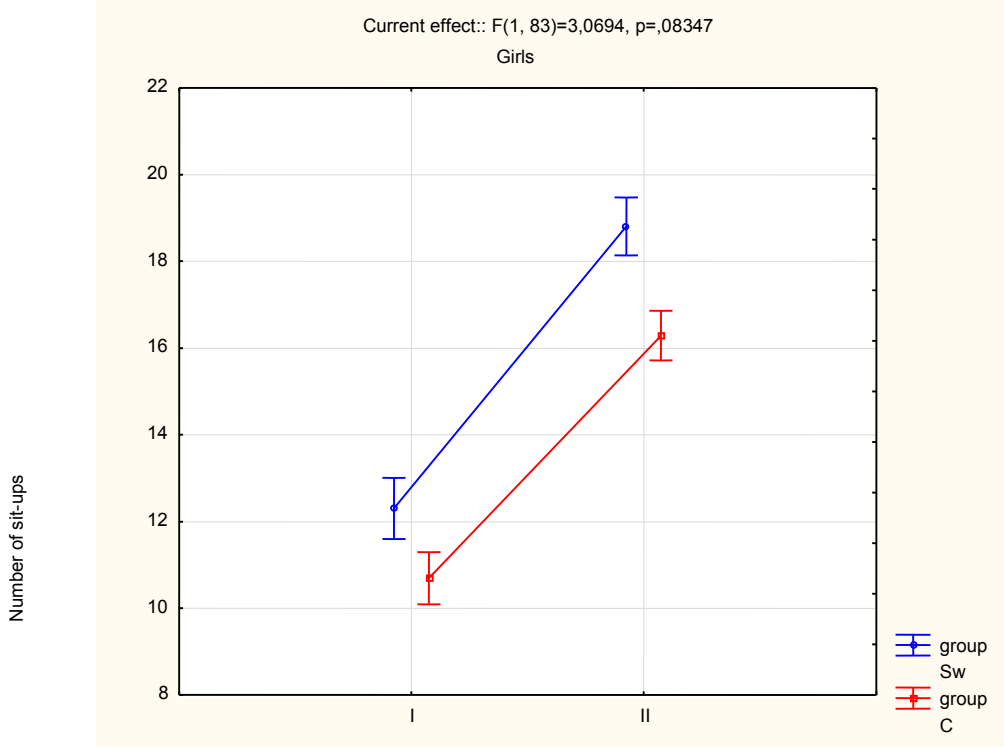

Fig 6. Changes of Sit-Up Test (torso strength) results in the Swimmers (Sw) and Control (C) groups

Table 8. Descriptive characteristics of Bent Arm Hang Test (functional strength) results in the Swimmers (Sw) group and Control (C) group

	Distribution type	Examination I		Examination II		Examination I vs. Examination II	
		Sw (seconds)	C (seconds)	Sw (seconds)	C (seconds)	Sw	C
Girls	n	36	49	36	49		
	min - max	1.4-21.1	0.9-20.0	4.9-23.1	3.6-22.2		
	mean	9.2	6.4	13.4	7.7		
	$\overline{X}$ (SD)	9.2 (4.2)	6.6 (4.1)	12.8 (3.8)	8.5 (3.7)		
	ss	0.004		<0.0001		<0.0001	<0.0001

Sw – Swimmers, C – Control, min – minimum value, max – maximum value, $\overline{X}$ – arithmetic mean, SD – standard deviation, ss – statistical significance

Table 9. Descriptive characteristics of 10 x 5m Shuttle Run Test (agility run) results in the Swimmers (Sw) group and Control (C) group

	Distribution type	Examination I		Examination II		Examination I vs. Examination II	
		Sw (seconds)	C (seconds)	Sw (seconds)	C (seconds)	Sw	C
Girls	n	36	49	36	49		
	min - max	20.7-37.4	23.0-34.6	19.2-35.9	21.2-32.5		
	mean	26.1	27.2	23.5	25.1		

Distribution type	Examination I		Examination II		Examination I vs. Examination II	
	Sw (seconds)	C (seconds)	Sw (seconds)	C (seconds)	Sw	C
$\overline{X}$ (SD)	26.7 (3.4)	27.8 (3.0)	24.0 (3.0)	25.8 (2.7)		
ss	0.097		0.006		<0.0001	<0.0001

Sw – Swimmers, C – Control, min – minimum value, max – maximum value, $\overline{X}$ – arithmetic mean, SD – standard deviation, ss – statistical significance

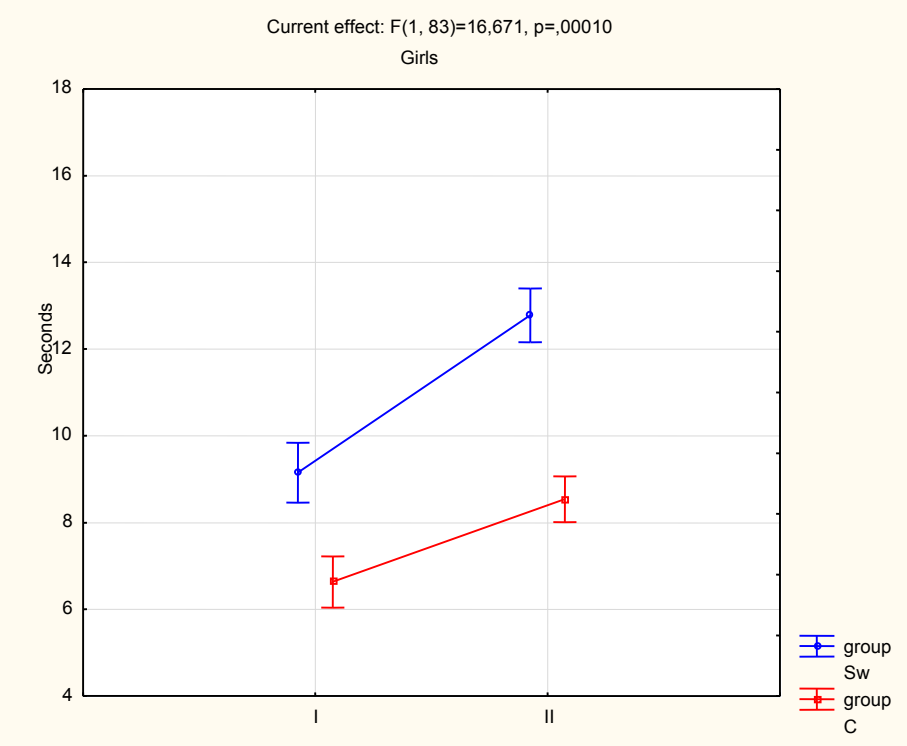

Fig 7. Changes of Bent Arm Hang Test (functional strength) results in the Swimmers (Sw) group and Control (C) group

Discussion

The research revealed changes in both groups (Sw, C) in terms of all eight tests. Examination II proved statistically significant improvement of results in both groups (Sw, C) in comparison with Examination I. Changes between Examination I and Examination II results were most visible in Swimmers groups in terms of balance, agility, static strength, functional strength and agility run. Changes between Examination I and Examination II were similar in both groups (Sw, C) in terms of speed of limb movement, explosive strength and torso strength.

The analysis of statistical data from the EUROFIT Test Battery conducted by the author of this paper proved that increased number of training hours resulted in enhanced motor skills of girls who started their swimming trainings. Other authors' research [Pietrusik 1981, Dziedziczak, Witkowski 1998] also indicated positive correlation between increased number of sports hours/trainings and motor skills of children who trained swimming.

Pietrusik's research [1981] confirmed that girls in swimming groups displayed significant improvements of final results of all physical ability tests (ICSPFT). There were no significant improvements of the examined motor skills (motor qualities) of subjects in control groups. It should be noted that initial stage of school education is the period of significant development of all motor skills [Osiński 2011], and it was confirmed by Denisiuk, Milcerowa's [1969] research, conducted in the 1960s.

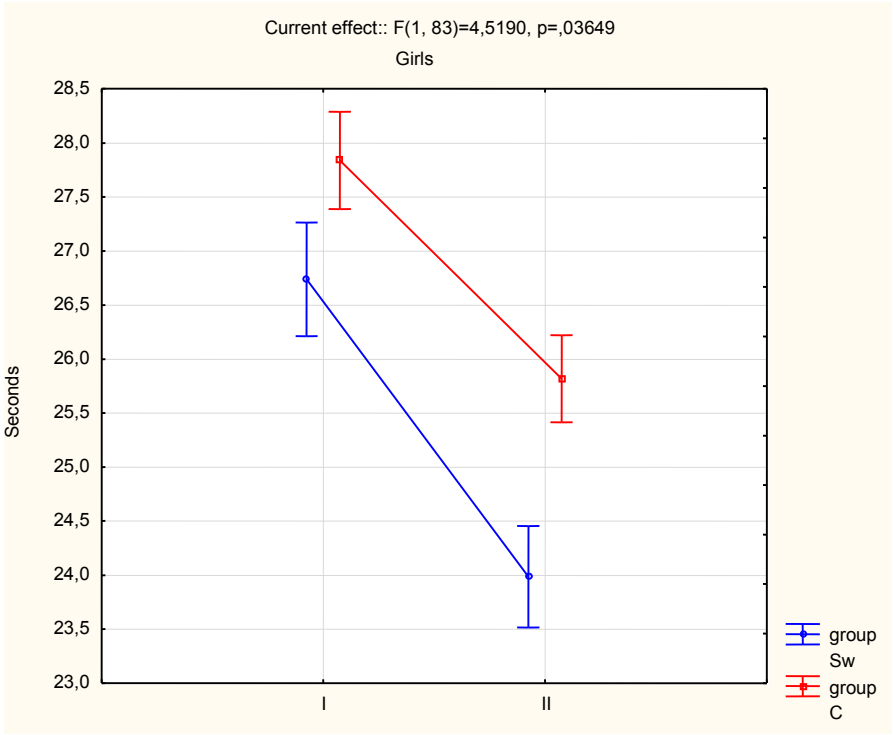

Fig 8. Changes of 10 x 5m Shuttle Run Test (agility run) results in the Swimmers (Sw) group and Control (C) group

As for this study, Swimmers group did not attain better dynamics of changes in all tests than the peers from Control group (i.e. speed of upper limb movement, agility, explosive strength, torso strength, agility run). It may be explained by specificity of swimming trainings: it was conducted at swimming pool, not at the gym, where strength of young swimmers could be increased more noticeably.

Progressive changes of subjects' motor skills are positive phenomenon in the physical development of a child. During both Examinations (I and II) subjects attended elementary school 1st grade, i.e. the first grade of junior school age [Osiński 2011]. School authorities, Physical Education teachers and Integrated Education teachers at Elementary Schools no. 51, 55, 56 and 62 in Szczecin (attended by the subjects from both groups: Sw and C) facilitated development of motor skills by their didactic, sports and recreational activities. Diversified motor and recreational activities provided during PE classes might have significantly influenced the EUROFIT Test results.

During both Examinations (I and II) subjects were 1st-graders, therefore their physical condition was at junior school age level, which lasts until puberty (age of 10-12) [Osiński 2011]. During this period, especially when children begin their school education, they must conform to certain requirements, school duties and new environment [Osiński 2011]. According to Przewęda [1981, p. 164] children demonstrate great 'need to blow off steam by physical activity, to satisfy their great «hunger for activity».' Schools (their sports and recreational infrastructure), Physical Education teachers, Integrated (junior age) education teachers influence the quality of motor skills' training. Therefore, Physical Education teacher plays significant role in the process of rising generation's physical development. Participation in organized, regular sports classes results in development of children's motor (physical) skills [Torrance et al. 2007, Chalcarz et al. 2008 Wilk, Eider 2014].

Conclusions

1. Examination II proved statistically significant improvement of results in both groups (Swimmers, Control) in comparison with Examination I.
2. Comparative analysis of both groups' motor skills confirmed that the dynamic of changes between Examinations I and II was greater in swimming subjects in five tests (general balance, agility, static strength, functional strength, agility run) (Fig. 1, 3, 5, 7, 8).
3. In the remaining motor skill tests (speed of upper limb movement, explosive strength, torso strength) differences in results between Examination I and Examination II were similar in both groups (Swimmers and Control group) (Fig. 2, 4, 6).
4. Progressive changes of subjects' motor skills are positive phenomenon in physical development of a child.
5. Swimming training resulted significantly in positive changes in terms of motor skills of subject who were at initial stage of swimming trainings, compared with their non-training peers.

6. Participation in organized, regular sports classes results in development of children's motor (physical) skills.

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- Perspectives of future researches in this direction.
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