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CONTENTS

STRUCTURAL-LINGUISTIC APPROACH TO ASSESSMENT OF FUNCTIONAL STATES OF ORGANISM OF ELITE SPORTSMEN, WHO HAVE SYMPTOMS OF CHRONIC TIREDNESS

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National University of Physical Education and Sport of Ukraine

Abstract. *Purpose:* assessment of functional states of sportsmen's, having symptoms of chronic tiredness, organism with the help of structural-linguistic approach. *Material:* Sportsmen of different kinds of sports participated in the research. For determination of degree of chronic tiredness questionnaire by Leonova was applied. For classification of functional states of sportsmen's organism structural-linguistic approach was applied. *Results:* in 41% of the questioned sportsmen chronic tiredness was found. Appearance of their not stable states can be caused by reduction of organism's resistance to loads and high risk of chronic tiredness syndrome. *Conclusions:* in sportsmen with chronic tiredness we observed functional tension of organism's regulatory systems in rest and over-tension – after loads. We determined types of functional states of sportsmen's with chronic tiredness organism.
Key words: sportsmen, chronic tiredness, ultra-stable system, heart rhythm, spectrum of power.

Introduction

In working out of assessment technology of human organism's functional state under influence of extreme factors it is important to choose basic physiological function, analysis of whose changes should be put in the base of this assessment. Such function shall meet at least two criteria: it should be easily registered in complex extreme conditions and it should not be influenced by regulating mind of the tested person [16, 2]. As per opinion of many researchers these two criteria are in the best way satisfied by heart rhythm [10]. However, in spite of rather great number of works devoted to analysis of heart rhythm's variability, its further interpretation is often realized by intuition, without consideration of laws of organism functional states' transformations.

To avoid this drawback, in our work we applied structural-linguistic analysis of heart rhythm's variability. It is based on three postulates, which consider fundamental properties of live organisms [4, 6]. First: in the process of live systems' development there exist certain laws of transformation of organism's functional states in dynamic of its life functioning. Secondly: organism's functional states can be sufficiently completely described with not great number of symbols, reflecting activity of different components and determining organism's functional state in different situations. Third: we considered principle, that live organism is an ultra stable system.

Purpose, tasks of the work, material and methods

The purpose of the work is assessment of functional states of sportsmen's, having symptoms of chronic tiredness (CT), organism with the help of structural-linguistic approach.

The tasks of the work:

1. Assess CT incidence among elite sportsmen in different kinds of sports.
2. Conduct spectral analysis of heart rhythm's variability (HRV) of sportsmen with CT and without it in rest and after functional load.
3. With the help of structural-linguistic analysis classify spectrums of power of HRV and, on this base, carry out comparative analysis of changes of organism's functional states of sportsmen with CT and without it.

Organization and methods of the research: the researches were conducted on the bases of scientific research institute of university of physical culture and sports of Ukraine, center of Olympic trainings (Koncha-Zaspa). In the researches 90 elite sportsmen (MS, IMS, CMS) from different kinds of sports participated (age of them was from 21 to 31 years old). For determination of degree of chronic tiredness (CT) questionnaire by Leonova was applied [9].

For determination of heart rhythm's wave structure we applied cardiography method [10]. In compliance with "International standard" [21] cardio-rhythm-gram was recorded before and after functional load for 5 minutes. Active orthostatic test (AOT) was used as functional load.

Spectrums of power KGR were determined with the help of spectral analysis of HRV. For classification of power spectrums and corresponding to them functional states of sportsmen's organisms we applied structural-linguistic approach [4].

Results of the research

Analysis of results of the conducted questioning showed that in 53 (59%) of the questioned sportsmen symptoms of CT were absent; in 37 (41%) they were found.

With analysis of cardio-rhythm-grams of elite sportsmen without symptoms of CT (recorded in rest and after functional load) we, with the help of structural-linguistic approach, found 8 from 16 possible power spectrums of heart rhythm: Sb, SmSb, SmSbSf, SmSfSb, SbSm, SbSmSf, SbSfSm (see fig.1). According to literature data [2, 4, 6] states with spectral formulas Sm, SmSb, SmSf, SmSbSf, SmSfSb are characterized by prevailing of sympathetic influences in vegetative balance; states with spectral formulas Sb, SbSm, SbSf, SbSmSf, SbSfSm – by prevailing of para-sympathetic influences. States with spectral formulas Sm, Sb, SmSb, SbSm, SmSbSf, SmSfSb, SbSmSf are stable. Organism can be in these states for long time and transition to other states is possible only under influence of external or internal factors

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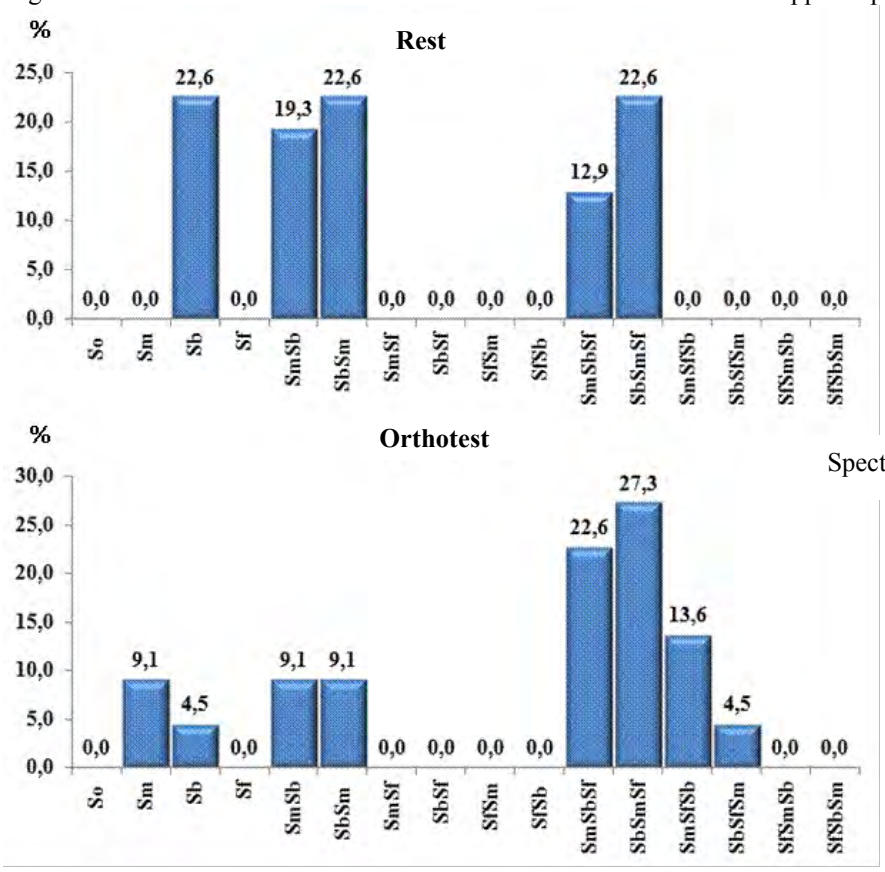
[2, 15]. These states are characterized by optimal tension of organism's regulatory systems (ORS) and are more frequent in relative rest or under little loads. States, described by spectral formulas SmSfSb и SbSfSm, are quasi stable. In them organism can be for indefinitely long time, but transition to other states happens either under influence of external or internal factors or spontaneously [2, 15]. These states are characterized by functional tension of regulatory systems (SFT) and appear under loads (see fig. 2).

Ion sportsmen with symptoms of CT we registered 10 from16 possible spectrums of power of heart rhythm in rest and after physical load: Sm, Sb, SmSb, SmSf, SfSm, SmSbSf, SmSfSb, SfSmSb, SbSm, SbSmSf, SbSfSm (see fig. 3). Presence of periodical component in heart rhythm's wave structure with spectrum SmSfSb of sportsmen with CT witnesses about functional tension of organism's regulatory systems. Spectrums SfSm, SfSmSb, which were recorded after AOT, correspond to not stable functional states with over tension (SO) of organism's regulatory systems [2, 6]. In these states organism can be for short time and transition from these states to other happens spontaneously (see fig.4).



Spectrums of HRV power

Spectrums of HRV power

Fig. 1. Distribution of types of power spectrums of HRV in rest and under functional loads (AFL) of sportsmen without CT symptoms:

On axis X – power spectrums of HRV, classified with spectrul-linguistic approach; on axis Y – percent correlation of states with certain power spectrum of HRV.

Discussion

Modern elite sports are a sphere of activity, in which sportsmen's organism suffers from extreme physical and psychological influences [7, 13, 14]. According to fulfilled researches elite sportsmen, in conditions of durable training and competition loads, can get syndrome of chronic tiredness (SCT) [1, 11].

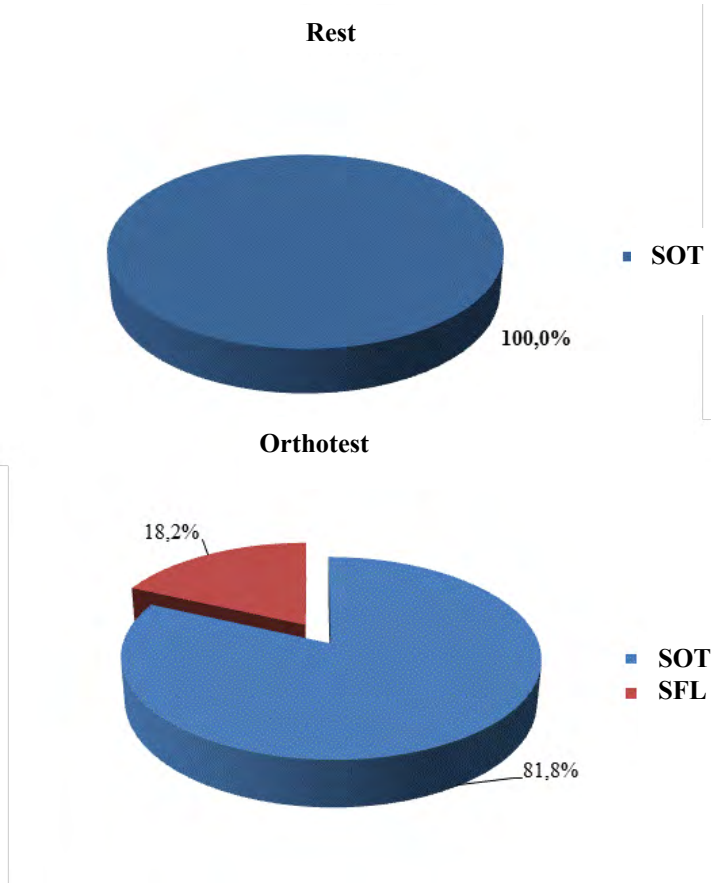


Fig.2. Distribution of states of optimal (SOT - Sm, SmSb, SmSbSf, Sb, SbSm, SbSmSf), functional tension (SFT - SmSfSb, SbSfSm) of regulatory mechanisms in rest and after AFL of sportsmen without CT symptoms.

With the help of questioning we found that 41% of elite sportsmen had CT of different degree. This fact agrees with literature data, according to which SCT can be preceded by early changes of functional, psycho-physiological and psychic status of sportsman, by development of acute and chronic forms of tiredness of different degree, when tiredness becomes frequent or constant "satellite" [3, 7, 12, 19].

Appearing of quasi stable and not stable functional states in sportsmen with CT is characterized by over tension of regulatory mechanisms and spontaneous transition to lower energy levels. It can be connected with reduction of organism's resistance to high physical and psychological loads and high risk of SCT formation [8, 17, 18].

Conclusions:

1. In 41% of sportsmen we found symptoms of CT.
2. In wave structure of heart rhythm of sportsmen with CT there appeared periodic components, which witnessed about functional tension of organism's regulatory systems in rest and about their over tension after functional loads.
3. With the help of structural-linguistic approach we carried out classification of power spectrums of HRV and determined types of organism's functional states of sportsmen with CT symptoms and without them.

In the future it is supposed to further research incidence of CT in elite sportsmen of different kinds of sports and determination of criteria for CT diagnostic on the base of assessment of sportsmen's physical fitness, physiological and psycho-physiological status.

Acknowledgement

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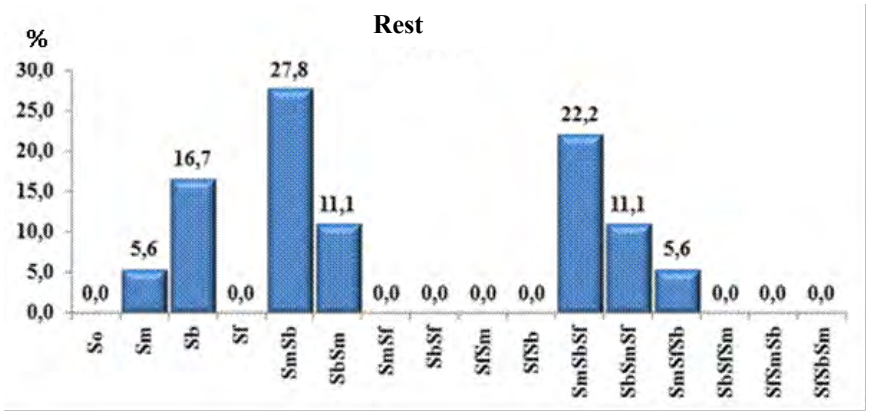
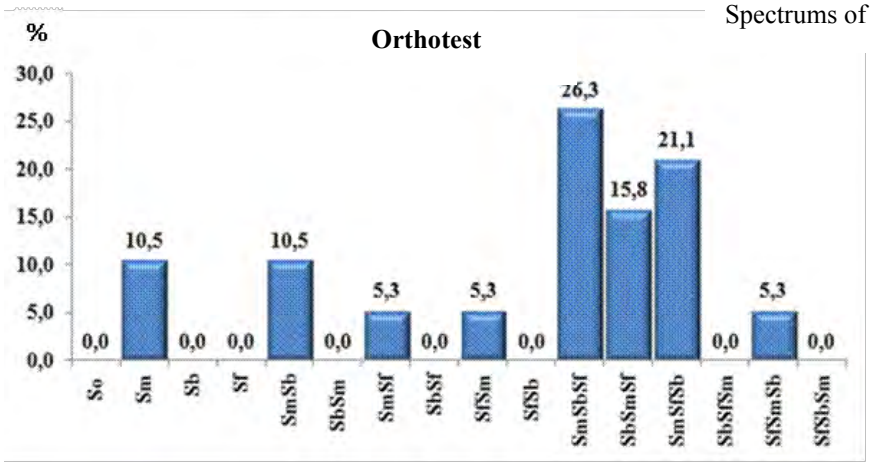
Conflict of interests

The author declares that there is no conflict of interests.



Spectrums of HRV power



Spectrums of HRV power

Fig.3. Distribution of types of power spectrums of HRV in rest and after functional loads (AFL) of sportsmen with CT symptoms.

Legend on axis X and axis Y is the same as in fig. 1.

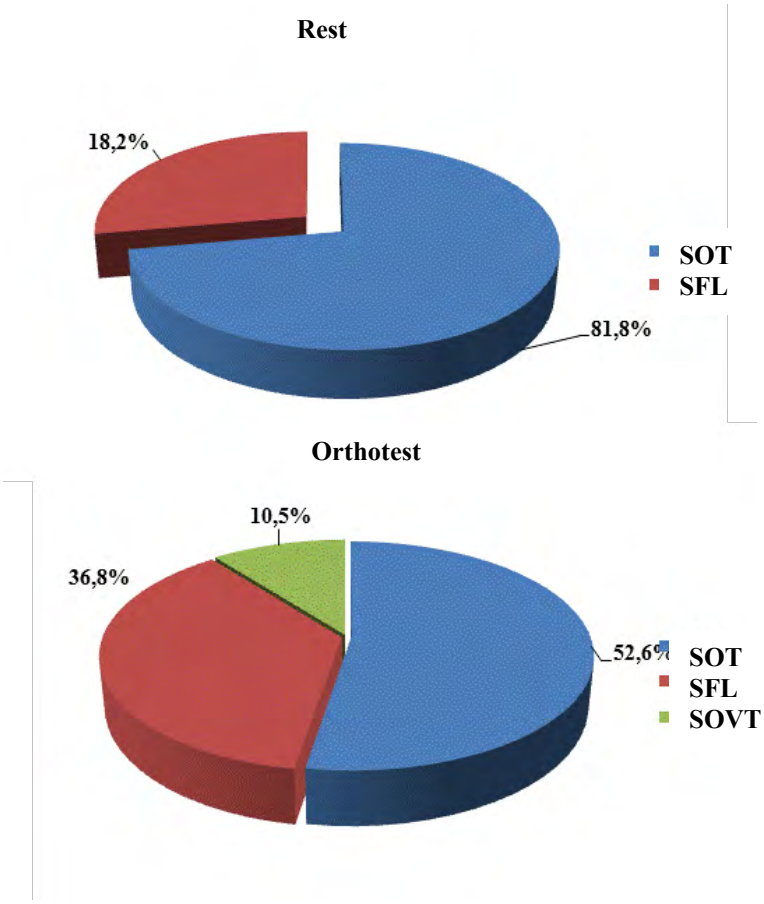


Fig.4. Distribution of optimal (SOT - Sm, SmSb, SmSbSf, Sb, SbSm, SbSmSf), functional (SFL - SmSfSb, SbSfSm) tension and over tension (SOVT - SfSm, SfSmSb) of regulatory mechanisms in rest and after AFL of sportsmen with CT symptoms.

References:

1 Gordon NF. *Khronicheskoe utomlenie i dvigatel'naia aktivnost'* [Chronic tiredness and motor functioning], Kiev: Olympic Literature; 1999 (in Russian)

2 Il'in VN, Batyrbekova LM, Kurdanova MKh, Kurdanov KhA. *Ritmokardiograficheskie metody ocenki funkcional'nogo sostoianiia organizma cheloveka* [Rhythm-cardiographic methods of assessment of human organism's functional state], Moscow, Ileksa. Stavropol: Servisshkola; 2003 (in Russian)

3 Il'in VM, Zhila RS, Cherkes LI, Rassokha GV, Medvidchuk KV. Osoblivosti funkcional'nogo i psikhofiziologichnogo statusu sportsmeniv visokoi kvalifikacii z oznakami khronichnogo stomlennia [Specific features of functional and psycho-physiological status of elite sportsmen with symptoms of chronic tiredness]. *Sportivna medicina* 2007; 1: 42-45 (in Ukrainian)

4 Il'in VM, Kal'nish VV, Kurdanov KhA. Strukturno–lingvistichnij pidkhid do ocinki funkcional'nogo stanu organizmu liudini [Structural linguistic approach to assessment of human organism's functional state], *Dopovidi NANU* 2001;6:185–189 (in Ukrainian)

5 Il'in VM, Koval' SB, Cherkes LI. Chastota proiaviv oznak khronichnoi vtomi u visokokvalifikovanikh sportsmeniv u riznikh vidakh sportu [Frequency of chronic tiredness manifestations in elite sportsmen of different kinds of sports], *Fizichne vikhovannia ta sport u konteksti derzhavnoi programi rozvitku fizichnoi kul'turi v Ukraini: dosvid, problemi, perspektivi* 2014;1:29-32. (in Ukrainian)

6 Il'in VN, Filippov MM, Alvani A. Ocenka funkcional'nogo sostoianiia organizma cheloveka v ekstremal'nykh usloviiakh na osnove teorii ul'trastabil'nykh sistem [Assessment of human organism's functional state in extreme conditions on the base of theory of ultra stable systems], *Ul'ianovskij mediko-biologicheskij zhurnal* 2014; 3: 94-100 (in Russian)

7 Korniakova VV, Konvaj VD, Rejs BA. Utomlenie posle chrezmernykh fizicheskikh nagruzok: mekhanizmy razvitiia, korrekciia [Tiredness after excessive physical loads: mechanisms of progressing, correction], *Teoriia i praktika fizicheskoj kul'tury* 2009; 3: 23-25. (in Russian)

8 Lebedev MA, Palatov SIu, Kovrov GV. Ustalost' i ee proiavleniia [Tiredness and its manifestations], *Russkij medicinskij zhurnal* 2014; 4: 282–287. (in Russian)

9 Leonova AB, Kuznecova AS. *Psikhologicheskie tekhnologii upravleniia sostoianiem cheloveka* [Psychological technologies of human state control], Moscow: Meaning; 2009 (in Russian)
10 Mikhajlov V.M. *Variabel'nost' ritma serdca: opyt prakticheskogo primeneniia metod* [Variability of heart rhythm: practical experience, method], Ivanovo: Igma; 2002 (in Russian)
11 Oknin VIu. Problema utomleniia, stressa i khronicheskoj ustalosti [Problem of tiredness, stress and chronic tiredness]. *Russkij medicinskij zhurnal* 2004; 12(5): 276-279. (in Russian)
12 Pizova NV. Utomliaemost', asteniia i khronicheskaia ustalost'. Chto eto takoe? *Consilium Medicum* 2012; 14(2): 61-64. (in Russian)
13 Platonov VN. *Sistema podgotovki sportsmenov v olimpijskom sporte* [The system of preparation of sportsmen in Olympic sport], Kiev: Olympic Literature; 2004 (in Russian)
14 Poliaev BA, Makarova GA, Vykhodec IT. Sindrom khronichnoi utomi. [Syndrome of chronic tiredness]. *Zbirnik statej zi sportivnoi medicini.* 2010; 4(1): 29-31. (in Ukrainian)
15 Solodkov AS. Osobennosti utomleniia i vosstanovleniia sportsmenov [Specific features of tiredness and recreation of sportsmen]. *Uchenye zapiski universiteta im. P.F. Lesgafta* 2013; 100(6): 130-143. (in Russian)
16 Eshbi UR. *Konstrukciia mozga* [Construction of brain], Moscow: Foreign Literature Publishing House; 1962 (in Russian)
17 Iabluchanskij NI, Martynenko AV, Isaeva AS. *Osnovy prakticheskogo primeneniia neinvazivnoj tekhnologii issledovaniia reguliatornykh sistem cheloveka* [Principles of practical application of non invasive technology of human regulatory systems' studying], Kharkiv: Basis; 2000 (in Russian)
18 Axe EK, Satz P, Fawzy I. Cognitive Function and Major Depression in Chronic Fatigue: The Apathy Construct. *Journal of Chronic Fatigue Syndrome* 2007; *14*(4): 19-38.
19 Fain O. How to manage asthenia and fatigue? *Rev. Prat.* 2011; 61(3): 423–426.
20 Jaffee MS, Winter WC, Jones CC. Ling G. Sleep disturbances in athletic concussion. *Brain Injury* 2015; 29(2): 221-227.
21 Knoop H, Prins JB, Moss-Morris R, Bleijenberg G. The central role of cognitive processes in the perpetuation of chronic fatigue syndrome. *J. Psychosom. Res*. 2010; 68: 489–94.
22 Task Force of the European of Cardiology and the North American Society of Pacing and Electrophysiology. Heart Rate Variability. Standarts of Measurements, Physiological Interpretation, and Clinical Use. *Circulation* 1996; 93: 1043-1065.

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APPLICATION OF INTERDISCIPLINARY CONNECTIONS AND INFORMATION TECHNOLOGIES FOR DEVELOPMENT OF MOTOR SKILLS IN LIGHT ATHLETIC OF GIRLS – SENIOR FORM PUPILS

Al-Ravashdeh Abdel Baset, Kozina Zh.L., Kramskoy S.I., Bazilyuk T.A.
Taras Shevchenko National University of Luhansk

Abstract. *Purpose:* to work out and substantiate technologies of motor and intellectual aspects' integral impact on process of training of light athletic' throws and run techniques of 15-16 years old girls. *Material:* in the research 2 groups of pupils participated: control group (n = 22) and experimental group (n = 21). *Results:* Methodic of run, jumps and throws techniques' training of senior school girl-pupils has been worked out. The methodic implies mastering of basic light athletic movements on the base of analogies with rational and economic movements in animate nature and laws of mechanic It conditions application of knowledge from physics, biology, mathematic for receiving of more complete understanding of light athletic movements' correct technique. *Conclusions:* we have shown that application of interdisciplinary connections permits to make the process of movements' training more effective in comparison with mastering material of purely physical education.
Key words: skills, light athletic, pupils, methodic.

Introduction

At present, in education there is a problem of absence of interconnection between studying of different disciplines: different school curriculum subjects are delivered without interconnection between them. As a result pupil receives systemless, fragmented knowledge, which turn out to be useless in practice and are quickly forgotten after leaving school [16; 22; 24]. The most separated is physical education. Physical education is a "counter-weight" to theoretical disciplines in school curriculum, not envisaging cognitive functioning [1; 15; 18; 19; 25; 26]. However, application of cognitive and associative spheres in any kind of functioning, including physical education, facilitates creation of holistic understanding of action. It improves effectiveness of motor skills' mastering and effectiveness of mastering of knowledge in other subjects [2; 6; 7; 13; 14].

In this connection it is necessary to work out approaches to physical education teaching, which would imply creation of holistic idea about movement, deep understanding of rational movements technique's physical principles [20; 27; 29; 32; 33]. Approaches of such orientation are rather effective; however, they practically have not been worked out for physical education and are not used in it by the present time [28; 30; 31]. That is why the problem of methodic' working out for schoolchildren's motor actions' training is urgent and important. It is conditioned by the following: integral combination of knowledge from different fields; creation of holistic idea about movement; enriching of theoretical knowledge with practical realization in the field of motor actions.

Analysis of problems in schoolchildren's physical education is present in many works that also witnesses about importance of this problem. The circle of the regarded problems is rather wide. In work by R. Podstavka et al. (2014) [25] physical education of rural schoolchildren are regarded. The authors note that only insignificant percentage of pupils participated in out-of-school sport trainings and other physical exercises, while relatively high percentage of children pay much of their free time to watching TV, DVD or computer games. The researches of R. Podstavka and K. Boryslavska (2014) [18] showed that the highest quantity of differences between results of individual motor tests in reaching of the best results were in schoolchildren, who were trained by qualified instructors. R. Podstavka et al. (2013) [26] showed that factors of secondary school's location and type differentiated insignificantly motor level of first year students. Weak interaction of the used factors was a result of leveling of distinctions and barriers between urban and rural schools.

The problem of interdisciplinary connections was elucidated by O.Ya. Chernoyarova (2001)[24]. The author analyzes problem of interdisciplinary connections in different fields of education. She pointed at demand in development of interdisciplinary connections in training of physical culture teachers. She sowed that it is necessary to integrate different educational aspects, connected with training of physical education specialists. However, realization of such integration in system of physical education in school has not been studied yet.

Purpose, tasks of the work, material and methods

The purpose of the work is to work out and substantiate technologies of motor and intellectual aspects' integral impact on process of training of light athletic' throws and run techniques of 15-16 years old girls.

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The methods of the research: theoretical analysis and generalization of special literature, pedagogic testing, pedagogic experiment, methods of mathematical statistic.

For determination of influence of authors' methodic on development of senior form girl-pupils' motor skills at academic and circle light athletic trainings we conducted forming pedagogic experiment (in period from September 2013 to May 2014). Control (n = 22) and experimental (n = 21) groups included girl pupils of senior forms of secondary school (Mu'tah, Al-Karak, Jordan).

Results of the research

On the base of theoretical principles [8; 9; 10; 11; 21] we worked out methodic of motor skills' training for senior pupils at light athletic lessons with application of interdisciplinary connections, information and interactive technologies. In our methodic, holistic approach is the main direction of motor skills' development at light athletic trainings. It implies mastering of light athletic basic movements on the basis of analogies with rational and economic movements in animate nature and laws of mechanics. It conditions application of knowledge from physics, biology, mathematic for receiving of more complete understanding of light athletic movements' correct technique. Besides, application of information technologies permits to improve effectiveness of training process owing to impact on supreme sectors of central nervous system. Just such approach is the most acceptable for motor actions' training of senior school's pupils. In senior school age cognitive and associative forms of learning are more expressed. That is why application of mind activating means is one of the most effective ways to improvement of quality of teaching.

These principles are realized in offered by us methodic of motor skills' training with application of interdisciplinary connections and information technologies, worked out for pupils of senior forms. Such approach meant that with pupils' mastering of run, jumps and throws multiple repetitions of actions was the methodic' approach and physiological, bio-mechanical principles of movements (run, jumps, throws) were explained. It implied application of analogies from biology and physics. Such information was delivered in oral form and in form of printed recommendations, methodic literature, video-aids and etc.

Let us regard application of interdisciplinary connections and information technologies in training of techniques of light athletic elements on example of run (jumps) and throws. As the basis of interdisciplinary connections we took approach, delivered in works of N. Romanov [21]. The author recommends such approach for mastering of technique of the so-called "postural method of run", implying improving of run technique's mastering owing to training of main body positions, ability to strain and relax required muscles. For realization of this idea the author uses analogies from animate nature, laws of physics, moving of wheel on inclined surface and so on.

For training of throws' technique we took as the basis methodic of initial training of throws in game kinds of sports, offered by Zh.L. Kozina [7]. In this work, with the help of analogies from animate nature demand in adding of all force-vectors for turn-by-turn switching of all muscles in is explained. At informatics, geometry and biology lessons pupils watched educational cartoon, in which there was analogy for rules of vectors' addition as well as for laws of bio-mechanical addition of forces when passing ball, laws of forces' interaction of ants, when they drag wear; laws of forces' addition in any collective single-directed action on example of tale "Turnip" [7].

As analogy from animate nature we supplied example with collective dragging wear by ants, when vectors of all ants' forces are added. It was shown that ants can drag wear quickly to the required place only adding their forces. In analogous way muscles can fulfill strong and accurate action only with agreed work. From this point of view when passing ball it is purposeful to switch in work the biggest muscles, i.e. lower limbs' muscles. It ensures speed-power aspect when fulfilling the given technique [7]. As analogy example from tale "Turnip" was supplied. In the tale vectors of all forces (i.e. "grandpa", "grandma", "granddaughter" and so on) added and "turnip was extracted" [7]. This material is delivered as cartoon, in which material of geometry, physics, biology and physical culture is combined. It strengthened pupils' understanding of material. This material was offered with the help of modern (multi-media) technologies that increased effectiveness of its perceiving.

In our opinion such approach conditions creation of holistic idea of movement, deep understanding of movement's physical principles and rational technique. Its effectiveness was proved by the conducted research.

Application of the worked out methodic resulted in registration of confident changes in indicators of girls' motor fitness in the following tests:

- "Long jump from the spot, cm" (141.4±5.23 cm before experiment and 155.7±4.62 cm after experiment, $t=3.04$, $p<0.01$),

- "Long jump from run, cm" (240.3±9.25 cm before experiment and 265.5±8.96 cm after experiment, t=2.76, p<0.03) (see fig. 1).
- "3×10 m run, sec." (11.2±0.66 sec. before experiment and 10.4±0.45 sec. after experiment, t=5.24, p<0.001),
- "30 m run, sec.", (6.34±0.07 sec. before experiment and 5.94±0.07 sec. after experiment, t=2.59, p<0.05),
- "60 m run, sec.", (11.51±0.22 sec. before experiment and 11.04±0.17 sec. after experiment, t=2.76, p<0.05) (рис. 2),
- "1000 m run, min.", (8.78±0.75 min. before experiment and 7.56±0.85 min. after experiment, t=2.47, p<0.05) (see fig. 2),
- "Ball throw, m." (15.24±2.13 m before experiment and 17.35±2.08 m after experiment, t=2,25, p<0.05) (see fig. 2).

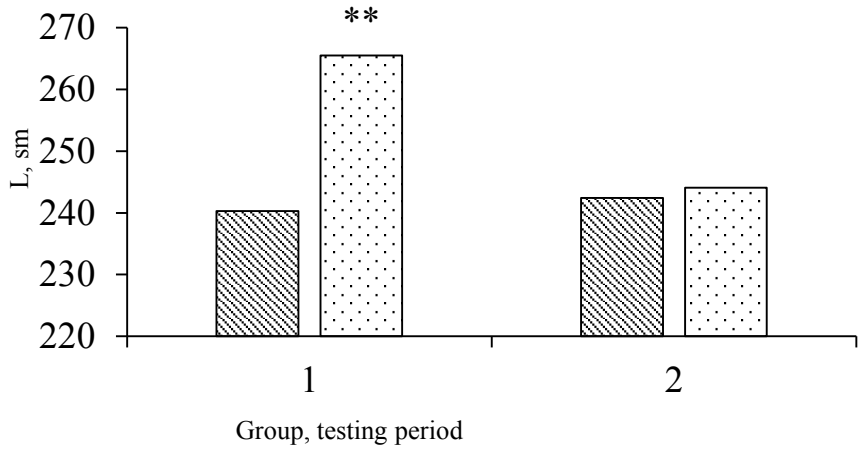

Fig.1. Results of test "Long jump from run" of experimental group pupils (n=21) and control group (n=22) before and after experiment (girls):

1 – Experimental group; 2 – Control group; ** – differences are confident with p<0.01; L, cm – result of run jump, cm;

- before experiment;
- after experiment;

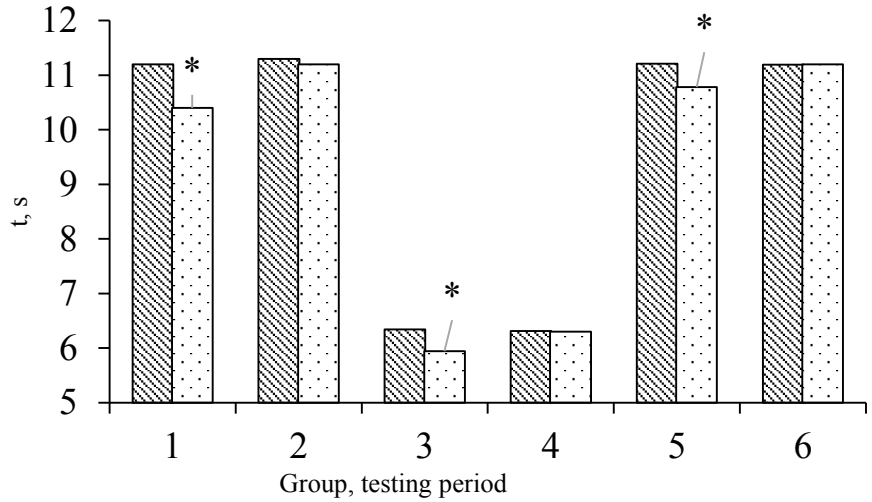

Fig.2. Results of test run tests of experimental group pupils (n=21) and control group (n=22) before and after experiment (girls):

1 –3×10 m, Experimental group;
2 –3×10 m, Control group;
3 –30 m run, Experimental group;
4 – 30 m run, Control group;
5 –60 m run, Experimental group;
6 – 60 m run, Control group;

* – differences are confident with $p<0.05$;
t, s – run result, sec.;
- before experiment;
- after experiment.

The received results show correctness and purposefulness of application of motor skills training methodic with the help of interdisciplinary connections and information technologies at light athletic lessons of senior forms' girl-pupils. In control groups such changes are not confident ($p>0.05$). It should also be noted that control and experimental groups confidently did not differ before experiment ($p>0.05$). After experiment groups became confidently different by all tested parameters ($p<0.05$; $p<0.01$; $p<0.001$) (see figs. 1, 2).

Thus, application of the worked out methodic of movements skills' training at light athletic lessons of senior forms' girl-pupils facilitates improvement of motor fitness indicators. Positive effect of methodic' application is ensured by adequate selection of exercises and expansion of theoretical aspect, which included interdisciplinary connections and informational technologies.

Discussion

Our research has been conducted in the frames of classic didactic principles and up-to-date pedagogic tendencies. Progress of theory of interdisciplinary connections was influenced on by processes of sciences differentiation and integration. Even outstanding pedagogues of 16-18th centuries Yan Amos Komensky [12], John Lock [3], Johann Henry Pestalozzi [17], Johann Friedrich Herbert [4], Friedrich Adolf Wilhelm Disterwerg [5] to certain extent pointed at malignancy of regarding of phenomena and processes in isolation. In their works they reflected demand in interaction between nature and studied subjects. In particular, Y.A. Komensky said that all must be taught in interconnection [12]. His idea implied setting of interconnection between academic subjects. It must facilitate formation of students' system of knowledge and ensure wholeness of teaching process. In work "Great didactic"[12] Y.A. Komensky wrote that nobody can be given education on the base of any one separate science, independently on other sciences. In his opinion interdisciplinary connections can save students from constant forgetting of the studied and give start to active creative functioning of students themselves in educational process.

However, at present time idea of interdisciplinary connections yet has been remaining not realized. Our work opens ways to realization of interdisciplinary connections in sphere of motor actions training. Realization of this work is becoming still more realistic in connection with usage of multi-media technologies.

Our research is experimental proof and practical realization of views of classic pedagogues on teaching process. Outstanding English philosopher and pedagogue J. Lock [3] in his work "Speculations about education" opened idea of generalized cognition as "method of sinking into truth". His idea is connected with definition of content of education. For example, one academic subject shall be filled with elements and facts from other and general education shall be combined with applied one [3].

J.G. Pestalozzi [17] in theory of developing teaching opened all diversity of interconnection of junior school's academic subjects. The author wanted to ensure system of pupils' knowledge about the world. He pointed at demand in bringing inside own mind all actually interconnected between each other subjects in connection, in which they are in animate nature [17]. The scientist warned about danger of subjects' separation one from other, especially in senior forms.

Exclusive attention to realization of interdisciplinary connections in teaching was paid by A. Disterwerg [5]. He included two kinds of connections in his classification: connection between allied academic subjects and connection between subjects of different teaching cycles. From this point of view we offered methodic, which realizes connections between subjects of quite different teaching cycles (humanitarian, natural and practical, like physical education).

According to K.D. Ushinsky [23], interdisciplinary connections are based on different associative connections and can be classified by similarity, opposite, time and oneness of place. His thoughts about world-vision role of interdisciplinary connection, forming of students' clear, full, holistic ideas about existing real world are especially significant for modern educational system. Knowledge and ideas in sciences shall be naturally built in light and expanded vision of world and life [23].

It should be noted that our work has shown effectiveness of this methodic application. This methodic combine differently oriented subjects and increase effectiveness of their mastering by creation of single idea about different processes in animate and inanimate nature. These ideas are realized in human rational movements.

Conclusions:

1. Methodic of senior girl-pupils' motor skills' training at light athletic lessons with the help of interdisciplinary connections and information technologies has been worked out. Holistic approach is the main direction of motor skills' training in this methodic. It implies mastering of basic movements on the base of analogies with rational and economic movements in animate nature and laws of mechanics. It conditions receiving of more complete understanding of movements' correct technique.

2. We have shown that application of interdisciplinary connections and information technologies increase effectiveness of training process in comparison with mastering only physical education material. Application of our methodic of motor skills' training during 1 academic year resulted in confident improvement of pedagogic tests' results for experimental group girl-pupils' motor fitness.

The prospects of further researches imply perfection of methodic of schoolchildren's skills with the help of integral impact of interdisciplinary connections and information technologies.

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Conflict of interests

Authors declare that there is no conflict of interests.

References:

1. Bal'sevich VK. Infrastruktura vysokoeffektivnogo fizicheskogo vospitaniia v obshcheobrazovatel'noj shkole [Infrastructure of highly effective physical education in comprehensive school]. *Fizicheskaia kul'tura: vospitanie, obrazovanie, trenirovka* 2003;4:3-12. (in Russian)
2. Beritashvili IS. *Struktura i funkcii kory bol'shogo mozga* [Structure and functions of brain cortex], Moscow; 1969. (in Russian)
3. Blaug M, Lokk Dzhon. 100 velikikh ekonomistov do Kejnsa [100 great economists before Keins], Sankt Petersburg: Economicus; 2008. (in Russian)
4. Gerbert Iogann Fridrikh. *Psikhologiia* [Psychology], Moscow: Publishing house "The territory of the future"; 2007. (in Russian)
5. Disterveg Adol'f. O prirodosoobraznosti i kul'turosoobraznosti v obuchenii [On nature-conformity and culture-conformity in teaching]. *Narodnoe obrazovanie* 1998;7:46-52. (in Russian)
6. Iermakov SS, Krivencova IV, Minenok AA. Osobennosti fizicheskogo vospitaniia studentov special'noj medicinskoj gruppy v pedagogicheskom vuze [Peculiarities of physical education of special health group's students in pedagogic HEE]. *Visnik Chernigivs'kogo derzhavnogo pedagogichnogo universitetu imeni T.G.Shevchenka* 2013;2(107):193-196. (in Russian)
7. Kozina ZhL. Analiz i obobshchenie rezul'tatov prakticheskoj realizacii koncepcii individual'nogo podkhoda v trenirovochnom processe v sportivnykh igrakh [Analysis and generalization of results of practical realization of individual approach conception in trainings of sport games]. *Fizicheskoe vospitanie studentov tvorcheskikh special'nostej* 2009;2:34-47. (in Russian)
8. Kozina ZhL. Nauchno-metodicheskie puti individualizacii uchebno-trenirovochnogo processa v sportivnykh igrakh [Scientific-methodic ways of individualization of training process in sport games]. In: Iermakov SS (editor) *Problemy i perspektivy razvitiia sportivnykh igr i edinoborstv v vysshikh uchebnykh zavedeniiakh* [Problems and prospects of development of sport games and martial arts in higher educational establishments].]. Kharkov: KSADA; 2005:188-191. (in Russian)
9. Kozina ZhL. *Sistema individualizacii podgotovki sportsmenov v igrovykh vidakh sporta* [System of individualization of sportsmen's training in game kinds of sports], Lambret Academic Publishing Russia; 2011. (in Russian)

10. Kozina ZhL. Teoretichni osnovi i rezul'tati praktichnogo zastosuvannia sistemnogo analizu v naukovikh doslidzhenniakh v oblasti sportivnikh igor [Theoretical principles and results of practical application of systemic analysis in scientific researches in field of sport games]. *Teoriia ta metodika fizichnogo vikhovannia* 2007;6:15-18. (in Ukrainian)
11. Kozina ZhL. Effektivnost' nachal'nogo obucheniia tekhnike gandbola na osnove primeneniia sovremennykh informacionnykh tekhnologij [Effectiveness of initial training of handball technique on the base of modern informational technologies]. *Fizicheskoe vospitanie studentov tvorcheskikh special'nostej* 2004;4:22-28. (in Russian)
12. Komenskij IaA. *Velikaia didaktika* [Great didactic], Moscow: Education; 1988. (in Russian)
13. Leont'ev AN. *Deiatel'nost'. Soznanie. Lichnost'* [Functioning. Consciousness. Personality], Moscow: Politizdat; 1977. (in Russian)
14. Lerner IIa. *Didakticheskie osnovy metodov obucheniia* [Didactic principles of teaching methods], Moscow: Pedagogy; 1981. (in Russian)
15. Liakh VI, Zdanevich AA. *Kompleksnaia programma fizicheskogo vospitaniia uchashchikhsia 11 klassov* [Complex program of 11 form pupils' physical education], Moscow: MO RF; 2002. (in Russian)
16. Fedorova VN. *Mezhpredmetnye sviazi estestvenno-matematicheskikh disciplin* [Interdisciplinary connections of natural-mathematic disciplines], Moscow: Education,;1980. (in Russian)
17. Pinkevich AP. *Pestalocci* [Pestalozzi], Moscow: Journal newspaper association; 1933. (in Russian)
18. Podstawski Robert, Borysławski Krzysztof. Influence of pe teachers' qualifications on the motor abilities of early school-age children. *Physical education of students* 2014;1:56-63. http://dx.doi.org/10.6084/m9.figshare.903695
19. Pukhov DN. Pedagogiko-psikhologicheskie aspekty analiza otnosheniia shkol'nikov 5-9 klassov k fizicheskoj kul'ture [Pedagogic-psychological aspects of analysis of 5-9 form pupils' attitude to physical culture]. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2011;2(19):1-8. (in Russian)
20. Zajcev VP, Iermakov SS, Manucharian SV, Fediaj IA. Rekreaciia kak nauchnaia disciplina i ee istoricheskie aspekty [Recreation as scientific discipline and its historical aspects].]. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2012;12:46-52. (in Russian)
21. Romanov Nikolaj, Robson Dzhon. *Poznyj metod bega* [Postural method of run], Moscow: Mann, Ivanov and Ferber; 2013. (in Russian)
22. Sitdikova LM. *Mezhpredmetnye sviazi fiziki i literatury kak sredstvo povysheniia kachestva znanij uchashchikhsia v gumanitarnykh klassakh. Cand. Diss*. [Interdisciplinary connections of physics and literature as mean of knowledge quality improvement of humanitarian pupils and students. Cand. Diss.], Chelyabinsk; 1997. (in Russian)
23. Ushinskij KD. *Chelovek kak predmet vospitaniia* [Person as a subject of education], Moscow: 1950. (in Russian)
24. Chernoiarova O.A. Mezhpredmetnye sviazi v sisteme prepodavaniia sportivno-pedagogicheskikh disciplin budushchim uchiteliam fizicheskoj kul'tury [Interdisciplinary connections in system of sport-pedagogic disciplines' teaching of future physical culture instructors]. *Vestnik Chuvashskogo gosudarstvennogo pedagogicheskogo universiteta im. I.Ia. Iakovleva* 1999;8:120 -122. (in Russian)
25. Podstawski Robert, Omelan Aneta, Zapert Monika, Żurek Piotr. School and out-of-school physical activity of children in rural areas. *Physical education of students* 2014;4:55-60. http://dx.doi.org/10.6084/m9.figshare.979315
26. Robert Podstawski, Danuta Zwolińska, Renata Urbańska-Gizińska, Danuta Nowosielska-Swadźba. The effect of learning environment factors on biological development of first year students. *Physical education of students* 2013;6:103-109. http://dx.doi.org/10.6084/m9.figshare.845594
27. Carlos Eduardo Da Costa, Vinicius Barroso Hirota, Ademir De Marco. Motivational goals orientation in Physical Education classes of elementary education. *Journal of Physical Education and Sport (JPES)* 2015;15(2):167 – 171.
28. David Hortigüela-Alcalá, Ángel Pérez-Pueyo, José Moncada-Jiménez. An analysis of the responsibility of physical education students depending on the teaching methodology received. *Journa of Physical Education and Sport (JPES)* 2015;15(2):202 – 207.
29. Krzysztof Prusik, Katarzyna Prusik, Kozina ZhL, Iermakov SS. Features of physical development, physical preparedness and functional state of boys and girls - students of Polish higher educational establishments. *Physical education of students* 2013;1:54-61. http://dx.doi.org/10.6084/m9.figshare.96415.

30. Krzysztof Prusik, Pavol Bartik, Sergii Iermakov, Agnieszka Garapuczyk, Walery Zukow. Assessment of the level of physical development and physical fitness overall girls aged 10-14 years [Ocena poziomu rozwoju somatycznego i sprawności fizycznej ogólnej dziewcząt w wieku 10-14 lat]. *Journal of Health Sciences* 2013;3:(10):401-418. (in Polish)
31. Hribovska Iryna, Danylevych Myroslava, Ivanochko Victoria, Shchur Lydia. Organizational conditions of healthy lifestyle promotion for arts students. *Journal of Physical Education and Sport (JPES)* 2015;15(2):218 – 224.
32. Prusik Katarzyna, Iermakov SS, Kozina ZhL. Indexes of physical development, physical preparedness and functional state of polish students. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2012;12:113-122
33. Patryk Smolarz, Marek Napierała, Mirosława Cieślicka, Walery Zukow, Radosław Muszkieta, Sergii Iermakov. The state of somatic features and the general fitness of thirteen-year-old footballer [Stan cech somatycznych i sprawność ogólna trzynastoletnich piłkarzy z KS „Legia" Chełmża i GLZS „Start" Warlubie]. *Journal of Health Sciences* 2013;3(16):209-230. (in Polish)

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INDIVIDUALIZATION OF PSYCHOLOGICAL TRAINING AND ITS IMPORTANCE AT DIFFERENT STAGES OF MANY YEARS' PERFECTION IN TENNIS

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Abstract. *Purpose:* to determine significance of individualized approach during psychological training at different stages of many years' perfection in tennis. The tasks of the research were studying of place and role of psychological component in general system of tennis players' sport training as well as determination of specificities of individualized approach during 14-15 years old and elite tennis players' psychological training. *Material:* In the research 24 experts, coaches of combined teams and clubs, elite tennis players took part. *Results:* Role of psychological training in general system of many years' perfection has been determined. We also found out that individualization of psychological training in modern tennis is not paid sufficient attention to at present. Most of the questioned respondents pointed, that such training is conducted mainly with elite sportsmen (42%). Only 14% noted that individual psychological training is carried out at basic stages of many years' perfection. *Conclusions:* Principle of individualization is a determining one in the course of sportsmen's training at stages of many years' perfection. About 86% of experts stressed on significance of application of individualized approach in work with tennis players. Consideration of tennis players' individual features during psychological training is a compulsory matter in increasing of effectiveness of sportsmen's training and competition functioning.
Key words: individualization, psychology, training, system, competition.

Introduction

Strive for provisioning of conditions for maximal possible results, coming from natural bents and developed on their base wide spectrum of sportsman's abilities, shall be in the basis of rational construction of tennis players' many years' training. Realization of this strive shall be ensured exclusively in planned way and with durable trainings, which consider peculiarities of organism's development and sportsmen's individual potentials [1-3, 5, 18, 19, 24, 30, 35, 39-41].

It was established that consideration of sportsmen's individual characteristics in training process facilitate more qualitative opening of their bents, effective mastering of technical-tactic skills and increase of sportsmanship. Thus, one of ways for optimizing of training process in any kind of sports is application of individual approach to construction of training sessions [4, 6, 7, 9-12, 19, 26-29].

In scientists' opinion usage of mentioned above arsenal of properties would permit to apply differentiated approach to construction of trainings and realize reliable training of sportsmen of different age and qualification [2, 5, 8, 20-24, 31-34, 36-38, 42- 43]. As data from different kinds of sports witness individual approach is used mainly in training of elite sportsmen. And such approach is connected with consideration of exercises' technique, choice of competition functioning's structure, modes of training and so on. In this connection research of individualization of psychological training of tennis players and determination of its role at stages of many years' perfection are rather urgent.

Purpose, tasks of the work, material and methods

The purpose of the work is to determine significance of individualized approach during psychological training at different stages of many years' perfection in tennis.

The tasks of the work were studying of place and role of psychological component in general system of tennis players' sport training as well as determination of specificities of individualized approach during 14-15 years old and elite tennis players' psychological training.

The methods of the research: analysis and generalization of data of special scientific-methodic literature, questioning, method of experts' assessments, pedagogic observation, methods of mathematical statistic, analysis of Internet data.

Results of the research

Psychological training is an important component of sport perfection in different kinds of sports. Tensed training and competition functioning require from a sportsman demonstration of different psychological qualities, which, harmoniously combining with other sides of fitness, would ensure opening of actual motor potential and the highest results in the most responsible competitions of training period or sport career of a player.

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In spite of undoubted significance of psychological training in sports, as on to day these urgent problems have been paid insufficient attention to. Tennis is not exclusion as well. Practically all questioned by us experts (94%, see fig. 1.) say about importance of psychological training in tennis. However, analysis of scientific works devoted to different components of fitness in tennis (technical tactic, physical and etc.) shows that psychological training takes nearly the last place.

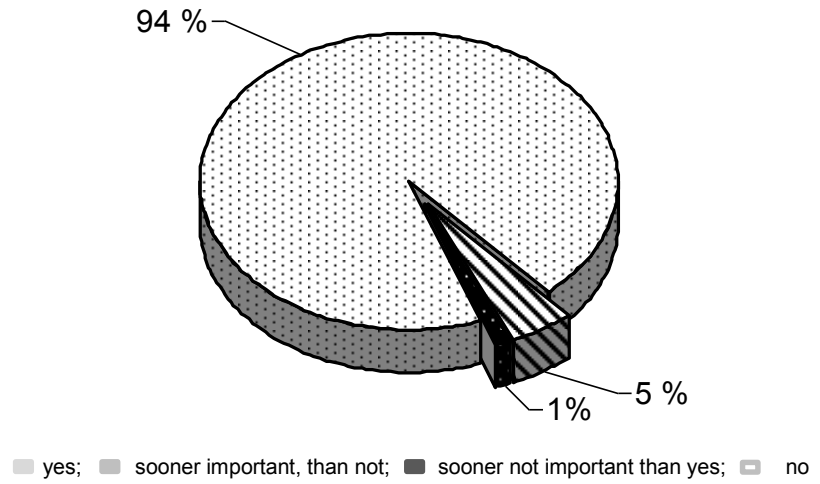

Fig.1. Significance of psychological training in tennis as per questioning of experts (n=24):

Insufficient quantity of researches on psychological training in tennis can be conditioned by a number of reasons. First of all, studying of sportsmen's psychological potentials requires certain level of additional knowledge (theoretical and practical base, methodic of diagnosing and so on), that can limit quantity of qualified specialists and spectrum of the studied questions. Second: the studied object (sportsman's psychological potentials) is rather complex structure, which requires consideration of many components and laws. The received during literature review data show that great number of works is devoted to studying of only separate problems of sportsmen's training (psychic features or personality's characteristics). It does not permit to create systemic idea of peculiarities and significance of psychic functioning in training and competition functioning of tennis players.

Besides, experts note importance of psychological training of tennis players at different stages of many years' perfection. But such work is conducted oftener only with elite sportsmen, who pretend on success in great international championships (see fig.2). Great majority of the questioned experts (62%) point that as on to day psychological training is conducted only with elite sportsmen. Only 32% of expert mentioned that psychological training is used in training process of tennis players at specialized basic stage. It quite clear that such differentiation of psychological training means is not accessible. Because formation of individual style of functioning's psychic regulation requires stage-by-stage process and takes long time.

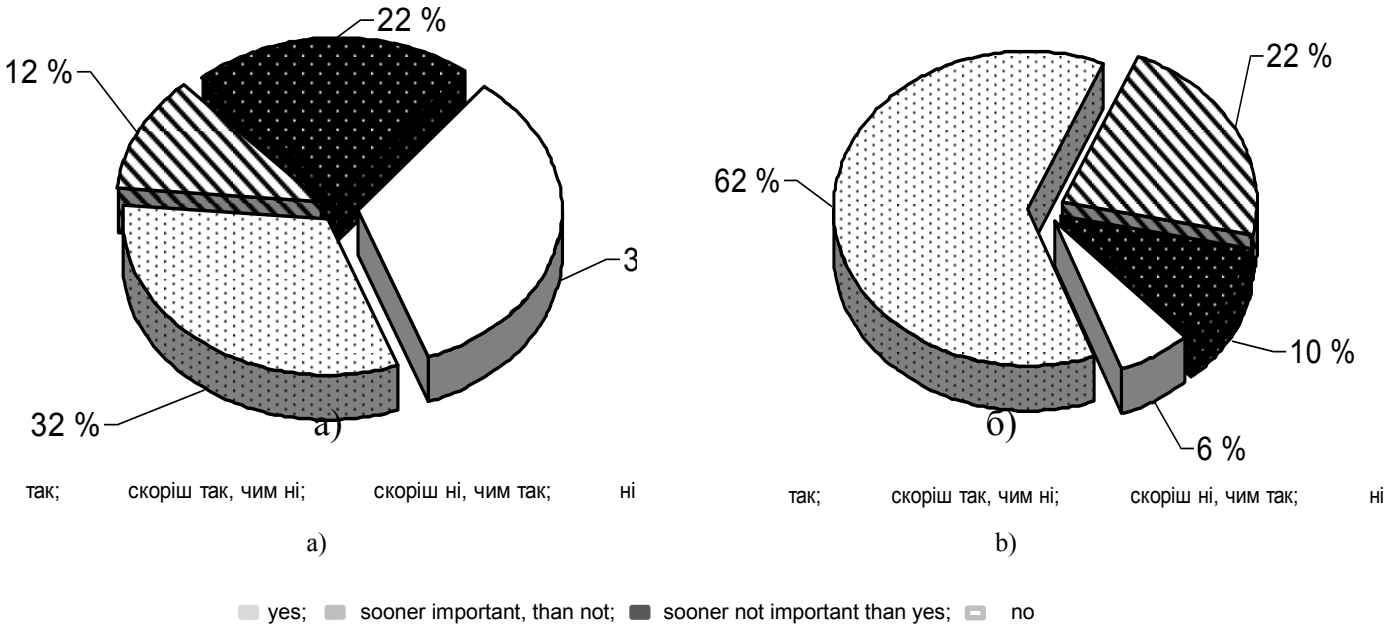

Fig.2. Application of psychological training means in training process of tennis players of different class (by expert' data n=24):
a)sportsmen of 14-15 years old age; b) elite sportsmen.

Early diagnostic of junior sportsmen's psychological features will permit not only to determine the prospects of their future sport perfection, but also to make correct choice of methods and means of sport training, to choose the object of future specialization, determine manner of competition functioning and so on.

One of urgent direction of training process's perfection is maximal orientation on individual bents of sportsman during construction of training process and choosing of individual structure of competition functioning. Specificity of sport functioning is that with every stage of many years' perfection sportsman faces newer, more difficult tasks. Then, amount of training and competition loads gradually increases, compatibility of environment intensifies. In such conditions every sportsman chooses his own way of overcoming obstacles, finds motivation for further struggle and achievement of future sport results. Surely, qualified assistance of specialist in sport psychology can significantly increase effectiveness of this process and usage of psychological training means shall not be restricted only by elite sports. That is why principle of individualization is a determining during sportsmen's training at all stages of many years' perfection (see fig.3). Just this opinion is shared by questioned by us experts (86%), who, by great majority of their answers, underlined importance of application of individualized approach in tennis players' trainings.

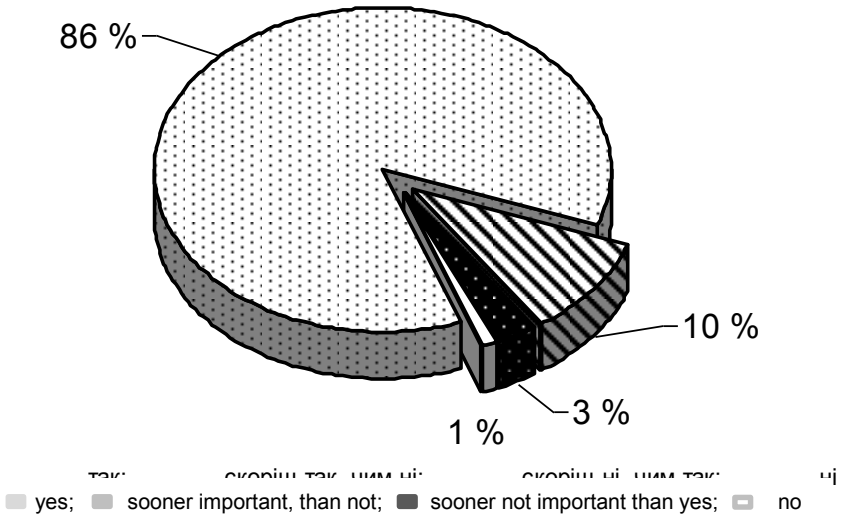

Fig.3. Importance of application of individualized approach in tennis players' training (by data of questioning n=24):

Besides, we questioned experts for application of individualized approach during psychological training of tennis players at different stages of many years' perfection (see fig.4). Analysis of the received data shows that in work with elite sportsmen (in contrast to junior tennis players) individualized approach is used much oftener (in 46% of cases).

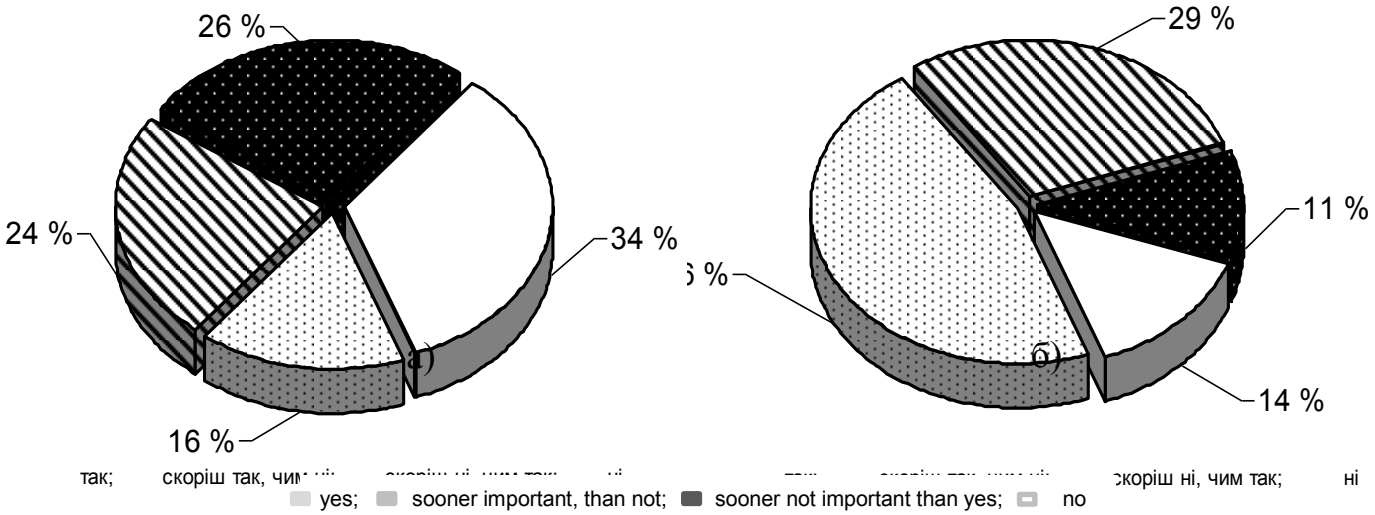

Fig.4. Application of individualized approach during psychological training in training sessions of different classes' tennis players (by experts' data, n=24):
а) спортсмени 14-15 років; б) спортсмени високого класу.
a)sportsmen of 14-15 years old age; b) elite sportsmen.

It should be noted that even such percentage is not completely accessible: only with every second elite sportsman individualized psychological training is conducted. In case with junior tennis players this percentage is much lower – 16% - at stage of specialized basic training. The quarter of the questioned experts pointed that individualized approach is not used in work with junior tennis players. One more quarter answered that such work is not sooner conducted than is conducted (see fig.4).

An important task of the research was determination of optimal age, since which it should be necessary to start purposeful psychological training, considering tennis players' individual features. Of course, with it, it is necessary to consider that tennis trainings are started in rather early age 4-5 years. Surely, so early psychological training can be of little effectiveness and not correspond to tasks of age period. In answers to this question experts' opinions were quite different (see fig. 5).

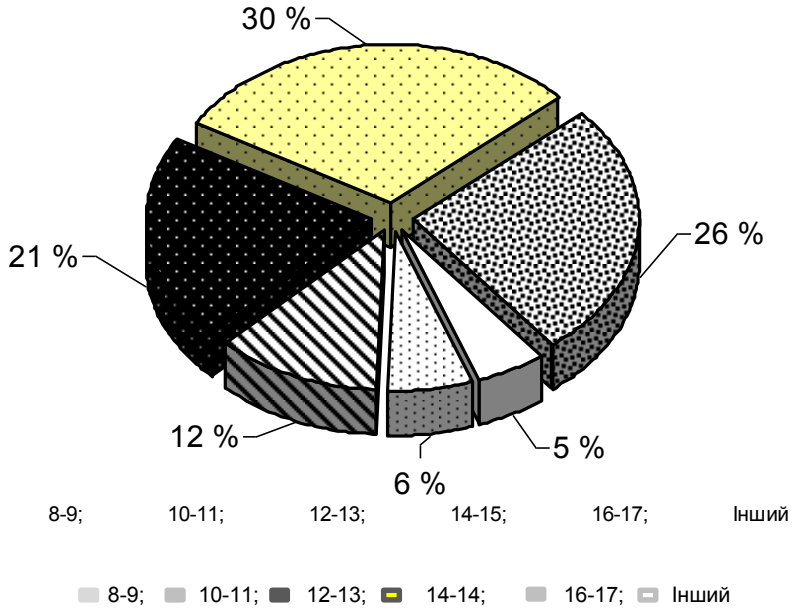

Fig.5. The most favorable age for starting of individualized psychological training of tennis players (by data of experts' questioning, n=24):

Thus, 30% of experts think that age of 14-15 years old is the most favorable for application of individualized psychological training means. 26% - called age of 16-17 years, 21% - 12-13 years, 12% - 10-11years, 6% - 8-9 years, 5 % - other age (including below 7 years old).

Discussion

As a result of the conducted researches we confirmed opinion of specialists (M.S. Bryl, 2001 [1]; Zh. L. Kozina, 2010 [9]; Bane M.K., Reid M., Morgan S., 2014 [13]; Borisova O. V., 2011, 2012 [14-16]; Buszard T., 2014 [17]; Jagiello Marina, Jagiello Wladyslaw, 2014 [25] et al.) about significance of application of individualized approach in training functioning in game kinds of sports.

This problem becomes especially acute concerning individualization of psychological training in tennis. For the first time we showed open attitude of coaches and elite players to means of individual psychological training at different stages of many years perfection. The received results permitted to state insufficient level of individual training of 14-15 years old tennis players and speak about demand in further implementation of specialized psychological training programs in practice.

Conclusions:

1. The conducted questioning showed that great majority of specialists consider psychological training to be an important component of general system of many years tennis players' training (94%). With it most of the questioned experts (62%) points that psychological training is usually practiced only with elite sportsmen. Only 32% of experts pointed that psychological training is used at stage of specialized basic training of tennis players.
2. Principle of individualization is a determining one in the period of sportsmen's training at all stages of many years perfection. About 86% of experts underlined significance of application of individualized approach in training of tennis players.
3. Analysis of received results showed that in work with elite sportsmen (in contrast to junior tennis players) individualized approach was used much oftener (in 46% of cases). Only 14% of the questioned respondents pointed that individual approach is used during psychological training of tennis players at basic stages of many years' perfection.

The prospects of further researches are connected with implementation in training process of 14-15 years old tennis players of specialized programs, oriented on correction of sportsmen's psychological fitness, considering their individual features.

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Conflict of interest

The authors declare that there is no conflict of interests.

References:

1 Bril' MS. Individualizaciia v sportivnykh igrakh [Individualization in sport games], *Teoriia i praktika fizicheskoj kul'tury* 2001;5:32-33. (in Russian)
2 Vasina EV. Sorevnovatel'naia deiatel'nost' tennisistov [Competition functioning of tennis players]. *Teoriia i praktika fizicheskoj kul'tury* 2008;5:45-49. (in Russian)
3 Guba VP, Kvashuk PV, Nikitushkin VG. *Individualizaciia podgotovki iunykh sportsmenov* [Individualization of junior sportsmen's training], Moscow: Physical Culture and Sport; 2009. (in Russian)
4 Emshanova IuA. Individual'no-tipologicheskie osobennosti tennisistov i ikh vliianie na sorevnovatel'nuiu deiatel'nost' [Individual-typological peculiarities of tennis players and their influence on competition functioning]. *Physical Education of Students* 2011;5:22-25. (in Russian)
5 Zaporozhanov VA. Individualizaciia – vazhnejshaia problema sporta vysshikh dostizhenij [Individualization – as the most important problem of elite sports]. *Teoriia i praktika fizicheskoj kul'tury* 2002;7:62-63. (in Russian)
6 Kozak AM, Ibraimova MV. Construction of training process of tennis players aged 5-6 years, taking into account the specifics of the development and control of their coordination skills. *Physical Education of Students* 2014;6:17-23. http://dx.doi.org/10.15561/20755279.2014.0604
7 Ivanova TS, Krasnova LP, Ivanov LIu, Pikalova AB. Otbor perspektivnykh iunykh tennisistov i individualizaciia ikh sportivnoj podgotovki [Selection of promising junior tennis players and individualization of their sport training]. *Fizkul'tura, obrazovanie i nauka* 1998;2:14-18. (in Russian)
8 Ivanova TS, Ivanov LIu. Ispol'zovanie zarubezhnogo opyta psikhologicheskoj podgotovki v trenirovke iunykh tennisistov [Application of foreign experience of psychological training in junior tennis players' training]. *Sbornik trudov uchenykh RGAFK* 1998;3:120-121. (in Russian)
9 Kozina ZhL. *Teoretiko-metodicheskie osnovy individualizacii uchebno-trenirovochnogo processa sportsmenov v igrovykh vidakh sporta. Dokt. Diss*. [Theoretical-methodic principles of individualization of sportsmen's training in game kinds of sports. Dokt. Diss.], Kharkov; 2010. (in Russian)
10 Markelov VV. Psikhologo-pedagogicheskie aspekty integrativnogo podkhoda k upravleniiu razvitiem individual'nosti sportsmena [Psychological-pedagogic aspects of integrative approach to control over development of sportsman's individuality]. *Teoriia i praktika fizicheskoj kul'tury* 2006;2:24-26. (in Russian)
11 Platonov VN. *Periodizaciia sportivnoj trenirovki* [Periodizing of sport training], Kiev: Olympic Literature; 2013. (in Russian)
12 Puni AC. *Problema lichnosti v psikhologii sporta* [Problem of personality in psychology of sports], Moscow: Physical Culture and Sport; 1984. (in Russian)
13 Bane MK, Reid M, Morgan S. Has player development in men's tennis really changed? An historical rankings perspective. *Journal of Sports Sciences*. 2014;32(15):1477–84.
14 Borisova OV. Tennis: history and the present. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2012;11:119 - 124. http://dx.doi.org/10.6084/m9.figshare.97379
15 Borisova OV, Michuda YP. Tennis as a kind of sports-commercial activity. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2011;3:20 - 25.
16 Borisova OV. Labour market in modern tennis: features of functioning. *Physical education of students* 2012;6:25 - 29. http://dx.doi.org/10.6084/m9.figshare.96563
17 Buszard T, Farrow D, Reid M, Masters RSW. Modifying Equipment in Early Skill Development: A Tennis Perspective. *Research Quarterly for Exercise and Sport* 2014;85(2):218–25.
18 Crespo M, Reid M, Quinn A. *Tennis Psychology*. ITF; 2009.
19 Elliot B, Reid M, Crespo M. *Technique development in tennis stroke production*. ITF; 2009.
20 Emshanova YO. Comparative analysis of individual peculiarities for tennis players of different qualification. *Physical Education of Students* 2013;4:23-26. http://dx.doi.org/10.6084/m9.figshare.662589
21 Farrow D, Reid M. The effect of equipment scaling on the skill acquisition of beginning tennis players. *Journal of Sports Sciences* 2010;28(7):723–32.
22 Ferrauti A, Kinner V, Fernandez-Fernandez J. The Hit & Turn Tennis Test: An acoustically controlled endurance test for tennis players. *Journal of Sports Sciences* 2011;29(5):485–94.
23 Ghazal Mohamadi, Masoome Shojaee, Afkham Daneshfar, Zahra Nili Ahmadabad. Impact of shift in focus of attention on learning table tennis backhand with self-talk in high school females students. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2014;11:66-73. http://dx.doi.org/10.15561/18189172.2014.1112
24 Girod A. Tennis and neurolinguistic programming. *ITF: Coaching and Sport Science Review*. 2005;37:11-12.
25 Jagiello Marina, Jagiello Wladyslaw. Final preparations to the girls' tennis Europe Junior Masters. *Physical Education of Students* 2014;5:59-64. http://dx.doi.org/10.15561/20755279.2014.0511
26 Kachel K, Buszard T, Reid M. The effect of ball compression on the match-play characteristics of elite junior tennis players. *Journal of Sports Sciences*. 2015;33(3):320–6.
27 Kay J. Grass Roots: The Development of Tennis in Britain, 1918–1978. *The International Journal of the History of Sport*. 2012;29(18):2532–50.

28 Khan F. Anyone for Tennis? Conversations with black women involved in tennis during the apartheid era. *Agenda*. 2010;24(85):76–84.
29 Molina I. Match analysis and evaluation. *ITF: Coaching and Sport Science Review*. 2004;38:3-4.
30 Moran A. The psychology of concentration in tennis. *Coaches review* 2005;5:7-8.
31 Reid M, Giblin G, Whiteside D. A kinematic comparison of the overhand throw and tennis serve in tennis players: How similar are they really? *Journal of Sports Sciences*. 2014;1:1-11.
32 Reid M, Morgan S, Churchill T, Bane MK. Rankings in professional men's tennis: a rich but underutilized source of information. *Journal of Sports Sciences*. 2014;32(10):986–92.
33 Reid M, Morris C. Ranking benchmarks of top 100 players in men's professional tennis. *European Journal of Sport Science*. 2013;13(4):350–5.
34 Reid M, Whiteside D, Elliott B. Effect of skill decomposition on racket and ball kinematics of the elite junior tennis serve. *Sports Biomechanics*. 2010;9(4):296–303.
35 Roetert EP, El-lenbecker TS. Biomechanics of Movement in Tennis. *ITF Coaching & Sports Science Review.* 2001;24:15 — 16.
36 Shalar OG, Strikalenko EA, Ivaschenko AN. Individual properties of personality as criterion of choice of style of game of tennis players. *Physical Education of Students* 2013;2:69-73. doi:10.6084/m9.figshare.156384
37 Timmerman E, de Water J, Kachel K, Reid M, Farrow D, Savelsbergh G. The effect of equipment scaling on children's sport performance: the case for tennis. *Journal of Sports Sciences*. 2014;1–8.
38 Torres-Luque G, Cabello-Manrique D, Hernández-García R, Garatachea N. An analysis of competition in young tennis players. *European Journal of Sport Science*. 2011;11(1):39–43.
39 Van Aken I. Mental skills to teach at young age 12. *ITF Asian Coaches Workshop* 2004;11:12-16.
40 Woods RB. Children development: Its impact on the young tennis player. In: *USA Tennis Parents Guide USTA*. Key Biscayne, Fl; 2001.
41 Yakubovskiy VS, Yakubovskiy GS. *Psychology of junior tennis player: tennis confidence and psychological advantage.* RSUPESY&T*;* 2010..
42 Yuan Zhaohui; Weihai Qiong, Factors affecting interest in training children tennis Enlightenment Training. *Wuhan Institute of Physical Education Journal* 2011;1:5-8.
43 Zhang Hailong, Lv Huimin, Cui Lei. Research on the theory and methods of teaching and training of children's tennis. *Friends of Science* 2011;18:7-9.

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ORGANIZATIONAL-PEDAGOGIC TECHNOLOGY OF FORMATION OF MOTOR FUNCTIONING CULTURE AS MEAN OF PHYSICAL FITNESS IMPROVEMENT OF 5 FORM PUPILS

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Abstract. *Purpose:* to analyze influence of organizational-pedagogic technology of formation of motor functioning's culture of five form pupils in process of physical education; to test experimentally methodic of formation of motor functioning's culture by means of general gymnastic in physical education system of comprehensive schools' pupils. *Material:* The research was conducted in comprehensive school N 67, Kharkov. 57 pupils of five forms (5-A form – 30 pupils, 5-B – 27 pupils) participated in the research. *Results:* we worked out organizational-pedagogic technology of formation of motor functioning's culture "Main gymnastic at school", which positively influenced on development of physical fitness of experimental groups' pupils. *Conclusions:* it was established that under influence of selected exercises of main gymnastic and introduced competitiveness elements pupils' movements became more accurate, plastic, acquired higher amplitude, coordination.

Key words: pedagogic technology, main gymnastic, culture, moving, physical fitness, pupils.

Introduction

As on to day, in Ukraine there exists acute demand in creation of proper conditions for healthy life style of pupils and students that was noted in Laws of Ukraine "On education", "On physical culture and sports". In this complex process important role is assigned to school. Indeed, in this period foundation of children's physical and mental health is embedded, their demands and motives for physical exercises for maintaining of own health are formed and values of healthy life style are perceived [12-16, 19-21, 23]. However, practice shows that during learning at comprehensive educational establishments pupils' physical health significantly worsens 18, 25-29, 49]. In spite of heavy situation with pupils' health as on present time, there have been still no generalized researches, devoted to problem of pupils' health strengthening and preservation [41, 44, 46]. Solution of mentioned above problems is possible at the account of formation of pupils' certain personal physical culture [30-33, 36-38]. Its basic element is culture of motor functioning [40, 45, 47]. It is evident that effective usage of main gymnastic in system of physical education of comprehensive schools' pupils will permit to solve the problem of formation of their certain level of personal physical culture. It is known that one of physical culture's sides is culture of motor functioning. It includes technique of motor functioning and is connected with sphere of motives, demands and values of a person. However, such approach has not been developed yet. On the basis of literature [24] we found that assessment of schoolchildren's motor functioning's culture includes three groups of indicators. These indicators characterize schoolchildren's motor fitness, technique of their fulfilling of main gymnastic exercises from curriculum. Besides, these indicators point at motivation-value characteristics of schoolchildren's personalities and ensure their understanding of need in mastering of "Physical culture" program material.

Purpose, tasks of the work, material and methods

The purpose of the article is studying of influence of organizational-pedagogic technology of formation of motor functioning's culture of five form pupils in process of physical education.

The tasks of the research imply substantiation of the worked out organizational-pedagogic technology – "Main gymnastic at school".

Basing on analysis of scientific-methodic literature we can present culture of comprehensive schools' pupils' motor functioning in the form of diagram (see fig.1).

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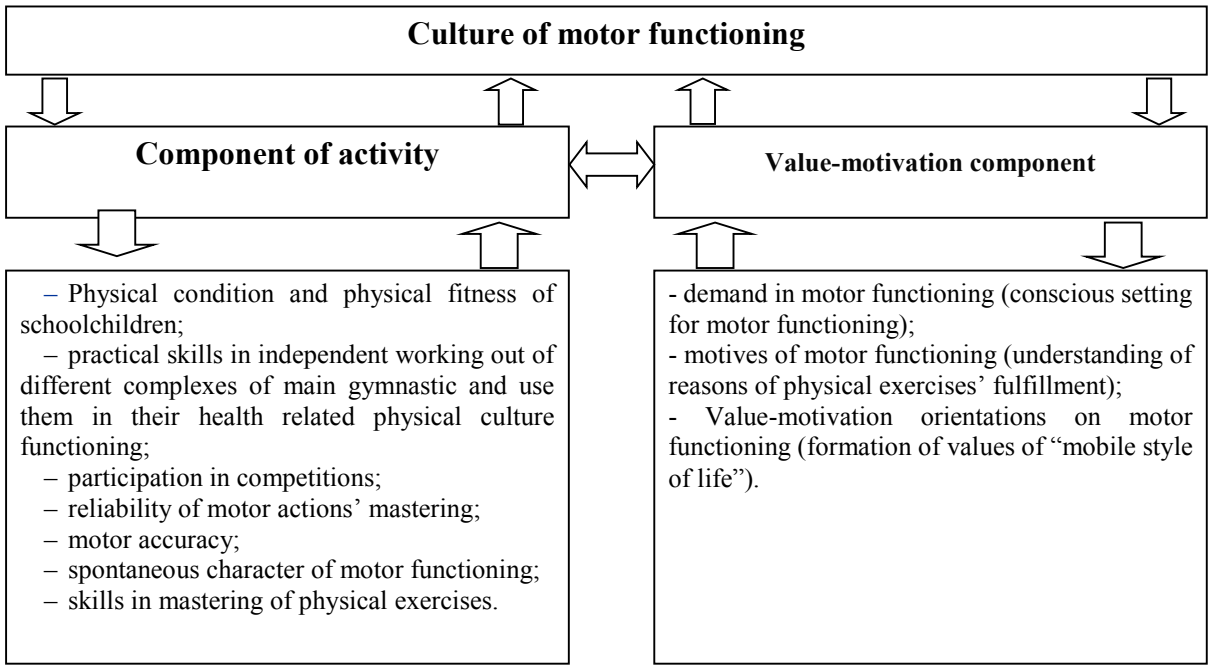

Fig.1. Culture of motor functioning

In the course of our researches we worked out appropriate organizational-pedagogic technology of formation of motor functioning's culture of pupils. In academic year structure of mastering of "Physical culture" discipline it envisages application of the following: a) methodic of successive complication of main gymnastic means, which are used in preparatory part of lesson; b) specially worked out competition-entertaining measures, which are used at the end of every semester and are oriented on increasing of pupils' motivation for health related physical culture functioning and assessment of actual level of motor functioning's culture; c) system of measures on pupils' involvement in composing (on the base of earlier mastered material) and conducting with class-mates different complexes of physical exercises that is one of key aspects of self organization of their physical culture and sport functioning.

For assessment of five form pupils' physical fitness we used tests, based on physical exercises of main gymnastic, recommended by curriculum, for assessment of physical qualities: a) "30 meters' run" – for quickness; b)"pressing up" in lying position – for strength; c) "long jump from the spot" – for speed-power qualities; d) forward torso bending from sitting position" – for flexibility; e) "shuttle run 4x9 m (sec.)" – for dexterity and "1 minute's jumps with skipping rope" for speed power endurance.

Results of the research

For estimation of effectiveness of the worked out organizational pedagogic technology we conducted forming pedagogic experiment in the process of our researches, whose condition was to use this technology during academic year. The worked out technology was used in preparatory part of physical culture lesson (invariant component of program "Physical culture at school"). It included specially worked out complexes of: a) exercises in formation; b) different kinds of walking, run, jumps; c) complexes of general warming up exercises in motion; d) complexes of general warming up exercises with o and without objects on the spot.

Results of researching of physical fitness and experiment are given in table 1. Analysis of these results witnesses that girls and boys of 5 forms have statistically not confident difference in mean results ($p>0.05$). For example, girls from experimental 5-A form in test "long jump from the spot" demonstrated mean result 123.5 cm. Girls from control 5-B form showed 124.3 cm. Difference between these results is statistically not confident ($p>0.05$). Boys of 5-A and 5-B forms showed the following mean results: accordingly, 144.5 cm and 143.3 cm. ($p>0.05$). Analogous picture is observed with comparing mean results of other tests: "pressing up in lying position", "30 meters' run (sec.)", "shuttle run", forward torso bending in sitting position", "jumps with skipping rope" (see table 1).

Comparative analysis of changes in physical fitness of 5 forms' boys and girls (control and experimental groups) for the period of experiment is given in table 2.

Table 1.

Physical fitness of five forms' pupils before experiment (p=0.05)

Indicators		Girls		t_p	t_{rp}	p	Boys		t_p	t_{rp}	p
		5-A form (n=13)	5-B form (n=15)				5-A form (n=17)	5-B form (n=12)			
		$\overline{X}$ ± m (level of competence)					$\overline{X}$ ± m (level of competence)				
1	**Speed-power:** long jump from the spot, (cm)	123.5±2.1	124.3±3.2 (sufficient)	0.21	2.06	>0.05	144.5±2.3 (sufficient)	143.3±4.1 (sufficient)	0.25	2.10	>0.05
2	**Strength:** Pressing up in lying position, quantity of times)	4.69±1.2 (middle-(sufficient)	3.8±0.4 (low-middle)	1.23	2.06	>0.05	6.1±0.5 (middle-sufficient)	6.5±0.4 (middle-sufficient)	0.74	2.10	>0.05
3	**Quickness:** 30 meters' run (sec.)	6.8±0.2 (sufficient)	6.8±0.7 (sufficient)	0.01	2.06	>0.05	5.7±0.1 (high)	5.9±0.2 (sufficient-high)	0.8	2.10	>0.05
4	**Dexterity:** Shuttle run 4x9 m (sec.)	12.9±0.2 (low-middle)	12.8±0.9 (low-middle)	0,12	2.06	>0.05	12.6±0.2 (sufficient-high)	12.8±0.3 (sufficient)	0.61	2.10	>0.05
5	**Flexibility:** Forward torso bending in sitting position, (cm)	4.7±0.9 (low)	4.3±0.4 (low)	0.46	2.06	>0.05	3.5±0.4 (sufficient-high)	3.5±0.2 (sufficient-high)	0.04	2.10	>0.05
6	**Speed endurance:** Jumps with skipping rope (q-ty of jumps for 1 minute)	40.0±2.3 (low)	40.5±3.7 (low)	0.11	2.06	>0.05	40.1±1.3 (low)	40.5±4.2 (low)	0.06	2.10	>0.05

Table 2

Physical fitness of five forms' pupils after experiment (p=0.05)

	Indicators	Girls		t_p	t_{rp}	p	Boys		t_p	t_{rp}	p
		5-A form (n=13)	5-B form (n=15)				5-A form (n=17)	5-B form (n=12)			
		$\bar{X}$ ± m					$\bar{X}$ ± m				
1	**Speed-power:** long jump from the spot, (cm)	147.7 ±2.4	135.9±3.6	2.7	2.06	<0.05	175.3±3.1	161.3±4.8	2.5	2.10	<0.05
2	**Strength:** Pressing up in lying position, quantity of times)	9.1 ± 0.5	7.3 ± 0.7	2.1	2.06	<0.05	10.4±0.6	8.8±0.4	2.2	2.10	<0.05
3	**Quickness:** 30 meters' run (sec.)	5.9 ± 0.2	6.1±0.6	0.3	2.06	>0.05	5.1±0	5.4±0.2	1.5	2.10	>0.05
4	**Dexterity:** Shuttle run 4x9 m (sec.)	11.6 ± 0.2	12.5±0.9	1.0	2.06	>0.05	11.2±0.3	12.0±0.2	2.2	2.10	<0.05
5	**Flexibility:** Forward torso bending in sitting position, (cm)	8.1 ± 0.8	5.9 ± 0.4	2.5	2.06	<0.05	5.9±0.4	4.2±0.2	3.8	2.10	<0.05
6	**Speed endurance:** Jumps with skipping rope (q-ty of jumps for 1 minute)	76.4±2.4	48.8 ± 3.3	6.8	2.06	<0.05	68.2±1.9	48.8±3.7	4.7	2.10	<0.05

Effective influence of organizational-pedagogic technology of formation of motor functioning' culture "Main gymnastic at school" on experimental 5-A form pupils' physical fitness in comparison with control 5-B form can be explained by the following:

- In experimental form quickness improved owing to introduction of different relays with ball, gymnastic stick, combinations of jumps and run, team relays for better result in physical culture lessons
- Level of strength in experimental form improved owing to practicing of static positions, increasing of exercises' repetitions, temp, rhythm of movements; execution of exercises in series, with the help of partner, application of current method of exercises' fulfillment, overcoming of obstacle course.
- Dexterity in experimental form became higher owing to application of exercises with skipping rope, different jumps; relays with skipping rope, competition and game methods of training to exercises from main gymnastic.
- Flexibility in experimental form improved at the account of systemic stretching exercises' fulfillment: active exercises (slow, elastic, waving movements); passive exercises (with using of own weight, with self-captures, with the

help of partner) and combined exercises (slow, elastic and waving movements in combination with keeping posture in extreme points of amplitude).

- Speed endurance in experimental form became better owing to usage of complexes of exercises with skipping rope, different jumps, relays with skipping rope, competition and game methods of exercises' fulfillment.

Discussion

Results of the conducted research **prove** described by V. Galuziak (2003), I. Prokopenko, V Yevdokimov (2008), V. Sutula (2012) approaches to determination of pedagogic technologies'essence, which are reproducible system of pedagogic techniques and methodic. Pedagogic techniques and methodic are combined by single algorithm of their application in educational process, which guarantees achievement of purpose.

Results of the conducted research **supplements the data** of G. Natalov (1998), L. Lubysheva (2004), R. Abzalov (2013), about essence of culture of pupils' motor functioning at the account of its marking out in structure of activity's and value-motivation component.

As a result of our researches we proved effectiveness of the worked out pedagogic technology of formation of pupils' motor functioning's culture, which stipulates its application in academic year structure of discipline "Physical culture" by methodic of successive complicating of main gymnastic means. In comparison with analogous researches (G. Globa, 2007; O. Kolonkova, O. Litovchenko, 2009; L. Deminskaya, 2010; K.T. Ferguson, 2014; R.C. Cassells, 2013) it is more efficient pedagogic tool, which can be used for formation of motor functioning's culture of 5 forms' pupils.

Conclusions:

Results of the conducted research witness that the worked out organizational pedagogic technology of formation of motor functioning's culture facilitated perfection of experimental form pupils' physical fitness. It is connected with general-developing influence of selected exercises and introduced competition's elements as well as with the fact that schoolchildren's movements became more accurate, owing to increasing of inter-muscular coordination. It facilitated fulfillment of exercises at technically higher level.

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Conflict of interest

The author declares that there is no conflict of interest.

Reference

1 Abzalov RA, Abzalov NI. *Teoriia i metodika fizicheskoj kul'tury i sporta* [Theory and methodic of physical culture and sports], Kazan: Vestfalika; 2013 (in Russian)

2 Vilenskij MIa, Solov'ev GM. Osnovnye sushchnostnye kharakteristiki pedagogicheskoj tekhnologii formirovaniia fizicheskoj kul'tury lichnosti [Main essencial characteristics of pedagogic technology of formation of personality's physical culture]. *Fizicheskaia kul'tura: vospitanie, obrazovanie, trenirovka*, 2001; 3: 2-7. (in Russian)

3 Galajdiuk M, Krasnobaieva T. Formuvannia zdorovogo sposobu zhittia iak skladova social'noi politiki derzhavi [Formation of healthy life style as a component of governmental social policy]. *Teoriia i metodika fizichnogo vikhovannia i sportu,* 2012; 3: 123–126. (in Ukrainian)

4 Durkin PK, Lebedeva MP. K probleme izucheniia motivacionno-potrebnostnoj sfery shkol'nikov i studentov kak sistemoobrazuiushchej osnovy vospitaniia u° nikh° fizicheskoj°kul'tury [On the problem of motivation-demand sphere of schoolchildren and students as system-formation basis of their physical culture education]. *Fizicheskaia kul'tura: vospitanie, obrazovanie, trenirovka*, 2005;6:102–110. (in Russian)

5 Ziemcova V. Sposib zhittia iak social'na ta osobistisna kategoriia [Life style as social and personal category]. Teoriia i metodika fizichnogo vikhovannia i sportu, 2013; 4: 10–16. (in Ukrainian)

6 Krucevich T, Ishchenko O, Imas T. Motivaciia u uchniv 6–9 klasiv do urokiv fizichnoi kul'turi [Motivation of 6-9 forms' pupils for physical culture lessons]. *Sportivnij visnik Pridniprov'ia*, 2014; 2: 68–72. (in Ukrainian)

7 Lubysheva LI. *Sociologiia fizicheskoj kul'tury i sporta* [Sociology of physical culture and sports], Moscow, Academy; 2004 (in Russian)

8 Natalov GG. Evoliuciia nauchnykh predstavlenij ob ob"ekte i krizis obshchej teorii fizicheskoj kul'tury [Evolution of scientific ideas about object and crisis of general theory of physical culture]. *Teoriia i praktika fizicheskoj kul'tury,* 1998; 9: 40–42. (in Russian)

9 Sutula VO. Bazovi oznaki fizichnoi kul'turi osobistosti [Basic signs of personality's physical culture]. *Dukhovnist' osobistosti: metodologiia, teoriia i praktika*, 2012; 6 (53): 186–192. (in Ukrainian)

10 Krucevich T.Iu. *Fizichna kul'tura v shkoli: navch. progr. dlia 1–4, 5–9 klasiv zagal'noosvitnikh navchal'nikh zakladiv* [Physical culture in school: academic program for 1-4, 5-9 forms of comprehensive educational establishments], Kiev; Litera LTD, 2013 (in Ukrainian)

11 Shiian O. Politika zabezpechennia zdorovogo sposobu zhittia molodi zasobami osviti v umovakh ievropejs'koi integracii [Policy of ensuring of youth's healthy life style by means of education in conditions of European integration]. *Fizichna aktivnist', zdorov'ia i sport,* 2012;2(8):66–72. (in Ukrainian)

12 Bedworth A, Bedworth B. *The Profession and Health Education*. WM.: Brown Publishers; 2001.

13 Braun BI, Harris AD, Richards CL, Belton BM, Dembry L-M, Morton DJ, et al. Does health care role and experience influence perception of safety culture related to preventing infections? *American Journal of Infection Control*. 2013;41(7):638–641.

14 Cote L, Bornstein M. Child and mother play in cultures of origin, acculturating cultures, and cultures of destination. *International Journal of Behavioral Development*. 2005;29(6):479–488.

15 Darst PW, Robert P. *Dynamic Physical Education for Secondary School Student*. 6 th ed. San-Francisco: Benjamin Cummings; 2008.

16 Deyneko AH. Formation of culture motor activity of pupils of 5-6 classes by means of basic gymnastics. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2015;1:24-28. http://dx.doi.org/10.15561/18189172.2015.0105

17 Eid L, Lovecchio Nicola, Bussetti Marco. Physical and Sport Education in Italy. *Journal of Physical Education and Health*. 2012;1(2):37-43.

18 Enright E, O'Sullivan M. Physical Education "In All Sorts of Corners": Student Activists Transgressing Formal Physical Education Curricular Boundaries. *Research Quarterly for Exercise and Sport* 2012;83(2):255–267. http://dx.doi.org/10.1080/02701367.2012.10599856.

19 Ferguson KT, Cassells RC, MacAllister JW, Evans GW. The physical environment and child development: An international review. *International Journal of Psychology* 2013;48(4):437–468. http://dx.doi.org/10.1080/00207594.2013.804190.

20 Filenko LV, Filenko IU, Martirosyan AA., Research of indexes of physical development, physical preparedness and functional state of students aged 10-11 years under the influence of engagement in rugby-5. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2013;6:53-58. http://dx.doi.org/10.6084/m9.figshare.714940

21 Grant J, Luxford Y, Darbyshire P. Culture, communication and child health. *Contemporary Nurse*. 2005;20(2):134–142.

22 Hardman Ken. The Situation of Physical Education in Schools: A European Perspective. *Human Movement* 2008;1:5-18.

23 Hoop JG, DiPasquale T, Hernandez JM, Roberts LW. Ethics and Culture in Mental Health Care. *Ethics & Behavior*. 2008;18(4):353–372.

24 Humphries CA, Hebert E, Daigle K, Martin J. Development of a Physical Education Teaching Efficacy Scale. *Measurement in Physical Education and Exercise Science* 2012;16(4):284–299. http://dx.doi.org/10.1080/1091367X.2012.716726.

25 Iermakova T. Development of the idea of forming health culture of a person in the world educational thought. *Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports* 2014;4:8–12.

26 Iermakova T.S. Peculiarities of forming health culture of pupils in Poland: historical aspect. // Pedagogics, phychology, medical-biological problems of physical training and sports, 2014 vol.6, pp. 16-20. http://dx.doi.org/10.6084/m9.figshare.1004090.

27 Ivashchenko OV, Khudolii OM, Yermakova TS, Pilewska Wiesława, Muszkieta Radosław, Stankiewicz Błażej. Simulation as method of classification of 7-9th form boy pupils' motor fitness. *Journal of Physical Education and Sport* 2015;15(1):142 – 147. http://dx.doi.org/10.7752/jpes.2015.01023

28 Iwelunmor J, Newsome V, Airhihenbuwa CO. Framing the impact of culture on health: a systematic review of the PEN-3 cultural model and its application in public health research and interventions. *Ethnicity & Health*. 2014;19(1):20–46.

29 Kalaja SP, Jaakkola TT, Liukkonen JO, Digelidis N. Development of junior high school students' fundamental movement skills and physical activity in a naturalistic physical education setting. *Physical Education & Sport Pedagogy* 2012;17(4):411–428. http://dx.doi.org/10.1080/17408989.2011.603124.

30 Kapranov SV, Petrov KV. Influence of physical culture and sports on health status of pupils of industrial city. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2013;8:36-40. http://dx.doi.org/10.6084/m9.figshare.745782

31 Khalajtsan A. Laying the foundations of a culture of health as a pedagogical problem. *Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports* 2014;8:22–28.

32 Lazarenko MG. Pedagogical aspects of effective use of simulator Straps with ring during the formation motor skills of pupils of 10 classes during the skiing training in the lessons of physical culture. *Physical Education of Students* 2014;6:24-28. http://dx.doi.org/10.15561/20755279.2014.0605

33 McMahon JA, Penney D. (Self-) surveillance and (self-) regulation: living by fat numbers within and beyond a sporting culture. *Qualitative Research in Sport, Exercise and Health*. 2012;5(2):157–178.

34 *National curriculum in England: PE programmes of study*, 2013. Available from: https://www.gov.uk/government/publications/national-curriculum-in-england-physical-education-programmes-of-study (date of application: 15.03.2014).

35 *National Healthy School Standart*. Partnerships. London : DfEE Publication; 2000.

36 Rice P, Gunstone R. Health and sickness causation and the influence of Thai culture among Thai schoolchildren. *Research in Science Education.* 1986;16(1):63–72.

37 Semanychyn TM, Popel' SL. Professional portrait of future instructors for physical education of preschool. *Physical Education of Students* 2015;1:60-66. http://dx.doi.org/10.15561/20755279.2015.0109
38 Sobyanin FI, Dudkina SG. About a competence and professional trade of specialists in the field of physical culture. *Physical Education of Students* 2013;1: 68-73. http://dx.doi.org/10.6084/m9.figshare.156361
39 Sozanski H, Siewierski M, Adamczyk J. Sport in schools - state and perspectives [Sport w szkole – stan i perspektywy]. *Physical education and sport in schools* [Wychowanie fizyczne i sport w szkole], Warsaw, 2010, pp. 75-89.
40 Ssali SN. Revisiting choice: gender, culture and privatised health care in Uganda. *Agenda*. 2006;20(68):42–53.
41 Tamozhanskaya GV. Morphological functional and psychological indicators of 11-12 yrs age boys' (members of preparatory special health groups of urban and countryside schools) development. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2015;4:43-50. http://dx.doi.org/10.15561/18189172.2015.0408
42 The Ontario curriculum, grades 1-8. Health and Physical Education; 2010.
43 *The World health report, 2002: reducing risks, promoting healthy life*. Genevap : World Health Organization; 2002.
44 Tikhonova NV, Sale leisure activities of children and youth in out of school educational establishments of physical culture and sports destinations. *Physical Education of Students* 2014;5:38-42. http://dx.doi.org/10.15561/20755279.2014.0507
45 Tomenko O, Starchenko A. Changes of values parents' scholarship in physical culture under the influence of realization set of activities on optimization of physical education of elder preschoolers. *Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports.* 2014;2:61–66. http://dx.doi.org/10.6084/m9.figshare.923516
46 Verkhovska MV. Basics of programming exercises using health and fitness technology in physical education pupils of secondary schools. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2015;1:17-24. http://dx.doi.org/10.15561/18189172.2015.0104
47 Williams J. Regional cultures and health outcomes: Implications for performance measurement, public health and policy. *The Social Science Journal*. 2013;50(4):461–470.
48 Wojnar J, Makarenko N, Nawarecki D, Menshyh E, Petrenko Yu, Pustovalov V. Physical development and individual-typological property peculiarities of the schoolchildren's nervous system. *Annales Lublin Universitatis Mariae Curie-Sklodowska* 2005;LX(XVI, 6):281-286.
49 Yermakova TS. Individualization of forming health culture in schoolchildren of Polish schools. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2015;1:29-33. http://dx.doi.org/10.15561/18189172.2015.0106

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SIMULATION OF PROCESS OF 14-15 YEARS OLD GIRLS' TRAINING OF LIGHT ATHLETIC AND GYMNASTIC EXERCISES

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Abstract. *Purpose:* to optimize physical exercises' training regiment in educational process of 14-15 years old girls. *Material:* in experiment girls of 14 years' age (n=24) and 15 years' (n=24) participated. The plan of factorial experiment was used. *Results:* we have shown influence of quantity of exercises' repetitions (X_1) and rest intervals (X_2) on effectiveness of physical exercises' training. We have offered complex approach to studying of objects, which admits simultaneous varying of several factors for assessment of their interactions' influence. Simultaneous varying of factors by special program ensured studying of each of them in different conditions. It permitted to receive more reliable conclusions, suitable for changeable conditions. *Conclusions:* it was established that increase of training process's effectiveness is possible on the base of analysis of regressive models, calculation of optimal modes of physical exercises' fulfillment in process of their mastering at school physical culture lessons.
Key words: simulation, regressive models, physical exercises, modes of training.

Introduction

Simulation in physical education is one of effective methods for searching and optimizing of training process (S.S. Iermakov [1, 2, 3]; O.M. Khudolii, S.S. Iermakov [13]; O.M. Khudolii, O.V. Ivashchenko [7, 11, 12]; O.M. Khudolii [14]). Simulation of complex, holistic processes permits to better understand the studied phenomenon, learn its content, establish visual connections, mark out the most substantial components and so on. Such approach is an effective mean of testing of theoretical ideas' about studied object correctness and completeness [11, 12, 16, 19, 20, 22, 23, 27- 30].

Analysis of scientific-methodic literature points at purposefulness of attention's concentration on formation of children's and adolescents' motor function [16, 19, 20]. Technologizing of training process in secondary school is elucidated in works of O.V. Ivashchenko [4], O.M. Khudolii [10, 15], O.M. Khudolii та O.V. Ivashchenko [17], O.M. Khudolii and A.A. Titarenko [9]. Conceptual approaches to planning of experiment in research of training process's effectiveness, in development of training models were grounded in works by O.M. Khudolii, O.V. Ivashchenko [7, 12, 16, 18]. Control over training process will be more effective, if orientation of training process is determined at different stages, considering modes of physical exercises' fulfillment in process of their mastering [5, 6, 8, 15].

Thus, simulation of secondary school pupils' training process is rather urgent.

Purpose, tasks of the work, material and methods

The purpose of the research – is to optimize physical exercises' training regiment in educational process of 14-15 years' old girls.

The methods and organization of the research: in our work we used analysis and generalization of scientific-methodic literature, Internet resource, pedagogic testing; methods of mathematical planning of experiment (FFE 2^2), pedagogic experiment, method of simulation.

In the process of tasks' formulation we used conceptual approaches to planning of experiment. It concerned studying of training process's effectiveness and working out of training models [7, 11, 12, 16, 18]. It was determined that increase of effectiveness of control over training process is possible if for calculation of training models regressive models, received as a result of full factorial experiment (FFE) of FFE $2^к$ type are used.

In the research we used plans of factorial experiment of FFE 2^2 type (see table 1). We studied motor modes of training of side roll, forward and back rolls, forced headstand, throwing of small ball and long jump from run.

Table 1

Matrix of factorial experiment $2-^2$ plan in studying of influence of quantity of repetitions (X_1) and rest intervals (X_2) in one lesson on process of 14-15 years' old girls' training of physical exercises

№ of experiment	Elements of coded variables	
	X_1	X_2
1	6 –	60 –
2	12+	60 –
3	6–	120 +
4	12 +	120 +

In physical exercises' training, at every lesson we assessed level of mastering by alternative method ("fulfilled", "not fulfilled"); calculated probability of exercise's fulfillment (p = n/m, where n — quantity of successful attempts, m

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— general quantity of attempts). Besides, we analyzed level of physical exercises' mastering.

In training of 14—15 years' age girls the method of algorithmic orders was applied. Transition to next exercise was realized after three successful attempts.

In experiment 24 – 14 years' old girls and 24 – 15 years' age participated.

Plan of factorial experiment permitted to study influence of quantity of repetitions (X_1) and rest intervals (X_2) on effectiveness of physical exercises' training of 14-15 years' age girls as well as to use complex approach to studying of objects, which admits simultaneous varying of several factors for assessment of them and their interactions' influence. Simultaneous varying of factors, conducted by special program, ensured studying of every of them in different conditions. It permitted to obtain more reliable results, suitable for changeable conditions.

Results of the research

For achievement the best pedagogic effect in girls' training of physical exercises we determined optimal correlations of quantity of exercises' repetitions (X_1) and rest intervals (X_2). In table 1 we present matrix of full factorial experiment's plan for studying of influence of different physical exercises fulfillment modes on effectiveness of training. Bottom and top factors were chosen on the base of data of O.M. Khudolii and O.V. Ivashchenko [16]: so, we considered frames of lesson and requirements of Governmental program. Distinctions in methodic of trainings' conduct were outlined by conditions of factorial experiment.

As a result we found out regressive dependence of results of quantity of repetitions' (X_1) and rest intervals' (X_2) influence on training process in compliance with age and gender peculiarities of the trained girls (see table 2).

Table 2

Regressive dependence of results in 14-15 years' old girls' training on quantity of repetitions (X_1) and rest intervals (X_2)

№	Description of exercises	Equations of regression for coded variables
14 years' old girls		
1	Side roll	Y= 0,.682–0.087X_1+0.097 X_1X_2
2	Forward roll	Y = 1.54–0.18 X_1
3	Backward roll	Y = 0.735–0.125X_1–0.75 X_2
4	Forced headstand	Y = 0.4+0.14 X_1X_2
5	Throw of small ball	Y = 0.835+0.65 X_1X_2
6	Long jump from run	Y = 0.775–0.065 X_1
15 years' old girls		
1	Side roll	Y = 0.85–0.04 X_1–0.07 X_2
2	Forward roll	Y = 0.725–0.085 X_1
3	Backward roll	Y = 0.7–0.11 X_1–0.07 X_2
4	Forced headstand	Y = 0.715–0.085 X_1–0.055 X_2
5	Throw of small ball	Y = 0.815–0.045 X_1
6	Long jump from run	Y = 0.765–0.045 X_2+0.075 X_1X_2

The process of pupils' training of physical exercises is influenced by every factor in different way.

Thus, in respect to 14 years' old girls effectiveness of trainings is influenced by quantity of repetitions in lesson. Increase of these repetitions up to 12 influences negatively. Interaction of quantity of repetitions and rest intervals also

influences on effectiveness of training process. Mastering level increases with increasing of quantity of repetitions up to 12 times and rest interval – up to 120 sec. (forced headstand and throwing of small ball).

In training of "Side roll" by 15 years' old girls negative influence was rendered by first factor (X_1) and by second factor (X_2). In second exercise "Forward roll" factor (X_1) influences negatively. In third exercise "Backward roll" first factor (X_1) and second factor (X_2) influence negatively. In forth exercise "Forced headstand" negative influence was rendered by first factor (X_1) and by second factor (X_2). In fifth exercise "Throw of small ball for distance" first factors (X_1) influences negatively. In sixth exercise "Long jump from the spot" second factor (X_2) influences negatively and interaction of both factors (X_1X_2) influence positively.

Thus, in respect to 15 years' old girls effectiveness of trainings is influenced by quantity of repetitions in lesson and rest interval. Optimal conditions are created with 6 repetitions of exercise and rest interval 60 sec.

Simultaneous varying by special program showed influence of each of these factors in different conditions.

Results of dispersion analysis show influence of the modes on girls' training (see table 3, figs. 1, 2).

Table 3

Results of dispersion analysis for FFE 2^2, , which shows influence of quantity of repetitions (X_1) and rest intervals (X_2) on training of physical exercises by pupils of 14-15 years' old age

Description of exercises	Relation of mean squares (%)		
	X_1	X_2	X_1X_2
14 years' old girls			
Side roll	42	2	54
Forward roll	97	0	2
Backward roll	73	26	0
Forced headstand	19	3	77
Throw of small ball	5	0	94
Long jump from run	69	10	20
15 years' old girls			
Side roll	23	71	5
Forward roll	33	61	5
Backward roll	69	28	2
Forced headstand	66	27	5
Throw of small ball	11	85	3
Long jump from run	0	26	73

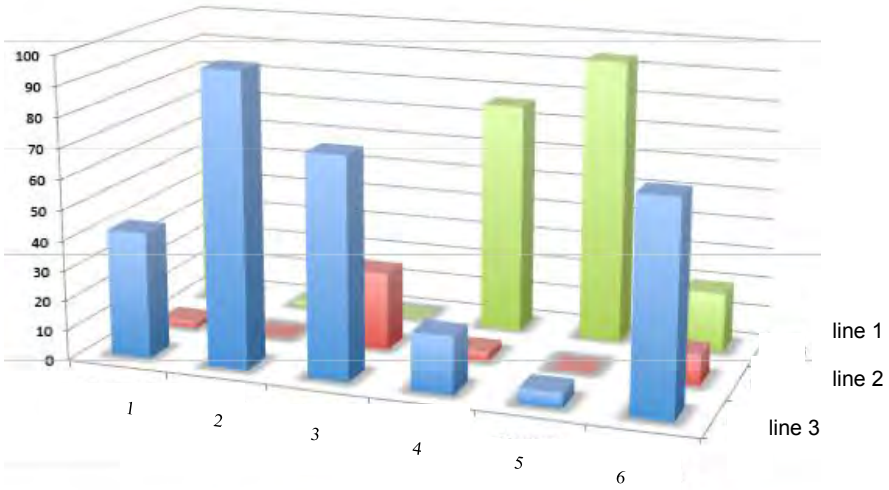

Fig.1. Graphic representation of mean squares' relations (%).14 years old girls: line 1 — X_1 (quantity of repetitions), line 2 — X_2 (rest interval), line 3 — X_1X_2 (interaction of quantity of repetitions and rest intervals)
1-Side roll, 2-Forward roll, 3-Backward roll, 4-Forced headstand, 5-Throw of small ball, 6-Long jump from run

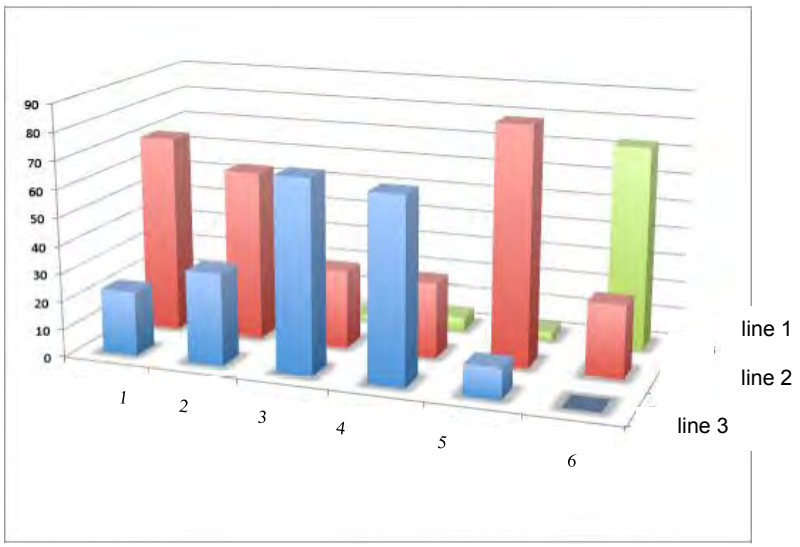

Fig.2. Graphic representation of mean squares' relations (%).15 years old girls: line 1 — X_1 (quantity of repetitions), line 2 — X_2 (rest interval), line 3 — X_1X_2 (interaction of quantity of repetitions and rest intervals)
1-Side roll, 2-Forward roll, 3-Backward roll, 4-Forced headstand, 5-Throw of small ball, 6-Long jump from run

In percentage the highest influence is rendered by first factor and the least – by second. For example, in respect to 14 years' girls in "Side roll" – 42% of quantity of repetitions and 54% of interaction of quantity of repetitions and rest intervals. In second exercise "Forward roll" influence was the following: 73% - quantity of repetitions and 26% - rest intervals. In forth exercise "Forced headstand" influence was the following: 77% - interaction of rest intervals and quantity of repetitions. In fifth exercise "Throw of small ball for distance" influence was the following: 94% - interaction of rest intervals and quantity of repetitions. In sixth exercise "Long jump from the spot" influence was: 69% - quantity of repetitions and 20% - interaction of rest intervals and quantity of repetitions.

In respect to 15 years' girls in "Side roll" – 23% of quantity of repetitions and 71% of quantity of repetitions and rest intervals' interaction. In second exercise "Forward roll" influence was the following: 33% - quantity of repetitions and 61% - rest intervals. In third exercise "Back roll" 69% - quantity of repetitions and 28% - rest intervals. In forth exercise "Forced headstand" influence was the following: 66% - quantity of repetitions and 27% - rest intervals. In fifth exercise "Throw of small ball for distance" influence was the following: 85% - rest intervals and 11% - quantity of repetitions. In sixth exercise "Long jump from the spot" influence was: 73% - interaction of rest intervals and quantity of repetitions and 26% - rest intervals.

Results of dispersion analysis witness that for 14-15 years' old girls the most optimal modes are 6-12 repetitions of exercise and rest intervals 60 – 120 sec. In training of 14 years' old girls attention should be paid to quantity of repetitions in one lesson; for 15 years' old girls attention should be paid to increasing of rest interval (see table 4).

Table 4

Comparative characteristic of studied factors' influence on effectiveness of 14-15 years' old girls' training

Description of exercises	age	
	14 years	*15 years*
Side roll	X_1X_2	X_2
Forward roll	X_1	X_2
Backward roll	X_1	X_1
Forced headstand	X_1X_2	X_1
Throw of small ball	X_1X_2	X_2
Long jump from run	X_1	X_1X_2

Discussion

Results of the research witness that in the offered matrix of factorial experiment's plan the method of factors' varying is sufficient for studying of influence of different modes of physical exercises' training by children and adolescents (see table 1).

These results expand and supplement the data of O.M. Khudolii та O.V. Ivashchenko [12, 16] about effectiveness of factorial experiment plans' application in studying of training process's effectiveness and development of children's and adolescents' motor skills. In opinion of García-Moya, I., Moreno, C., & Jiménez-Iglesias [19], A. Wang, A., Karns, J. T., & Meredith, W., García-Moya [36] usage of factorial experiments' plans in researches, involving children and adolescents, facilitate increase of quality of their progress assessment. Validity of full factorial experiment of 2^k type usage is proved by data of et.al. [20, 21].

The received data supplement information presented in works of Ivashchenko O.V., Khudolii O.M., Yermakova T.S., Pilewska Wiesława, Muszkieta Radosław, Stankiewicz Błazej [22], Ivashchenko O.V., Yermakova T.S., Cieślicka M., Śukowska H. [23], Khudolii O.M., Iermakov S.S., Prusik K. [26], O.M. Khudolii, O.V. Ivashchenko [16] that control over training process is more effective if training modes are determined on the base of regressive models.

Conclusions:

1. Experiment of type 2^2 permitted to study multi-factorial structure of training process of 14-15 years' old pupils; to specify factors' optimal correlations for their application in training of physical exercises at physical culture lessons. They are objective tool of educational process's optimization.
2. In respect to 14 years' old girls effectiveness of trainings is influenced by quantity of repetitions in lesson. Increase of these repetitions up to 12 influences negatively. Interaction of quantity of repetitions and rest intervals also influences on effectiveness of training process. Mastering level increases with increasing of quantity of repetitions up to 12 times and rest interval – up to 120 sec. (forced headstand and throwing of small ball).
3. In respect to 15 years' old girls effectiveness of trainings is influenced by quantity of repetitions in lesson and rest interval. Optimal conditions are created with 6 repetitions of exercise and rest interval 60 sec.
4. Results of dispersion analysis witness that for 14-15 years' old girls the most optimal modes are 6-12 repetitions of exercise and rest intervals 60 – 120 sec. In training of 14 years' old girls attention should be paid to quantity of repetitions in one lesson; for 15 years' old girls attention should be paid to increasing of rest interval.

The next task of already conducted experimental work is working out of methodic recommendations on organization and methodic of physical exercises' training of 14-15 years pupils at physical culture lessons.

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Conflict of interests

The authors declare that there is no conflict of interests.

References:

1. Iermakov S. Modeli biomekhanicheskikh sistem v organizacii effektivnogo dejstviia sportsmena [Models of bio-mechanical systems in organization of sportsman's effective functioning]. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2001;17:40–47. (in Russian)

2. Iermakov SS. Modeli rabochikh poz sportsmena kak faktor effektivnosti vypolneniia dvigatel'nykh dejstvij [Models of working postures as factor of effectiveness of motor actions' fulfillment]. *Fizicheskoe vospitanie studentov tvorcheskikh special'nostej* 2001;4:16–22. (in Russian)
3. Iermakov SS. Biomekhanichni modeli udarnikh rukhiv u sportivnikh igrakh u konteksti vdoskonalennia tekhnichnoi pidgotovki sportsmeniv [Bio-mechanical models of strike movements in context of perfection of sportsmen technical fitness]. *Teoriia ta praktika fizichnogo vikhovannia* 2010;4:11–18. (in Ukrainian)
4. Ivashchenko OV. Metodika navchannia gimnastichnim vpravam shkil'noi programi [Methodic of gymnastic exercises' training in school program]. *Teoriia ta praktika fizichnogo vikhovannia* 2001;1:26—31. http://dx.doi.org/10.17309/tmfv.2001.1.7 (in Ukrainian)
5. Ivashchenko OV, Karpunec' TV. Normativni pokazniki trenuval'nikh navantazhen' na pochatkovomu etapi pidgotovki iunikh gimnastok 6—8 rokiv [Normative indicators of training loads at initial stage of junior,6-8 years age, girl-gymnasts' training]. *Teoriia ta praktika fizichnogo vikhovannia* 2001;3:19—24. (in Ukrainian)
6. Ivashchenko OV. *Normativnye pokazateli trenirovochnykh nagruzok na nachal'nom etape podgotovki iunykh gimnastok 6—8 let. Cand. Diss*. [Normative indicators of training loads at initial stage of junior, 6-8 yrs., girl-gymnasts], Moscow; 1988. (in Russian)
7. Khudolii OM, Ivashchenko OV. Konceptual'ni pidkhodi do rozrobki programi naukovikh doslidzhen' u fizichnomu vikhovanni [Conceptual approaches to working out of program of scientific researches in physical education]. *Teoriia ta metodika fizichnogo vikhovannia* 2004;4:2—5. http://dx.doi.org/10.17309/tmfv.2004.4.140 (in Ukrainian)
8. Khudolij OM. Navantazhennia u sportivnomu trenuvanni iunikh gimnastiv [Loads in sport training of junior gymnasts]. *Teoriia ta metodika fizichnogo vikhovannia* 2001;3:13-19. (in Ukrainian)
9. Khudolij OM, Titarenko AA. Osoblivosti rozvitku rukhovikh zdibnostej u khlopchikiv molodshogo shkil'nogo viku [Peculiarities of motor abilities' development in junior school age boys]. *Teoriia ta metodika fizichnogo vikhovannia* 2010;8:3-12. http://dx.doi.org/10.17309/tmfv.2010.8.644 (in Ukrainian)
10. Khudolij OM. Zakonomirnosti rozvitku silovikh zdibnostej u fizichnomu vikhovanni i sporti. Povidomlennia II [Laws of strength training in physical education and sports. Report II]. *Teoriia ta metodika fizichnogo vikhovannia* 2011:2:19-34. http://dx.doi.org/10.17309/tmfv.2011.2.690 (in Ukrainian)
11. Khudolii OM, Ivashchenko OV. Informacijne zabezpechennia procesu navchannia i rozvitku rukhovikh zdibnostej ditej i pidlitkiv (na prikladi sportivnoi gimnastiki) [Informational provisioning of training process and development of children's and adolescents, motor skills (on example of calisthenics)]. *Teoriia ta metodika fizichnogo vikhovannia* 2013;4:3–18. http://dx.doi.org/10.17309/tmfv.2013.4.1031 (in Ukrainian)
12. Khudolii OM, Ivashchenko OV. Konceptual'ni pidkhodi do modeliuvannia procesu navchannia i rozvitku rukhovikh zdibnostej u ditej i pidlitkiv [Conceptual approaches to simulation of training process and development of children's and adolescents' motor skills]. *Teoriia ta metodika fizichnogo vikhovannia* 2013;2:3—16. http://dx.doi.org/10.17309/tmfv.2013.2.1012(in Ukrainian)
13. Khudolii OM, Iermakov SS. Zakonomirnosti procesu navchannia iunikh gimnastiv [Training process of junior gymnasts]. *Teoriia ta metodika fizichnogo vikhovannia* 2011;5:3—18. http://dx.doi.org/10.17309/tmfv.2011.5.707 (in Ukrainian)
14. Khudolii ON. Zakonomernosti formirovaniia dvigatel'nykh navykov u iunykh gimnastov [Regularities of motor skills' formation in junior gymnasts]. *Nauka v olimpijskom sporte* 2012;1:36—46 (in Russian)
15. Khudolij OM. Metodika planuvannia navchal'noi roboti z gimnastiki v shkoli [Methodic of planning of gymnastic training work in school]. *Teoriia ta metodika fizichnogo vikhovannia* 2008;9:19-35. http://dx.doi.org/10.17309/tmfv.2008.9.454 (in Ukrainian)
16. Khudolii OM, Ivashchenko OV. *Modeliuvannia procesu navchannia ta rozvitku rukhovikh zdibnostej u ditej i pidlitkiv* [Simulation of training process and development of children's and adolescents' motor skills], Kharkov: OVS, 2014. (in Ukrainian)
17. Khudolii OM, Ivashchenko OV. *Osnovi naukovo-doslidnoi roboti u fizichnomu vikhovanni i sporti* [Principles of scientific research work in physical education and sports], Kharkov: OVS, 2014. (in Ukrainian)
18. Khudolii OM, Ivashchenko OV. *Osnovi naukovo-doslidnoi roboti u fizichnomu vikhovanni i sporti* [Principles of scientific research work in physical education and sports], Kharkov: OVS, 2014. (in Ukrainian)
19. García-Moya I, Moreno C, Jiménez-Iglesias A. Building a composite factorial score for the assessment of quality of parent–child relationships in adolescence. *European Journal of Developmental Psychology* 2012;10(5):642–648. http://dx.doi.org/10.1080/17405629.2012.707781
20. Correa AA, Grima P, Tort-Martorell X. Experimentation order with good properties for 2k factorial designs. *Journal of Applied Statistics* 2009;36(7):743–754. http://dx.doi.org/10.1080/02664760802499337
21. Correa AA, Grima P, Tort-Martorell X. Experimentation order in factorial designs: new findings. *Journal of Applied Statistics* 2012;39(7):1577–1591. http://dx.doi.org/10.1080/02664763.2012.661706
22. Ivashchenko OV, Khudolii OM, Yermakova TS, Pilewska Wiesława, Muszkieta Radosław, Stankiewicz Błazej. Simulation as method of classification of 7-9th form boy pupils' motor fitness. *Journal of Physical Education and Sport (JPES)* 2015;15(1):142-147. http://dx.doi.org/10.7752/jpes.2015.01023
23. Ivashchenko OV, Yermakova TS, Cieślicka M, Zukowska H. Discriminant analysis in classification of motor

fitness of 9-11 forms' juniors. *Journal of Physical Education and Sport (JPES)* 2015;15(2):238 – 244. http://dx.doi.org/10.7752/jpes.2015.02037
24. Milić M, Milavić B, Grgantov Z. Relations between sport involvement, selfesteem, sport motivation and types of computer usage in adolescents. In: S. Simović (Ed.), *Proceedings of 3rd International Scientific Congress «Anthropological Aspects of Sport, Physical Education and Recreation».* November 2011. Banja Luka: University of Banja Luka, Faculty of Physical Education and Sport; 2011. p. 100-104.
25. Gert-Jan de Bruijn and Benjamin Gardner. Active Commuting and Habit Strength: An Interactive and Discriminant Analyses Approach. *American Journal of Health Promotion* 2011;25(3):e27-e36. http://dx.doi.org/10.4278/ajhp.090521-QUAN-170
26. Khudolii OM, Iermakov SS, Prusik K. Classification of motor fitness of 7-9 years old boys. *Journal of Physical Education and Sport (JPES)* 2015;15(2): 245 - 253. http://dx.doi.org/10.7752/jpes.2015.02038
27. Lulzim I. Discriminant analysis of morphologic and motor parameters of athlete and non athlete girl pupils of primary school on age 14 to 15 years. *Research in Kinesiology* 2013;40(2):185-190.
28. Meng FH, Li QL. Application of Data Mining in the Guidance of Sports Training. *Advanced Materials Research* 2013;765:1518-1523. http://dx.doi.org/10.4028/www.scientific.net/AMR.765-767.1518
29. Merala R, Piziali RL. *Water ski binding release loads: Test method and results. Skiing Trauma and Safety,* Tenth Volume, ASTM STP 1266, Mote CD Jr, Johnson RL, Hauser W, Schaff PS (eds), American Society for Testing and Materials, Philadelphia, PA; 1996. p. 361–379.
30. Kirk D. Physical Culture, Physical Education and Relational Analysis. *Sport, Education and Society* 1999;4(1):63–73.
31. Hongliang W. Data analysis for sports training based on information technology. *Information Technology and Industrial Engineering* 2013;48:411.
32. Wu L. The Application of Basketball Coach's Assistant Decision Support System. *Journal of Theoretical and Applied Information Technology* 2013;49(3)120-125.
33. Dorita Du Toit, Anita E, Pienaar & Leani Truter. Relationship between physical fitness and academic performance in south african children. *SAJR SPER* 2011;33(3):23-35.
34. Geoffrey D, Broadhead And Gabie E Church. Discriminant analysis of gross and fine motor proficiency data. *Perceptual and Motor Skills:* 1982;55:547-552. doi: http://dx.doi.org/10.2466/pms.1982.55.2.547
35. Rink Judith. Teacher perceptions of a physical education statewide assessment program. *Research quarterly for exercise and sport* 2007;78(3):204-215.
36. Wang A, Karns JT, Meredith W. Motivation, Stress, Self-Control Ability, and Self-Control Behavior of Preschool Children in China. *Journal of Research in Childhood Education* 2003;17(2):175–187. http://dx.doi.org/10.1080/02568540309595008
37. Wright Steven. A compatative view of teaching practice in Physical Education. *International Sports Studies* 1999;21(1):55-68.

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INFLUENCE OF HIKING TRAININGS ON 13 YEARS OLD ADOLESCENTS' HEALTH

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Abstract. *Purpose:* determination of influence of hiking trainings on adolescents' health. *Material:* the research covered adolescents, who train hiking for one year in hiking circles (20 boys and 16 girls) and adolescents, who do not practice hiking trainings (18 boys and 20 girls). Age of participants was 13 years. The following indices were determined" Ketle -2 index, Robinson's index, indices of Skibinskiy, Shapovalova, Ruffiet. *Results:* positive influence of hiking trainings on general health condition of adolescents was determined. It has been recommended to practice hiking at days off, summer holidays and during academic year. It was found that general health of group 2 adolescents (who did not practice hiking) corresponds to level below middle (10-13 points). Adolescents of group 1 (who practice hiking) level of general health reaches middle level (14-18 points). *Conclusions:* it is recommended to assess schoolchildren's health in points. Besides, it is necessary to consider points of every separate index; it will permit to find weak points of adolescents organism's functioning.
Key words: physical health, hiking, adolescents, school, health indices.

Introduction

Health of population is one of main criteria of society's welfare. It is of common knowledge that for the recent 100 years human motor functioning reduced from 94% to 1%. Furmanov A.G. et. al. note that absence of muscular work (muscles make 40% of our organism) is dangerous for our health [8]. Special attention should be paid to schoolchildren's health condition and their reduced motor functioning.

Analysis of special literature shows that schoolchildren's health has being significantly worsened. For example for the recent 10 years morbidity of school age adolescents has increased by 26.8% [10]. As on to day, by statistical data, among first from schoolchildren 30% have different health problems [7, 11, 12, 15, 16, 18, 19, 23]. The most typical of them are problems of muscular skeletal apparatus, eyesight, nervous-mental problems, brain dysfunctions, complexes of chronic diseases and etc. [2]. Among school leavers about 90% have different abnormalities of physical and mental health [7, 11].

In Ukraine 60% of school leavers and graduates are unfit for military service; quantity of schoolchildren and students, who are not able to practice physical culture and are members of special health groups constantly increases [3]. In this connection it is necessary to pay special attention to children's and adolescents' health. The most accessible and the least costly is circle hiking trainings.

Researches of domestic [1, 2, 4, 5, 12, 15, 16] and foreign [13, 20-24] scientists elucidate problems of youth's health and state positive influence of hiking on life quality. Alongside with it youth's health protection with the help of hiking has not been studied sufficiently, considering changing environment and social structure.

Purpose, tasks of the research, material and methods

The purpose of the research is determination of influence of hiking trainings on health of 13 years' old adolescents.

The tasks of the research:

1) Analysis of literature sources, devoted to modern adolescents' health.
2) Determination of physical health of 13 years' old adolescents, who practice hiking and their peers, who do not practice it.
3) Find out and analyze distinctions in health of adolescents, practicing and not practicing hiking.

For solution of the mentioned above tasks we used the following methods: analysis and generalization of scientific methodic literature, determination of indices of Ketrle-2, Robinson, Skibinskiy, Shapovalova, Ruffiet and level of physical health; methods of mathematical statistic.

The research covered 13 years' old adolescents, who train hiking for one year in hiking circles of Chuguyev hiking and regional geography district center (group 1, n=36) and their peers, who do not practice hiking (group 2, n=38).

Results of the research

We made assessments in points and by the total sum of points we determined schoolchildren's health condition. However, except general assessment, we considered points for every separate index that permitted to find "weak points" of organism's functioning.

In tables 1 and 2 we can see that most of indicators of group 1 adolescents are better than in group 2. It witnesses about positive influence of hiking on adolescents' health.

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Table 1

Level of physical health of 13 years old boys, who practice (n=20) and do not practice \ (n=18) hiking

Indicators		Boys, who do not practice hiking	Boys, who practice hiking
Ketle-2 index	index, kg/m^2	18.4	18.2
	points	3.9	3.7
	assessment of indicator	Harmonious (+)	Harmonious (+)
Robinson's index	Index, conv.un.	108	102.1
	points	2.3	2.7
	assessment of indicators	Below middle	middle
Skibinskiy's index	Index, conv.un.	787	959.6
	points	2.8	3.7
	assessment of indicator	middle	Above middle
Shapovalova's index	Index, conv.un.	77	143
	points	1.3	3.3
	assessment of indicator	low	middle
Ruffiet's index	Index, conv.un.	15.8	15.1
	points	2.4	2.3
	assessment of indicator	Below middle	Below middle
Total of points		**12.6**	**16.0**
General assessment of physical health		**Below middle**	**middle**

Table 2

Level of physical health of 13 years old girls, who practice (n=16) and do not practice \ (n=20) hiking

Indicators		Girls, who do not practice hiking	girls, who practice hiking
Ketle-2 index	index, kg/m^2	18.8	18.4
	points	3.1	3.8
	assessment of indicator	Harmonious (+)	Harmonious (+)
Robinson's index	Index, conv.un.	105	100
	points	2.4	2.6
	assessment of indicators	Below middle	middle
Skibinskiy's index	Index, conv.un.	723	727
	points	2.9	2.6
	assessment of indicator	middle	middle
Shapovalova's index	Index, conv.un.	88	151
	points	1.6	3.2
	assessment of indicator	low	middle
Ruffiet's index	Index, conv.un.	15.4	15.3
	points	2.8	2.6
	assessment of indicator	Below middle	Below middle
Total of points		**12.4**	**15.0**
General assessment of physical health		**Below middle**	**middle**

Index Ketle-2 characterizes how harmonious physical condition and body constitution are. The received results witness that in all groups results correspond to harmonious level with bent to stout constitution. However, we see that in group 1 (boys and girls) these indicators are less by 0.2 and 0.4 points accordingly. It witnesses about decreasing of body fat and body mass.

By Robinson's index we can see condition of cardio-vascular system. It is evident that under influence of hiking, adolescents' motor functioning increases. Hiking as one of forms of active leisure, has health related character, positively influences on physical workability and facilitates perfection of human physical qualities. Hiking is practiced mainly in the open air and gives reasonable physical loads that improve cardio-vascular system. For example, indicators of group 2

adolescents correspond to level below middle. In group 1 these indicators, being not very higher, nevertheless reached middle level.

Skibinskiy's index characterizes functional potentials of respiratory system, organism's resistance to hypoxia and will qualities. In average, boys of this age have indicators from 734 to 898 and girls - 630-984 conv,un. The received difference in girls' indicators is not significant. Difference of boys' indicators first of all witnesses about higher will qualities of hikers. It is known that under influence of hiking character of a personality is formed. Specific conditions of hiking functioning facilitate progressing of discipline and commitment of a child, sensitivity and attention to friends and surrounding people, firmness and courage, responsibility and features of organizer.

Shapovalova's index characterizes strength, quickness and speed endurance of back and abdomen muscles. Indicators of adolescents-hikers are nearly 2 times higher than of the rest of adolescents (boys-hikers have 143 conv.un.; girls-hikers – 151 conv.un.; their peers, who do not practice hiking have 77 and 88 conv.un, accordingly) Such difference is conditioned by requirements of hiking to torso muscles: when walking with load on rough terrain, passing technically difficult parts of route muscles of legs, arms and torso take great load during long time.

Ruffiet's index characterizes response of cardio-vascular system to physical load. All adolescents demonstrated level below middle that witnesses about "weakest points" of organism's functioning of 13 years' old schoolchildren. After one year of hiking practicing there is certain improvement of this indicator. Though, it is not sufficient and in process of further this indicator shall be paid special attention to.

Thus, we determined that general level of physical health of group 2 adolescents corresponds to level below middle (10-13 points) nearly not exceeding this level (boys – 12.6; girls – 12.4 points). At the same time, indicators of group 1 approach to middle level (14-18 points).

Discussion

Learning conditions of adolescents influence significantly on their health. Among factors, which influence on health indicators school takes far from the last place. &0% of time child spends in school and during this time he (she) has to be under influence of school factors, which are of combined character [2]. General morbidity of comprehensive schools' pupils in Ukraine is 64% - 71% [4]. For the period of learning at school quantity of pupils – members of special health group- increases nearly 2 times [6]. At the same time, recent years high level of physical health has been found only in 0.32% boys and girls; level "above middle" – in 4.18%, middle – in 27%, "below middle" – in 27%, low – in 41.48% [1].

In opinion of scientists optimal scope of adolescents' motor functioning shall be 12-14 hours per week, providing proper physiological loads are ensured. Though, existing complex program of physical education contains only three lessons every week. That is, motor functioning of modern Ukrainian schoolchild does not exceed 3-4 hours a week and is only 25-30% from hygienic norm [5, 9].

That is why hiking at day off, summer vacations and in academic year is an effective mean of improvement of school children's physical functioning.

The carried out research proved results of other authors [2, 4, 7, 13, 14, 17, 20] related to positive influence of hiking on children's health. Besides, we expanded data of M. Kolesnikova and M. Borisiuk (2012) A. Fedorov and S. Sharmanov (2009) et al. [1, 6, 10, 21, 22, 24] about demand in optimization of schoolchildren's motor functioning. Alongside with it this research showed that it is necessary to consider environmental conditions, when practicing hiking.

Conclusions:

Thus, one year of hiking practicing results in improvement of physical health of adolescents nearly by all indicators that witnesses about positive influence of hiking on adolescents' organism, especially in modern conditions of insufficient motor functioning and weakened schoolchildren's health.

The prospects of further researches imply determination of influence of different kinds of hiking on students' physical health.

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Conflict of interests

The authors declare that there is no conflict of interests.

References:

1 Apanasenko G, Dovzhenko L. Riven' zdorov'ia i fiziologichni rezervi organizmu [Health and physiological reserves of organism]. *Teoriia i metodika fizichnogo vikhovannia i sportu* 2007; 1: 17-21. (in Ukrainian)

2 Berezhna TI. Shkola – zdorove seredovishche dlia rozvitku pidlitkiv ta uchnivs'koi molodi [School as healthy environment for progressing of adolescents and children]. *Valeologiia: suchasnij stan, napriamki ta perspektivi rozvitku, VI mizhnarodna naukovo-praktichna konferenciia, 2008, kviten'* [Valueology: modern state, directions and prospects of development, IV international scientific-practical conference, 2008, April]. Kharkiv, 2008; 3: 380. (in Ukrainian)

3 Bulatova M, Litvin O. Zdorov'ia i fizichna pidgotovlenist' naselennia Ukraini [Health and physical fitness of Ukrainian population]. *Teoriia i metodika fizichnogo vikhovannia i sportu* 2004; 1:3-8. (in Ukrainian)

4 Grin'ova TI, Mulik KV. Ocinka vplivu zaniat' turizmom na riven' zdorov'ia ditej 10-11 rokiv [Hiking influence on 10-11 years' old children's health]. *Zdorov'esberegaiushchie tekhnologii, fizicheskaia reabilitaciia i rekreaciia v vysshikh uchebnykh zavedeniiakh, V mezhdunarodnaia nauchnaia konferenciia, 2012, 9-10 noiabria* [Health-related technologies, physical rehabilitation and recreation in higher educational establishments, V scientific conference, 2012, November 9-10]; Kharkov-Belgorod-Krasnoyarsk-Moscow: KSAPC; 2012 (in Ukrainian)

5 Kolesnikova M, Borisiuk M. Pishokhidnij turizm – iak zasib optimizacii rukhovogo rezhimu shkoliariv [Hiking as mean of optimization of schoolchildren's motor regiment]. *Turizm i kraieznavstvo* 2012; 1:87-91. (in Ukrainian)

6 Krucevich T, Petrovs'kij V. Fizicheskoe vospitanie kak social'noe iavlenie [Physical education as social phenomenon]. *Nauka v olimpijskom sporte* 2001; 3:3-15. (in Russian)

7 Makushchenko I, Pristins'kij V. Osvitn'o-valeologichna spriamovanist' fizichnogo vikhovannia uchniv molodshogo viku [Educational-valueological orientation of juniopr pupils' physical education]. *Teoriia i metodika fizichnogo vikhovannia i sportu* 2009;1:45-48. (in Ukrainian)

8 Furmanov AG, Iuspa MB. *Ozdorovitel'naia fizicheskaia kul'tura* [Health related physical culture]. Minsk: Tesey; 2003 (in Russian)

9 Krucevich TIu, Bezverkhnia GV. *Rekreaciia u fizichnij kul'turi riznikh grup naselennia* [Recreation in physical culture of different population strata]. Kiev: Olympic Literature; 2010 (in Ukrainian)

10 Sutula VO, Kochuieva MM, Bondar TS. Zdorov'ia shkoliariv iak social'no-pedagogichna problema [Schoolchildren's health as social-pedagogic problem]. *Visnik Lugans'kogo nacional'nogo universitetu imeni Tarasa Shevchenka* 2010;17(204):295-305. (in Ukrainian)

11 Fedorov A, Sharmanova S. Dvigatel'naia aktivnost' v strukture zdorovogo stilia zhizni podrostkov [Motor functioning in structure of adolescents' healthy life style]. *Teoriia i metodika fizichnogo vikhovannia i sportu* 2009;2:103-107 (in Russian)

12 Baikina NG, Pyptyuk PF. Method of correction of motive sphere for deaf schoolboys during an orientation on employments on health tourism. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2012; 7: 15 - 24.

13 Christine Y-H, Shu SM-C. A Study of Occupational Stressors Perceived by Hospitality and Tourism Teachers in Taiwan's Vocational Schools. *Journal of Teaching in Travel & Tourism*. 2006;6(3):47–67.

14 Dale C, Hassanien A. Podcasting in Tourism Education. *Journal of Teaching in Travel & Tourism*. 2008;7(3):43–60.

15 Denisenko IA. The peculiarities of functional state changes of cardiovascular system of girls at the age 18-19 years in the process of practicing sport and health tourism. *Physical Education of Students* 2013; 5: 32-36. http://dx.doi.org/10.6084/m9.figshare.781289

16 Dudorova LJ. Conceptual approaches to vocational and tourism training of teachers in higher education institutions. *Physical Education of Students* 2013; 4: 19-22. http://dx.doi.org/10.6084/m9.figshare.681643

17 Fatemeh Eloon Kashkuli, Mehrdad Moharramzadeh, Sohrab Ghalehgir. The role of advertisement factors in development of sport tourism industry of Fars province. *Physical Education of Students* 2014; 3: 61-66. http://dx.doi.org/10.6084/m9.figshare.978671

18 Grinyova TI, Mulik EV. The dynamics of indicators of physical qualities of boys aged 10-13 years under the influence of different types of tourism activities. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2013; 10: 16-21. http://dx.doi.org/10.6084/m9.figshare.775317

19 Grynova TI, Taran LN. Assessment of the preparedness level of 10-12 aged boys under the influence of taking up sports tourism. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2012; 1: 49 – 52.

20 Hawkins DE. Transferring Tourism Knowledge. *Journal of Quality Assurance in Hospitality & Tourism*. 2006;7(1-2):13–27.

21 Peters M, Pikkemaat B. Innovation in Tourism. *Journal of Quality Assurance in Hospitality & Tourism*. 2006;6(3-4):1–6.

22 Ruhanen L, McLennan C-L. The Learning Experiences and Preferences of Tourism Postgraduate Students. *Journal of Teaching in Travel & Tourism*. 2012;12(2):146–64.

23 Toporkov AN. The preparation of tourists to the ski sports tours in a limited time in order to prevent injuries and accidents. *Physical Education of Students* 2014; 4: 42-48. http://dx.doi.org/10.6084/m9.figshare.979433

24 Williams G, McKercher B. Tourism Education and the Internet. *Journal of Teaching in Travel & Tourism*. 2001;1(2-3):1–15.

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PRINCIPLES OF MACRO-METHODIC OF JUNIOR FEMALE GYMNASTS' TRAINING TO SPORT EXERCISES FOR GYMNASTIC ALL ROUND COMPETITIONS AT SPECIALIZED BASIC STAGE

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Abstract. *Purpose:* working out of principles of junior female gymnasts' macro-methodic training to sport exercises for all round competitions at stage of specialized basic training. *Material:* in the research 19 girl-gymnasts from reserve of combined team of Romania participated. Measurements and assessment of technical fitness at training sessions and in conditions of competitions were conducted at 120 training sessions (10 sessions a week). *Results:* we worked out and realized experimentally and in training sessions principles of macro-methodic training to gymnastic exercises. Macro-methodic of training is presented in structure of long-term programs of training for all round competitions. Macro-methodic is presented as combination of elements of motor, technical, didactic and technological structures of sport exercises (in the present article it was described on material of vaults of Yurchenko's type). *Conclusions:* macro-methodic permits to state optimal algorithm of mastering of theoretical and practical materials at training sessions. Besides, it permits to demonstrate steady growth of sport results at competitions. With it individual-age features of junior female gymnasts, tendencies and specialists' requirements are considered.
Key words: sportswomen, gymnastic, bio-mechanic, exercises, basic training, macro-methodic.

Introduction

Olympic sport gymnastic develops in compliance with regularities and tendencies of world sports [1, 13, 16, 22, 26, 27, 38]. Main tendencies of women's sport gymnastic are increasing of complexity of competition programs at all round, rising of quality of performance, expansion of geography of sport gymnastic development in the world, winning of medals at large international tournaments and main competitions of 4 years' period. Important role is taken by deepening of specificity of development of kinds of gymnastic all round competitions, increasing of quantity of exercises of different structural groups on apparatuses and increasing of quantity of competitions. Sport compete of national combined teams grows. In this connection coaches have to start training of junior female gymnasts since very early age. It permits to master "school of movements", basic exercises, exercise of high and highest complexity by, approximately, beginning of puberty period; i.e. to fulfill exercises from tables of difficulty groups of International federation of gymnastic (IFG) «D» and «E», and even «F». Analysis shows there is no sufficient quantity of normative documents (logistically constructed plans of junior female gymnasts' training, considering age features and level of fitness, training programs, methodic and practical materials and technologies of their realization), which could ensure success of basic training on systemic principles or they are absent at all. For example, in the best world gymnastic school (Romania) junior female gymnasts start competition activity since 9 years' age. Federation of sport gymnastic and its coaches do not have required methodic literature for trainings at preliminary, preliminary basic and specialized basic stages. Alongside with it, since 11 years' old age junior female gymnasts start mastering of difficult exercises and in 12- 15 years' age (stage of specialized basic training) master highly difficult exercises from Rules of competitions of IFG. Analysis of junior female gymnasts' training shows that coaches are in conditions of "race" for sport results and, that is why, train exercises in accelerated manner. In this period trainees have no finally formed motor skills and formation of individual style of sport technique goes against the background of technical mistakes, made with fulfillment of exercises [8, 12, 13, 16, 18, 26, 27, 36, 38]. Actually a coach forces gymnast's transition to next stage of training. Such imperfect training and competition construction was made in favor of momentary sport achievements of junior female gymnasts. It is intrinsic to basic stages of training in many countries of the world. For mastering of exercises with complex coordination of movements trainees shall repeat exercises for many times and fulfill them intensively. Often it is accompanied by fear of complex exercise's fulfillment. It results in different negative after-effects on training sessions and at competitions [1, 11, 16, 18, 22, 23, 35, 37, 38].

Purpose, tasks of the work, material and methods

Purpose: working out of principles of junior female gymnasts' macro-methodic training to sport exercises for all round competitions at stage of specialized basic training.

The tasks of the research: 1. Analyze development and process of perfection of gymnastic exercises from different groups of complexity on apparatuses of women all round; specificity and to-day's content of stage of specialized basic training in structure of many years' sport perfection.

2. Study indicators, which characterize level and dynamic of junior female gymnasts' individual-age features, their sensor-motor coordination; basic, special motor and special technical fitness as well as progress of sport-technical fitness at stage of specialized basic training.

3. Study and indentify kinematic and dynamic indicators of sport technique's key elements in the process of development and perfection of phase structure of basic gymnastic exercises. These exercises were fulfilled by junior female gymnasts on apparatuses of women all round competitions at specialized basic stage in conditions of training sessions and competitions.

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4. Work out and use principles of macro-methodic of junior female gymnasts' training to sport exercises on apparatuses of women gymnastic all round competitions at specialized basic stage and in pedagogic experiments (in laboratory conditions) as well as in conditions of competitions (field conditions). Test effectiveness of influence of macro-methodic as system on perfection of sport-technical fitness.

Methodology of the researches: 1. Theoretical-methodic analysis of junior female gymnasts' training at specialized basic stage by the data of literature and existing in sport gymnastic practical experience. In modern scientific-methodic literature [5, 9, 11, 12, 16, 17, 18, 22, 27, 30, 33, 38] theoretical substantiation of sportsmen's basic training is given. On the base of it scientific-methodic and practical development of training process and competition functioning shall be realized. Conception of elite female gymnasts' training (as many years' controlled process) shall be based on unity of organizational and program-methodic principles, on material provisioning. Besides, it shall be realized with complex and systemic application of specific training means and methods. All these are realized in combination with pedagogic and medical-biological control [1, 6, 11, 12, 15, 16, 17, 21, 23, 32, 34, 37, 38].

2. Systemic-structural approach to assessment of gymnastic exercises' sport technique is realized with the help of algorithm of movements' analysis [11, 12, 13]. Technique of gymnastic exercises was taken as subject of training. Basic motor actions and gymnastic movements (static balance, dynamic balance, push offs, pulling, jumps and landings; kinematic, dynamic of unsupported travels and rotations). Cause-effect structure of movements; kinematic and dynamic structure of movements; phase structure of movements.

3. Video-computer program analysis of gymnastic exercises with the help of systems: Panasonic mini DV, Pinnacle Studio, Kinovea, Physics ToolKit. Program Pinnacle Studio is designed for converting of video AVI at speed of video recording of 30 frames per second. Computer program «Kinovea» is used for measuring of joint angles, body links of key elements of gymnastic exercises' sport technique in vaults of Yurchernko type, in dismounts from bars of different height, dismounts from balance beam and in acrobatic exercises like double back flip in floor exercises. Program «Physics ToolKit» is intended for receiving of indicators of kinematic and dynamic structure of gymnastic exercises' key elements (error of measurement 3–3.5 %).

4. Method of gymnastic exercises' simulation was used for solution of main tasks: studying of movements, exercises and training to them. Prof. N.A. Bernstein [2] points that model shall be sufficiently rigid and, at the same time, flexible, able for transformation. The structure of simulation process, to be realized in researches and experiments, was the following: description of task, choice of model, studying of model, control [14].

4. Method of postural points of movements for analysis and assessment of key elements of exercises with complex coordination. Method of postural points of movements [8] is bio-mechanical study of sport exercises by means of measurements, analysis and assessment of preceding and subsequent body postures in phase structure of the fulfilled exercise. Its purpose is determination of key elements of sport technique. Method of postural points of movements was worked out and offered for analysis of sport technique of gymnastic and acrobatic exercises at the end of 70-ees [3]. Then conception and methodology was being perfected as well as scientific-practical application in works by V.N. Boloban [4, 5, 7, 8], Ye. Sadovskiy, T. Nizhnikovskiy, A. Mastalege, V. Vishniovskiy, M. Begaylo [7, 20], V.A. Potop [19, 34, 35], N. Andreeva [28]. With the help of method of postural points of movements we identified key elements of sport technique. In phase of preparatory actions key element is start posture of body (SP). SP is bio-mechanically rational posture of body for entering main phase of exercise. In phase of main motor actions key element is multiplication of body posture (postures) (MP). MP is regarded as process of successive fulfillment of instant fixed postures of single-profile exercise (for example double back flip tuck) or exercise of combined profile (for example double back flip tuck with 360 degrees' turn in first flip). Its purpose is creation of holistic motor action with controlled change of body postures. MP determines content and structure of exercise. In final phase key element is final posture (FP). FP is a key element, which characterizes body stability on support with finishing of exercise or for creation of conditions for fulfillment of next combination of exercises. Conceptual essence of method of postural points of movements is that every preceding body posture in fulfilled exercise shall positively influence on bio-mechanic of next body posture. It permits to fulfill exercise without extra re-constructions in order not to accumulate technical mistakes in demonstration of exercise or combination of exercises.

5. Pedagogic observation, questioning, talks were techniques of the research. They were intended for objective assessment of training process, effective connection of training content, skills of trainees with growth of sportsmanship in structure of many years' sport training.

6. Experts' assessment is solution of research's tasks with the help of committee (group of experts, consisting of specialists of Federation of gymnastic of Romania, scientists, referees, coaches). It purpose is to objectively assess quality of mastering of gymnastic and acrobatic exercises; determine authenticity of sport technique's perfection, course and results of the research and experiments in dynamic of their realization.

7. Pedagogic experiments (ascertaining and forming) were fulfilled by technique of one group (comparative, successive). The tested had different individual level of sportsmanship.

8. Method of tests and control tasks.

9. Didactic principles meeting the requirements of modern kinds of sport gymnastic [4, 5, 9, 10, 11, 16, 17, 36, 37].

10. Training methods, which activate mastering of gymnastic and acrobatic exercises with different coordination complexity [4, 5, 9].

11. Method of linear-branched programming of training tasks and perfection of gymnastic/acrobatic exercises [5, 6].

12. Mathematical statistic (with the help of computer program KyPlot»).

Organization of the research

The research and experiments were conducted in three stages:

First stage (initial, 2012) was analysis and assessment of content of modern standard program of junior female gymnasts' training. Measurement and assessment of sensor-motor coordination, special motor fitness, level of basic and special technical fitness and personal features of junior female gymnasts. Assessment and identification of bio-mechanical indicators of junior female gymnasts' of sport technique's key elements in conditions of competitions was the next step. Measurement and assessment of technical fitness at training sessions and in competition conditions at 120 sessions (10 sessions a week) was conducted. In ascertaining pedagogic experiment 19 female gymnasts of stage of specialized basic training participated. Ascertaining pedagogic experiment was conducted in Olympic junior gymnastic center, Deva, Romania, in 2012. Results of ascertaining pedagogic experiment are presented as well as results of junior female gymnasts' performances in three national female sport gymnastic competitions in Romania 2012.

The second stage of the research (intermediate, 2013) included forming pedagogic experiment, in which 14 female gymnasts of specialized basic stage participated. We worked out theory and methodic of construction of long term programs of motor, technical, didactic and technological structures elements' combining in process of sport exercises' mastering. Studying and identification of kinematic and dynamic indicators of sport techniques' key elements in process of development and perfection of phase structure of basic gymnastic exercises, fulfilled by junior female gymnasts on apparatuses of female gymnastic all round in training and competition conditions. Working out of element-by-element content (principles) of macro methodic of junior female gymnasts' training to sport exercises of stage of basic specialized training and in pedagogic experiments as well as at competitions. We also carried out testing of quality of gymnastic exercises' training and effectiveness of sportsmanship perfection under influence of macro methodic as system. In forming experiment 14 female gymnasts participated. Results of forming pedagogic experiment are presented as well as results of junior female gymnasts' performances in three national female sport gymnastic competitions in Romania 2013.

The third stage of the research (final – 2014) was continuation of pedagogic experiment and its finalizing. Dynamic of combination of motor, technical, didactic and technological structures of sport exercises' mastering on the base of long term training programs was realized. Comparative analysis of kinematic and dynamic indicators of sport technique's key elements in process of perfection of basic gymnastic exercises' phase structure was fulfilled. These exercises were fulfilled by junior female gymnasts on apparatuses of female gymnasts all round competitions in training and competition conditions. Pedagogic experiment was conducted in Olympic gymnastic center, Izvoran, Romania.

Results of junior female gymnasts' performance at national competition, Bucharest, Romania, 2014 are presented.

Results of the research

Analysis of scientific-methodic literature, practical experience of sport gymnastic coaches resulted in registration of new process of sport training, connected with increasing of its show character and performance level of junior female gymnasts. The process also included modern technologies and results of many years' training of female sport gymnastic meeting requirements of IFG.

It was found that specificity and world requirements to sport fitness of junior female gymnasts are characterized by care of their health, formation of trainees' sufficient "fund" of movements, mastering of great number of different gymnastic and acrobatic exercises of different coordination complexity, perfection of special technical fitness and competition programs. Prof. Yu.K. Gaverdovskiy (2007, pg.13) [11] writes that in contrast to other kinds of sports (track and fields, different motor functioning, outdoor games, martial arts, weight lifting and etc.) technical-aesthetic kinds of sports require constant upgrading and complication of competition program. Up to 80% of all training time (not considering competitions) gymnasts, acrobats, skaters spend for mastering and perfection exactly technique of exercises (i.e. on technically oriented training). Alongside with it consideration of age and individual features of trainees is not sufficient; forced technical training still exists. It results in overloading of natural physical abilities and central nervous system. In its turn it results in sport traumas and giving up of sport gymnastic trainings. Prof. V.N. Platonov (2013, pg.37), [17] points: "Junior athletes shall be oriented on optimally constructed process of many years perfection. In practice exploitation of junior athletes is manifested in their orientation on sport result and victory in competitions. It results in preparation of junior champions, who will stop progress in the future. In the future they yield to their peers who did not endure such pressing. Under such training junior athletes have the following after effects: adaptation resource is spent too early; over tension and over training occur; they become weaker than their peers with less potentials but who did not endure forced training".

Scientific-methodic literature, practical experience of female sport gymnastic coaches, results of competition performances witness that training of exercises with constantly growing complexity is usually in period of gymnasts' 12-15 years' old age. For example, after mastering of back flip arching (end of stage of preliminary basic training – 10-11 years' old age)T at stage of specialized basic training they have to master back flip arching with turn by 180 degrees (half of pirouette). Further (in didactic sequence) female gymnasts master flip pirouette, one and half pirouette, double pirouette, two and half pirouette and even triple pirouette (flip with turn by 1080 degrees). When training easier exercises of this structural group standard methodic is realized or its separate modifications in the form of means, techniques, approaches, local technologies of program material's mastering. Besides, corrections are worked out and introduced in already applied by coach programs of preparatory, imitating exercises. When training more complex exercises of the mentioned structural group the applied methodic is perfected. Special and general didactic principles, techniques of training, local technologies are introduced. Author's means of result's achievement, additional methods of training's activation are applied. Means of regulation and control, correction through biological feedback are realized. Important pedagogical constructions and algorithms of training material's mastering in time are created. We should remind that we

speak about training of elements of only one structural group of gymnastic exercises. Training of gymnastic exercises of different structural groups, different coordination complexity at stage of specialized basic training can not be crammed in pedagogical borders of one or several fragmented training methodic.

We suppose that strategic role in effective control over process of mastering and perfection of gymnastic exercises at stage of specialized basic training shall be played by modern dynamic system, which includes individualized motor, technical, didactic and technological structures of mastering of valid exercises of different coordination complexity. It is regarded as macro methodic of gymnastic exercises' training. Macro – from Greek (μακρός) – points at big dimensions or significant size, at combination of something. Methodic – is ready "receipt", algorithm; procedure of realization of some purposeful actions. In education it is description of certain techniques, means of pedagogical functioning. Structurally macro methodic is a functional combination of long term programs of junior female gymnasts' training to exercises of "school of movements", to basic level, specialization, competition exercises in vaults, on bars of different height, balance beam and in floor exercises. It includes motor, technical, didactic and technological structures of valid exercises' mastering (exercises of different coordination complexity, providing following didactic requirements and rules of trainings at stage of specialized basic training).

We have worked out and studied macro-methodic principles of gymnastic exercises' training at stage of specialized basic preparation for gymnastic all round competitions in female sport gymnastic. Macro-methodic is a dynamic system of theoretical and training-methodic materials, which shall be realized in process of junior female gymnasts' training. Macro-methodic consists of twelve key principles, having scientific novelty and practical significance at stage of specialized basic training of gymnastic all round competitions in female sport gymnastic.

1. Tendencies of development of female sport gymnastic are as follows: specificity of kinds of female gymnastic all round competitions; requirements and rules, worked out by specialists for trainees at stage of specialized basic training.

2. Content and orientation of stage of specialized basic training imply mastering as many as possible of new movements in form of training exercises and in form of elements, which can be applied in competition practice. Program basis of training is composed of most important elements of special technical training in the form of "school" of general and specific purposes (the so-called "basic blocks": complex skills, ensuring fulfillments of waving movements, push offs, complex rotations, landings, balance); holistic basic elements of kinds of all round (accelerations, connections, "profiling"), combinations and basic combinations. Total scope of junior female gymnasts' work at stage of basic specialized training is great and intensive. Bent for trainings, trainability are main criteria of detection of talented female gymnasts.

3. Individual and age specificities of junior female gymnasts of stage of specialized basic training (12-15 years old age) and content of stage of specialized basic training as well as level and dynamic of general, special motor, basic and sport-technical fitness; content of stage of specialized basic training. Mastering of sport grade material, which permits to participate in competitions and receive necessary qualification. Mastering of program of first adult sport grade, candidate master of sports and master of sports. Regular systemized pedagogic and medical-biological control.

4. Mastering of gymnastic exercises of different structural groups of complexity in kinds of female gymnastic all round competitions (vault, bars of different height, balance beam and floor exercises), from which compulsory, free and final programs of female gymnasts are formed. Bio-mechanical indicators of key elements of exercises' sport technique in all kinds of female gymnastic all round competitions, which shall be fulfilled by junior female gymnasts at stage of specialized basic training.

5. Stages of gymnastic exercises' mastering are as follows: training of "school" of movements, pedagogic technologies of formation of ideas about mastered exercise – initial training. Deepened training is consolidation and further perfection of competition programs' elements.

6. Long term programs of training of gymnastic exercises with different coordination complexity are: macro-methodic elements of training of exercises with complex coordination, logical-structural schema of their functioning, active period of their realization. They ensure effective mastering of gymnastic, acrobatic exercises in structure of stage of specialized basic training [6, 29, 36]. Main purposes (MP) and specific purposes (SP) of sport training can be represented as solid and dotted lines. Their constant dynamic links and relations in realization are the basis for working out of training programs. These programs are of long term character. They are prolonged by development of female gymnastic and their specific features, their mastering and improvement of exercises' sport technique; by growth of their complexity and peculiarities of development of competition functioning's structural elements. In fig. 1 we can see approximate long term program of training of Yurchenko-type vaults. Horizontal lines in vertical columns mean prevailing realization of training-methodic materials from long term programs of junior female gymnasts' training to Yurchenko-type vaults.

Long term program and its elements for training to Yurchenko-type vaults at stage of specialized basic training	Age of junior female gymnasts			
	12 years old	13 years old	14 years old	15 years old
General and special physical fitness				**ГЦ:**
Quickness	----------	----------	----------	
Sensor motor coordination	----------	----------	----------	----------
Strength	----------	----------	----------	----------
Speed power qualities. Jumping	----------	----------	----------	----------
Special endurance		----------	----------	----------
Flexibility	----------	----------		
Elastic-rigid interaction of limbs with support	----------	----------	----------	----------
Acrobatic and trampoline fitness				
Rolls, somersaults, flips, fulfilled on acrobatic track, on mat for floor exercises. Formation of skill of postures' multiplication in jumping on trampoline	----------	----------	----------	----------
Basic technical training				
"School" of movements	----------	----------	----------	----------
Acceleration	----------	----------	-------	
Front arms, courbette	----------	------		
Rondat, rondat on bridge	----------			
Flic flac, half flic flac in stand	----------	----------		
Rondat – back flip, arching and with turn by 180 degrees	----------	----------		
Rondat – back flip, arching and with turn by 360 degrees		----------		
Rondat – back flip, arching and with turn by 540 degrees			----------	
Rondat – back flip, arching and with turn by 720 degrees			------	
Special technical training. Formation of key elements of sport technique				
Starting position of body	----------	----------	----------	
Rondat on bridge – half of flic flac on support	----------	----------	----------	
Courbette from support	----------			
Multiplication of posture: straightened in the first (half of flic flac) and the second (flip arching) flight phases				
Multiplication of posture: straightened in the first (half of flic flac) and the second (flip arching 180° and 360°) flight phases				
Multiplication of posture: straightened in the first (half of flic flac) and the second (flip arching 540 °) flight phases				
Multiplication of posture: straightened in the first (half of flic flac) and the second (flip arching 720 °) flight phases				
Final body posture (formation and perfection of skill to land properly)				
Yurchenko-type vaults in competitions: YuSP, YuS180°, YuS360°, YuS540°, YuS720°				
Tests	-------	-------	-------	-------
Sport grades **SP:**	**Jun. II**	**Jun.I**	**Ad. I**	**CMS** **MS**

Fig.1. Long term program and its elements for training of Yurchenko-type vaults and logical-structural schema of its realization, built on the base of algorithms of main purposes (MP) and specific purposes (SP) interaction (in diagram they are solid and dotted lines) at stage of specialized basic training. [by 6].

Legend: **MP –**main purpose of sport training: to master Yurchenko-type vaults of different groups of complexity; fulfill requirements for CMS and MS; **SP** – specific purposes of sport training: to master vaults of qualification, free, and final programs; to fulfill requirements of sport grades: Jun. – junior; Ad. – adult; CMS – candidate master of sports; MS – master of sports.

7. Special and general didactic principles, method and means, which activate process of training of gymnastic and acrobatic exercises at stage of specialized basic training in sport gymnastic [4, 8, 9, 10, 11, 16, 17, 25, 26].
8. Transfer technology (vertical, horizontal0 of training of gymnastic exercises of different all round structural groups [18, 33]. Vertical technology implies mastering of exercises with increasing complexity of one or different profiles in one kind of all round competitions. Horizontal transfer technology envisages application of already mastered exercise (formed motor skill) in competition programs on different apparatuses of female gymnastic all round competitions. For example, back flip arching after rondat in floor exercises, mastered by female gymnast, is included in program of vaults (Yurcheko flip, arching), dismounts from bars and balance beam.
9. Functional pedagogic equation (FPE) was worked out by prof. V.N. Boloban [4, 5]. It illustrates modern technology of realization of didactic elements in process of training of gymnastic and acrobatic exercises of different coordination complexity at stage of specialized basic training in female sport gymnastic. In fig. 2 we present FPE, which is an element of macro methodic structure, intended for training of gymnastic and acrobatic exercises in female gymnastic all round competitions at stage of specialized basic training.

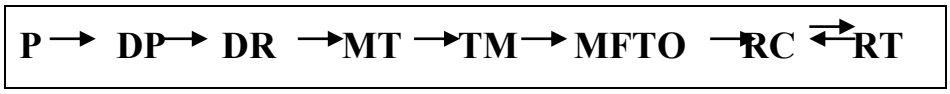

Fig.2. Functional pedagogic equation (FPE) as technology of junior female gymnasts' training to Yurchenko-type vaults at stage of specialized basic training [by 4, 5, 29]
Legend: P – purpose and tasks of training; DP – didactic principles; DR – didactic rules; MT – method of training; TM – training means; MFTO – method and forms of trainees' organization; RC – regulation and control; RT – result of training.

Algorithm of FPE acting: by planned result of training (RT) of junior female gymnasts to Yurchenko-type vaults at stage of specialized basic training (in formula it is right part of equation, which is a pedagogic doctrine – to train (!) sport exercise, i.e. to achieve the planned result) didactic programming and structuralizing of content of forming knowledge, motor skills of the mastered gymnastic and acrobatic exercise is conducted. I.e. the most adequate and the most effective structure as well as content of didactic elements are selected (in formula it is left part of equation). In connection with dynamic character of training process functional pedagogic equation is regarded as creative search of the most effective elements of training. In this case main condition is female gymnasts' fitness level. It pre-suppose formulation of purposes and tasks of training, selection of didactic principles, method, means, forms of trainings, means of trainees' organization, elements of regulation and control with the help of biological feedback as well as their relations with planned result of training.
10. Linear-branched programming of training material: reduction of knowledge content, motor skills to algorithms in process of training of gymnastic and acrobatic exercises of different coordination complexity (see fig.3).

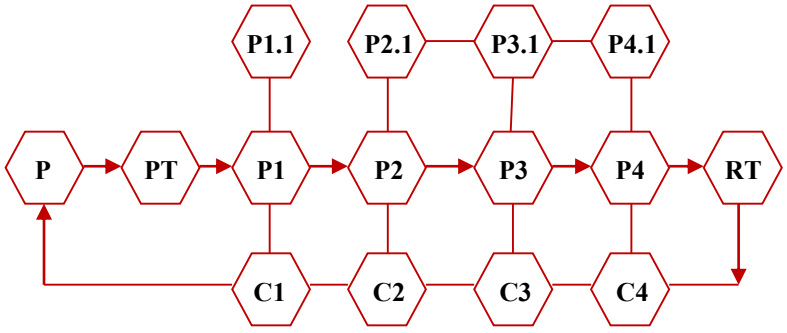

Fig.3. Algorithm of linear-branched programming of training material for training of Yurchenko-type vaults.
Legend: P – purpose of training; PT – pedagogic tasks; P1, P2, P3, P4 – portions of training material (preparatory exercises); P1.1, P2.1, P3.1, P4.1 – additional portion of training material of preparatory character; C1, C2, C3, C4 – control, correction of training process; RT – result of training [5, 6, 36, 37]

11. Sensor motor coordination as the basis of technical training and technical fitness of junior female gymnasts. Sensor systems and their integration. Static-dynamic and static kinetic stability. Coordination training [8, 24].
12. Elements of regulation, control and correction of training of gymnastic exercises, considering biological feedback (BFB). BFB is regarded as mean of control over training process and perfection of gymnastic exercises' sport technique in competition conditions.

In table 1 we present results of performances of 12-14 years' old female gymnasts in national competitions on female sport gymnastic, Romania, 2012. In table 2 we present results of performances of 13-16 years' old female gymnasts in national competitions on female sport gymnastic, Romania, 2013, 2014. Realization of macro –methodic resulted in growth of competition programs' complexity against the background of perfection of exercises' key elements, their stable fulfillment and rising of performance quality of pedagogic experiment's participants. These gymnasts were included in

the nearest and remote reserves of sport gymnastic combined team of Romania.

Table 1

Results of performances of female gymnasts of specialized basic training stage (participants of pedagogic experiment) in national competitions on female sport gymnastic, Romania, 2012

Gymnastic apparatus	**C1- CNEJ Constanta , 2012, N=18**			**C2 – CNIJ Deva, 2012, N=14**			**C3 – CNM Oneshty, 2012, N=15**		
	D	E	NF	D	E	NF	D	E	NF
V	4.41	8.88	12.44	4.29	8.76	13.04	4.52	8.77	13.25
BDH	4.33	8.41	12.73	4.67	8.18	12.86	4.3	7.65	11.95
BB	5.21	8.08	13.31	5.3	7.96	13.24	5.22	8.18	13.38
FE	4.91	8.99	13.88	5.2	8.88	14.05	5.08	8.36	13.45

Table 2

Results of performances of female gymnasts of specialized basic training stage (participants of pedagogic experiment) in national competitions on female sport gymnastic, Romania, 2-13, 2014

Gymnastic apparatus	**C4- CNEJ Oneshty, 2013, N=8**			**C5 –CNM Bucharest, 2013, N=13**				**C6 – CNIJ Oneshty, 2013, N= 9**			**C7 – CNM Bucharest, 2014, N=7**
	D	E	NF	D	E	Pen.	NF	D	E	NF	NF
V	4.55	8.97	13.52	4.63	9.09	0.10	13.68	4.71	8.83	13.54	13.56
BDH	4.65	7.23	11.88	4.83	7.85		12.79	5.18	7.62	12.80	12.38
BB	5.6	8.63	14.38	5.36	8.71	0.10	14.06	5.8	8.53	14.33	13.83

Gymnastic apparatus	C4- CNEJ Oneshty, 2013, N=8			C5 –CNM Bucharest, 2013, N=13				C6 – CNIJ Oneshty, 2013, N= 9			C7 – CNM Bucharest, 2014, N=7
	D	E	NF	D	E	Pen.	NF	D	E	NF	NF
FE	5.23	8.82	14.03	5.2	8.9		14.10	5.16	8.95	14.07	13.74

Legend: V – vault, BDH – bars of different height, BB – balance beam, FE – floor exercises, C1-7 - № of competitions; N – quantity of female gymnasts; CNEJ – Team national championship of juniors; CNJI – Individual national championship of juniors; CNM – national championship of masters; D – complexity; E – execution; Pen.- points' deductions; NF – final mark in points.

Discussion

Detail study of urgent problem of female sport gymnastic trainees' sport training at stage of specialized basic training and its actual status in the world permitted to find direction of priority: working out and experimental substantiation of macro-methodic of theory's improvement, methodic and practice of sport exercises' training in structure of long term programs of training material' mastering. We mean combined registration, usage and conjugation (in process of long time of training of still newer exercises for general and special motor fitness) of sport techniques' key elements' indicators in all kinds of gymnastic all round competitions, transfer technology [18, 33]. Besides, we mean functional pedagogic equations with their didactic content. It is necessary for formation of motor skills in process of gymnastic exercises' mastering and algorithms of their realization [5, 8, 9]. Effectiveness of macro-methodic of junior female gymnasts' training at stage of specialized basic training has been proved on material of training to basic exercises' sport technique for all kinds of gymnastic all round competitions. In this article (on example of Yurchenko-type vaults) we showed content and orientation of sport fitness of junior female gymnasts at stage of specialized basic training. Results of the tested gymnasts' performances in sport gymnasts' competitions of Romania (2012, 2013, 2014, see tables 1 and 2) are the proof of effectiveness of realization of training macro-methodic, applied to junior female gymnasts at stage of specialized basic training.

Conclusions

1. In structure of many years' training in Olympic female sport gymnastic one of the most important by scope of work and intensity is stage of specialized basic training. On this stage there are realized: controlled sport training, attention to children's health is paid, basis of sportsmanship is embedded. Overloads of young organism, forced training are obvious; frequent traumas, failure in fulfillment of training plans are possible. It is connected with a number of reasons: deficit of scientific-methodic literature devoted to training of female gymnasts at basic stages, increased international sport competitiveness, especially for adolescents, insufficient personnel support. Analysis has shown that key problem of basic specialized training stage for junior female gymnasts is insufficient quality of training of gymnastic exercises from different structural groups of complexity for all round competitions. It results in low level of performances' stability on competitions.

2. In successive pedagogic experiments we studied theory and practice of gymnastic exercises' training at basic specialized stage and gave experimental foundation to working out, development and perfection of macro-methodic of gymnastic exercises' training (as dynamic system). It includes motor, technical, didactic and technological structures of valid exercises' mastering (of different structural groups and complexity levels). We mean system of long term programs of development and purposeful perfection of sportsmanship in all round competitions (see fig.1); combined usage and conjugation of key elements indicators in phase structure of sport technique; transfer technology of gymnastic exercises' training as well as functional pedagogic equations (see fig.2) with their didactic content for formation of motor skills in process of exercises' mastering.

3. Conceptual essence of macro-methodic of junior female gymnasts' training to sport exercises at specialized basic stage (as holistic system) is dynamically agreed, internally interconnected main purpose and specific purposes of many years sport training. In their basis there are experimentally grounded for practical application means and method of long term programs of training material's mastering. The participants of pedagogic experiment demonstrated growth of complexity of competition programs, perfection of sport technique's key elements, stable rising of performance quality in conditions of female sport gymnastic national competitions, Romania, 2012, 2013, 2014 (the tested were included in nearest and remote reserves of female sport gymnastic combined team of Romania).

The prospects imply development and perfection of principles of macro-methodic of exercises' training for female gymnastic all round competitions in structure of many years' sport training.

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Conflict of interests

The author declares that there is no conflict of interests.

References:

1. Arkaev LIa, Suchilin NG. *Kak gotovit' chempiona* [How to train a champion]. Moscow: Physical Culture and Sport; 2004 (in Russian)
2. Bernshtejn NA. *O postroenii dvizhenij* [On construction of movement]. Moscow, Medicine; 1947 (in Russian)
3. Boloban VN, Biriuk EV. Statodinamicheskaia ustojchivost' tela sportsmena kak pokazatel' effektivnogo obucheniia fizicheskim uprazhneniiam progressiruiushchej slozhnosti [Static-dynamic stability of sportsman's body as indicator of effective training of physical exercises with progressing complexity]. *Optimizaciia upravleniia processom sovershenstvovaniia tekhnicheskogo masterstva sportsmenov vysshej kvalifikacii* [Optimization of control of perfection of elite sportsmen's technical fitness]. Kiev: KSIPC; 1979 (in Russian)
4. Boloban V.N. *Sportivnaia akrobatika* [Sport acrobatic]. Kiev, High School; 1988 (in Russian)
5. Boloban V.N. Makrometodika obucheniia akrobaticheskim uprazhneniiam slozhnym po koordinacii [Macro-methodic of training of acrobatic exercises with complex coordination]. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2010;6:14–24.
6. Boloban V. Dolgovremennye programmy obucheniia uprazhneniiam sportivnoj akrobatiki [Long term programs of sport acrobatic exercises' training]. *Nauka v olimpijskom sporte* 2011;1–2:75–87. (in Russian)
7. Boloban V, Sadovski E, Nizhnikovski T, Mastalezh A, Vishniovski V, Begajlo M. Kinematicheskaia struktura uzlovykh elementov sportivnoj tekhniki bazovoj sviazki akrobaticheskikh uprazhnenij perevorot vpered – sal'to vpered v gruppirovke [Kinematic structure of sport technique's key elements of acrobatic basic combination: revolution forward – forward flip tuck]. *Nauka v olimpijskom sporte* 2013;1:76–79. (in Russian)
8. Boloban VN. *Reguliaciia pozy tela sportsmena* [Regulation of sportsman's body posture]. Kiev: Olympic Literature; 2013 (in Russian)
9. Boloban V. *Makrometodika obucheniia sportivnym uprazhneniiam* [Macro-methodic of sport exercises' training]. LAP LAMBERT Academic Publishing: Deutschland; 2014 (in Russian)
10. Gaverdovskij IuK. Opyt traktovki ortodoksal'noj didaktiki v sovremennom kontekste obucheniia sportivnym uprazhneniiam [Experience of interpretation of orthodox didactic in contest of sport exercises' training]. *Teoriia i praktika fizicheskoj kul'tury* 1991;8:12 – 20. (in Russian)
11. Gaverdovskij IuK. *Obuchenie sportivnym uprazhneniiam* [Training of sport exercises]. Moscow: Physical Culture and Sport; 2007 (in Russian)
12. Gaverdovskij IuK. Sovershenstvovanie tekhniki dvizhenij i special'noj tekhnicheskoj podgotovki kak osnova vysshikh dostizhenij v sovremennoj gimnastike [Perfection of motor technique and special technical fitness as the basis of elite level in modern gymnastic]. *Nauka v olimpijskom sporte* 2012;1:7–26. (in Russian)
13. Gaverdovskij IuK. Biomekhanika gimnastiki: skrytye vozmozhnosti [Bio-mechanic of gymnastic: hidden potentials]. Nauka v olimpijskom sporte 2013;2:57–64. (in Russian)
14. Gamalij VV. *Teoretiko-metodicheskie osnovy modelirovaniia tekhniki dvigatel'nykh dejstvij v sporte* [Theoretical methodic principles of simulation of motor actions in sports]. Kiev: Poligrafservis; 2013 (in Russian)
15. Matveev LP. *Obshchaia teoriia sporta i ee prikladnye aspekty* [Obshchaia teoriia sporta i ee prikladnye aspekty]. Moscow: News; 2001 (in Russian)
16. Platonov VN. *Sistema podgotovki sportsmenov v olimpijskom sporte* [The system of preparation of sportsmen in Olympic sport], Kiev: Olympic Literature; 2004 (in Russian)
17. Platonov V.N. *Periodizaciia sportivnoj trenirovki* [Periodizing of sport training]. Kiev: Olympic Literature; 2013 (in Russian)
18. Potop V, Grigore V, Marinesku S. Motornoe obuchenie gimnasticheskim uprazhneniiam na osnove transfernoj tekhnologii [Motor training of gymnastic exercises on the base of transfer technology]. *Nauka v olimpijskom sporte* 2012;1:47–57. (in Russian)
19. Potop VA, Grad R, Boloban VN. Biomechanical indicators of key elements of sports equipment gymnastic exercises. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2013;9:59-72. http://dx.doi.org/10.6084/m9.figshare.751559.
20. Sadovski E, Boloban V, Nizhnikovski T, Mastalezh A, Vishniovski V. Poznye orientiry dvizhenij kak uzlovye elementy sportivnoj tekhniki akrobaticheskikh uprazhnenij [Postural points of movements as key elements of acrobatic exercises' sport technique]. *Teoriia i praktika fizicheskoj kul'tury* 2009;12:42–47. (in Russian)
21. Sili RR, Stivens TD, Tejt T. *Specificheskie vidy chuvstv* [Specific kinds of senses]. Kiev: Olympic Literature; 2005;1:525–570. (in Russian)
22. Suchilin NG. Tekhnicheskaia struktura gimnasticheskikh uprazhnenij [Technical structure of gymnastic exercises]. *Gimnastika. Teoriia i praktika* 2010;1:5–19. (in Russian)

23. Smolevskij VM, Gaverdovskij IuK. Sportivnaia gimnastika [Sport gymnastic]. Kiev: Olympic Literature; 1999 (in Russian)
24. Tereschenko IA, Otsupok AP, Krupenio SV, Levchuk TM, Boloban VN. Evaluation of freshmen coordination abilities on practical training in gymnastics. *Physical education of students* 2013;3:60-71. http://dx.doi.org/10.6084/m9.figshare.663628
25. Khudolij OM, Iermakov SS. Zakonomirnosti processu navchannia iunikh gimnastiv [Laws of junior gymnasts' training]. *Teoriia ta metodika fizichnogo vikhovannia* 2011;5:3–18. (in Ukrainian)
26. Khudolej OM. Zakonomernosti formirovaniia dvigatel'nykh navykov u iunykh gimnastov [Laws of formation of junior gymnasts' motor skills]. *Nauka v olimpijskom sporte* 2012;1:36–46. (in Russian)
27. Shinkaruk M.P. *Otbor sportsmenov i orientaciia ikh podgotovki v processe mnogoletnego sovershenstvovaniia* [Selection of sportsmen and orientation of their training in process of many years' perfection]. Kiev: Olympic Literature; 2011 (in Russian)
28. Andreeva N. Key elements of sports techniques of ball throwing and catching by those engaged in rhythmic gymnastics at the stage of preliminary basic preparation. *Journal of Physical Education and Sport* 2013;13(1):46–52.
29. Boloban V, Sadowski J, Niznikowski T, Wisniwski W. Didactic technology in mastering complex motor task. In: Sadowski J, Niznikowski T. *Coordination motor abilities in scientific research*. Biala Podlaska: Faculty of Physical Education and Sport 2010;33:112–129.
30. Boloban V, Potop V. Biomechanical characteristics of key elements of sports technique of apparatus exercises in the women's gymnastics all-around. *Science in Olympic Sport* 2014;1:44–49.
31. Grigore V. Artistic gymnastics: theoretical fundamentals of sports training. Bucharest: "Semne" Publishing House; 2001
32. Peixoto C. Technical Development. How coaches understand movements. Performance Indicator. *Coordination motor abilities in scientific research* 2010;33:49–54.
33. Potop V. *Motor learning and transfer in performance artistic gymnastics*. Kembridg: New York; 2007
34. Potop V. Improvement of Key Elements of Sports Technique Based on the Biomechanical Analysis of Yurchenko vault. Ovidius University Annals, Series Physical Education and Sport. *Science, Movement and Health* 2013;13(2):291–298.
35. Potop V. E-Learning by Computer Video Analysis the Key Elements of Sports Technique of Yurchenko Vault in Women's Artistic Gymnastics. *The 9th International Scientific Conference eLearning and software for Education,* Bucharest, 2013;3:151–158.
36. Potop V. Macro-methods of Learning the Technical Elements of Junior Female Gymnasts in the Stage of Sports Training Basic Specialization. *Procedia - Social and Behavioral Sciences* 2013;92:747–751.
37. Potop V. *Theory and Practice in Artistic Gymnastics*. Bucharest: Discobolul: Publishing House; 2014
38. Vieru N. *Handbook of Sports Gymnastics*. Bucharest, Driada Publishing House; 1997

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EFFECTIVENESS OF ELITE FEMALE BASKETBALL PLAYERS' TECHNICAL-TACTIC ACTIONS AND WAYS FOR THEIR IMPROVEMENT AT STAGE OF MAXIMAL REALIZATION OF INDIVIDUAL POTENTIALS

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Abstract. *Purpose:* study effectiveness of elite female basketball players' technical-tactic actions and determine the ways for their improvement at stage of maximal realization of individual potentials. *Material:* the authors analyzed competition functioning's indicators of female basketball players of national combined team of Ukraine and their age characteristics. *Results:* effectiveness of technical-tactic actions in structure of national female basketball players' combined team of Ukraine competition functioning at European championship. The authors present: indicators of team composition; roles in team; won and lost games; quantity of scored and skipped points; technical-tactic actions; age of sportswomen. Age indicators of elite female basketball players at stage of maximal realization have been given. *Conclusions:* we have composed a list of the most important technical-tactic actions in competition functioning. We also outlined ways for their perfection at stage of maximal realization of individual potentials of elite female basketball players of different game roles.

Key words: basketball, competitions, technique, tactic, training, stage, indicators, game role.

Introduction

Modern conceptions of sport trainings' periodization (V. Platonov, 2008; 2013) underline presence of substantial contradictions in system of many-years' training of qualified sportsmen, which are conditioned by a number of factors:

- professionalization of elite sports, which results in increasing of difficulties. These difficulties are connected with significant difference of games, in which elite female basketball players participate. It results in negative after-effects, connected with certain imbalance in fitness of players, with need in planning team's training, considering national combined team's competition on club and international levels;
- intensification of training in children-junior sports. It borders with increase of traumatism, drawbacks in technical-tactic training at stage of maximal realization of individual potentials, violation of principles of selection to teams;
- insufficient interaction of different kinds of sports' national federations , specialists of Ministry of youth and sports, leading higher educational establishments of physical culture and sports and scientific –research establishments of this profile. Just they are responsible for preparation of programs for CJSS, SCJSSOR, national programs of development of certain kinds of sports, which would meet requirements to many years' training of qualified sportsmen [11,10].

In these conditions analysis of effectiveness of technical-tactic actions and determination of ways of their perfection at stage of maximal realization of individual potentials are an urgent problem for basketball. In this kind of sports efficiency of competition functioning is rather highly determined by level of technical-tactic fitness of players.

Effectiveness of technical-tactic actions in competition process is an important component of achievement of high sport results in basketball. It conditions significant researchers' interest to these problems. Besides, analysis of technical-tactic actions of female basketball players of national combined team of Ukraine in official games of European championship permits to say that these sportswomen are at stage of maximal realization of individual potentials. All these are additional factor of scientific interest to the mentioned problem.

The problems of optimal assessment of effectiveness of elite female basketball players' technical-tactic actions were described in detail in works by M. Bezmylov, 2010; [1], M. Bezmylov, O. Shynkaruk, 2010; 2011 [2, 3]. These authors render modern approaches to assessment of competition functioning results of elite female basketball players, which are the ground for system of players' selection to team. These problems were regarded in researches by D. Okamoto (2011). The author offers to take algorithm with consideration of mistaken and effective games techniques as a base of optimal assessment of technical-tactic actions [19].

The works by V. Koriagin (2010), S. Yelevich (2008, 2009) are devoted to solution of the mentioned problems at different stages of system of qualified basketball players' many years' perfection [4, 5, 7]. The authors stressed that exactly the level of technical-tactic fitness, together with rather high indicators of physical fitness, plays the most important role in achievement of maximal sport results. In these researches they show that at different stages of many years' basketball training, orientation of training sessions shall be formed by different factors, but analysis of quality and effectiveness of technical-tactic actions is one of the most important.

In works by Zh. Kozina there are elucidated problems, connected with factors of professionalization of modern basketball, when advanced players have indicators of technical-tactic actions in competition practice close to maximal in games of national championships and games for Cup of country, official international championships of club level (Cup of Europe – FIBA; Euro-league FIBA) and national combined teams (European and world championships, Olympic games) [6, 20]. At the same time other players have not sufficient scope of game practice in elite competitions that create certain imbalance in macro-cycle of elite basketball players' training. It would facilitate increase of effectiveness of

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sportsmen's technical-tactic actions at the account of highly specialized means of training and consideration of peculiarities of technical-tactic actions of different role players. Though, absence of elite competition practice practically can not be replaced even with the most effective and highly specialized training means owing to influence of psychological factors on a player.

In researches by I. Losieva, M. Pityn (2010) authors attempted to determine factors, which negatively influence on adaptation of young basketball players to training process and competition practice of teams [8]. They showed that effectiveness of young players' technical-tactic actions is influenced by psychological factors, which are connected with player's adaptation to sport collective. Influence of these factors to larger extent is noticed in competition practice and to lesser extent in training process. The authors stress on demand in application of complex approaches, which are based on usage of highly specialized means in training process and required amount of competition practice in official competitions.

Foreign authors stress on specific problem and possible ways of its overcoming [14, 21]. For example dissertation of T. Khutsynskiy (2004) is devoted to influence of sex factors on many years' training of female basketball players [13]. The author shows that effectiveness of elite female basketball players is influenced on by phases of ovarian-menstrual cycle and other specificities, intrinsic to women's organism. That is why determination of orientation in training of female basketball players and in planning of micro-, meso-, and macro-cycles of training requires consideration of these factors' influence for avoiding of negative effects in training process.

C. Lopes et al. (2012) on example of team U-19 render data that special physical fitness is the basis of effective realization of available technical-tactic potential during competition season [18]. It agrees with principles of general theory of sportsmen's training, by V. Platonov (2004) and data of theory and methodic of sportsmen's training in game kinds of sports: basketball (V. Koriagin, 2010, L. Poplavskiy, 2004) [7, 9, 12], volleyball (Ye. Yu. Doroshenko, 2013 [16], football, (Ye. Yu. Doroshenko, 2011, 2013) [15, 17].

Determination of effectiveness of technical-tactic actions of qualified female basketball players at stage of maximal realization, considering age indicators of sportswomen of different game roles will permit to specify age limits of this stage and orientation of training in macro-cycle's different structural formations.

Purpose, tasks of the work, material and methods

The purpose is to study effectiveness of elite female basketball players' technical-tactic actions and determine the ways for their improvement at stage of maximal realization of individual potentials.

The object of the research is technical-tactic functioning of elite female basketball players at stage of maximal realization of their individual potentials.

The subject of the research is technical tactic and age indicators in process of training and competition functioning of elite female basketball players at stage of maximal realization of their individual potentials.

Material and methods of the research

The authors analyzed results of competition functioning and age indicators of female basketball players of national combined team of Ukraine in European championship games for the period from 1995 to 2013. In the research we used the following *methods:* analysis of scientific literature, retrospective analysis of Internet data, pedagogic observations, analysis of advanced pedagogic experience and competition functioning's results, pedagogic experiment and methods of mathematical statistic.

Results of the research

Study of effectiveness of technical-tactic actions is a complex of problems. In competition process player is influenced by a number of factors, which complicate realization of his (her) technical-tactic potential. Besides, we should consider influence of group of factors, which belong to staff of coaches: character of chief coach and his technical-tactic preferences, which are connected with strategy of team, determined in training process and in competitions and etc. In final tournaments of European championships women's national combined team of Ukraine was trained by the following specialists:

- 1995, Brno (Czech Republic) – Volodymyr Ryzhov;
- 1997, Petch (Hungary) – Isaac Myzline;
- 2001, Orleans (France) – Igor Tkachenko;
- 2003, Pirgos (Greece) – Yuriy Veligura;
- 2009, Riga (Latvia) – Iryna Schypakina;
- 2013, Lille (France) – Vadym Chechuro.

Results of performances of women's national combined team of Ukraine are given in table 1. Pedagogic analysis of table 1 data permits to say that in most of final tournaments our sportswomen took 10-13 places. Exception was final tournament of 1995, when women's combined team of Ukraine took first place under guidance of Volodymyr Ryzhov.

Table 1

Results of women's national combined team of Ukraine (basketball) in finals of European championships 1995-2013, n=6

Won places	National combined teams					
	Final 1995	Final 1997	Final 2001	Final 2003	Final 2009	Final 2013
1	**Ukraine**	Lithuania	France	Russia	France	Spain
2	Italy	Slovakia	Russia	Czech Republic	Russia	France
3	Russia	Germany	Spain	Spain	Spain	Turkey
10	-	**Ukraine**	-	-	-	-
11	-	-	**Ukraine**	**Ukraine**	-	-
12	-	-	-	-	-	-
13	-	-	-	-	**Ukraine**	**Ukraine**

Analysis of teams' completing, considering players' game roles, witnesses about tactical preferences of coach staff of women's national combined team of Ukraine during preparation for official competitions and in process of management of competition functioning. The data about completing of teams with players of different roles are presented in table 2.

Table 2

Quantitative staff of national combined basketball team of Ukraine (women) in finals of European championships 1995-2013, n=6

Players' roles	National combined teams					
	Final 1995	Final 1997	Final 2001	Final 2003	Final 2009	Final 2013
Start-player	3	3	3	2	2	2
Forward	6	6	7	7	7	7
Center player	3	3	2	3	3	3

Pedagogic analysis of table 3 witnesses that the most effective was team staff at European championship 1995: 3-start players, and attacking backs; 6 – "light" and "heavy" forwards, 3 – center players.

Correlation of won and lost games witnesses about general level of sport fitness of women's national basketball combined team of Ukraine in finals of European championships 1995-2013. The received results are given in table 3.

Table 3

"Victory-defeat" indicators of national basketball combined team of Ukraine (women) in finals of European championships 1995-2013,
n=6

Results of games	Finals of European basketball championships					
	1995	1997	2001	2003	2009	2013
Victories	9	3	1	1	0	0
Defeats	1	4	6	6	3	3
Correlation	+ 9	- 0.75	- 0.17	- 0.17	0	0

It is well known that effectiveness of elite female basketball players' competition functioning if influenced on by correlation of scored and skipped points. Such information permits to form mark of effectiveness of team's technical-tactic actions in competition process, expert assessment of sportswomen's complex fitness, determine strong and weak points of attacking and defensive actions of separate basketball players, links and team in general (see table 4).

Table 4

Scored and lost points of basketball combined team of Ukraine (women) in finals of European championships 1995-2013, n=6

Points	Finals of European basketball championships					
	1995	1997	2001	2003	2009	2013
Scored	638	528	452	476	191	180
Lost	561	543	541	526	241	225
Difference	+77	-15	-89	-50	-50	-45
Correlation	≈ 1.14	≈ 0.97	≈ 0.84	≈ 0.90	≈ 0.79	≈ 0.80

The data presented in table 4 witness that indicators of positive or negative difference and correlation of scored and skipped points are one of most important components with analysis of technical tactic actions' effectiveness in competition process. Most of specialists are of opinion that high effectiveness of technical-tactic actions, providing proper level of functional fitness and leader features of sportswomen's psycho-type, to large extent determines successfulness and efficiency of competition functioning. On the other hand, the higher level of sport competitiveness and sportsmanship of separate players and teams is the greater role in achievement of positive results can be played by secondary factors of competition functioning. Indicators of effectiveness of elite female basketball players' competition functioning are given in table 5.

Table 5

Indicators of effectiveness of basketball combined team of Ukraine (women) in finals of European championships 1995-2013, n=6

Indicators	Finals of European basketball championships					
	1995	1997	2001	2003	2009	2013
2-scores throws n_1 / n_2	188/438	141/313	117/255	116/337	56/117	56/124
Effectiveness,%	42.9	45	45.9	34.4	47.9	45.2
3-scores throws, n_1 / n_2	36/109	44/122	35/133	41/115	15/55	16/57
Effectiveness,%	33.0	36.1	26.3	35.7	27.3	28.1
Penalty throws, n_1 / n_2	154/245	114/168	113/154	212/167	34/47	20/36
Effectiveness, %	62.9	67.9	73.4	72.5	72.3	55.6
Passes, n_1	85	86	73	109	23	47
Captures, n_1	186	99	131	172	78	64
Blocked shots, n_1	271	185	204	281	101	111
Losses, n_1	26	25	106	64	35	39
Pick ups in attack, n_1	69	101	68	57	32	17
Pick ups in defense, n_1	-	-	15	27	12	4
Total of pick ups, n_1	89	66	107	122	68	61

Notes: n – quantity of finals; n_1 – total quantity of technical-tactic actions; n_2 – quantity of effective technical-tactic actions.

Application of these indicators for pedagogic analysis of technical-tactic actions' effectiveness is conditioned by their wide usage in practice and scientific researches. This list of indicators is used for determination of effectiveness of technical-tactic actions and assessment of competition functioning's effectiveness with formation of statistical material of official competitions under the auspices of international federation of basketball (FIBA), federation of basketball of Ukraine, coaches, specialists of complex scientific groups and other. In table 6 we present averaged indicators of technical-tactic actions of female basketball players of national combined team of Ukraine in finals of European championships.

Table 6

Averaged indicators of competition functioning of basketball combined team of Ukraine (women) in finals of European championships 1995-2013, n=6

Indicators	Finals of European basketball championships					
	1995	1997	2001	2003	2009	2013
2-scores throws n_1 / n_2	20.9/48.7	20.1/44.7	16.7/36.4	16.6/48.1	18.7/39.0	18.7/41.3
Effectiveness,%	42.9	45	45.9	34.4	47.9	45.2
3-scores throws, n_1 / n_2	4.0/12.1	6.3/17.4	5.0/19.0	5.9/16.4	5.0/18.3	5.3/19.0
Effectiveness,%	33.0	36.1	26.3	35.7	27.3	28.1
Penalty throws, n_1 / n_2	17.1/27.2	16.3/24.0	16.1/22.0	17.3/23.9	11.3/15.7	6.7/12.0
Effectiveness, %	62.9	67.9	73.4	72.5	72.3	55.6
Passes, n_1	9.4	12.3	10.4	15.6	7.7	15.7
Captures, n_1	20.7	14.1	18.7	24.6	26.0	21.3
Blocked shots, n_1	30.1	26.4	29.1	40.2	33.7	37.0
Losses, n_1	2.9	3.6	15.1	9.1	11.7	13.0
Pick ups in attack, n_1						
Pick ups in defense, n_1						
Total of pick ups, n_1						

Notes: n – quantity of finals; n_1 – total quantity of technical-tactic actions; n_2 – quantity of effective technical-tactic actions.

In table 7 we give age indicators of elite female basketball players, who participated in finals of European championships 1995-2013. The purpose is specification of age limits of stage of maximal realization of individual potentials in process of many years' training.

Pedagogic analysis of age indicators of female basketball players permits to state that age of most of sportswomen was ≈25-27 years old. Age ranges of elite basketball players are within 18-38years.

Table 7

Age indicators of female basketball players of basketball combined team of Ukraine (women) in finals of European championships 1995-2013, n=6

Number of player	Age indicators of basketball players in finals of European basketball championships (years)					
	1995	1997	2001	2003	2009	2013
4	20	21	26	28	31	26
5	22	19	36	22	21	24
6	19	22	31	25	24	22
7	24	32	31	25	27	31
8	30	26	27	23	23	23
9	27	30	36	38	23	27
10	25	23	23	22	18	27
11	30	32	22	25	22	21
12	24	26	23	22	28	32
13	29	27	28	27	25	26
14	24	24	20	22	28	32
15	28	20	28	30	31	24
$\bar{x}$	25.17	25.17	27.58	25.75	25.08	26.25
S	3.71	4.47	5.21	4.67	4.01	3.77

In process of analysis of literature and generalization of experimental results we determined the following ways of perfection of technical-tactic actions and increase of their effectiveness:

- Application of highly specialized means of technical-tactic fitness's training, which by structure and character

of loads are close to competition exercises. It permits to significantly realize available technical-tactic potential of female basketball players in competition process;

- application of means of technical-tactic orientation on the basis of consideration of game role that permit to optimize training process and increase competition functioning's effectiveness.

Discussion

At the beginning of the research we hoped to receive a number of technical-tactic actions' indicators, which to the largest extent determine results of competition functioning and are used by scientists and coaches for assessment of its effectiveness. The basis of such assumptions was works by M. Bezmylova, O. Shynkaruk , 2010; [3], 2011; [2]. In these works technical-tactic actions, used in different systems of technical-tactic actions' assessment are described. Besides, assessment of technical tactic actions, considering psycho-emotional condition of qualified female basketball players is given in dissertation of T. Khutsynskiy, 2004; [13]. The author stresses on importance of influence of motivation components and psychic condition on final result of competition process.

We think that our purpose, formulated in this research, has been achieved, as far as the received list of technical-tactic actions' indicators is actually a basic one and, with certain modifications, is used in most systems of assessment of technical-tactic actions. We noted that analysis and generalization of scientific-methodic literature (V. Platonov, 2004; [9], 2008; [11], 2013 [10], Zh. Kozina, 2009; [6], V. Koriagina, [7], S. Yelevych, 2008; [4], 2009; [5] et al.) and experimental results permit to outline main directions of perfection of elite female basketball players' technical-tactic actions and age limits of stage of maximal realization. Technical-tactic actions' indicators of elite female basketball players are the basis for optimizing of sportswomen's training: correction of training loads, determination of scope of competition functioning, which is minimally required for further perfection of sportsmanship and etc.

The above said permits to regard technical-tactic actions as a leading component, which, to certain extent, determines effectiveness of competition process and realization of available technical-tactic potential of different role female basketball players in certain game. The received data about methodic approaches to perfection of technical-tactic actions shall be regarded just as main factors, which permit to optimize training processes and rationally determine orientation of training sessions. Generalization of age ranges for elite female basketball players at stage of maximal realization of individual potential will require further specifications and researches on example of national teams' sportswomen, who are leaders of European and world basketball.

Conclusions:

1. Effectiveness of technical-tactic actions of different game roles' elite female basketball players is, to large extent, determined by character of competition functioning and peculiarities of sport training. Technical-tactic actions, which are used in analysis of competition functioning and determination of its efficiency, include: ball throws (2-scores and 3-scores; penalty throws), pick ups of ball (in attack, in defense, total), capture of ball, efficient passes, blocked shots, losses of ball, fouls (of player and with player).
2. Main means of increasing effectiveness of elite female basketball players' technical-tactic actions are the following:

- application of highly specialized means of technical-tactic orientation, which, by structure and character of loads, are close to competition exercises;
- application of means of technical-tactic orientation on the base of game role's specificities;
- application of the most optimal and rational tactic constructions of game conduct against certain opponent.

3. Approximate age indicators of elite female basketball players at stage of maximal realization of individual potentials can be considered the following: averaged indicators - ≈25-27 years; age ranges– 18-38 years.

The prospects of further researches this direction are based on constant monitoring of indicators of technical-tactic actions' effectiveness of elite female basketball players, participating in official international championships in order to find out the trends to perfection of technical-tactic level of different game roles' sportswomen.

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Conflict of interests

The authors declare that there is no conflict of interests.

References.

1 Bezmylov NN. *Kriterii otbora kvalificirovannykh basketbolistov v komandu. Cand. Diss*. [Criteria of selection of qualified basketball players in team. Cand. Diss.], Kiev; 2010. (in Russian)

2 Bezmylov N, Shinkaruk O. Ocenka sorevnovatel'noj deiatel'nosti basketbolistov vysokoj kvalifikacii v igrovom sezone [Assessment of competition functioning of elite basketball players in game season]. *Nauka v olimpijskom sporte* 2011;1-2:45-52. (in Russian)

3 Bezmilov M, Shinkaruk O. Pedagogichne testuvannia basketbolistiv riznoi kvalifikacii ta igrovikh amplua dlia efektivnosti zmagal'noi diial'nosti [Pedagogic testing of basketball players of different qualification and game roles for effectiveness of competition functioning]. *Teoriia i metodika fizichnogo vikhovannia i sportu* 2010;3:8-11. (in Ukrainian)

4 Elevich S. *Mnogoletniaia podgotovka basketbolistov vysokoj kvalifikacii* [Many years' training of elite basketball players], Sankt Petersburg, Olimp; 2008. (in Russian)

5 Elevich SN. *Upravlenie sostoianiem sorevnovatel'noj gotovnosti vysokokvalificirovannykh basketbolistov v processe mnogoletnej sportivnoj podgotovki. Cand. Diss*. [Control over competition fitness of elite basketball players in process of many years' sport training. Cand. Diss.], Sankt Petersburg; 2009. (in Russian)

6 Kozina ZhL. *Individualizaciia podgotovki sportsmenov v igrovykh vidakh sporta* [Individualization of sportsmen's training in game kinds of sports], Kharkiv, Point; 2009. (in Russian)

7 Koriagin VM. Teoretiko-metodicheskie osnovy sistemy podgotovki iunykh basketbolistov [Theoretical-methodic principles of training system of junior basketball players]. *Teoriia ta metodika fizichnogo vikhovannia* 2010;10:3-7. (in Russian)

8 Loseva I, Pityn M. Metodicheskie priemy v adaptacii molodykh basketbolistov v usloviiakh sorevnovatel'noj deiatel'nosti komand vysshego klassa [Methodic techniques in adaptation of young basketball players in conditions of competition functioning of elite teams]. *Fizichna aktivnist', zdorov'ia i sport* 2010;1:24-30. (in Russian)

9 Platonov VN. *Sistema podgotovki sportsmenov v olimpijskom sporte* [The system of preparation of sportsmen in Olympic sport], Kiev, Olympic Literature; 2004. (in Russian)

10 Platonov VN. *Periodizaciia sportivnoj trenirovki* [Periodization of sport training], Kiev, Olympic Literature; 2013. (in Russian)

11 Platonov VN. Teoriia periodizacii podgotovki sportsmenov v techenie goda: predposylki, formirovanie, kritika [Theory of periodization of sportsmen's training during year: pre-conditions, formation, critics]. *Nauka v olimpijskom sporte* 2008;1:3-23. (in Russian)

12 Poplavs'kij LIu. *Basketbol* [Basketbol], Kiev, Olympic Literature; 2004. (in Russian)

13 Khucinskij T. *Sportivnaia podgotovka zhenshchin-basketbolistok v aspekte polovogo dimorfizma. Dokt. Diss.* [Sport training of women-basketball players in aspect of sex dimorphism. Dokt. Diss.]. Sankt Petersburg; 2004. (in Russian)

14 Csapo P, Avugos S, Raab M, Bar-Eli M. The effect of perceived streakiness on the shot-taking behaviour of basketball players. *European Journal of Sport Science* 2014;1:1–8. http://doi.org/10.1080/17461391.2014.982205

15 Doroshenko EI. Assessing the impact of training load on the body of footballers in the light of its external and internal parameters. *Physical Education of Students* 2011:6:31 - 36.

16 Doroshenko E.Iu. Model parameters of technical and tactical actions in the competitive activities of volleyball players. *Physical Education of Students* 2013:5:41-45. http://doi.org/10.6084/m9.figshare.771020

17 Doroshenko EY. Technology of perfection to technical tactical preparedness of skilled footballers in microcycles of competition period. *Physical Education of Students* 2012;4:47 - 54.

18 Lopes CR, Mota da GR, Dechechi CJ, Tessutti LS, Galatti LR. Effect of a Physical Training Season Applied on a U-19 Male Basketball Team. *International Journal of Sports Science* 2012:2(4):32-35.

19 Okamoto D. Stratified Odds Ratios for Evaluating NBA Players Based on their Plus/Minus Statistics. *Journal of Quantitative Analysis in Sports* 2011;7(2):1-12.

20 Sobko IN, Kozina ZhL, Iermakov SS, Muszkieta Radosław, Prusik Krzysztof, Cieślicka Mirosława, Stankiewicz Błażej. Comparative characteristics of the physical and technical preparedness of the women's national team of Ukraine and Lithuania basketball (hearing impaired) before and after training to Deaflympic Games. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2014;10:45-51.

21 Uchida Y, Mizuguchi N, Honda M, Kanosue K. Prediction of shot success for basketball free throws: Visual search strategy. *European Journal of Sport Science* 2014:14(5):426–432. http://doi.org/10.1080/17461391.2013.866166

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EFFECTIENESS OF JUNIOR FORM PUPILS' TRAINING OF GYMNASTIC EXERCISES IN DIFFERENT MODES OF THEIR FULFILLMENT

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Abstract. *Purpose:* determination of junior pupils' motor skills' formation. *Material:* in the research 172 pupils participated: in every parallel of forms – 48 pupils. *Results:* effectiveness of 1st form pupils' is positively influenced (exercise – forward roll) by increase of attempts up to 12 times; quantity of repetitions in one attempt shall be within 1-3. For 2nd form pupils (exercise – forward roll), 3rd form (exercise – vault over the width of gymnastic horse) and 4th form pupils (exercise – vault over width of gout with bent legs) positive influence was rendered by increase of repetitions in one attempt up to 3 times and quantity of attempts within 6-12 times. Attention shall be accentuated on quantity of exercise's repetitions in one attempt (2nd-4th forms) and quantity of attempts (4th from). *Conclusions:* Experiment of 2^3 type permitted to study multi-factorial structure of modes of 1-4 forms' schoolchildren's training to physical exercises; to specify optimal correlations of quantity of attempts, quantity of repetitions in one attempt and rest interval in period of acrobatic exercises' and gymnastic vaults' training at physical culture lessons.
Key words: training, motor skills, schoolchildren, gymnastic, teaching.

Introduction

In modern conditions of weakening of schoolchildren's motor functioning, low resistance of their organisms to diseases there appears the problem of optimization of children's and adolescents' physical education (V.K. Baltsevych [1], T.Yu. Krutsevych, G.V. Bezverkhnia [12], O.M. Khudolii, O.V. Ivashchenko [35]). Effectiveness of physical education is influenced by correlation of physical exercises' training and development of motor abilities. Development of motor abilities is effective if they become a component of motor skills' mastering (A. M. Shlemin [38], M. M. Bogen [3], V. I. Liakh[15], O.M. Khudolii [26, 27, 28, 30], O.M. Khudolii O.M. Khudolii [29], D.T. Miroshnichenko [17]).

In researches of O.V. Ivashchenko [10], D.T. Miroshnichenko 17] There was regarded methodic of training of curriculum physical exercises from. In works by O.M. Khudolii [28, 30], O.M. Khudolii, S.S. Iermakov [29] laws of motor skills' formation in junior gymnasts were substantiated. For junior schoolchildren technological approaches to training of light athletic, gymnastic, acrobatic exercises, climbing the rope were offered (A. A. Zdanevich [9], D.T. Miroshnichenko [17], V. Rybalko [21], O.M. Khudolii [27], O.V. Ivashchenko [10]).

It was established that effectiveness of training increases if methods of programmed training were used (A.I.Berg, I.I. Tikhonov [2], V.P. Golubiev [4], A.M. Shlemin [38], Zh.K. Kholodov, P.N. Khlomeniuk [22], A.N. Laputin [13], P.K. Petrov, [18, 19, 20], O.M. Khudolii [27, 28], O.V. Ivashchenko [10]) and modes of exercises' and rest's alternation were considered (O.V. Ivashchenko [23], O.V. Ivashchenko [11], V. I. Miroshnichenko [16], O.V. Ivashchenko, O.V. Ivashchenko [31, 35]).

One of methods of children's and adolescents' motor skills' studying is simulation, conception of which was delivered in works by O.M. Khudolii [26], A.O. Lopatyeva [14], S.V. Dmitriyeva [5], Milić, M., Milavić, B., & Grgantov, Z. [43], O.M. Khudolii, O.V. Ivashchenko [31, 35], O.M. Khudolii [6, 7, 8], O.M. Khudolii, O.M. Khudolii [29], Ivashchenko O.V., Khudolii O.M., Yermakova T.S., Pilewska W., Muszkieta R., Stankiewicz B. [40], Ivashchenko O.V., Yermakova T.S., Cieślicka M., Zukowska H. [41], Khudolii O.M., Iermakov S.S., Prusik K. [42], Adashevskiy V. M., Iermakov S. S. [39].

In works of O.M. Khudolii, O.V. Ivashchenko [31, 35] there was studied level of physical exercises' mastering and its dynamic. For determination of training process's laws study of level increment of physical exercises' mastering as a criterion of training effectiveness is rather promising. Thus, study of junior schoolchildren's motor skills' formation is rather important and urgent.

Table 1

Matrix of 2^3 type factorial experiment in studying of different modes of exercise's repetitions for level of its mastering

Experimental groups	Factors		
	x_1 quantity of attempts (times)	x_2 quantity of repetitions in one attempt (times)	x_3 rest interval (sec.)
1	6	1	60
2	12	1	60

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3	6	3	60
4	12	3	60
5	6	1	180
6	12	1	180
7	6	3	180
8	12	3	180

Purpose, tasks of the work, material and methods

The purpose of the work is determination of junior pupils' motor skills' formation.

The methods and organization of the work: in the work we used analysis and generalization of scientific and methodic literature data, theoretical general-scientific methods: analogy, analysis, synthesis, abstraction, induction. Besides, we used empiric general scientific methods: observation, testing, experiment.

In the process of planning of our research we used conceptual approaches to planning of experiment, which were substantiated in works of O.M. Khudolii and T.V. Karpunets [24], O.M. Khudolii and O.V. Ivashchenko [31, 35], O.M. Khudolii [26]. In dissertation works of O.M. Khudolii [28], O.V. Ivashchenko [11], V.I. Miroshnichenko [16] there was stated that control over training process would be more effective with determination of training modes on the base of regressive models by results of full factorial experiment (FFE) of type FFE 2^{κ}.

In the research we used plans of factorial experiment of type FFE 2^3 (see table 1). We researched motor modes of training: forward roll (1^{st}, 2^{nd} forms' pupils); vault over width of horse (3^{rd} form pupils); vault over width of gout with bent legs (4^{th} form pupils. The purpose of FFE was to optimize modes of training and determine peculiarities of formation of 1^{st}-4^{th} form schoolchildren's motor skills on the base of regression equations' analysis.

In pedagogic experiment we studied influence of quantity of attempts (x_1), quantity of repetitions in one attempt (x_2) and rest intervals (x_3) on change of mastering level's increment of 1^{st}-4^{th} form schoolchildren.

In the process of gymnastic exercises' training we assessed level of mastering with alternative method ("fulfilled", "not fulfilled"), considered probability of exercise's fulfillment (p = n/m, where n — quantity of successfully fulfilled attempts, m — general quantity of attempts). Then we analyzed increment of mastering of gymnastic exercises.

In training of junior school age children we used method of algorithmic orders. Transition to next exercises was realized after three successful attempts. In 1^{st}-4^{th} forms we trained forward roll,, vault over gout with legs apart and legs bent [10, 36,].

Training of forward roll was in 1^{st}-2^{nd} forms. *Technique of fulfillment:* forward roll – forward movement of body with full turnover and successive touching floor with shoulders and back. Forward roll is fulfilled from squat position, hands are placed at 30-40 cm from tip toes (resting on hands) unbend legs. Strongly bending back and dropping head on chest fall down ahead, bending arms. Slowing fall, softly rest on neck and blades, quickly tuck and make roll.

Training tasks:

1. From position sitting on floor roll back in tuck and turn in initial position.
2. From squat position with hands on floor roll back in tuck and turn in initial position.
3. From standing position with hands on floor, legs apart, make forward roll in sitting position with expanded legs.
4. From standing position with hands on floor make forward roll in sitting position in tuck.
5. From standing position with hands on floor make forward roll in sitting position with hands on floor.
6. From squat position with hands on floor roll forward.
7. Make forward roll from main stance.
8. Three forward rolls at convenient temp.

Vault over width of gymnastic horse (3^{rd} form), training tasks:

1. From lying position with hands on floor go in standing position with hands on floor, legs are wide apart and quickly straighten body.
2. From 2—3 step run jump in squat position with hands on floor and expand legs.
3. From 2—3 step run jump in standing position with hands on hours with handle, legs apart – on horse, torso is bent; dismount.
4. From squat on horse (gout) jump down with legs apart over one more horse or gout standing in front..
5. Jump from the spot with legs apart over width of horse with handle.
6. Jump from the spot with legs apart over length of gout.
7. With legs apart jump over length of gout and make bridge at 1 meter distance from apparatus.
8. The same but jump over width of horse.

Vault over width of gout with bent legs (4^{th} form), training tasks:

1. From lying position with hands on floor, simultaneously pushing up with two arms and two legs take

squat position with arms stretched forward.

2. From squat position with hands on floor jump not loosing hands' contact with floor.
3. From, 3 meters' run jump into squat on gout with hands, touching the gout; dismount with bent legs.
4. From squat position with hands on bench, jump with bent legs over gymnastic bench.
5. From 3-5 meters' run jump over width of gout with bent legs.
6. From 5-7 meters' run jump over width of gout with bent legs, as far as possible from the apparatus.
7. From full run jump over width of gout with bent legs.
8. From full run jump over width of gout with bent legs and make bridge at distance of 1 m from the apparatus.

In every parallel of forms 48 pupils participated in the research; in total -172 pupils.

Results of the research

Results of factorial experiment are given in table 2-3.

Table 2

Regressive dependence of fitness in gymnastic exercises on quantity of attempts (x_1), quantity of repetitions in one attempt (x_2) and rest intervals (x_3) of 1-4 form pupils

Form	Description of exercises	Regression equation for coded variables
1	1. From position sitting on floor roll back in tuck and turn in initial position.	$Y = 0,45 + 0,108x_1 + 0,078x_3$
	2. From squat position with hands on floor roll back in tuck and turn in initial position.	$Y = 0,57 — 0,063x_1x_2$
	3. From standing position with hands on floor, legs apart, make forward roll in sitting position with expanded legs.	$Y = 0,561 + 0,096x_1 + 0,056x_2$
	4. From standing position with hands on floor make forward roll in sitting position in tuck.	$Y = 0,55 + 0,091x_1$
	5. From standing position with hands on floor make forward roll in squat position with hands on floor.	$Y = 0,64 + 0,064x_1$
2	1. From sitting in tuck position roll backward and turn in initial position	$Y = 0,504 + 0,071x_2$
	2. From squat position with hands on floor roll backward in tuck and return in initial position	$Y = 0,658 + 0,095x_2$
	3. From standing position with legs apart make forward roll in sitting position with legs expanded.	$Y = 0,628 + 0,01x_2$
	4. From standing position with hands on floor and legs apart make forward roll in sitting position in tuck	$Y = 0,629 + 0,064x_1$
	5. From standing position with hands on floor and legs apart make forward roll in squat with hands on floor.	$Y = 0,663 + 0,078x_2$
3	1. From lying position with hands on floor, by pushing up with legs take standing position with hands on floor and legs expanded and quickly straighten the body	$Y = 0,636 + 0,054x_2$
	2. From 2—3 step run jump in squat position with hands on floor and legs expanded	$Y = 0,703 + 0,053x_2 — 0,08x_3$
	3. From 2—3 step run jump in standing position with hands on floor; torso is and legs apart on horse with handle and dismount arching torso	$Y = 0,711 + 0,069x_2$
	4. In squat on horse jump with legs apart over horse or gout, standing in front	$Y = 0,714 + 0,066x_2$
	5. Jump from the spot with legs apart over horse with handles	$Y = 0,663 + 0,06x_2 — 0,06x_1x_3$

Form	Description of exercises	Regression equation for coded variables
4	1. From lying position with hands on floor, simultaneously pushing up with two arms and two legs take squat position with arms stretched forward.	$Y = 0,628 + 0,07x_1 + 0,43x_2$
	2. From squat position with hands on floor jump not loosing hands' contact with floor.	$Y = 0,613 + 0,055x_1 + 0,075x_2$
	3. From 3 meters' run jump into squat on gout with hands, touching the gout; dismount with bent legs.	$Y = 0,739 — 0,061x_1x_2 + 0,061x_1x_2x_3$
	4. From squat position with hands on bench, jump with bent legs over gymnastic bench.	$Y = 0,739 + 0,061x_1$
	5. From 5-7 meters' run jump over width of gout with bent legs	$Y = 0,68 + 0,05x_2 — 0,06x_1x_2$

Table 3

Results of dispersion analysis for FFE 23, which studies dependence of increment of gymnastic exercises mastering on quantity of attempts (x_1), quantity of repetitions in one attempt (x_2) and rest intervals (x_3) of 1-4 form pupils

Form	Description of exercises	Regression equation for coded variables						
		x_1	x_2	x_1x_2	x_3	x_1x_3	x_2x_3	$x_1x_2x_3$
1	1. From position sitting on floor roll back in tuck and turn in initial position.	57.42	0.77	1.98	29.84	3.1	6.08	0.77
	2. From squat position with hands on floor roll back in tuck and turn in initial position.	15.45	28.47	49.29	5.04	0.31	0.70	0.70
	3. From standing position with hands on floor, legs apart, make forward roll in sitting position with expanded legs.	50.25	17.16	10.38	15.67	1.02	4.48	1.02
	4. From standing position with hands on floor make forward roll in sitting position in tuck.	46.48	20.94	6.35	20.94	2.52	2.52	0.21
	5. From standing position with hands on floor make forward roll in squat position with hands on floor.	60.22	5.2	5.2	6.69	16.87	0.57	5.2
2	1. From sitting in tuck position roll backward and turn in initial position	10.53	40.69	1.01	10.53	19.05	1.01	17.14
	2. From squat position with hands on floor roll backward in tuck and return in initial position	0	78.35	1.35	4.39	10.63	0.86	4.39
	3. From standing position with legs apart make forward roll in sitting position with legs apart	12.36	77.25	0.43	2.36	0.19	6.95	0.43
	4. From standing position with hands on floor and legs apart make forward roll in sitting position in tuck	51.37	21.5	0.49	3.33	0.49	10.44	12.34
	5. From standing position with hands on floor and legs apart make forward roll in squat with hands on floor.	3.12	61.32	18.44	7.72	3.12	3.12	3.12
3	1. From lying position with hands on floor, by pushing up with legs take standing position	23.82	26.2	23.82	1.71	8.85	15.43	0.12

Form	Description of exercises	Regression equation for coded variables						
	with hands on floor and legs apart and quickly straighten the body							
	2. From 2—3 step run jump in squat position with hands on floor and legs apart	12.27	18.72	0.04	43.48	4.24	16.98	4.24
	3. From 2—3 step run jump in standing position with hands on floor; torso is and legs apart on horse with handle and dismount arching torso	7.26	60.9	7.26	2.43	0.18	14.67	7.26
	4. In squat on horse jump with legs apart over horse or gout, standing in front	10.36	55.04	10.36	0.01	3.31	4.4	16.48
	5. Jump from the spot with legs apart over horse with handles	23.37	25.64	5.29	1.90	30.52	8.95	4.29
4	1. From lying position with hands on floor, simultaneously pushing up with two arms and two legs take squat position with arms stretched forward.	58.55	21.58	10.75	2.68	1.86	2.68	1.86
	2. From squat position with hands on floor jump not loosing hands' contact with floor.	26.37	49.04	2.67	2.67	3.48	3.48	12.26
	3. From 3 meters' run jump into squat on gout with hands, touching the gout; dismount with bent legs.	9.6	9.6	31.62	14.34	1.59	1.59	31.62
	4. From squat position with hands on bench, jump with bent legs over gymnastic bench.	73.04	10.98	10.98	0.27	0.27	0.76	3.68
	5. From 5-7 meters' run jump over width of gout with bent legs	9.85	23.32	33.58	9.85	9.85	11.42	2.09

Increment of *first form* pupil' mastering of *first* task (from position sitting on floor roll back in tuck and turn in initial position) is positively influenced by quantity of attempts (x_1) and rest interval (x_3) (see table 2). Increment of *first form* pupil' mastering of *second* task (from squat position with hands on floor roll back in tuck and turn in initial position) is negatively influenced by interaction of quantity of attempts and quantity of repetitions (x_1x_2). Increment of *first form* pupil' mastering of *third* task (from standing position with hands on floor, legs apart, make forward roll in sitting position with expanded legs) is positively influenced by quantity of attempts (x_1) and quantity of repetitions (x_2). Increment of mastering of *forth* task (from standing position with hands on floor make forward roll in sitting position in tuck) is positively influenced by quantity of attempts (x_1). Increment of *fifth* task mastering (from standing position with hands on floor make forward roll in squat position with hands on floor) is positively influenced by quantity of attempts (x_1).

Thus, effectiveness of *first form* pupils' training of forward roll is positively influenced by the following: quantity of attempts up to 12 times; quantity of repetitions in one attempt – up to 1-3 times; rest interval - 60—180 sec. In process of training attention should be accentuated on quantity of attempts.

Increment of *second form* pupil' mastering of *first* task (from sitting in tuck position roll backward and turn in initial position) is positively influenced by quantity of attempts (x_1). Increment of *second form* pupil' mastering of *second* task (from squat position with hands on floor roll backward in tuck and return in initial position) is positively influenced by quantity of repetitions in one attempt (x_2). Increment of *third* task mastering (from standing position with legs apart make forward roll in sitting position with legs apart) is positively influenced by quantity of repetitions in one attempt (x_2). Increment of *forth* task mastering (from standing position with hands on floor and legs apart make forward roll in sitting position in tuck) is positively influenced by quantity of attempts (x_1). Increment of *fifth* task mastering (from standing position with hands on floor and legs apart make forward roll in squat with hands on floor) is positively influenced by quantity of repetitions in one attempt (x_2).

Thus, effectiveness of *second form* pupils' training of forward roll is positively influenced by the following: quantity of attempts up to 6 - 12 times; quantity of repetitions in one attempt – up to 3 times; rest interval - 60—180 sec. In process of training attention should be accentuated on quantity of repetitions in one attempt.

Increment of *third form* pupils' mastering of *first* task in training of "vault over width of gymnastic horse with legs apart" (from lying position with hands on floor, by pushing up with legs take standing position with hands on floor

and legs expanded and quickly straighten the body) is positively influenced by quantity of repetitions in one attempt (x_2). Increment of *third form* pupil' mastering of *second* task (from 2—3 step run jump in squat position with hands on floor and legs apart) is positively influenced by quantity of repetitions in one attempt and negatively - by rest interval (x_3). Increment of *third* task mastering (from 2—3 step run jump in standing position with hands on floor; torso is and legs are expanded on horse with handle and dismount arching torso) is positively Influenced by quantity of repetitions (x_2). Increment of *forth* task mastering (in squat on horse jump with expanded legs over horse or gout, standing in front) is positively influenced by quantity of repetitions in one attempt (x_2). Increment of *fifth* task mastering (jump from the spot with expanded legs over horse with handles) is positively influenced by quantity of repetitions (x_2) and interaction of quantity of attempts with rest intervals (x_1x_3).

Thus, effectiveness of *third form* pupils' training of "vault over width of gymnastic horse with legs apart" is positively influenced by the following: quantity of attempts up to 6 - 12 times; quantity of repetitions in one attempt – up to 3 times; rest interval - 60—180 sec. In process of training attention should be accentuated on quantity of repetitions in one attempt.

Increment of *forth form* pupils' mastering of *first* task in training of "vault over width of gout" (from lying position with hands on floor, simultaneously pushing up with two arms and two legs take squat position with arms stretched forward) is positively influenced by quantity of attempts (x_1) and quantity of repetitions in one attempt (x_2). Increment of *forth form* pupils' mastering of *second* task (from squat position with hands on floor jump not loosing hands' contact with floor) is positively influenced by quantity of attempts (x_1) and quantity of repetitions in one attempts (x_2). Increment of *forth form* pupils' mastering of *third* task (from 3 meters' run jump into squat on gout with hands, touching the gout; dismount with bent legs) is positively influenced by interaction of quantity of attempts with quantity of repetitions in one attempt (x_1x_2) and interaction of quantity of attempts, quantity of repetitions in one attempt and rest interval ($x_1x_2x_3$). Increment of *forth* task mastering (from squat position with hands on bench, jump with bent legs over gymnastic bench) is positively influenced by quantity of attempts (x_1). Increment of *fifth* task mastering (from 5-7 meters' run jump over width of gout with bent legs) is positively influenced by quantity of repetitions in one attempt (x_2), and negatively – by interaction of quantity of attempts with quantity of repetitions in one attempt (x_1x_2).

Thus, effectiveness of *forth form* pupils' training of "vault over width of gout" is positively influenced by the following: quantity of attempts up to 6 - 12 times; quantity of repetitions in one attempt – up to 3 times; rest interval - 60—180 sec. In process of training attention should be accentuated on quantity of repetitions in one attempt and on quantity of attempts.

Results of dispersion analysis for FFE 2^3 are given in table 3.

Increment of first form pupils' mastering (forward roll) of first task "from position sitting on floor roll back in tuck and turn in initial position" is influenced by quantity of attempts - by 57.42% (x_1) and by rest interval – by 29.84% (x_3) (see table 3, fig.1). Increment of second task's mastering ("from squat position with hands on floor roll back in tuck and turn in initial position") is influenced by interaction of quantity of attempts and quantity of repetitions in one attempt - by 49.29% (x_1x_2), by 28.47% — by quantity of repetitions in one attempt (x_2), by 15.45% — by quantity of attempts (x_1). Increment of third task's mastering ("from standing position with hands on floor, legs apart, make forward roll in sitting position with legs apart") by 50.25% is influenced by quantity of attempts (x_1), by 17.16% — by quantity of repetitions in one attempt (x_2), by 15.67% — by rest interval (x_3). Increment of forth task's mastering ("from standing position with hands on floor make forward roll in sitting position in tuck") by 46.68% is influenced by quantity of attempts (x_1), by 20.94% — by quantity of repetitions in one attempt (x_2), by 20.94% — by rest interval (x_3). Increment of fifth task's mastering ("from standing position with hands on floor make forward roll in squat position with hands on floor") by 60.22% is influenced by quantity of attempts (x_1), by 16.87 — by interaction of quantity of attempts with rest interval x_1x_3).

Thus, effectiveness of *first form* pupils' training of forward roll by 15-60% is influenced by the following: quantity of attempts up to 12 times; quantity of repetitions in one attempt – up to 1-3 times; rest interval - 60—180 sec. In process of training attention should be accentuated on quantity of attempts.

Increment of second form pupils' (forward roll) mastering of *first* task ("from sitting in tuck position roll backward and turn in initial position") by 40.69% is influenced by quantity of repetitions in one attempt (x_2). Increment of second form pupils' mastering of *second* task ("from squat position with hands on floor roll backward in tuck and return in initial position") by 78.35% is influenced by quantity of repetitions in one attempt (x_2). Increment of third task's mastering of ("from standing position with legs apart make forward roll in sitting position with legs apart") by 77.25% is influenced by quantity of repetitions in one attempt (x_2). Increment of forth task's mastering of ("from standing position with hands on floor and legs apart make forward roll in sitting position in tuck") by 51.37% is influenced by quantity of attempts (x_1), by 21.5% — by quantity of repetitions in one attempt (x_2). Increment of fifth task's mastering of ("from standing position with hands on floor and legs apart make forward roll in squat with hands on floor") by 61.32% is influenced by quantity of repetitions in one attempt (x_2).

Thus, effectiveness of *second form* pupils' training of forward roll by 40.69—78.35% is influenced by the following: quantity of attempts up to 6 - 12 times; quantity of repetitions in one attempt – up to 3 times; rest interval - 60—180 sec. In process of training attention should be accentuated on quantity of repetitions in one attempt.

Increment of third form pupils' ("vault over width of gymnastic horse with legs apart") mastering of *first* task ("from lying position with hands on floor, by pushing up with legs take standing position with hands on floor and legs apart and quickly straighten the body") by 26.2% is influenced by quantity of repetitions in one attempt (x_2), by 23.82%

— by quantity of attempts (x_1), by 23.82% — by rest interval (x_3). Increment of third form pupils' mastering of *second* task ("from 2—3 step run jump in squat position with hands on floor and legs apart") by 43.48% is influenced by rest interval (x_3), by 18.72% — by quantity of repetitions in one attempt (x_2). Increment of *third* task's mastering of ("from 2—3 step run jump in standing position with hands on floor; torso is and legs apart on horse with handle and dismount arching torso") by 60.9% is influenced by quantity of repetitions in one attempt (x_2). Increment of *forth* task's mastering of ("in squat on horse jump with legs apart over horse or gout, standing in front") by 50.4% is influenced by quantity of repetitions in one attempt (x_2). Increment of *fifth* task's mastering by 25.64% is influenced by quantity of repetitions (x_2), by 30.52% — by interaction of quantity of attempts with rest intervals (x_1x_3).

Thus, effectiveness of *third form* pupils' training of "vault over width of gymnastic horse with legs apart" is positively influenced by the following: quantity of attempts up to 6 - 12 times; quantity of repetitions in one attempt – up to 3 times; rest interval - 60—180 sec. In process of training attention should be accentuated on quantity of repetitions in one attempt.

Increment of *forth* form pupils' ("vault over width of gout") mastering of *first* task ("from lying position with hands on floor, simultaneously pushing up with two arms and two legs take squat position with arms stretched forward") by 58.55% is influenced by quantity of attempts (x_1), by 21.58% — by quantity of repetitions in one attempt (x_2). Increments of *second* task's mastering of ("from squat position with hands on floor jump not loosing hands' contact with floor") by 26.37% is influenced by quantity of attempts (x_1), by 49.04% — by quantity of repetitions in one attempts (x_2). Increment of *third* task's mastering of ("from 3 meters' run jump into squat on gout with hands, touching the gout; dismount with bent legs") by 31.62% is influenced by interaction of quantity of attempts with quantity of repetitions in one attempt (x_1x_2), by 31.62% — by interaction of quantity of attempts, quantity of repetitions in one attempt and rest interval ($x_1x_2x_3$). Increment of *forth* task's mastering of ("from squat position with hands on bench, jump with bent legs over gymnastic bench") by 73.04% is influenced by quantity of attempts (x_1). Increment of *fifth* task's mastering of ("from 5-7 meters' run jump over width of gout with bent legs") by 23.32% is influenced by quantity of repetitions in one attempt (x_2), by 23.32% — by interaction of quantity of attempts with quantity of repetitions in one attempt (x_1x_2).

Thus, effectiveness of *forth form* pupils' training of "vault over width of gout" is positively influenced by the following: quantity of attempts up to 6 - 12 times; quantity of repetitions in one attempt – up to 3 times; rest interval - 60—180 sec. In process of training attention should be accentuated on quantity of repetitions in one attempt and on quantity of attempts.

Discussion

Results of the research permitted to supplement the data about planning of experiment in studying of training process's effectiveness and working out of training models (O.M. Khudolii, T.V. Karpunets [24]; O.M. Khudolii, O.V. Ivashchenko [31, 35]; O.M. Khudolii, O.V. Ivashchenko, S.O. Chernenko [32, 33]). We have confirmed that control over training process is more effective with specifying of training modes on the base of regressive models by full factorial experiment of FFE 2^{κ} type (O.M. Khudolii [28], O.V. Ivashchenko [11]; V.I. Miroshnichenko [16]).

We also supplemented the data of O.M. Khudolii and O.V. Ivashchenko [31, 35] about possibility to use level of mastering of physical exercises and its dynamic for assessment of training effectiveness. It was established that for obtaining objective information about training process studying of physical exercises' mastering level's increment is promising as a criterion of assessment of training effectiveness.

The novelty is the data about modes of gymnastic training of 1^{st}-4^{th} form pupils.

Conclusions:

Experiment of 2^3 type permitted to realize the following: study multi-factorial structure of modes of 1^{st}-4^{th} form pupils' training of physical exercises; to specify optimal correlations of quantity of attempts, quantity of repetitions in one attempt and rest intervals.

Effectiveness of *first form* pupils' training of forward roll is positively influenced by the following: quantity of attempts up to 12 times; quantity of repetitions in one attempt – up to 1-3 times; rest interval - 60—180 sec. In process of training attention should be accentuated on quantity of attempts.

Effectiveness of *second form* pupils' training of forward roll by 40.69—78.35% is influenced by the following: quantity of attempts up to 6 - 12 times; quantity of repetitions in one attempt – up to 3 times; rest interval - 60—180 sec. In process of training attention should be accentuated on quantity of repetitions in one attempt.

Effectiveness of *third form* pupils' training of "vault over width of gymnastic horse with legs apart" is positively influenced by the following: quantity of attempts up to 6 - 12 times; quantity of repetitions in one attempt – up to 3 times; rest interval - 60—180 sec. In process of training attention should be accentuated on quantity of repetitions in one attempt.

Effectiveness of *forth form* pupils' training of "vault over width of gout" is positively influenced by the following: quantity of attempts up to 6 - 12 times; quantity of repetitions in one attempt – up to 3 times; rest interval - 60—180 sec. In process of training attention should be accentuated on quantity of repetitions in one attempt and on quantity of attempts.

The prospects of further researches are determination of training modes' influence on dynamic of indicators of motor skills' progressing in junior school age children.

References:

1. Bal'sevich VK. *Ontokineziologiia cheloveka* [Onto kinesiology human], Moscow: Theory and practice of physical culture; 275. (in Russian)
2. Berg AI, Tikhonov II. *Problemy programmirovannogo obucheniia* [Problems of programmed teaching], Leningrad: Knowledge; 1968. (in Russian)
3. Bogen MM. *Obuchenie dvigatel'nym dejstviiam* [Training of motor actions], Moscow: Physical Culture and Sport; 1985. (in Russian)
4. Golubev VP. Programmirovannoe obuchenie v teorii i praktike fizicheskogo vospitaniia studentov [Programmed training in theory and practice of students' physical education]. *Teoriia i praktika fizicheskoj kul'tury* 1969;6:50–52. (in Russian)
5. Dmitriev SV. Proektno-tekhnologicheskoe modelirovanie dvigatel'nykh dejstvij — didakticheskie osnovy [Projecting-technological simulation of motor actions – didactic principles], *Physical education of students* 2008;2:17–32. (in Russian)
6. Iermakov S. Modeli biomekhanicheskikh sistem v organizacii effektivnogo dejstviia sportsmena [Models of bio-mechanical systems in organization of sportsman's effective functioning]. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2001;17:40–47. (in Russian)
7. Iermakov SS. Modeli rabochikh poz sportsmena kak faktor effektivnosti vypolneniia dvigatel'nykh dejstvij [Models of working postures as factor of effectiveness of motor actions' fulfillment]. *Fizicheskoe vospitanie studentov tvorcheskikh special'nostej* 2001;4:16–22. (in Russian)
8. Iermakov SS. Biomekhanichni modeli udarnikh rukhiv u sportivnikh igrakh u konteksti vdoskonalennia tekhnichnoi pidgotovki sportsmeniv [Bio-mechanical models of strike movements in context of perfection of sportsmen technical fitness]. *Teoriia ta praktika fizichnogo vikhovannia* 2010;4:11–18. (in Ukrainian)
9. Zdanevich AA. U mladshikh shkol'nikov — metanie v cel' [For junior pupils – throwing into target]. *Fizicheskaia kul'tura v shkole* 1995;1:13-16. (in Russian)
10. Ivashchenko OV. Metodika navchannia gimnastichnim vpravam shkil'noi programi [Methodic of gymnastic exercises' training in school program]. *Teoriia ta praktika fizichnogo vikhovannia* 2001;1:26—31. http://dx.doi.org/10.17309/tmfv.2001.1.7 (in Ukrainian)
11. Ivashchenko O. V. *Normativnye pokazateli trenirovochnykh nagruzok na nachal'nom etape podgotovki iunykh gimnastok 6—8 let. Cand. Diss*. [Normative indicators of training loads at initial stage of junior, 6-8 yrs., girl-gymnasts], Moscow; 1988. (in Russian)
12. Krucevich TIu, Bezverkhnia GV. *Rekreaciia u fizichnij kul'turi riznikh grup naselennia* [Recreation in physical education of different population groups], Kiev: Olympic Literature; 2010. (in Ukrainian)
13. Laputin AN. *Obuchenie sportivnym dvizheniiam* [Training of sport movements], Kiev: Health; 1986. (in Russian)
14. Lopat'iev A. O. Modeliuvannia iak metodologiia piznannia [Simulation as cognitive methodology]. *Teoriia ta metodika fizichnogo vikhovannia* 2007;8:4–10. (in Ukrainian)
15. Liakh VI. *Dvigatel'nye sposobnosti* [Motor abilities]. Fizicheskaia kul'tura v shkole 1996;2:C. 2–6. (in Russian)
16. Miroshnichenko VI. *Metodika formirovaniia dvigatel'nykh navykov u detej mladshego shkol'nogo vozrasta. Cand. Diss.* [Methodic of motor skills' formation in junior school age children. Cand. Diss.], Moscow; 1988. (in Russian)
17. Miroshnichenko DT. Metodika navchannia akrobatichnim vpravam uchniv molodshikh klasiv [Methodic of junior form pupils' training to acrobatic exercises]. *Teoriia ta metodika fizichnogo vikhovannia* 2007;12:29—31. (in Ukrainian)
18. Petrov PK. *Sistema podgotovki budushchikh specialistov fizicheskoj kul'tury v usloviiakh informatizacii obrazovaniia. Dokt. Diss*. [System of training of future physical culture specialists in conditions of increasing of information's role in education. Dokt. Diss.], Izhevsk; 2004. (in Russian)
19. Petrov PK. *Informacionnye tekhnologii v fizicheskoj kul'ture i sporte* [Information technologies in physical culture and sports], Moscow: Academy; 2013. (in Russian)
20. Petrov PK. *Osnovy programmirovannogo obucheniia v fizicheskom vospitanii* [Principles of programmed training in physical education], Ustinov; 1987. (in Russian)
21. Ribalko V. Navchannia tekhniki metannia m'iacha na urokakh fizichnoi kul'turi [Training of ball throwing technique at physical culture lessons]. *Fizichne vikhovannia v shkoli* 2005;5:27—31. (in Ukrainian)
22. Kholodov ZhK, Khlomenok PN. Aktual'nye voprosy algoritmizacii i programmirovaniia obucheniia [Urgent problems of algorithm provisioning and programming of teaching]. *Teoriia i praktika fizicheskoj kul'tury* 1979;9:51–53. (in Russian)
23. Khudolij OM. Navantazhennia u sportivnomu trenuvanni iunikh gimnastiv [Loads in sport training of junior gymnasts]. *Teoriia ta metodika fizichnogo vikhovannia* 2001;3:13-19. (in Ukrainian)
24. Khudolii OM, Karpunec' TV. Planuvannia eksperimentu v doslidzhenni procesu pidgotovki iunikh gimnastiv [Planning of experiment in study of junior gymnasts' training]. *Teoriia ta metodika fizichnogo vikhovannia* 2002;4:2—8. http://dx.doi.org/10.17309/tmfv.2002.4.73 (in Ukrainian)
25. Khudolii OM, Ivashchenko OV. Konceptual'ni pidkhodi do rozrobki programi naukovikh doslidzhen' u fizichnomu vikhovanni [Conceptual approaches to working out of program of scientific researches in physical

education]. *Teoriia ta metodika fizichnogo vikhovannia* 2004;4:2—5. http://dx.doi.org/10.17309/tmfv.2004.4.140 (in Ukrainian)
26. Khudolii ON. *Modelirovanie processa podgotovki iunykh gimnastov* [Simulation of junior gymnasts' training process], Kharkov: OVS; 2005. (in Russian)
27. Khudolii OM. Tekhnologiia navchannia gimnastichnim vpravam. Dopovid' 1 [Technology of gymnastic exercises' training. Report 1]. *Teoriia ta metodika fizichnogo vikhovannia* 2009;8:19—34. http://dx.doi.org/10.17309/tmfv.2009.9.562 (in Ukrainian)
28. Khudolii OM. *Teoretiko-metodichni zasadi sistemi pidgotovki iunikh gimnastiv 7—13 rokiv. Dokt. Diss.* [Theoretical-methodic principles of system of junior, 7-13 yrs. age, gymnasts' training Dokt. Diss.], Kiev; 2011. (in Ukrainian)
29. Khudolii OM, Iermakov SS. Zakonomirnosti procesu navchannia iunikh gimnastiv [Training process of junior gymnasts]. *Teoriia ta metodika fizichnogo vikhovannia* 2011;5:3—18. http://dx.doi.org/10.17309/tmfv.2011.5.707 (in Ukrainian)
30. Khudolii ON. Zakonomernosti formirovaniia dvigatel'nykh navykov u iunykh gimnastov [Regularities of motor skills' formation in junior gymnasts]. *Nauka v olimpijskom sporte* 2012;1:36—46 (in Russian)
31. Khudolii OM, Ivashchenko OV. Konceptual'ni pidkhodi do modeliuvannia procesu navchannia i rozvitku rukhovikh zdibnostej u ditej i pidlitkiv [Conceptual approaches to simulation of training process and development of children's and adolescents' motor skills]. *Teoriia ta metodika fizichnogo vikhovannia* 2013;2:3—16. http://dx.doi.org/10.17309/tmfv.2013.2.1012(in Ukrainian)
32. Khudolii OM, Ivashchenko OV, Chernenko SO. Chinniki, shcho vplivaiut' na efektivnist' navchannia fizichnim vpravam khlopchikiv molodshikh klasiv [Factors, influencing on effectiveness of physical exercises' training of junior form boys]. *Teoriia ta metodika fizichnogo vikhovannia* 2013;1:21—26. http://dx.doi.org/10.17309/tmfv.2013.1.1006(in Ukrainian)
33. Khudolii OM, Ivashchenko OV, Chernenko SO. Chinniki, shcho vplivaiut' na efektivnist' navchannia fizichnim vpravam divchatok molodshikh klasiv [Factors, influencing on effectiveness of physical exercises' training of junior form girls]. *Teoriia ta metodika fizichnogo vikhovannia* 2013;2:43—47. http://dx.doi.org/10.17309/tmfv.2013.2.1016(in Ukrainian)
34. Khudolii OM, Ivashchenko OV. Informacijne zabezpechennia procesu navchannia i rozvitku rukhovikh zdibnostej ditej i pidlitkiv (na prikladi sportivnoi gimnastiki) [Informational provisioning of training process and development of children's and adolescents, motor skills (on example of calisthenics)]. *Teoriia ta metodika fizichnogo vikhovannia* 2013;4:3–18. http://dx.doi.org/10.17309/tmfv.2013.4.1031 (in Ukrainian)
35. Khudolii OM, Ivashchenko OV. *Modeliuvannia procesu navchannia ta rozvitku rukhovikh zdibnostej u ditej i pidlitkiv* [Simulation of training process and development of children's and adolescents' motor skills], Kharkov: OVS, 2014. (in Ukrainian)
36. Khudolii OM, Ivashchenko OV. *Teoriia ta metodika vikladannia gimnastiki* [Theory and methodic of gymnastic's training], Kharkov: OVS, 2014. (in Ukrainian)
37. Khudolii OM, Ivashchenko OV. *Osnovi naukovo-doslidnoi roboti u fizichnomu vikhovanni i sporti* [Principles of scientific research work in physical education and sports], Kharkov: OVS, 2014. (in Ukrainian)
38. Shlemin AM. Formirovanie u detej dvigatel'noj funkcii [Formation of children's motor function], *Fizicheskaia kul'tura v shkole* 1983;1:13– 14. (in Russian)
39. Adashevskiy VM, Iermakov SS, Firsova IuIu. Physical mathematical modelling of difficult elements of acrobatic rock-and-roll. *Physical Education of Students* 2013;3:3-10. http://dx.doi.org/10.6084/m9.figshare.662463
40. Ivashchenko OV, Khudolii OM, Yermakova TS, Pilewska Wiesława, Muszkieta Radosław, Stankiewicz Błazej. Simulation as method of classification of 7-9th form boy pupils' motor fitness. *Journal of Physical Education and Sport (JPES)* 2015;15(1):142-147. http://dx.doi.org/10.7752/jpes.2015.01023
41. Ivashchenko OV, Yermakova TS, Cieślicka M, Zukowska H. Discriminant analysis in classification of motor fitness of 9-11 forms' juniors. *Journal of Physical Education and Sport (JPES)* 2015;15(2):238 – 244. http://dx.doi.org/10.7752/jpes.2015.02037
42. Khudolii OM, Iermakov SS, Prusik K. Classification of motor fitness of 7-9 years old boys. *Journal of Physical Education and Sport (JPES)* 2015;15(2): 245 - 253. http://dx.doi.org/10.7752/jpes.2015.02038
43. Milić M, Milavić B, Grgantov Z. Relations between sport involvement, selfesteem, sport motivation and types of computer usage in adolescents. Anthropological Aspects of Sport, Physical Education and Recreation. *Proceedings of 3rd International Scientific Congress*.Banja Luka: University of Banja Luka; 2011. p. 151-156.

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FATIGUE AND FAULTY POSTURE CONNECTION AMONG CHILDREN, DIAGNOSED WITH DYSARTHRIA

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Abstract. *Purpose*: To analyze spastic dysarthria form in children population dependency of fatigue and faulty posture relationship. *Methods:* Research performed with the permission of the bioethics committee (RE-BK-063). The Dutch Fatigue Scale (DUFS). Posture in standing was assessed by Hoeger and Kendall. Research subjects n=40. n=20 children diagnosed with spastic dysarthria and n=20 of children without dysarthria. Their age was 10±2.1years. Boys were n=20 and girls - n=20.Results were statistically significant at $p<0.05$. Microsoft Office 2013, Excel package were used to count a research results. *Results:* For children with dysarthria fatigue level is more significant that for children without dysarthria; results were statistically significant, $p<0.05$. Posture disorder for children with dysarthria was statistically significant higher than among children without dysarthria, $p<0.05$. *Conclusions:* For children with dysarthria fatigue level is higher than for healthy children, thus for the girls fatigue level is higher than for the boys. Spastic form dysarthria has an impact to a child posture, by creating a direct dependency between posture deformation and skeletal muscle system disease, which decreases muscle power and increasing fatigue for a child. To correct faulty posture thus to decrease fatigue the tight collaboration needed between rehabilitation team members.
Keywords: spastic dysarthria, children, posture, fatigue assessment.

Introduction

Dysarthria - is insufficient verbal articulation resulted from speech function's disability, which appeared as a consequence of central nerve and peripheral nerve systems' damage. Clinical neurology (2009) states that dysarthria is inability to perform a clear speech because of articulate function dysfunction. Non-congenital dysarthria can be classified as progressive (during degenerative diseases such as Parkinson, Multiple Sclerosis, motoneuron dysfunctions, Huntington disease, and non-progressive (during stroke or during traumatic brain injury), Dysarthria can be characterized according to a special type (Darley & Aronson, 1975; Duffy, 2005), or/and according dysarthria level (light, moderate, heavy (Yorkston et al., 1999). Dysarthrya pathology: let's imagine our speech as certain cortical process. BROKA centre is human brain cortical centre, which is responsible for speech development and its control. VERNIKE centre – human brain cortical part, which is responsible for person's speech recognition. Concerning ASSOCIATIVE centre - its localization isn't known. But it is responsible for phrases and sentences and there settlement. It is responsible for „what" Broka centre will „spell" and what „hear" VERNIKE centre. So cortical centre brain damage appears as coordination disorder and spasticity, peripheral centres damage determines muscle atrophy (Selivestrov, 1997).

Human posture is formed from the birth. Correct posture has an impact to an internal organs function and if posture becomes faulty, CNS normal functionality decreases, Cardio vascular system capability and normal functionality decreases. All that factors make headaches worse, and determines lumbar spine and thoracic spine pan and disorders. Posture – this is static-dynamic position of head, shoulders and pelvic, with their help, person is able to maintain posture during every day activities, during professional activity with an external and external factors impact (Kendall et al., 2005). Muscle fatigue can be defined as the fall in maximum force-generating capacity of the muscle. During exercise, the magnitude and mechanisms of human skeletal muscle fatigue vary widely and depend to a large extent on the individual, the type of muscle, and the exercise stimulus or task. In general, fatigue may arise during muscular contractions due to failure at one or more sites along the pathway of force production from the central nervous system to the contractile apparatus (Edwards, 1981). There is reason to believe that both age and gender can affect the fatigue process, although our understanding of these effects is hampered by a lack of consensus in the literature. Although it has been reported that older adults fatigue relatively more than young adults (Lennmarken et al., 1985) and that men fatigue more than women (Hicks et al., 1996) some investigators have found no effect of age (Stackhouse et al., 2001) or gender (Ditor, 2000) on fatigue. Still others have found that older subjects fatigue relatively less than younger subjects (Ditor, 2000). Along with the lack of clarity regarding the effects of age and gender on the magnitude of muscle fatigue, the mechanisms of these differences have not been established. Differences in fatigability across age or gender could occur as a result of differences in neural drive, fiber-type composition, contractile function, muscle membrane excitability, metabolic capacity, or muscle mass and blood flow. For example, it was recently suggested that central activation failure may play a relatively larger role in the fatigue of older compared with younger adults (Stackhouse et al., 2001). Other investigators have reported impairments in excitation-contraction coupling in the muscle of older adults (Delbono et al., 1995) although the possible role of this impairment in fatigue has not been established. The results of some (McCully, 1993) but not all (Kent-Braun, 2000) studies suggest that oxidative capacity may be impaired with aging, despite a general shift toward a more oxidative fiber-type profile in older compared with younger muscle (Lexell, 1995). An impaired oxidative capacity in the muscle of older adults might contribute to fatigue in this group. Finally, it is unclear how a gender-based difference in fatigue

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might interact with the aging process. In addition to the effects of activation, contractile function, and metabolism on muscle performance, the degree of fatigue that develops during exercise may be affected by muscle size and, consequently, vascular constriction during contraction. The impact of larger muscle mass, greater strength, and higher target tensions during exercise in men compared with women has been addressed in several studies. In the adductor pollicis, a gender-based difference in endurance time during a sub-maximal contraction persisted despite matching subjects to similar strengths (Fulco et al., 1999). More recently, Hunter & Enoka (2001) showed a gender difference in endurance (time to failure to maintain target tension) of the elbow flexor muscles during a contraction sustained at 20% maximal voluntary contraction (MVC) force but similar fatigue (fall in MVC) in men and women at the end of this exercise. Notably, the gender difference in endurance was negated by accounting for pre-exercise differences in muscle strength. These and other (Ditor & Hicks, 2000) results suggest that the relationship between muscle strength and fatigue should be examined in studies of the effects of age or gender on fatigue.

Fatigue – is very acute and important problem in a modern community. Economic split and development, for rapid speed of life, forces person to hurry. During such speed of life person spends much less time by taking care of his health state. Fatigue can appear form a heavy mental and physical work, big media amount emotional stress, strong emotional stressor. Fatigue is multidimensional factor, which appears as person's systematic disorder. It can be defined with subjective and objective specifications. Subjective specifications: physical complains increment, emotional liability, feeling of being sleepy or apathy, awareness in appearance, introspection, bigger sensation of rest necessarily, inability to gain strength after sleep. Objective features: permanent and irresistable lack of energy inability to maintain the previous level of physical activity. The thoughts, that to maintain and perform ordinary task on the everyday level becomes challenging, sense of guilty because of expectations failure (Stankus, 2013).

Physical fatigue is mainly resulting from three reasons: magnitude of the external load, duration and frequency of the external load, and vibration. It was proved in (Chen, 2000) that the movement strategy in industrial activities involving combined manual handling jobs, such as a lifting job, depends on the fatigue state of muscle, and it is obvious that the change of the movement strategy in the activities directly impacts the motion of the operation and then results in different loads in muscles and joints. If it goes worse, once the desired exertion is over the physical capacity, cumulative fatigue or injury might appear in the tissues as potential risks for musculoskeletal disorders (Ma et al., 2009).

Methods of the research: our research performed with the permission of bioethics committee (RE-BK-063) The Dutch Fatigue Scale (DUFS). It can assess common fatigue aspect, which defined as irresistible, long-term sense of exhaustion and decreased ability to maintain appropriate level of mental and physical fitness (Tiesinga Lucas J., Dassen Theo W.N., Halfens Rund J.G., 1998). Scale consists of 9 divisions with 5 choices to answer in each section, from 0=no and 4=yes. Time limit 3-5 days. Cronbach alfa ≥ 0.80 were kept statistically significant (Nunnally & Bernstein, 1994).

Posture in standing was assessed by (Hoeger, 1988) and (Kendall et al., 2005): normal, lordotic-kifotic, straight, humped. Normal – slightly waved back, risen chest, straight abdomen. Straight – straight spine, almost its curvature's absence. Humped – middle part of the trunk if flexed forward direction. Lordotic - a big angle lordotic curvature, week abdomen muscles, weak upper trunk muscles. Kifotic – strong lumbar and neck lordosis, most noticeable spine kifosis, very noticeable hump back. During posture assessment researches was assessing head, neck, upper trunk position, shoulders, pelvis and lower part of the body, hips, knees, ankle and foot joints position were also assessed. Research subject posture is assessing from back, left, right sides. Assessing from the side, the standard point of beginning is vertical line which is equilibrated to line of gravity in a frontal plane. This plane is dividing trunk to anterior and posterior parts. Those parts are nor symmetrical. During assessment head position, cervical spine, scapular position, thoracic, lumbar position, pelvis, hips, knees and ankles are also evaluated. Assessing from the back, standard point of beginning is accounted from line of gravitation in a sagittal plane. The line begins between the heels, rises up between the legs, through pelvic centre, spine, thorax and skull. Right and left sides are symmetrical and in balance. During assessment head position, cervical spine position, shoulders, scapulars, thoracic and lumbar spine, pelvis, hip joints, legs and ankles are evaluated.

Research subjects were n=40; n=20of children diagnosed with spastic dysarthria and n=20 of children without dysarthria. Their age was 10±2,1year. Boys were n=20 and girls - n=20.

Research subjects were asked to fill the Dutch Fatigue Scale (and to return after 5 days, all files were returned (100%). Results were held statistically significant at $p<0.05$. Microsoft office 2013 Excel package was used for statistical analysing.

Results of the research

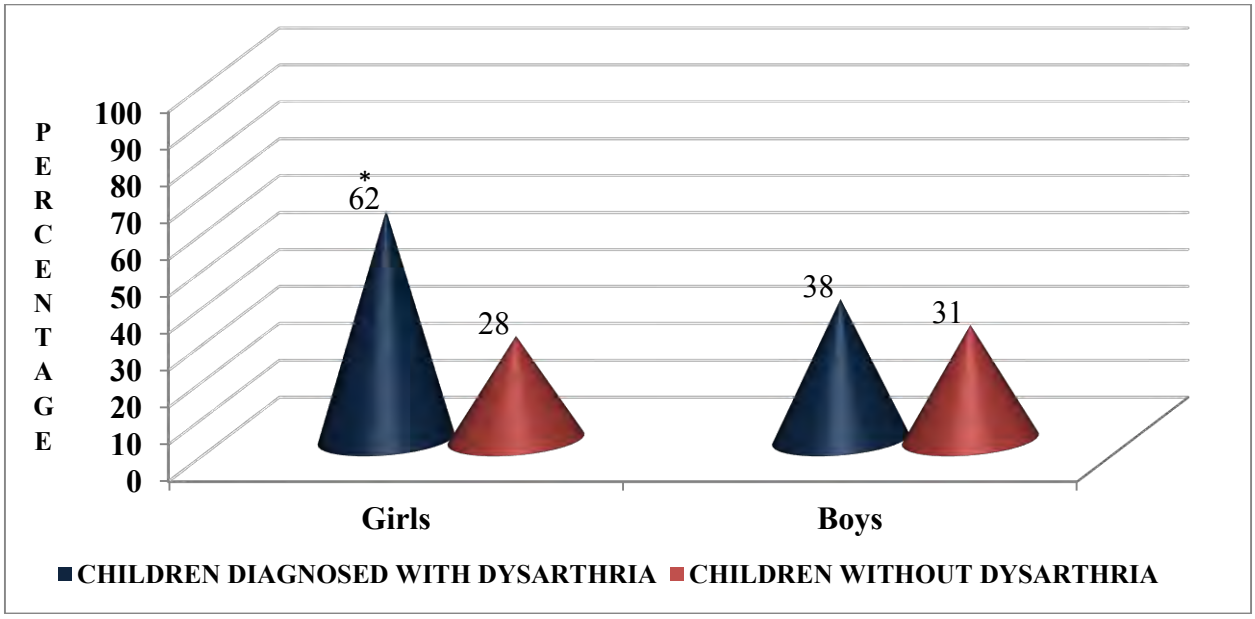

Fig. 1. DUFS (fatigue assessment scale).

During fatigue assessment with DUFS scale, research results showed that fatigue level for children diagnosed with dysarthria was statistically significantly higher than for children without dysarthria $p<0.05$. For the girls fatigue level was higher than for the boys, and respectively (62 ± 2.4) and (28 ± 3.3) for the girls and 38 ± 4.1) thus (31 ± 5.6) percent's for the boys. For the girls fatigue level was statistically significantly higher, compared to the boys, $p<0.05$. For children without dysarthria, fatigue level was statistically not significantly higher, thus for boys higher than for the girls, $p>0.05$.

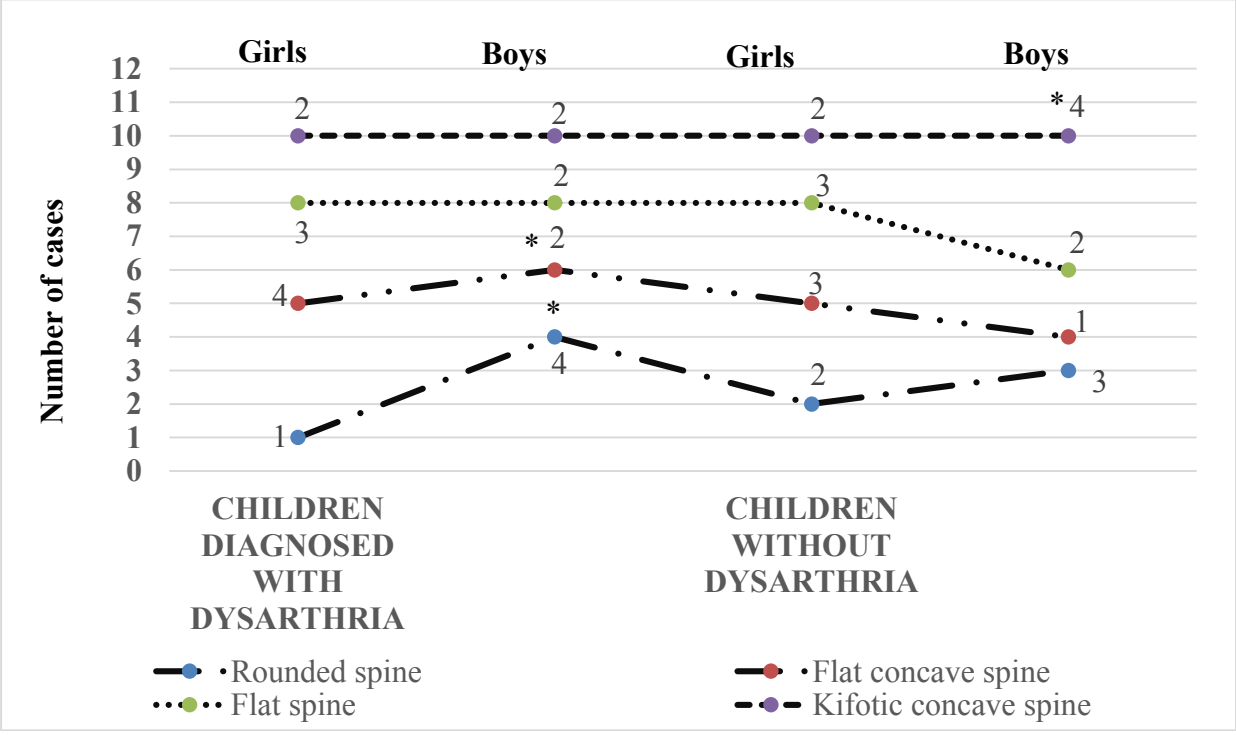

Fig. 2. Forms of faulty posture for children diagnosed with dysarthria and for children without dysarthria.

Analysing posture for children with dysarthria research results showed that more cases of faulty posture was with flat concave spine and accordingly for the girls (4 ± 1.2) cases, for the boys (2 ± 1.5), difference was statistically significant, $p<0.05$ for children without dysarthria, flat concave spine number of cases was less and accordingly were (3 ± 2.1) for the girls, and (1 ± 0.3) for the boys, results were not statistically significant $p>0.05$. Also the second biggest

number of cases was in rounded posture form, and accordingly (1±0. 4) for the girls, and (4±1.7) for the boys number of cases, $p<0.05$.

For the children without dysarthria the biggest number of faulty posture was kifotic concave form and for the girls (2±0.9) and for the boys (4±1.6) number of cases, results were statistically significant, $p<0.05$. Flat spine form in both groups were in the same number of cases and the difference didn't show statistical significance, $p>0.05$.

Discussion

Analysing DUFS fatigue scale research results showed that, fatigue level for children diagnosed with spastic form of dysarthria was statistically significantly higher than for children without dysarthria, $p<0.05$ for the girls fatigue level was statistically significantly higher compared to the boys, $p<0.05$. For children without dysarthria fatigue level was statistically insignificantly higher for the boys compared to the girls, $p>0.05$. Speech fatigue reviews in a literature several prosodia components, which are changing the function together with an increase of level of fatigue, including variations in a voice tone height, speech frequency and spectral energy. Intonations also specifically changes (monotonic or flat voice) (Harrison and Horne, 1997).

Fatigue level for children diagnosed with spastic form of dysarthria was statistically significantly higher than for children without dysarthria, $p<0.05$. acoustical properties of the voice gives a reliable information about CNS damage, as often changes during different types of damages including neuromuscular degenerative diseases (Josephset al., 2006; Folkeret al., 2010) thus brain lesions (Ziegleret et al., 1993). In recent years, a growing number of studies have reported increased postural sway during quiet standing with muscle fatigue localized at the lower back (Davidson et al. 2004; Madigan et al. 2006; Pline et al. 2006; Vuillerme et al. 2007). Although the exact mechanism inducing these postural impairments is rather difficult to be determined, it is likely that an alteration of the functionality of the sensory proprioreceptive and motor systems caused by trunk muscles fatiguing exercise explained these observations. Indeed previous studies have reported that trunk muscles fatigue altered proprioreceptive acuity at the ankle (Pline et al. 2005) and the torso (Taimela et al. 1999), delayed the reaction time of the muscles in response to a sudden load (Wilder et al. 1996), reduced the force-generating capacity (Ng et al. 2003; Potvin & O'Brien 2002) and increased its variability (Ng et al. 2003; Potvin & O'Brien 2002).

For children diagnosed with dysarthria research results showed, that the biggest number of faulty posture made flat concave spine cases, for the girls the number of cases was statistically significantly higher than for the boys. Thus the highest amount of faulty posture among children diagnosed with dysarthria showed rounded type of faulty posture, for the boys the number of cases was statistically significantly higher than for the girls. Even among healthy subjects have an acoustical voice properties changes as a respond to environmental (Liebermanet al., 2005), physical (Patil & Hansen, 2008) and pharmacological (Thompson, 1995; Hollienet al., 2001) impact. It is well known, that voice does changes when a healthy subject is affected by the physical fatigue (Whitmore and Fisher, 1996) including performed research of the fatigue level changes in terms of time (Bardet al., 1996) and voice tone (height) (Harrison and Horne, 1997).

For children without dysarthria the biggest number of cases concerning faulty posture was in rounded concave type, among girls the number of cases was statistically significant less than for the boys. Flat type spine in both groups had the same number of cases and they were not statistically significant. The research performed by other scientists, showed, that stressful posture can decrease ability to tolerate physical work load and it can lead to a fatigue level increase, which in turn determines every day activities and tasks performance diminution. Specific tasks, during which stressful posture can appear, should be noticed and directed by physiotherapists to the specific correction and stress decrease methods, for everyday activities and performance improvement (Seidel D., 2011).

For children without dysarthria fatigue level was statistically insignificantly higher among the boys then for the girls $p>0,05$, children have less muscle mass then adult, thus are able to generate less absolute power during high intensity work load performance. Several scientists have noticed that, children have much better oxidative and glycolytic peculiarities during physical workload, besides children's ability to activate slower II type muscle fibres, can explain children's feature to resist to a fatigue during long-term maximal voluntary contractions (Ratel, 2006). By making decision from a clinical profile, fatigue profiles have differences among healthy children and children diagnosed with a muscle and metabolic diseases. Performing research on a dystrophic muscles for children it had been noticed, that contradictive changes appeared in muscle contractile features thus in muscle fatigue ability. Several performed research on boys atrophic muscles diagnosed with a Duchene syndrome, showed there less fatigue ability then the healthy boys, but other research showed that fatigue among Duchene syndrome children and healthy subjects was equal. Children with glycogenesis V and VII type and dermatomiositis and children with obesity who are havening workload every week have showed early fatigue signs (Ratel, 2006). Physical therapy intervention for faulty posture correction and to reduce fatigue may include, but not limited to: thorough assessment of overall posture and thorough examination of the structures involved [muscles, ligaments, and joints] as well as to soft tissue mobilization of tight or shortened myofascial structures. Manual therapy was used to mobilize joint structures. Therapeutic exercises to strengthen weak muscles, to stretch out tight structures, and to correct posture. Functional training was applied for proper posture learning (Grimmer, 1997).

Posture is considered by many clinicians to be an important factor in dysfunction and pain. As part of physiotherapy intervention, patients are often advised about their habitual postures in relation to musculoskeletal pain and fatigue. A clear, quantified understanding of the relationships between physical characteristics should enhance the effectiveness of both therapeutic and educative intervention (Raine & Twomey, 1994).

Considering the important role of foot and ankle somatic-sensory inputs in the regulation of postural sway during quiet standing (Kavounoudias et al. 2001; Meyer et al. 2004).The recovery process after fatigue procedures is often considered as a limitation for all fatigue experiments (Vuillerme and Pinsault, 2007). The effects of trunk extensor muscles fatigue during quiet standing depended on the availability, accuracy and/or reliability of somatic-sensory inputs from the foot and the ankle (Vuillerme and Pinsault, 2007). This result suggests that the CNS was able to integrate the afferent input from cutaneous mechanoreceptors in the foot and shank (stimulated by the pressure and traction of the material on the skin) to limit the postural destabilization induced by trunk extensor muscles fatigue (Vuillerme and Pinsault, 2007). Central nervous system dynamically and selectively adjusts relative contributions of sensory inputs (i.e. sensory weights) in order to maintain upright stance, depending not only on the sensory environment but also on the neuromuscular constraints acting on the subject (Vuillerme and Pinsault, 2007).

Conclusions

For children with dysarthria fatigue level is higher than for healthy children, thus for the girls fatigue level is higher than for the boys. Spastic form dysarthria has an impact to a child posture, by creating a direct dependency between posture deformation and skeletal muscle system disease, which decreases muscle power and increasing fatigue for a child. To correct faulty posture thus to decrease fatigue the tight collaboration needed between rehabilitation team members.

Conflict of interests

Authors declare that there is no conflict of interests.

References

Bard EG, Sotillo C, Anderson AH, Thompson HS, and Taylor MM. The DCIEM Map Task Corpus: Spontaneous dialogue under sleep deprivation and drug treatment. *Speech Communication* 1996;20:71–84.

Budrys V. *Clinical Neurology*. Compiler and scientific editor: Phramaceutical Information; 2009.

Chen Y-L. Changes in lifting dynamics after localized arm fatigue. *International Journal of Industrial Ergonomics* 2000,25(6):611-619.

Davidson BS, Madigan ML, Nussbaum MA. Effects of lumbar extensor fatigue and fatigue rate on postural sway. *European Journal of Applied Physiology and Occupational Physiology* 2004;93:183–189.

Delbono O, O'Rourke KS, Ettinger WH. Excitation-calcium release uncoupling in aged single human skeletal muscle fibers. *Journal of Membrane Biology* 1995;148:211–222.

Ditor DS, Hicks AL. The effect of age and gender on the relative fatigability of the human adductor pollicis muscle. *Canadian Journal of Physiology and Pharmacology* 2000;78:781–790.

DiSimoni FG, Keith RL, Holt DL, Darley FL. Practicality of shortening the Porch Index of Communicative Ability. *Journal of Speech and Hearing Research* 1975;18(3):491-497.

Edwards RH. Human muscle function and fatigue. *Ciba Foundation Symposium* 1981;82:1–18.

Folker JE, Murdoch BE, Cahill LM, Delatycki MB, Corben LA, and Vogel AP. Dysarthria in Friedreich's ataxia: A perceptual analysis. *Folia Phoniatrica Logopaedica* 2010;62: 97–103.

Friedl KE, Grate SJ, Proctor SP, Ness JW, Lukey BJ, and Kane RL. Army research needs for automated neuropsychological tests: Monitoring soldier health and performance status. *Archives of Clinical Neuropsychology* 2007;22(1):S7–S14.

Fulco CS, Rock PB, Muza SR, Lammi E, Cymerman A, Butterfield G, Moore LG, Braun B, Lewis SF. Slower fatigue and faster recovery of the adductor pollicis muscle in women matched for strength with men. *Acta Physiologica Scandinavica* 1999;167:233–239.

Grimmer Karen An investigation of poor cervical resting posture. *Australian Journal of Physiotherapy* 1997;43(1):7–16.

Harrison Y, and Horne JA. Sleep deprivation affects speech. *Sleep* 1997;20:871–877.

Hicks AL, McCartney N. Gender differences in isometric contractile properties and fatigability in elderly human muscle. *Canadian Journal of Applied Physiology* 1996;21:441–454.

Hoeger WWK. *Principles and Laboratories for Physical Fitness and Wellness*. Englewood, Colorado: Morton Publishing Company; 1988.

Hollien H, De Jong G, Martin CA, Schwartz R, and Liljegren K. Effects of ethanol intoxication on speech suprasegmentals. *The Journal of the Acoustical Society of America* 2001;110:3198–3206.

Hunter SK, Enoka RM. Sex differences in the fatigability of arm muscles depends on absolute force during isometric contractions. *Journal of Applied Physiol*ogy 2001;91:2686–2694.

Josephs KA, Duffy JR, Strand EA, Whitwell JL, Layton KF, Parisi JE, Hauser MF, Witte RJ, Boeve BF, Knopman DS, Dickson DW, Jack CR, Jr, and Petersen RC. Clinico pathological and imaging correlates of progressive aphasia and apraxia of speech. *Brain* 2006;129:1385–1398.

Kavounoudias A, Roll R, Roll JP. Foot sole and ankle muscle inputs contribute jodintly to human erect posture regulation. *Journal of Physiology* 2001;532:869–878.

Keith RL, Aronson AE. Singing as therapy for apraxia of speech and aphasia: report of a case. *Brain Language* 1975;2(4):483-488.

Kendall HO, Kendall FP, and Boynton DA. *Posture and Pain*. Florida: Robert E. Krieger; 1952.

Kendall FP, McCreary EK, & Provance PG. *Muscles, Testing and Function: with Posture and Pain*. Publisher: Lippincott Williams & Wilkin; 1993.

Kent-Braun JA, Ng AV. Skeletal muscle oxidative capacity in young and older women and men. *Journal of Applied Physiology* 2000;89:1072–1078.

Lennmarken C, Bergman T, Larsson J, Larsson LE. Skeletal muscle function in man: force, relaxation rate, endurance and contraction time-dependence on sex and age. *Clinical Physiology* 1985;5:243–255.

Lexell J. Human aging, muscle mass, and fiber type composition**.** *Journal of Gerontology A: Biological Science and Medical Science* 1995;50:11–16.

Lieberman P, Morey A, Hochstadt J, Larson M, and Mather S. Mount Everest: A space-analog for speech monitoring of cognitive deficits and stress. Aviation, Space and Environmental. *Medicine* 2005;76:198–207.

Ma L, Zhang W, Bennis F, Chablat D, Guillaume F. Multi-Objective Optimisation Method for Posture Prediction and Analysis with Consideration of Fatigue Effect and its Application Case. *Computers & Industrial Engineering* 2009;57(4):1235-1246.

Madigan ML, Davidson BS, Nussbaum MA. Postural sway and joint kinematics during quiet standing are affected by lumbar extensor fatigue. *Human Movement Science* 2006;25:788–799.

Meyer PF, Oddsson LIE, De Luca CJ. The role of plantar cutaneous sensation in unperturbed stance. *Experimental Brain Research* 2004;156:505–512.

McCully KK, Fielding RA, Evans WJ, Leigh JSJ, Posner JD. Relationships between in vivo and in vitro measurements of metabolism in young and old human calf muscles. **Journal of Applied Physiology** 1993;75:813–819.

Ng JKF, Parnianpour M, Richardson CA, Kippers V. Effect of fatigue on torque output and electromyographic measures of trunk muscles during isometric axial rotation. *Archives of Physical Medicine and Rehabilitation* 2003;84:374–381.

Mannheimer JS, and Rosenthal RM. Acute and chronic postural abnormalities as related to craniofacial pain and temporomandibular disorders. *Dental Clinics of North America* 1991;35:185-208.

Nunnally JC, & Bernstein IH. *Psychometric Theory*, 3rd edn. NewYork: McGraw-Hill; 1994.

Paslawski T, Duffy JR, Vernino S. Speech and language findings associated with paraneoplastic cerebellar degeneration. *American Journal of Speech-Language Pathology* 2005;14(3):200-207.

Patil SA, and Hansen JH. *Detection of speech under physical stress: Model development, sensor selection, and feature fusion*. Brisbane, Australia; 2008.

Pline KM, Madigan ML, Nussbaum MA, Grange RW. Lumbar extensor fatigue and circumferential ankle pressure impair ankle joint motion sense. *Neuroscience Letters* 2005;390:9–14.

Pline KM, Madigan ML, Nussbaum MA. Influence of fatigue time and level on increases in postural sway. *Ergonomics* 2006;49:1639–1648.

Potvin JR, O'Brien PR. Trunk muscle co-contraction increases during fatiguing, isometric, lateral bend exertions. Possible implications for spine stability. *Spine* 2002;23:774– 780.

Raine S, Twomey L. Posture of the head, shoulders and thoracic spine in comfortable erect standing. *Australian Journal of Physiotherapy* 1994;40:25-32.

Seidel D, Jalmarson J, Freitag S, Larsson TJ, Brayne C, Clarkson PJ. Measurement of stressful postures during daily activities: An observational study with older people. *Gait Posture* 2011;34(3):397-401.

Stankus A. *Recommendations for fatigue diagnosis and it correction*. Accessed 2013.12.21d. http://www.pri.kmu.lt/Rekomendacijos_nuovargio_1.pdf. (in Lithuanian).

Stackhouse SK, Stevens JE, Lee SC, Pearce KM, Snyder-Mackler L, Binder-Macleod SA. Maximum voluntary activation in non fatigued and fatigued muscle of young and elderly individuals. *Physical Therapy* 2001;81:1102–1109.

Taimela S, Kankaanpaa M, Luoto S. The effect of lumbar fatigue on the ability to sense a change in lumbar position. A controlled study. *Spine* 1999;24:1322–1327.

Thompson AR. Pharmacological agents with effects on voice, American. *Journal of Otolaryngology* 1995;16:12–18.

Tiesinga LJ, Dassen TWN, Halfens RJG. DUFS and DEFS: development, reliability and validity of the Dutch Fatigue Scale and the Dutch Exertion Fatigue Scale. *International Journal of Nursing Studies* 1998;35(1–2):115–123.

Vuillerme N, Demetz S. Do ankle foot orthoses modify postural control during bipedal quiet standing following a localized fatigue at the ankle muscles? *International Journal of Sports Medicine* 2007;28:243–246.

Vuillerme N, Pinsault N. Re-weighting of somatosensory inputs from the foot and the ankle for controlling posture during quiet standing following trunk extensor muscles fatigue. *Experimental Brain Research* 2007;183:323–327.

Wilder DG, Aleksiev AR, Magnusson ML, Pope MH, Spratt K, Goel VK. Muscular response to sudden load—a tool to evaluate fatigue and rehabilitation. *Spine* 1996;21:2628– 2639.

Whitmore J, and Fisher SE. Speech during sustained operations, *Speech Communication* 1996;20:55–70.

Yorkston KM, Beukelman DR, Strand EA, Bell KR. *Management of Motor Speech Disorders in Children and Adults*. Austin: Pro-Ed; 1999.

Ziegler W, Hartmann E, and Hoole P. Syllabic timing in dysarthria. *Journal of Speech and Hearing Research* 1993;36:683–693.

Selivestrov VI. *A dictionary of speech pathology and therapy*. Moscow: Vlados; 1997. (in Russian).

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EFFECT OF TWO TAPERING METHODS ON INTERLEUKIN-6, CORTISOL AND PERFORMANCE IN ELITE MALE WRESTLER

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Abstract. *Purpose*: This study examined that effect of two types of tapering on interleukin-6(IL-6), cortisol and performance in elite male wrestler. *Material*: After 4 weeks of progressive training, wrestlers were randomly divided into three equal groups, 1-control group (N=10) continued performing progressive training for one week, 2-taper group 1 (N=10) continued with a 50% reduction in training volume for one week, 3-taper group 2 (N=10) continued with a 75% reduction in volume of training for one week .plasma blood IL-6 and cortisol levels were assayed from analysis obtained via standard ELISA. Also general strength of muscles was recorded as a performance test. All data were collected before and after progressive training and also after one week of tapering period. *Results*: There were significant reduction of IL-6 and cortisol levels in both tapering group comparing with control group ($P \leq 0.05$).There was significant reduction of IL-6 and cortisol levels among tapering 50% and tapering 75% after tapering period ($P \leq 0.05$). Also there was significant increase of general strength of muscles between tapering 75% and control group ($P \leq 0.05$). *Conclusion*: hence, one week tapering with 75% reduction in training volume after progressive training while the intensity kept high is effective strategy for reduction of IL-6, and cortisol levels and also increase performance. It seems that higher reduction of training volume when the intensity kept high is a good strategy for wrestler before main competition.
Key word: tapering, interleukin-6, cortisol, wrestling, performance.

Introduction

Over training may be defined as an increase in the training volume or intensity which results in decrease of performance (Petibois et al., 2002). Six percent of endurance runners, 21% of Australian swimmers and more than 50% of soccer players complained of over training (Smith et al., 2000) and it is estimated that 70% of high level endurance athletes experienced over training during their training (Michael et al. , 2014). Tapering is a recovery technique that is used prior to competition to reverse the fatigue caused by intense training with the aim of optimizing performance (Farhangimaleki et al., 2009). During the taper, the intensity, volume and frequency of training may be altered depending upon factors such as previous conditioning, level of fatigue, and the type and significance of competition (Coutts et al., 2007). Some researches indicate that reductions in training volume have varied from 44 to 100% in majority of sport (Houmard et al., 1994). Tapering could effect on reduce physiological and psychological stress of daily training and increase sport performance (Mujika et al., 2004).One of important goals for coaches and wrestlers is to increase competitive abilities to maximal levels, and to design a well- training program to ensure that peak performance would be attained at each point of a major wrestler competition (Mirzaei et al., 2009). In fact, there is no definitive training theory that describes the type, quantity or pattern of training and tapering that guarantees a given level of athletic performance (Neary et al., 1992). One of mainly suggested physiological mechanisms of exercise –induce impaired immune function is the elevated levels of stress hormones (catecholamine, cortisol and growth hormone) during and after heavy exercise (Bethin et al., 2000).

On the other hands tapering usually consists of high intensity exercise, with low volumes (Neary et al., 2003). After a period of good tapering, improved performance times have been reported in numerous athlete groups including swimmers (Mujika et al., 2002) runners (Shepley et al., 1992) and cyclists (Neary et al., 2003). However, some coaches and athletes still believe that tapering could lead athletes to detraining. They believe that the tapering period has negative effects on performance (Houmard et al., 1994). Intense and prolong exercise induce high levels of circulation inflammatory cytokine, especially IL-6, and it has been suggested that release of IL-6 in exercise is related to the occurrence of muscle damage and depletion of muscle glycogen (Steensberg et al., 2003 ; Smith et al., 2000).

Some research indicates that subjects with higher plasma IL-6 concentration had higher cortisol response to ACTH stimulation (Nemet et al., 2002; Smith et al., 2002). It is known that elevation in cortisol may affect cytokine production (Smith et al., 2000). Decrease in cortisol levels during the taper have been proposed as a mean of monitoring positive performance capacity in athletes in order to improve performance and to decrease symptoms of overtraining (Petibois et al., 2002). Some studies have suggested that reduction of training volume should be substantial, somewhere near 85% of normal training volume, whereas others have reported similar improvement after 31% reduction of training volume (Papacostae et al., 2013; Michelle Bartlett et al., 2006).

Many wrestlers reduce their training volume some days before the major competition (Mirzaei et al., 2009). Some studies have suggested that reduction of training volume should be near 85% of normal training volume, others have reported similar improvement after 31% reduction of training volume (Hovanlo et al., 2012; Andre et al., 2013). Although tapering techniques are widely used in a variety of sports, guidelines for the programming of optimal tapering regimens in wrestling have not been well studied. Research data on different types of workload reduction are limited. The overall aim of this study was to determine effects of two types of tapering periods (50% and 75%) on the concentration of post-

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exercise plasma levels of IL-6 and cortisol and performance in wrestler. We hypothesized that increase of reduction of training volume in tapering period could more benefit effect for elite wrestler before main competition.

Materials and Methods

Subjects

Table1:

Anthropometric and experience data for the subjects at the start of study.

Group	Control (n = 10)	Tapering 50% (n = 10)	Tapering 75% (n = 10)
Age (yrs.)	23 ± 1	22 ± 2	22 ± 1
Body Mass (kg)	73 ± 6	70 ± 8	67 ± 6
Height (cm)	174 ± 3	170 ± 5	167 ± 6
Training experience(years)	6 ± 1	5 ± 2	6 ± 2
Fat percentage (%)	12 ± 1	11 ± 2	11± 1

Experimental procedure:

Subject consists of 30 Iranian high-level male wrestlers, after receiving oral and written information about the study plans and all procedures and measurement of baseline and performance tests. All participants completed 4-week progressive training period. After four-week progressive training and before the one week tapering period began, the subjects were randomly divided into three equal groups: 1- non- tapering group that continued progressive training for one week, 2- tapering with 50% reduction in training volume for one week and, 3- tapering with 75% reduction in training volume for one week. All performance data were collected before and after progressive training and also after one week of tapering period.

Performance Test

To estimate general strength of upper and lower limbs of wrestler, bench press and squat test were used. For doing these tests first of all correct performance of bench press and squat test were showed to the wrestler and after warm up maximal effort was recorded. Performance tests were conducted before and after 4 weeks of progressive training and also after tapering period.

Blood sampling

Before and after progressive training program and the end of tapering period blood sample of wrestler was taken in order to determine IL-6 and cortisol levels. At every session plasma was immediately separated from blood cells by centrifugation at 2150 g at +4ºC for 15 min, and was transferred into Eppendorf tubes and immediately frozen at −80°C until later analysis. We used high-sensitive Enzyme-linked immune sorbent assay (ELISA) kit from Rand D systems (Minneapolis, MN, USA).

Training Program

Training Program designed in five weeks that included four weeks progressive training and one week tapering.

Table 2.

Training program: values in parentheses denote the number of sessions for each item per week.

per week Monocycle	**progressive training WEEKS 1.2.3.4**				**Tapering sessions WEEK 5**		
Weeks	1	2	3	4	Control	Tapering 1 %50	Tapering 2 %75
Warm-up(min)	15 (6)	15 (6)	15 (6)	15 (6)	15 (6)	15 (6)	15 (6)
Interval training (min)	20(3)	-	-	-	-	-	-
Resistance training (min)	45 (3)	45 (3)	45 (3)	45 (3)	45 (3)	23 (3)	12 (3)
Speed training (me)	160(2	190 (2)	210 (2)	240 (2)	270 (2)	120(2)	60(2)
Ply metric training (j)	-	30 (3)	36 (3)	42 (3)	48 (3)	23 (3)	10 (3)
Technical training (min)	16 (3)	18 (3)	20 (3)	22 (3)	24 (3)	11 (3)	6 (3)

Wrestling competition (min)	10 (3)	12 (3)	14 (3)	16 (3)	18 (3)	9 (3)	4 (3)
Warm-down (min)	10 (6)	10 (6)	10 (6)	10 (6)	10 (6)	10 (6)	10 (6)

Training was design for five weeks but all wrestlers passed general fitness training at least two months before. This research and this protocol of training were conducted before main wrestling competition. Program training included six session exercises per week and they lasted 90 minute per session; exercises started with warm up and finished with cold down every session and all procedures were done under control of researcher.

Data analysis

Mean and standard deviation were used for every one of variables. Kolmogorov-Smirnov test was applied to determine homogeneity of data. With respect to normality of data distribution, data were analyzed by analysis of variance with repeated measures. Bonferroni test was used when significant results had been observed. Statistical calculations were performed by SPSS 20 software in $p<0.05$ significance level.

Results

IL6

At the baseline, there was no significant difference in IL6 levels between trials. There was significant difference in IL-6 concentration after tapering period among both tapering group with control group ($P<0.05$) and among tapering 50% and tapering 75% group ($P<0.05$).

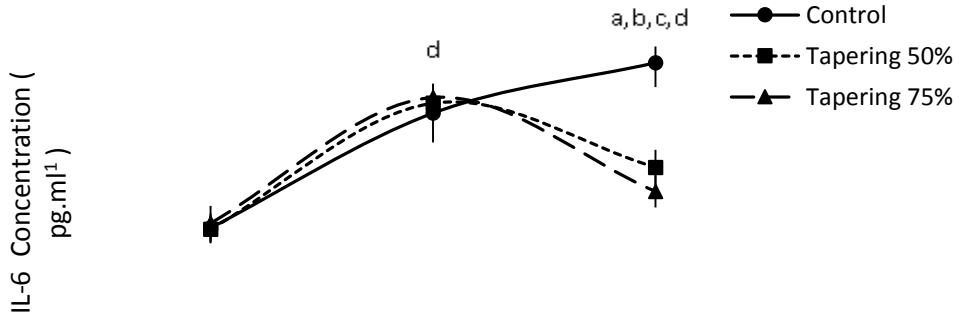

Fig 1: The comparison of the IL-6 plasma levels before, after training phase as well as after tapering period in three groups. Significant differences between tapering 50% and control group are indicated with (a) where $P<0.05$; Significant differences between tapering 75% and control group are indicated with (b) where $P<0.05$, Significant differences between tapering 50% and tapering 75% group are indicated with (c) where $P<0.05$, Significant differences from baseline are denoted by (d) where $P<0.05$. Values are mean ± SD.

Cortisol

At the baseline, there was no significant difference in cortisol levels between trials. There was significantly difference after tapering period among both tapering group with control group ($P<0.05$) and among tapering 50% and tapering 75% group ($P<0.05$).

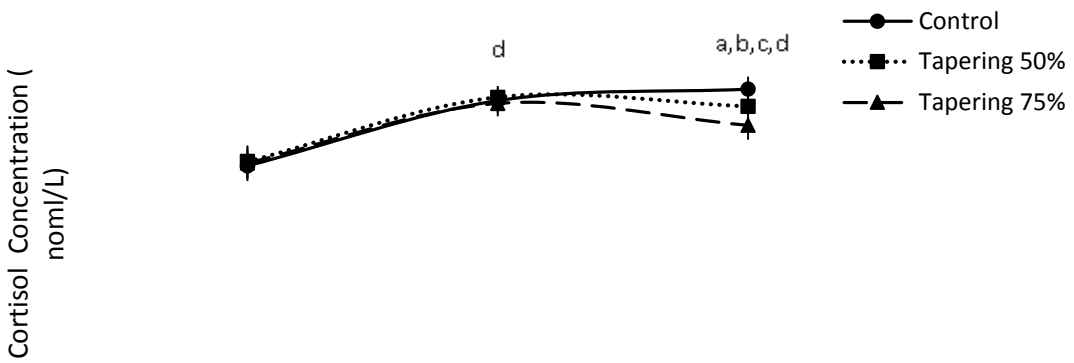

Fig 2: Comparison of the cortisol plasma levels before, after training phase as well as after tapering period in three groups. Significant differences between control and tapering 50%) are indicated with (a) where P<0.05, Significant differences between control and tapering 75% are indicated with (b) where P<0.05, Significant differences between tapering 50% and tapering 75are indicated with (c) where P<0.05, Significant differences from baseline are denoted by (d) where P<0.05. Values are mean ± SD.

Performance

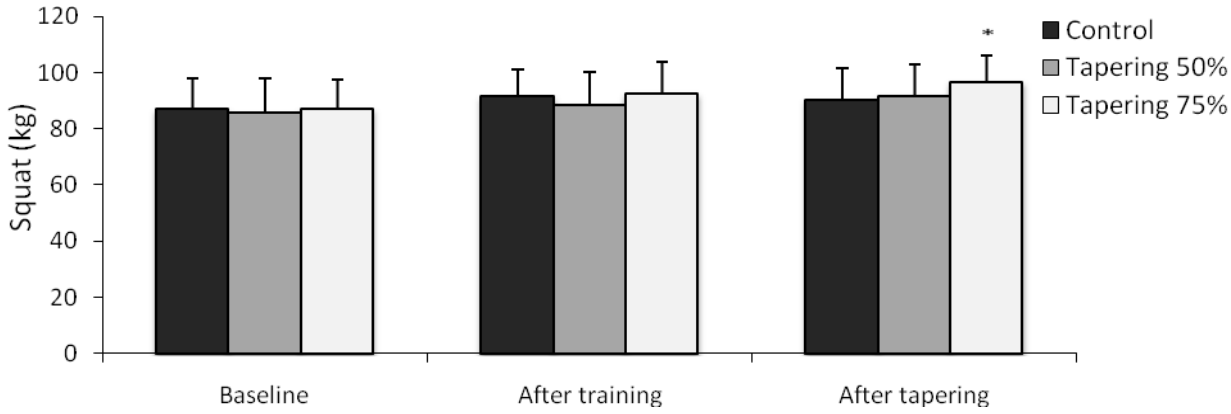

Fig 3. The comparison of means (SD) of Squat test in the three groups. Significant among control and tapering 75% are indicated with (*).

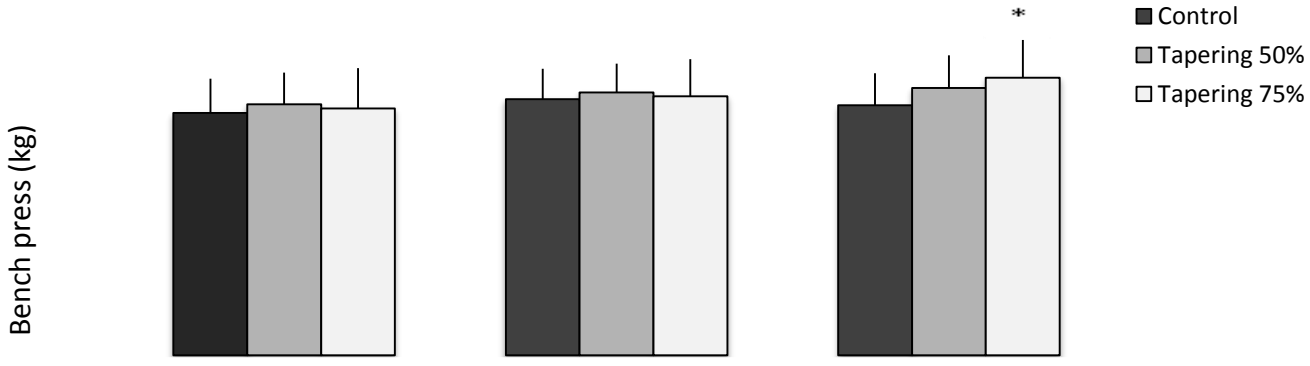

Fig 4: The comparison of means (SD) of Bench press test in the three groups. Significant among control and tapering 75% are indicated with (*).

Discussion

Results of present study showed that there were significant reductions in plasma IL-6 and cortisol levels in both tapering group, comparing with control group at the end of one week of tapering period. While this decrement in taper 75% were significant, comparing with tapering 50%. High levels of plasma IL-6 and cortisol in control group may result in high volume of training and thereby contribute to a higher rate of infection in wrestler. These findings are similar to

those reported by (Mujika et al., 2011; Mujika et al., 2002; Ronsen et al., 2003) and disagree with those, reported by (Coutts et al., 2007). Elevation of IL6 concentration prevents from protein synthesis due to muscular proteolysis, which finally leads to impairment of performance (Peake et al., 2005). The cytokine theory of overtraining suggests that repetitive trauma of musculoskeletal system is possible, because of high intensity and training volume, related with insufficient rest and recovery time, in other words inadequate rest is the important cause of overtraining. IL6 level indicators of exercise stress reflect changes in training load in various stages of tournament season (Ostrowski et al., 1998). High plasma IL6 and cortisol levels are known as sign and symptom of tissue catabolic actions. In many researches, high cortisol and IL-6 are proposed as indicators of training pressure, but response of these hormones to tapering in wrestler and athlete is not completely certain. According to our results higher reduction of training volume (75 % reduction of training volume) enhanced performance hormones. Results of this part are compatible with research results of (Rietjen et al., 2001; Mujika et al., 2002; Neary et al., 2003) but are not compatible with research results of Stone et al (1996). Different results in studies probably are associated with many factors, for example exercise type, intensity and volume of exercise, age and design of training program and also rate of athletic fitness.

Some research indicate that increasing of training volume results in increase of cortisol plasma levels, elevating of free fatty acids releasing and so preventing of immune system and inflammation response.(Yuichi et al., 2013; Kubukeli et al., 2002). Cortisol could increase protein catabolism in body. Combination of increase training volume, IL-6, cortisol levels and inadequate recovery finally can lead to creation of overtraining conditions (Laurent et al., 2007). It seems that the main reason of increasing of cortisol concentration in stress conditions and physical pressures is changing in performance of hypothalamic–pituitary–adrenal axis. This performance stimulated in response to heavy exercises and stressful conditions and increased its activity which results in increasing of secretion of ACTH hormone and then increasing secretion of cortisol (Bethin et al., 2013). Also variation of immune function, related to variation of plasma cytokine " cortisol " catecholamine's hormone and growth hormone (Petersen et al., 2005; Petibois, 2002). Higher levels of IL6 and cortisol representative of segment of inflammatory phase and catabolic situation in body induce exercise. Systematic inflammatory could influence of creation catabolic situation (Pedersen et al., 1995). As our findings showed, after one week of tapering, plasma levels of IL-6 decreased. This is most likely related to the increasing muscle glycogen during the tapering period.

Another finding of present study showed that there was significant increasing in strength muscle (squat and bench press) after tapering period in tapering 75% relative to control group. Accordance with previous research maximal gains of performance are obtained with a tapering intervention of 6-21 days duration, where the training volume is exponentially decreased by 41–60%, without any modification of either training intensity or frequency (Mujika, et al 2011). Result of this part are compatible with research result of (Hovanloo et al., 2012; Coutts et al., 2007). And they are not compatible with research results of (Houmard,. et al 1994). Different results in studies probably are associated with result of some studies that indicate that some variable of performance could be improved with tapering, but depend on choice of suitable time, type and length of tapering strategy, because bad tapering could result in detraining (Mujika et al., 2003; Coutts, et al., 2007). On the other hand Cortisol is one of important catabolic hormones quantity of which increases under mental and physical stress. Increases in plasma cortisol levels can cause an immune response during incremental training and lead to overtraining syndrome. Also over increase of cortisol and IL-6 levels can result in performance reduction in sports. Studies demonstrate that low cortisol concentration is a prerequisite for improved performance in athletic. (Mujika et al., 1996).Our finding from this research support suggestions that a higher reduction in training volume, prior to competition, may reduce negative after effects of overtraining for example regulation of cytokine (IL-6) and cortisol levels and increase performance.

Conclusion

One week tapering with 75% reduction in training volume, while the intensity kept high, is more useful tapering strategy for wrestling. Its seems that one week tapering with higher reduction of training volume(75%) before main competition, is effective strategy for decrease signs and symptoms of over training and also improve performance in elite male wrestler.

References

Bethin K, Sherri K. IL-6 is an essential, corticotrophin-releasing hormone-independent stimulator of the adrenal axis during immune system activation. *Proceedings of the National Academy of Sciences of the United States of American*. 2000;97:9317–9322.

Coutts A, Reaburn P, Piva T, Murphy A. Changes in selected biochemical, muscular strength, power, and endurance measures during deliberate overreaching and tapering in rugby league players. *International Journal of Sports Medicine.* 2007;28:116-124.

Coutts A, Reaburn P, Piva T, Rowsell G. Monitoring changes in performance, physiology, biochemistry, ad psychology during overreaching and recovery in triathletes. *International Journal of Sports Medicine*. 2007;28:25-34.

Hovanlo F, Khosrow E, Alizadeh R. The Effects of Two Tapering Methods on Physical and Physiological Factors in Amateur Soccer Players. *World Journal of Sport Sciences*. 2012;6:194-199.

Farhangimaleki N, Zehsaz F, Peter M. The effect of tapering period on plasma pro- inflammatory cytokine levels and performance in elite male cyclists. *Journal of Sports Science and Medicine*. 2009;4:600-606.

Goldshy R, Kindt T. Impact of reduced training on performance in endurance athletes. *Sports Medicine*. 2003;12:380-393.

Houmard J, Scott B, Justice L, Chenier C. The effects of taper on performance in distance runners. *Medicine and Science in Sports and Exercise* 1994;26:624-631.
Laurent B, Tjonathan M, Denis A. Effects of Tapering on Performance: A Meta-Analysis. *Medicine and science in sports and exercise*. 2007;19:908-914.
Mujika I. Tapering for triathlon competition Journal of human sport and exercise. *International Journal of Sports Medicine* 2011;2:264-270.
Mujika I, Goya A, Ruiz E. Physiological and performance responses to a 6-day taper in middle-distance runners: influence of training frequency. *International journal of sport medicine* 2002;23:367-373.
Mujika I, Padilla S. Physiological changes associated with pre-event taper in athletes. *Sports Medicine* 2004;34:891-927.
Michelle Bartlett B. Intense Training in Sport: Monitoring the Effects on Immune Function and Mood State. *Journal of Athletic Enhancement* 2014;3:210-217.
Mujika I, Chatard JC. Effects of training and taper on blood leucocyte populations in competitive swimmers: relationships with cortisol and performance. *International Journal Sports Medicine* 1996;17:213-217.
Mirzaei B, Curby D. physiological profile of elite Iranian junior freestyle wrestler. *Journal of strength condition Research* 2009;23:2339-2344.
M ujika I, Padilla S. Scientific bases for precompetition tapering strategies. *Medicine and Science in Sports and Exercises* 2003;35:1182–1187.
Nemet D, Youngman O, Seong Kim H. Effect of Intense Exercise on Inflammatory Cytokines and Growth Mediators in Adolescent Boys. *Pediatrics* 2002;110:681-689.
Neary J, Martin T, Mckenzie D. The effects of a reduced exercise duration taper programme on performance and muscle enzymes of endurance cyclists. *European Journal of Applied Physiology* 1992;65:30-36.
Neary J, Bhambhani Y, McKenzie C. Effects of different stepwise reduction taper protocols on cycling performance. *Canadian Journal of Applied Physiology* 2003;28:576-587.
Ostrowski K, Rohde T, Zacho M. Evidence that interieukin-6 is produced in human skeletal muscle during prolonged running. *Journal of Physiology* 1998;508:949- 953.
Papacostae L, Michael GL. Effects of intensify training and taper on immune function. *School of Sport, Exercise and Health Sciences*, 2013;20:73-79.
Peake J, Suzuki K. Exercise-induced muscle damage, plasma cytokines and markers of neutrophil activation. *Medicine and Science in Sports and Exercise* 2005;37:737-745.
Peake J, Wilson G. Changes in neutrophil receptor expression, degranulation and respiratory burst activity after moderate and high intensity exercise. *Journal of Applied Physiology* 2004;97:612-618.
Pedersen B, Bruunsgaard H. How physical exercise influences the establishment of infections. *Sports Medicine* 1995;19:393–400.
Petibois C, Cazorla G, Poortmans J. Biochemical aspects of overtraining in endurance sports: a review. *Sports Medicine* 2002;13:867-878.
Rietjens G, Keizer H, Kuipers H. A reduction in training volume and intensity for 21 days does not impair performance in cyclists. *British Journal of Sports Medicine* 2001;35:431-434.
Ronsen O, Kjeldsen-Kragh J. Recovery time affects immune endocrine responses to a second bout of endurance exercise. *American Journal of Physiology* 2002;283:1612-1620.
Ronsen O, Pedersen B. Leukocyte counts and lymphocyte responsiveness associated with repeated bouts of strenuous endurance exercise. *Journal of Applied Physiology* 2001;91:425–434.
Steensberg A, Fischer C, Keller C, Moller K. IL-6 enhances plasma IL-1ra, IL-10, and cortisol in humans. *American Journal of Physiology Endocrinal Endocrinology and Metabolism* 2003;285: 33-437.
Smith L. Cytokine hypothesis of overtraining: a physiological adaptation to excessive stress? *Medicine and Official Journal of the American College of Sports Medicine* 2002;32:317-331.
Smith L, Anwar A, Fragen M. Cytokines and cell adhesion molecules associated with high-intensity eccentric exercise. *European Journal of Applied Physiology* 2000;2:61-67.
Shepley B, MacDougall J, Cipriano N, Sutton J. Physiological effects of tapering in highly trained athletes. Journal of *Applied Physiology* 1992;2:706-711.

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