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CONTENTS

INFLUENCE OF SKILLS' TRAINING METHODIC WITH THE APPLICATION OF INTERDISCIPLINARY CONNECTIONS ON MOTOR FITNESS OF SENIOR PUPILS IN LIGHT ATHLETIC

Al-Ravashdeh Abdel Baset[1], Kozina Zh.L. [2], Bazilyuk T.A. [3], Ilnickaya A.S. [2]
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Abstract. *Purpose:* determination of influence of technologies of motor and intellectual aspects' impact on process of basic light athletic movements' development. *Material:* in the research 2 groups of pupils participated: control (n = 22 – girls, n=34 – boys) and experimental (n = 21 – girls and n=34 – boys). *Results:* we have shown comparison of basic light athletic movements and movements in wildlife. We compared movements in sports with their physical analogues. Main characteristics of basic movements in light athletic have been defined. Methodic of rising of theoretical knowledge level about light athletic exercises has been presented. *Conclusions:* it is recommended to apply complex methodic of motor actions' training. The methodic combines practical trainings with theoretical knowledge about main laws of movements in wildlife.

Key words: abilities, skills, light athletic, pupils, methodic.

Introduction

At present time in education, in field of physical education disunity of disciplines has been becoming one of reasons of school leavers' fragmentary world vision [2; 7; 17; 19; 20]. In modern world tendencies to economic, cultural and informational integration prevail. In this connection independence of disciplines and their weak interconnection give birth to serious difficulties information of pupils' holistic picture of world. They prevent from natural perceiving of general culture and physical culture [21; 23; 25; 26; 27].

Importance of integration of different educational aspects is witnessed by assertions of pedagogic classics. Great didactic Yan Amos Komensky [13] underlined that everything is interconnected. That is why all disciplines shall be taught in the same interconnection.

I.G. Pestalozzi [18], basing on large didactic material, opened diversity of academic disciplines' interconnections. He based on requirement, that is was necessary to bring all subjects in ones mind into interconnection. It is conditioned by connection of these subjects in the nature. Pestalozzi noted special danger of separation of one discipline from other.

In modern conditions this old pedagogic problem acquires new interpretation. Traditional "mono-logic" system in education has nearly lost its practical effectiveness. In modern school academic disciplines are of "competing" character. Every discipline is in opposite to other, as if it pretends to be more significant than other [29; 31]. Every school discipline is by itself a set of pieces of information from certain field of knowledge. That is why it can not pretend to give systemic description of reality [2; 28; 30; 32; 33; 34].

Teachers notice that pupils master fragmentary knowledge. Pupils have incomplete picture of the world and its laws [17; 23; 25]. Such not systemic knowledge spoils thinking and distorts attitude to the world and to a person; pupils can not connect newly studied discipline with mastered earlier and use knowledge of other disciplines at lesson. For teachers it is also difficult to apply correctly knowledge from other disciplines owing to a number of reasons. Knowledge of allied disciplines either already has been forgotten or has been unknown owing to their novelty; there is no information about achievements in boundary sciences; there are no methodic abilities. Together with mastering of ready differentiated knowledge pupils master reproductive character of thinking. It is not desirable in context of modern requirements. There occurs duplicating of one and the same material in academic programs and in manuals. Pedagogues, working in one class do not have joint educational policy; they do not act as single collective. Pedagogues compete and try to "re-switch" pupils' attention and interest to own discipline.

All listed above statements also belong to field of physical education. In other fields problem of interdisciplinary connections has already been raised partially. However, in field of physical education this problem is only at the beginning of working out.

At present time the range of means and methods, offered for application in pupils' physical education has expanded. For example in works by O.V. Antonov [1] effectiveness of modified means of hiking and team building is

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shown. Problem of interdisciplinary connections is elucidated by O.A. Chernoyarova (2001) [25]. The author analyzes problem of interdisciplinary connections in different fields of education. The author points at demand in development of interdisciplinary connections in training of physical culture instructors. She also shows importance of different educational aspects', connected with training of physical education specialists, integration. However, problem of such integration's realization in system of physical education has not been studied yet.

Purpose, tasks of the work, material and methods

The purpose of the work: determination of influence of technologies of motor and intellectual aspects' impact on process of basic light athletic movements' development.

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

For determination of influence of authors' methodic for training of senior school girls' motor skills at curriculum and sport circles' trainings of light athletic we conducted forming pedagogic experiment. This experiment was conducted from September 2013 to May 2014. Control (n = 22 – girls and n=34 – boys) experimental and (n = 21 –girls, n=34 – boys) groups included senior pupils of secondary school of settlement Mu'tah, Al-Karak, Jordan.

Results of the research

In the research we used conceptual principles [8; 11; 16; 18; 20] and analysis of modern tendencies in education. We worked out methodic of motor skills' training for schoolchildren at light athletic lessons with application of interdisciplinary connections, information and interactive technologies.

Holistic approach is the main direction in our methodic of light athletic motor skills' training. It implies mastering of basic movement from light athletic on the base of analogies with rational and economic movement in animate nature and with laws of mechanic. It conditions application of knowledge from physics, biology, physiology, bio-mechanic for receiving of more complete idea about correct technique of light athletic movements. Besides, application of information technologies permits to make training process more effective through influence on supreme sectors of central nervous system [3; 4; 5; 6; 14; 15]. Exactly such approach is the most acceptable for training of pupils to motor actions. It is conditioned by more expressed cognitive and associative forms of teaching. That is why application of mind activation means [9; 10; 11; 12] is one of the most effective methods of improvement of quality of education.

In our approach we used multiple repetitions of actions with explanation of physiological and bio-mechanical principles of movements (run, jumps, throws). It implied usage of analogies from biology and physics. This information was delivered in oral and printed forms, as methodic recommendations, visual aids.

Let us regard application of interdisciplinary connections and information technologies in training of light athletic elements' technique on example of run (jumps) and throws. As the basis of interdisciplinary connections we took approach, delivered in works by N. Romanov [22]. This approach is recommended by the author for mastering of technique of the so-called "postural method of run". It implies increase of effectiveness of run technique's mastering at the account of mastering of main body positions, as well as ability to tense and relax required muscular groups. For realization of this idea the author resorts to analogies from animate nature, laws of physics, moving of wheel on inclined plane.

Also key moments of run correct technique, with the help of visual aides from mathematic, physics, biology, were explained. When explaining of correct body position of a runner in different moments of time and importance of balance interdisciplinary connections were used: with biology – analogy with running of cheetah; with physics – spring's operation. Visual aids of body rational position in moment of balance were applied. When explaining demand in usage of gravitation force during running interdisciplinary connections with physics were used (principle of free falling body). It permitted to more efficiently form ability to change rationally and economically points of support during running.

When explaining demand in ability to rationally and economically change points of support during running analogies with biology (run of animals) were used; with physics (economical principle of wheel's moving) [22]. Fig.1 is an illustration of "principle of wheel" of legs' movements during run. This principle permits to keep practically straight line of gravity center's moving. Besides, visual aids on run correct technique were demonstrated. With such run human center of gravity practically does not oscillate. It is achieved with movement of legs by principle of wheel, (see fig. 2). With it, visual aids on animals run were demonstrated. They showed character of cheetah's run and other animals. Their run is characterized by absence of gravity center's oscillations. In movements of animals' paws one can notice rotary motion. Further, other components of run correct technique were explained: importance of legs' work in hip joints; ability to use inertia and gravity forces; correct placing of foot.

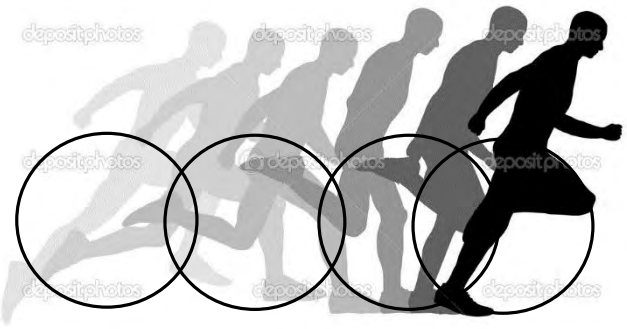

Fig.1. Illustration of "principle of wheel" in technique of run
[http://ru.depositphotos.com/21370889/stock-photo-running-man.html]

Fig. 2. Video gram of run technique of elite sportsman
[http://n-shipilov.narod.ru/Markin.htm; http://omskathletics.hoha.ru/book/555/4_1.shtml]

For training of throw technique we took as the basis methodic of throw initial training in game kinds of sports by Zh. L. Kozina [8]. In this methodic importance of forces vectors' addition for turn-by-turn switching of all muscles is explained.

At informatics, geometry and biology lessons pupils watched educational cartoon. It illustrated analogy between laws of bio-mechanical addition of forces with ball passing and laws of ants' forces' interaction during carrying burden. Then, cartoon illustrated laws of forces addition in any collective unidirectional action on example of tale "Turnip" [8]. In our opinion creation of holistic idea of movement, profound understanding of movement's rational technique' physical principles are rather effective approaches. This material was offered to pupils with the help of modern informational (multi-media) technologies. It facilitated efficiency of its perceiving.

Results of application of the worked out methodic of run technique in boys' experimental group were assessed by experts. We detected confident increase of experts' assessment of movements' technique and theoretical knowledge in experimental group of boys (see table 1). In this group experts' assessment of jump technique before experiment witnesses about extremely low level of skills (see table 1). In control group changes are not confident (see table 1). It should be noted that there are confident distinctions between results of control and experimental groups after experiment (see table 1).

After experiment experts' assessment of girls' jumps was confidently better (see fig.3). Analogous changes were characteristic for other abilities and skills of this group's girls (see fig.4).

Table 1

Indicators of motor abilities and skills of control (n=34) and experimental groups' pupils before and after experiment (boys)

Indicators of testing	**Time of testing**	**Group**	$\bar{x}$	**S**	**p BE-AE**	**P CG-EG, BE**	**P CG-EG, AE**
1	2	3	4	5	9	11	13
Experts' assessment of jumps, points	BE	EG	2.98	0.72	0.02	0.97	0.03
	AF		4.23	0.67			
	BE	CG	2.99	0.82	0.43		
	AF		3.02	0.85			
Experts' assessment of run technique, points	BE	EG	3.25	0.53	0.00	0.83	0.00
	AF		4.36	0.56			
	BE	CG	3.34	0.52	0.31		
	AF		3.45	0.56			
Experts' assessment of throw technique, points	BE	EG	3.04	0.64	0.01	0.17	0.00
	AF		4.15	0.61			
	BE	CG	3.05	0.56	0.57		
	AF		3.08	0.52			
Theoretical knowledge, points	BE	EG	22.6	5.43	0.02	0.47	0.02
	AF		46.5	6.54			
	BE	CG	24.5	5.34	0.35		
	AF		29.8	5.72			

Notes: CG – control group; EG – experimental group; ЭГ –BE – before experiment; AE – after experiment.

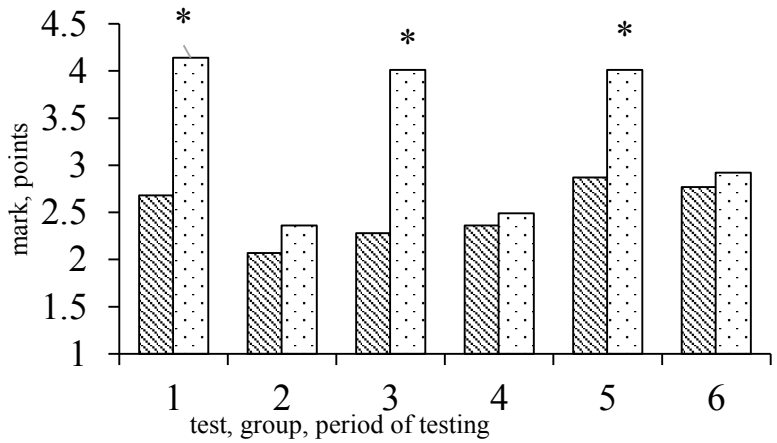

Fig.3 Results of experts' assessment of motor skills of experimental (n=21) and control (n=22) groups' pupils before and after experiment (girls):

1 – Experts' assessment of jumps technique, experimental group;
2 – Experts' assessment of jumps technique, control group;
3 – Experts' assessment of run technique, experimental group;

4 – Experts' assessment of run technique, control group;
5 – Experts' assessment of throw technique, experimental group;
6 – Experts' assessment of throw technique, control group;
* – differences are confident at p<0.05;
- before experiment;
- after experiment

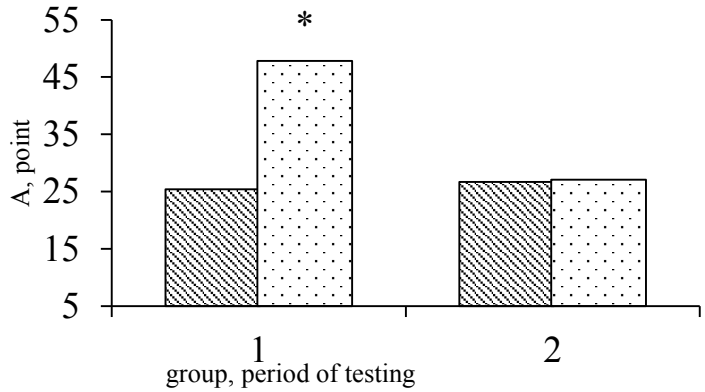

Fig. 4. Level of theoretical knowledge on light athletic of experimental (n=21)and control (n=22) groups' pupils before and after experiment (girls):

1 – Experimental group;
2 – Control group;
* – differences are confident at p<0.05;
А – теоретические знания;
- before experiment;
- after experiment

In control group of girls such changes were not confident (see fig.2). Control and experimental girls' groups became confidently different by all tested parameters after experiment (see fig. 1, 2).

Thus, application of worked out training methodic facilitates improvement of motor fitness indicators. It is an important aspect of schoolchildren's physical education. Positive effect of application of this methodic is ensured by adequate selection of exercises and expansion of theoretical aspect.

Discussion

Our research was conducted within the frames of classic didactic principles [2; 3; 4; 5; 6] and modern pedagogic tendencies [17; 23; 25]. Development of theory of interdisciplinary connections was influenced by processes of differentiation and integration of sciences. In the whole idea of interdisciplinary connections was deduced by K.D. Ushinsky [24] from general problem of systemic character of teaching. The author notes that it is important to systemize knowledge in process of their receiving. The scientist compares fragmentary and rambling knowledge with pantry. In this pantry there is disorder and owner can not find anything. At the same time the scientist underlined that system without knowledge is like shop with inscriptions on empty boxes [24].

Usage of interdisciplinary connections by a teacher makes the whole process of teaching easier. Children acquire interest and system of their knowledge forms. It helps to rise to high philosophical and logic abstractions.

K.D. Ushinsky [24] pointed that only if teachers' work is coordinated it is possible to overcome chaos in pupil's head. Teachers shall take care of their disciplines and of rising generation's general progress. Separation of knowledge can result in "dead" state of ideas and conceptions, when "they are lying in head like on cemetery and do not know about existence of each other" [24, pg. 177]. The author found distinctions between system of knowledge mastering under scholastic separation of disciplines and system of knowledge on the base of common ideas and facts, with usage of interdisciplinary connections between them. With it K.D. Ushinsky [24] thought that learning is a cognitive process. Its main task is determined by formation of scientific knowledge and, at the same time, by process of development of pupils' mental abilities. Just in process of cognition and development interaction of thinking, memory and attention occurs. Thus, holistic and systemic knowledge is formed. It facilitates perfection of learning process. In the scientist's opinion

connections between disciplines are embedded in general conceptions of different sciences. Besides special conceptions, in every science there are general conceptions, common for many and even for all sciences [24]. Therefore, connection between general conceptions and their development in school disciplines has a potential for expansion and deepening of pupils' knowledge. It is also required for formation of world vision system in general.

It should be noted that our work showed effectiveness of application of methodic, which combines differently oriented disciplines. It increases effectiveness of their mastering through creation of single idea about different processes in animate and inanimate nature. These processes are realized in human rational movements.

Conclusions

1. We have worked out methodic for training of senior pupils motor skills at light athletic lessons with application of interdisciplinary connections and informational technologies. Holistic approach is the main direction of motor skills and abilities' development. It implies mastering of light athletic basic movements on the base of analogies with rational and economic movements in animate nature and with laws of physics. It conditions receiving of more complete ideas about light athletic correct technique.

2. We have shown that application of the worked out methodic of motor actions' training facilitates improvement of motor fitness's indicators. Level of theoretical knowledge also confidently rises. Positive effect of application of this methodic is ensured by adequate selection of exercises and expansion of theoretical aspect. It includes interdisciplinary connections and informational technologies.

In prospects of further researches it is suggested to perfect the methodic of pupils' skills' formation with integral influence of interdisciplinary connections and informational technologies.

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Conflict of interests

The authors declare that there is no conflict of interests.

References:

1. Antonov OV. Timbilding s elementami peshekhodnogo turizma kak forma provedeniia vneurochnykh zaniatij v shkole [Team building with elements of hiking as a form of out of curriculum classes at school]. *IX Mezhdunarodnaia konferenciia «Problemy i perspektivy razvitiia sportivnykh igr i edinoborstv v vysshikh uchebnykh zavedeniiakh». 8-9 fevralia 2013 goda, Belgorod* [IX International conference "Problems and prospects of development of sport games and martial arts at higher educational establishments" February 8-9, Belgorod], Belgorod, 2013, p. 35-39. (in Russian)
2. 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)
3. Beritashvili IS. *Struktura i funkcii kory bol'shogo mozga* [Structure and functions of brain cortex], Moscow; 1969. (in Russian)
4. Blaug M. *Lokk Dzhon. 100 velikikh ekonomistov do Kejnsa* [100 great economists before Keins], Sankt Petersburg: Economicus; 2008. (in Russian)
5. Gerbert Iogann Fridrikh. *Psikhologiia* [Psychology], Moscow: Publishing house "The territory of the future"; 2007. (in Russian)
6. 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)
7. 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)
8. 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)
9. 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)
10. 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)
11. 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)
12. 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)
13. Komenskij IaA. *Velikaia didaktika* [Great didactic], Moscow: Education; 1988. (in Russian)
14. Leont'ev AN. *Deiatel'nost'. Soznanie. Lichnost'* [Functioning. Consciousness. Personality], Moscow: Politizdat; 1977. (in Russian)
15. Lerner IIa. *Didakticheskie osnovy metodov obucheniia* [Didactic principles of teaching methods], Moscow: Pedagogy; 1981. (in Russian)
16. 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)
17. Fedorova VN. *Mezhpredmetnye sviazi estestvenno-matematicheskikh disciplin* [Interdisciplinary connections of natural-mathematic disciplines], Moscow: Education;1980. (in Russian)
18. Pinkevich AP. *Pestalocci* [Pestalozzi], Moscow: Journal newspaper association; 1933. (in Russian)
19. 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
20. 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)
21. 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)
22. Romanov Nikolaj, Robson Dzhon. *Poznyj metod bega* [Postural method of run], Moscow: Mann, Ivanov and Ferber; 2013. (in Russian)
23. 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)
24. Ushinskij KD. *Chelovek kak predmet vospitaniia* [Person as a subject of education], Moscow: 1950. (in Russian)
25. Chernoiarova OA. 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)
26. 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
27. 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

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. *Journal of Physical Education and Sport*, 2015;15(2):202 – 207.
29. 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,* 2015;15(2):167 – 171.
30. Prusik Krzysztof, Prusik Katarzyna, 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.
31. 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. *Journal of Health Sciences*, 2013;3(10):401-418.
32. Hribovska Iryna, Danylevych Myroslava, Ivanochko Victoria, Shchur Lydia. Organizational conditions of healthy lifestyle promotion for arts students. *Journal of Physical Education and Sport.* 2015;15(2):218 – 224.
33. 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. http://dx.doi.org/10.6084/m9.figshare.105467
34. 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. *Journal of Health Sciences,* 2013;3(16):209-230.

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INTERCONNECTION OF SPEED, POWER AND SPEED-POWER ABILITIES OF PROFESSIONAL HOCKEY PLAYERS ON ICE AND OUT OF ICE

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Abstract. *Purpose:* determination of correlation's degree between speed, power and speed-power abilities of professional hockey players on ice and out of ice. *Material:* 65 professional hockey players of age from 16 to 33 years old were tested. 75 highly qualified coaches were questioned. *Results:* The found out interconnections between 11 indicators of speed, power and speed power qualities supplement knowledge about transfer physical qualities. We detected high interconnection between speed and speed-power abilities, manifested by sportsmen in exercises on ice and on land. We registered moderate level of interconnection between static (absolute) power and speed abilities of hockey players. We proved hypothesis about possibility of start speed (power) transfer in different conditions of its manifestation. *Conclusions:* the received data permit to correct hockey players' training program, considering new knowledge about transfer of one or the other physical qualities on sportsmen's training.
Key words: hockey, control, testing, correlation, exercises, skill.

Introduction

Physical training is rather popular and topical subject of researches. Interest to it does not weaken at the present time as well. Obviously, high rate of sport achievements' rising requires constant specification and renewal of knowledge on this subject. A lot of scientific researches are devoted to hockey on ice [1, 2, 4-8, 11-26]. Alongside with it, competition functioning in specific conditions of ice arena sets rather many questions to practicians and theoreticians of this kind of sports [8, 21].

It should be noted that situation with scientific-methodic provisioning in hockey is rather ambiguous. For example, in children-junior hockey there are all required recommendations on planning of training and control over it, which are in the form of programs and other normative documents [13, 21, 27-29]. In professional hockey solution of such problems is entrusted to clubs. Every club is a system with full autonomy for solution of all training tasks. Absence of own scientific provisioning in clubs resulted in the fact that in professional hockey a lot of scientifically not supported, voluntaristic decisions in many aspects of training are taken. The most serious drawback is absence of unified battery of tests in domestic professional hockey [5]. It made impossible to work out hockey players' model characteristics, without which effective control of sportsmen's training is impossible [6]. Moreover nowadays there are many discussions about how necessary can be testing of professional hockey player's general physical fitness [4]. There are opinions about secondary character of physical training [6]. Besides, there is negative attitude of some coaches to testing in general [5, 6].

By results of questioning, realized by us in 2014, from 75 highly qualified specialists 88% conducted testing at the beginning of pre-season camp trainings [6]. At the end of cap trainings, before regular championship, the progress of trainees is assessed only by 56% of specialists. Only 43% of the questioned try to objectively assess physical condition in the middle of game season. Final testing at the end of season is carried out by 53% of coaches. The data about periodical character of control witness that as minimum the half of the questioned has no clear control and physical fitness assessment system during all period of training and competitions (see fig.1).

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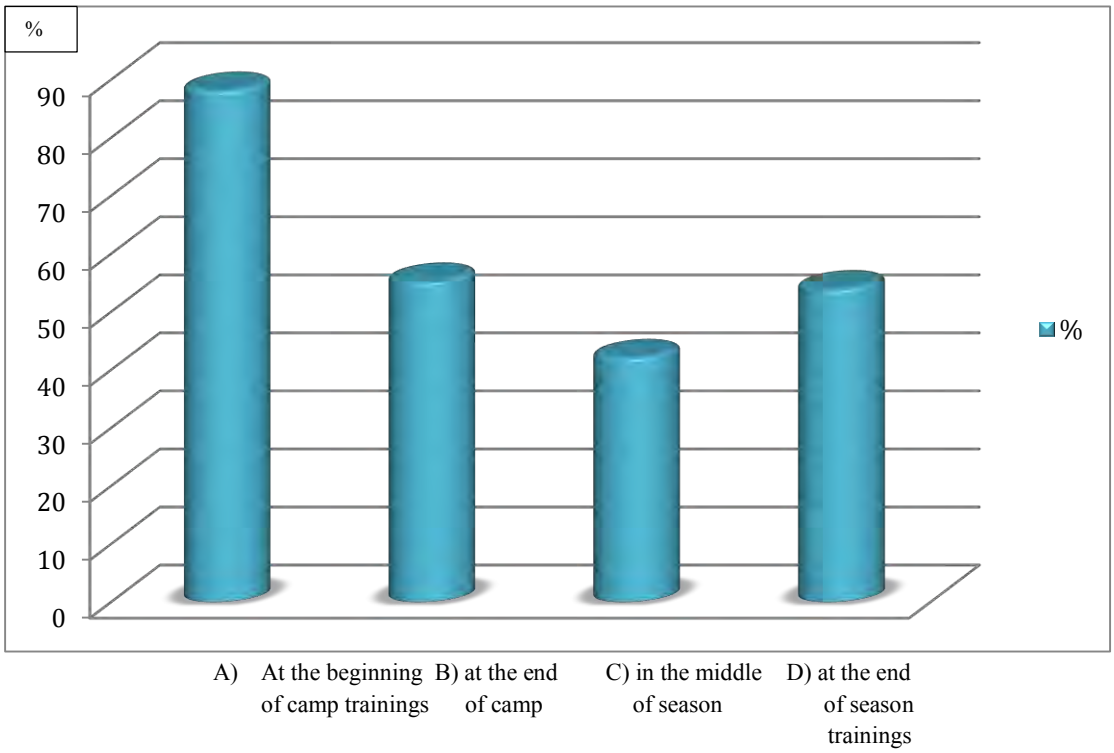

Fig. 1. Practical application of testing

The received data permit to assess the situation objectively. Most of coaches recognize importance of pedagogic control (testing). However, most of the questioned does not use it systemically and significant part of them – ignore it [5]. As a result, coach of physical conditions works out of ice arena and the second group of coaches train on ice. To certain extent they work independently due to absence of effective control over progress in general and special physical fitness and it does not permit to determine the degree of transfer quality from training hall to ice. The attempts to ensure transfer qualities in hockey locally were numerous, but often they were not supported by serious experimental researches [12, 14, 17, 30-46].

Purpose, tasks of the work, material and methods

The purpose of the research: determination of correlation's degree between speed, power and speed-power abilities of professional hockey players on ice and out of ice.

Methodic of the research:

Methodic of quickness testing:

For studying of interconnection of speed abilities, manifested on ice and on land) we chose 27.5 meters' run on skates, which is widely spread in North America [HockeyTech. – Mode of access: http://www.hockeytech.com. - Date of access: 12.06.2015.]. Then there is one more reliable test for assessment of this ability on land – 30meters' run [14, 17, 22]. Fore receiving more complete information we upgraded it a little. For this purpose we used highly preise system Swift. Sensors were located in the following sequence: first sensors – on start; second group – at 5 meters' distance, third – at 20th meter and forth group of sensors – 30 meters distance (finish). This technology permits to simultaneously measure start speed (0-5 meters), distance speed (20-30 meters) and general speed (0-30 meters)/ The same concerns testing on ice with the only remark: third group of sensors is at 17.5 meters' distance and forth – at 27.5 meters (finish).

Methodic of speed-power abilities' testing:

For this purpose we used standard test – long jump from the spot [13, 22].

Methodic of power abilities' testing:

Registration of power abilities was carried out with test for dead-lift with the help of poly-dynamometer. Poly-dynamometric testing of strength of 21 muscles' groups showed that this test reflects total power potential of sportsman [3]. To ensure safety sportsman was proposed top fulfill three attempts. In first attempt he fulfills dead-lift with force about 50% from maximal; in the second – with 75% and only in the third attempt – with maximal force (see fig.2).

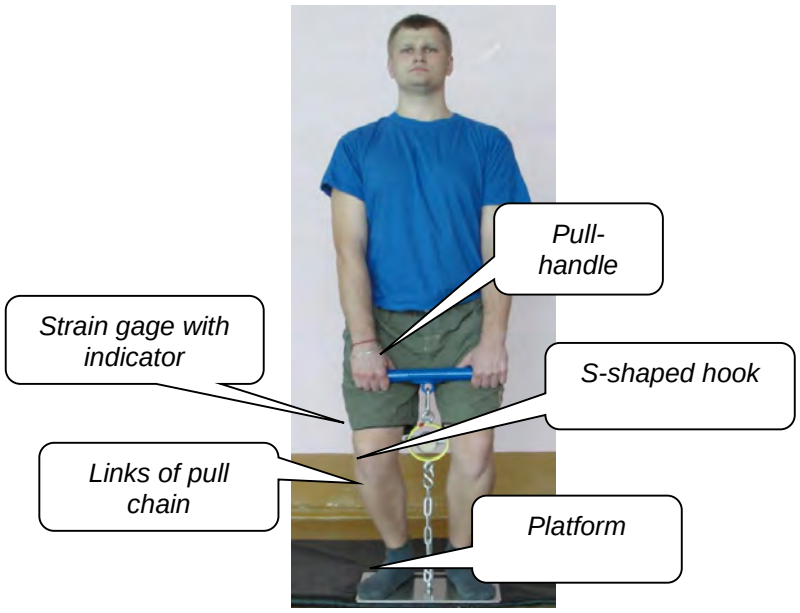

Fig.1. General view of dynamometric device for determination of dead-lift power and pulling force of legs' extensors, of foot muscles.

Characteristic of contingent: we have tested 65 professional hockey players: 25 of them – backs and 40 – forwards. In general the tested are representatives of Belarusian extra-league (supreme division of Belarusian hockey championship) and junior combined team of Belarusian Republic (up to 20 years old age).

Results of the research

The received in pedagogic control data were processed with Microsoft Excel "Descriptive Statistic" and "Correlation" [9]. Results of statistic processing are given in tables 1 and 2.

Table 1

Descriptive statistic

Tests	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Mean value	1.16	1.17	4.13	1.43	1.41	5.01	1.19	1.26	4.53	233.92	241.5
Standard error	0.01	0.01	0.04	0.02	0.01	0.04	0.01	0.02	0.05	6.34	3.1

Notes: 1 – Start speed at first 5 meters of skating of 27.5 meters (sec); 2 – Distance speed (from 17.5 meters to 27.5 meters) in test 27.5 meters' skating (sec.). 3 - Skating of all 27.5 meters (sec.); 4 – Start speed at first 5 meters distance in 27.5 meters' skating backward test (sec.); 5 –Distance speed from 17.5 to 217.5 meters' distance in 27.5 meters' skating backward test (sec.); 6 – Skating backward of all 27.5 meters (sec.); 7 – Start speed at first 5 meters of 30 meters' run test (sec.); 8 – Distance speed (from 20 to 30 meters) in 30 meters' run test (sec.); 9 – 30 meters' run (sec.); 10 – Dead-lift registered by dynamometric device (kg); 11 – Long jump from the spot (cm).

Besides, we received correlation matrix:

Table 2

Correlation of testing results

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	1									
2	0.72	1								
3	0.9	0.93	1							
4	0.69	0.62	0.71	1						
5	0.58	0.64	0.69	0,53	1					

	1	2	3	4	5	6	7	8	9	10
6	0.69	0.72	0.78	0,83	0.88	1				
7	0.58	0.60	0.66	0,54	0.31	0.46	1			
8	0.67	0.81	0.86	0.6	0.61	0.71	0.61	1		
9	0.74	0.86	0.91	0.67	0.61	0.74	0.73	0.96	1	
10	-0.55	-0.65	-0.64	-0.52	-0.58	-0.63	-0.27	-0.56	-0.54	1
11	-0.59	-0.73	-0.77	-0.59	-0.63	-0.72	-0.54	-0.86	-0.84	0.54

Notes: 1 – Start speed at first 5 meters of skating of 27.5 meters (sec); 2 – Distance speed (from 17.5 meters to 27.5 meters) in test 27.5 meters' skating (sec.). 3 - Skating of all 27.5 meters (sec.); 4 – Start speed at first 5 meters distance in 27.5 meters' skating backward test (sec.); 5 –Distance speed from 17.5 to 217.5 meters' distance in 27.5 meters' skating backward test (sec.); 6 – Skating backward of all 27.5 meters (sec.); 7 – Start speed at first 5 meters of 30 meters' run test (sec.); 8 – Distance speed (from 20 to 30 meters) in 30 meters' run test (sec.); 9 – 30 meters' run (sec.); 10 – Dead-lift registered by dynamometric device (kg); 11 – Long jump from the spot (cm).

For assessment of power connection between correlation coefficients we used Cheddok's scale [10]:

Table 3

Connection power between variables

Value	Interpretation
from 0 to 0,3	Very weak
from 0,3 to 0,5	Weak
from 0,5 to 0,7	Moderate
from 0,7 to 0, 9	High
from 0,9 to 1	Very high

Analysis of correlation matrix permitted to make some conclusions and assumptions, For example dead-lift power has moderate correlation with all speed and speed power indicators. Exclusion is weak correlation between start speed in run on land and power abilities. This fact can be explained by measuring of power indicators in static conditions and have no relation to start speed.

However attention should be paid to the fact that absolute strength even in static mode renders rather significant influence on speed qualities on ice and on land. Long jump from the spot is of special interest because it is a commonly acceptable test for speed-power qualities. This test assesses sportsman's power, if to process properly results of measurement. Correlation analysis results proved out hypothesis. Statistical processing of data showed high correlation of this test with five other. Besides, we found average level of its correlation with four speed and speed power tests. In this case our assumption about connection of jump result with start speed in run on land and in skating on ice was also confirmed.

In test 30 meters' run we established the following: high correlation was registered in all tests of start and distance speed and moderate level – with technically very specific backward skating. The same situation takes place with indicators of distance speed in skating on ice and run on land. It permits for us to affirm that speed abilities of hockey players can be trained on land.

Start speed in 30 meters' run on land has moderate correlation with start speed in skating and even in skating backward. We detected high level of correlation of 30 meters' run test and speed test on ice (r=0.91). But expectations of high correlation of this indicator with long jump from the spot have not been met that requires further studying.

By testing results high correlation of 25.5 meters' skating on ice forward and backward is rather interesting. Obviously, professional contingent had professional level of skating technique and backward skating was not a limiting factor for the sportsmen. Both these tests were created not only for assessment of speed abilities but also for control over technique level.

Discussion

The received data confirmed available in literature data about interconnection of speed and speed power abilities within equal conditions: on run tract, swimming pool and so on [22]. Alongside with it, in hockey physical training is regarded (as a rule) in aspect of general physical training in fitness center, or special physical training on ice [18, 19]. The received by us results do not agree with opinion of some hockey specialists [17 et al.], who note absence of correlation between sportsman's speed potentials on ice and out of ice. Large sample of the tested in our research and up-to-date electronic means of registration permit for us to affirm that speed and sped power qualities can be transferred in the frames of their manifestation. The degree of transfer will depend on training period and sportsman's fitness. It is also important to note that it is necessary to specify the existing opinion about prevalence of power component over speed one [14]. It is connected with different modes of muscles' contractions.

In this research, for the first time in theory and practice we made attempt to study possibility of transfer of most important for hockey player qualities in different conditions of their manifestation on material of professional sports.

Conclusions:

We have found high correlation between speed and speed-power abilities, manifested by sportsmen in exercises on ice and on land. We detected moderate correlation between static (absolute) strength and speed abilities of hockey players. Hypothesis about possibility of start speed (power) transfer in different conditions of its manifestation has been proved.

The received data permit to correct training program, considering new knowledge about possible transfer of one or other physical qualities in preparation of sportsmen.

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The researches were conducted during camp trainings of junior ice hockey combined team of Belarus Republic.

Conflict of interests

The authors declare that there is no conflict of interests.

References:

1. Bukatin AIu. *Kontrol' za podgotovlennost'iu khokkeistov razlichnykh vozrastnykh grupp* [Control over fitness of hockey players of different age groups], Moscow: Ice Hockey Federation of Russia; 1997. (in Russian)
2. Gorskij L. *Trenirovka khokkeistov* [Training of hockey players], Moscow: Physical Culture and Sport; 1981. (in Russian)
3. Dojlido AA, Popov VP. Faktornyj analiz struktury fizicheskogo razvitiia i silovoj podgotovlennosti plovcov v lastakh vysokogo klassa [Factorial analysis of physical condition and power fitness's structure of elite swimmers fins]. *VIII nauchnaia konferenciia Respublik Pribaltiki i Belorussii po problemam sportivnoj trenirovki* [VIII scientific conference of the Baltic republics and Belarus on problems of sport trainings], Tallinn; 1980. p. 94-95. (in Russian)
4. Zankovec VE, Popov VP. Modifikaciia testa Kupera dlia ocenki aerobnoj rabotosposobnosti v igrovykh vidakh sporta [Modification of Cooper's test for assessment of aerobic workability in game kinds of sports]. *Universitetskij sport v sovremennom obrazovatel'nom sociume* [University sports in modern educational social medium], Minsk BGUFK; 2015. (in Russian)
5. Zankovec VE, Popov VP. Problema optimizacii obratnoj sviazi v professional'nom khokkee [Problem of feedback's optimization in professional hockey]. *Nauka. Obrazovanie. Lichnost'* [Science. Education. Personality], Stavropol: Logos; 2015. (in Russian)
6. Zankovec VE, Popov VP. Testirovanie kak element processa upravleniia podgotovk. khokkeistov vysokoĭ kvalifikacii [Testing as element of control over elite hokey players' training], *Psikhologiia i pedagogika: metodika i problemy prakticheskogo primeneniia* [Psychology and pedagogic: methodic and problems of practical application], Novosibirsk: Publishing TSRNS; 2015. (in Russian)
7. Zankovec VE. *Khochesh' zakonchit' s khokkeem – ubej svoe telo* [Want to end hockey? – Kill your body], Minsk: A.N.Varaksin; 2014. (in Russian)

8. Konovalov VN. *Sovremennye podkhody k organizacii kompleksnogo kontrolia khokkeistov* [Modern approaches to organization of hockey players' complex control], Minsk; 2014. (in Russian)
9. Kur'ianova NI, Volkov IuO, Ponomarenko VK. *Informacionnye tekhnologii* [Informational technologies], Minsk BGUFK; 2013. (in Russian)
10. Makarova NV, Trofimec VIa. *Statistika v Excel* [Statistic in Excel], Moscow: Finance and Statistics; 2002. (in Russian)
11. Mikhno LV, Mikhajlov KK, Shilov VV. *Soderzhanie i struktura sportivnoj podgotovki khokkeistov* [Content and structure of hockey players' sport training], Sankt Petersburg; 2011. (in Russian)
12. Nikonov IuV. *Podgotovka kvalificirovannykh khokkeistov* [Training of elite hockey players], Minsk: Asar; 2003. (in Russian)
13. Nikonov IuV. *Podgotovka iunykh khokkeistov* [Training of junior hockey players], Minsk: Asar; 2008.. (in Russian)
14. Nikonov IuV. *Fizicheskaia podgotovka khokkeistov* [Physical training of hockey players], Minsk: Vitposter; 2014. (in Russian)
15. Pavlov SE. *«Sekrety» podgotovki khokkeistov* ["Secrets" of hockey players' training], Moscow: Physical Culture and Sport; 2008. (in Russian)
16. Pankov MV. *Aerobnye vozmozhnosti vysokokvalificirovannykh khokkeistov* [Aerobic potentials of elite hockey players]. Vestnik sportivnoj nauki 2012;5(5):54-58. (in Russian)
17. Savin VP. *Teoriia, metodika khokkeia* [Theory and methodic of hockey], Moscow, Academy; 2003. (in Russian)
18. Sarsaniia SK, Seluianov VN. *Pokazatel' special'noj podgotovlennosti khokkeistov i metodika ego ocenki* [Indicator of hockey players' special fitness and methodic of its assessment]. Khokkej. Ezhegodnik; 1986. (in Russian)
19. Smit Majkl A. *Khokkej* [Hockey], Moscow: Astrel; 2010. (in Russian)
20. Tvist P. *Khokkej: teoriia i praktika* [Hockey: theory and practice], Moscow: Astrel; 2008. (in Russian)
21. Uriupin NN, Savost'ianov VV, Alekhnovich AV. *Obshchaia i special'naia podgotovlennost' khokkeistov* [General and special fitness of hockey players], Moscow; 2014. (in Russian)
22. Kholodov ZhK, Kuznecov VS. *Teoriia i metodika fizicheskogo vospitaniia i sporta* [Theory and methodic of physical education and sports], Moscow: Academy; 2003. (in Russian)
23. Brétigny P, Leroy D, Button C, Chollet D, Seifert L. Coordination profiles of the expert field hockey drive according to field roles. *Sports Biomechanics*. 2011;10(4):339–50.
24. Gleddie DL. The minor hockey experience. *Sport in Society*. 2013;16(3):267–82.
25. Green H, Bishop P, Houston M, McKillop R, Norman R. Time Motion and Physiological Assessments of Ice Hockey Performance. *Journal of Applied Physiology* 1976;40(2):159-163.
26. Kostyukevych VM. The construction of the training process highly skilled athletes in soccer and field hockey in the annual cycle of training. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2013;8:51-55. doi:10.6084/m9.figshare.750446
27. Kugayevskiy SA. Individualization as one of the directions of optimization training process of hockey players at the age of 14-16 years old. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2012;1:72 - 75.
28. Kygaevskiy S. Direction for optimization of the training process in junior hockey. *Pedagogics, psychology, medical-biological problems of physical training and sports*. 2014 Feb;2:37–41.
29. Kygaevskiy SA. Direction for optimization of the training process in junior hockey. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2014;2:37-41. doi:10.6084/m9.figshare.923512
30. Lau S, Berg K, Latin RW, Noble J. Comparison of Active and Passive Recovery of Blood Lactate and Subsequent Performance of Repeated Work Bouts in Ice Hockey Players. *Journal of Strength and Conditioning Research* 2001;15(3):367-371.
31. López-Villar C. The Beginnings of Hockey in 1930s Galicia (Spain): A Female Phenomenon. *The International Journal of the History of Sport.* 2014;31(9):1133–57.
32. McEwan D, Martin Ginis KA, Bray SR. "With the Game on His Stick": The home (dis)advantage in National Hockey League shootouts. *Psychology of Sport and Exercise*. 2012 Sep;13(5):578–81.
33. Meulman HN, Berger MAM, van der Zande ME, Kok PM, Ottevanger EJC, Crucq MB. Development of a tool for training the drag flick penalty corner in field hockey. *Procedia Engineering*. 2012 Jan;34:508–13.

34. Mikhnov AP. Effectiveness of competitive activity of high class hockey players accounting a level of their self-esteem. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2015;2:47-52. http://dx.doi.org/10.15561/18189172.2015.0208
35. Mikhnov AP. Rationale set of indicators and prioritize relevant to assess competitive activity of hockey players of high qualification of different roles. *Physical education of students* 2015;1:31-35. http://dx.doi.org/10.15561/20755279.2015.0105
36. Montgomery DL. Physiology of Ice Hockey. *Journal of Sports Medicine* 1988;5(2):99-126.
37. Papapanagiotou A, Gissis I, Papadopoulos C, Souglis A, Bogdanis GC, Giosos I, et al. Changes in Homocysteine and 8-iso-PGF2a Levels in Football and Hockey Players After a Match. *Research in Sports Medicine*. 2011;19(2):118–28.
38. Perepelytsya OA. Technical training of highly skilled hockey players on the grass in the Context of Model-purpose approach. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2013;8:69-73. http://dx.doi.org/10.6084/m9.figshare.747476
39. Proceedings From the Ice Hockey Summit on Concussion: A Call to Action. *The Clinical Neuropsychologist.* 2011;25(5):689–701.
40. Sunderland C, Nevill ME. High-intensity intermittent running and field hockey skill performance in the heat. *Journal of Sports Sciences*. 2005;23(5):531–40.
41. Sunderland C, Nevill ME. High-intensity intermittent running and field hockey skill performance in the heat. *Journal of Sports Sciences*. 2005;23(5):531–40.
42. Tremayne M, Thiel DV, Nottle S. Accelerometer measures of field hockey skills development. *Sports Technology*. 2011;4(3-4):122–7.
43. Twist P, Rhodes T. Bioenergetic and Physiological Demands of Ice Hockey. *National Strength and Conditioning Journal* 1993;15(5):68-70.
44. Twist P, Rhodes T. Physiological Analysis of Ice Hockey Positions. *National Strength and Conditioning Association Journal* 1993;15(6):44-46.
45. Twist P. *Sport Science for Superior Hockey Performance*. Vancouver, BC: University of British Columbia; 1987.
46. Zavalniuk VD. General and specific features of organization hockey in the light of regional development kind of sports. *Physical education of students* 2011;5:26 – 32

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ASSESSMENT OF FUNCTIONAL, COORDINATION AND POWER FITNESS OF 7-8 FORM BOYS

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Abstract. *Purpose:* determination of informative indicators of 7-8 form boys' motor and functional fitness. *Material:* in the research 24 pupils of 7th form and 35 pupils of 8th form participated. For assessment of functional and motor fitness test of Shtange, Genchi, Serkin and motor tests were conducted. *Results:* Analysis witnesses that be results of testing between boys of 7th and 8th dorm there are statistically confident differences by most of indicators ($p<0.05:0.001$). By functioning of respiratory and blood circulation systems 7-8 form boy pupils were assessed as healthy-not trained. *Conclusions:* structural coefficients of canonic discriminant function witness that the function is connected to the largest extent with variables. So, substantial difference between 7th for pupils and 8th form pupils was observed in condition of motor abilities: speed-power, coordination of movements and strength itself.
Key words: boys, functional, coordination, fitness, strength, motor abilities.

Introduction

Health of nation is an integral indicator of social-economic and spiritual condition of society. As it is known human health is formed in children's and adolescent's age. This process is influenced by many factors: genetic factors, way of life, social economical and ecological conditions. As per scientific data schoolchildren's health has significantly worsened recent years [1, 2, 5, 6, 26]. In target complex program "Physical education – health of nation" it is noted that situation with health, especially health of children and adolescents is extremely unsatisfactory in Ukraine. Nearly 90% of pupils have health disorders; above 50% have insufficient physical fitness.

One of conditions of improvement of schoolchildren's motor fitness is organization of pedagogic control at physical culture lessons [3, 4, 11, 13], and in conditions of sport training [9, 10, 13-16]. Procedure of pedagogic control is classification of current state of motor and functional fitness, on which taking decisions in controlling of children's and adolescents' physical education depends.

So, classification of motor fitness is of practical importance for taking decisions in controlling of children's and adolescents' physical education. Classification is also important for working out of effective programs of children's and adolescents' physical training.

In researches of O.M. Khudolii and S.S. Iermakov (2011), O.M. Khudolii and O.V. Ivashchenko (2013) there were worked out conceptual approaches to simulation of motor abilities' training in children and adolescents. Also models of motor skills' training, which can be used for current and summarizing control of children and adolescents' fitness, are regarded. By the data of different [4, 12, 20-22] current control over children's and adolescents' motor fitness can be realized on the base of discriminant analysis.

However, in available scientific literature there is paid insufficient attention to application of simulation method for classification of motor and functional fitness of children and adolescents.

That is why, solution of problem of assessment and detection of secondary form pupils' functional and motor fitness is rather urgent.

Purpose, tasks of the work, material and methods

The purpose of the research: is determination of informative indicators of 7-8 form boy-pupils' motor and functional fitness.

The methods of the research: the following methods were used – analysis of scientific-methodic literature, pedagogic testing and methods of mathematical statistic.

For assessment of 7-8 form pupils' functional and motor fitness we registered results of tests of Shtange, Genchi, Serkin and motor tests. In the research 24 pupils of 7th form and 35 pupils of 8th form participated.

Results of the research

Results of the research are given in tables 1-5.

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Table 1

Results of analysis of motor and functional fitness of 7th and 8th forms

№	Test	7th form (n=24)		8th form (n=35)		t	P
		x	s	X	s		
1	Jumps with (additions), times	4.16	,87	2.80	,93	5.683	< 0.001
2	Assessment of time parameters of movement, mistake, sec.	1.08	,83	,78	,57	1.681	> 0.098
3	Assessment of power parameters of arms' movements, mistake, %	12.13	1.68	14.71	1.86	-5.471	< 0.001
4	Shuttle run 4×9 m, sec.	12.74	,72	10.93	,81	8.811	< 0.001
5	Pressing up in lying position, times	24.00	4.11	15.86	3.26	8.469	< 0.001
6	Chin ups, times	11.04	1.27	6.26	2.39	8.955	< 0.001
7	Hanging on bent arms, sec.	27.00	4.00	39.17	13.29	-4.341	< 0.001
8	Long jump from the spot, cm.	163.25	434	185.89	11.74	-9.015	< 0.001
9	Shtange's test, sec.	39.92	3.19	40.86	10.79	-,414	<0.001
10	Genchi's test, sec.	23.96	2.59	32.26	7.16	-5.430	<0.001
11	Serkin's test, sec.	17.83	3.03	23.80	5.65	-4.720	<0.008

Analysis witnesses, that by testing results there are statistically confident differences between boys of seventh and eighth forms by most of indicators (p<0.05:0.001). By functional state of respiratory and blood circulation system 7-8 form pupils are assessed as healthy but not trained.

Statistically confident differences are also observed between 7-8 form pupils in tests, which characterize coordination fitness and strength itself (p<0.001). Boys from 7th form have better fitness by results of tests 1, 5 and 6 (p<0.001). Boys from 8th form have better indicators of speed power, static power, coordination and functional state of respiratory and blood circulation systems.

In tables 2-5 we present results of discriminant analysis, which permit to classify 7-8 form pupils by their functional state and motor fitness.

In table 2 we can see normalized coefficients of canonic discriminant function, which permit to determine correlation of variables' contribution in result of function. With the greatest contribution variables 10, 6, 11 and 8 enter canonic function: the higher values of these variables are, the bigger is value of the function. The above said witnesses about possibility of classification of seventh and eighth forms boys' age distinctions on the base of testing of functional, coordination and power fitness.

In table 5 we give coordinates of centroids for first (7th form) and second (8th form) groups. They permit to interpret canonic function in respect to its role in classification. At negative pole there is centroid for 8th form; at positive pole – for 7th form. It witnesses about substantial difference in fitness of seventh and eighth forms' pupils.

Table 2

Normalized coefficients of canonic discriminant function

№ of test (variables)	Description of test	Function
1	Jumps with (additions), times	,268
2	Assessment of time parameters of movement, mistake, sec.	,281
3	Assessment of power parameters of arms' movements, mistake, %	-,509
4	Shuttle run 4×9 m, sec.	,413
5	Pressing up in lying position, times	,319
6	Chin ups, times	,624
7	Hanging on bent arms, sec.	-,171
8	Long jump from the spot, cm.	-,512
9	Shtange's test, sec.	-,077
10	Genchi's test, sec.	-,628
11	Serkin's test, sec.	,563

Table 3

Structural coefficients of canonic discriminant function

Rank	№ of test	Description of test	Function
1	8	Jumps with (additions), times	-,394
2	6	Assessment of time parameters of movement, mistake, sec.	,392
3	4	Assessment of power parameters of arms' movements, mistake, %	,386
4	5	Shuttle run 4×9 m, sec.	,371
5	1	Pressing up in lying position, times	,249
6	3	Chin ups, times	-,239
7	10	Hanging on bent arms, sec.	-,238
8	11	Long jump from the spot, cm.	-,207
9	7	Shtange's test, sec.	-,190
10	2	Genchi's test, sec.	,074
11	9	Serkin's test, sec.	-,018

Table 4

Results of classification of groups

		Classifier	Prognosticated belonging to group		Total
			7,00	8,00	
Final	Frequency	7,00	24	0	24

		8,00	0	35	35
	%	7,00	100,0	,0	100,0
		8,00	,0	100,0	100,0

Table 5

Functions in groups' centroids

Form	Function
	1
7th form	3.593
8th form	-2.464

In table 2 we can see normalized coefficients of canonic discriminant function, which permit to determine correlation of variables' contribution in result of function. With the greatest contribution variables 10, 6, 11 and 8 enter canonic function: the higher values of these variables are, the bigger is value of the function. The above said witnesses about possibility of classification of seventh and eighth forms boys' age distinctions on the base of testing of functional, coordination and power fitness.

In table 5 we give coordinates of centroids for first (7th form) and second (8th form) groups. They permit to interpret canonic function in respect to its role in classification. At negative pole there is centroid for 8th form; at positive pole – for 7th form. It witnesses about substantial difference in fitness of seventh and eighth forms' pupils.

In table 3 we present structural coefficients of canonic discriminant function, which are coefficients of variables' correlation with function. For example, function is most significantly connected with variables № 8, 6, 4 and 5: so substantial difference between boys of seventh and eighth forms is observed in condition of motor skills: speed-power, coordination and strength itself.

In table 4 one can see results of groups' classification. 100% of final grouped observations are classified correctly. Thus, canonic discriminant function can be used for classification of age peculiarities of seventh and eighth forms' boys.

Discussion

In the researches in the sphere of physical education and sports discriminant function is used for classification of pupils by their motivation for sport training [24], by motor activity [19], for classification of groups into sportsmen and not sportsmen [23], for determination of dynamic of 9-12 years' age children's physical condition under influence of fitness-programs [17].

Geoffrey D. Broadhead and Gabie E. Church (1982) points at possible application of disciminant analysis for classification of 5-12 years' age children's motor functioning, depending on its scope. Equations of discriminant functions permit for 93% of grouped data to be classified correctly. Titarenko A.A. (2010); Ivashchenko O.V. et al. (2015); Ivashchenko O.V. (2015); Khudolii O.M. (2015) also point at possibility to classify schoolchildren by level of their motor fitness with the help of motor tests.

The purpose of discriminant analysis is studying of discriminant function's coefficients in order to maximally accurately classify pupils into groups with the help of their values. It permits to solve two groups of problems:

- to answer the question how confidently one can separate one form from other by set of offered variables; which of these variables render the most significant influence on distinguishing of forms;
- to classify objects on the base of discriminant function. I.e. answer the question: to which class (form) object belongs on the base of values of discriminant variables.

In experiment we detected that by set of the offered variables it is possible to statistically confidently ($p < 0.001$) separate seventh form boys from eighth form pupils.

So, for finalizing pedagogic control of seventh boys' motor and functional fitness we can use first discriminant function with accent on the most informative variables. If results of seventh form's boys are classified as similar to results of eighth form's boys, we can speak about effectiveness of physical education.

Conclusions:

1. Analysis witnesses, that by most of indicators there are statistically confident differences between 7th and 8th forms boys ($p<0.05:0.001$). By functional state of respiratory and blood circulation system 7-8 form pupils are assessed as healthy but not trained.

2. Statistically confident differences are also observed between 7th and 8th forms boys in tests, which characterize coordination and power fitness ($p<0.001$). 7th form's boys are better by results of tests 1, 5 and 6 ($p<0.001$). 8th form's boys have better indicators of speed-power and static power, coordination and functional state of respiratory and blood circulation systems.

3. Normalized coefficients of canonic discriminant function permit to determine correlation of variables' contribution in function's result. Variables 10, 6, 11 and 8 enter in function with largest contribution: the higher values of these variable are, the bigger if value of the function. The above said witnesses about possibility to classify of age distinctions of seventh and eighth forms' boys on the base of testing of their functional, coordination and power fitness.

4. Structural coefficients of canonic discriminant function witness, that the function is most substantially connected with variables № 8, 6, 4 and 5: so, significant difference between boys of seventh and eighth forms is observed in condition of motor skills, speed-power, coordination and strength itself.

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Conflict of interests

The author declares that there is no conflict of interest.

References

1. Baltsevych VK. *Onto kinesiology of a man. Moscow*, Theory and practice of physical culture; 2000. (in Russian)
2. Ilyin PE. *Psychomotor organization of a man*. Sankt Petersburg, Peter; 2003. (in Russian)
3. Ivashchenko OV, Cieślicka M, Khudolii OM, Iermakov SS. Simulation as a method of classification power state of preparedness 6-7 classes girls. *X International Conference. Modeling and information technology in physical education and sport.* Kharkiv, 2014. p. 34-36. (in Ukrainian)
4. Ivashchenko OV, Muszkieta Radosław, Khudolii OM, Iermakov SS. Simulation as a method of classifying state power training boys 6-7 classes. *X International Conference. Modeling and information technology in physical education and sport.* Kharkiv, 2014. p. 37-39. (in Ukrainian)
5. Krutsevych TYu, Bezverkhnya GV. *Recreation in physical education of different population groups*. Kiev, Olympic Literature; 2010. (in Ukrainian)
6. Nosko MO, Iermakov SS, Garkusha SV. Theoretical and methodological aspects of strengthening physical health of pupils and students. *Visnik Chernigivs'kogo nacional'nogo pedagogichnogo universitetu*, 2010;76:243-247. (in Ukrainian)
7. Titarenko AA. Features of motor abilities of girls of primary school age. *Teoria ta metodika fizicnogo vihovanna,* 2010;9:3-13. (in Ukrainian)
8. 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)
9. Khudolii OM, Shlemin AM. *Methods of preparing young gymnasts*. Kharkov, KHPY, HHPY; 1988. (in Russian)
10. Khudolii OM, Iermakov SS. Regularities of the learning process of young gymnasts. *Teoria ta metodika fizicnogo vihovanna,* 2011;5:3-18. http://dx.doi.org/10.17309/tmfv.2011.5.707 (in Ukrainian)
11. Khudolii OM, Zabora AV. Theoretical foundations of curriculum of physical culture at school. *Teoria ta metodika fizicnogo vihovanna,* 2001;1:3-12. http://dx.doi.org/10.17309/tmfv.2001.1.1 (in Ukrainian)
12. Khudolii OM, Ivashchenko OV. Conceptual modeling approaches to learning and development of motor skills in children and adolescents. *Teoria ta metodika fizicnogo vihovanna*, 2013;10:3-16. http://dx.doi.org/10.17309/tmfv.2013.2.1012 (in Ukrainian)
13. Cieślicka M, Napierała M. The somatic build of lightweight rowers. *Medical and Biological Sciences*, 2009;23(3): 33 – 38.
14. Cieślicka M, Napierała M, Zukow W. State building somatic and motor abilities in kids practicing tennis on prebasic training. In: *Health - the proper functioning of man in all spheres of life*. Bydgoszcz school higher, Bydgoszcz, 2012.
15. Cieslicka Mirosława, Słowiński Mariusz. Training loads of female canoeing youth national team in sprint competitions. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2012;12;149-157.
16. Dmitruk K, Adamczyk W, Cieślicka M, Napierała M, Wasielewska K. The influence of swimming training on postural control system. In: *Impact of a healthy and unhealthy lifestyle on wellness*. Publisher NeuroCentrum in Lublin, Lublin; 2008.

17. Dorita du Toit, Anita E Pienaar, Leani Truter. Relationship between physical fitness and academic performance in South African children. *South African Journal for Research in Sport, Physical Education & Recreation*, 2011;33(3):23-35.
18. Geoffrey D Broadhead, Gabie E Church. Discriminant analysis of gross and fine motor proficiency data. *Perceptual and Motor Skills*, 1982;55:547-552. http://dx.doi.org/10.2466/pms.1982.55.2.547
19. Gert-Jan de Bruijn, Benjamin Gardner. Active Commuting and Habit Strength: An Interactive and Discriminant Analyses Approach. *American Journal of Health Promotion*, 2011;25(3):27-36. http://dx.doi.org/10.4278/ajhp.090521-QUAN-170
20. 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
21. 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
22. 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- 53. http://dx.doi.org/10.7752/jpes.2015.02038
23. 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*, 2012;40(2):185-190.
24. Milić M, Milavić B, Grgantov Z. Relations between sport involvement, selfesteem, sport motivation and types of computer usage in adolescents. *Proceedings of 3rd International Scientific Congress. Anthropological Aspects of Sport, Physical Education and Recreation*. Banja Luka, University of Banja Luka; 2011. p. 34-40.
25. Mrozkowiak Mirosław, Posłuszny Mariusz, Żukowska Hanna, Iermakov Sergii, Szark-Eckardt Mirosława. The correlations among the complex of spine-pelvis traits and the feet traits in boys aged 4 to 6 years. *Pedagogics, psychology, medical-biological problems of physical training and sports,* 2014;8:46-50. http://dx.doi.org/10.6084/m9.figshare.1022955
26. 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/10.15561/18189172.2014.1206

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FEATURES OF 14-15 YEARS' AGE BOYS' TRAINING TO PHYSICAL EXERCISES

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Abstract. *Purpose:* to optimize modes of 14-15 years' age boys' training to physical exercises in educational process. *Material:* in experiment 14 years' age boys (n=24) and 15 years' old boys (n=24) participated. Plan of factorial experiment was used. *Results:* we detected influence of quantity of exercises' repetitions (X1) and rest intervals (X2) on effectiveness of physical exercises' training. Simultaneous varying of factors as per special program ensured studying of every of them in different conditions. It permitted to receive more reliable conclusions, suitable for changeable conditions. Results of dispersion analysis witness that for 14-15 years' age boys optimal modes of training are within 6-12 repetitions in one lesson with rest intervals 60-120 sec. In case of 14 years' age boys it is necessary to pay attention to quantity of exercises' repetitions in one lesson. Concerning 15 years age boys – attention should be paid to increase of rest intervals and consideration of interaction of these two factors. *Conclusions:* We have determined that increase of effectiveness of training process is possible on the base of analysis of regression models, calculation of optimal modes of physical exercises' fulfillment in process of their training.
Key words: simulation, regression models, physical exercises, modes of training.

Introduction

Analysis of scientific-methodic literature shows that it would be purposeful to concentrate attention at formation of motor function of secondary forms pupils [12, 13]. The works by O.V. Ivashchenko [1], O.M. Khudolii [6-8] are devoted to technologizing of learning process at school. Conceptual approaches to planning of experiment In researching of training process's effectiveness, working out of training models are substantiated in works by O.M. Khudolii, T.V. Karpunets [5], O.M. Khudolii, O.V. Ivashchenko [6], O.M. Khudolii [7]. In dissertation works of O.M. Khudolii, [10], O.V. Ivashchenko [2], V.I. Miroshnichenko [4] there are defined ways of training process's control. This control will be more effective, if orientation of training process is determined, considering modes of physical exercises' fulfillment. In our previous work we noted that increasing of training process is possible on the base of analysis of regression models, calculations of optimal modes of physical exercises' execution for 14-15 years' age girls at lessons of physical culture.

Thus, simulation of training process of secondary forms' pupils is rather important.

Purpose, tasks of the work, material and methods

The purpose of the works is to optimize modes of 14-15 years' age boys' training to physical exercises at physical culture lessons.

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

Simulation in physical education is one of effective methods for searching and optimization 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, cognate its content, determine correlations, mark out the most important components and so on. It is an effective mean of verifying validity and completeness of theoretical views about the researched object [11, 12, 16, 19, 20, 22, 23, 27, 28, 29, 30].

In the process of organization of our research we used conceptual approaches to planning of experiment, considering working out of training models. They were substantiated in works by O.M. Khudolii, O.V. Ivashchenko [7, 11, 12, 16, 18]. We determined certain ways for increasing of effectiveness of training process's control. It is possible with calculation of training modes through regression models, received as a result of full factorial experiment of FFE 2^2 type (see table 1). We studied modes of training of side roll, forward and backward rolls, forced headstand, throw of small ball, long jump from place.

The plan of factorial experiment permitted to study influence of quantity of repetitions (X_1) and rest intervals (X_2) on effectiveness of 14-15 years' old boys' training to physical exercises. Besides, we used complex approach to studying of objects, which admits simultaneous varying of several factors. Main target was to assess their influence and influence of their interactions. Simultaneous varying of factors by special program ensured studying of every of them in different conditions. It permitted to receive more reliable conclusions, suitable for changeable conditions.

Results of the research

For achievement of the best pedagogic effect in training of 14-15 years' age pupils to physical exercises we determined optimal correlations of quantity of repetitions (X_1) and rest intervals (X_2). In table 1 we present matrix of plan of full factorial experiment for studying of different modes of exercises' fulfillment influence on effectiveness of training. Lower and upper factors were received on the base of data of O.M. Khudolii, [5, 7] considering frames of lesson and requirements of Governmental program. Distinctions in methodic of lessons' conduct were determined by conditions of factorial experiment.

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Table 1

Matrix of factorial experiment (type 2-^{2}) for studying of influence of quantity of repetitions (X_1) and rest intervals (X_2) in one lesson on training of 14-15 years' age pupils.

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

As a result we detected regressive dependence of results of quantity of repetitions X_1) and rest intervals (X_2) influence on training of 14-15 years' age boys to physical exercises in compliance with their age specificities (see table 2).

Table 2

Регресійна залежність результатів в процесі навчання фізичним вправам хлопців 14–15 років від впливу кількості повторів (X_1) та інтервалів відпочинку (X_2)

№	Description of exercises	Equation of regression for coded variables
14 years' age boys		
1	Side roll	$Y = 0.76–0.1\ X_1$
2	Forward roll	$Y = 0.825–0.075\ X_2$
3	Backward roll	$Y = 0.74–0.08\ X_1\ X_2$
4	Forced headstand	$Y = 0.77–0.08\ X_1+0.09\ X_1X_2$
5	Throw of small ball	$Y = 0.865+0.075\ X_1$
6	Long jump from the place	$Y= 0.775–0.065\ X_1+0.065X_1X_2$
15 years' age boys		
1	Side roll	$Y = 0.845–0.065\ X_2$
2	Forward roll	$Y = 0.765– 0.045\ X_1+0.045X_2$
3	Backward roll	$Y = 0.79–0.06\ X_1X_2$
4	Forced headstand	$Y = 0.81–0.055\ X_2$
5	Throw of small ball	$Y = 0.82–0.06\ X_2–0.06\ X_1X_2$
6	Long jump from the place	$Y = 0.74– 0.05\ X_1–0.13\ X_2$

Effectiveness of 14 years' age boys' training to "side roll" is influenced negatively by first factor (X_1), "forward roll" – by second factor (X_2), "backward roll" – by interaction of factors (X_1X_2). Effectiveness of "forced headstand" training is negatively influenced by first factor (X_1) and positively influenced by interaction of factors (X_1X_2). The fifth exercise "throw of small ball for distance" is positively influenced by first factor (X_1). The sixth exercise "long jump from place" is negatively influenced by first factor (X_1) and positively – by interaction of factors (X_1X_2).

Thus, effectiveness of 14 years' age boys' training to physical exercises is influenced by quantity of repetitions in one lesson: increase of repetitions up to 12 times influences negatively on effectiveness of training process. Interaction

of quantity of repetitions and rest intervals influences positively on effectiveness of trainings. Level of exercise's mastering increases in case of reduction of quantity of repetitions to 6 times and increasing of rest interval to 120 sec. In training of "throw of small ball" quantity of repetitions shall be increased up to 12 times.

Training of 15 years' age boys to "side roll" is negatively influenced by second factor (X_2). Second exercise "forward roll" is negatively influenced by first factor (X_1) and positively – by second factor (X_2). Third exercise "backward roll" is negatively influenced by interaction of both factors (X_1X_2). Forth exercise "forced headstand" is negatively influenced by second factor (X_2). Fifth exercise "throw of small ball for distance" is negatively influenced by second factor (X_2) and by interaction of both factors (X_1X_2). Sixth exercise "long jump from place" is negatively influenced by first factor (X_1) and by second factor (X_2).

Thus, effectiveness of 15 years' age boys' training to physical exercises is influenced positively if quantity of repetitions in one lesson is reduced to 6 times. Interaction of quantity of repetitions and rest intervals influences on effectiveness of trainings. Level of mastering of exercises increases in case of repetitions' quantity reduction up to 6 times and rest interval increase up to 60 sec. ('backward roll", "throw of small ball")

Simultaneous varying of factors by special program permitted to assess influence of each of them in different conditions. Results of dispersion analysis of the used modes' influence on training of 14-15 years age boys are given in table 3.

Table 3

Results of dispersion analysis for FFE 2^2, concerning influence of quantity of repetitions (X_1) and rest intervals (X_2) on 14-15 years' age boys' training to physical exercises

Description of exercises	Relations of mean squares (%)		
	X_1	X_2	X_1X_2
14 years' age boys			
Side roll	98	0	0
Forward roll	3	86	9
Backward roll	1	27	71
Forced headstand	86	0	13
Throw of small ball	79	17	3
Long jump from place	42	2	54
15 years' age boys			
Side roll	0	94	5
Forward roll	79	10	10
Backward roll	0	20	80
Forced headstand	27	67	5
Throw of small ball	5	47	47
Long jump from place	0	2	97

In case of 14 years' age boys on effectiveness of training to "side roll" (98%), "forced headstand" (86%), "throw of small ball" (79%) priority influence is rendered by quantity of repetitions. Training of "forward roll" is mainly influenced by rest interval (86%). Effectiveness of "backward roll" (71%) and "long jump from place" (54%) is mainly influenced by quantity of repetitions and rest intervals.

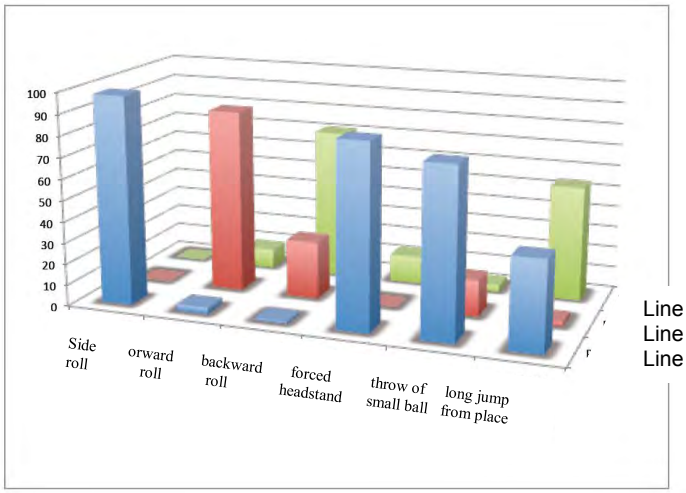

Fig.1. Diagram of relation of mean squares (%). 14 years' age boys: line1— X_1 (quantity of repetitions), line 2 — X_2 (rest interval), line 3 — X_1X_2 (interaction of quantity of repetitions and rest intervals)

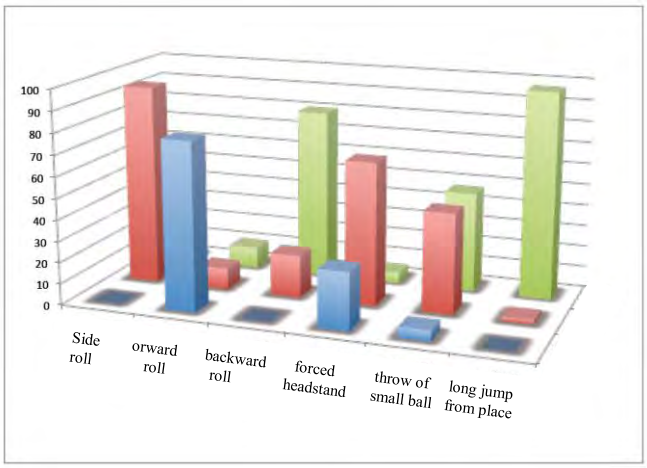

Fig.2. Diagram of relation of mean squares (%). 15 years' age boys: line1— X_1 (quantity of repetitions), line 2 — X_2 (rest interval), line 3 — X_1X_2 (interaction of quantity of repetitions and rest intervals)

In case of 15 years' age boys on effectiveness of training to "forward roll" depends on quantity of repetitions (79%); "side roll" (94%), "forced headstand" (67%), depends on rest interval; "backward rolls" (80%), long jump from place" (97%) depend on interaction of both factors.

Results of dispersion analysis witness that for 14-15 years age boys optimal modes of training are within 6-12 repetitions in one lesson with rest intervals of 60-120 sec. In case of 14-years' age it is necessary to pay attention to quantity of repetitions. In case of 15 years' age boys attention shall be paid to increase of rest intervals and consideration of both factors' interaction (see table 4).

Table 4

Comparative characteristic of the studied factors' influence on effectiveness of 1415 years' boys' training

Description of exercises	Age	
	14 років	*15 років*
Side roll	X_1	X_2
Forward roll	X_2	X_1
Backward roll	X_1X_2	X_1X_2

Forced headstand	X_1	X_2
Throw of small ball	X_1	X_2
Long jump from place	X_1X_2	X_1X_2

Discussion

Results of the researches witness that in the offered matrix of factorial experiment's plan the chosen step of factors' varying is sufficient for studying of influence of different physical exercises' fulfillment modes on effectiveness of children's and adolescents' training (see table 1).

Our results widen and supplement the data of O.M. Khudolii and O.V. Ivashchenko [12, 16] about effectiveness of factorial experiments plans' application in researches of effectiveness of children's and adolescents' motor skills' training. In opinion of different authors [19, 36] usage of plans of factorial experiments in researches, involving children and adolescents facilitates increasing of quality of their indicators' assessment. Validity of full factorial 2^k type experiments' usage is confirmed by the data of Correa et.al. [20, 21].

The received data supplement information of different authors [22, 23, 26, 16] about increasing of effectiveness of training processes' control through regression models of training modes' determination.

Conclusions:

1. Experiment of 2^2 type permitted to study multi-factorial structure of 14-15 years' age pupils' training process; to specify optimal correlations of factors for their usage in period of physical exercises' training. They are objective tool of educational process's optimization.

2. In case of 14 years' age boys on effectiveness of training to "side roll" (98%), "forced headstand" (86%), "throw of small ball" (79%) priority influence is rendered by quantity of repetitions. Training of "forward roll" is mainly influenced by rest interval (86%). Effectiveness of "backward roll" (71%) and "long jump from place" (54%) is mainly influenced by quantity of repetitions and rest intervals.

3. In case of 15 years' age boys on effectiveness of training to "forward roll" depends on quantity of repetitions (79%); "side roll" (94%), "forced headstand" (67%), depends on rest interval; "backward rolls" (80%), long jump from place" (97%) depend on interaction of both factors.

4. Results of dispersion analysis witness that for 14-15 years age boys optimal modes of training are within 6-12 repetitions in one lesson with rest intervals of 60-120 sec. In case of 14-years' age it is necessary to pay attention to quantity of repetitions. In case of 15 years' age boys attention shall be paid to increase of rest intervals and consideration of both factors' interaction

The next task of our experimental researches is working out of methodic recommendations on organization and methodic of physical exercises' training at physical culture lessons for 14-15 years age pupils.

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Conflict of interests

The author declares 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. 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)
6. 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)
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. 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)
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. *Teoriia ta metodika vikladannia gimnastiki* [Theory and methodic of gymnastic's training], 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. Anthropological Aspects of Sport, Physical Education and Recreation. *Proceedings of 3rd International Scientific Congress*.Banja Luka: University of Banja Luka; 2011. p. 151-156.
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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CONNECTION OF BOXERS' COMBAT STYLES WITH PSYCHO-PHYSIOLOGICAL CHARACTERISTICS

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Abstract. *Purpose:* By dominating physical characteristics boxers' combat styles are divided into "strongmen", "paced in hold" and "players". However, connection of combat style with psycho-physiological characteristics of elite boxers has been remained not determined. *Material:* in the research 28 elite sportsmen (master of sports and international masters of sports) participated. Psycho-physiological characteristics were studied with the help of hardware and software psycho-diagnostic complex "Multi-psycho-meter 05". *Results:* it was found that attacking combat style is accompanied by presence of high workability, reduced tiredness and anxiety, presence of psychological comfort. It was also found that defensive combat style is characterized by better quickness and processing of information. It happens at the account of worsening of qualitative characteristics: efficiency and effectiveness. We also detected presence of more rigid organization of psycho-physiological status of boxers, having attacking combat style (strongmen) in comparison with boxers of defensive style (players and paced in hold).

Introduction

At modern stage of development of boxing combat style is a characteristic feature of every professional boxer [1, 2]. Up to the present time origin of different combat styles in martial arts has not been determined completely. There is an opinion that styles were formed as a result of separate trainings of separate groups of people [3]. However, great majority of specialists think that combat style depends on boxer's individual characteristics and his inborn features [4, 5, 6].

Modern classification of combat styles in boxing is based on attacking or defensive actions. Basing on it, styles are divided into attacking, counter-attacking and defensive [7, 8, 9]. By dominating physical characteristics boxers' combat styles are divided into "strongmen", "paced in hold" and "players". "Players" are characterized by high coordination or dexterity and by wide technical arsenal [10, 11, 12]. In martial arts combining of different physical features and prevailing of attacking or counter-attacking actions is often observed. For example, for "strongmen" attacking actions can be the most often characteristic. "Players" can demonstrate counter-attacking or defensive actions [13, 14, 15, 16]. Determination of boxer's bent to certain combat style is rather important question, as far as style of actions is the most expressed at the stage of maximal realization of sportsman's potentials. However, for improvement of boxers' training effectiveness their bents to certain combat styles shall be determined at all stages of training [17, 18, 19, 20].

Considering the above said we can assume that physiological basis of styles' formation is relatively unchangeable genetically determined psycho-physiological functions: for example, neuro-dynamic processes and cognitive characteristics. That is why assessment of such indicators of boxer's bent to certain combat style in training process will be useful for the stage of specialized basic training.

Methods, tasks of the work, material and methods

The purpose of the work is to analyze connection of combat style with different psycho-physiological characteristics of elite boxers.

Materials and methods of the research: in the research 28 elite sportsmen (master of sports and international masters of sports) participated. The researches were conducted on the base of NUPESU, department of biology of sports and department of sport martial arts and power kinds of sports. Examinations were carried out with the help of hardware and software psycho-diagnostic complex "Multi-psycho-meter 05".

Psycho-physiological status was studied with 8 colors' variant of Luscher's test in modification of L/ Sobchyk (method of pairwise comparison). We determined indicators of workability, tiredness, anxiety, excentricity, concentricity, vegetative coefficient, heteronomousity, autonomity.

Cognitive function (as component of psycho-physiological status: attention, perceiving and thinking) were detected by test "determination of regularities". We assessed quickness and accuracy of word's recognition. The word was coded by symbols' sequence among 25-points' varianta with 5-alternatives' choice. Function of perception was detected with test "perceptive quickness". We determined indicators of efficiency and quickness of visual perception. Quickness of responses was assessed by determination of latent period of simple visual-motor response. For studying of connections between the researched indicators we used correlation analysis.

Results of the research

With the help of cluster analysis sportsmen were divided into groups. We conducted analysis of combat styles' peculiarities of every group's boxers basing on experts' assessment of technical tactic actions. As a result we marked out three main groups of boxers by their combat styles: counter-attacking (player), attacking (strongman) and defensive-counterattacking (paced in hold).

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Table 1

Psycho-physiological indicators by digital test of Luscher of boxers with different combat styles (n=28)

Groups of boxers	Indicators				
	Workability, conv.un.	Tiredness, conv.un.	Anxiety, conv.un.	Deviation from autogenic norm, conv.un.	Vegetative coefficient, conv.un.
Players	9. 91±0. 4	3. 09±0.43	1.91±0.25	18.04±0.75	17.09±0.39
Strongmen	10. 43±0. 42	1. 14±0.16*	1.14±0.4*	12.57±0.84*	12.57±0.98*
Paced in hold	9.25±0. 21	2. 50±0.65	2.00±0.32**	16.50±0.43**	16.25±1.27**

Notes: 1. * p< - comparing with players' group; 2. * p< - comparing with strongmen's group.

The conducted Luscher's tests showed difference between groups of boxers (players, paced in hold and strongmen) by indicators of workability, anxiety and fatigue (see table 1).

"Attackers" – strongmen are characterized by higher workability, low tiredness, reduced anxiety, moderate deviation from autogenic norm (psychological comfort), low sympathetic tone, increased heteronomousity (see table 1).

In their turn "counter-attacking" – players and paced in hold are characterized by relatively not high workability, high tiredness and anxiety, high deviation from autogenic norm (psychological discomfort), high sympathetic tone, low heteronomousity (see table 1).

Table 2

Indicators of latent period of visual-motor response of boxers with different combat styles (n=28)

Groups of boxers	Indicators	
	Latent period, m.sec.	Stability, %
Players	262.99±0.11	17.73±0.49
Strongmen	279.33±0.85*	19.97±0.17*
Paced in hold	265.62±0.52	18.24±0.25

Notes: 1. * p< - comparing with players' group.

Analogous results were received with studying of latent period of complex visual motor response. Boxers of attacking style (strongmen) have higher time indicators of response, comparing with other combat styles (see table 2).

Table 3

Indicators of boxers with different combat styles by test "quickness of perception" (n=28)

Groups of boxers	Indicators	
	Eficiency, conv.un.	Quickness, conv.un.
Players	62.55±0.55	16.75±0.45
Strongmen	58.57±0.62*	15.85±0.42
Paced in hold	46.50±0.95***	14.31±0.61*

Notes: 1. * p< - comparing with players' group; 2. * p< - comparing with strongmen's group.

Research of perception quickness showed presence of high indicators of efficiency and quickness of visual information's perception, belonging to players and boxers with counter-attacking combat style (see table 3). Analysis of thinking and information processing functions of boxers with different combat styles resulted in determination of difference in effectiveness and stability of information's processing (see table 4). It was found that effectiveness and stability of information's processing if the highest in boxers-stronmen (see table 4).

Table 4

Indicators by test "comparison of numbers" of boxers with different combat styles (n=28)

Groups of boxers	Indicators			
	Effectiveness, conv.un.	Latent period, m.sec.	Accuracy, m.	Stability, %
Players	1006.36±17.84	963.89±26.14	0.96±0.01	23.28±0.24
Strongmen	1241.88±11.22*	1177.56±41.57*	0.95±0.01	31.7±0.28*
Paced in hold	1006.44±13.35**	953.10±35.05**	0.95±0.01	28.26±0.25**

Notes: 1. * p< - comparing with players' group; 2. * p< - comparing with strongmen's group.

The fulfilled analysis between indicators of Luscher's test and psycho-physiological indicators (received in other tests) showed the following: boxers with defensive combat style demonstrated less quantity of confident correlations (only 5) than attacking boxers (in total 29 confident correlation). This circumstance points at more rigid organization of psycho-physiological state of attacking-style boxers.

Discussion

At modern stage of boxing development combat style is characteristic feature of every professional boxer. Among known boxers there are sportsmen, who are characterized by strong aggressiveness in duel. They have powerful blow, strive for power suppression of opponent. They are attacking "strongmen". Some boxers constantly vary their actions. They use a lot of "feints", strikes in the most unexpected moments. They are counter-attacking "players". There are boxers, who "exhaust" opponent with high pace of many rounds. They win, when opponent is not able to keep the imposed pace. They are counter attacking "pace in hold".

Nevertheless, the most characteristic features of boxers' motor actions are unchangeable that permits to speak about dominating style. It is known that sportsman's individual typological characteristics (genetically determined) are reflected just in psycho-physiological characteristics of perception and processing of information [6, 9, 20].

In process of researching of combat style's connection with psycho-physiological characteristics of elite boxers we detected that attacking style (of strongmen) is accompanied by high workability, reduced tiredness and anxiety, presence of psychological comfort. At the same time defensive and counter-attacking combat styles (intrinsic to players and paced in hold) are characterized by better indicators of quickness and processing of information. It is achieved at the account of worsening of qualitative characteristics: efficiency and effectiveness.

Study of psycho-physiological functions' organization of boxers with different combat styles resulted in the fact that attacking style is characterized by more rigid organization of psycho-physiological status. It points at individual-typological distinctions by psycho-physiological characteristics of boxers with different combat styles.

Conclusions

1. Attacking combat style of strongmen is characterized by high workability, reduced tiredness and anxiety, presence of psychological comfort.

2. Defensive combat style of players and paced in hold is characterized by better indicators of quickness and processing of information at the account of worsening of qualitative characteristics: efficiency and effectiveness.

3. It was found that attacking boxers (strongmen) have more rigid organization of psycho-physiological state in comparison with boxers of defensive style (players and paced in hold).

Conflict of interests

The authors declare that there is no conflict of interests.

Reference

1. Kiprych SV, Donets AV, Makhdi Omar Ali. Improvement of management by training process of boxers at a stage of direct preparation for competitions. *Physical Education of Students*, 2013;6:20-24. http://dx.doi.org/10.6084/m9.figshare.840495.
2. Revenko EM, Pitnikov AA, Salnikov VA. Individual factors in the manifestation of shock actions in boxers with differing manner of conducting a fight. In: *Methodology and organization of physical education, sports training and recreation activities*. Ekaterinburg, 2001. (in Russian)
3. Zefirova EV. The accuracy of predicting the successful performance of mental in combat athletes. *Scientific notes University named P.F. Lesgaft,* 2010;10(68):39–44. (in Russian)
4. Petrov AG. Factors influencing the formation of individual style of boxer. *Vesnik UGPU*. Ulianovsk, 2009;5:234-238. (in Russian)
5. Mutahina RM, Shajhmetova ES. Peculiarities of some psychophysiological functions of right-handed and left-handed boxers. *Bulletin of the Chelyabinsk State Pedagogical University*, 2009;10:285-291. (in Russian)
6. Korobeynikov G, Korobeynikova L, Dakal N. The cognitive functions and styles of fight in elite female judokas. *Physical activity health and sport*, 2015;1(19):31-37.
7. Kiprich SB, Berinchik DY. Specific descriptions of functional providing of the special endurance of boxers. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2015, vol.3, pp. 20-27. http://dx.doi.org/10.15561/18189172.2015.0304.

8. Klichko V, Savchenko M. Sistema testov dlia ocenki special'noj podgotovlennosti bokserov vysokoj kvalifikacii [The system tests to evaluate of special trained for qualifications boxers]. *Nauka v olimpijskom sporte.* 2000;2:23-30. (in Russian)
9. Tunnemann H. Evolution and adjustments for the new rules in wrestling. *International Journal of Wrestling Science*, 2013;3(2):94–105.
10. Filimonov VI, Martirosov EG. Puti individualizacii trenirovochnogo processa v bokse [Ways of individualization of training process in boxing]. *Teoriia i praktika fizicheskoj kul'tury*, 1982;10:8-10. (in Russian)
11. Belousov SN. Puti formirovaniia individual'noj manery [Ways of formation of individual manner]. *In: Boks: Ezhegodnik* [Boxing: Yearbook], 1978. p. 19-20. (in Russian)
12. Radchenko UA. Vzaiemozv'iazok mizh psikhofiziologichnimi funkciiami i chasom vikonannia tekhnichnikh dij u visokokvalifikovanikh borciv [The relationship between physiological functions and time of execution of technical actions in qualified wrestlers]. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2009;1:114–118. (in Russian)
13. Latyshev SV, Korobeynikov GV. Approach of the systems to problem of individualization of training of fighters. *Physical Education of Students*, 2013;5:65-68. http://dx.doi.org/10.6084/m9.figshare.771109
14. Graczyk M, Hucinski T, Norkowski H, Pęczak-Graczyk A, Rozanowska A. The level of aggression syndrome and a type of practised combat sport. *Journal of Combat Sports and Martial Arts*. 2010;1(2):1-14.
15. Kalina RM, Chodała A, Dadeło S, Jagiełło W. Empirical basic for predicting-success in combat sport and self-defence. *Kinesiology*, 2005;37(1):64-73.
16. Blumenstein B, Lidor R, Tenenbaum G. Periodization and planning of psychological preparation in elite combat sport programs: the case of judo. *International Journal of Sport and Exercise Psychology*, 2005;3(1):7–25.
17. Korobeynikov G, Korobeynikova L, Mazmanian K, Jagello W. Psychophysiological states and motivation in elite judokas. *Archives of Budo Science of Martial Arts,* 2010;6:129-136.
18. Gaskov AV, Kuzmin VA. *Struktura i soderzhanie trenirovochno-sorevnovatel'noj deiatel'nosti v bokse* [The structure and content of the training-competitive activity in the box]. Krasnoyarsk: Krasnoyarsk University; 2004. (in Russian)
19. Husianov ZM. Osobennosti proiavleniia udarnoj massy pri nanesenii udarov v bokse [Peculiarities of manifestation of shock mass in hitting boxing]. In: *Taktiko-tekhnicheskie kharakteristiki poedinka v sportivnykh edinoborstvakh* [Tactical and technical performance characteristics of the fight in combat sports]. Moscow: Physical Culture and Sport; 2007. (in Russian)
20. Mouelhi GS, Tenenbaum G, Bouzaouach I. Simple and choice reaction times under varying levels of physical load in high skilled fencers. *The Journal of Sports Medicine and Physical Fitness*, 2006;46(2):335–343.

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ELECTRIC MYOGRAPHIC CONTROL OF ELECTRIC THERAPEUTIC APPARATUS -CERAGEM MASTER CGM 3500 INFLUENCE ON BACKBONE OF PATIENTS WITH SCOLIOSIS

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Abstract. *Purpose:* determination of effectiveness of electric therapeutic apparatus Ceragem master CGM 3500 in its influence on backbone of patients with scoliosis. *Material:* in examination 11 female patients with scoliosis of age from 21 to 35 years and 12 practically healthy persons participated. The research of para-vertebral muscles of back was fulfilled with method of electric myography. *Results:* we determined positive effect in nervous-muscular functioning of back. The proof was increase of integrated amplitude of back muscles' electric activity on convex and concave sides of scolytinae arc; increase of maximal amplitude of H-reflex and M-response. *Conclusions:* standard electric myography permits to receive objective information about functional state of muscles of patients with scoliosis and assess effectiveness of rehabilitation process with application of electric therapeutic apparatus - – Ceragem Master CGM 3500.
Key words: scoliosis, muscles of back, physical rehabilitation, electric myographic control.

Introduction

Adult people with scoliosis (in contrast to children and adolescents with such pathology) have quite different problems that is connected with specificity of etiology and pathogenesis of scoliosis progressing and peculiarities of approaches to treatment. It is considered that by the end of growing process (for women – by 18-20 years and for men – by 22 – 24 years) progressing of scoliosis stops. Surely, after such terms stoppage of progressing scoliosis with therapeutic methods is practically impossible [7]. As usual, increase of scoliosis deformation stops after finishing of bone growth [4, 5, 14, 17]. However, in patients with weak muscular corset and articular ligaments deformation can slowly progress [18, 20]. Sometimes, increase of deformation cannot be stopped even with perfectly developed muscles and everyday therapeutic exercises. In spite of favorable prognosis, prospects for future with scoliosis threaten with progressing of abnormalities in different structures of backbone and some functional system of the whole organism [5]. That is why programs of physical rehabilitation for adult persons shall be oriented on stoppage of backbone deformation and pain killing. It is connected with improvement of backbone's flexibility and mobility, normalization of muscles' functioning, complete or partial elimination of body asymmetry, prophylaxis of possible complications. The subject of discussions is still a problem about working out and implementation of innovative technologies in rehabilitation process of persons with scoliosis. Its purpose is excluding of unfavorable static-dynamic loads on affected sections of backbone, stimulation of backbone muscles' own functioning; influence on not vertebral organs. Origin of nervous-muscular asymmetry with scoliosis is also unknown. Some authors regard it as result of backbone deformation [3, 4, 6]. Other researchers connect nervous-muscular abnormalities with changes in central nervous system and relate them to reasons of scoliosis [5, 9, 11, 13, 15, 21]. That is why electric myographic researches are of theoretical importance when speaking about etiology and pathogenesis of scoliosis and of practical importance for improvement already known and working out of new physical rehabilitation methods. As on to day scientific substantiation of application of effective correction- recreational programs on the base of innovative rehabilitation technologies is rather urgent; in particular with the help of non traditional equipment – electric therapeutic apparatus Ceragem master CGM 3500 [8, 10].

Purpose, tasks of the work, material and methods

The purpose of the works is determination of effectiveness of electric therapeutic apparatus Ceragem master CGM 3500 in its influence on backbone of patients with scoliosis.

The methods and organization of the research: the research was conducted on the base of medical center Valeo Melitopol, Zaporizska region. In conditions of rehabilitation department we examined 11 female patients of age from 21 to 35 years with backbone scoliosis. Control group consisted of 12 practically healthy persons. We carried out electric myographic (EMG) testing of para-vertebral muscles of back with surface myography (SEMG). EMG testing was conducted during fulfillment of motor tests:

- Static load of back muscles – keeping of torso in initial position (I.P.) – lying on abdomen during 3 minutes;
- Dynamic load – bending and unbending of torso in I.P. – lying on abdomen.

Registration of skeletal muscles' bio-potentials was conducted as per standard methodic [6]. Testing of shin muscle was conducted in order to receive M-response and H-reflex.

Results of the researches

Members of experimental group (patients with scoliosis) were examined before their complex rehabilitation. We measured static forces of SEMG on convex side of scolytinae arc. We detected expressed asymmetry of bio-electric activity at first and at the last minutes of the test. At the beginning of static test integrated amplitude of muscles' electric activity on convex side of scolytinae arc was 313.4±57.5 mV×sec. It is lower ($p>0.05$) than on concave side – 376.9±63.3 mV×sec. At the last minute of the test amplitude of EMG curve at convex side decreased significantly. Comparing with initial data ($p>0.05$) it was 278.6±54.8 mV×sec. Amplitude of EMG curve at concave side increased and became

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415.2±62.3. It witnesses about switching on of compensatory mechanism (p>0.05). In three tests total electric activity of back muscles reduced by the end of test on convex and concave sides of scolytinae arc. In control group (practically healthy persons) we did not observe any asymmetry (see fig.1.).

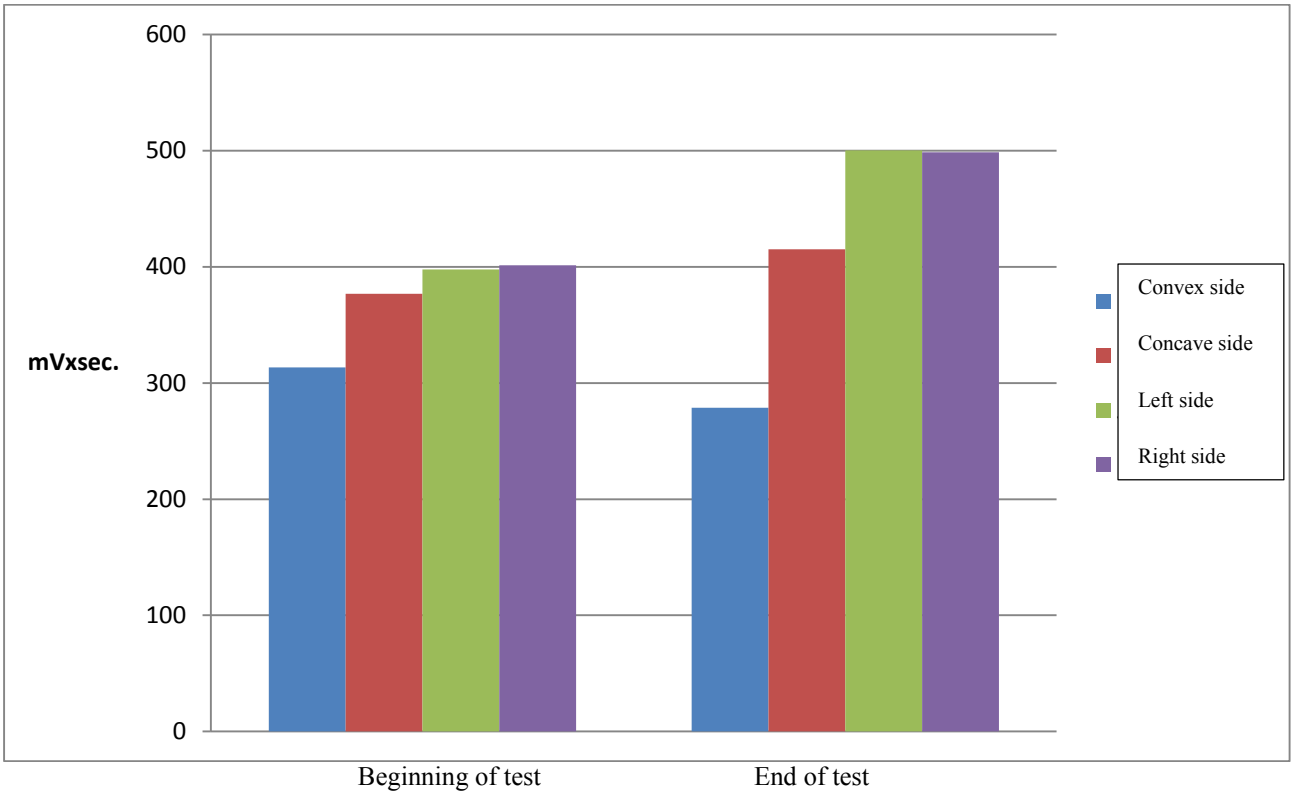

Fig.1. Indicators of back muscles' electric activity in experimental and control groups during static test

In control group there was a tendency to increasing of total electric activity of back muscles: from 397.6±36.7 mV×sec. (beginning of static loads) to 500.1±56.4 mV×sec. (at the end, p>0.05). It is connected with tiredness and switching on of additional motor units.

During dynamic test we observed similar dynamic of changes of back muscles' electric activity in both groups (see fig.2).

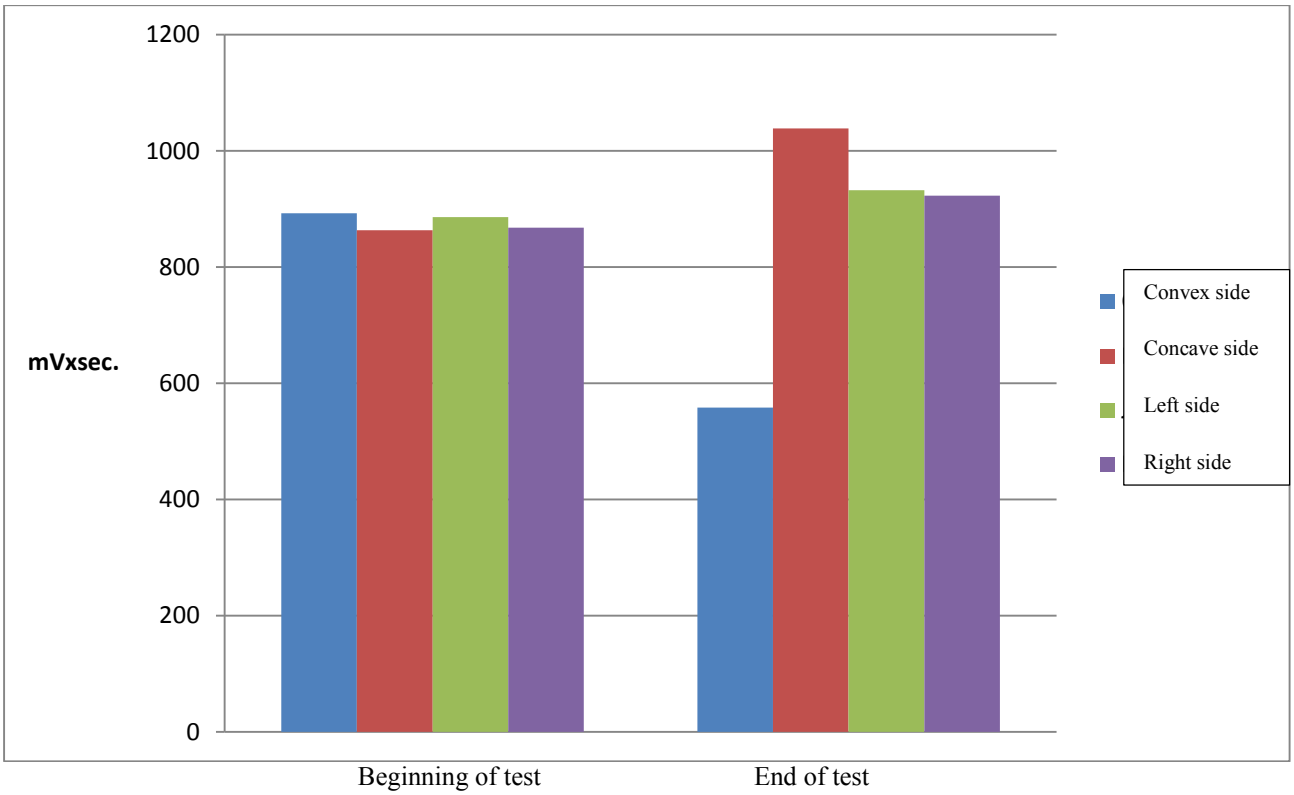

Fig.2. Indicators of back muscles' electric activity in experimental and control groups during dynamic test

We determined that in control group, in average there was confident ($p<0.05$) increment of total electric activity from 867.7±29.6 mV×sec. to 930.0±49.2 mV×sec.

In experimental group mean group value of integrated muscles' activity on convex side of scolytinae arc was 892.6±58.3 mV×sec. at the beginning of test. By the end of keeping of body position this indicator confidently ($p<0.001$) reduced to 558.4±84.4 mV×sec. (see fig. 2).

Back muscles on concave side fulfilled compensatory function. Their integral amplitude confidently ($p<0.005$) increased from 863.6±72.2 mV×sec. (at the beginning of the test) to 1038.6±65.5 mVм×sec. (at the end of the test). In both tests total activity of back muscles on both sides reduces. It permits to speak about possible two sided trauma of spinal roots of this backbone segment, which is characteristic for clinical symptoms of osteochondrosis.

After rehabilitation in complex with apparatuses Ceragem Master CGM 3500 in experimental group we observed the following:

- In four persons there were no improvement; two of them had reduced integral amplitude ($p<0.05$) on both sides at the beginning and at the end of the test;
- Concerning ten persons, total electric activity of back muscles was 497.6±67.1 mV×sec. (on convex side of scolytinae arc) at the beginning of static test and 510.2±64.4 mV×sec. (on concave side). It was confidently ($p>0.05$) higher than before the procedures (313.4±57.5 mV×sec., 376.9±63.3 mV×sec., accordingly) (see fig. 3). ,

By the end of test total electric activity of back muscles on convex side of scolytinae arc also increased ($p>0.05$). It was, in average, 340.4±57.3 mV×sec. Before complex rehabilitation integral amplitude was 278.6±54.8 mV×sec.

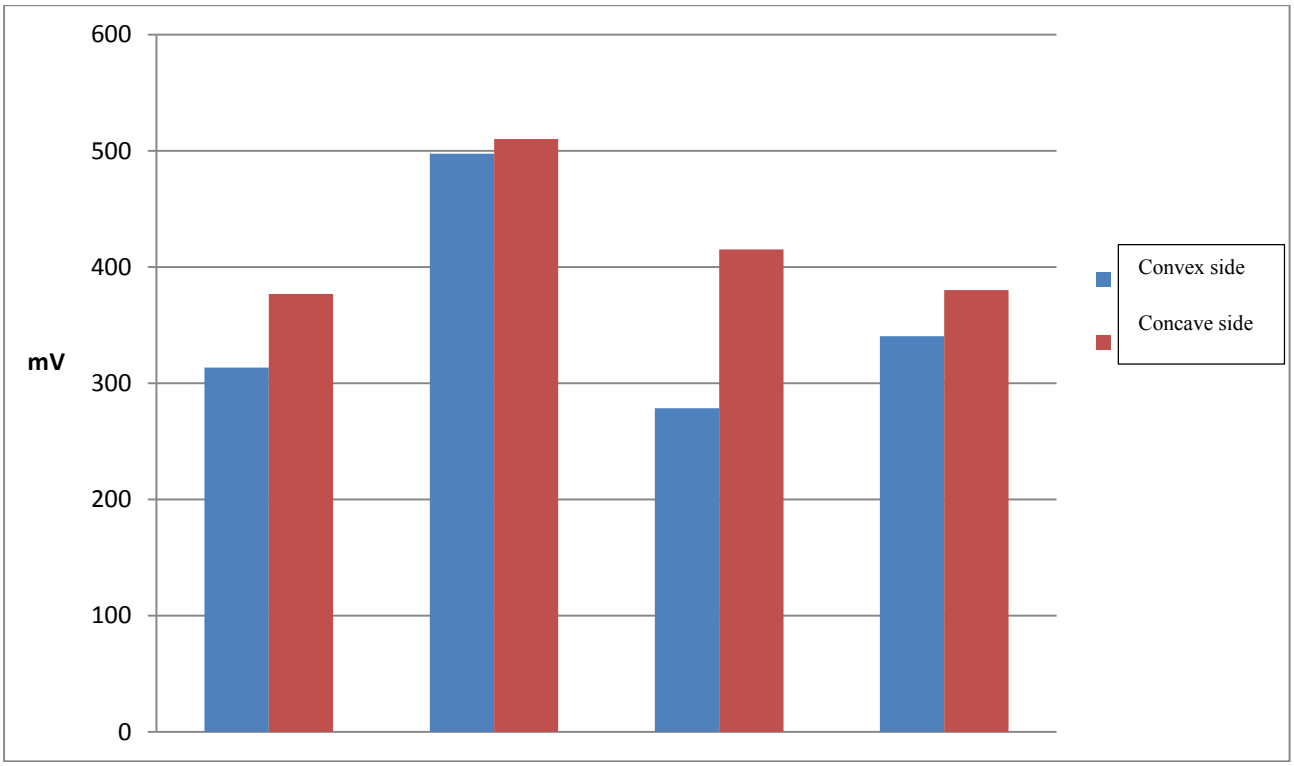

Fig.3 Mean group values of total electric activity of back muscles in experimental group with keeping of static force before and after rehabilitation

Electric activity of muscles on concave side before the end of the test reduced ($p>0.05$) in six persons from 415.2±63.3 mV×sec. (before complex rehabilitation) to 380.2±32.5 mV×sec. (after rehabilitation). In two tested it remained unchanged. The same picture was observed during dynamic load. Increment of total muscles' activity ($p>0.05$) was registered on convex side of scolytinae arc: 892.6±58.3 mV×sec. (at the beginning of test, before complex rehabilitation) to 922.6±52.3 mV×sec. (after rehabilitation); from 558.4±84.4 mV×sec. (at the end of the test) to 878.4±81.3 mV×sec. (after test) ($p<0.05$).

During examination female patients complained on pain in lumbar sacral sector. Most of them had pain expanded to lower limb with root syndrome. This syndrome is characteristic for lumbar osteochondrosis of backbone at level of L5 and S1. It is known that sacral plexus together with coccygeal plexus innerves buttocks, hips, shin and feet. That is why we conducted EMG – testing of shin muscle.

Comparative analysis of EMG parameters showed that in relative rest in experimental group there happened confidently significant ($p<0.05$) reduction of amplitude of maximal reflective spinal response of shin muscle (see table 1).

Table 1.

Electric miogram parameters of shin muscle in rest state

Indicators	Control group n=12	Experimental group n=11	
		Before rehabilitation	After rehabilitation complex
Maximal amplitude of H-response, mV	5.6±0.8	39±1.2	4.3±0.9
Current of maximal H-response, mA	6.4±1.6	10.8±2.0	8.9±1.9
Threshold current of H-response, mA	7.9±1.6	9.0±2.1	8.6±1.2
Maximal amplitude of M-response, mV	7.4±1.3	5.2±0.6	6.4±0.9
Current of maximal M-response, mA	6.0±0.8	6.9±1.6	6.6±1.8
Threshold current of M-response, mA	7.1±1.4	12.3±2.4	7.8±2.9

H-response to affected limb of two tested persons was absent. After rehabilitation procedures mean group maximal amplitude of H-response increased from 3.9±1.2 mV to 4.3±0.9 mV (see table 1). In two patients its value was near maximal amplitude of healthy persons. Threshold of nerve fibers' irritation in patients with scoliosis is higher than in healthy persons ($p<0.05$). Threshold current for receiving of M-response in experimental group was higher than in

control one. Threshold current does not differ confidently ($p>0.05$). Some patients (n=3) have it even lower than in control group. It can point at insignificant reduction of quantity of sensitive fibers Ia or at their thinning [1, 16]. For obtaining of maximal by amplitude H-response in experimental group it is necessary to apply higher current ($p<0.05$), than in control group.

M-response is a total electric potential of muscles in response to single electric irritation of motor fibers of mixed periphery nerve. Maximal amplitude of motor response in control group is confidently lower than in patients with scoliosis. In some tested persons (n=2) we observed crest-like form of indicator. In some cases (n=3) in experimental group M-response appeared the first. In the process of current increasing H-response also appeared. In other cases (n=2) with increasing of stimulation and simultaneous increasing of M-response there was no reduction of H-response amplitude. Output M-response shows that for irritation of low threshold afferent fibers Ia (which are responsible for H-response) less current is required than for activation of efferent motor fibers (which are responsible for M-response) [6, 15]. The found peculiarity can point at the fact that in condition of damaged spinal nerve sensitive afferents Ia suffer to larger extent than efferent fibers [1, 17]. After complex rehabilitation with electric therapeutic apparatus Ceragem Master CGM 3500 many patients (n=10) had increased maximal amplitude of M-response ($p>0.05$). Its mean group value was 6.4±0.9 mV, comparing with initial level of 5.2±0.6 mV. Also threshold current confidently reduced ($p<0.05$) in (n=8). Two patients did not demonstrate obvious changes of EMG parameters.

Discussion

The results of our researches are confirmed by data of other scientists. A.M. Ziedman et al. [5], Berven S. and Bradford D.S. [13] showed that innervations of para vertebral muscles on convex and concave sides of scolytinae arc confidently differs from biological activity of the same muscles of healthy peers. With it, EMG amplitude and total value of biological activity on convex side of arc is higher. EMG frequency is lower than on concave side. At the beginning of our research we received the same results. T.A. Korshunova [11] and S.L. Shcherbinin [9] connect increasing of muscles' biological activity on convex side of deformation with increasing of motor neurons' irritation under influence of increased impulses from over stretched muscles. Significant distinctions in biological activity of para vertebral muscles on convex side of scolytinae arc are connected with progressing of deformation. The authors use these data as diagnostic criteria for prognosis of disease.

Similar EMG researches were conducted by A.L. Boyko [2] and Yu.A. Maximova [10] on sportsmen, suffering from lumbar-sacral osteochondrosis. That is why we can note that changes in nervous-muscular apparatus of persons with scoliosis and osteochondrosis of backbone are of the same type.

In our EMG researches of shin muscle we confirmed the data about reduction and asymmetry of quickness of irritating impulses' conduct by motor fibers of shin nerves [3, 11].

The results, received by us are of certain novelty. We received the data about positive influence of electric therapeutic apparatus– Ceragem Master CGM 3500 on nervous-muscular system of female patients with scoliosis.

Conclusions

Application of apparatus Ceragem Master (CGM) renders tonic effect on healthy persons. It increases total electric activity of back muscles. Among female patients of experimental group most of them felt positive effect in work of nervous-muscular functioning of back muscles.

After complex rehabilitation we observed:

- Increase of integrated amplitude of back muscles' electric activity on convex and concave sides of scolytinae arc;
- Increase of maximal amplitude of H-reflex and M-response of shin muscle;
- Reduction of threshold current for receiving of H-reflex and M-response;

Thus, standard EMG (except differentiated diagnostics of deformation's etiology and character of its progressing) permits: to receive information about functional state of muscles and central nervous system's structures of patients with scoliosis; to assess effectiveness of rehabilitation process. The conducted researches showed purposefulness of application of electric therapeutic apparatus– Ceragem Master CGM 3500 in general program of health related-correction measures in rehabilitation of persons with scoliosis.

The future researches shall be oriented on determination or purposefulness of application of electric therapeutic apparatus– Ceragem Master CGM 3500 in system of correction measures for patients with osteochondrosis of backbone.

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Conflict of interests

The author declares that there is no conflict of interests.

Reference

1. Adriianova EIu, Gorodnichev PM. *Elektromiograficheskie pokazateli i mekhanizmy razvitiia poiasnichno-krestcovogo osteokhondroza* [Electric myographic indicators and mechanisms of lumbar sacral osteochondrosis progressing], Great Luke, 2006. (in Russian)

2. Bojko AL, Rozorinov GN. Elektromiograficheskij kontrol' vozdejstviia elektrostimuliacii i elektrostaticheskogo polia pri lechenii osteokhondroza poiasnichno-krestcovogo otdela pozvonochnika [Electric myographic control of electric stimulation and electrostatic field impact in treatment of lumbar sacral osteochondrosis]. *Biomedicinskie pribory i sistemy*, 2010; 5: 185-188. (in Russian)
3. Burygina AA, Golubova TF. Sostoianie nervno-myshechnogo apparata u bol'nykh skoliozom v period adaptacii i kompleksnogo sanatorno-kurortnogo lecheniia [Status of nervous-muscular apparatus of patients with scoliosis in period of adaptation and complex sanatorium and resort treatment]. *Voprosy kurortologii, fizioterapii i lechebnoj fizkul'tury*, 1985; 3: 25-28. (in Russian)
4. Dudin MG, Pinchuk DIu. *Idiopaticheskij skolioz: nejrofiziologiia, nejrokhimiia*. [Idiopathic scoliosis: neuro-physiology, neuro-chemistry], St. Petersburg, Man; 2013 (in Russian)
5. Zajdman AM, Mikhajlovskij MV, Sadovoj MA. *Nejrofibromatoz i skolioz* [Neurofibromatosis and scoliosis], Novosibirsk: Science; 2011. (in Russian)
6. Zenkov LR, Ronki MA. *Funkcional'naia diagnostika nervnykh boleznej* [Functional diagnostics of nervous diseases], Moscow: MEDpress inform; 2004 (in Russian)
7. Lomaga IA, Mal'mberg SA. Progressiruiushchie skoliozy: nevrologicheskie aspekty [Progressing scoliosis: neurological aspects]. *Vestnik RGMU*, 2008; 6:56 – 59. (in Russian)
8. Makarova EV, Vilachev SO. Zastosuvannia aparata Ceragem Master CGM – M3500 v reabilitacijnikh ta ozdorovchikh zakhodakh [Application of apparatus Ceragem Master CGM – M3500 in rehabilitation and health related measures], *II Vseukrains'kij z'izd fakhivciv zi sportivnoi medicini ta likuval'noi fizkul'turi "Liudina, sport i zdorov'ia"* [II All-Ukrainian congress of specialists in sports medicine and therapeutic physical culture "Man, sports and health"], Kiev, 2008. p. 99–100. (in Ukrainian)
9. Shcherbin SL. Elektromiografiia, stabilometriia i pal'paciia - kak metody vyiavleniia raznicy dlin nizhnikh konechnostej i sedalishchnykh bugrov pri skolioze [Electric myography, stabilometry and palpation as the methods of detection of difference in length of lower limbs and ischial tuberosity with scoliosis]. *1-j vserossijskij s"ezd vosstanovitel'noj mediciny* [1st all-Russian congress of recreational medicine], Moscow: REASPOMED; 2007. p. 311-312. (in Russian)
10. Maksimova IuA, Il'in VN, Kolosova EV, Vilachev SO. Elektronejromiograficheskij kontrol' vozdejstviia elektroterapevticheskogo apparata «Ceragem Master CGM» na pozvonochnik sportsmenov [Electric-neuro-myographic control of electric therapeutic apparatus «Ceragem Master CGM» impact on backbone of sportsmen]. *Sportivna medicina*, 2008; 2:125–129. (in Ukrainian)
11. Korshunova TA, Norkin IA, Gerasimov VA. i dr. Elektronejromiograficheskoe issledovanie u bol'nykh skoliozom [Electric-neuro-myographic researches of patients with scoliosis]. *Simpozium detskikh travmatologov i ortopedov Rossii "Optimal'nye tekhnologii diagnostiki i lecheniia v detskoj travmatologii i ortopedii: Oshibki i oslozhneniia", 17–19 sentiabria 2003* [Symposium of pediatric traumatology and orthopedic specialists of Russia "Optimal technologies of diagnostic and treatment in pediatric traumatology and orthopedics: mistakes and complications", September 17-19, 2003], Volgograd, 2003. p. 208. (in Russian).
12. Oliva-Pascual-Vaca Á, Heredia-Rizo AM, Barbosa-Romero A, Oliva-Pascual-Vaca J, Rodríguez-Blanco C, Tejero-García S. Assessment of paraspinal muscle hardness in subjects with a mild single scoliosis curve: a preliminary myotonometer study. *J Manipulative Physiol Ther.* 2014;37(5):326-33. http://dx.doi.org/10.1016/j.jmpt.2014.03.001.
13. Berven S, Bradford DS. Neuromuscular scoliosis: causes of deformity and principles for evaluation and management. *Semin Neurol.* 2002;22(2):167-78.
14. Brooks WJ, Krupinski EA, Hawes MC. Reversal of childhood idiopathic scoliosis in an adult, without surgery: a case report and literature review. *Scoliosis*. 2009;15;4:27. http://dx.doi.org/10.1186/1748-7161-4-27
15. Chwała W, Koziana A, Kasperczyk T, Walaszek R, Płaszewski M. Electromyographic assessment of functional symmetry of paraspinal muscles during static exercises in adolescents with idiopathic scoliosis. *Biomed Res Int.* 2014;5:732-776. http://dx.doi.org/10.1155/2014/573276.
16. de Oliveira AS, Gianini PE, Camarini PM, Bevilaqua-Grossi D. Electromyographic analysis of paravertebral muscles in patients with idiopathic scoliosis. *Spine*, 2011;36(5):334-339. http://dx.doi.org/10.1097/BRS.0b013e3181f516cd.
17. Chwała W, Płaszewski M, Kowalski P. Variations in bioelectric activity during symmetric loading and asymmetric stretching of paraspinal extensors in young adult women with mild single curve scoliosis. *Studies in Health Technology and Informatics.* 2012;176:129–132.
18. Gremeaux V, Casillas JM, Fabbro-Peray P, Pelissier J, Herisson C, Perennou D. Analysis of low back pain in adults with scoliosis. *Spine*. 2008;33:402–405. http://dx.doi.org/10.1097/BRS.0b013e318163fa42.
19. Miriutinova NF, Suleĭmanov RR. Peculiarities of clinical manifestations and physiotherapy of discogenic scoliosis in young subjects. *Vopr Kurortol Fizioter Lech Fiz Kult*. 2011;5:6-10.
20. Marty-Poumarat C, Scattin L, Marpeau M, Garreau de Loubresse C. Natural history of progressive adult scoliosis. *Spine*. 2007;32:1227–1234.
21. Schmid AB, Dyer L, Böni T, Held U, Brunner F. Paraspinal muscle activity during symmetrical and asymmetrical weight training in idiopathic scoliosis. *Journal of Sport Rehabilitation*. 2010;19(3):315–327.

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FACTORIAL ANALYSIS OF TENNIS PLAYERS' PSYCHOLOGICAL AND TECHNICAL-TACTIC FITNESS AT THE STAGE OF SPECIALIZED BASIC TRAINING

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Abstract. *Purpose:* to determine the structure of tennis players' psychological and technical-tactic fitness with principle component method. *Material:* 24 tennis players of 14-15 years' age participated in the researches. For determination of personal psychological features of junior tennis players we used the following methodic: by Dembo-Rubinstein (testing of self-assessment), by Burdon-Anfimov (attention), by G. Ayzenk (type of temper), by T. Elers (motivation, Spilberg – Khanin (level of anxiety). *Results:* we have determined the structure of tennis players' psychological and technical tactic fitness at stage of specialized basic training. For psychological fitness we found five factors, for technical-tactic – three factors. High level of inter-factorial connections was observed only in structure of technical-tactic fitness. We did not detect significant connections between five factors of psychological fitness. *Conclusions:* the determined features of factorial structure of tennis players' fitness can be used for planning of psychological training programs and learning-training process of junior players.
Key words: competitions, psychology, technique, tactic, physical, factorial, load.

Introduction

Achievement of high sport results is impossible without consideration of individual-typological peculiarities of sportsmen's supreme nervous system, which compose psychological and psycho-physiological basis of behavioral and cognitive processes and their vegetative provisioning [1-5, 6, 9, 19]. Psychological peculiarities of tennis players' functioning are determined by objective peculiarities of struggle on court and are characterized by quickness and suddenness of game situations, severe limit of time for their perceiving, taking decisions in conditions of multiple choice and responsibility for effective fulfillment of game technique [2, 4-6, 10-14, 20]. Competition functioning in tennis takes place in extreme conditions and in non-stationary environment, which is formed by own actions of sportsman and by actions of his (her) opponent. In comparison with other kinds of sports tennis is characterized by high emotional and intellectual tension. It sets high requirements to physical and psychic qualities of sportsmen [1, 15-18]. Recent time, specialists in different kinds of sports have widely been using method of factorial analysis, which permits to detect complex of dominating components. It conditions sport result, determines character of interconnections between indicators. Besides, it permits to see contribution of different factors in general result [7, 8, 11, 12].

Determination of fitness factorial structure at different stages of perfection in tennis is rather important. But these questions are not paid sufficient attention to in special literature. Determination of factorial structure of tennis players' psychological and technical-tactic fitness at stage of specialized basic training is extremely important task. Exactly in this age future foundation of further sport achievements is embedded; tennis players' training becomes more specific [5-7]. Determination of leading components of junior players' fitness will permit to significantly increase effectiveness of training and competition functioning.

Purpose, tasks of the work, material and methods

The purpose of the work is to determine the structure of 14-15 years' old tennis players' psychological and technical-tactic fitness with principle component method.

The tasks of the research were: determination of leading factors in structure of junior tennis players' psychological and technical tactic fitness as well as detection of inter-factorial connections of the researched components of sportsmen's fitness.

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

Results of the research

For determination of the most important factors of junior sportsmen's psychological and technical-tactic fitness we used principle component method. The advantage of this method was possibility to use only the most informative, principle components and exclude other ones from analysis; it permitted to significantly simplify interpretation of the obtained data.

According to algorithm of principle component method confidence of results of research is achieved only if percentage of sample of interconnected elements is not less than 60% from total dispersion. In our analysis of tennis players' psychological fitness factorial structure this value was 80.6%: for structure of technical-tactic fitness it was 79.5%.

The procedure of factorial analysis permitted to form system of factorial loads and determine five factors of psychological fitness, own values of which exceeded "one" (see fig.1).

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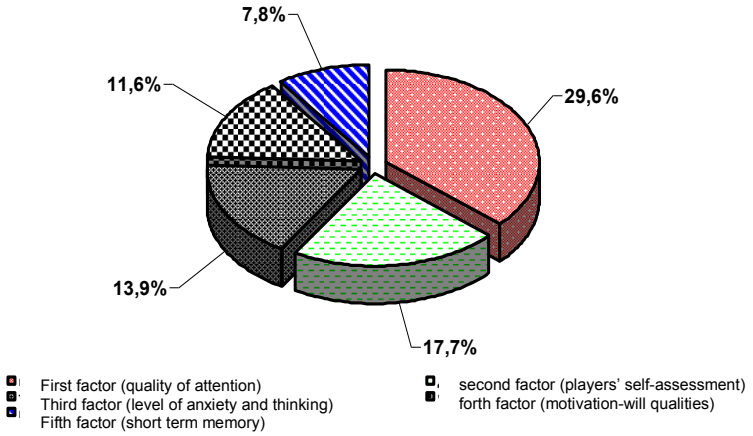

Fig.1. Factorial structure of 14-15 years' age tennis players' psychological fitness:

General factor (contribution of which in general dispersion was 29.6%) includes indicators, which characterized level of sportsmen's attention parameters' manifestation (accuracy, r= 0.960, coefficient of mental workability, r= 0.961, effectiveness of work, r= 0.749). The second factor grouped indicators, which reflected level of self-assessment and strives of sportsmen (contribution in general dispersion was 17.7%).

Third factor (13.9%) combined indicators of situational and personal anxiety (r= 0.875 and r= 0.873accordingly). In forth factor (11.6%) there are loads, higher than threshold ones, which had variables, reflecting tennis players' motivation-will sphere (motivation for avoiding failures r= - 0.717, bent to risk r= 0.948). The fifth factor characterized quality of tennis players' short-term memory (r= 0.755).

In fig.2 we present values of tennis players' psychological fitness factors in comparison with threshold value, which was equal to "one". For example, value of general factor (attention) was equal to 5.96, factor "players' self-assessment" – 3.54, factor "anxiety and thinking" – 2.79. The forth factor "motivation-will qualities" was 2.32; the fifth factor "quality of short-term memory" – 1.57.

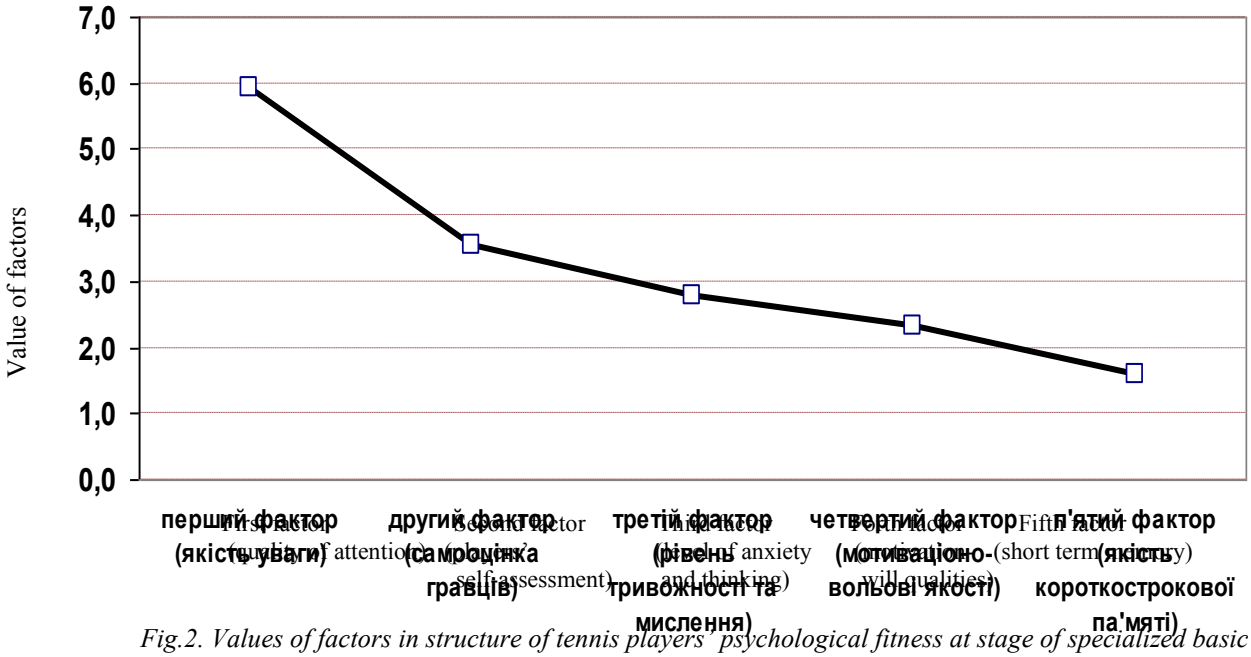

Fig.2. Values of factors in structure of tennis players' psychological fitness at stage of specialized basic training

At the same time correlation analysis did not show statistically significant inter-factorial connections in structure of psychological fitness (see table 1). The highest level was observed between the first (quality of attention) and the third (anxiety and thinking) r=0.336; between forth (motivation-will qualities) and fifth (short-term memory) factors r=0.437. However these correlations were not confident.

Table 1

Inter-correlation connections of tennis players' psychological fitness factors at stage of specialized basic training

Factor	1	2	3	4	5
1	1.000				
2	0.198	1.000			
3	0.336	0.244	1.000		
4	0.195	0.351	0.032	1.000	
5	0.032	-0.004	0.021	0.437	1.000

Analysis of physical matrix of physical and technical-tactic fitness permitted to find out three factors, own values of which exceeded "one" (see fig. 3).

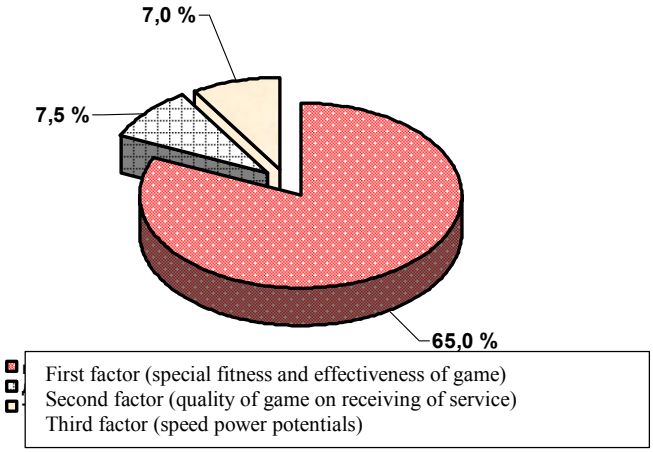

Fig.3. Factorial structure of general physical and technical-tactic fitness of 14-15 years' age tennis players:

The first and the most significant factor (65.0%) included variables, which characterized special technical-tactic fitness (fulfillment of shortened blows, tests "smash" and "weir") as well as indicators of competition functioning, which reflected quality of games at the moments of rebound (coefficient of stability, coefficient of effectiveness, complex indicator of efficiency) Second factor (7.5%) combined variables, which characterized quality of game at receiving of service (coefficient of stability, r= 0.753, coefficient of effectiveness, r= 0.896, complex indicator of efficiency, r= 0.830). Third factor included indicators of general physical fitness, which showed speed-power and quickness potentials. Own values of each of three detected factors of physical and technical-tactic fitness are shown in fig. 4.

Fig.4. Values of factors in structure of tennis players' physical and technical-tactic fitness at stage of specialized basic training

For example, the most significant first (general) factor has own value 12.35. Two other factors have approximately equal own values: factor "quality of game at receiving of service" – 1.44; factor "speed-power potentials" – 1.34. In contrast to psychological fitness, factors of general and special technical-tactic fitness have high (statistically significant) correlations (see table 2).

For example, correlation between first and second factors was r= 0,704; between first and third – 0.813; between second and third - r= 0.606. It witnesses about great influence of factors each on other. The received data permitted to find out leading components in structure of tennis players' fitness and to determine the character of their internal correlations.

Table 2

Inter-correlation connections of tennis players' physical and technical-tactic factors at stage of specialized basic training

Factor	1	2	3
1	1,.000		
2	0.704	1.000	
3	0.813	0.606	1.000

Discussion

The received results confirm data of other authors (A.V. Alexeyev, 2005; S.P. Belits-Geyman,1989; A.A. Bodalev, 1999; T.V. Diubina; T.S. Ivanova, 1999; Yuan Zhaohui; Weihai Qiong, 2011; Zhang Hailong, Lv Huimin, Cui Lei, 2011) about influence of tennis players' individual psychological characteristics on effectiveness of training and competition functioning and their significance in it.

For the first time factorial structure of tennis players' psychological and technical tactic fitness at stage of specialized basic training has been obtained. Also we determined inter-factorial correlations. Consideration of leading psychological and technical-tactic components in practice can be an important factor of increasing of training process and competition functioning's quality of junior sportsmen.

Conclusions:

1) The fulfilled factorial analysis permitted to determine the structure of tennis players' psychological and technical-tactic fitness at stage of specialized basic training. For example, as a result of analysis of psychological fitness we found out five factors; in case of technical-tactic fitness – three factors, own values of which were more than "one". First (general) factor of psychological fitness characterized tennis players' attention (contribution in general dispersion 29.6 %), second – level of players' self-assessment (17.7 %), third – anxiety and operative thinking третій (13.9 %), forth – tennis players' motivation-will qualities (11.6 %) and fifth – quality of short-term memory (7.8 %). First factor of technical-tactic fitness combined practically all significant variables and its contribution in general dispersion was 65 %, with own value -12.35.
2) High level of inter-factorial correlations was observed only in structure of technical-tactic fitness. Connection between first and second factor was r= 0.704, between first and third – 0.813, and between second and third - r= 0.606, that witnesses about high influence of one factor on another. Between five factors of psychological fitness significant correlations were not detected. The highest correlations were observed between first (quality of attention) and third factors (anxiety and operative thinking) r=0.336, as well as between forth (motivation-will qualities) and fifth (short-term memory) factors r=0.437, though they were not statistically confident.

The prospects of further researches are connected with determination of factorial structure of elite tennis players.

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Conflict of interests

The authors declare that there is no conflict of interests.

Reference:

1. Alekseev AV. *Psikhologicheskaia podgotovka v tennise* [Psychological training in tennis], Rostov on Don: Phoenix; 2005. (in Russian)
2. Belic-Gejman SP. *Prognozirovanie veroiatnostej iskhodov rozygrysha v tennise* [Prognosis of probabilities of draws' results in tennis], Moscow; 1989. (in Russian)
3. Bodalev AA, Stolin VV. *Psikhodiagnostika* [Psycho-diagnostic]. Sankt Petersburg: Speech; 1999. (in Russian)
4. Godik MA, Skorodumova AP. *Kompleksnyj kontrol' v sportivnykh igrakh* [Complex control in sport games], Moscow: Soviet sport; 2012. (in Russian)

5. Guba VP, Shestakov MP, Bubnov NB, Borisenko MP. *Izmereniia v sportivno-pedagogicheskoj praktike* [Changes in sport-pedagogic practice], Moscow: Physical Culture and Sport; 2006. (in Russian)
6. Denisova LV, Khmel'nickaia LV, Kharchenko LA. *Izmereniia i metody matematicheskoj statistiki v fizicheskom vospitanii i sporte* [Measurements and methods of mathematical statistic in physical education and sports], Kiev: Olympic Literature; 2008. (in Russian)
7. Diubina TV, Zav'ialov AI. Metodika ocenivaniia urovnia podgotovlennosti iunykh tennisistov [Methodic of junior tennis players' fitness assessment]. *Pedagogics, psychology, medical-biological problems of physical training and sports,* 2009;5:80-83. (in Russian)
8. Iermakov SS. *Komp'iuternye programmy v sportivnykh igrakh* [Computer programs in sport games], Kharkov: KSADA; 1996. (in Russian)
9. Iberla K. *Faktornyj analiz* [Factorial analysis], Moscow: Statistics; 1980. (in Russian)
10. Ibraimova MV, Kozak AM, Polishchuk LV. Specifika sorevnovatel'noj deiatel'nosti tennisistov vysokoj kvalifikacii [Specificity of elite tennis players' competition functioning]. *Slobozhans'kij naukovo-sportivnij visnik*, 2011;4:63-66. (in Russian)
11. Ivanova TS. *Testirovanie podgotovlennosti iunykh tennisistov* [Testing of junior tennis players' fitness]. Matchbol Tennis, 1999;5:32-36. (in Russian)
12. Klichko V. Formirovanie struktury special'nykh sposobnostej bokserov vysshej kvalifikacii [Formation of structure of elite boxers' special skills]. *Nauka v olimpijskom sporte*, 2000;1:11-15. (in Russian)
13. Tarpishchev ShA, Guba VP, Samojlov VA. *Osobennosti podgotovki iunykh tennisistov* [Peculiarities of junior tennis players' training]. Moscow: Physical Culture and Sport; 2006. (in Russian)
14. Shinkaruk OA, Pavliuk EO, Svergunec' EM, Flerchuk VV. *Teoriia i metodika ditiacho-iunac'kogo sportu* [Theory and methodic of children-junior sports], Khmelnitsky: KNU; 2011. (in Ukrainian)
15. Borg G. Psychophysical bases of perceived exertion. *Med. And Science in Sport and Exert*, 1982;5(1):327-332.
16. Brody H. Match statistics and their importance. ITF. *Coaches review*. 2000;22:14-20.
17. Molina I. Match analysis and evaluation. ITF. *Coaching and Sport Science Review*. 2004;38:3-4.
18. Vealey RS. *Personality in sport: A comprehensive view*. Human Kinetics, Champaign, IL. Advances in sport psychology; 2000.
19. Yuan Zhaohui, Weihai Qiong. Factors affecting interest in training children tennis Enlightenment Training. *Wuhan Institute of Physical Education Journal,* 2011;1:5-8.
20. Zhang Hailong, 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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STUDY OF JUNIOR WEIGHT LIFTERS' SPECIAL FITNESS WITH DIFFERENT METHODS OF SPEED-POWER TRAINING IN PREPARATORY PERIOD OF GENERAL PREPARATORY STAGE

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Abstract. *Purpose:* studying of junior weight lifters' special fitness in preparatory period of general preparatory stage. *Material:* 30 junior weight lifters of 12 – 14 years' old age were involved in experiment (2nd and 3rd sport grades). *Results:* optimal indicators of training by shock method have been determined for sportsmen of experimental group. Scope of loads was: squats with barbell on shoulders - lifting 779 times (90 tons); 310 jumps in depth and jumps out. Power indicators in total of combined exercises have increased by 16.5 kg. In control group other methodic was used. In control group scope of loads was: lifting of barbell - 910 times (111 tons). Power indicators in total of combined exercises have increased by 7.2 kg. *Conclusions:* the following regiment of training is recommended: first 3 weeks - jumps. Dozing and load scopes shall be as follows: first two trainings - two attempts (10 times each) with height of 0.5 m; third training – 3 attempts (10 times each) with height of 0.5 m; forth training – 4 attempts (10 times each) with height of 0.7 m. Jumps in depth shall be used 3 times weekly.
Key words: training, junior, weight lifter, preparatory period, advanced method, speed-power training.

Introduction

Modern system of trainings requires constant perfection of sportsmen-weight lifters' technical fitness, oriented on realization of effective technical actions of junior weight lifters in conditions of preparation for competition functioning. Increase of competitiveness at competitions requires searching of new ways to increasing of competition functioning's efficiency from coaches and sportsmen [1].

Exercises in weight lifting are rather complex by technique. Lifting of edge weight is connected with maximal tension of torso and limbs' muscles, quick change of their operation mode, keeping of balance in reference phase of junior sportsmen's movement. Technique of fulfillment of weight lifting exercises is also influenced by organism's constitution and typological features [5; 6].

Speed-power training is a leading one in weight lifting. Level of speed-power qualities to large extent determines achievement of high results in classic exercises. Weight lifter shall have great strength and be able to manifest it in short period of time.

For training of strength in weight lifting dynamic exercises with heavy weights are used. As it was shown in researches of known scientists [2; 3] with 120 kg snatch sportsman shall realize pull of 130-140 kg. In this case heavy loads ensure increment of muscular strength. But it does not train quickness of muscles' contraction.

It is usually considered that heavy weights increase strength's potential of muscles, which is required for development of quickness. But, as researches of known domestic authors show (N.A. Laputin; A.S. Medvedev; V.G. Oleshko) in explosive phases of snatch and push (lifting and push from breast) working muscles do not manage to manifest their maximal power potential. It witnesses that weight lifter needs speed-power training for achievement of higher sport results [5; 8; 17-18]

It should be noted that in scientific-methodic literature speed-power training of junior weight lifters is elucidated insufficiently. It conditioned urgency of our topic.

Many researchers found that development of speed-power qualities is the most effective in adolescent age up to 14 years [10; 11]. On the base of experimental data V.S. Filin made the following conclusions: mans and methods of speed-power qualities' training are the most effective at stage of initial preparation [3]. Training of weight lifter's speed-power qualities starts from mastering of weight lifting exercises' technique. For this purpose it is necessary to achieve accurate and economic movements. At the beginning exercises shall be fulfilled slowly, then – with maximal pace. In the process of mastering of barbell lifting, its weight shall increase, providing quickness and accuracy of movements remain at proper level [7].

In the base of shock method of training of muscles' explosive power there is sharp (shock) mechanical stretching of tensed muscles. For stimulation of muscles' activity kinetic energy of sportsman's body falling (or sport apparatus) is used [2]. Positive influence of preliminary stretching of tensed muscles was shown in a number of experimental works of known domestic scientists [11; 19; 20].

Purpose, tasks of the work, material and methods

The purpose of the research: studying of junior weight lifters' special fitness with the help of different methods of speed-power training in preparatory period of general preparatory stage.

Organization of the research: in the research pupils of children-junior sport school (CJSS) "KhTZ" participated. 30 junior weight lifters of 12 – 14 years' old age were involved in experiment. All they had 2nd and 3rd sport grades. By sport qualification the participants were divided into two groups: control and experimental. All participants of experiment trained 3 times a week. Experiment was conducted on the base of CJSS KhTZ.

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Results of the research

For control group experiment was organized by traditional schema. Experimental group was trained with application of shock method, oriented on speed-power development. Before experiment all tested participated in control competitions (their results were taken as initial level of their sportsmanship) (see table 1). Results of competitions are regarded as main criterion of experimental training's effectiveness. Before experiment all sportsmen mastered technique of pushing off after jump in depth.

Control group trained by traditional methodic: scope of loads was: 910 of control lifting of barbell (CLB) and 111 tons. Jump loads included jumps on "gout", long jumps, vertical high jumps and triple jumps. In total there were 300 jumps.

In experimental group total scope of work was shortened at the account of squats with barbell on shoulders and included 779 lifting of barbell (90 tons) and 310 jumps in depth. Distinctive feature of experimental training program was application of shock method of speed-power training. Jumps were used only first 3 weeks. Dozing and scope of loads were the following: first 2 trainings – 2 attempts (10 times which) with height 0.5 m; third training – 3 attempts (10 repetitions) with height 0.5 m; forth training – 4 series of 10 repetitions each with height 0.7 m. Jumps in depth were used 3 times a week.

Peculiarities of shock method of speed-power training are as follows: in the base of shock method of explosive power training there is sharp (shock) mechanic stretching of tensed muscles, previous to their active working contraction. As factor of muscles' stimulation we used kinetic energy of sportsman body's falling (or sport apparatus) [2; 9; 11].

Pushing off after jump in depth means jump downward from certain height, then springing by both legs, sportsman pushes off and makes vertical high jump out. In the moment of springing landing and damper squat, kinetic energy of sportsman is partially absorbed by muscles extensors and transformed in potential of their tension. This potential facilitates re-switching of muscles to work in phase of active push off. It is a kind of power addition, which increases intensity and quickness of muscles' contraction in this phase of work. Shock mode of work has specific training effect. It is oriented on physiological mechanisms, which are responsible for quickness and power of muscles' switching in work. For achievement of training effect power dozing is ensured by value of body kinetic energy, height of its falling and depth of damper braking.

Results of experiment were expressed in the following way: at the end of the stage experimental group sportsmen showed higher results then in control group (see table 2). With it 10 of them set personal records in sum of combined exercises and in some special training exercises.

Table 1

Mean indicators of competition and special preparatory exercises of junior weight lifters of control and experimental groups at the beginning of preparatory period of special preparatory stage
(n_1= n_2=15)

Indicators	CG		EG		*T*	*P*
	$\overline{X}_1 \pm m_1$	V,%	$\overline{X}_2 \pm m_2$	V,%		
Classic snatch, kg	47.5±1.7	13.7	48.5±1.8	14.0	0.4	>0.05
Classic push, kg	67.1±1.6	9.4	67.5±1.3	77	0.2	>0.05
Sum of combined exercises, kg	1140.6±3.3	11.0	116.0±2.9	9.8	0.3	>0.05
Squats with barbell, kg	90.1±1.8	7.5	88.7±1.2	5.4	0.7	>0.05
Bench press, kg ,	56.1±1.8	12.6	60.1±1.5	9.8	1.7	>0.05
Deadlift, kg	96.5±2.1	8.6	99.9±1.9	7.6	1.2	>0.05

At the beginning of preparatory period of general preparatory period distinctions in groups were not confident: in classic snatch (control group – 47.5kg, experimental – 48.5 kg; P>0.05); classic push (accordingly – 67.1 kg, 67.5 kg; P>0.05); sum of combined exercises (accordingly - 114.6 kg, 116.0 kg; P>0.05); squats with barbell on shoulders (accordingly – 90.1 kg, 88.7 kg; P>0.05); bench press (accordingly – 56.1 kg, 60.1 kg; P>0.05); deadlift (accordingly – 96.5 kg, 99.9 kg; P<0.05).

Variation coefficients of all main indicators of special exercises for control and experimental groups taken separately practically did not exceed initial level. For example, for classic snatch it was V=13.7% in control group and V =14.0% in experimental group. Accordingly, in control and experimental groups variation coefficients were as follows: classic push V =9.4 %, V =7.7 %; sum of combined exercises – V =11.0 %, V =9.8 %; squats with barbell – V =90.1 %, V =88.7 %; bench press– V =12.6 %, V =9.8 %; deadlift – V =8.6 %, V =7.6 %.

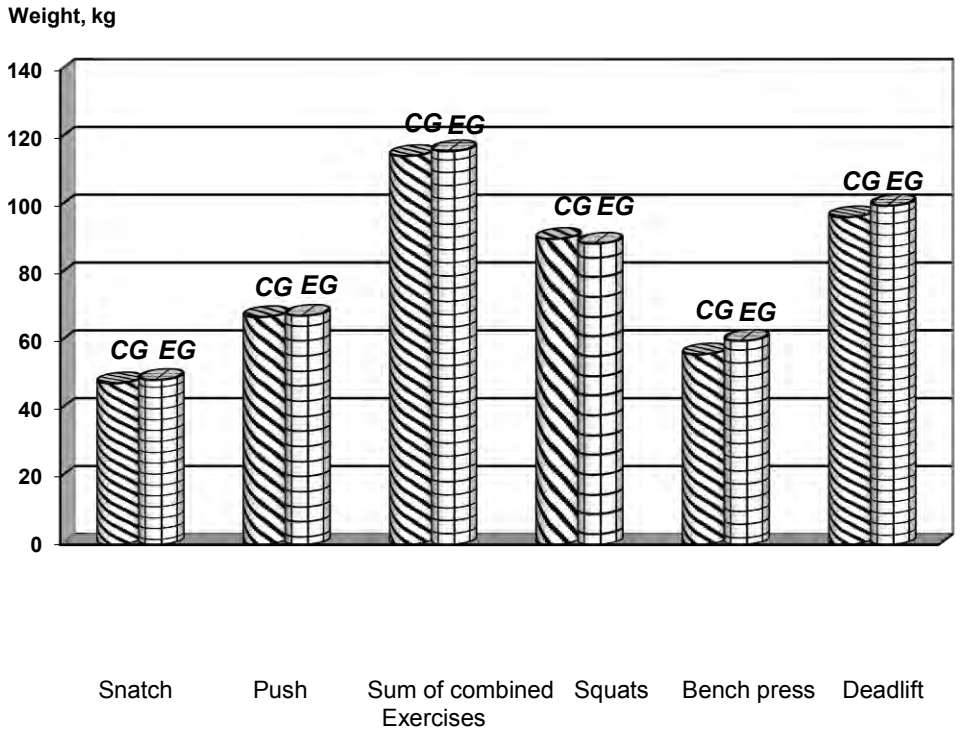

Fig.1. Comparative analysis of special exercises' fulfillment in control (CG) and experimental (EG) groups at the beginning of preparatory period

At the end of preparatory period of general preparatory stage there was confident difference between the following indicators: classic snatch (control group – 50.5 kg, experimental – 56.5 kg; (t=2.5; P<0.05); classic push (accordingly – 71.3 kg, 76.0 ; (t=2.5; P<0.05); sum of combined exercises (accordingly – 121.1 kg, 132.5 kg; (t=2.5; P<0.05); squats with barbell (accordingly– 99.8 kg, 105.3 kg; (t=2.5; P<0.05); bench press (accordingly – 61.0 kg, 67.1 kg; (t=2.5; P<0.05); deadlift (accordingly – 106.3 kg, 118.2 kg; (t=4.6; P<0.05).

Table 2

Mean indicators of results' increment of competition and special preparatory exercises, fulfilled by junior weight lifter of control and experimental groups at the end of preparatory period of special preparatory stage ($n_1 = n_2 = 15$)

Indicators	**CG**	**EG**	***T***	***P***
	$\overline{X}_1 \pm m_1$	$\overline{X}_2 \pm m_2$	2.5	<0.05
Classic snatch, kg	50.5±1.7	56.5±1.6	2.2	<0.05
Classic push, kg	71.3±1.7	76.0±1.3	2.5	<0.05
Sum of combined exercises, kg	12.,8±3.3	132.5±2.7	2.5	<0.05
Squats with barbell, kg	99.8±1.6	105.3±1.5	2.5	<0.05
Bench press, kg ,	61.0±1.8	67.1±1.4	2.5	<0.05
Deadlift, kg	106.3±1.9	118.2±1.8	4.6	<0.05

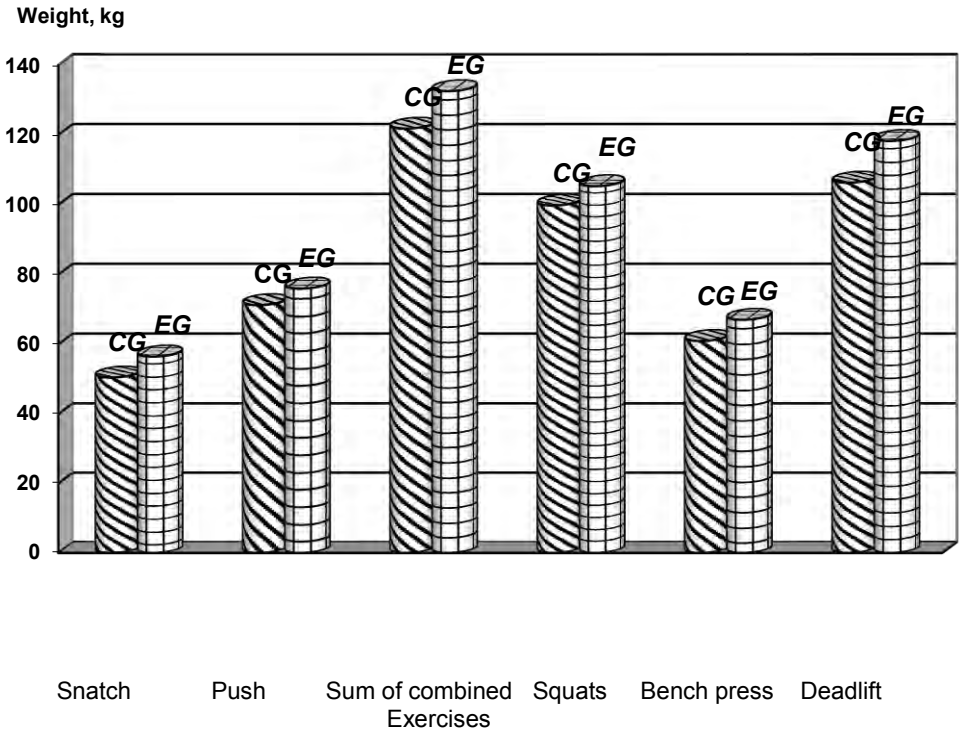

Fig. 2. Comparative analysis of special exercises' fulfillment in control (CG) and experimental (EG) groups at the end of preparatory period

Discussion

Analysis of scientific literature confirmed that researches in sphere of weight lifting were, mainly, of especial character. Recent years scientists have carried out researches of content and methodic of junior weight lifters' training process with the help of different methods, oriented on speed power development [2, 3]; recent scientific works were also devoted to planning of junior weight lifters' training process for year macro-cycle, considering speed-power qualities [4; 8; 10; 11; 12]. However, till present time influence of speed-power trainings on junior weight lifters in preparatory period of general preparatory stage has not been studied yet.

The conducted research confirmed results of other authors [2; 3] about demand in consideration of speed-power trainings' influence on junior weight lifters in preparatory period of general preparatory stage. Besides, we expanded the data of domestic [4; 8; 10; 11; 12] and foreign authors [21; 22; 23; 24] concerning ways for increasing of the most important indicators of speed-power qualities and their influence on junior weight lifters' organism.

Conclusions:

We determined that application of shock method facilitates more effective progress of speed-power qualities and results in improvement of sport results in weight lifting.

Isokinetic exercises are effective supplement to existing traditional means of speed-power trainings. They facilitate more effective increment of efforts in final phase of weight bar lifting that is not always accessible in natural conditions of weight bar lifting. Training of speed-power qualities is the most effective in adolescent age. Just because of this fact it is necessary to train speed-power qualities with the help of special means and methods exactly after mastering of competition exercises' technique. It is rather effective at the stage of initial training. It is witnessed by the results of the research. At the end of preparatory period there was confident difference between indicators of classic snatch (in control group – 50.5 kg, in experimental – 56.5 kg; ($t=2.5$; $P<0.05$); classic push (accordingly – 71.3 kg, 76.0 kg; ($t=2.5$; $P<0.05$); sum of combined exercises (accordingly – 121.1 kg, 132.5 kg; ($t=2.5$; $P<0.05$); squats with barbell (accordingly – 99.8 kg, 105.3 kg; ($t=2.5$; $P<0.05$); bench press (accordingly – 61.0 kg, 67.1 kg; ($t=2.5$; $P<0.05$); deadlift (accordingly – 106.3 kg, 118.2 kg; ($t=4.6$; $P<0.05$).

Further researches will be devoted to working out and substantiation of junior weight lifters' training process at special preparatory stage of preparatory training period.

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Conflict of interests

The authors declare that there is no conflict of interests.

References:

1. Platonov VN. *Sistema podgotovki sportsmenov v olimpijskom sporte* [System of sportsmen's training in Olympic sports], Kiev: Olympic Literature; 2004. (in Russian)
2. Verkhoshanskij IuV. *Osnovy special'noj silovoj podgotovki v sporte* [Principles of special power training in sports], Moscow: Physical Culture and Sport; 1970. (in Russian)
3. Dvorkin LS. *Iunyj tiazheloatlet* [Junior weight lifter], Moscow: Physical Culture and Sport; 1982. (in Russian)
4. Ippolitov NS. *Issledovanie prognosticheskoj znachimosti skorostno-silovykh kachestv u podrostkov pri otbore dlia zaniatij tiazheloj atletikoj. Cand. Diss*. [Study of prognostic significance of adolescents' speed-power qualities with their selection for weight lifting training. Cand. Diss Leningrad; 1975. (in Russian)
5. Laputin AH. *Special'nye uprazhneniia tiazheloatleta* [Special exercises of weight lifter], Moscow: Physical Culture and Sport; 1973. (in Russian)
6. Gaverdovskij IuK. *Obuchenie sportivnym uprazhneniiam* [Training to sport exercises], Moscow: Physical Culture and Sport; 2007. (in Russian)
7. Evdokimov BS. *Ocenka urovnia special'noj podgotovki fizicheskoj podgotovlennosti tiazheloatleta* [Assessment of weight lifter's special physical fitness], Moscow: Physical Culture and Sport; 1971. (in Russian)
8. Medvedev AS, Frolov AI, Furaev AN. *Skorostno-silovye kachestva tiazheloatletov vysokoj kvalifikacii i ikh vzaimosviaz' s tekhnicheskim masterstvom* [Speed-power qualities of elite weight lifters and their interconnection with sportsmanship], Moscow: Physical Culture and Sport; 1980. (in Russian)
9. Filin VP. *Problema sovershenstvovaniia dvigatel'nykh (fizicheskikh) kachestv detej shkol'nogo vozrasta v processe sportivnoj trenirovki. Dokt. Diss*. [Problem of motor (physical) qualities improvement in school age children in process of sport training. Dokt. Diss.], Moscow; 1970. (in Russian)
10. Farfel' BC. Dvigatel'nye kachestva shtangistov [Motor qualities of weight lifters], In: *Tribuna masterov tiazheloj atletiki* [Tribune of weight lifting masters], Moscow: Physical Culture and Sport; 1963. (in Russian)
11. Cherniak AV. *Skorostno-silovaia podgotovka sportsmenov-razriadnikov* [Speed-power training of sportsmen with sport grades], Moscow: Physical Culture and Sport; 1970. – S.28–36. (in Russian)
12. Djim VY. Comparative analysis of exercise equipment jerk in weightlifting and weight sport. *Pedagogics, psychology, medical-biological problems of physical training and sports,* 2013;11:10-16. http://dx.doi.org/10.6084/m9.figshare.815868.
13. Doronin AM. *Skorostno-silovaia podgotovka sportsmenov s ispol'zovaniem mashiny upravliaiushchego vozdejstviia. Cand. Diss*. [Speed-power training of sportsmen with the help of control machine. Cand. Diss.], Moscow; 1992. (in Russian)
14. Arkhangorods'kij ZS, Pilipko VF. *Metodi shvidkisno-silovoi pidgotovki vazhkoatleta* [Methods of weight lifter's speed-power training], Kharkiv, KSAPC; 1998. (in Ukrainian)
15. Mikhajliuk MP. *Skorostno-silovaia podgotovka kvalificirovannykh tiazheloatletov* [Speed-power training of elite weight lifters], Moscow: Physical Culture and Sport; 1977. (in Russian)
16. Filin VP. *Skorostno-silovaia podgotovka iunykh sportsmenov* [Speed-power training of junior sportsmen], Moscow: Physical Culture and Sport; 1968. (in Russian)
17. Oleshko VG. *Pidgotovka sportsmeniv u silovikh vidakh sportu* [Sportsmen's training in power kinds of sports], Kiev: DIA; 2011. (in Ukrainian)
18. Oleshko VG, Pucov OI. *Vazhka atletika* [Weight lifting], Kiev: Weightlifting Federation Ukraine; 2004. (in Ukrainian)
19. Mikhajliuk MP. *Skorostno-silovaia podgotovka kvalificirovannykh tiazheloatletov* [Speed-power training of elite weight lifters], Moscow: Physical Culture and Sport; 1977. 46-48. (in Russian)
20. Cornelius AE, Brewer BW, Van Raalte JL. Applications of multilevel modeling in sport injury rehabilitation research. *International Journal of Sport and Exercise Psychology*. 2007;5(4):387–405. http://dx.doi.org/10.1080/1612197X.2007.9671843.
21. Visek AJ, Watson JC, Hurst JR, Maxwell JP, Harris BS. Athletic identity and aggressiveness: A cross-cultural analysis of the athletic identity maintenance model. *International Journal of Sport and Exercise Psychology*. 2010;8(2);99–116. http://dx.doi.org/10.1080/1612 197X.2010.9671936.
22. Huijing PA. Elastic Potential of Muscle. In: *Strength and Power in Sport*. Blackwell Scientific Publications; 1992. p. 151 – 168.
23. Komi PV. Stretch-Shortening Cycle. In: *Strength and Power in Sport*. Blackwell Scientific Publications; 1992. p. 169 – 179.

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CHARACTERISTICS OF PHYSICAL LOADS ENDURED BY MILITARY OFFICERS OF MECHANIZED TROOPS DURING FIELD MANEUVRES

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Abstract. *Purpose:* observation over influence of physical loads on military officers in process of acquiring and mastering of military applied skills during field maneuvers. *Material:* in experiment 120 military officers of 20-25 years old age with equal physical fitness participated. *Results:* it was determined that in period of field maneuvers the greatest load was endured by military officers in attack exercises and on the march. The least physical loads were in period of organization and fulfillment of combat shooting. It was also established that main part of motor actions was fulfilled in aerobic mode. Military officers' functioning in field maneuvers was accompanied by heart beats rate of 120-150 b.p.m. and 60-90 b.p.m. during long time. *Conclusions:* We offered to practice physical training of mechanized units' military officers in modes, close to field ones.
Key words: physical loads, military officers, heart beats rate, field maneuvers.

Introduction

Analysis of physical training system in Armed Forces of Ukraine shows that it is insufficient for ensuring of troops combat readiness. One of reasons is old means and technologies of military officers' physical training. Analysis of combat training's requirements to military officers' physical fitness points at demand in reformation and improvement of physical training system.

Recent years most of researches concerned level of military officers' physical fitness and its interconnection with results of combat readiness. L.A. Weiner-Dubrovin (1974), L.P. Popov (1984) studied organization of physical training; V.P. Leontyev (2000) carried out researches for determination of character of loads, endured by military officers of mechanized units; Yu.S. Finogenov (2003), O.I.Velychko (1990) researched structure of military professional actions; S.I.Glazunov (2003), V.M. Romanchuk (2006), S.V. Romanchuk (2013) studied dynamic of military officers' active actions and character of rest. Alongside with it, researches of main indicator of load's tension – heart beats rate (HBR) with palpation method of individual military officers at certain stages of trainings has not been practiced yet.

That is why there has been appeared a demand in researching of HBR dynamic as objective criterion of load's tension and value with modern objective methods.

Purpose, tasks of the work, material and methods

The purpose of the work is to determine characteristics of physical loads, endured by Land Forces mechanized troops' military officers during field maneuvers.

The tasks:

- Conduct timing of military officers' motor functioning during field maneuvers;
- Register HBR dynamic of military officers during fulfillment of military applied actions.

The methods of the research: analysis of literature, scientific and Internet sources, observation, medical-biological methods (pulse metering with system «Polar Team System»), method of mathematical statistic.

Organization of the research: as per idea of the research it was necessary to determine (with the help of system «Polar Team System») pulse value of different variants of military-professional actions (total quantity of HBR – heart beats rate of military officers during certain period of field maneuvers) In the research 120 military officers of 169 Training center of 20-25 years old age participated. The research was conducted during September 2012, with officers' dress code – field and ammunition of 30-40 kg weight.

Results of the research

Orientation of loads is one of main signs of physical loads' qualification (M.A. Godik, 1980). Its studying permits to understand requirements of training-combat functioning by qualitative character of military officers' motor actions.

The research of variability of alternation of different orientation's loads permits to receive materials, which can explain the reasons of weakening of military officers' professional workability in field marches. The received data can serve as a model for construction of trainings in organization of military officers' physical training.

Orientation of physical loads was studied by analyzing of motor actions' timing during 2 days' (48 hours) field marches in summer period with air temperature up to 30°. With it, we continuously registered HBR with "Polar Team System" of individual military officer. The received data were processed with the help of program Microsoft Excel – 2007. Mean HBR of military officers in rest was 60 b.p.m.

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During 2 days' field maneuvers military officers of mechanized units fulfilled a number of tasks: preparing of arms and machinery (IFV) for moving, 50 km march on IFV, two ten kilometers' marches by foot in full military ammunition; tactic tasks during attacking of enemies positions; training-combat shooting from all kinds of arms. We calculated mean HBR for 1 minute, determined HBR changes during fulfillment of every combat task in respect to indicators in rest.

Motor actions of military officers during field maneuvers were conventionally divided into the following kinds (of professional-combat functioning):

1. Actions by training alarm signal.
2. Preparation of arms and machinery for march and shooting.
3. March on IFV with rest.
4. Functioning in the staging area.
5. Organization of defense and repelling of attack.
6. Actions in attack and capture of enemies object.
7. Combat shooting of company.
8. First march by foot.
9. Second march by foot.
10. Eating, rest sleeping, hygienic measures.

Actions by training alarm signal continued 90 minutes and were 3.1% of total time. Mean HBR was 95.4 b.p.m., relative pulse intensity (pulse increment in respect to rest state) was 58.3%. Analysis of pulse values distribution in this period witness that maximal HBR reached 145 b.p.m. (approximately 3% of total time).

Preparation of arms and machinery for march and shooting took 480 minutes (16.5%) of total time. Mean HBR was 113.9 b.p.m. Such HBR was conditioned by the fact that field maneuvers envisaged mastering of certain trainings tasks. Such training stage reflected in general structure of infantryman's motor actions and character of his physical loads. These actions are of collective character, but every officer has own kind of functioning, depending on his military specialty.

Actions in march were organized moving of military officers on IFV, mainly off roads and on field roads. IFV march took 6.3% of time. It should be noted that motor functioning of military officers at this time was minimal. But uncomfortable position inside IFV, durable static tension, vibrations, constant oscillations and certain gas contamination set significant requirements to organism. Mean HBR was 106.6 b.p.m. and in some cases increased up to 165 b.p.m. In such conditions high requirements are set to power and static endurance of arms' and back's muscles.

Functioning in the staging area took 3.1% of training time. Mean HBR increased to 109.2 b.p.m. but in part of the time pulse was from 180 to 200 b.p.m. (4.4%). In general such functioning was characterized more or less smooth pulse. Distribution of time for actions in different HBR ranges was the following: from 72 to 155 b.p.m. (94.5% of time). Loads in this period were qualified as aerobic-anaerobic from maximal to moderate aerobic power.

Defensive actions took 11.9% of training time. Military officers arranged company strong point. Work was fulfilled in quick temp and required physical and psychological loads. Mean HBR was 120 b.p.m. and maximal – up to 150 b.p.m. Most of time work was fulfilled with HBR of 100-140 b.p.m. (74.4% of time).

Actions in attack and capture of enemies object took about 1.1% of total training time. Mean HBR was at level of 138.1 b.p.m. and relative pulse intensity was 130%. It was the highest value in block of soldiers' functioning. As per the data of pulse registration main part of actions (up to 70%) was fulfilled with HBR of 140-165 b.p.m. and in 6.2% of time HBR was 160-180 b.p.m. Load at this stage can be qualified as aerobic-anaerobic near maximal and sub-maximal power.

Zombat shooting included preparation of ammunition and arms, directly shooting and etc. It took 12.5% of training time. Mean HBR was 83.2 b.p.m.; in some cases it raised to 140 b.p.m. and dropped to 60 b.p.m. Analysis of military officers' actions on preparation of arm and ammunition showed that they do not require great muscular efforts and are carried out more or less in calm condition. As far as with combat shooting defensive actions are trained, shooting was fulfilled from static position from trench and from IFV.

When moving by foot (1 march was 3.4% of general training time) mean HBR was 106.6 b.p.m. At the end of march (before halt for rest) pulse reached 160 b.p.m. During most of moving time HBR was 110-130 b.p.m.

The second march by foot (final one, which took place at the end of maneuvers) was mainly with HBR of 130-140 b.p.m. (23.3%) and in some cases maximal pulse reached 180 b.p.m.

Analysis of timing data showed that marches took 5.3% of training time and mean HBR was ЧСС 142 b.p.m. (31.1% of march time). Military officers' work was, mainly, of cyclic character; it was interrupted by stops (for waiting for lagging persons). It conditioned wide range of HBR in movement.

Rest actions included eating, actions at bivouacs, preparing for sleep and night sleep. It took 27.4% of all time. Rests were distributed uniformly in process of maneuvers. Mean HBR was 60-70 b.p.m. At bivouacs it reached 80 b.p.m.

By the data of pulse register main part of actions during field maneuvers (up to 50%) was fulfilled with HBR of 100-140 b.p.m. and in 1.2% of time HBR was 160-190 b.p.m. Load in field maneuvers can be qualified as aerobic-anaerobic with near maximal and sub-maximal power.

The received data are given in table 1 and 2.

Table 1

Indicators of scope and intensity of loads during field maneuvers

Military applied actions	HBR (b.p.m.)	Time, taken by action (min.)	Relative tension of HBR (%)
Actions by training alarm signal	95.8	90	59.0
Preparation of arms and machinery for march and shooting	113.9	480	89.8
March on IFV with rest	106.6	182	77.7
Functioning in the staging area	109.2	90	82.0
Organization of defense and repelling of attack	120.1	344	100.2
Actions in attack and capture of enemies object	138.1	32	130.2
Combat shooting of company	83.1	360	38.5
First march by foot	106.6	98	77.7
Second march by foot	142.1	154	136.8
Eating, rest sleeping, hygienic measures	67.5	1050	11.5

Table 2

Indicators of loads during field maneuvers

Class intervals of HBR (b.p.m.)	Kinds of professional-combat functioning and time of actions																	
	Actions by training alarm signal		Preparation of arms and machinery for march and shooting		March on IFV with rest		Functioning in the staging area		Organization of defense and repelling of attack		Actions in attack and capture of enemies object		Combat shooting of company		First march by foot		Second march by foot	
	min.	%	min.	%	min.	%	min.	%	min.	%	min.	%	min.	min.	min.	%	min.	%
191-200		0.0		0.0		0.0	1	1.1		0.0		0.0		0.0		0.0		0.0
181-190		0.0		0.0		0.0	2	2.2		0.0		0.0		0.0		0.0		0.0
171-180		0.0		0.0		0.0	1	1.1		0.0	1	3.1		0.0		0.0	2	1.3
161-170		0.0	1	0.2	8	4.4		0.0		0.0	1	3.1		0.0		0.0	6	3,9
151-160		0.0	14	2.9	9	4.9		0.0	2	0.6	10	31.3		0.0	1	1.0	31	20.1
141-150	3	3.3	43	9.0	12	6.6	7	7.8	53	15.4	6	18.8	2	0.6	1	1.0	51	33.1
131-140	5	5.6	44	9.2	12	6.6	8	8.9	56	16.3	6	18.8	5	1.4	2	2.0	42	27.3
121-130	6	6.7	32	6.7	10	5.5	8	8.9	72	20.9	2	6.3	14	3.9	27	27.6	15	9.7
111-120	23	25.6	110	22.9	16	8.8	6	6.7	67	19.5	1	3.1	29	8.1	14	14.3	6	3.9
101-110	7	7.8	118	24.6	23	12.6	18	20.0	61	17.7	2	6.3	40	11.1	22	22.4	1	0.6
91-100	8	8.9	113	23.5	31	17.0	19	21.1	9	2.6	2	6.3	38	10.6	10	10.2		0.0
81-90	9	10.0	3	0.6	31	17.0	12	13.3	6	1.7	1	3.1	53	14.7	9	9.2		0.0
71-80	1	1.1	2	0.4	30	16.5	7	7.8	11	3.2		0.0	64	17.8	9	9.2		0.0
61-70	21	23.3		0.0		0.0	1	1.1	7	2.0		0.0	45	12.5	3	3.1		0.0
51-60	7	7.8		0.0		0.0		0.0		0.0		0.0	70	19.4		0.0		0.0
	90		480	-	182		90		344		32		360		98		154	

Analyzing timing data of field maneuvers we can note that the highest load was endured by military officers in attack actions and in marches. The least loads were endured with organization and fulfillment of combat shooting.

In general, physical load gradually increased from the beginning of training to the middle of the first day, when military officers mastered attacking actions. Then we observed its reduction and during certain period it was insignificant.

In the second day of training, loads' dynamic had other characteristic, videlicet: gradual increase of tension from moderate to maximal.

Discussion

As on to day, for optimization of military officers' physical fitness research and studying of loads' characteristics, which are endured by military officers during training combat actions (military training, field maneuvers, combat actions) are still urgent. In the process of our research we proved the character of military officers' actions, established by such scientists as L.A. Weiner-Dubrovin (1980), L.P. Popov (1983). We also supplemented indicators of scope and intensity of loads, endured military officers of mechanized units in their professional functioning, which were studied by L/P/ Leontyev (2000) and S.I. Glazunov (2003). Comparing with mentioned above scientists we researched wider spectrum of military applied actions. Measurements were carried out continuously from the beginning to the end of experiment. Modern technologies were used.

For the first time scope and intensity of loads of mechanized units' military officers in field maneuvers were determined. Class intervals of HBR during fulfillment of different professional actions were calculated. It permits to orient content and intensity of physical exercises, during training of exactly those exercises, which facilitate the most effective fulfillment of combat tasks.

Conclusions:

Analysis of HBR results showed that main part of motor actions was fulfilled mainly in aerobic-anaerobic mode. Three HBR ranges can be marked-out at these trainings:

1. Motor actions in HBR range from 60 to 100 b.p.m. – approximately 35% of training time.
2. Motor actions in HBR range from 100 to 130 b.p.m. - about 40.5% of training time.
3. Motor actions in HBR range from 130-160 b.p.m. – 23.25%.

Besides, little part of military officers' actions was conducted with HBR 160-190 b.p.m. (1.25%).

These data can be used for organization of physical training of mechanized units' military officers, for determination of its orientation, intensity and correlation of loads of different power.

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Conflict of interests

The authors declare that there is no conflict of interests.

References:

1 Glazunov SI. *Ekspres-kontrol' special'noi fizichnoi pidgotovlenosti vijs'kovosluzhbovciv mekhanizovanikh pidrozdiliv Sukhoputnikh vijs'k. Cand. Diss*. [Express control of physical fitness of mechanized units' military officers of Land forces. Cand. Diss.]. Kiev; 2003 (in Ukrainian)

2 Leont'ev VP. *Normativnoe obespechenie fizicheskoj podgotovki kursantov vysshikh voenno-uchebnykh zavedenij Sukhoputnykh vojsk Ministerstva oborony Ukrainy. Cand. Diss*. [Normative provisioning of physical training of military higher educational establishments' cadets of Land forces of Ministry of Defense of Ukraine. Cand. Diss.]. Kiev; 2000 (in Russian)

3 Pichugin MF, Griban GP, Romanchuk VM, Romanchuk SV. *Fizichne vikhovannia vijs'kovosluzhbovciv* [Physical education of military officers]. Zhitomir: ZHVI of NAU; 2011 (in Ukrainian)

4 Popov LP, Mikheev SD, Borodin IuA. O nekotorykh putiakh povysheniia effektivnosti voenno-prikladnykh vidov sporta v sisteme voenno-professional'nogo obucheniia v VUZakh [On some ways of effectiveness increase of military-applied kinds of sports in system of military-professional training in HEEs]. *Voenno-professional'noe obuchenie i fizicheskaia podgotovka* 1983;3:29–33. (in Russian)

5 Romanchuk SV, Boiarchuk OM, Romanchuk VM. Suchasnij stan ta perspektivni napriamki vdoskonalennia fizichnoi pidgotovki u sukhoputnikh vijs'kakh [Modern status and promising directions of physical training improvement in land forces]. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2010;12:125–128 (in Ukrainian)

6 Romanchuk S. Fizichna pidgotovka iak sistemoutvoriuiuchij chinnik pidtrimki boiezdatnosti vijs'kovosluzhbovciv v umovakh spekotnogo klimatu [Physical training as system-formation factor of maintenance of military officers' combat fitness in conditions of hot climate]. *Zdorov'esberegaiushchie tekhnologii, fizicheskaia reabilitaciia i rekreaciia v vysshikh uchebnykh zavedenniakh, III mezhdunarodna konferenciia, Belgorod-Krasnoiarsk-Khar'kov* [Health related technologies, physical rehabilitation and recreation in higher educational establishments, III international conference, Belgorod-Krasnoyarsk-Kharkov]; 2010 (in Ukrainian)

7 Vejdner-Dubrovina LA. *Teoriia i organizaciia fizicheskoj podgotovki vojsk* [Theory and organization of physical training of troops]. Leningrad: VDKYFK; 1980 (in Russian)

8 Fedak S. Fizichna pidgotovka iak zasib zavchasnoi adaptacii vijs'kovosluzhbovciv mirotvorchogo kontingentu do dij

v nezvichnikh umovakh sluzhbi [Physical training as a mean of preliminary adaptation of peacekeeping contingent military officers for actions in unusual conditions]. *Naukovo-pedagogichni problemi fizichnoi kul'turi* 2011;11:442-446. (in Ukrainian)

9 Finogenov Iurij, Glazunov Sergij. Utochnennia konceptual'nikh osnov funkcionuvannia ta strukturi sistemi fizichnoi pidgotovki vijs'kovosluzhbovciv Zbrojnikh Sil Ukraini [Specification of conceptual principles of functioning and structure of Armed Forces of Ukraine military officers]. *Pedagogichni nauki: realii ta perspektivi* 2009;14:255-260. (in Ukrainian)

10 Chapligin V. Vpliv faktoriv zovnishn'ogo seredovishcha na formuvannia zdorov'ia liudini [Influence of environmental factors on formation of human health]. *Fizichna kul'tura, sporti ta zdorov'ia nacii* 2004;5:509-513. (in Ukrainian)

11 Chukh L. Vpliv ekstremal'nikh faktoriv sluzhbovo-bojovoi diial'nosti na psikhofizichnij stan vijs'kovosluzhbovciv [Influence *of professional-combat functioning's extreme factors on military officers' psycho-physical condition]. Vidkrita naukovo-metodichna konferenciia "Fizichna pidgotovka vijs'kovosluzhbovciv", Kiiv* [Physical training of military officers, open scientific-methodic conference, Kyiv]; 2003 (in Ukrainian)

12 Shvec' AV, Luk'ianchuk IA. Fiziologo-psikhichna kharakteristika umov profesijnoi diial'nosti vijs'kovosluzhbovciv mirotvorchikh kontinentiv ZS Ukraini [Physiological-psychic characteristic of professional functioning's conditions of military officers-peacekeepers of AF of Ukraine]. *Problemi vijs'kovoi okhoroni zdorov'ia* 2006;16:382-387. (in Ukrainian)

13 Shekera OG. *Novi problemi mizhnarodnoi mirotvorchoi diial'nosti Ukraini* [New problems of international peacekeeping activity of Ukraine]. Kiev; 2004 (in Ukrainian)

14 Bulicz E, Murawow I. *Human health and diagnostics: health effects of motor activity.* Radom: Politechnica R; 2003

15 Bonn KE, Baker AE. *Guide to military operations other than war. Tactics, techniques and procedures for stability and support operations.* Domestic and International; 2000.

16 Neschadym M.I. *Reform in the Ukrainian Military Education. NATO training group working group on individual training and education developments*. Bonn; 1998.

17 Huang J, Wang Y, Cheng X, Zhou L, Wu Z. Current status of medical support in military operations other than war in domestic and overseas. *Journal of Medical Colleges of PLA* 2012;27(6):343-350. http://dx.doi.org/10.1016/S1000-l948(13)60004-0.

18 Nada RA, Armstrong A, Shaheen HI. Phenotypic and genotypic characterization of enterotoxigenic Escherichia coli isolated from U.S. military personnel participating in Operation Bright Star. Egypt, from 2005 to 2009. *Diagnostic Microbiology and Infectious Disease* 2013;76(3):272-277. http://dx.doi.org/10.10I6/j.diagmierobio.20I3.03.028.

19 Sergienko YP, Andreianov AM. Models of professional readiness of students of higher military schools of the Armed Forces of Ukraine. *Physical Education of Students* 2013;6:66-72. http://dx.doi.org/l0.608/m9.figshare.840507.

20 Lisowski VO, Mihuta PYu. Importance of coordination skills essential psychophysical demonstrated competencies as a military specialists. *Physical Education of Students* 2013;6:38-42. http://dx.doi.org/10.6084/m9.figshare.840501.

21 Konovalov VV, Poddubny AG, Poltavec AI. Forming a motivation to the studies by the military-applied exercises for the cadets of few specialties of university of civil defence of Ministry of emergency measures of Ukraine. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2013;3:31-35. http://dx.doi.org/10.6084/m9.figshare.653978.

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THE COMPARISON OF SOME ANTHROPOMETRIC, BODY COMPOSITION INDEXES AND VO2MAX OF AHWAZ ELITE SOCCER PLAYERS OF DIFFERENT PLAYING POSITIONS

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Abstract. *Purpose*: The purpose of this study was to compare some anthropometric, body composition indexes and VO2max of Ahvaz elite soccer players of different playing positions. *Material*: Participants were 60 male soccer players (age 24.31±4.20 years) from 4 teams in the two highest divisions in Iran. The sample included 8 goalkeepers, 18 defenders, 20 midfielders and 14 strikers. Anthropometric variables of subjects (height, weight and BMI) and body composition (%BF) were measured. Skinfold thickness measurements were taken using Harpenden skinfold calipers at three sites (triceps, subscapular and abdominal) and the VO2max of the subjects was estimated by participation in a multi-stage 20m shuttle-run test. One-way ANOVA and Tukey testes were used for possible differences in test variables between different player positions. *Results*: Results revealed that the goalkeepers were significantly ($p<0.05$) the tallest, heaviest and had lower VO2max than another positions. Beside the midfielders had significantly ($p<0.05$) higher VO2max than the goalkeepers. Also, no difference in estimated body fat percentage and BMI was observed between players of all positions. *Conclusion:* Thus, it can be concluded that anthropometric and physiological differences are exist among soccer players who play in different positions. These differences fit with their different workload in a game. Therefore, programs must be include specific sessions for each positional role.
Key words: BMI, Body Fat Percentage, Shuttle-Run Test, VO2max.

Introduction

Soccer is the most popular sports all over the world, and it has been practiced by every nation, without exceptions (1), and in the last few years, there is more and more interest by the biological sciences to improve the knowledge related to the soccer game through studies in several areas.

Due to the big dimensions of the game field and the duration of a match, each athlete performs a specific function within the team, as follows: goalkeepers, defenders, midfielders and strikers. According to each position and tactical pattern, the total distance ran by a player is different from the remaining, as well as the type and intensity of the actions accomplished (2-4).

The assessment and determination of the anthropometric characteristics (height, body mass and composition) is essential to a successful achievement of a soccer team not only during a game, but also along the whole sportive season, and such information can and must be used by the coach to change the player's function or even the tactical formation of the whole team, with the purpose to maximize the performance, once each positioning presents specific features (5).

During a 90-min soccer match an elite player covers on the average between 10 and 11 km per game (6-10). Although the distance covered by different players in the same position varies, studies have shown that midfielders travel farther than goalkeepers, defenders or strikers, probably because of their linking role in the team (6,8,10). Studies on the physical performance of elite soccer players indicate that the average maximal O2 uptake ranges between 56.8 and 67.6 $mL \cdot kg^{-1} \cdot min^{-1}$ (6,7,11-17.

Nevertheless, aerobic power has been well recognized as an important physiological contributor to soccer performance (7,18). Previous studies have demonstrated a significant relationship between distance covered during the game and the players maximum aerobic power (11,19).

Since the physiological as well as physical characteristics are rather important in players' performance (19), it may therefore be assumed that anthropometric and VO2max measurements may differ between footballers of different playing positions, for instance forward, goalkeeper, back and halfback. Consequently, differences in the physical characteristics of footballers of different playing positions within teams are also worth investigating.

Thus, the purpose of this study was to assess the anthropometric profile, body composition and VO2max of elite soccer players, and to verify if there is any difference between their positioning (goalkeepers, backs, halfbacks and forwards) among the assessed variables.

Materials and Methods

The study was approved by the Human Research Ethics Committees of Shahid Chamran University of Ahwaz. Subjects were included 60 elite players (age mean 24.31±4.20 year) from 4 Ahwaz soccer teams (these teams participated in the super and the first Iran soccer league in session 2008-2009), divided according to their field positioning: 8 goalkeepers, 18 defenders, 20 midfielders and 14 strikers.

Anthropometric and body composition measurements

Weight (kg) was measured with Seca digital scale to the nearest 0.1 kg.

Height was measured using a wooden stadio-meter (20,21) to the nearest 0.5 cm.

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Skinfold thickness measurements were taken with Harpenden skinfold caliper (British Indicators, UK) to the nearest 0.1 mm. The formula used to attain the body fat percentage was proposed by FAULKNER (%BF = Σ of the skin folds × 0.153 + 5.783) using the tricipital, subscapular, and abdominal folds (21).

Body mass index (BMI, $kg \cdot m^{-2}$) was calculated as the mass (kg) divided by the squared height (m).

VO2max measurements

As a guide to overall fitness, the subjects participated in a multi-stage 20m shuttle-run test to estimate their VO2 max (22). After familiarization, the tests were performed in groups to ensure maximal effort by stimulating competition.

Following personal warm up routines, the test commenced with a four second countdown after which the tape emitted a single beep at regular intervals. The subjects had to reach the end of the 20m course by the time the next beep sounded. They then proceeded to run back and forth along the 20m reaching either end of the course every time a beep was emitted from the cassette recorder. After each minute, the span between the beeps decreased leading to a proportional increase in running speed of 0.14 m/second.

Every minute spent running was termed "another level".

Each subject ran for as long as was possible before voluntarily withdrawing when they could no longer keep up with the pace set by the tape. Subjects failing to reach the end of the 20m run twice before the beep sounded was withdrawn. The number of levels and shuttle runs completed were noted at the time the subject retired. Maximal oxygen uptake values were then predicted using the tables of Leger & Lambert (1982) (22) based on the relationship between VO2 max and the maximum speed achieved in the multi-stage shuttle run.

The shuttle-run test was performed on the Takhti stadium in Ahwaz of Iran.

Statistical analysis

SPSS (version 17.0) was used for the statistical analysis. Players in the study were classified as strikers, midfielders, defenders, and goalkeepers. The most common playing formation was 4-4-2 (four defenders, four midfielders, and two attackers), although 3-5-2 and 4-5-1 were also seen. A one-way ANOVA and Tukey Test were used for possible differences in test variables between different player positions (goalkeepers, defenders, midfielders, and strikers). P values < 0.05 were considered as statistically significant.

Results

Table 1 presents the results related to the anthropometric, body composition and VO2max data. Goalkeepers was significantly taller than defenders (p=0.034), midfielders (p=0.001), and strikers (p=0.003) and defenders was significantly taller than midfielders (p=0.004). Goalkeepers was significantly heavier than defenders (p=0.003), midfielders (p=0.001), and strikers (p=0.001). Midfielders had significantly higher VO2max than goalkeepers (p=0.005). Also, no difference in estimated body fat percentage and BMI was observed between players of all positions.

Table 1

Anthropometric, body composition indexes and VO2max in Iranian elite soccer players

Positioning	Height)cm(	Weight)kg(	BMI)m/kg²(	Body fat)%(	VO2max (ml.kg⁻¹min⁻¹)
Goalkeepers (n = 8)	b 1.87±0.04 1.94 1.80	b 85.18±4.1 92.10 80.53	24.24±1.16 22.63 25.98	12.25±1.30 13.74 9.61	a 55.73±2.93 59.66 50.45
Midfielders (n = 20)	1.75±0.05 1.86 1.67	72.35±4.54 82.50 66.32	23.45±1.04 25.01 20.53	10.71±1.12 12.71 8.86	60.69±3.55 66.29 54.12
Strikers (n = 14)	1.79±0.05 1.89 1.70	73.76±8.90 87.40 58.00	22.93±2.00 25.98 19.16	10.84±1.65 14.79 8.54	59.71±3.16 65.60 54.01
Defenders (n = 18)	a 1.81±0.04 1.90 1.73	75.78±5.66 85.14 64.50	22.89±1.29 24.78 20.66	11.17±1.67 13.74 8.86	57.89±3.57 65.30 51.35
All Players (n = 60)	1.79±0.06 1.94 1.67	75.40±7.14 92.10 58.00	23.27±1.42 25.98 19.16	11.08±1.50 14.79 8.54	58.96±3.73 66.29 50.45

a Significantly different from midfielders ($P < 0.05$). b Significantly different from players of other positions ($P < 0.05$).	Mean and SD Vmax Vmin

Discussion

The anthropometric profile in soccer professional players can be characterized by its heterogeneity, and this may be partially explained by the ethnic and racial differences of its practitioners (1,5). The present results on player height, weight, BMI, %BF and VO2max are in accordance with previous studies on elite soccer players.

In this study, it was verified that goalkeepers and defenders are taller compared to other analyzed athletes, and such data was also found in several studies evidencing such trend (1, 3, 23-27). In order to a team to be successful, it is essential that goalkeepers have a privileged height, Because the important tasks of a goalkeeper are to react and move quickly, to a higher amount of jump or dive to save or deflect shots, and to cover a large perimeter (2.44 × 7.32 m).

We observed very few differences between the three groups of outfield players, defenders, midfielders, and strikers. Defenders were significantly taller than midfield players, which can be taken as an indication that size is an advantage in this position to be able to reach high balls in their defensive role and perhaps to increase their reach in tackling duels, as well. Opposite to this, midfielders and strikers are shorter and rather run with the ball, and they are quicker, and this fact grants to them an additional advantage against the defenders (11, 28).

As to the body weight, goalkeepers have shown to be heavier than the other assessed positions. These results are similar to the ones found by several authors from several countries, who also attained the same answers (14,23,24,27,29,30,). The behavior of this variable seems to partially explain the lower distance they run, besides of their specific role during a game (4, 11, 15, 26), trend to present a higher percentage of body fat by a lower metabolic energy cost both in gaming days and along training sessions (3, 26), have a higher amount of muscular by requiring to much explosive power and be taller than players of other positions. In this the study, there was not differences in BMI between different playing positions that such data are in accordance with previous studies on elite soccer players (24, 27,31,32).

The body composition is a very important aspect to the physical ability level of the professional athletes in any modality, as the fat surplus can substantially decrease the human performance (Reilly, 2003). It was observed in the present study no differences in the percentage of body fat among the assessed positions, and such data are in accordance to other found in literature (23, 27, 31), but some previously mentioned researches (14, 25, 29, 30) have shown that the goalkeepers have a higher percentage of body fat due to a lower metabolic energy cost both in gaming days and along training sessions then players of other positions (3, 26).

It can be seen clearly in literature (11, 14, 17, 18, 23, 32, 33) that the midfielders always have highest VO2max and the goalkeepers have lowest VO2max in compared with players of other positions but there are not differences in VO2max between midfield players and strikers or defenders. Our comparison between different playing positions related to VO2max showed that the goalkeepers had a lower VO2max than players of other positions because they present much more anaerobic strength and power both in gaming days and along training sessions than midfielders with an excellent aerobic ability level, indicating that running ability and aerobic power are less important for them. We did not find a difference in VO2max between midfield players and strikers or defenders but the midfielders had the highest VO2max. Midfielders cover greater total distances than any other players in the other positions. The midfielders must have high level of aerobic fitness because they perform both defensive and offensive roles and are always required to make long run (19).

Conclusion

The results obtained in this study suggest that there are anthropometric differences between athletes, according to their assessed positions, and the correct use of these individual differences in behalf of the team can contribute to the sportive success. We observed very few differences between the three groups of outfield players, defenders, midfielders, and strikers but Goalkeepers demonstrated different physical and physiological characteristics from outfield players. The small differences observed in physical and physiological fitness between players in different player positions (outfield players) is perhaps not surprising, because in modern soccer each outfield player assumes a larger role in the overall play of the team, so the positional differences are less than previously seen.

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References

1. Reilly T, Duran D. Fitness assessment. In: Reilly T, Williams AM, editors. *Science and soccer*. 2nd ed. London: Routledge;.2003.
2. Guerra I, Soares E, Burinini R. Aspectos nutricionais do futebol de competição. *Rev Bras Med Esporte*. 2001;7:200-206.
3. Reilly T, Bangsbo J, Franks A. Anthropometric and physiological predispositions for elite soccer. *J Sports Sci.* 2000;18: 669-683.
4. Salvo VD, Pigozzi F (1998). Physical training of football players based on their positional rules in the team. J Sports Med Phys Fitness. 38: 294-7.
5. Shephard R. Biology and medicine of soccer: an update. *J Sports Sci.* 199917:757-786.
6. Bangsbo J, Norregard L, Thorso F. Activity profile of competition soccer. *Can. J. Sport Sci*. 1991;16:110–116.
7. Bangsbo J, Michalsic L. Assessment of the physiological capacity of elite soccer players. In*: Science and Football IV*. W. Spinks, T. Reilly, and A. Murphy (Eds.) London: Routledge; 2002.
8. Ekblom B. Applied physiology of soccer. *Sports Med*. 1986;3:50–60.
9. Reilly T. Motion characteristics. In: *Football (Soccer),* B. Ekblom (Ed.). London, Blackwell; 1994.
10. Tumilty D. Physiological characteristics of elite soccer players. *Sports Med*. 1993;16:80–96.
11. Al-Hazzaa H, Al-muzaini K, Al-Refaee S, Sulaiman M, Dafterdar M, Al-Ghamedi A. Aerobic and anaerobic power characteristics of Saudi elite soccer players. *J.Sports Med Phys Fitness*. 2001;41:54-61.
12. Bangsbo J, Lindquist F. Comparison of various exercise tests with endurance performance during soccer in professional players. *Int. J. Sports Med*. 1992;13:125–132.
13. Casajus JA. Seasonal variation in fitness variables in professional soccer players. J. Sports Med. Phys. Fitness. 2001;41:463–469.
14. Davis JA. Pre-season physiological characteristics of English first and second division soccer players. *Journal of Sports Sciences*. 1992;10(6): 541-547.
15. Rhodes EC, Mosher RE, Mckenzie DC, Franks IM, Potts JE, Wenger HA. Physiological profiles of the Canadian Olympic Soccer Team. *Can. J. Appl. Sport Sci.* 1986;11: 31–36.
16. Strudwick A, Reilly T, Doran D. Anthropometric and fitness profiles of elite players in two football codes. *J. Sports Med. Phys. Fitness.* 2002;42: 239–242.
17. Wilsoff helgard U, Jand hoff J. Strength and endurance of elite soccer players. *Br.J. Sports Med.* 1998;38(3): 285-288.
18. Reilly T. *Science and Soccer* .E & FN Spon, London; 1996.
19. Bell W, Rhodes G. The morphological characteristics of the association football player. *J Sports Med Phys Fitness.* 1998;20:196-200.
20. Lohman T, Roche A, Matorrel R. *Anthropometric standardization reference manual*. Illinois: Human Kinetic books; 1998.
21. Marins J, Giannichi R. *Assessment and prescription of Physical Activity*. 2a ed. Rio de Janeiro: Ed. Shape. 1998.
22. Leger J, Lambert L. A multistage shuttle run test as a predictor of VO2 max. *Eur J App Physiol*. 1982;49:1-12.
23. Arnason A, Sigurdsson A, Gudmundsson I, Holme L, Engedrebsen B, Bahr R. Physical Fitness, Injuries, and Team Performance in Soccer. *Med Sci Sport Exerc*. 2004;36: 278-289.
24. Carvalho C, Roriz-Olivera P, Carvalho A. Analysis of different parameters of physical condition for footballers in accordance to their field position. *World Congress of Science and Football* V. Faculdade de Motrisidade Humana, Universidade Tecnica de Lisboa, Lisbon, Portugal; 2003.
25. Matkovic B.R.ac, Misigoj-Durakovic M.a, Matkovic B.a, Jankovic S.a, Ruzic L.d, Leko G.a, Kond ric M.b. Morphological differences of elite croatian soccer players according to the team position. *Scopus- Collegium Antropologicum.* 2003;27: 167-174**.**
26. Rico-Sanz J. Body composition and nutrition assessment in soccer. *Int J Sport Nutr.* 1998;8:113-123.
27. Wanger L.d.P, Joao P.B, Ricardo L. F.G, Celis L.R, Laura C.C, Ana R. Damaso B. Anthropometric profile and macronutrient intake in professional Brazilian soccer players according to their field positioning. *Rev Bras Med Esport*, 2006;12: 52-55.
28. Bangsbo J. The physiology of soccer-with special reference to intense intermittent exercise. *Acta Physiol Scand.* 1994;15(Supply 619):1-156.
29. Reeves S, Poh B, Brown M, Tizzard N, Ismail M. Anthropometric measurements and body composition of English Malaysian footballers. *Mal J Nutr.* 1999;5: 79-86.
30. Gil S.M, Gil J, Ruiz F, Irazusta A, Irazusta J. Physiological and anthropometric characteristics of young soccer players according to their playing position: Relevance for the selection process. *J. Strength Cond. Res.* 2007;21(2): 438-445.
31. Clare H, and Colin W. Anthropometric assessment of Premiership soccer players in relation to playing position. *European Journal of Sport Science*. 2006;6(4): 205-211.

32. Cochrane B, Pyke F. Physiological assessment of the Australian soccer squad. *The Australian journal of the health, physical education and recreation*. 1976;4:21-25.
33. Cristiano DDS, Jonatan B, Joao CBM. A review of stature, body mass and maximal oxygen uptake profiles of U17, U20 and first division players in Brazilian soccer. *Journal of Sports Science and Medicin*e; 2008;7: 309-319.

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THEORY AND PRACTICE OF RHYTHM IN THE PROFESSIONAL TRAINING SYSTEM FOR ATHLETES AND TEACHING STAFF

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Abstract. *Background*. Rhythm is important for the implementation of all processes as in nature and in living organisms. It organizes motor human activity making it more productive and rational. On teaching working and sports motions the process of the impellent work correct rhythm assimilation plays an important role because it determines the movement performance optimum that is shown in its automation process reduction. As a result, man's physical strength and nervous energy are saved. Rhythm category acquires a special status for the physical training specialist. All his activity including the motor component depends on the rhythm. The aim of the research is to study the physiology of rhythm and justify the more efficient training process for future teachers and coaches. *Methods*. The following theoretical research methods were used: the abstract and axiomatic methods, analysis and synthesis, induction and deduction, idealization, comparison and generalization. *Results*. As a result of study of materials from the natural sciences, numerology, psychology, music, cybernetics, synergetic, physiology, was found that the change of different states, as in nature and in living organisms, is an undulating rhythmic character. Physiological basis of the same rhythm is dynamic change excitation and inhibition processes occurring in the central nervous system. In this paper features of rhythm were identified. To accelerate the assimilation of motor action rational rhythm it is necessary to develop a sense of rhythm which is successfully formed in during the musical-motor activities. *Conclusions*. For today the study of the rhythm phenomenon in professional preparation on physical education and sport, in our opinion, requires the further study. Adding exercises involving certain motor skills elements similar in rhythmic structure with professional and technical actions to the coaches and teachers education and the competitive technology formation should be indisputable.
Key words: rhythm, motor action, professional preparation, coaches, teachers.

Introduction

"The world is ruled by the rhythm. Cepheid stars rhythmically pulse, waves rhythmically billow, hearts rhythmically beat, day and night, and seasons are replaced. To a certain rhythm, …, is corresponding the phases of mountain formation…. There is the precise rhythm in climate changes…. The rhythm is for all beings – a lot of birds, fish and animals perform seasonal migration, most of plants have seasonal life rhythm. But the rhythm laws seemed to permeate our world deeper that it can be supposed" [20].

Even the ancient noticed rhythmic character of many life phenomena starting with the seasons and corresponding changes of nature and a man and ending with the rhythm in music and different peoples' languages.

The continuous change of qualitatively different states in nature as well as in beings defines wave rhythm characteristic. Waviness is shown as a result of some heterogeneous reason clash. Some process increases and decreases do not just occur, the certain phase change is observed. Every wave is something achieved, and next wave showing something like cumulative effect, stratifying on the previous one is defined by any further penetration. This rhythmical process must not be compared with going round in circles where everything is back to the point of reference. There is the spiral motion like we have such return but on the next level every time. The more complete this process, the more noticeable its creative character. It is marked in rhythmic processes of life where their structural and creative character can be spoken about.

Material and Methods.

Rhythm category gets special status for physical education specialist. All of his or her activities including motor component depend on the rhythm laws. The aim of the investigation is to study the physiology of rhythm for improving the process preparation of teachers of physical education and coaches. The research used the theoretical investigation methods: abstract and axiomatic methods, analysis and synthesis, induction and deduction, idealization, simile and generalization.

Results of the study.

The scientist-physiologist Perna N. (1878 – 1923) in his work, "Man's Life" [17], presented all life processes as the wave-like rhythmic processes and justified every new wave of this process as a new achievement stage. He analyzed the physiological rhythms at the separate tissues and organs level and resulted that rhythm is for every organism process without exceptions. On scientist's opinion the people who "concentrated on their inner spiritual life", musicians, poets, philosophers, artists, have more expressed long-term rhythm. The wave-like life according to Perna N., however, cannot be found at people of practical activity. It is probably due to natural professional selection as far as the scientist says that practice needs to react to external impulses quickly and precisely. The people having expressed periodicity in their spiritual life are not always able to do it. As for scientists Perna N. notices that they are between those two categories mentioned above.

Rhythm is the most important forming characteristic of the spatial unity, so it is one of the universe and worldview background. Morozov N.D. [16] justifies historic event cycle in this context. He says that due to cycle laws

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the events within any historic period can be forecasted drawing an analogy between modern and ancient worlds. All historic events developing spirally are accurately cycled complying with mathematics laws, and it is impossible to resist this process. Morozov N.D. notices that knowing the repetition algorithm of historic processes the program to analyze future changes in the society can be created.

The researcher calculated so called "polar cycle" and mathematically proved that it is the natural model of the planet rhythm phase interaction. Its stages and periods effect on our life.

In 1881 Sechenov I.M., world known physiologist, was the first who managed to observe the right rhythmic occurrence of voltage in frog's medulla oblongata according to the respiratory process rhythm. It shows the fact that this rhythm changes and can be disrupted stopped if they are influenced by the afferent nerves injuring. It was the respiratory period that the physiologist used as circumstance helped to define that the rhythm of voltage occurrence regarding the impulses from afferent nerves transforms and is blocked according to the same laws as well as the respiratory rhythm itself does [18].

The continuation of physiological theory of rhythm can be observed in the works written by Ukhtomskii A.A. His dominant model presents the cooperation system of the processes where rhythmical, oscillatory processes of subsystems are the system forward movement basis. From this point of view we can say that the dominant integrates separate processes from diverse fields together due to "the driving rhythm" drawing them into resonance, and these constellations can be stable. The rhythmic influences from initiative centre gradually include new and new components into harmonic activity areas because these ones can perceive the rhythm specified and be set according to it. "Monotonous operating march at ongoing work is only achieved by mutual co-setting up on some average "sympathetic rhythm" of the work in more labile and less labile components of central constellation" [19, p.219]. According to the utterance given to us are allowed to analyze the problem of rhythm reception.

Sechenov I.M. [11] was the first who highlighted the sense organs' role in time perception. He believed that temporal features of objective reality, a person perceives through a system of analyzers. The auditory organ and kinesthetic sensitivity organs become the most important of them. Motor analyzer sets the interaction between different analyzers (perception of space, time) a man comprehends the surrounding reality.

Pavlov I.P. and his students realized the farther experimental study of theoretical conceptions on analyzer's activity connected with conditioned reflex. Having established the concept of conditioned reflex Pavlov's school [10] showed that time is the same stimulus such as visual, acoustic, tactile and so on. In addition, it was proved experimentally that the time perception is carried out with the help of analyzers uniting into a kind of system, acting as a unit. This fact, in turn, determined connection of rhythm assimilation with all analyzers activity. To understand physiological mechanism rhythm sense the great interest is for the cortical processes of duration perception, quickness perception and the sequence of stimuli i.e. those parameters which are characteristic of rhythm.

Pavlov I.P. [10] established excitation and inhibition processes existence in every main process occurring in nervous system. Besides excitatory process attenuation, change by inhibitory process has a wave-like rhythmic character. So the peculiarities of central nervous regulatory processes and external activity of efferent apparatus have all main features of the rhythm for motion. The dynamic stereotype formed this way in motor activity is a balanced system of excitation and inhibition cortical processes which are perceived with sufficient stability in time and space under these conditions.

We see the role of cortical stereotype at motion apparatus rhythmic organization in Vinogradov's M.I. researches. While studying labor processes physiology he revealed that at the process of conditioned reflex elaboration "the new rhythmic process, this or that, periodicity of excitation state changes in nerve processes" is created for a while [13].

The famous physiologist Kvasov D.T., Ukhtomskii's student, showed the rhythmic motion regulation by cerebral cortex hemispheres [15]. He was one of the first who used the method of rhythmic motion electrophysiological research, confirming once more the thesis that the motion automation does not connected with motion regulation transition into sub cortical centers, but it must be considered as the stable fixation of temporary connections in cerebral cortex hemispheres.

Thus, we can conclude that cortical parts of the brain play leading role in time perception process. Conditioned reflex activity is a basis of the time perception; the neural processes occurring in it have the rhythmical character. The dynamic change of excitation and inhibition processes in nervous system is the physiological basis of the time perception and, therefore, the sense of rhythm.

For the time conditioned reaction formation as a physiological mechanism underlying the rhythmic movements the readers are referred to a number of the works on physiology written by other scientists such as Behterev V.M., Alexeev M.A., Vasiutin A.I.

The rhythmic processes importance and turning them into the same rhythm while combining a holistic process are noticed in cybernetics and synergetics paying attention to the essence of complex systems self-organization.

Norbert Wiener, an American famous mathematician and philosopher, the originator of cybernetics and artificial intelligence theory marked "… nonlinear interaction creating the gravity of frequencies can originate self-organizing system, …" [14, p. 293]. The researcher studied the brain electrical wave origin, as a result he discovered that they go through the sequence of positive and negative phases before calming down. This fact, to some extent, explains the theory of brain waves self-organization. These waves, in turn, promote the organization rhythm of individual human organs and systems rhythm. So, the diurnal rhythm is about 23 ½ hours. It is observed in many living organisms. This rhythm can be turned into 24 hour rhythm of day and night by the environmental changes. Biologically it is not significantly if the living organism natural rhythm is 24 hours exactly providing it can be drawn to 24 hour rhythm by environment" [14, p. 290].

Amosov N.M., a Ukrainian cardio-surgeon and cyberneticist, in his works paid attention to the fact that "… while designing the real systems of "artificial intelligence" it can be reasonable to show some functions of the mind as network models, others – as algorithmic ones" [1, p. 11].

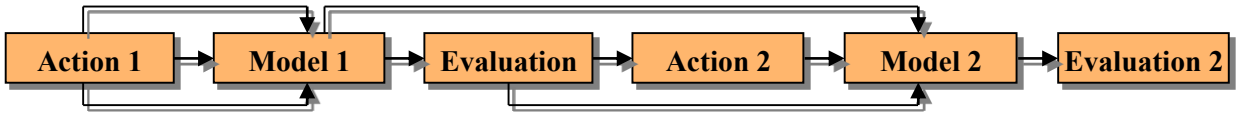

Fig. 1. Chain of actions as "activity tacts" according to Amosov N.M. [1]

Figure 1 shows the algorithm of actions with models implementation. Herewith every next model is chosen as a result of elementary action taking into consideration the links with the previous models within some "tacts". Besides, to perform actions it is necessary to have a stimulus that defines the activity level of the model chosen making it generate energy according to its "input" – "output" characteristic. The other models and stimulus energy is considered at the "input". For example, the stimulus energy is considered for **Model 2** not only from **Action 2** but from **Model 1**.

Scientist says that the action model is a part of the program where the hierarchy can be revealed: from the actions "in general" in any event chain to the concrete action with a model. Besides, the necessary condition of this program must be some "tension" as an activity level being the need or stimulus for this or that activity.

Kurdiumov S.P., a scientist, specialist in Mathematical Physics, math-modeling, Plasma Physics and synergetics, said the same: "The complexity of the structure is associated with coherence. The coherence is the coordination of the structure life paces by means of diffuse, dissipative processes being macroscopic manifestation of chaos. To create complex organization it is necessary to connect substructures inside it, to synchronize the pace of their evolution. As a result, the structures get into the same tempo-world, thus they acquire the same exacerbation moment, start "to live" at the same pace. To create the complex structure it is necessary to be able to connect the structures of "different age" developing at different tempo of the structure, memory elements must be turned on" [9, p. 104].

We should mark that rhythm is brightly shown at the human motor activity doing sports, athletic movements as well as in every day life. The motor rhythm is presented by different time correlation of motion strong accent parts connected with active muscular efforts and tenses, and weak, passive movement phases. In other words, the motor rhythm can be determined as coherently organized distribution of the efforts in space and in time. Both cyclic movements presenting periodically repeating cycles (walking, running, jumping with jump ropes, rowing etc) and acyclic (one-act) forms of movement (jumping, throwing) have rhythmic characteristic. Any complete motor act is performed rhythmically, thus, it will be performed either rationally (rhythmically right) or irrationally (breaking the rhythm that is the correlation between movement parts duration.) It should be noted here that we must not say there is no rhythm in the movement at all. In this aspect the *rhythm* features are:

- the natural ratio correlation of the elements duration. These elements form the complex structure of the process given and present the definite rhythmic pattern;
- the elements difference according to the force. The difference is expressed by emphasizing/accentuating in sound or motor form;
- form-building importance of the rhythm that unite the process elements and the structure of the process given has its inner regularity and certainty;
- manifestation of emotional character. It is connected with the effect of rhythmic pattern different forms on the emotion centre.

Thus, rhythm is an important thing for processes performed by people at any activity. It organizes the motive activity, makes it more efficient and rational. The process of the right motive rhythm adoption is very important for labor and sports movement teaching because it presents the optimal option of movement performing. It is exercised at shortening the process of its automation. As a result man's physical strength and nervous energy are saved. To learn the rational rhythm of motor actions as soon as possible we must develop a sense of rhythm that is understood as person's ability to distinguish with great fidelity his motion in time, in space and according to the efforts expended.

A sense of rhythm can be considered as specialized perception generating in the process of motor, music and other human activities. It is a basis to educate all types of coordination that will help to achieve the great results in any activity.

A number of scientific works studies the rhythm sense problem. The researches made by Teplov B.M., a professor, an outstanding psychologist, have a special place among them. He showed in his work "Psychology of Musical Abilities" [12] that the sense of rhythm has the motor nature. The rhythm perception has never been only the aural one. It is always auditory-motor process. Experience, by itself, is always active. You must not simply "hear the rhythm". A listener only experiences the rhythm when he "co produces", "co does" it, that is expressed in peculiar experience of the activity "sense of activities".

Thus, music perception has the auditory-motor character. Learning the music rhythm we form movement performance rhythm itself.

Foreign psychologists such as Roger McDoudall [5], Thaddeus Bolton [3], Kurt Koffka [8] and others highlighted the active, efficient motor nature of the rhythm perception.

This statement has a great importance at specialists training in the sphere of physical education. Along with the pedagogical skills a teacher of physical education at institutions as well as organizations which are for physical development and health promotion must manage specific musical and rhythmic/motor skills. It is particularly for coaches of different types of fitness, especially in aerobics where the skills given are necessary for training. It includes the following: conducting exercises in accordance with the musical-rhythmic composition; implementation of rhythmic counting in accordance with the musical measure; timely submission of commands and special gesture for starting and ending the exercise; implementation of methodological comments and instructions in accordance with the rhythm of executing the movements.

Athletic coach faces this problem forming the exercise technique. It has special rhythmic structure (in each sport) supposing optimal implementation of these exercises. It means that a coach should have appropriate professional skills showing the exercises as well as explaining them.

The basis of skills mentioned is a sense of rhythm that can be developed by those people who have not this sense and can be improved by those who spontaneously showed it with birth.

Discussion.

We can suppose that working-out of rhythmic patterns of every motor action (professional, competitive) and the following practice can promote coaches-teachers' faster learning as well as sport activities. In other words, the law of skill positive transfer will be reflected here. It is very important at the beginning stage of pedagogical studying at higher education establishment and at the beginning stage of the training in any sport. Both in the first and second cases, the process of professional and technical actions formation is consecutive from initial to linking and partial skills where rhythmic patterns will be the fundamental fixed basic points. In our opinion, adding the exercises that include definite elements of motor skills to the process of coach-teacher education and competitive technique formation must be without controversy. These skills are similar with professional and technical actions according to the rhythmic structure.

The investigations, made by Aftimichuk O.E. [2], Craijdan O.M. [4], Faur M.-L. [6], Gönczi-Raicu M. [7] have confirmed this fact. Their works have the same aims: improvement of sportsmen and profile specialists' training process, and the objectives, the main of which are: development of rhythm sense with musical and rhythmic education, formation of pedagogical and sports activity's rhythmic structure.

To solve these problems we focused on the main tasks: creation of rhythmic patterns and their coordination with structure of any motor action. Thus, the researches had to study music basis (which is included in the program of university discipline "Musical and Rhythmic Education").

The problem of competitive activity's rhythmic structure has always been actual for investigations in lots of sports. There is a lot of information in literature on biomechanics of motor action locomotion in cyclic exercises. It has been analyzed to some extent in acyclic sports. Meanwhile there are not materials on the methodology of the motor action rhythmic structure formation in scientific and methodological sources. The scientists often research the motor action formation and its phase character without taking into account the methods of education.

Speaking about professional pedagogical training for specialist of physical culture and fitness, in particular, his activity rhythmic structure has not been investigated enough, though not only the sensor-motor and motor aspect [6], but the speech aspect [2] as the principal one is included. This fact predetermines integrative coordination (fig. 2).

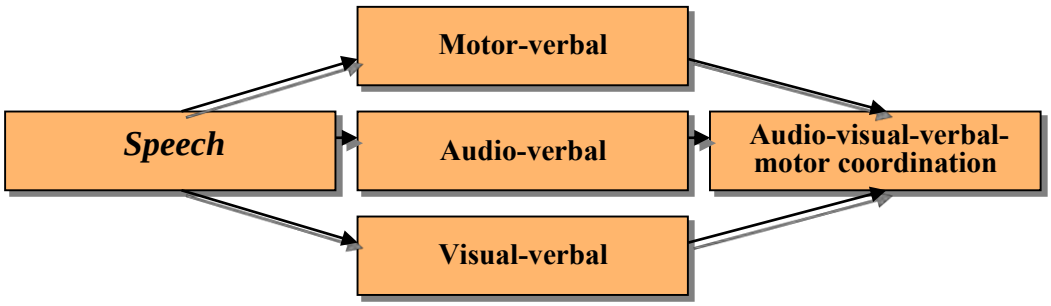

Fig. 2. Rhythmic structural components of professional activity of the physical culture specialist (coordination aspect)

The process of rhythmic structures' formation in professional activity can be presented within the framework in the Conceptual Model (fig. 3).

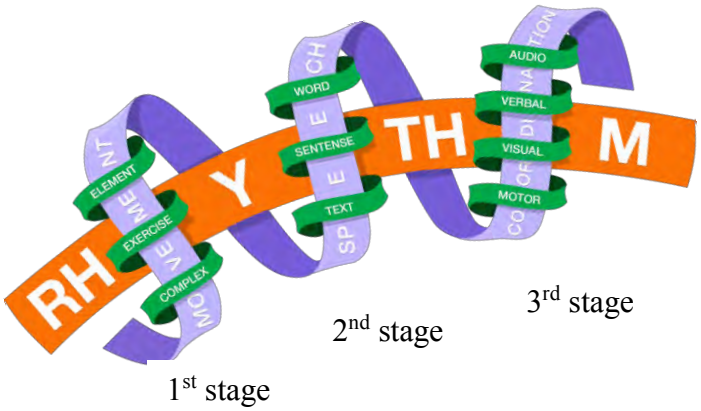

Fig. 3. The Conceptual Model formation of rhythmic-structures activity of the specialist of Physical Culture

To summarize the mentioned above we can make the following conclusion and the further investigation prospects.

Conclusions

Having studied materials from natural history, psychology, music, cybernetics, synergetics, physiology we have revealed that change of different states occurring in nature as well as in living organisms has wave-like rhythmic character. Physiological basis of rhythm is the dynamic change of excitation and inhibition processes occurring in the central nervous system.

To form rhythmic structure of both motor and speech actions purposefully, we offered to add "Musical and Rhythmic Education" working out to different sports training systems as well as adapting its content to verbal software for educational and training process for teachers and specialists in fitness.

References

1. Amosov NM. *Algorithms of the Mind*. Kiev: Naukova Dumka; 1979.
2. Aftimiciuc O. Formation of the rhythm didactical communication at the students of the Institute of physical culture: Diss. Kishinau; 1998.
3. Bolton TL. Rhythm. *American Journal of Psychology*. 1894; 6: 145-238.
4. Craijdan O, Aftimiciuc O. Education of coordination abilities at the stage of initial sports training in rhythmic gymnastics. *Science of Physical Education: Professional preparation, sports training, physical education, rehabilitation, recreation*, 2013;15(3):10-18.]
5. Dougall McR. The Relation of Auditory Rhythm to Nervous Discharge. *Psychological Review*. 1902; 9: 17-34.
6. Faur M-L, Aftimiciuc O, Danail S. *The rhythm of motor activity in the system of professional pedagogical training of the teacher of physical education*. Kishinau: Valinex; 2014.
7. Gönczi-Raicu M, Aftimiciuc O, Danail S. *The complex coordination of skills within the integrative didactic activity of the teacher of physical education*. Kishinau: Valinex; 2014.
8. Koffka K. Perception: and introduction to the Gestalt-theorie. *Psychological Bulletin*. 1922; 19: 531-585.
9. Knyazeva EH, Kurdyumov SP. Nonlinear Synthesis and Co-evolution of Complex Systems. *World Futures*. 2001; 57: 239-261.
10. Pavlov IP. *Conditioned reflexes. An investigation of the physiological activity of the cerebral cortex*. London: Oxford University Press: Humphrey Milford; 1926.
11. Sechenov IM. Physiological studies moderators centers reflex movements in the brain of frogs. *Annals of Natural Sciences*.1863;19: 09-134.]
12. Teplov BM. *Psychology of musical abilities*. Paris: Presses Universitaires de France; 1966.
13. Vinogradov MI. General need for energy. In: *Physiology terms of harmfulness and danger factors of production environment severity and intensity of the lab our process: the Leadership of R. 2.2. 755-99.* Moscow; 1999.
14. Wiener N. *Cybernetics, or the Control and Communication in the Animal and the Machine*. Second Edition. Cambridge, Massachusetts: The MIT Press; 1965.
15. Kvasov DG. About development the automatic movements of hand. *Physiological Journal of the USSR N.A.Sechenov*. 1952;38(4):423-433.
16. Morozov ND. *The rhythms of history. Systematic analysis of the past and projecting the future*. Moscow: ACT; 2001.
17. Perna NIa. *A person's life (From his diaries).* St. Petersburg; 1993.
18. Ukhtomskij AA. I.M. Sechenov in the University of Leningrad. *Collected Works*; 1962;6:131-151.
19. Ukhtomskij AA. *The dominant*. St. Petersburg: Peter; 2002.

20. Chubur AA. *Short course of the History of Natural Science*. Bryansk Publishing complex BF MGSU; 2003.

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EMOTIONAL INTELLIGENCE AMONG FEMALE BASEBALL PLAYERS: A PSYCHOLOGICAL PROBE

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Abstract. *Purpose*: The present study was conducted to determine the emotional intelligence among Indian female baseball players. *Material*: For the purpose of present study, two hundred (N=200) senior national female baseball players were selected through purposive sampling technique from different regions of India. They were selected from four different regions: A (North region baseball players=50), B (East region baseball players=50), C (West region baseball players=50) and D (South region baseball players=50). To collect the required data for the present study, the questionnaire developed by Hyde et al. (2001) on emotional intelligence was administered. One Way Analysis of Variance (ANOVA) was employed to compare the entire regions. Where 'F' values were found significant, LSD (Least Significant Difference) Post-hoc test was applied to find out the direction and degree of difference. The level of significance was set at 0.05. *Results*: Significant differences were observed among North, East, West and South regions female baseball players on the sub-parameters; empathy, self-development, value orientation and on the parameter Emotional Intelligence (Total). No significant differences were noticed on the sub-parameters; self-awareness, self-motivation, emotional stability, managing relations, integrity, commitment and altruistic behaviour. *Conclusion:* The outcome of results might be due to the fact that East region female baseball players are able to pay attention to the worries and concerns of others, can listen to someone without the urge to say something, can stay focused under pressure, are able to handle multiple demands and able to identify and separate their emotions.
Keywords: Emotional intelligence, female, baseball players, motivation.

Introduction

Emotional intelligence was established as a popular area of research during the 1990s and since then has emerged as an important construct (Meyer & Zizzi, 2007; Petrides et al., 2004). Emotional intelligence is defined as "the ability to perceive, monitor, employ and manage emotions within oneself and in others" (Salovey & Mayer, 1990). Although, the popularity of emotional intelligence begun when Goleman (1995) emphasized the construct being more useful than intelligence quotient (IQ) in the workplace (Mayer et al., 2008). Zizzi et al. (2003) explored relationships between emotional intelligence and baseball performance and found that the emotional intelligence was an important predictor of success for pitchers, though comparatively it was not as strong for batters. They suggested that emotional intelligence for pitchers was higher because they have more time to think of their own emotions and engage in regulatory processes.

Emotional intelligence is a concept that helps out to know how to separate healthy from unhealthy feelings and how to transform negative feelings into positive ones. Goleman (1999) explored the means for managing feelings so that they are expressed appropriately and effectively, enabling people to work together smoothly towards their common goals. According to him, emotional intelligence has proved to be an effective measure of human capabilities and programmes of emotional intelligence have shown to enhance an individual's productivity in different fields of human activities.

Spinoza (1677) revealed that both the emotion and intellect together contribute to the ultimate cognitive tool. He talked about three levels of cognition i.e. emotional cognition, intellectual cognition and a kind of intuition. Emotional intelligence has been accepted by the psychologists as the one which affects human performance. It is one such thing which drives man as a motivational force leading to all his achievements. Therefore, the present days' training is needed to consider this aspect of human psychology for complete preparation of the sportsperson for the competition. For this, the nature in which emotional intelligence affects the sports performance has to be tested with appropriate psychological tools and methods. Baseball was the first sport to successfully employ the league structure (Masteralexis et al., 2009). Baseball, perhaps more than any other sport, combines both individual and team effort. The battle between the pitcher and the batter is an individual one; play in the field is performed by individual players with individual responsibilities yet each man's own effort must be subordinated to that of the team. It is a wonderful game that teaches youngsters how to win their individual battles within a frame work of cooperative enterprise. In baseball the good of the group is always of paramount importance, yet completely dependent upon the individual efforts of each man (Watts, 1964).

Therefore, the purpose of the present study was to investigate the emotional intelligence among female baseball players of India.

Method and procedure

Sample: Two hundred (N=200) senior national female baseball players were selected through purposive sampling technique from different regions of India.They were selected from different regions: A (North region baseball players=50), B (East region baseball players=50), C (West region baseball players=50) and D (South region baseball players=50).

Instrument: The Emotional Intelligence Questionnaire developed by Hyde et al. (2001) was administered.

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Statistical Analysis: One Way Analysis of Variance (ANOVA) was employed to compare the entire regions. Where 'F' values were found significant, LSD (Least Significant Difference) Post-hoc test was applied to find out the direction and degree of difference. The level of significance was set at 0.05.

Ethical Committee: This study was approved by the Joint Research Board (JRB) of Panjab University, Chandigarh (India).

Results

Table 1

Analysis of Variance (ANOVA) results among North, East, West and South regions female baseball players with regard to the sub-parameter Self-Awareness

Source of Variation	Sum of Squares	Degree of Freedom	Mean Square	F-value	P-value (Sig.)
Between Groups	6.660	3	2.220	.469	.704
Within Groups	927.960	196	4.734		
Total	934.620	199			

$F_{0.05}$ (3,196)

The results depicted in table 1 revealed insignificant differences with regard to the sub-parameter Self-Awareness among North, East, West and South regions female baseball players as the P-value (Sig.) .704 was found higher than 0.05 level of significance ($p>0.05$). Since F-value was found insignificant, therefore, there is no need to apply Post-hoc test.

Table 2

Analysis of Variance (ANOVA) results among North, East, West and South regions female baseball players with regard to the sub-parameter Empathy

Source of Variation	Sum of Squares	Degree of Freedom	Mean Square	F-value	P-value (Sig.)
Between Groups	162.295	3	54.098	8.932*	.000
Within Groups	1187.100	196	6.057		
Total	1349.395	199			

*Significant at 0.05 $F_{0.05}$ (3,196)

The results projected in table 2 described significant differences with regard to the sub-parameter Empathy among North, East, West and South regions female baseball players as the P-value (Sig.) .000 was found smaller than 0.05 level of significance ($p<0.05$).

Since the obtained F-value was found significant, therefore, Least Significant Difference (LSD) Post-hoc test was employed to study the direction and significance of differences between paired means among various regions female baseball players on the sub-parameter Empathy. The results of LSD Post-hoc test have been presented in Table 3.

Table 3

Significant differences among North, East, West and South regions female baseball players with regard to the sub-parameter Empathy

Means		Mean Difference	P-value (Sig.)
North [19.84]	East[20.14]	0.30	.543
	West[18.98]	0.86	.082
	South[17.82]	2.02*	.000
East [20.14]	North[19.84]	0.30	.543
	West[18.98]	1.16*	.019
	South[17.82]	2.32*	.000
West [18.98]	North[19.84]	0.86	.082
	East[20.14]	1.16*	.019
	South[17.82]	1.16*	.019
South [17.82]	North[19.84]	2.02*	.000
	East[20.14]	2.32*	.000
	West[18.98]	1.16*	.019

*Significant at 0.05

The results in table 3 showed insignificant differences between North and East, North and West regions female baseball players as the P-values (Sig.) .543, .082 respectively were found greater than 0.05 of significance level on the sub-parameter Empathy.

The above table showed significant differences between North and South, East and West, East and South, West and South regions female baseball players as the P-values (Sig.) .000, .019, .000, .019 respectively were found lesser than

0.05 of significance level on the sub-parameter Empathy. The graphical representation of mean scores of Empathy among North, East, West and South regions female baseball players has been exhibited in Figure 1.

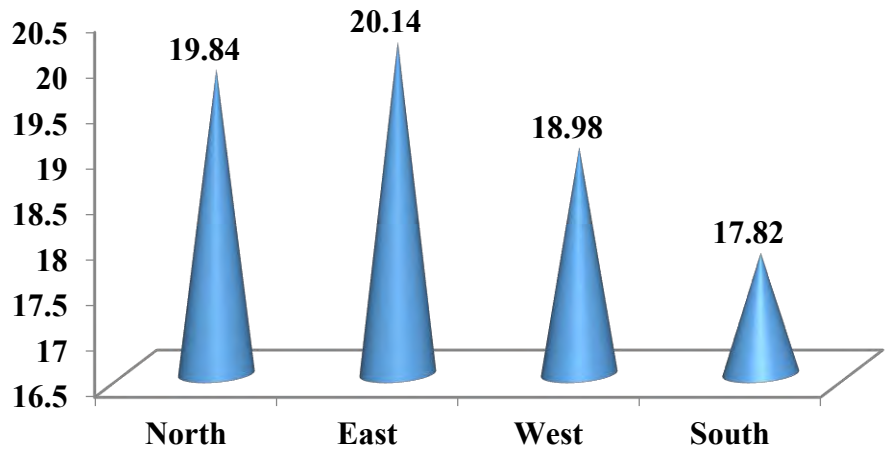

Figure 1. Graphical representation of mean scores with regard to North, East, West and South regions female baseball players on the sub-parameter Empathy

Table 4

Analysis of Variance (ANOVA) results among North, East, West and South regions female baseball players with regard to the sub-parameter Self-Motivation

Source of Variation	Sum of Squares	Degree of Freedom	Mean Square	F-value	P-value (Sig.)
Between Groups	28.415	3	9.472	1.339	.263
Within Groups	1386.180	196	7.072		
Total	1414.595	199			

$F_{0.05}$ (3,196)

It is evident from table 4 that insignificant differences were found with regard to the sub-parameter Self-Motivation among North, East, West and South regions female baseball players as the P-value (Sig.) .263 was found higher than 0.05 level of significance (p>0.05). Since F-value was found insignificant, therefore, there is no need to apply Post-hoc test.

Table 5

Analysis of Variance (ANOVA) results among North, East, West and South regions female baseball players with regard to the sub-parameter Emotional Stability

Source of Variation	Sum of Squares	Degree of Freedom	Mean Square	F-value	P-value (Sig.)
Between Groups	40.740	3	13.580	2.362	.073
Within Groups	1126.760	196	5.749		
Total	1167.500	199			

$F_{0.05}$ (3,196)

The results presented in table 5 showed insignificant differences with regard to the sub-parameter Emotional Stability among North, East, West and South regions female baseball players as the P-value (Sig.) .073 was found higher than 0.05 level of significance (p>0.05). Since F-value was found insignificant, therefore, Post-hoc test has not been applied.

Table 6

Analysis of Variance (ANOVA) results among North, East, West and South regions female baseball players with regard to the sub-parameter Managing Relations

Source of Variation	Sum of Squares	Degree of Freedom	Mean Square	F-value	P-value (Sig.)
Between Groups	14.695	3	4.898	.861	.462
Within Groups	1114.860	196	5.688		
Total	1129.555	199			

$F_{0.05}$ (3,196)

Table 6 showed insignificant differences with regard to the sub-parameter Managing Relations among North, East, West and South regions female baseball players as the P-value (Sig.) .462 was found higher than the 0.05 level of significance (p>0.05). Since F-value was found insignificant, therefore, there is no need to apply Post-hoc test.

Table 7

Analysis of Variance (ANOVA) results among North, East, West and South regions female baseball players with regard to the sub-parameter Integrity

Source of Variation	Sum of Squares	Degree of Freedom	Mean Square	F-value	P-value (Sig.)
Between Groups	9.695	3	3.232	.820	.484
Within Groups	772.260	196	3.940		
Total	781.955	199			

$F_{0.05}$ (3,196)

It appears from table 7 above that insignificant differences were found with regard to the sub-parameter Integrity among North, East, West and South regions female baseball players as the P-value (Sig.) .484 was found higher than the 0.05 level of significance (p>0.05). Since F-value was found insignificant, therefore, there is no need to apply Post-hoc test.

Table 8

Analysis of Variance (ANOVA) results among North, East, West and South regions female baseball players with regard to the sub-parameter Self-Development

Source of Variation	Sum of Squares	Degree of Freedom	Mean Square	F-value	P-value (Sig.)
Between Groups	38.775	3	12.925	4.783*	.003
Within Groups	529.620	196	2.702		
Total	568.395	199			

*Significant at 0.05 $F_{0.05}$ (3,196)

The results in table 8 explored significant differences with regard to the sub-parameter Self-Development among North, East, West and South regions female baseball players as the P-value (Sig.) .003 was found smaller than 0.05 level of significance (p<0.05).

Since the obtained F-value was found significant, therefore, Least Significant Difference (LSD) Post-hoc test was employed to study the direction and significance of differences between paired means among various regions female baseball players on the sub-parameter Self-Development. The results of LSD Post-hoc test have been presented in Table 9.

Table 9

Significant difference among North, East, West and South regions female baseball players with regard to the sub-parameter Self-Development

Means		Mean Difference	P-value (Sig.)
North [7.56]	East[8.44]	0.88*	.008
	West[7.30]	0.26	.430
	South[7.48]	0.08	.808
East [8.44]	North[7.56]	0.88*	.008
	West[7.30]	1.14*	.001
	South[7.48]	0.96*	.004
West [7.30]	North[7.56]	0.26	.430
	East[8.44]	1.14*	.001
	South[7.48]	0.18	.585
South [7.48]	North[7.56]	0.08	.808
	East[8.44]	0.96*	.004
	West[7.30]	0.18	.585

*Significant at 0.05

Table 9 demonstrated significant differences between North and East, East and West, East and South regions female baseball players as the P-values (Sig.) .008, .001, .004 respectively were found lesser than 0.05 of significance level on the sub-parameter Self-development.

Insignificant differences were found between North and West, North and South, West and South regions female baseball players as the P-values (Sig.) .430, .808, .585 respectively were found higher than 0.05 of significance level on the sub-parameter Self-development. The graphical representation of mean scores of Self-Development among North, East, West and South regions female baseball players has been exhibited in Figure 2.

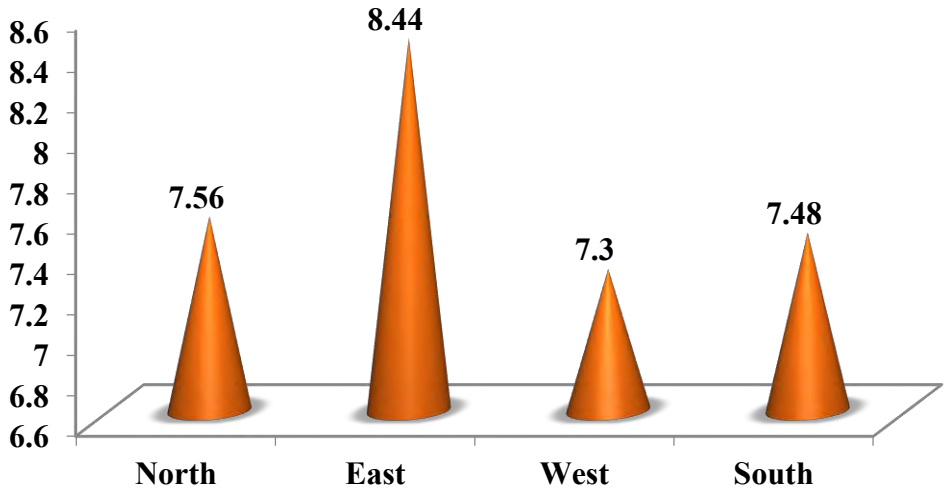

Figure 2. Graphical representation of mean scores with regard to North, East, West and South regions female baseball players on the sub-parameter Self-Development

Table 10

Analysis of Variance (ANOVA) results among North, East, West and South regions female baseball players with regard to the sub-parameter Value Orientation

Source of Variation	Sum of Squares	Degree of Freedom	Mean Square	F-value	P-value (Sig.)
Between Groups	24.695	3	8.232	3.975*	.009
Within Groups	405.900	196	2.071		
Total	430.595	199			

*Significant at 0.05 $F_{0.05}$ (3,196)

It is evident from table 10 that significant differences were found with regard to the sub-parameter Value Orientation among North, East, West and South regions female baseball players as the P-value (Sig.) .009 was found smaller than 0.05 level of significance ($p<0.05$).

Since the obtained F-value was found significant, therefore, Least Significant Difference (LSD) Post-hoc test was employed to study the direction and significance of differences between paired means among various regions female baseball players on the sub-parameter Value Orientation. The results of LSD Post-hoc test have been presented in Table 11.

Table 11

Significant difference among North, East, West and South regions female baseball players with regard to the sub-parameter Value Orientation

Means		Mean Difference	P-value (Sig.)
North [8.22]	East[8.26]	0.04	.890
	West[7.96]	0.26	.367
	South[7.38]	0.84*	.004
East [8.26]	North[8.22]	0.04	.890
	West[7.96]	0.30	.299
	South[7.38]	0.88*	.003
West [7.96]	North[8.22]	0.26	.367
	East[8.26]	0.30	.299
	South[7.38]	0.58*	.045
South [7.38]	North[8.22]	0.84*	.004
	East[8.26]	0.88*	.003
	West[7.96]	0.58*	.045

*Significant at 0.05

Table 11 demonstrated significant differences between North and South, East and South, West and South regions female baseball players as the P-values (Sig.) .004, .003, .045 respectively were found lesser than 0.05 of significance level on the sub-parameter Value Orientation.

Insignificant differences were found between North and East, North and West, East and West regions female baseball players as the P-values (Sig.) .890, .367, .299 respectively were found higher than 0.05 of significance level on the sub-parameter Value Orientation. The graphical representation of mean scores of Value Orientation among North, East, West and South regions female baseball players has been exhibited in Figure 3.

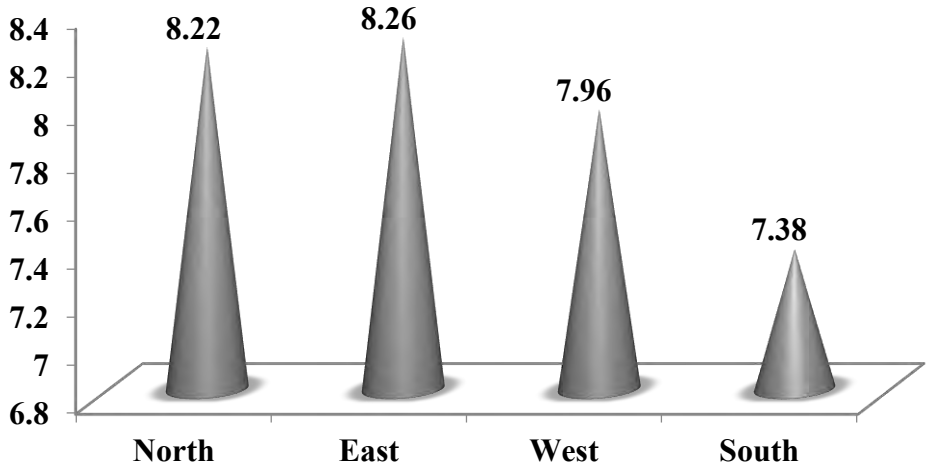

Figure 3. Graphical representation of mean scores with regard to North, East, West and South regions female baseball players on the sub-parameter Value Orientation

Table 12

Analysis of Variance (ANOVA) results among North, East, West and South regions female baseball players with regard to the sub-parameter Commitment

Source of Variation	Sum of Squares	Degree of Freedom	Mean Square	F-value	P-value (Sig.)
Between Groups	7.480	3	2.493	1.496	.217
Within Groups	326.600	196	1.666		
Total	334.080	199			

$F_{0.05}$ (3,196)

It can be observed from table 12 that insignificant differences were found with regard to the sub-parameter Commitment among North, East, West and South regions female baseball players as the P-value (Sig.) .217 was found higher than 0.05 level of significance (p>0.05). Since F-value was found insignificant, therefore, there is no need to apply Post-hoc test.

Table 13

Analysis of Variance (ANOVA) results among North, East, West and South regions female baseball players with regard to the sub-parameter Altruistic Behaviour

Source of Variation	Sum of Squares	Degree of Freedom	Mean Square	F-value	P-value (Sig.)
Between Groups	13.015	3	4.338	1.711	.166
Within Groups	496.980	196	2.536		
Total	509.995	199			

$F_{0.05}$ (3,196)

The results projected in table 13 revealed insignificant differences with regard to the sub-parameter Altruistic Behaviour among North, East, West and South regions female baseball players as the P-value (Sig.) .166 was found higher than 0.05 level of significance (p>0.05). Since F-value was found insignificant, therefore, Post-hoc test has not been applied.

Table 14

Analysis of Variance (ANOVA) results among North, East, West and South regions female baseball players with regard to the parameter Emotional Intelligence (Total)

Source of Variation	Sum of Squares	Degree of Freedom	Mean Square	F-value	P-value (Sig.)
Between Groups	1259.935	3	419.978	3.033*	.030
Within Groups	27144.220	196	13.491		
Total	28404.155	199			

*Significant at 0.05 $F_{0.05}$ (3,196)

Table 14 showed significant differences with regard to the parameter Emotional Intelligence (Total) among North, East, West and South regions female baseball players as the P-value (Sig.) .030 was found smaller than 0.05 level of significance ($p<0.05$).

Since the obtained F-value was found significant, therefore, Least Significant Difference (LSD) Post-hoc test was employed to study the direction and significance of differences between paired means among various regions female baseball players on the parameter Emotional Intelligence (Total). The results of LSD Post-hoc test have been presented in Table 15.

Table 15

Significant difference among North, East, West and South regions female baseball players with regard to the parameter Emotional Intelligence (Total)

Means		Mean Difference	P-value (Sig.)
North [137.04]	East[137.50]	0.46	.845
	West[134.54]	2.50	.289
	South[131.18]	5.86*	.014
East [137.50]	North[137.10]	0.46	.845
	West[134.54]	2.96	.210
	South[131.18]	6.32*	.008
West [134.54]	North[137.10]	2.50	.289
	East[137.50]	2.96	.210
	South[131.18]	3.36	.155
South [131.18]	North[137.10]	5.86*	.014
	East[137.50]	6.32*	.008
	West[134.54]	3.36	.155

*Significant at 0.05

The results in table 15 showed insignificant differences between North and East, North and West, East and West, West and South regions female baseball players as the P-values (Sig.) .845, .289, .210, .155 respectively were found greater than 0.05 of significance level on the parameter Emotional Intelligence (Total).

The above table showed significant differences between North and South, East and South regions female baseball players as the P-values (Sig.) .014, 008, respectively were found lesser than 0.05 of significance level on the parameter Emotional Intelligence (Total). The graphical representation of mean scores of parameter Emotional Intelligence (Total) among North, East, West and South regions female baseball players has been exhibited in Figure 4.

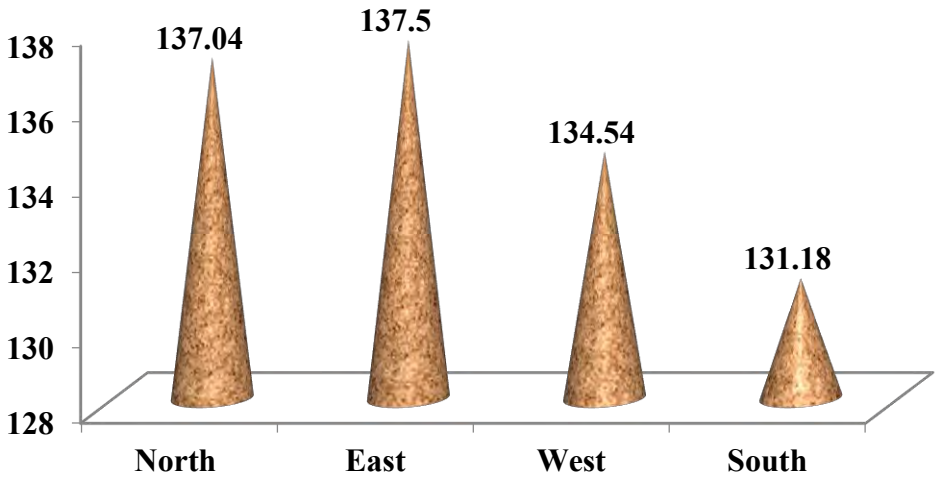

Figure 4. Graphical representation of mean scores with regard to North, East, West and South regions female baseball players on the parameter Emotional Intelligence (Total)

Discussion

It is evident from above results that significant differences were found among North, East, West and South regions female baseball players with regard to the sub-parameters; empathy, self-development, value orientation and the parameter emotional intelligence (total). While comparing the mean values of the entire regions, it has been noticed that East region female baseball players demonstrated significantly better empathy, self-development, value orientation and emotional intelligence (total) than their counterpart North, West and South regions female baseball players. The outcome of results might be due to the fact that East region female baseball players are able to pay attention to the worries and concerns of others, can listen to someone without the urge to say something, can stay focused under pressure, are able to handle multiple demands and able to identify and separate their emotions. They feel that they must develop themselves even when their job does not demand it, are able to maintain the standards of honesty and integrity and also able to confront unethical actions in others which enable them to outdo their counterparts on the said sub-parameters and parameter. Kaur (2008) reported significant differences on self-motivation among scheduled caste, backward class and general adolescent girls. Amy et al. (2007) reported that Taiwan physical education teachers were found to be significantly higher on value orientation mastery than Hong Kong and Shanghai physical education teachers. Ahmed et al. (2011) reported that male volleyball players had more emotional intelligence than the female volleyball players. Kumar (2009) revealed significant differences among swimming, kayaking and canoeing players on the parameter emotional intelligence.

However, insignificant differences were found on the sub-parameters; self-awareness, self-motivation, emotional stability, managing relations, integrity, commitment and altruistic behaviour among North, East, West and South regions female baseball players. It can be safely surmised that the female baseball players of entire regions were equally developed on the said sub-parameters. Torkfar et al. (2011) reported insignificant differences on the sub-parameters; self-awareness and empathy between team and individual sports athletes. Kajtna et al. (2004) revealed that high risk sports athletes scored highest in emotional stability followed by the non-athletes and the lowest scores were achieved by non-risk sports athletes. Sandhu et al. (2009) found that Coaches with experience of more than 20 years are more committed, better in control and challenge dimensions of hardiness as compared to the coaches with experience of less than 10 years and between 11 to 20 years. Bawa (2005) found significant relationship between commitment and control in relation to athletic, gymnastic, hockey and wrestling coaches.

Conclusion

It is concluded that significant differences were observed among North, East, West and South regions female baseball players on the sub-parameters; empathy, self-development, value orientation and on the parameter Emotional Intelligence (Total). While comparing the mean values of the entire regions, it has been noticed that East region female baseball players demonstrated significantly better empathy, self-development, value orientation and emotional intelligence (total) than their counterpart North, West and South regions female baseball players. No significant differences were noticed on the sub-parameters; self-awareness, self-motivation, emotional stability, managing relations, integrity, commitment and altruistic behaviour.

References

Ahmed S, Khan KS, & Ahmed S. A study on emotional intelligence among male and female volleyball players. *Golden Research Thoughts,* 2011;1(3):1-4.

Amy HSC, Keh NC, & Xu BL. A comparative study on value orientations of physical education teachers among Hong Kong, Taiwan, and Shanghai. *International Journal of Eastern Sports and Physical Education,* 2007;5(1):141-151.

Bawa H. *Study of personality hardiness, traits anxiety and burnout among coaches* (Unpublished doctoral thesis). Kurukshetra University, Kurukshetra; 2005.

Goleman D. *Emotional intelligence.* New York: Bantam Books; 1995.

Goleman D. The human task of a project leader. *PM Network Journal,* 1999;13(11):38-41.

Hyde A, Pethe S, & Dhar U. *Publication manual for emotional intelligence scale.* National Psychological Corporation, 4/230, Kacheri Ghat, Agra, India; 2001.

Kajtna T, Tuak M, Baric R, & Burnik S. Personality in high-risk sports athletes. *Kinesiology,* 2004;36(1):24-34.

Kaur M. *Emotional intelligence, personality characteristics, interests and academic achievement of backward class and scheduled caste adolescent girls* (Unpublished doctoral thesis). Panjab University, Chandigarh; 2008.

Kumar R. *Evaluation of cognitive and mental constructs among all India inter-university sportspersons* Unpublished doctoral thesis Panjab University, Chandigarh; 2009.

Masteralexis CP, Barr CA, & Hums MA. *Principles and practice of sport management.* Massachusetts*:* Jones and Bartlett learning; 2009.

Mayer JD, Roberts RD, & Barsade SG. Human abilities: Emotional intelligence. *Annual Review of Psychology*, 2008;59(1):507-536.

Meyer BB, & Zizzi S. *Emotional intelligence in sport: Conceptual, methodological and applied issues.* In A. M. Lane Ed.), Mood and human performance: Conceptual, measurement, and applied issues. Hauppauge, New York: Nova Science; 2007.

Petrides KV, Furnham A, & Frederickson N. Emotional intelligence. *The Psychologist*, 2004;17(10):574-577.

Salovey P, & Mayer JD. Emotional intelligence. *Imagination, Cognition and Personality,* 1990;9(3):185-211.

Sandhu KS, Sharma RK, & Singh A. Personality hardiness of Indian coaches in relation to their age and coaching experience. *Journal of Exercise Science and Physiotherapy,* 2009;5(1):38-41.

Spinoza B. *Ethics: The collected works of Spinoza.* New Jersey: Princeton University Press. 1977.

Torkfar A, Abbariki Z, Rostami AG, & Karamiyan E. Relationship between emotional intelligence and competitive anxiety in athlete students, in individual and group fields. *World Applied Sciences Journal,* 2011;15(1): 92-99.

Watts C. *The fine art of baseball-A complete guide to strategy, skills and system.* New Jersey: Englewood Cliffs, Prentice-Hall, Inc.; 1964.

Zizzi JS, Deaner H, & Hirschhorn D. The relationship between emotional intelligence and performance among college baseball players. *Journal of Applied Sport Psychology*, 2003;15(3):262-269.

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