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CONTENTS

THE APPLICATION OF THE ALGORITHM OF THE INDIVIDUALIZATION OF STUDENTS' PHYSICAL EDUCATION PROCESS

Barybina L.N.[1], Kolomiec N.A. [2], Komotskaja V.A. [3]
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Kharkiv State Academy of Design and Arts[2]
Automobile and Road Institute[3]

Annotation. *Purpose:* theoretically and experimentally justify the use of the algorithm of physical education process individualization in universities taking into account the psychophysiological features of students. *Material:* the study involved 413 students. It was defined indicators of the level of physical fitness and functional status, psycho-physiological features. *Results:* it was worked out the algorithm of individualization of students' physical education process. It was defined the structure of the complex preparedness and it was developed models of characteristics of students – representatives of different sports specializations. It was established that for the successful construction of the training process, it is necessary to combine the parameters of physical, functional training and physiological indicators into a single integral evaluation of the individual characteristics of students. It was shown that at the students of the experimental group was improved indicators of functional, psychophysiological capabilities and physical preparedness. *Conclusions:* the application of the algorithm of the individualization of process of physical education enhances the functionality of the students.
Keywords: students, preparedness, individualization, algorithm, specialization, psychophysiology.

Introduction

Nowadays HEE has become nearly the only opportunity for girls and boys' physical perfection. That is why correct choice of sport specialty by a student is very important not only for his perfection as specialist in certain kind of activity but also influences on his physical fitness, functional state and health. In this connection, at present individualization of physical education at higher educational establishments has been becoming still more important [2, 3, 6, 9, 15, 21, 22].

Many authors [2, 4, 5, 16, 17, 18, 23] stress that it is necessary to organize physical education process at HEE in compliance with sport specialties, because sport-oriented form of trainings is the most demanded form of educational process.

However, with it there often appears a problem of student's choice of sport specialty, which would be the most suitable for him in compliance with his motion and psycho-physiological characteristics. Individually suitable trainings are one of main factors of health strengthening. But not every student can quickly determine his own motion preferences. Central nervous system is responsible for individual organization of psycho-motor functions. That is why individualization of students' physical education envisages consideration of both physical fitness indicators and psycho-physiological indicators, because they are one of aspects of organism's functional state [1, 8, 10, 11, 19, 20]. In this connection it has become urgent to develop algorithm for physical education's individualization at higher educational establishments.

The researches were fulfilled in compliance with combined plan of scientific – research works for 2011-2015, topic 2.4 "theoretical-methodic principles of individualization in physical education and sports" (state registration number 0112U002001) as scientific work, which is financed by Ministry of education and science for 2013-2014 "Theoretical-methodic principles of application of information, pedagogic and medical-biological technologies for formation of healthy life style "(state registration № 0113U002003).

Purpose, tasks of the work, material and methods

The purpose of the research is to give theoretical and experimental foundation for application of individualization algorithm in physical education process at higher educational establishments, considering students' psycho-physiological characteristics.

The methods of the research are: theoretical analysis and generalization of literature sources, anthropometric and physiological methods, pedagogic testing, psycho-physiological methods of examination, mathematical statistic. Determination of physical fitness and functional state was carried out by results of boys' chin-ups and girls' pressing ups; rising torso from lying position in sitting one for 1 minute; shuttle run 4 x 9 meters; forward torso bent in sitting position; long jump from the spot. Functional state was determined by indicators of ortho-test, Stange's test, Genci's test, Letunov's test. Psycho-physiological indicators were measured in tapping test, Gorbov's test (red and black tables), Shulte's test (5 tables), Burdon's test by computer programs, developed under guidance of Ashanin [1]. Besides, for determination of short term memory volume, characteristics of nervous system and latent period of responses in different modes we worked out computer programs "Perception-1", "Perception-2", "Psycho-diagnostic" with application of traditional diagnostic's methodic [1, 4, 8, 10, 11].

In our research 413 students of Kharkov national university of radio-electronics (KNURE) took part. At final experimental stage – they were 209 students of 2-5 years, who trained different sport specialties of main health group (among them: 122 students: 27 – football specialty; 19 – "sambo"; 27 – "volleyball"; 28- "basketball"; 21 – "boxing";

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also there were 87 girl students: 23 – "aerobics" specialty; 21 – "power kinds of ports, martial arts"; 22 – "volleyball"; 21 – "basketball"). At stage of forming experiment 204 1st year students participated, who were divided in control group (48 girls and 56 boys) and experimental group (42 girls and 58 boys).

Results of the research

Practical physical education classes in KNURE as well as in other HEE, where physical education classes are specialized, are based on choice of certain kind of sports; that is why students of one department are trained not as academic groups but they attend different circles according to their sport specialty and are trained by instructors – specialists in this kinds of sports.

In final experiment, which was conducted for determination of the most important indicators of every sport specialty we practiced expanded testing, which included both tests for physical fitness and tests for psycho-physiological potentials. For foundation of effectiveness of the worked out individualization algorithm, in forming experiment we carried out the most significant tests, determined with factorial analysis in final experiment.

As a result of theoretical-analytical work we worked out algorithm of physical education's individualization for higher educational establishments, which was pointed, on the one hand to help student in choice of sport specialization, and, on the other hand, to using of individual approach in every sport circle. This algorithm is based on principles of theoretical conception of Zh.L. Kozina. [6, 7] about importance of determination of complex fitness for determination of trainees' individual characteristics.

Algorithm of individualization consists of the following stages:

Stage 1 – factorial analysis of indicators of 2-5 years students' complex testing (students, who already chose their sport specialty and started self-realization in it). Testing includes determination of both physical and functional fitness as well as psycho-physiological potentials. There determined students' individual characteristics and the most significant indicators for representatives of different sport specialties.

Stage 2 – working out of sigmal scales of evaluation by the most significant indicators of testing, resulted from factorial analysis for every sport specialization.

Stage 3 – determination of sport specialization for 1st year students, who is to be conducted in two directions: the first – with the help of students' independent choice of sport specialization; the second – students, for whom it is difficult to choose and for students, who did not practiced sports beforehand we offered tests for physical, psycho-physiological and functional fitness by indicators, which were selected and scaled at first and second stages.

Stage 4 – application of methodic of physical education's individualization at higher educational establishment, which consists of two parts:

1 – distribution of students by sport specializations; 2 – individualization of training process in every sport circle, where, at initial stage students are divided by level of fitness and at later stages – by game roles, styles of duel, modes of loads. Physical education classes in control and experimental groups of every sport specialization were conducted 1 time a week, in compliance with curriculum and, additionally 1-2 times a week as optional trainings [2].

Here we provide results of application of the worked out algorithm of educational process's individualization.. Students – representatives of different sport specializations- show different individual expressiveness of factors in structure of fitness. For example, basketball and volleyball players have such expressed factors as "speed of run at short and middle distances, jumping", "cognitive abilities (short term memory)", "Bent to think about actions". Football players, martial arts representatives have the following mostly expressed factors as: "Power potentials", "Concentration of attention", "Psychic stability". Besides, sambo wrestlers and boxers show such factors as "sense of time" and "speed of nervous processes".

Girl students – representatives of different specializations – manifest the following expressiveness of factors in structure of fitness. Basketball players show "Short term memory", "Concentration and re-switching of attention", "Sense of time", "Power and endurance"; girls – representatives of martial arts – have such expressed factors as: "Power and endurance", "Psychic stability". Volleyball players manifest "Speed-power endurance, "Short term memory", "Psychic stability", "Flexibility". Aerobics' representatives have "Psychic adaptability", "Concentration and re-switching of attention", "Short term memory".

Such model characteristics of students – representatives of different sport specializations- were taken as the base, when working out of evaluation scales for main tests by results of factorial analysis. These scales were intended for make students' choice of sport specialty easier. Specialists in physical education and sports [13, 14, 16] are sure that progressing of motion abilities and improvement of trainees' health to large extent depend on diagnostic of their bents. On the base of the most significant physical and psycho-physiological parameters for different kinds of motion functioning, it is possible to prognosticate student's bents to certain physical activity. According to own choice and in compliance with worked out scales first year students were divided by sport specializations at the beginning of academic year.

In every specialization trainings were conducted, considering students' individual potentials. Such individual approach not only stimulated students' vivid interest to certain kind of sports, but also interest to development of own abilities, to own health and physical perfection.

As a result of individualization of physical education process we registered confident reduction of heart beats rate (HBR) in rest in experimental groups from 75.3 b.p.m.-1 to 65.3 b.p.m.-1 of volleyball players ($p<0.05$), from 74.5 b.p.m.-1 to 64.0 b.p.m.-1 of basketball players ($p<0.05$), from 832 b.p.m.-1 to 72.0 b.p.m.-1 of sambo wrestlers ($p<0.05$), from 78.8 b.p.m.-1 to 68.4 b.p.m.-1 of boxers ($p<0.05$), from 85.2 b.p.m.-1 to 80.4 b.p.m.-1 of representatives

of power kinds of sports ($p<0.05$), from 85.6 b.p.m.-1 to 74.8 b.p.m.-1 of football players ($p<0.05$).; increment of students' functional potentials by Shtange's test, which, in experimental group, confidently increased from 54.0 sec. to 59.7sec. ($p<0.05$) of basketball players; from 50.4 sec. to 57.8 sec. ($p<0.05$) of representatives of power kinds of sports; from 36.4 sec. to 47.6 sec. ($p<0.05$) of football players. In control groups such changes were not confident ($p>0,05$).

We registered statistically confident ($p<0.05$) reduction of HBR with fulfillment of Letunov's test after experiment in experimental groups, that witness about increasing of functional potentials and improvement of cardio-vascular and respiratory systems – main systems, which determine state of health. In control groups such changes were not confident.

We also observed confident improvement of psycho-physiological characteristics: increasing of quantity of correctly reproduced symbols by program "Perception-2" (test №1) in experimental groups of volleyball players from 5.18 to 7.21, of basketball players – from 5.84 to 6.98, of sambo wrestlers – from 4.34 to 5.83, of boxers – from 5.25 to 6.64, of representatives of power kinds of sports from 5.15 to 5,96 with $p<0.05$; and by program, "Perception-2" (test 2) in experimental groups of volleyball players – from 7.3 to 8.7, of basketball players – from 7.1 to 8.2, of sambo wrestlers – from 4.8 to 7.4, of boxers – from 6.4 to 7.6, of football players – from 6.5 to 8.3 with $p<0.05$.

In experimental group of girls - volleyball players increment of correctly reproduced symbols by program "Perceptio-1" (test №1) was registered in from 4.4 to 5.0, of basketball players – from 4.3 to 4.9, of aerobics – from 3.7 to 5.8; in experimental group of representatives of power kinds of sports – from 3.1 to 4.1 with $p<0.05$. We also found confident improvement of results in other psycho-physiological tests that witness about improvement of nervous system, which reflects health condition.

We also observed confident increase of physical fitness indicators: time of fulfillment of test "Shuttle run" confidently reduced in experimental groups of girls-basketball players – from 10.2 sec. to 9.6 sec., of volleyball players – from 9.9 sec. to 9.4 sec., of football players – from 9.8 sec. to 9.2 sec. with $p<0.05$. Similar data were received in groups of girl students. Changes in control boys and girls' groups were not confident. We also observed the trend to improvement of results in experimental groups in tests "pressing ups in lying positions", "Long jump from the spot", "Forward torso bending from sitting position".

Conclusions:

1. We have experimentally grounded application of algorithm of physical education's individualization, considering students' psycho-physiological potentials. We have shown that the worked out algorithm of students' physical education's individualization, based on determination of structure of psycho-physiological potentials and physical fitness, can be applied for students to make easier and more correct choice of sport activity that is of great importance for effectiveness of professional training, improvement of motion abilities, perfection of health.
2. We have determined the structure of students' complex fitness, (students, who are representatives of different sport specializations) and their psycho-physiological characteristics.
3. We have proved that as a result of experiment students of experimental groups demonstrated better indicators of functional potentials that is witnessed by reduction of HBR in rest, by improvement of Shtange's test and Letunov's test; the students also demonstrated improved indicators by programs "Perception-1" and "Perception-2" as well as physical fitness indicators.

The prospects of further researches imply perfection of individualization system for development of students' physical and functional potentials.

References:

1. Ashanin V. S. *Slobozhans'kij naukovo-sportivnij visnik* [Slobozhanskyi Herald of Science and Sport], 2002, vol.5, pp. 164-166.
2. Barybina L.N. *Fiziceskoe vospitanie studentov* [Physical Education of Students], 2012, vol.6, pp. 20-24.
3. Egorychev A.O. *Teoriia i praktika fizicheskoj kul'tury* [Theory and practice of physical culture], 2005, vol.4, pp. 48-50.
4. Iermakov S.S. *Fiziceskoe vospitanie studentov tvorceskih special'nostej* [Physical Education of the Students of Creative Profession], 2004, vol.3, pp. 8-24.
5. Kanishcheva O.P., Iefimenko N.P., Iefimenko P.B. *Fiziceskoe vospitanie studentov* [Physical Education of Students], 2010, vol.2, pp. 93-95.
6. Kozina Zh.L., Barybina L.N., Grin' L.V. *Fiziceskoe vospitanie studentov* [Physical Education of Students], 2010, vol.5, pp. 30-35.
7. Kozina Zh.L. *Sistema individualizacii podgotovki sportsmenov v igrovykh vidakh sporta* [System of individualization of training athletes in team sports], Lambert Academic Publishing Russia. 2011, 532 p.
8. Korobejnikov G.V., Korobejnikova L.G., Kozina Zh.L. *Ocinka ta korekciia psikhofiziologichnikh staniv u sporti* [Evaluation and correction of physiological states in sports], Kharkiv, KNPU, 2012, 390 p.
9. Krucevich T.Iu., Marchenko O.Iu. *Sportivnij visnik Pridniprov'ia* [Dnipro Sports Bulletin], 2008, vol.3-4, pp. 103–107.
10. Lizogub V.S. *Fiziologichnij zhurnal* [Journal of physiology], 2010, vol.56(1), pp. 148-151.
11. Makarenko N.V. *Fiziologichnij zhurnal* [Journal of physiology], 1999, vol.45(4), pp. 125-131.
12. Moskalenko N.V., Kovtun A.A. *Fiziceskoe vospitanie studentov* [Physical Education of Students], 2012, vol.3, pp. 83-86.

13. Ozerov V.P. *Psikhomotornye sposobnosti cheloveka* [Psychomotor abilities of the person], Dubna, Phoenix +, 2002, pp. 216-221.
14. Seluianov V.N., Shestakov M.P. *Opredelenie odarennosti i poisk talantov v sporte* [Definition of giftedness and talent search in sport], Moscow, Sports Academic Press, 2000, 112 p.
15. Il'inich V.I. *Fizicheskaia kul'tura studenta* [Physical education student], Moscow, Gardariki, 2007, 447 p.
16. Kozina Zh.L., Baribina L.M., Lugina I.V., Kozin A.V. *Fiziceskoe vospitanie studentov* [Physical Education of Students], 2012, vol.4, pp. 77-86.
17. Anne Flintoff, Rebecca Foster, Simon Wystawnoha Promoting and sustaining high quality physical education and school sport through school sport partnerships. *European Physical Education Review*, 2011, vol.17, pp. 341-351.
18. Clive C. Pope. The physical education and sport interface: Models, maxims and maelstrom. *European Physical Education Review*, 2011, vol.17, pp. 273-285.
19. Cécile R. L. Boot, Nathalie C. G. M. Donders, Peter Vonk, Frans J. Meijman. Development of a student health questionnaire: the necessity of a symbiosis of science and practice. *Global Health Promotion*, 2009, vol.16, pp. 35-44.
20. Eivind Å. Skille. Competitiveness and health: The work of sport clubs as seen by sport clubs representatives – a Norwegian case study. *International Review for the Sociology of Sport,* 2010, vol.45, pp. 73-85.
21. Junwook Hwang, Minki Hong, Seung-Yeol Yee, Sang-Min Lee. Impact of sports' characteristics on the labor market. *International Review for the Sociology of Sport*, 2012, vol.47, pp. 60-76.
22. Isao Okayasu**,** Yukio Kawahara, Haruo Nogawa. The relationship between community sport clubs and social capital in Japan: A comparative study between the comprehensive community sport clubs and the traditional community sports clubs. *International Review for the Sociology of Sport*, 2010, vol.45, pp. 163-186.
23. Bäckström M, Tinnsten M, Koptyug A. Sports Technology Education at Mid Sweden University. *Procedia Engineering.* 2013, vol.60, pp. 214-219. doi:10.1016/j.proeng.2013.07.037.

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AN INVESTIGATION OF INDIVIDUAL FUNCTIONALITY FOOTBALL REFEREES QUALIFICATIONS

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Annotation. *Purpose:* determine the level of individual functionality referees qualifications. Objective of the study was to determine the physiological parameters characterizing the functionality of football referees qualifications. *Material*: mainly experiment involved 29 highly qualified referees aged 21-45 years. In the main experiment participated 29 referees and 40 assistant referees (n = 69) Ukrainian Premier League. *Results:* found that the means and methods that use Ukrainian football referee high qualification in the special physical training for a competition, are not effective enough. Consequence of poorly planned training process is to increase the number of wrong decisions of the referees during the match associated with poor motor activity. *Conclusions:* data obtained in the course of educational research confirmed our theory about the necessity of individualization process special physical training qualifications of referees, which would entail increasing the functional and motor abilities of the referees, and as a consequence of better and successful completion of the work.
Keywords: referee, individualization, preparation, planning, error.

Introduction

Basing on recommendations of FIFA and UEFA we can say that physical training of football referees is of priority, especially when it concerns highly qualified referees.

Recent time testing of referees' special physical fitness takes place 4 times a season that helps for referees to maintain good physical form during all season and for managers of "Referees' committee" receive information about their current condition.

That is requirements to highly qualified referees' physical fitness are constantly increasing; psychological indicators and theoretical level go after them [1, 6].

The problem of referees' physical fitness was regarded in works by A.B. Abdula, A.D. Budgorskiy, K.L. Vikhrov, Yu.F. Kuznetsov, P.M. Kulalayev, A.N. Spirin, Yt.A. Turbin [1-7], et al. The works of the mentioned authors were oriented on training of referees of initial qualification or touched aspects of their psychological and theoretical levels. Special physical training of referees and its individualization was regarded by the authors only fragmentary or did not studied at all. In spite of the fact that all authors noted that it was the most important component in work of football referee.. That is why research of individualization of highly qualified football referees' special physical training is urgent as on to day [1-3, 5, 7].

This research is a part of scientific-research work, which was fulfilled in compliance with combined plan of SRW in sphere of physical culture and sports for 2011-2015 by topic 2.3 "Scientific-methodic principles of perfection of football sportsmen's training system considering specificities of competition functioning" (state registration number 0111U001722).

Purpose, tasks of the work, method and material of the research

The purpose of the work is to theoretically and experimentally ground need in individualization of special physical training of highly qualified football referees.

For solution of our task we used the following *methods and organization of the research:*

1. Pedagogic studying, analysis and generalization of scientific methodic literature, pedagogic observation, photo and video recording of different game situations, questioning;
2. Statistical analysis of the results.

Results of the research

During all sport season highly qualified football referees take part in conducting of official competitions of country and cup championships as well as international matches (referees of FIFA category) [4].

Recent years, quantity of games, conducted by highly qualified referees within frames of all-Ukrainian competitions, has been remaining relatively unchanged [1].

In season of 2012-2013 in **239 matches of Ukrainian Supreme league there were engaged 26 referees; the most wanted referee of Supreme league judged 15 matches and mean indicators of matches per one referee was** 9.2. Having compared indicators of Ukrainian highly qualified referees with indicators of advanced European referees of 2012-2013 season we can surely say that domestic referees receive in season much less assignments for matches than referees from other countries. The highest load in season is endured by referees of England Supreme league; mean quantity of matches, conducted by one English referee in one season is 20 (see fig. 1) [8].

Such indicators are connected, first of all, with insufficient physical fitness of our referees that is a result of wrong approach to training process; football referee of high qualification shall be ready to long and tensed competition [3].

If badly trained player can be replaced by other player in one match then referee cannot be replaced. High level of physical fitness shall be maintained by referee during all season, which takes 9 months [1].

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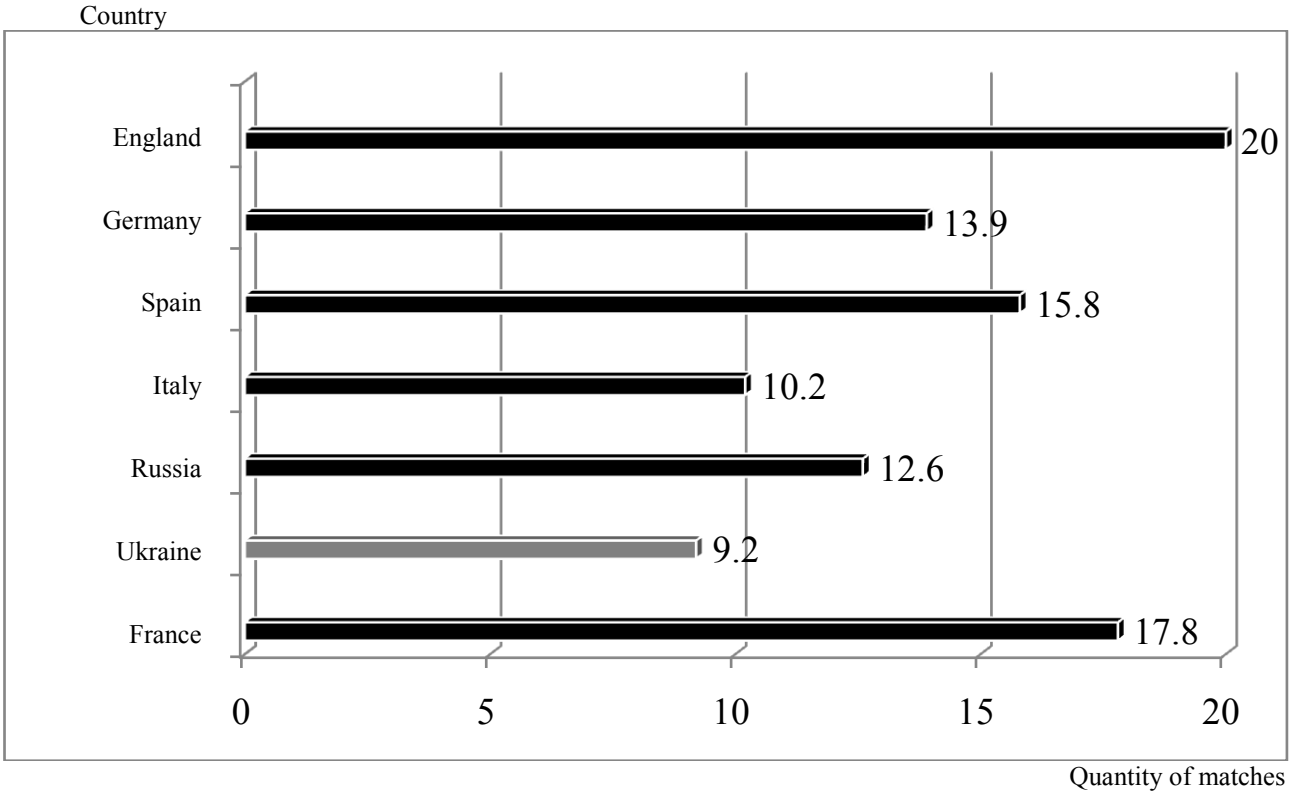

Fig.1. Comparative statistics of matches' quantity during season, conducted by highly qualified referees of Ukraine and advanced football championships of Europe (season 2012-2013.).

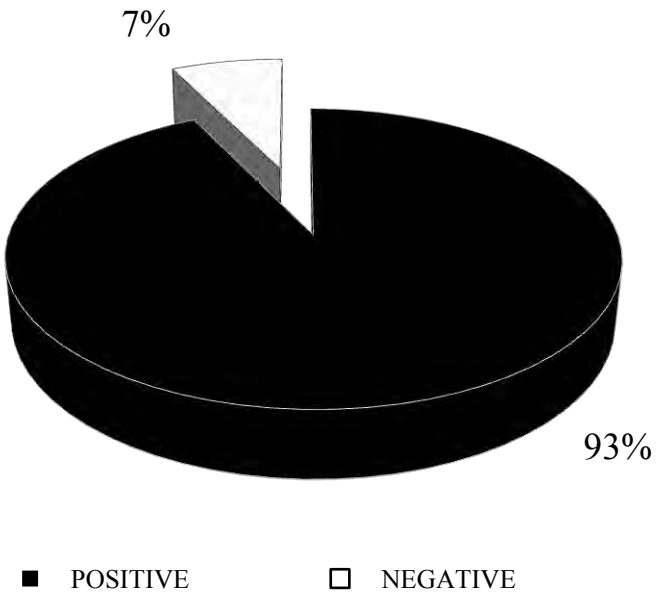

Fig.2. Attitude of referees and referees' assistants of Ukrainian Supreme League to individualization of special physical training

Analysis of results of our pedagogic questioning of 29 referees and 40 referees' assistants (n=69) (Supreme league of Ukraine) showed that 86.6% of referees feel, as a rule, significant physical tiredness after every match. Tensed matches noticeably influence on nervous muscular system and a number of functional indicators of referees [9].

Our questionnaire consisted of 16 questions, which were oriented on determination of factors, which, in opinion of referees, influence on effectiveness of special physical fitness and high level of functional state.

Besides, the questionnaire included question, determining referees' and referees assistants' attitude to individualization of special physical fitness on the base of individual peculiarities of development of their motion skills and functional potentials (see fig.2).

93% of respondents answered this question positively. Only 7% have negative attitude to individualization ogf special physical training.

Achieving and maintaining of high level of special physical fitness in process of practical refereeing during all season can surely facilitate both higher quality of refereeing and referee's ability to cope with constantly increasing competition load [1, 3, 5, 6, 8].

The fulfilled by us researches in frames of video reviewing of refereeing, conducted by highly qualified referees permit to see not only quantitative picture of every 15-minutes' period of match but also to determine distance at which referees take decisions about violation of rules and determine interconnection of special physical fitness and quantity of referees' correct and wrong actions (see figs. 3, 4, 5).

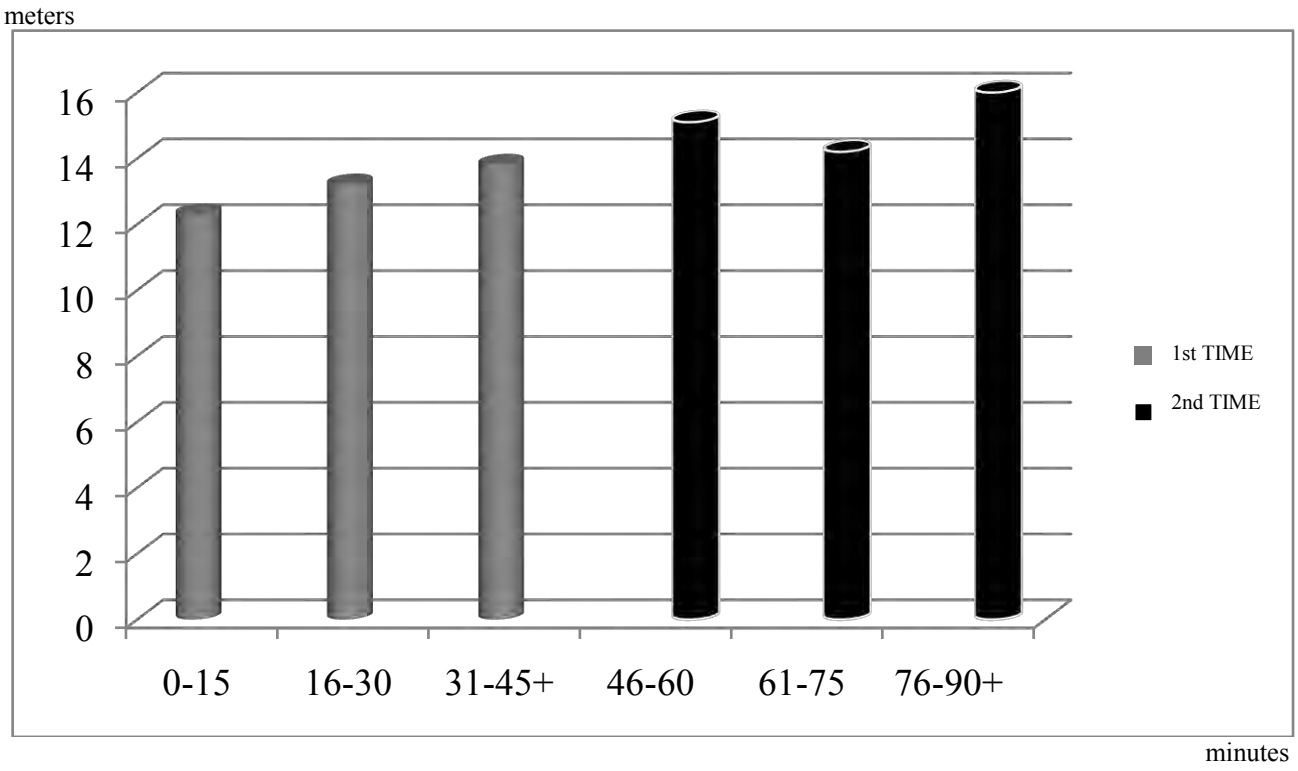

Fig.3 Mean distance from referee to place of rule's violation (differentiated by 15 minutes' periods) (in meters)

Having analyzed the data of supplied above figures we can see noticeable trend to increasing of mistakes with increasing of distance from referee's position to match's episode at moment of taking of decision.

Basing on all received in the course of our pedagogic researches data we can make definite conclusions that all means and methods, which are used by highly qualified referees in process of special physical training for com,petitions are not sufficiently effective that results in refereeing with insufficient quality.

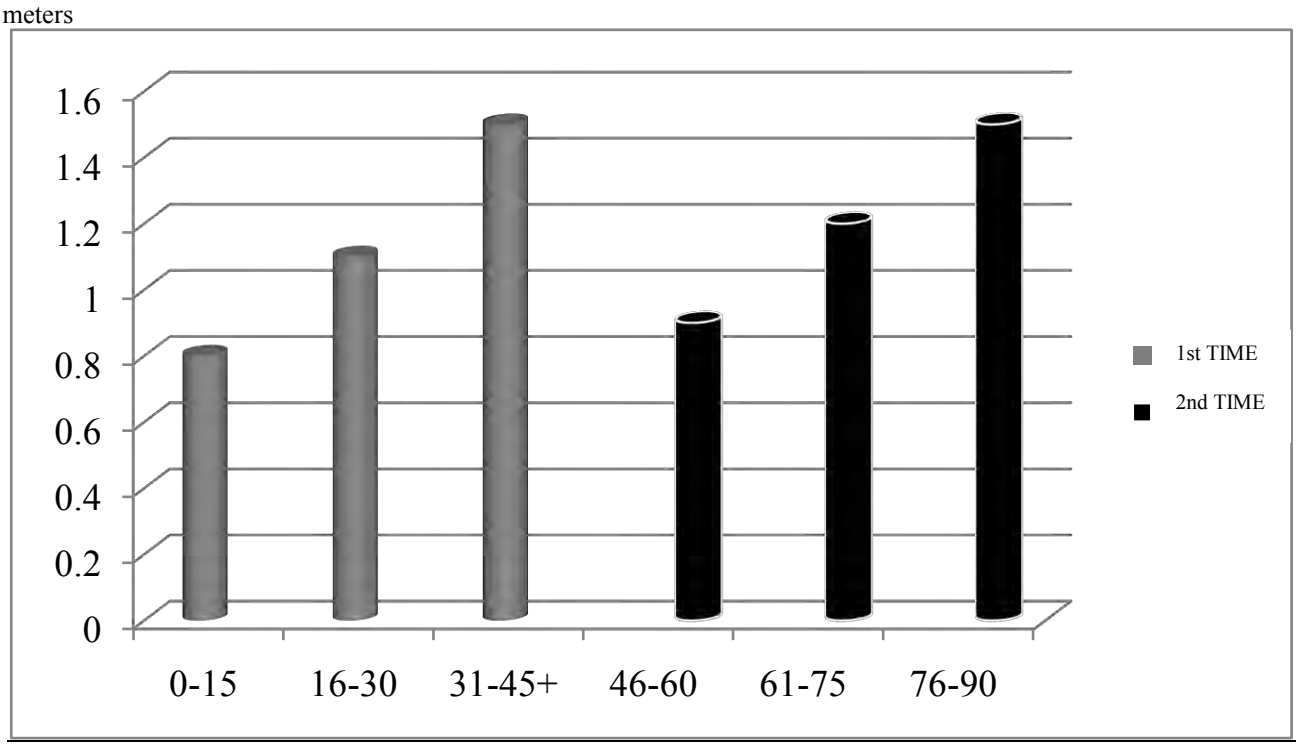

Fig.4. Mean quantity of referees' wrong decisions on interpretation of rules and on stoppages of match (differentiated by 15 minutes' periods)

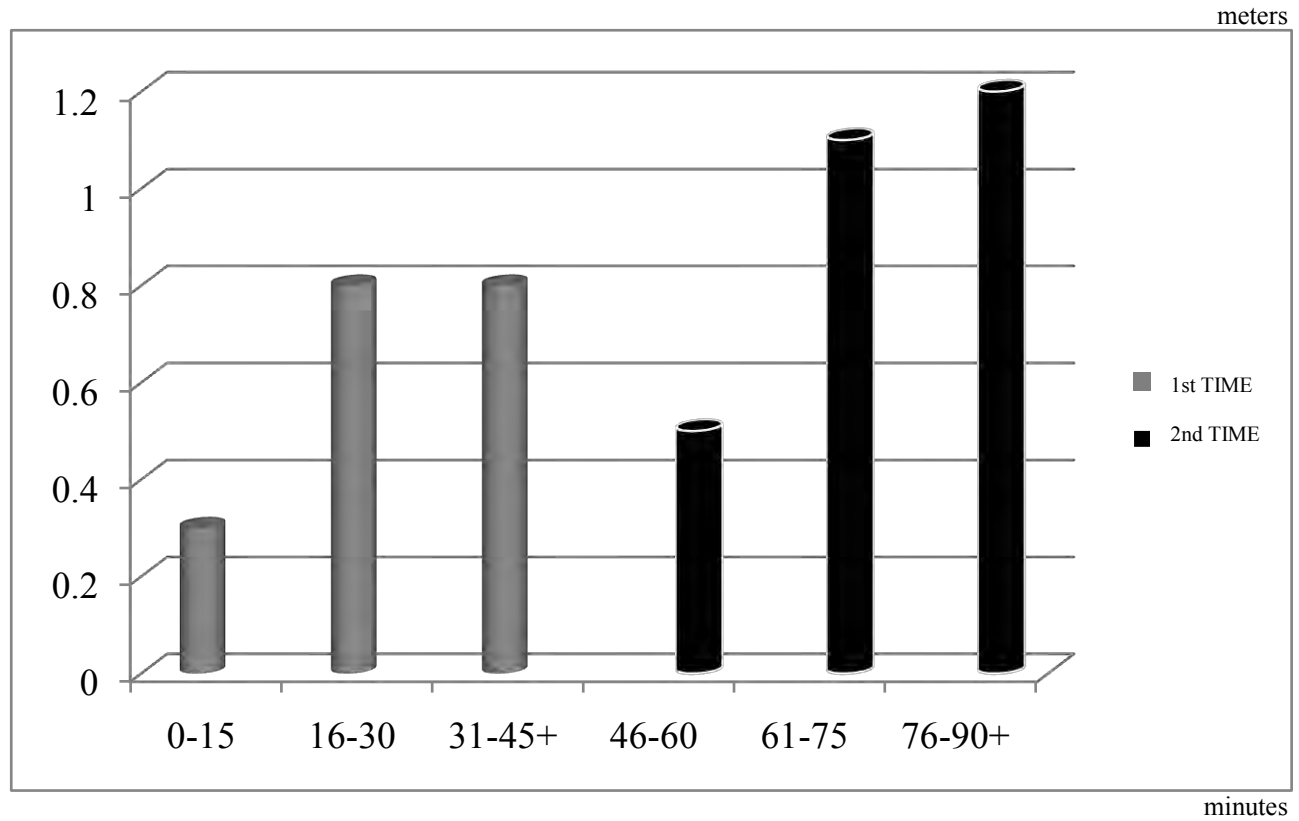

Fig.5. Mean quantity of violations, not noticed by referee (differentiated by 15 minutes' periods)

Conclusions:

Modern football requires from referee's special physical fitness high standards that are witnessed by results of our researches; see below brief conclusions.

With the help of pedagogic questioning, in which 29 referees and 40 referees' assistants of Ukrainian Supreme league took part, we determined that highly qualified referees apply in training process quite different methodic and

programs, oriented on perfection of general and special physical fitness. Personal experience and self feeling of referees were the basis of planning of their trainings loads.

93% of respondents (n=69) noted that individualization of special physical training of highly qualified referees on the base of development of their motion abilities and functional potentials is required.

All received in pedagogic researches data proved our theory about demand in individualization of special physical training of highly qualified referees that will result in increasing of referees' functional potentials and, consequently, fulfillment of their work with higher quality.

The next stage of our research will be preparation of individual programs on special physical training of highly qualified referees.

References:

1. Abdula A.B. *Udoskonalennia fizichnoyi pidgotovki futbol'nikh arbitriv riznoyi kvalifikaciyi* [Improving physical fitness football referees with different qualifications], Cand. Diss., Kharkiv, 2011, 20 p.
2. Budogosskij A.D. *Organizacionno-pedagogicheskie aspekty postroeniia processa professional'noj podgotovki futbol'nykh arbitrov nachal'noj kategorii* [Organizational and pedagogical aspects of the process of constructing training football referees primary category], Cand. Diss., Moscow, 2008, 26 p.
3. Vikhrov K.L. *Kompan'en futbol'nogo arbitra* [Assistant soccer referee], Kiev, Combi LTD, 2006, 150 p.
4. Zemcova I.I. *Sportivna fiziologiia* [Sports physiology], Kiev, Olympic Literature, 2008, 208 p.
5. Iordanskaia F.A., Iudinceva M.S. *Monitoring zdorov'ia i funkcional'naia podgotovlennost' vysokokvalificirovannykh sportsmenov v processe uchebno-trenirovochnoj raboty i sorevnovatel'noj deiatel'nosti* [Monitoring the health and functional preparedness of elite athletes during training work and competitive activities], Moscow, Soviet sport, 2006, 184 p.
6. Karpman V.L., Belocerkovskij Z.B., Gudkov I.F. *Testirovanie v sportivnoj medicine* [Testing in sports medicine], Moscow, Physical Culture and Sport, 1988, 207 p.
7. Kuznecov Iu.F. *Teoriia i praktika fizicheskoj kul'tury* [Theory and practice of physical culture], 2000, vol.7, pp. 34-38.
8. Kulalaev P.M. *Nachal'naia podgotovka futbol'nykh arbitrov* [Initial training of football referees], Volga, 2006, 165 p.
9. Spirin A.N., Budogosskij A.D. *Sudejstvo: vzgliad na problemu* [Refereeing: A look at the problem], Moscow, 2003, 274 p.
10. Matveev L.P. *Osnovy obshchej teorii sporta i sistemy podgotovki sportsmenov* [The general theory of sport and the system of training athletes], Kiev, Olympic Literature, 1999, 317 p.
11. Turbin E.A. *Vybor pozicii i napravlenie peremeshcheniia arbitrami v khode igry* [Selecting the position and direction of movement of the arbitrators in the course of the game], 2004, 17 p.
12. Castagna C. Training the Italian Football Referees. *Coaching and Sports Science Journal.* 2008, vol.3, pp. 6-7.
13. Di Salvo V, Gregson W, Atkinson G, Tordoff P, Drust B. Analysis of High Intensity Activity in Premier League Soccer. *International Journal of Sports Medicine.* 2009, vol.30, pp. 205-212.
14. Mallo J, Navarro E, Garcia-Aranda JM, Gilis B, Helsen W. Analysis of the Kinematical Demands Imposed on Top-Class Assistant Referees During Competitive Soccer Matches. *Journal of Strength and Conditioning* Research. 2008, vol.22, pp. 235-242.
15. Weston M, Castagna C, Impellizzeri FM, Rampinini E, Abt G. Analysis of Physical Match Performance in English Premier League Soccer Referees with Particular Reference to First Half and Player Work Rates. *Journal of Science and Medicine in Sport.* 2007, vol.10, pp. 390-397.

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DEVELOPMENT OF MOTIVE SKILLS OF STUDENTS WHILE MAKING UNDERARM PASS DURING PLAYING VOLLEYBALL

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Annotation. *Purpose:* The effect of the experimental procedure on the development of motor abilities of students in the course of employment volleyball. *Material*: The experiment involved 80 students of the Faculty of Physical Education. *Results*: Studies have shown that when passing the ball with two hands at the bottom of the students there is a certain dynamic changes in the structure of support interactions, which is expressed by the increase of biodynamic and time indicators on 8.19% of the students in the control group and 16.17% of the students in the experimental group. The technique allowed tenzodynamometry qualitatively assess the level of development of motor abilities of students in performing the ball with two hands at the bottom. Determine the validity of the growth of average indicators support reactions of the body of students in the experimental group when the transfer of the ball with two hands at the bottom. *Conclusions*: Recommended every lesson during warmup volleyball include special exercises, tasks are executed sequentially, with a gradual increase in load as the assimilation of motor actions, use the methods of biomechanical control.
Keywords: students, biomechanical, tenzodynamometry, volleyball, physical education.

Introduction

Training of motion skills is required in any activity. However, only in sphere of physical education this training is a core of all training process, as far as in this sphere motion functioning is both the object and the mean and the purpose of perfection. In physical education training is rather specific. The sense specificity is that main scope of new is learnt in mastering of different motion actions, i.e. physical exercises [6, 8, 9].

All movements are formed during life of a person under influence of different factors and the process of their formation can have different character. Optimization of this process is achieved in conditions of rationally built training. Inner logic of educational process and improvement of motion actions in such conditions is usually interpreted as consequent transition from knowledge and ideas to ability to fulfill it and then – from skill to reflex. Possibility to master rational movements depends on correct knowledge about sense, rules and conditions of their fulfillment; transformation of knowledge in actions can be possible only on the base of its practical realization [2, 4].

Mastering of a movement starts from formation of its visual-logic picture. As main methods oral description, showing and their combination – demonstration-comment - are used. The next task of training – formation of motion ideas about elements, required for movement. The main method of solution of this task is practical fulfillment of action, which is learnt in parts or as a whole [5].

At initial stage of movements' training the most typical mistakes are: extra movements by amplitude and direction; wrong rhythm; low speed of movement 1, 5, 11].

Mastering of movements requires many repetitions that causes significant losses of physical, psychic and mental energy. Quantity of movements' repetitions is determined by dynamic of their mastering and by dynamic of remembering. Rest intervals are determined by peculiarities of dynamic of physical and psychic workability and by regularities of mastering of the material [6].

Ability to control own movements and fulfill them adequately to own demands is formed only in process of special training with the help of specially selected physical exercises. With it, it is necessary to consider that in volleyball the most important is ability to evaluate own movements in respect to time and space and by increasing of muscular tension [3, 5, 10].

In this connection we researched influence of experimental methodic on development of students' motion skills in process of volleyball trainings.

The topic of this work complies with scientific program of faculty of physical education of Chernigov National pedagogic university, named after T.G. Shevchenko and is a part of university's topic "Pedagogic ways of healthy life style's formation of different age schoolchildren" *state registration number 0112U001072 dt. January18, 2012).

Purpose, tasks of the work, material and methods

The purpose of the work is to theoretically ground and experimentally test effectiveness of methodic of motion skills' development of students in volleyball training.

The tasks of the research:

Receive data, which permit to develop and control motion skills in process of volleyball training.

- Work out methodic of development of students' motion skills with ball's passing by two hands from below.

The methods of the research: theoretical analysis and generalization of literature sources, pedagogic experiment, strain gauge dynamometry, methods of mathematical statistics.

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Organization of the research: experimental researches were conducted on the base of Chernigov National pedagogic university, named after T.G. Shevchenko, in laboratory of bio-mechanics with participation of 1st and 2nd year students of faculty of physical education (n=80).

Results of the research

Training of elements of volleyball technique is the basis of game, as far as no tactic idea can be realized without perfect mastering of techniques. The more various technical fitness of players is the more tactical possibilities exist for a team [3, 7].

Passing of ball is a targeted action, which is connected with taking of ball and re-directing of it to one of partners. Taking of ball (for example taking of ball from adversary's service) does not reflect actual position because in this case main aim is targeted pass to attacking player. Term "taking" is connected with time, when many players could not handle served ball correctly.

Success of ball pass's training depends on level of players' physical fitness. They shall be able to stand on half bent legs for long time, to quickly move on site.

We worked out special methodic of development of students' motion skills in process of volleyball trainings with ball's passing by two hands from below, which included 30 special exercises with certain tasks. The tasks were realized consequently, with gradual increasing of loads in the course of mastering of movements. At every training during warming up we fulfilled special volleyball exercises and used method of repetition. General group (GG) of physical education faculty students was divided into control group (CG) (n=40), which was trained by traditional methodic and experimental group (n=40), which was trained by special methodic.

Control over development of motion skills was conducted with the help of bio-mechanical methods, videlicet: method of strain gauge dynamometry that permitted to promptly correct training and perfection process.

Influence of methodic of motion skills' development on bio-mechanical indicators of support responses when fulfilling ball's passing with two hands from below by control group's students was characterized by positive increment of changes ($P<0.05$), videlicet: the highest percentage increment belonged to indicators of maximal force of pushing in respect to sagittal axis – 7.35 %, gradient of force– 9.66 % and impulse of force– 13.33 % (see table 1).

Table 1

Mean statistic indicators of support responses of body of physical education faculty students when fulfilling ball's passing with two hands from below

№	Description of characteristics	GG (n=80)	CG (n=40)	Increment, %	EG (n=40)	Increment, %
1	$F_{z\ max}$	1614.5±397.5	1645.8±53.12	1.94	1678.6±41.16	3.97
2	$F_{x\ max}$	56.15±8.29	58.97±9.91	5.02	93.51 ±19.88	66.54
3	$F_{y\ max}$	57.54±20.12	61.23±19.87	7.35	66.14 ±22.13	14.95
4	F_{max}	1615.1±398.1	1643.2±53.31	1,74	1881.2±54.78	16.48
5	F_{max}/P	2.31±0.42	2.26±0.09	-2.16	2.33±0.21	0.87
6	GRAD	3384.1±947.4	3711.1±239.1	9.66	4359.7±166.5	28.66
7	I	99.39±23.35	112.64±15.31	13.33	139.12±25.22	39.94
8	P	693.67±50.22	727.15±8.23	5.01	739.12±25.23	6.57
9	T_{ps}	0.22±0.04	0.21±0.03	-4.55	0.18±0.05	-18.18
10	T_{max}	0.33±0.09	0.32±0.04	-3.03	0.31±0.02	-6.06
11	T_o	0.12±0.04	0.08 ±0.09	-33.33	0.11±0.02	-8.33
12	$T_{max}+T_o$	0.45±0.13	0.42±0.03	-6.66	0.43±0.01	-4.44
13	T_h	0.51±0.18	0.39±0.03	-23.53	0.46±0.11	-9.81

14	H_{max}	0.16±0.06	0.15 ±0.03	-6.25	0.12 ±0.05	-18.75
15	T_{sum}	1.07±0.15	1.03±0.02	-3.74	1.04±0.15	-2.81

Indicators of maximal force of pushing in respect to vertical and frontal axes had lower increment – 1.94 % and 5.02 % respectively, of maximal value of support response' components– 1.74 %, of body mass– 5.01 %. Indicator of correlation of support responses force indicators' maximal value to body mass reduced by 2.16 % ($P>0.05$). As a result of experiment mean increment of bio-dynamic indicators in control group was 10.85 %.

Time characteristics of support responses with ball's passing by two hands from below reduced values from 3.03 % to 33.33 %. Mean increment of time indicators of control group was 8.19 %.

In experimental group we found great quantity of confident changes of our methodic influence on bio-mechanical characteristics of ball's passing with two hands from below. All bio-mechanical characteristics changed confidently ($P<0.05$). Increasing of changes was in mean range from 0.87 % to 66.54 %. Time characteristics changed confidently ($P<0.05$). Increment of percentage of their values was within from 2.81 % to 18.18 %. Mean increment of experimental group's indicators was 16.17 % (see table 1).

Therefore approximate schema of training and development of motion skills implies understanding of sense of a technique, imagining of movements' structure during practical actions with ball, finding of the most rational solution and fixing of skills with multiple repetitions.

Conclusions:

On the base of obtained by us results we can affirm that the offered experimental methodic is effective for development of students' motion skills in process of volleyball trainings. Application of the offered methodic in combination with bio-mechanical methods of control in process of volleyball training permits to achieve better indicators of support responses of body that is witnessed by increment of percentage of mean statistic indicators of support responses on experimental group in comparison with control one by 7.98 %.

The prospects of further researches in this direction imply offering of new ways of motion skills' development on the base of experimental data in the process of volleyball trainings in sphere of HEEs physical education.

References:

1. Abramov S.A., Kuz'minova M.I. *Visnik Chernigivs'kogo derzhavnogo pedagogichnogo universitetu* [Bulletin of the Chernihiv State Pedagogical University], 2011,vol.1(91), pp. 12-14.
2. Bernshtejn N.A. *Ocherki po fiziologii dvizhenij i fiziologii aktivnosti* [Essays on the physiology of movements and physiology of activity], Moscow, Medicine, 1966, 349 p.
3. Turovs'kij V.V. , Nosko M.O. , Osadchij O.V. , Garkusha S.V. , Zhula L.V. *Volejbol* [Volleyball], Kiev, 2009, 138 p.
4. Gaverdovskij Iu.K. *Obuchenie sportivnym uprazhneniiam* [Training exercise], Moscow, Physical Culture and Sport, 2007, 912 p.
5. Ivojlov A.V. *Volejbol* [Volleyball], Moscow, Physical Culture and Sport, 1981, 152 p.
6. Nosko N.A. *Pedagogicheskie osnovy obucheniia molodezhi i vzroslykh dvizheniiam so slozhnoj biomekhanicheskoj strukturoj* [Pedagogical bases of youth and adult education movements with complex biomechanical structure], Kiev, Scientific World, 2000, 326 p.
7. Pimenov M.P. *Volejbol* [Volleyball], Ivano-Frankivsk: Lily-NV, 2001, 196 p.
8. Agostini Valentina, Emma Chiaramello, Lorenzo Canavese, Carla Bredariol Marco Knaflitz. Postural sway in volleyball players. *Human Movement Science.* 2013, vol.32(3), pp. 445–56. doi:10.1016/j.humov.2013.01.002
9. Artemenko B.O. The significance of the tactical training of volleyball players of different skill levels in their play activities. *Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports.* 2014, vol.1, pp. 9–12. doi:10.6084/m9.figshare.894384
10. Asai Takeshi, Shinichiro Ito, Kazuya Seo, Akihiro Hitotsubashi. Fundamental aerodynamics of a new volleyball. *Sports Technology,* 2010, vol.4(3), pp. 235–239. doi:10.1080/19346182.2012.663528
11. Ennis C.D. Physical Education Curriculum Priorities: Evidence for Education and Skillfulness. *Quest*, 201, vol. 63(1), pp. 5–18.
12. Kirk D., MacDonald D. , Suliva M.O., Kirk D. *The handbook of physical education*. Sage. 2006, 838 p.
13. Lobietti Roberto, Simon Coleman, Eduardo Pizzichillo, Franco Merni. Landing techniques in volleyball. *Journal of Sports Sciences,* 2010, vol.28(13), pp. 1469–1476. doi:10.1080/02640414.2010.514278
14. Sands R.R. *The anthropology of sport and human movement: a biocultural perspective*. ed. By R.R. Sands, L.R. Sands. Lexington Books, 2012, 353 p.
15. Zadraznik M., Dervisevic E. Level of play related anthropometric differences in volleyball players. *British Journal of Sports Medicine*. 2011, vol.45, pp. 542-543. doi:10.1136/bjsm.2011.084558.27

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CONSTRUCTION OF TRAINING PROCESS OF TENNIS PLAYERS AGED 5-6 YEARS, TAKING INTO ACCOUNT THE SPECIFICS OF THE DEVELOPMENT AND CONTROL OF THEIR COORDINATION SKILLS

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Annotation. *Purpose:* Presented results of the research to determine the features of the construction of the training process for young tennis players aged 5-6 years, in particular the specific application of pedagogical testing to test the level of development of their coordination skills. *Material:* The survey was attended by 30 experts. *Results:* Established that bigger part of coaches build the training process at the initial stage of preparation on the basis of the game approach and apply a program of the International Tennis Federation "Play and stay". About two-thirds of the coaches do not carry out a selection of tennis players aged 5-6 or make it only in individual cases. To assess the level of development of motor abilities are equally important coaches define pedagogical supervision and pedagogical testing. A significant proportion of respondents (43%) previously had experience in assessing motor abilities of tennis players 5-6 years by mean of pedagogical tests. *Conclusions:* Overwhelming majority of coaches support the idea of having to modify the tests in accordance with the age characterristics of tennis players aged 5-6 years and expediency of complex assessment of the level of development of their coordination skills.
Key words: tennis, testing, coordination abilities, complex control, tennis players.

Introduction

Currently, new requirements produced in respect of the construction of the training process, the selection to sports schools, the diagnosis of various aspects of the development and preparedness of young sportsmen. Accordingly, many specialists and coaches have questions, answers for which it is possible to get only as a result of the special researches.

Today greater amount of parents engage the children in sport schools and clubs on tennis from the earliest age. This tendency, caused by changes in tennis Curriculum for Sport Tennis Schools now oriented to experience of international researches in child's tennis [12].

By some authors have developed and proposed for use the methodology and complexes exercises for teaching children 4-6 years [4,6,11], and studied their influence on the improvement of the functional systems of the body, motor skills, physical development [3,7,13,14]. Today is absent publication about the diagnosis level of coordination – key ability for children of this age to effectively teach basic technical skills of tennis. Coordination abilities are also an important criterion for the selection and the future orientation young athletes in tennis.

Study the features of diagnosing the level of coordination abilities tennis players 5-6 years will contribute to the effective selection young tennis players and a differentiated approach to the rational construction of the training process at the initial stage of preparation.

In the Curriculum for Sport Tennis Schools 2012 [12] the construction of the initial stage preparation is based on 3 levels learning tennis: "red", "orange" and "green." Levels are derived from the names of colors and special compression balls, the size of the playing area, which take into consideration the age characteristics younger school children.

In initial preparation groups of the 1st year of study ("red" tennis level) executed the selection of capable children for further specialization in tennis. Because of this aim, there are complex of organizational and methodical actions, in a result of which carry out viewing as possible greater amount of active children. Coaches fix special abilities, which are needed for tennis player, reveal compliance physical, technical and psychological readiness of children, that engage in the initial preparation groups, to normative requirements [5,12].

According to the training program (Curriculum) Sport Tennis Schools can engage children 5-6 years (10 people in the group). Children can distribute into several subgroups by coaches, according to various criteria: age, gender, level of physical development, mental characteristics, the level of physical and especially – coordination abilities [5,12].

As before children began engaging tennis from seven, there was not significant necessity for determination the level of developing coordination abilities 5-6 years old children, but now this question looks actually enough. The level of developing coordination abilities can become one of the key criteria for the differentiated approach to education and for passing to the next stage of preparation.

Data trainers questioning shows that majority of them consider, that coordination abilities is major physical ability for education the basic tennis skills. As well-known researchers mark, many of relatively independent types of coordination abilities have sensitive periods of development, that fall on the stage of initial preparation in tennis [2,5,8]. By A.S. Solodkov and E.B. Sologub [10], in the basic motor structure of 3-6-years-old children coordination abilities amount 52-57%. To the coaches, that are training preschoolers, it is important to know about so-called «slow» children which require the special approach to development motor abilities, including coordination [10]. In particular, by results of children's pedagogical testing of this age it is expedient to plan the proper tasks and create (if it is necessary) a separate sub-group for effective development more capable children.

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Purpose, tasks of the work, material and methods

The aim of this research is to determine the characteristics of the construction of the training process for tennis players 5-6 years as a result of the survey of coaches.

Methods and organization studies. Methods were follows: study and analysis of literary and documentary materials about the problem of research, pedagogical observation, survay. The study involved 30 tennis coaches – 15 men and 15 women, the large majority of them – 90% – had direct experience of engaging with children 5-6 years of age. Another 10% worked with tennis players of groups of initial preparation 2-3 year of study. The average age of respondents was 30 ± 8,9 years, and the average duration of their work – 9 ± 6,7 years.

Results of the research

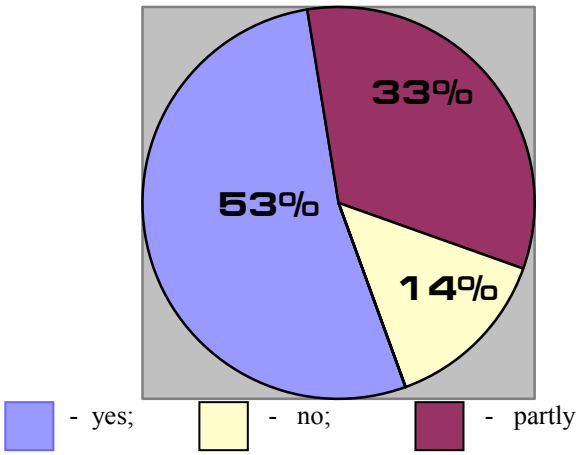
The importance of coordination abilities to play tennis and branching their structures necessitate integrated control of all relatively independent kinds this physical quality of young tennis players [1,2,8,9]. As long as the development of coordination abilities begins mainly in the stage of initial preparation, it becomes relevant to determine the level of it development in young athletes. Coaches poll was conducted in order to supplement information obtained from the analysis of literature and pedagogical observations about the features of the control of coordination abilities of children of 5-6 years on the stage of initial preparation in tennis.

Almost half of polled coaches (47%) train tennis groups of the first year initial preparation, in which the number of children exceeds the minimum rate. This figure indicates that at present there is a big demand for tennis lessons. Almost half of the coaches (47%) has experience with preschool children 5-6 years old, engaging with more than one group, and may offer the optimal modern training program considering the age of the children.

The amount of specialists which teach young sportsmen playing tennis is lately increased, using offered the International Tennis Federation program «Play and remain in tennis forever» («Play & Stay») or some elements of this program to which, foremost, belongs varying of playground's sizes, rackets, index of compression of balls, and also rules of game on an account depending on age and individual possibilities of players.

All these innovations are called to improve the process of teaching of tennis players on the stage of initial preparation and bring over as many as possible children to employments by sport. In this connection, was detected opinion of coaches about application of the program «Play & Stay» in training children under age 10 years.

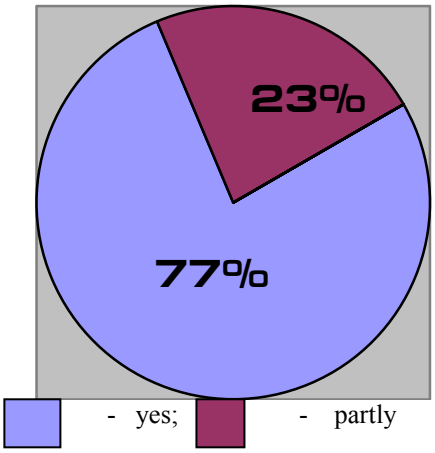
On fig.1 shown results of coach's survey about applying new presented program on children's training in Sport Tennis Schools.



Picture 1. Application of the program «Play and remain in tennis forever» («Play & Stay») by coaches in-process with children in Sport Tennis Schools.

Playing approach as a key component of the presented program of development young player on the initial stage is basis to increase motivation of children and their harmonious development. He supposes not only the use of different mobile games but also that in a playing form it is possible to conduct a whole tennis lesson, which consists of different interesting tasks which a trainer presents children as a game, often using different images and associations.

During the lesson there is alternation of playing tasks (mobile games and relay races), directed on development of motor skills, physical qualities (coordination, speed and speed-power capabilities, aerobic endurance), that provides high dynamic quality of lesson. On a fig. 2 the results of questioning of coaches are indicate on application by them playing approach in training process. So, 77% polled coaches apply playing approach during employments, 23% – use such approach from time to time, and none of respondents specified that does not takes it into account.

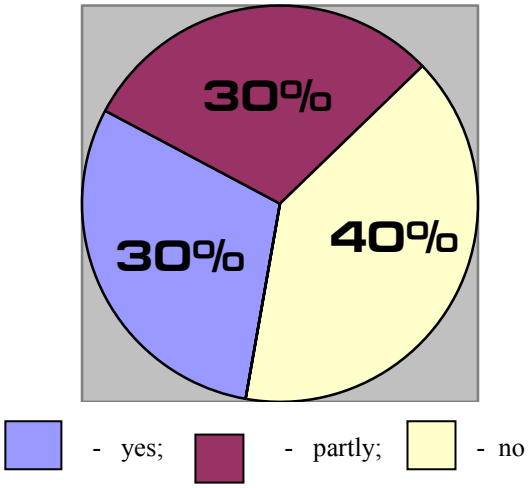


Picture 2. Application of play approach by coaches to teaching young tennis players on the stage of initial preparation.

It testifies about understanding of key role of play approach by coaches to teach tennis exercises children of preschool and junior school age, about their knowledge the mental features of children at the construction of training process on the stage of initial preparation.

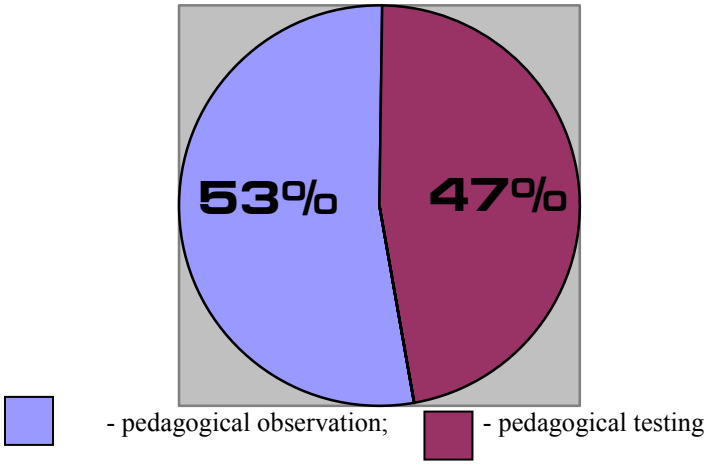
Considering the indicated initial age for tennis employments and duration of the stage of initial preparation, the enough actual is become a question about expedience of selecting children 5-6 years for employments by this type of sport.

Outspoken opinions by trainers in the poll in relation to expedience of selection of 5-6-years children for tennis employments distributed as follows: 30% agree with his necessity, 30% acknowledge necessary to select only on occasion, and 40% does not consider his expedient in this age (fig. 3).



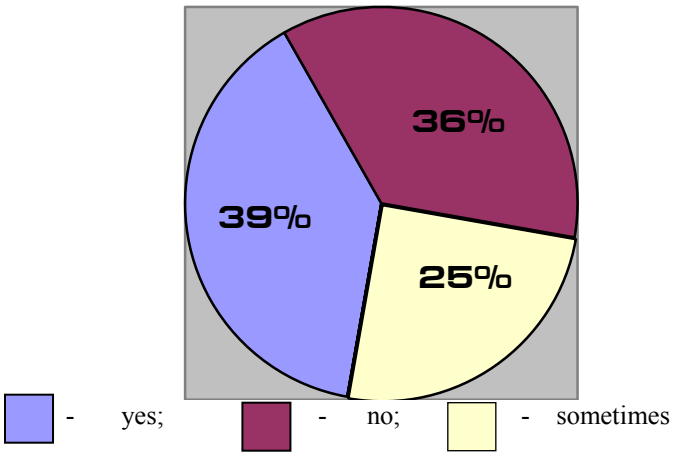
Picture 3. Expedience of selection 5-6 years children for tennis employments on the stage of initial preparation.

As is generally known from researches of many scientists [2,5,8,12], the stage of initial preparation is major for development of physical qualities. On results questioning most coaches is estimated level of development of physical qualities by a pedagogical supervision – 53%, and pedagogical testing – 47% (fig. 4). Thus, almost the half of respondents is well-informed about the specific of maintenance and method of leadthrough of control children's physical abilities.



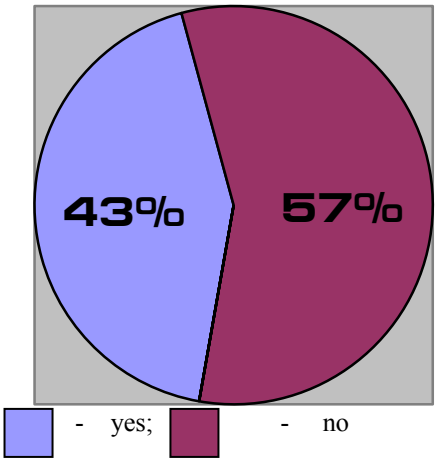
Picture 4. Basic methods of estimation motor abilities of young tennis players on the stage of initial preparation.

However, taking into account the real initial age of employments tennis (5 years), there is a question about expedience of the use of standard test tasks for tennis preschool players. On a fig. 5 the results of determination of coach's opinion are rotined about expedience of the use test tasks for determination the level of physical preparedness 5-6 years children, engaged in tennis.



Picture 5. Expedience of the use test tasks by coaches for determination the level of physical preparedness of tennis players 5-6 years.

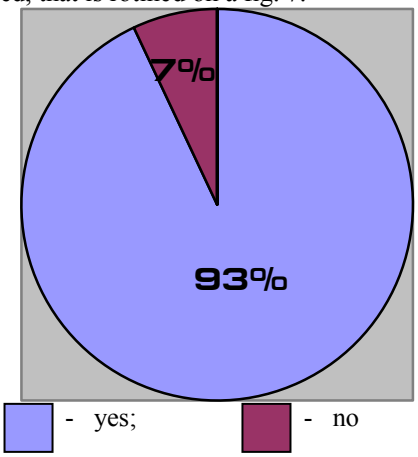
39% polled specialists estimate practice of the pedagogical testing positively, 36% does not count its expedient, and 25% guess that application of testing for the selection children to employments on a first year of study is possible only under favourable circumstances. Favourable circumstances, in their opinion, is an enough amount of time for plugging of testing in the program of reading with the large group of children, without violation process of decision the planned tasks. In training process, when present the proper equipment, that use in a test, quality theoretical and methodical preparedness of coach – is possible the leadthrough of control different types of physical qualities of children 5-6 years. These circumstances are stipulated by the followings results of questioning about estimation by coaches the level of development of coordination capabilities children 5-6 years with the purpose of selection in the groups of initial preparation through the pedagogical testing: the 43% polled conduct the pedagogical testing as a rule, and 57% – no (fig. 6).



Picture 6. Application of pedagogical tests by trainers for determination the level of development coordination abilities of children 5-6 years.

Some of the known tests, developed before by specialists and approved in practice of training the children of school age can be difficult for implementation 5-6-years-old tennis players. On the indexes, it is impossible exactly to say about the level of the probed physical quality. For example, in the test of Filipovich-Malinak [9] comparison of speed at run in ordinary and complicated terms on segments accordingly 30 m and 3x10 m will not show in the same degree the level of development of coordination abilities for preschoolers, and for children middle and senior classes. At the same time, at run on proportionally brief segments 12 m and 3x4 m in this test, at first, will allow 5-6 years players to retain high speed on all distance, and in the second, will anymore correspond the standards of tennis ground at «red» level of tennis – 12x6 m. For this reason modification of some tests becomes actual for determination the level of development coordination abilities by adaptation their spatial and temporal descriptions, level of motor complication to age-dependent possibilities of tennis players 5-6 years old.

Swingeing majority (93%) of coaches was supported such suggestion, and not see a necessity for modifications test tasks for children 5-6 years only 7% polled, that is rotined on a fig. 7.



Picture 7. Necessity of modification tests that applying by coaches for determination the level of development coordination abilities 5-6 years children.

Among the polled coaches 70% accede to the necessity of complex estimation of coordination abilities, and 30% – does not insist on it. From data of survey the level of actually of different relatively independent kinds of coordination abilities was certain at teaching children to tennis and competition activity, level of influence different factors on the indexes the development of coordination abilities of sportsmen. Positive opinion of trainers had determined in relation to expedience of leadthrough the complex testing of coordination abilities of tennis players 5-6 years, that will increase efficiency of selection and control on the stage of initial preparation in tennis.

Conclusions.

Most trainers use the modern program of the International Tennis Federation «Play & Stay» during training process the children and actively apply play approach during training employments. Specialists of tennis (30% trainers) deem it wise to select tennis players 5-6 years, 30% respondents acknowledge necessary to select only on occasion, and 40% does not consider his expedient in this age. The methods of pedagogical supervision and pedagogical testing apply for a selection, as a rule. Part of trainers does not consider it necessary to apply the estimation of physical abilities of children 5-6 years and does not apply the method of the pedagogical testing for determination the level of development of their coordination abilities (53%), however such practice estimated by many trainers (47%) positively. Swingeing

majority of specialists (70%) acknowledge importance of complex estimation of coordination abilities of tennis players 5-6 summer age and accede to suggestion of modification of different test's parameters in accordance with age of student (93%). The most polled is counted, that leadthrough of the pedagogical testing 2 times in a school year – optimum. Thus, in opinion of most trainers, it is necessary to use 2 tests for the estimation the level of development in relation to the independent kinds of coordination abilities.

Prospect of further researches. Researches the level of development coordination abilities, related to their complex estimation for tennis players on the stage of initial preparation, considering modern approaches, will matter very much and will help coaches more rationally plan content of physical preparation. Application of the differentiated approach to teaching of young tennis players will allow to promote efficiency of training process on the initial stage of preparation.

References:

1. Bernshtejn N.A. *O lovkosti i ee razvitii* [On dexterity and its development], Moscow, Physical Culture and Sport, 1991, 228 p.
2. Volkov L.V. *Teoriia i metodika detskogo i iunosheskogo sporta* [Theory and methods of youth sport], Kiev, Olympic Literature, 2002, 294 p.
3. Zhuravleva A.Iu. *Fizicheskaia kul'tura: vospitanie, obrazovanie, trenirovka* [Physical education: upbringing, education, training], 2011, vol.6, pp. 42-47.
4. Zhuravleva A.Iu., Zajceva L.S. *Fizicheskaia kul'tura: vospitanie, obrazovanie, trenirovka* [Physical education: upbringing, education, training], 2008, vol.4, pp. 34-35.
5. Ibraimova M.V., Khaniukova O.V., Polishchuk L.V. *Suchasna shkola tenisu* [Modern tennis school], Kiev, Express, 2013, 204 p.
6. Kurmaieva Ie.V. *Pedagogika, psihologia ta mediko-biologicni problemi fizicnogo vihovanna i sportu* [Pedagogics, psychology, medical-biological problems of physical training and sports], 2014, vol.6, pp. 21-25.
7. Loboda V.S., Mulik Z.V., Duzhina L.V. *Slobozhans'kij naukovo-sportivnij visnik* [Slobozhanskyi Herald of Science and Sport], 2012, vol.2 (37), pp. 51-55.
8. Liakh V.I. *Koordinacionnye sposobnosti* [Coordination abilities], Moscow, TBT Division, 2006, 290 p.
9. Sergiienko L.P. *Testuvannia rukhovikh zdibnostej shkoliariv* [Testing of motor abilities of students], Kiev, Olympic Literature, 2001, 439 p.
10. Solodkov A.S. *Fiziologiia cheloveka* [Human physiology], Moscow, Olympia Press, 2005, 528 p.
11. Suprunenko M.V. *Visnik Chernigivs'kogo derzhavnogo pedagogichnogo universitetu* [Bulletin of the Chernihiv State Pedagogical University], 2010, vol.81, pp. 447–451.
12. Grishko L.G. *Tenis* [Tennis], Kiev, RNMK, 2012, 160 p.
13. Shevchenko O.A. *Slobozhans'kij naukovo-sportivnij visnik* [Slobozhanskyi Herald of Science and Sport], 2013, vol.4(37), pp. 111-114.
14. Iakubovskij V.S., Iakubovskij G.S., Ivanova T.S. *Fizicheskaia kul'tura: vospitanie, obrazovanie, trenirovka* [Physical education: upbringing, education, training], 2012, vol.6, pp. 71-72.
15. Borisova O. V. Tennis: history and the present. *Pedagogics, psychology, medical-biological problems of physical training and sports*. 2012, vol.11, pp. 119-124.
16. Emshanova Y.O., Comparative analysis of individual peculiarities for tennis players of different qualification. *Physical Education of Students*, 2013, vol.4, pp. 23-26. doi:10.6084/m9.figshare.662589
17. Jagiello Marina, Jagiello Wladyslaw. Final preparations to the girls' tennis europe junior masters. *Physical Education of Students*, 2014, vol.5, pp. 59-64. doi:10.15561/20755279.2014.0511

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PEDAGOGICAL ASPECTS OF EFFECTIVE USE OF SIMULATOR "STRAPS WITH RING" DURING THE FORMATION MOTOR SKILLS OF PUPILS OF 10 CLASSES DURING THE SKIING TRAINING IN THE LESSONS OF PHYSICAL CULTURE

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Annotation. *Purpose*: to develop a system of ski training exercises using a functional simulator at physical training lessons. *Material*: The study took 90 young men attended 10 class. To determine the level of formation of motor skills of pupils were tested on 7 indicators: skiing skating style 5 km; skiing classic style 3 km; pulling up on the bar; long jump with space, running 60 meters, running 3 miles, 4x9 meters shuttle run. A year after the first experiment was conducted a second experiment. *Results*: The developed and adapted to the physical education class simulator exercises which compounded the gravity load and moving straps with rings. The test results confirmed that the proposed method makes it possible to more effectively shape the motor skills of pupils in the process of ski training at physical training lessons. *Conclusions*: It is recommended to the lessons of physical training on use of ski training complex of 22 exercises that will most effectively influence the formation of motor skills of pupils.
Keywords: simulator, pupils, motor, skills, ski training.

Introduction

Motion skills are rather important in educational process because the main in them is active creative thinking, oriented on analysis and synthesis of movements. Just senior pupils (10^{th}-11^{th} forms) are characterized by formation of schoolchildren's physical development. Especially it is necessary to note that in schoolchildren's physical education movements' technique takes one of the most important places [2, 6, 7, 9, 10, 11]. Among different kinds of sports we can call skiing in this aspect. Skiing training with application of technical aids facilitates successful formation of schoolchildren's skills, which will be used further in life, as well as in mental, moral, aesthetic, labor and patriotic education [1, 3, 4, 7, 12, 13].

There are different approaches to training of movements' techniques and designs of technical aids, oriented on different aspects of young organism's development. All they have sufficient scientific foundation however it is difficult to speak about their equal effectiveness and purposefulness [5, 8, 14, 15]. That is why it is necessary to work out new methods and methodic for improvement of schoolchildren's skills with the help of new TA. In this aspect it is necessary to regard effectiveness of simulator "Straps with rings" in formation of motion skills of 10 form pupils at physical culture lessons (skiing). The offered device belongs to functional simulators and system of exercises, known as Suspension Training (http://ironflex.com.ua/stati/trx-remni; Eugeny Gogolevskiy. Rubber simulators//Sports in school. 2007. Issue 5 (408). - C.2.), which was improved and adapted for school physical culture lessons.

The research was fulfilled in compliance with combined plan of scientific and research works of Chernigov national pedagogic university, named after T.G. Shevchenko "Didactic principles of motion function's formation of persons, who practice physical education and sports" (state registration number 0108U000854, dt. February 19, 2008).

Purpose, tasks of the work, material and methods

The purpose of the research is to determine pedagogic aspects of effectiveness of simulator "Straps with rings" in formation of motion skills of 10 form pupils at physical culture lessons (skiing training).

The tasks of the research:

1. Fulfill analysis of literature, devoted to the topic of our research work.
2. Carry out analysis of pedagogic aspects of simulator "Straps with rings" effectiveness in formation of motion skills of 10 form pupils at physical culture lessons (skiing trainings).
3. Work out system of skiing training exercises with the help of simulator "Straps with rings" at physical culture lessons.

Organization of the research:

Our researches were conducted during 2012-2014on the base of Chernigov National pedagogic university, named after T.G. Shevchenko and four comprehensive schools. For determination of level of motion skills' formation pupils were tested by 7 indicators: skiing by skating style – 5 km; classic style skiing – 3 km; chin ups; long jump from the spot; 60 meters' run; 3 km run; shuttle run 4x9 meters (see table 1).

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Table 1

Differences in indicators of model group (MG) pupils and general group (GG) by level of formation of motion skills in first experiment

Description of test / Group	Quantity of chin ups	Long jump from the spot, meters	60 meters' run, sec.	Shuttle run 4x9 meters, sec.	3 km run, min.	3 km classic style skiing, min.	5 km skating style skiing, min.
Model group	22.6	2.68	10.22	8.3	9.27	9.16	14.30
General group	164	2.63	10.36	8.6	10.37	10.13	15.32

As a result we observed differences between MG and GG: quantity of chin ups– 22.6 in MG and 16.4 in GG; long jump from the spot – 2.68 m in MG and 2.63 in GG; 60 meters' run – 10.22 sec. in MG and 10.26 sec. in GG; shuttle run 4x9 meters – 8.3 sec. in MG and 8.6 sec. in GG; 3 km run– 9.27 min. in MG and 10.37 min. in GG; 3 km classic style skiing, – 9.16 min. in MG and 10.13 min. in GG; skating style skiing - 14.30 min. in MG and 15.32 min. in GG.

After processing of this research's results we formed model group of 30 pupils, who had better indicators; other 60 pupils composed two groups: one experimental group and one control group (30 pupils in each of them). The received results were processed with common methods of mathematical statistics.

Experimental group started to work by author's methodic, which was worked out considering didactic principles of teaching. In compliance with author's methodic formation of motion skills and methods of senior pupils in skiing training was conducted in three stages: formation (creation) of skill, fixing and perfection of the skill. Sequence of pupils training was realized by schema: explanation. Demonstration – fulfillment.

Verbal method dominates in the work. Pedagogue stimulates verbally pupils to work consciously and persistently. He uses methods of encouragement6, stimulation. Pedagogue shall find something positive in every pupil and praise him for it, stimulating pupil for active work. At first classes task is to teach pupils to keep balance during transferring body mass on supporting leg, when skiing.

In order to ski well it is necessary to powerfully and frequently push off and for this purpose it is necessary to have strong muscles. That is why it is necessary to multiply repeat exercises for strength, flexibility, endurance, dexterity and quickness because development of motion skills is closely connected with these qualities.

For this purpose, author worked out and manufactured special simulator "Straps with rings" (see fig.1). Execution of exercises on this simulator is complicated by gravitational load and straps with rings, which are constantly move.

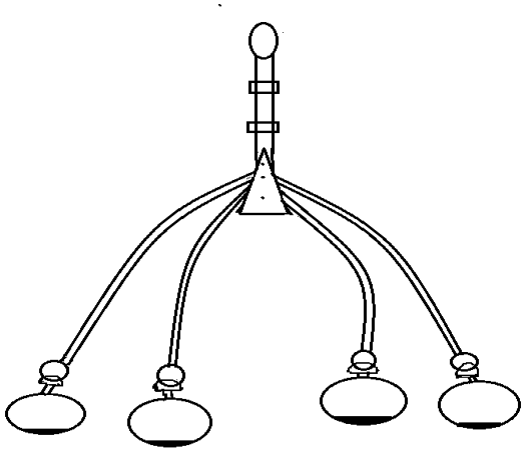

Fig.1. Diagram of simulator

At this simulator it is possible to fulfill required special exercises for strength of neck, upper girdle, back, abdomen; for strength, flexibility, dexterity and special endurance.

Experimental group started to train by author's methodic, which was worked out considering didactic

principles of teaching. In compliance with this methodic formation of motion skills of senior pupils in process of skiing training was conducted in three stages: formation (creation) of skill, fixing and improvement of the skill.

Sequence of 10 form pupils was realized bu schema: explanation – demonstration – fulfillment. They fulfilled only required muscles without loading of muscles-antagonists. Exercises on simulator were fulfilled at physical culture lessons after warming up and then, repeatedly, after finishing of main part of the lesson.

In one year after first experiment we fulfilled second experiment based on the same 7 tests. Testing results proved that the offered methodic permits to more effectively form motion skills in process of skiing training at physical culture lessons (see table 2).

Table 2

Differences in indicators of model group (EG) pupils and control group (CG) by level of formation of motion skills in second experiment after one year

Description of test / Group	Quantity of chin ups	Long jump from the spot, meters	60 meters' run, sec.	Shuttle run 4x9 meters, sec.	3 km run, min.	3 km classic style skiing, min.	5 km skating style skiing, min.
Experimental group	22.3	2.72	10.19	8.0	9.16	8.31	14.31
Control group	18.0	2.65	10.22	8.5	9.53	9.15	15.05

As a result we observed differences between EG and CG: quantity of chin ups– 22.3 in EG and 18.0 in CG; long jump from the spot – 2.72 m in EG and 2.65 in CG; 60 meters' run – 10.19 sec. in EG and 10.22 sec. in CG; shuttle run 4x9 meters – 8.31 sec. in EG and 8.5 sec. in CG; 3 km run– 9.16 min. in EG and 9.53 min. in CG; 3 km classic style skiing, – 8.31 min. in EG and 9.15 min. in CG; skating style skiing - 14.31 min. in EG and 15.05 min. in CG.

Owing to fulfillment of exercise on simulator "Straps with rings" 10 form pupils of experimental group were able to quickly master actions with complex coordination, exactly fulfill them in compliance with requirements of skiing technique and reconstruct movements depending on situation. That is, they can quickly adapt to permanent changes of situations and choose the most effective means of skiing; they feel space and time quite well. Also owing to high and precise coordination of muscles' relaxation and contraction they can quickly and precisely fulfill movements and demonstrate high results in skiing.

Conclusions:

1. We have fulfilled analysis of literature sources, devoted to the problems of our research.
2. We have determined pedagogic aspects, didactic principles for effectiveness of application of simulator "Straps with rings".
3. Effectiveness of simulator "Straps with rings" in formation of motion skills at physical culture lessons (skiing trainings) has been proved.
4. We have recommended 22 necessary exercises for effective application of simulator "Straps with rings".

In the future it is necessary to continue such researches, because their results will give recommendations for formation of motion skills of 10 form pupils that will facilitate breeding of young healthy generation and improvement of results in skiing.

References:

1. Azhippo O.Iu. *Teoriia ta metodika fizichnogo vikhovannia* [Theory and methods of physical education], 2008, vol.9, pp. 46-51.
2. Antonik V. I., Antonik I. P. , Andrianov V. Ie. *Anatomiia, fiziologiia ditej z osnovami gigiieni ta fizichnoyi kul'turi* [Anatomy and physiology of children with the basics of hygiene and physical education], Kiev, Publishing house "Professional", Center educational literature, 2009, 336 p.
3. Vlasenko S.O. *Lizhnij sport z metodikoiu vikladannia* [Ski sport with the method of teaching], Chernigov, 2002, 356 p.
4. Lazarenko M.G. *Naukovo-pedagogichni problemi fizichnoyi kul'turi* [Scientific and pedagogical problems of physical culture], 2014, vol.45(14), pp. 98-103.
5. Lazarenko N.G. *Fizicheskaia kul'tura, sport i turizm* [Physical culture, sports and tourism], 2014, vol.11(2), pp. 95-101.

6. Lazarenko M.G. *Visnik Chernigivs'kogo derzhavnogo pedagogichnogo universitetu* [Bulletin of the Chernihiv State Pedagogical University], 2013, vol.112, pp. 186-188.
7. Litovchenko G.O., Kozeruk Iu.V., Lazarenko M.G., Troianovs'ka M.M. *Osnovi fizichnogo vikhovannia liudej riznogo viku* [Basics of physical education of people of all ages], Chernigov, 2012, 230 p.
8. Nosko M.O. *Teoretichni ta metodichni osnovi formuvannia rukhovoyi funkciyi u molodi pid chas zaniat' fizichnoiu kul'turoiu ta sportom* [Theoretical and methodological basis for the formation of motor function in young people during physical training and sports], Dokt. Diss., Chernigov, 2003, 434 p.
9. Nosko M.O. *Pedagogika, psihologia ta mediko-biologicni problemi fizicnogo vihovanna i sportu* [Pedagogics, psychology, medical-biological problems of physical training and sports], 2001, vol.17, pp. 7-9.
10. Nosko M.O. Sinigovec' V.I. *Pedagogika, psihologia ta mediko-biologicni problemi fizicnogo vihovanna i sportu* [Pedagogics, psychology, medical-biological problems of physical training and sports], 2001, vol.13, pp. 25-31.
11. Nosko N.A., Sinigovec V.I. *Pedagogika, psihologia ta mediko-biologicni problemi fizicnogo vihovanna i sportu* [Pedagogics, psychology, medical-biological problems of physical training and sports], 2001, vol.9, pp. 59-62.
12. Pen'kovec' V.I. *Teoretichni aspekti lizhnogo sportu* [Theoretical aspects of ski sport], Chernigov, 2008, pp. 77-168.
13. Fomin S.K. *Lyzhnyj sport* [Skiing sports], Kiev, The Soviet school, 1988, 176 p.
14. Arkhipov A. A. *Video computer Modeling of Technique for Elite Athletes*. TISU, CESU Conference. The 18th Universidad 1995, Tukuoka. Creating a New Vision. 24 – 26.09.1995, pp 370-371.
15. Laputin A.N. Didactic biomechanics: problems and solutions. 12 International Symposium Sports. *Siofok,* Hungary, july 2-6, 1994, p. 49.

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EVALUATION OF THE KINEMATIC STRUCTURE OF INDICATORS KEY ELEMENTS OF SPORTS EQUIPMENT EXERCISE BY POSTURAL ORIENTATION MOVEMENTS

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Annotation. *Purpose*: Examine the kinematic structure of indicators key elements of sports equipment exercise (difficult to coordinate). The method of postural orientation movements. *Material*: The study involved acrobats jumpers on the path of high qualification (n = 7). The method used video - computer recording the movements of the athlete. *Results*: Identified nodal elements of sports equipment double back somersault tuck. Exercise performed after rondat and double back flip and stretch after rondat - flick (coup ago). In the preparatory phase of motor actions acrobatic exercises isolated and studied central element of sports equipment - starting posture of the body; in the phase of the main motor action - animation poses of the body; in the final phase - the final body posture (stable landing). *Conclusions*: The method of video - computer registration allowed to perform a biomechanical analysis and evaluation of key elements of sports equipment double back somersault tuck and a double back flip and stretch. Also gain new knowledge about the mechanism of the phase structure of movements when performing double somersaults.
Key words: biomechanics, acrobatics, exercise, sports equipment, double somersault, phase, posture, central element.

Introduction

Method of movements' postural orient is intended for bio-mechanical study of kinematic structure of sport exercises by means of analyzing of preceding and following body postures, body positions in phase structure of fulfilled exercise in order to know key elements of sport technique. Key element of sport technique is a signal position of movement, which pre-determines effectiveness of sportsman's solution of his motion task [3]. Method of movements' postural orient was developed and offered for analysis of sport technique of gymnastic and acrobatic exercises at the end of 70-tees [2]. Then, they perfected the concept and methodology of studying of movements' bio-mechanic, provided scientific-practical principles in works [3, 4, 5, 6, 7, 8, 10]. The authors carried out bio-mechanical study of sport technique of the following exercises: jump-step – jump-step; throw of ball in back jump – catching of ball and rolling on arms and back in rhythmic steps; ball throw in ring in jump - rolling on arms and back in rhythmic steps; forward roll – forward somersault in group position; rondat – grouped back somersault; rondat – arched double back somersault; rondat – double back somersault in combination with temp somersault. We also carried out detail bio-mechanical analysis of exercises on gymnastic apparatuses [4].

The conceptual sense of method of movements' postural orient is that every preceding posture of body in exercise, fulfilled by a sportsman, shall positively influence on bio-mechanic of following body position that permits to fulfill exercise without extra movements in order not to accumulate mistakes in demonstration of an exercise or combination of exercises. "New-coming always strives to follow the preceding… and similar to the order of all existing, the new coming is not a simple sequence but certain remarkable order" – Marcus Aurelius (Speculations. Book forth). In Thai Tsi Tsuan – martial and health related art there are also interesting and instructive ideas. For mastering of this system's exercises at high level it is necessary to pass three compulsory stages…. "First stage – making foundation is mastering of correct body posture and steady steps. Second stage is mastering of main positions or final positions with coming from one posture to other. Third stage is full understanding of all movements" (Magazine "Daruma", 2008, http://dharuma/ru>?p=222) [1].

We shall consider scientific and practical facts, which prove the above said. As example we provide our written evaluation of Olympic champion Aliya Mustafinova's (Russia) exercise on gymnastic bars. She fulfilled exercise of increased complexity, but in rather elegant, beautiful and correct manner. All movements matched each other, all preceding and following postured were technically correct; the sportswoman use inner energetic potential of movements through effective transmitting of preceding posture's characteristics ()power, space, time) to following posture without accumulating technical mistakes and it permitted to her to demonstrate perfect sport technique of turns, raises, flights over bar, dismount – double somersault with one and half pirouette (www.youtube.com. Alija Mustafina).

In modern "acrobatizing" of sport kinds of gymnastics (perfection of acrobatic jumps on tract as independent sport discipline, exercises on mat for floor exercises, dismounts from gymnastic apparatuses, vaults and etc) can be bio-mechanically analyzed with seeking of mechanisms, for perfection of technically correct fulfillment and working out of effective training programs. Competition acrobatic jump exercise, which was fulfilled by Byelorussian sportsman – Andrey Kabyshev (rondat – back double somersault in arching position – temp somersault – back turnover – back somersault in arching position with pirouette in first somersault semi-pirouette ion second somersault) can be positively characterized, using the following bio-mechanical categories: the mentioned exercise is of high complexity, was smooth and dynamic; it had clearly recognized body postures; steady position on rest and without rest, technically correct key elements of every acrobatic jump, videlicet: starting posture, multiplication of body postures, final posture (www.youtube.com. Andrej Kabyshev). Acrobatic exercises are the basis of competition programs of sportsmen, who

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practice other kinds of sports with complex coordination of movements (free style, jumping in water, jumping on trampoline and other). So, practical recommendations for mastering of exercises' technical structure are demanded. Back double somersault in group position, double back arching somersault – are exercises of high difficulty. Considering multi-functional purpose of the mentioned exercises (fulfillment with stoppage, transferring to combination of exercises; making this exercise more difficult in vertical direction, for example, triple back somersault in group position, triple back arching somersault) the role of technically correct body positions on rest for effective pushing off for somersault increases. Analysis of sportsmen's performances shows that most mistakes in fulfillment of somersaults were registered in pushing offs and landing [15].

Thus, method of movements' postural orient as mean of bio-mechanical study of sport exercises with the help of analyzing of preceding and following body postures, body positions in phase structure of fulfilled exercise is realized in sport science for learning of sport technique's key elements [3 – 7, 11-14].

The work has been fulfilled in compliance with "Combined plan of SRW in field of physical culture and sports of Ukraine for 2011-2015" by topic 2.15 "Control of static-dynamic body balance by sportsman and system of bodies in kinds of sports with complex coordination of movements" and by governmentally financed topic "Technical training of qualified sportsmen on the base of simulation of sport exercises' motion structure".

Purpose, tasks of the work, material and methods

The purpose of the work – is to study kinematic structure of indicators of sport technique's key elements, of exercises with complex coordination of movements with the help of method of movements' postural orient; to identify key elements in phase structure of exercises (on example of back grouped double somersault after rondat and arching back double somersault after rondat – back turnover.

The method and organization of the research: video-recording of acrobatic exercises (with two digital cameras of 240 shots per second speed. Application of computer program APAS 2000 for receiving of quantitative data about bio-mechanical structure of the analyzed movements. In our research highly qualified acrobats-jumpers on track (n=7) participated. Mean indicators of body height, body mass and acrobats' age (x±S) were as follows: 170. 00±4. 00 cm, 72. 40±3.60 kg, 20. 40±1. 70 years old.

Results of research and their discussion

In preparatory phase of the analyzed somersaults we marked out starting position of body(SP) as sport technique's key element – bio-mechanically rational position of sportsman's body in coordinates' system, on floor, which creates effective conditions for pushing off and controlled upward flight; in phase of main movements – sport technique's key element is multiplication of sportsman body's postures (MP). Multiplication of sportsman body's postures is a process of consequent alternation of instant, fixed postures for creation of holistic movement; these postures determine and characterize content of exercise; in final phase – sport technique's key element was final posture of body (FP) – landing and stoppage.

Phase of preparatory actions. Indicators of angle joints (see fig.1) are as follows: the tested A (variant 1) had angle thigh – torso 177. 0°, the tested B (variant 2) had angle thigh – torso 184. 4°.

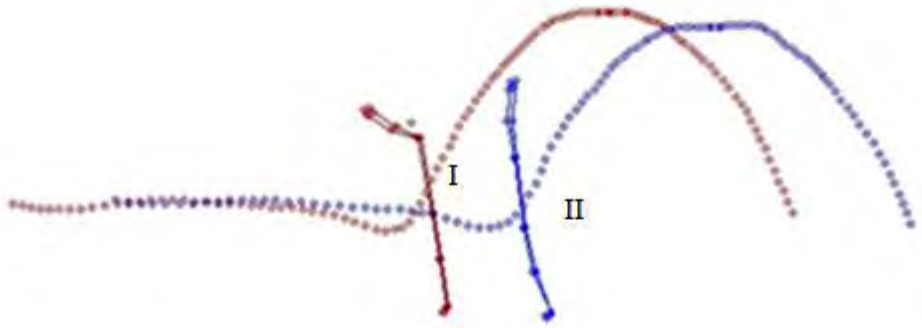

Fig.1. Phase of preparatory movements

Key element of sport technique is starting posture of body for fulfillment of grouped back double somersault after rondat (tested A, variant 1, time 0. 633sec.) and for fulfillment of arched back double somersault after rondat – back turnover (tested B, variant 2, time 0. 583sec.)

In variant 1 sportsman keeps body posture rigidly; he interacts with support, he effectively use energy of elastic deformation. It is proved by scientific fact that resultant curves of speed of sportsman A body's bio links are bunched ((see fig.2), time 0.633 sec.) during short term fixing of starting body posture on support. In variant 2, sportsman B shows excessive plasticity of body position in short term fixing of SP with arms upward and slightly backward. It facilitates arching of body. Certain loss of energy during short term fixing of SP happened; rigidness of

"sportsman- track" system was also lost and, finally, resultants of speed of body bio-links were not bunched (see fig.2, time, 0.583sec.).

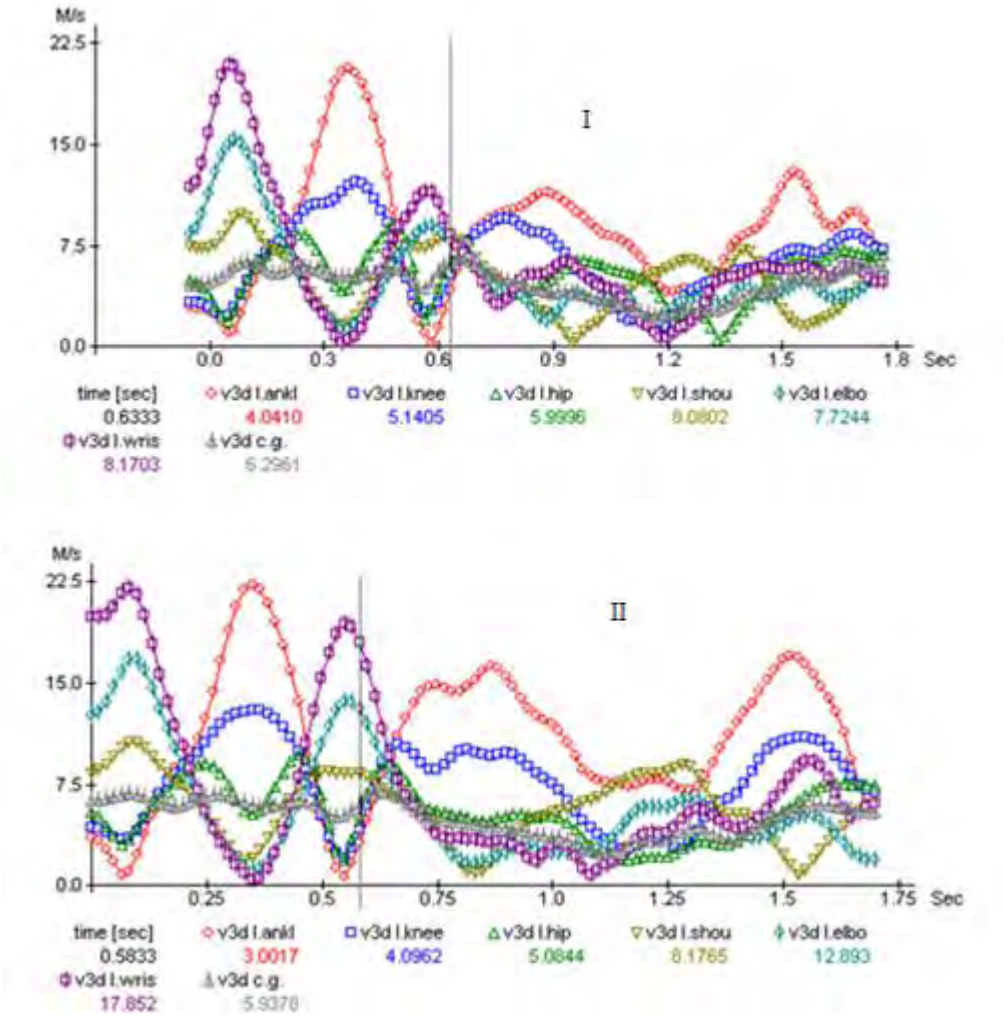

Fig.2. Starting posture of body. Resultants of speed of ankle, hip, elbow, shoulder and wrist joints as well as GMC of sportsmen's bodies during short term fixing of starting posture for grouped back double somersault after rondat (tested A, upper section of figure, variant 1) and arched back double somersault after rondat-back turnover (tested B, lower section of figure, variant 2).: ankle –ankle joint; knee – knee joint; hip – hip joint; should – shoulder joint; elbow – elbow joint; wrist – wrist joint; c.g. – general mass center of body (GMC).

Phase of main movements. Key element of sport technique is multiplication of postures (MP) "grouping" and "straightening" with insignificant bending in hip joints. Sportsmen fulfill first somersault on ascending part of flight trajectory in structure of double somersault (variant 1, time 1. 033sec., angle hip – body equals to 69. 30°; variant 2, time 0. 917 sec., angle hip – body equals to 151. 30°) (see fig. 3).

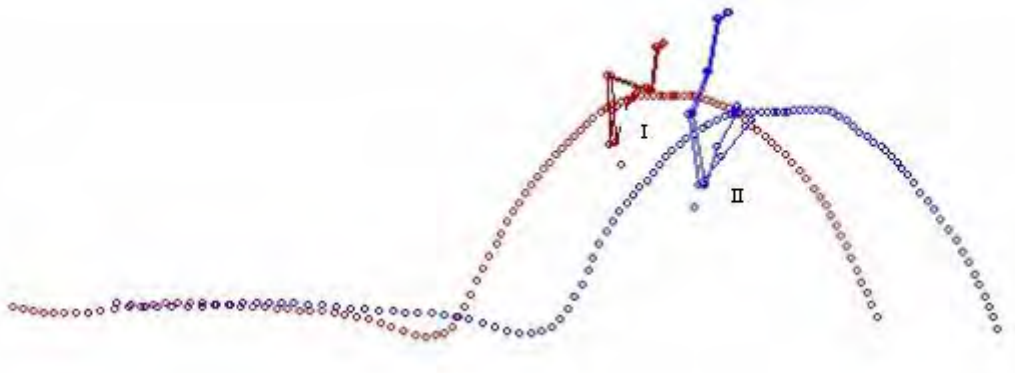

Fig. 3. Phase of main movements of acrobats, who fulfill first somersault at ascending part of flight trajectory in structure of double somersault, Key element of sport technique – MP "grouping" (tested A, variant 1, time 1. 033 sec.), and MP "arching with insignificant bending in hip joints (tested B, variant 2, time 0. 917 sec.)

In variant 1 acrobat A groups tightly, in variant 2 acrobat B takes slightly arched body position to keep speed of rotation in order to ensure uninterrupted passing to second somersault in structure of double somersault (see fig. 4, 5, 6).

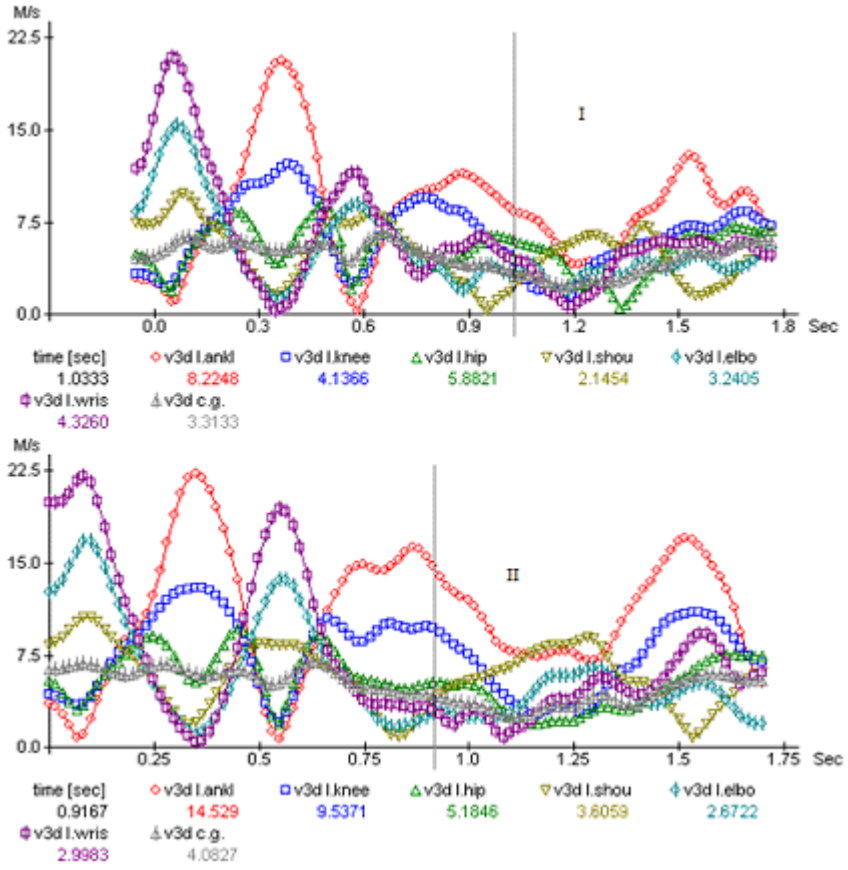

Fig.4. Resultant speed values of ankle, knee, hip, shoulder, elbow and wrist joints, GMC in phase of main movements; MP in grouped back double somersault after rondat (tested A, upper section of figure, time – 1. 033sec.)and arched back double somersault after rondat – back turnover (tested B, lower section of figure, variant 2, time - 0. 917sec.).

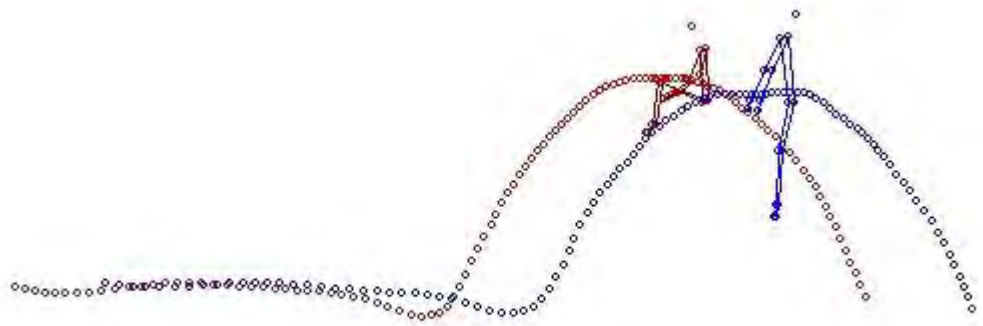

Fig.5. Phase of main movements at acrobats' passing to second somersault (grouped back double somersault after rondat and arched back double somersault after rondat – back turnover. Key element of sport technique – MP "grouping" (tested A, variant 1, time 1. 266 sec.) and MP "arching" (tested B, variant 2, time 1. 183 sec.).

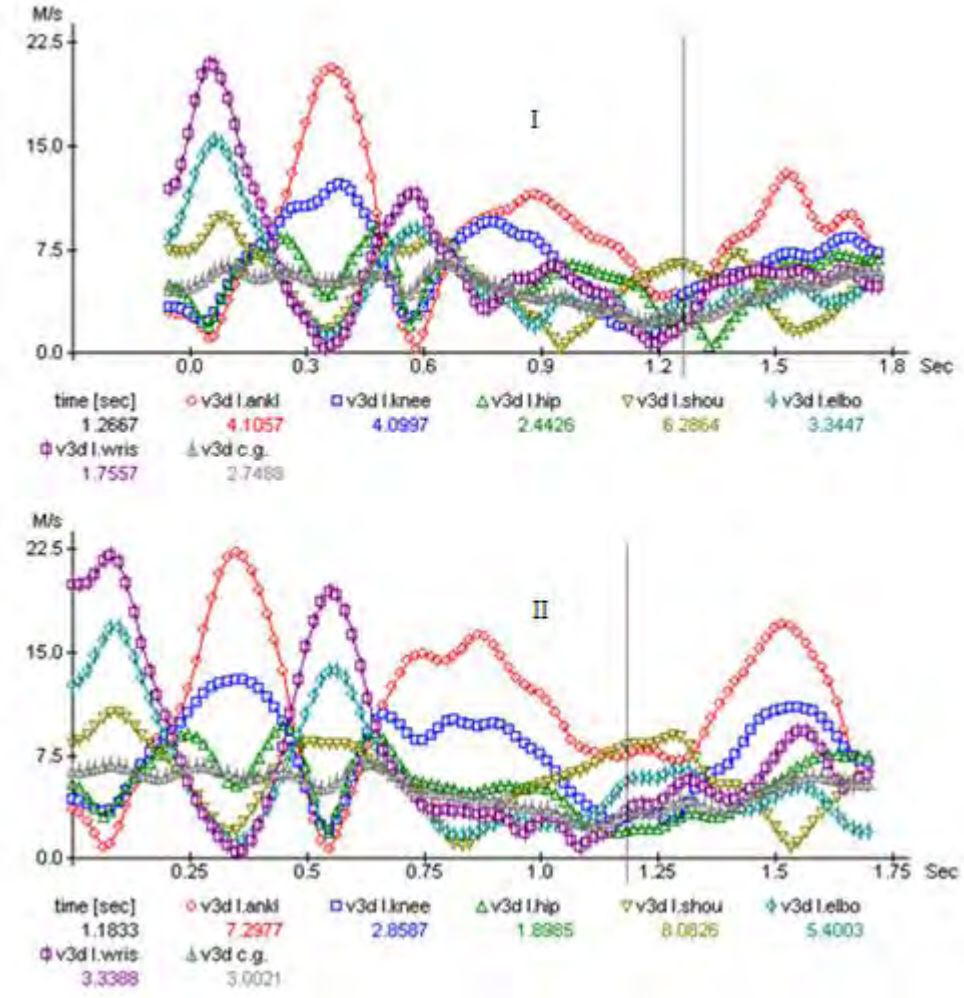

Fig.6. Resultant speed values of ankle, knee, hip, shoulder, elbow and wrist joints, GMC in phase of main movements; MP – passing in second somersault during grouped back double somersault after rondat (tested A, upper section of figure, variant 1, time 1. 266sec.c) and arched back double somersault after rondat- back turnover (tested B, variant 2, lower section of figure, time 1. 183sec.).

Phase of final movements. In fig. 7 we present body postures of final phase, which go just before key element – FP (balanced landing), (variant 1 – 1. 750 sec., variant 2 – 1. 683 sec.). In variant 1 hip-torso angle is 144.63°, in variant 2 – 141.93°. Video analysis, pedagogic observations permit to conclude that in variants 1 and 2 sportsmen demonstrate elastic-rigid interaction with support, which facilitated taking optimal FP – "half squatting" with "half bending" of body, arms forward-downward and effective control of body posture on support..

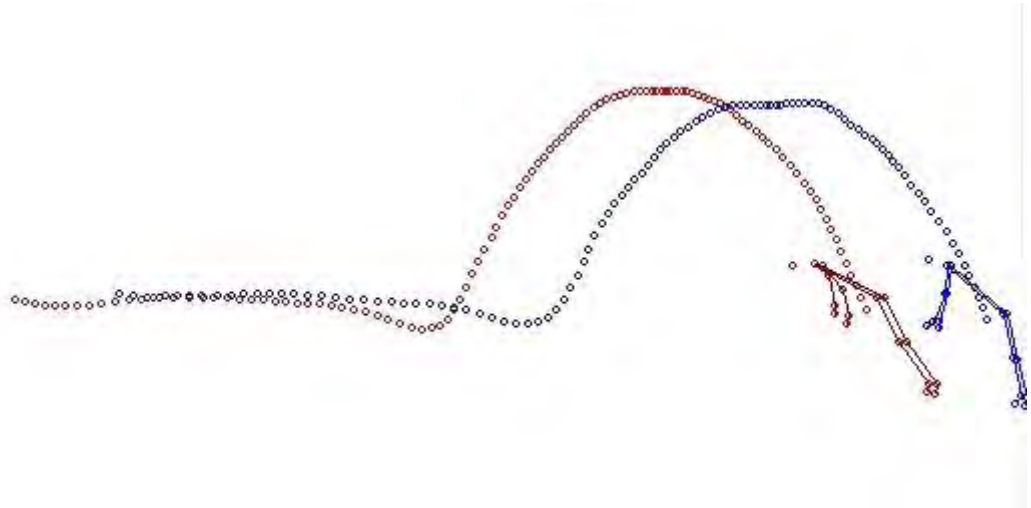

Fig. 7. Phase of finalizing movements with grouped back double somersault after rondat (tested A, variant 1, time 1. 750 sec.) and arched back double somersault after rondat – back turnover (tested B, variant 2, time 1. 683sec.) Body postures on support precede key element FP, i.e. posture of balanced landing (half squatting with forward half bent, arms forward-downward).

Resultant speed values of body's bio links and GMC are proof of effectiveness of movements on support in final phase. They "bunched" in variant 1, time– 1. 750 sec. and in variant 2, time – 1. 683 sec. (see fig. 8). The only exclusion was speed of elbow joints (1. 854 m.p.sec., variant 2).

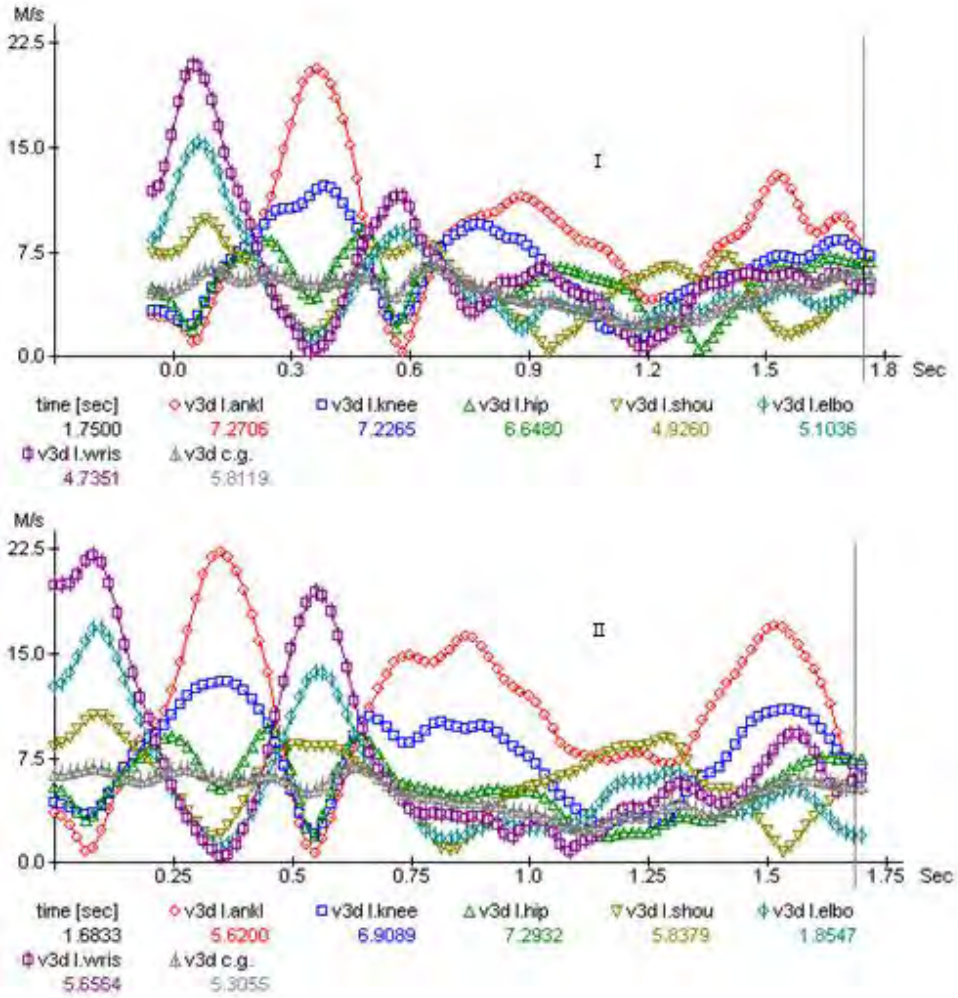

Fig. 8. Resultant speed values of ankle, knee, hip, shoulder, elbow and wrist joints, GMC in phase of final movements (FP) of grouped back double somersault after rondat (tested A, variant 1, upper section of figure, time 1. 750sec.) and arched back double somersault after rondat – back turnover (tested B, lower section of figure, variant 2, time 1. 683 sec.).

Conclusions

In phase structure of acrobatic jumps on track (grouped back double somersault after rondat and arched back double somersault after rondat – back turnover) we, with the help of movements' posture orient method, indentified key elements of sport technique. We found that key element of sport technique is a signal posture of movement, which pre-determines effective following actions in certain exercise.

We have proved that signal postures of the studied by us sport exercises were: starting posture of body (bio-mechanically rational posture of body on support for effective upward flight in somersault), multiplication of body postures (consequent alternation of instant, fixed postures fro creation of holistic movement), final posture of body (landing and stoppage).

Solution of tasks of acrobatic exercises' bio-mechanical analysis and working out of up-to-date training programs will permit to realize significant reserves of training process, improve theory and practice of all kinds of sports, which are characterized by complex coordination of movements.

References:

1. Asmolova V.L. *Zhurnal Daruma* [Daruma journal], 2008, vol.1, pp. 15-20.
2. Boloban V.N., Biriuk E.V. Statodinamicheskaia ustojchivost' tela sportsmena kak pokazatel' effektivnogo obucheniia fizicheskim uprazhneniiam progressiruiushchej slozhnosti [Static-dynamic stability of the athlete's body as an indicator of effective training exercise progressive complexity]. *Optimizaciia upravleniia processom sovershenstvovaniia tekhnicheskogo masterstva sportsmenov vysshej kvalifikacii* [Process control optimization improving technical skills of athletes of the highest qualification], Kiev, KSIPC, 1979, pp. 79 – 85.
3. Boloban V.N. *Reguliaciia pozy tela sportsmena* [Regulation of body posture athlete], Kiev, Olympic Literature, 2013, 232 p.
4. Boloban V.N., Potop V.A. *Nauka v olimpijskom sporte* [Science in Olympic Sport], 2014, vol.1, pp. 44 – 49.
5. Nizhnikovski T., Sadovski E., Boloban V., Mastalezh A., Vishniovski V., Begajlo M. *Teoriia i praktika fizicheskoj kul'tury* [Theory and practice of physical culture], 2013, vol.2, pp. 41 – 47.
6. Potop V.A., Grad R., Boloban V.N. *Pedagogika, psihologia ta mediko-biologicni problemi fizicnogo vihovanna i sportu* [Pedagogics, psychology, medical-biological problems of physical training and sports], 2013, vol.9, pp. 59 – 72.
7. Sadovski E., Boloban V., Nizhnikovski T., Mastalezh A., Vishniovski V., Begajlo M. *Teoriia i praktika fizicheskoj kul'tury* [Theory and practice of physical culture], 2012, vol.7, pp. 98-102.
8. Andreyeva N.O. Key elements of sports techniqus of ball throwing and catching by those engaged in rhythmic gymnastics at the stage of preliminary basic preparation. *Journal of Physical Education and Sport*, 2013, vol.13(1), pp. 46 -52.
9. Boloban V., Sadowski J., Niżnikowski T., Wiśniowski W. Didactic technology in mastering complex motor tasks. *Coordination motor abilities in scientific research*. Biała Podlaska, Faculty of Physical Education and Sport, 2010, vol.33, pp. 112 – 129.
10. Niźnikowski T. *Teaching exercises a complex structure moves when exposed to the elements sports technique technology* [Nauczanie czwiczeń o złożonej strukturze ruchów przy oddzialywaniu na węnzlowe elementy techniki sportowej], Biała Podlaska, ZWWF, 2009, 148 p.
11. Potop V.A., Grad Rafal, Omelyanchik O.A., Begajlo Marta, Boloban V.N. Element nodes of sports equipment double back flip factions and double back flip hunched performed gymnast in floor exercise. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2014, vol.7, pp. 23-30. doi:10.6084/m9.figshare.1015381
12. Potop V.A., Rafal G., Boloban V.N., Otsupok A.P., Biomechanical characterization dismount from balance beam on the basis of the analysis of key elements of sports equipment. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2013, vol.12, pp. 58-66. doi:10.6084/m9.figshare.880619
13. Tereshchenko I.A., Otsupok A.P., Krupenya S.V., Liauchuk T.M., Boloban V.N., Sensomotor coordination, theoretical and physical (motor) preparedness of first year students of higher educational institutions of physical education and sport. *Physical Education of Students*, 2013, vol.6, pp. 88-95. doi:10.6084/m9.figshare.840509
14. Tereschenko I.A., Otsupok A.P., Krupenio S.V., Levchuk T.M., Boloban V.N., Evaluation of freshmen coordination abilities on practical training in gymnastics. *Physical Education of Students*, 2013, vol.3, pp. 60-71. doi:10.6084/m9.figshare.663628
15. Sadowski J., Boloban V., Mastalerz A., Niźnikowski T. Velocities and joint angles during double backward stretched salto performed with stable landing and in combination with tempo salto. *Biology of Sport*, 2009, vol.26, pp. 87 – 101.

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LOCOMOTOR ACTIVITY OF PROFESSIONAL FOOTBALL REFEREES

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Annotation. *Purpose*: To study the structure of the motor activity of foreign (European) football referees qualifications and Ukrainian arbitrators (Premier League, the first, second league). The objectives of the study was to determine the amount and direction of the motor activity of soccer referees. Also perform a comparative analysis of the motor activity of football referees of different qualifications in Europe and Ukraine. *Material*: The study involved 38 referees - soccer referees first, second, of the Premier League with the different regions of Ukraine, as well as foreign arbitrators FIFA. *Results*: It was found that in the period of the motor activity of the arbitrator was walking - 13.0% of the total distance when moving, running at a moderate pace - 67.4%, accelerating - 16.7%, jumps - 2.9%. Average per match referee overcomes distance 8970.2 m: foreign arbitrators - 12,030.0 m., Arbitrators Premier League - 9292.5 m., 1 league - 7530.0 m., 2 leagues - 7028.3 m. Ukrainian Premier League referees are inferior to move moderate jogging foreign arbitrators FIFA respectively - 6,425.0 m (69.1%) and 9615.3 m (79.9%). *Conclusions*: The results of the research showed that the magnitude of motor activity during football matches in professional arbitrators may be different. It depends on their physical fitness Championship (competition), the league, the level of the teams playing, the nature of the intensity of the match. The arbitrator must remain near the gaming moments to control them and prevent possible confrontation.
Key words: locomotor activity, football, football referees, football field, match, playing moment, championship.

Introduction

Football is one of the most mass kinds of sports, which also requires mass training of qualified referees for matches of professional teams. For taking correct and important decisions being at optimal distance from game situation referee shall always be in perfect physical condition [4, 5, 8, 11].

Thus, football referee shall be able to quickly and frequently move. Most of referees demonstrate reduction of motion activity during football matches, depending on temp of game, on teams, condition of football field and referee's physical fitness [1, 3, 16].

In connection with increased speed in football matches, temp of game also increased and referee can not always be in optimal position, especially if he does not recognize football players' intentions, does not foresee next stage of attack's development [2, 6, 7].

Referee, as well as football player, shall have perfect physical fitness. He shall be constantly near game situation, to control it in compliance with football rules, prevent from different confrontations, psychologically influence on football players [10, 17].

The research has been fulfilled in compliance with "Combined plan of scientific-research works in sphere of physical culture and sports for 2011-2015" of State committee on youth problems, sports and tourism of Ukraine by topic "Theoretical-methodic principles of individualization in physical education and sports" (state registration number 0112U002001).

Purpose, tasks of the work, material and methods

The purpose of the work is to analyze the structure of motion functioning of highly qualified foreign (European) football referees as well as Ukrainian ones of Prime, first and second leagues.

The tasks of the research were to determine the scope and orientation of football referees' motion functioning and to fulfill comparative analysis of motion functioning indicators of different qualifications' referees from Europe and Ukraine.

The methods and material of he research: analysis of literature sources, pedagogic observations, timing of motion functioning, video-recording,, methods of mathematical statistic. 12 football referees of first, second, Prime leagues of Ukraine participated in the research; besides, we conducted analysis of functioning of foreign referees of FIFA, who participated in European cup matches of. In total, we analyzed 38 matches, in which referees of different qualification participated.

For evaluation of every referee's motion functioning in national matches (Prime, first and second leagues) and in matches at European level we determined distances of walking, moderate running, accelerations and entered the data in records of the research. In the course of match kinds of referee's travelling constantly changed from moderate running to accelerations and intensive jerks.

Results of the research

Physical fitness is an important part of referee's general training for competitions. It facilitates progressing of motion potential, connected with improvement of organism's functional potentials, with comprehensive physical development [9, 12].

The level of referees' physical fitness shall also be constantly perfected. It is connected with the fact that in his highly intensive activity referee shall be near game situations (considering his location with diagonal system of refereeing), and take optimal for taking decisions position [13].

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Modern football referee can conduct match successfully only if his own functional state is perfect. Accelerations and jerks are followed by moderate running (forward and backward), walking, stops, and are fulfilled in different directions, with different temp and speed. Such activity is connected with certain physical loads and is accompanied by significant functional changes in metabolism, respiratory and blood circulation systems [14, 15].

The research resulted in the facts that highly qualified referees (foreign referees from FIFA, Ukrainian Prime league referees) during one match cover distance, in average, of 10 600 meters and their mean heart beat rate is 150 – 170 b.p.m.

Table 1

Mean indicators of motion functioning of professional football referees in the course of matches

Referees, leagues	Motion functioning ($\bar{x} \pm s$)				Total, meters, % from total scope
	Walking, meters % from total scope	Moderate running, meters, % from total scope	Accelerations, meters, % from total scope	Jerks, meters, % from total scope	
Foreign referees, FIFA (п=26)	1125.3 ±24.1, 9.4%	9615.3 ±111.4, 79.9%	973.7 ±21.1, 8.1%	315.7 ±6.5, 2.6%	12030.0 ±163.1, 100%
Prime league (п=4)	1057.5 ±84.1, 11.4%	6425.0 ±415.9, 69.1%	1587.5 ±137.2, 17,1%	222.5 ±48.6, 2.4%	9292.5 ±685.8, 100%
1 league (п=2)	1270.0 ±486.7, 16.9%	4302.5 ±1101.8, 57.1%	1750 ±177.0, 23.2%	207.5 ±57.5, 2.8%	7530.0 ±1823.0, 100%
2 league (п=6)	1005.8 ±204.4, 14.3%	4453.3 ±1154.0, 63.4%	1292.5 ±279.2, 18.4%	276.7 ±144.1, 3.9%	7028.3 ±1781.7, 100%
Total (п=38)	1114.6 ±199.8, 13.0%	6199.0 ±695.8, 67.4%	1400.9 ±153.6, 16.7%	255.6 ±64.2, 2.9%	8970.2 ±1113.4, 100%

Correlations of football referees' motion functioning are as follows: waking was – 13.0% from total distance of travelling, moderate running - 67.4%, accelerations – 16.7%, jerks – 2.9% (see table 1, fig.1).

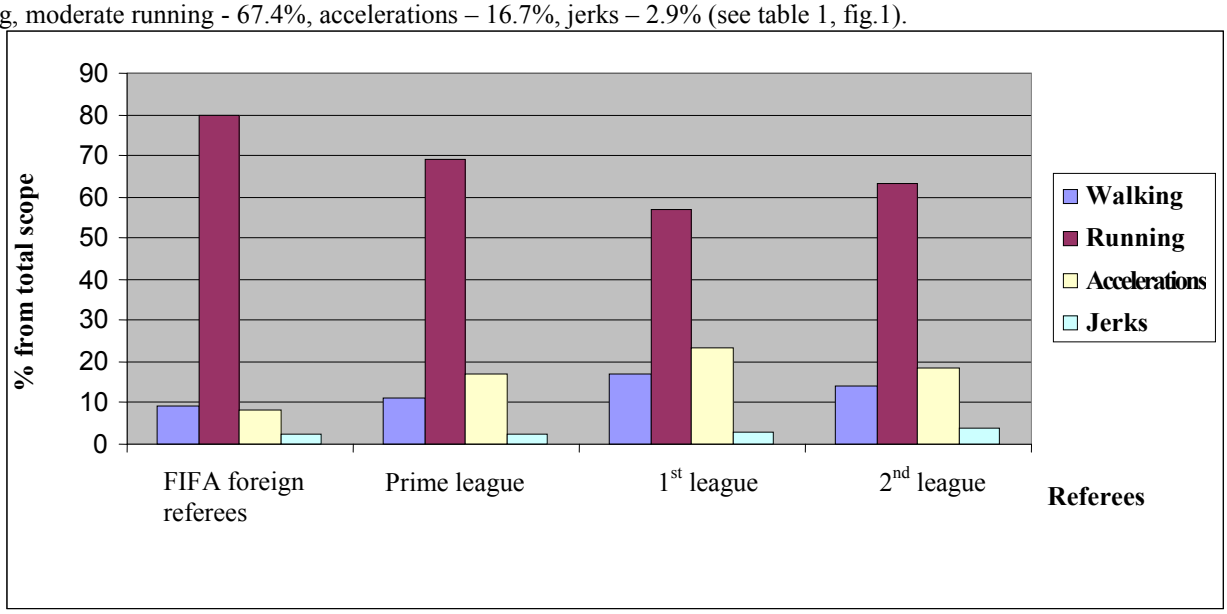

Fig.1.Comparison of mean indicators of professional football referees' motion functioning in the course of different levels' matches

Besides, we determined that foreign referees from FIFA are far superior in comparison with Ukrainian colleagues form Prime, first and second leagues by scope of travelling on football field. In average, referee covers distance of 8 970.2 meters during match. Having calculated all kinds of motion functioning, we determined that foreign referees in total cover 12 030 meters during match, Prime league referees -9 292.5 meters, 1st league referees– 7 530.0 meters, second – 7 028.3 meters (see table 1). Besides, foreign referees use walking to less extent – 1 125.3 meters

(9.4%) than their Ukrainian colleagues: Prime league – 1 057.5 meters (11.4%), first league -1 270.0 meters (16.9%) and second league - 1 005.8 meters (14.3%) (see fig.1). Ukrainian referees of Prime league yield to FIFA referees also in moderate running accordingly – 6 425.0 meters (69.1%) and 9 615.3 meters (79.9%). Foreign referees use accelerations to less extent – 973.7 meters (8.1%) than their Ukrainian colleagues (see table 1, fig.1).

Conclusions

1. Results of the researches showed that motion activity of professional referees can be different during football matches and depends on their physical fitness, level of championship (competition), league, level of teams and match's intensity.
2. The more football referee use such kinds of motion functioning as walking, moderate running, accelerations and jerks the closer he will be to situation of rules' violation taking, with it, favorable, optimal position, and the more effective refereeing will be.
3. Foreign referees from DFIFA have higher physical fitness than Ukrainian professional referees.

The further researches of this problem will be oriented on working out of model of football referee's fitness.

References

1. Abdula A.B. *Pedagogika, psihologia ta mediko-biologicni problemi fizicnogo vihovanna i sportu* [Pedagogics, psychology, medical-biological problems of physical training and sports], 2007, vol.5, pp. 85-87.
2. Bogino A.V., Kazarina E.A. *Teoriia i praktika futbola* [Theory and practice of football], 2004, vol.2, pp. 12-15.
3. Budogosskij A.D. *Organizacionno-pedagogicheskie aspekty postroeniia processa professional'noj podgotovki futbol'nykh arbitrov nachal'noj kategorii* [Organizational and pedagogical aspects of the construction process of training of football referees in the initial category], Cand. Diss., Moscow, 2008, 26 p.
4. Vikhrov K.L. *Kompan'on futbol'nogo arbitra* [Companion soccer referee], Kyiv, Combi LTD, 2006, 352 p.
5. Zuev V.N. *Sportivnyj arbitr* [Sports referee], Moscow, Soviet sport, 2004, 394 p.
6. Kostiukevich V. M. *Futbol* [Football], Vinnitsa, JSC "Vinobl printing", 1997, 260 p.
7. Kostiukevich V. M. *Organizaciia i provedennia zmagan' iz sportivnikh igor* [Organizing and conducting sports competitions], Vinnitsa, Glider, 2005, 216 p.
8. Petrov V.D., Abdula A.B. *Fizicheskaia podgotovka futbol'nykh arbitrov* [Physical training of football referees], Kharkov, 2007, 96 p.
9. Seluianov V. N., Sarsaniia S.K., Sarsaniia K.S. *Fizicheskaia podgotovka futbolistov* [Physical training players], Moscow TBT Division, 2004, 192 p.
10. Spirin A. N. Budogosskij A.D. *Sudejstvo* [Refereeing], Moscow, 2003, 273 p.
11. Turbin E.A. *Formirovanie special'nykh navykov futbol'nikh arbitrov nachal'noj podgotovki* [Formation of special skills soccer referee initial training], Cand. Diss., Malahovka, 2009, 24 з.
12. Uilmor Dzh., Kostill D. *Fiziologiia sporta i dvigatel'noj aktivnosti* [Physiology of sport and motor activity], Kiev, Olympic Literature, 1997, 504 p.
13. Khusainov G. *Teoriia i praktika futbola* [Theory and practice of football], 2001, vol.21, pp. 21–23.
14. Shalenko V.V., Perevoznik V.I. *Pidgotovka arbitriv u futboli* [Training referees in football], Hark, KSAPC, 2001, 92 p.
15. Helsen W. *Performance training in football refereeing*. UEFA Referee Commiti, 2005, 200 p.
16. Krustrup P., Mohr M, Bangsbo J. Activity profile and physiological demands of top class soccer assistant refereeing in relation to training status. *Journal Sports Sciences.* 2002, vol.20, pp. 861-871.
17. Sampaio J., Ganeira M., Ibez S., Lorenzo A. Discriminant analysis of game-related statistics between basketball guards, forwards and centrec in three professional leagues. *Europian Journal of Sports Science,* 2006, vol. 6, pp. 173-178.

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COMPARATIVE ANALYSIS OF COMPETITIVE ACTIVITY PARAMETERS OF AMATEUR BOXERS HIGH QUALIFICATION

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Annotation. *Purpose*: analyze competitive activity of boxers of high qualifications in different time periods in the development of boxing. *Material*: 142 analyzed boxing matches at the Olympic Games 2012. *Results*: present indicators of competitive activity of boxers. Shows the comparative characteristics of the battles that took place under different formulas of competitive activity in different periods of the development of amateur boxing. It is shown that increasing the skills of athletes appear to increase the density of hits in combat. As a result of innovations in the rules of the competition, boxing match was different higher intensity combat, attacking actions began to perform at a higher speed mode. *Conclusions*: As a result of the transition to the new formula of fighting to increase the density of the match. Also a 3-fold increase in the number of strikes indicator, surviving on target. Increased efficiency factor strikes, which leads to the expansion of effective technical and tactical actions.
Keywords: boxing, figure, fighting, hitting, competitive coefficient.

Introduction

Analyzing sports activities with the system approach, it appears that the competition is its main and primary component, and training - a secondary component, which serves as a means to prepare for participation in the competition [1, 2]. As a consequence, the study of the requirements of competitive activity in a particular sport they depend on the structure and content of the training process - one of the most pressing problems in the theory and methodology of sports training.

Many authors have noted the need to study the modern requirements for competitive activities, and the establishment of adequate technology to these requirements the training of qualified athletes [1, 2, 3, 5, 7]. Sporting activities boxer aims to achieve victory in a personal duel with his rival and provided the necessary level of technical, tactical, physical and mental preparedness due to the individual characteristics of the athletes, as well as the quality and efficiency of the training process. [7]

Changing the rules of the competition according to the formula of fighting and scoring, the use of electronic refereeing led to a correction method of training, as well as requirements for the athletes' body. [4]

For 12 years, has repeatedly changed the rules of the fights in boxing, which influenced the preparation of athletes for competition. Relevance of our research is to generate new indicators of competitive activity, it is at the present stage of development of boxing.

The studies were conducted in accordance with the theme 2.9. "Customization of the training process qualified fighters" Consolidated Plan of the research work in the field of physical culture and sports in 2011-2015.

Purpose, tasks of the work, material and methods

The object of study - highly skilled boxers.

Subject of research - competitive activity boxers' qualifications.

The purpose of the study - to analyze competitive activity boxers qualifications in different time periods in the development of boxing.

Objectives of the study:

- Get the performance of competitive activity boxers' qualifications at the present stage of development of boxing;
- Compare the performance of competitive activity boxers skilled with the results of previous studies.

Methods:

- Theoretical analysis and synthesis;
- Video;
- Analysis of technical and tactical training of skilled boxers with the help of expert judgment;
- Methods of mathematical statistics.

Organization and methods of the study.

Analyzed 142 bouts boxers qualifications Olympics 2012 while watching a video such fights were assessed technical and tactical indicators of competitive activity:

1) The total number of beats in a fight;
2) the number of strokes per round;
3) the number of beats in 1 minute;
4) the number of strokes, which have reached the goal;
5) the number of beats, not come down to the target;
6) the density of technical actions - the ratio of the number of strokes that have come to the purpose, duration of the fight (in minutes);

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7) the coefficient of efficiency of shocks - the ratio of the number of strokes that have reached the goal, the total number of strokes for the fight;

8) to protect the safety factor - the ratio of the amount before reaching the target attacks, the total number of strikes per fight.

The obtained data were processed by methods of mathematical statistics, namely, using a standard computer program "Statistica 7" of StatSoft. We analyzed the following parameters: the arithmetic mean, the significance of differences by t-test Styudenta.

Results of the research

Table 1 presents data on the performance of competitive activity highly skilled boxers who fought on different formulas:

- 3 rounds of 3 minutes (60 years);
- 3 rounds of 3 minutes (90 years);
- 5 rounds of 2 minutes (1997);
- 4 rounds of 2 minutes (1998-2000);
- 3 rounds of 3 minutes in 2012.

Table 1

Indicators of competitive activity boxers' qualifications at different periods of development of amateur boxing

№	indicators of competitive activity	periods of Boxing				
		(3 rounds of 3 minutes) 60 years	(3 rounds of 3 minutes) 90 years	(5 rounds of 2 minutes) 1997-1998	(4 rounds of 2 minutes) 1998-2000	(3 rounds of 3 minutes) 2012
		1	2	3	4	5
1	the total number of beats per bout (N)	122,1	167,7	221,5	224,5	**174,17**
2	the number of strokes per round	40,7	55,9	44,1	55,3	**58,06**
3	the number of beats in 1 minute	13,6	18,6	22,1	28,25	**19,35**
4	strikes, which have reached the goal (n) (in battle)	57,65	33,5	30,5	36,5	**104,63**
5	blows that did not reach the target (for a fight)	64,45	134,2	190,6	187,5	**70,03**
6	density technical actions	22,6	31,5	36,8	40,7	**35,2**
7	effectiveness ratio of strikes	0,47	0,21	0,14	0,16	**1,75**
8	reliability coefficient of protection	0,53	0,82	0,86	0,84	**0,62**

The first column of numbers in Table 1 shows the data obtained V. Petukhov [6], in the second, third, fourth – S. Shcherbakov [8]. Data obtained in the analysis of video fighting boxers in the Olympics in 2012 are presented in the fifth column of the table.

In the 60-80 years of the last century there was the classic formula of combat - 3raundy for 3min.

In 1997 it adopted a new formula of warfare - 5 rounds of 2 minutes, lasted until 1998. Since 1998, operated a different formula - 4 rounds of 2 minutes.

Since 2009, Bouts was 3 rounds of 3 minutes.

Improving skills of boxers, and with it the development trends of boxing, manifested primarily in the growth of density blows in battle in recent years.

Study of indicators of competitive activity boxers qualifications, who conducted the formula fights the battle (3 rounds of 3 minutes at 60 years, 3 rounds of 3 minutes at 90 years, 5 rounds of 2 minutes in 1997 and 4 rounds of 2 minutes in 1998 - 2000, 3 rounds of 3 minutes in 2012) revealed the following trends to change. Namely

1. Indicator "total number of beats for battle" (see Table 1) is 174.17% (column 5).

It has increased by 52.07% to indicators (see column 1), 6.47% (see column 2).

However, this figure has decreased by 47.33% (see column 3), at 50.33% (see column 4).

2. The indicator "number of strokes per round" (see Table 1) is 58.06% (column 5).

It increased to 17.36% of the values (see column 1), 2.16% (see column 2) at 13.96% (see Column 3), 2.76% (see column 4).

3. The indicator "number of beats in 1 minute" (see Table 1) is 19.35% (column 5).

It has increased by 5.75% to performance (see column 1), 0.75% (see column 2).

However, this figure has decreased by 2.75% (see column 3), 8.9% (see column 4).

4. Indicator «have reached the goal" (see Table 1) is 104.63% (column 5).

It increased to 46.98% of the values (see column 1), in 71.13% (see column 2) at 74.13% (see Column 3), at 68.13% (see column 4).

5. Indicator «did not reach the goal" (see Table 1) is 70.03% (column 5).

It has increased by 5.58% (see column 1).

However, this figure has decreased by 64.17% of the values (see column 2), at 120.57% (see column 3), at 117.47% (see column 4).

6. Indicator "density technical activities" (see Table 1) is 35.2% (column 5).

It increased by 12.6% to indicators (see column 1), 3.7% (see column 2).

However, this figure decreased by 1.6% (see column 3), 5.5% (see column 4).

7. Indicator "efficiency factor strikes" (see Table 1) is 1.75% (column 5).

It has increased by 1.28% to performance (see column 1), 1.54% (see column 2), 1.61% (see column 3), 1.59% (see column 4).

8. Indicator "safety factor to protect" (see Table 1) is 0.62% (column 5).

It has increased by 0.09% (see column 1).

However, this figure has decreased by 0.20% from the values (see column 2), 0.24% (see column 3), 0.22% (see column 4).

According to S. Shcherbakov [8] a density battlefield since 1991, 1995 amounted to P = 31%, and in 60 years it stood at P = 22.6%. The increase of the density of the battle, he linked to the following reasons:

- Scientific and technical progress;
- With some changes in the training process, namely the preparation of boxers have been widely used methods of preparing some of the practices of foreign schools of boxing, including the training of professional boxers. We know that professional boxers are practicing a dense, hard, technical and tempo boxing;
- There are athletes in boxing with a new style of warfare, have a fight at all distances;
- Significantly increased the technical and tactical skills;
- There were some changes in the judging, in particular the fight to change the formula and methods of judging;
- Changed outfitting boxers.

Analysis of density index combat between 1997 and 2012 remained at the same level (within 35 - 40 units).

Conclusions.

As a result of the transition to the new formula of warfare has increased the density of the fight and a 3-fold increase in the indicator "number of strokes, which have reached the goal," namely, and increased "efficiency factor strikes", which leads to an increase in technical and tactical actions.

The density of the shock action is an individual characteristic, depends on its weight athlete and decreases with an increase of total body size (height and weight).

Density shock actions boxers depends on the skills of athletes and is the quantity that determines, ceteris paribus, the result of the battle. The density depends on the outcome of battle.

In connection with the transition to a new formula fight a density in 4-round bout compared with the 3-round rose 18.1%, the rate of effectiveness of shock action decreased by 0.31, the rate of effectiveness of protective actions has increased by 0.31. As a result of innovations in the rules of the competition, a boxing match was different higher density perform technical and tactical actions, greater intensity of hostilities attacking actions were carried out at a higher speed mode. According to the study of singularities of the boxers qualifications indicate differences in DEs (efficiency factor shocks).

References:

1. Akopian A.O., Novikov A.A. *Analiz kharakteristik sorevnovatel'noj deiatel'nosti kak faktor postroeniia trenirovochnykh processa v edinoborstvo* [Analysis of the characteristics of competitive activity as a factor in the construction of the training process in combat], Moscow, VNIIFK, 1985, 18 p.
2. Demin V.A., Piloian R.A. Sportivnaia deiatel'nost' v teorii funkcional'noj sistemy [Sporting activities in the theory of functional systems]. *Sport v sovremennom obshchestve* [Sport in contemporary society], Moscow, GTSOLIFK, 1980, pp. 192, 193.
3. Dzheroian G.A. *Takticheskaia podgotovka bokserov* [Tactical training boxers], Moscow, Physical Culture and Sport, 1970, 116 p.
4. Kiselev V.A. *Sovershenstvovanie sportivnoj podgotovki vysokokvalificirovannykh bokserov* [Improving athletic training highly skilled boxers], Moscow, Physical Culture and Sport, 2006, 127 p.
5. Matveev L.P. *Sorevnovatel'naia deiatel'nost' sportsmena i sistema sportivnykh sorevnovanij* [Competitive activity athlete and sports competition system], Moscow, 1996, 79 p.

6. Petukhov V.A. *Issledovanie plotnosti i effektivnosti udarnykh dejstvij bokserov i metodika ikh sovershenstvovaniia* [The study of the density and efficiency of shock action boxers and a technique to improve them], Cand. Diss., Moscow, 1970, 19 p.
7. Frolov E.P., Vartanov G.M., Ispandiiarov M.I. *Metodika izucheniia sorevnovatel'noj deiatel'nosti bokserov* [Method of study of competitive activity boxers], Moscow, RIOVNIIFK. 1986. 33 p.
8. Shcherbakov S.I. *Analiz sorevnovatel'noj deiatel'nosti bokserov vysokoj kvalifikacii v sviazi s izmeneniiami formuly vedeniia boia* [Analysis of competitive activity boxers qualifications in connection with changes in the formula of combat], Cand. Diss., Moscow, 2003, 129 p.
9. Keller V.S., Platonov V.M. *Teoretiko–metodichni osnovi pidgotovki sportsmeniv* [Theoretical and methodological basis of training athletes], Lviv, Ukrainian sports association, 1993, 207 p.
10. Linec' M.M. *Osnovi metodiki rozvitku rukhovikh iakostej* [Basic methods of development of motor skills], Lviv, Shtabar, 1997, 207 p.
11. Platonov V.N. *Sistema podgotovki sportsmenov v olimpijskom sporte* [The system of preparation of sportsmen in Olympic sport], Kiev, Olympic Literature, 2004, 808 p.
12. Taratorin N.N. *Boks* [Boxing], Moscow, Terra-Sport, 1998, 320 p.
13. Filimonov V.I. *Boks* [Boxing], Moscow, INSAN, 2001, 400 p.
14. Chen Y-C., Tseng T-C., Hung T-H., Hsieh C.C., Chen F-C., Stoffregen T.A. Cognitive and postural precursors of motion sickness in adolescent boxers. *Gait & Posture*. 2013, vol.38(4), pp. 795-799. doi:10.1016/j.gaitpost.2013.03.023.
15. Ashkinazi S. Jagiello W., Kalina R. The importance of hand-to-hand fights for determining psychomotor competence of antiterrorists. *Archives of Budo*, 2005, vol.1, pp. 8-12.

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THEORY OF SAFETY NEEDS (ABOUT THE THEORY OF ARISE OF PHYSICAL EDUCATION)

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Annotation. *Purpose*: Existing theories of physical education are examinated. *Material*: the analysis and synthesis of more than 20 literary sources and Internet information, reflecting the general patterns of occurrence and development of physical education during birth civilization. *Results*: Informed that early humans lived in a permanent state of the struggle for existence, associated with the satisfaction of primary needs. Ascertain in the process of obtaining food and ensuring their own safety, people began to use the means of physical education, resulting in a conscious understanding of the phenomenon and the importance effectiveness (the result) of doing (perform) the exercises preparation. *Conclusions*: First put forward and substantiated the theory safety needs as one of the top priorities and the likely causes of physical education and sport, as this needs arose almost simultaneously with the appearance of a person.
Key words: theory, appearance, physical, education, needs, security.

Introduction

Problems of appearance and development of physical education always attracted attention of scientists-historians, who deal with researches in this field. Physical education facilitates formation of required qualities, applied skills, considering specificities of certain historic period.

For better understanding of reasons of human activity it is purposeful to analyze demands, motives, which can be satisfied in sphere of physical education [6, 8; www.revista-apunts.com/en/library?article=494]. Thus, urgency of the research is conditioned by demand in more profound understanding of reasons of physical education's appearing, which shall consider such important factor as *demand in safety.*

History of physical education is an important sector of science and is a specific branch of historic and pedagogic knowledge. The subject of physical education's study is general regularities of its appearing and formation at different stages of development of society [5, 9, 11, 13, 15, 16]. At present time we know several theories of physical education's appearing:

1. *Theory of game* (Shiller, Biukher, Gross (Germany), Spenser (England), Letournaut (France). According to this theory person developed physically and mentally owing to labor, while labor appeared from game. Main form of physical education was games. They were of naturalistic character and practically repeated labor process. Game activity facilitated appearing of culture, including physical culture and sports. Game is a form of physical development, facilitates strengthening of organism and perfection of human physical qualities [3, 5, 10; europeanvirtualmuseum.net/.../prototipo_route...].

2. *Theory of labor* implies that most of modern kinds of physical-culture and sport activity *origin* from labor activity as natural demand of human being [1]. *Materialistic Marx-Lenin's theory* states that social-historical basis of human being's development and origin of physical culture as culture in general is labor [4]. According to this theory physical education and physical exercises appeared owing to subjective and objective factors. *Objective factors* are, that in labor process (hunting, fishing,) person had to constantly develop physical qualities. Training, he perfected his physical qualities (dexterity, endurance, quickness, strength) [2, 4, 9, http://www.studymode.com/]. *Subjective factors mean human consciousness itself.* People invented exercises for preparation for labor activity, started to see connection between preliminary training and, for example, results of hunting [5, 10, 14; http://lifeinhockey.ru/.../478-sushchnost-i-prichiny-vozniknoveniya-fizichesko].

3. *Theory of magic* (founder was G. Rainak (England), his followers – K. Dim and V. Kerbe (Germany), B. Gillette (France), says that physical exercises and games has cult and animal-like origin. Motion actions, which were repeated in process of magic ceremonies, were directed on perfection of certain skills [1, 9; www.revista-apunts.com/en/library?article=494].

4. *Theory of extra biological energy* was put forward by American scientist G. Spenser, who says that primitive man had extra energy, which was released owing to different actions (games, dances) [1]. Main principle of this theory implies that physical culture is a kind of biological instinct [9; www.revista-apunts.com/en/library?article=494].

5. *Theory of war* (founder was E. Berk) declares that preparation to war facilitated specifying of certain functions, oriented on development of physical qualities and training of required movements [1].

Physical education was born in the depths of civilization and is a product of that social formation, in which it exists [3, 5, 10, 13; http://www.studymode.com]. Pre-history of physical exercises relates to time, when human life was devoted to ensuring of conditions for survival, i.e. eating and safety that was conditioned, first of all, by instincts [3;9; http://www.studymode.com]. In originating of physical exercises important role was played also by objective biological pre-condition – motion functioning is a natural demand of human being. In primitive society physical education was compulsory for everybody. It was understood not as a right but as an obligation of every member of society as one of means of person's preparation for labor functioning [2, 4, 14; http://lifeinhockey.ru/.../478-sushchnost-i-prichiny-vozniknoveniya-fizichesko; http://www.studymode.com].

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Purpose, tasks of the work, material and methods

The purpose of the research: on the base of analysis and synthesis of literature and Internet sources, devoted to history of physical culture, to ground *theory of demand in safety,* as one of the most important reason of physical education's appearing.

Results of the research

Appearing of physical culture belongs to the earliest period in history of human society. Elements of physical education appeared in primitive society [5, 10, http://opace.ru/a/vozniknovenie_fizicheskogo_vospitaniya]. People found food, hunted, built dwellings and, in the course of natural and necessary activity, spontaneously perfected physical qualities – strength, endurance, quickness. It is evident that those members of tribe, who practiced active and mobile life style, who repeated for many times some physical actions and manifested greater physical efforts, were stronger, more endurable and workable. It permitted to understand what is *physical training*, which became a basis of physical education; besides people understood importance of *preliminary training*, which facilitated application of imitating movements (exercises) out of labor process (for example throwing of dart in picture of animal). Experience permitted for primitive man to understand demand in *purposeful trainings* in order to ensure successful influence on environment, to get food, to work, to defend [2, 3, 9, 10; www.preservearticles.com/.../primitive-human-...].

In nature there are inevitable such phenomena as struggle for survival, natural selection [9, 12]. Primitive men had to be in proper physical form, master practical skills of hunting and martial arts in order to survive. It was desisive for their existing in extremely difficult conditions of life [2, 3, 4, 9; www.preservearticles. com/... /primitive-human-...; europeanvirtualmuseum.net/.../prototipo_route...; www.revista-apunts.com/en/library?article=494].

Primitive people, in their permanent struggle, connected with getting food and fear of hostile environment [www.deep-ecology-hub.com/primitive-people...; sober.ucoz.com/blog/2009-03-05-3]. That is, they lived in permanent state of struggle for survival, connected with satisfying of primary demands. This fact is proved in works of other authors [www.revista-apunts. com/en/library?article=494; www.studymode.com]. In process of satisfying of primary demands (getting food and *ensuring of own safety)* man started to use means of physical education..

Practicing of physical exercises differs from other kinds of activity, first of all, by the fact that they are oriented on development of own *conditions* of a person: functional potentials, motion abilities, physical qualities. For successful counteracting to predatory animals or irresistible forces of nature, ensuring of own safety it was necessary to have preliminary trained fitness, simulation of different situations: standard (which happened earlier) and not standard (all dangerous, extreme situations are not standard), on which human health depend. Speaking in modern language (on example of sports) it is evident that, for example a sportsman, with equal weight and proportions of body will show better results than a person, who does not practice sports. That is why priority of *inner content* with approximately similar external forms is evident [7, 8].

In patriarchal society games take symbolic character; in them there remains imitation of labor processes, but animals are replaced with dummies, hunting inventory – with special, game one. There appear special forms of testing of physical fitness – ceremonies of initiation *in adults,* in which boys were trained to different techniques of labor activity; physical exercises were practiced as well as games. In period of primitive community's decomposition there happened different conflicts; duels became form of relations between tribes that is why elements of martial-physical training appeared. With appearing of private ownership physical exercises became more connected with martial training instead of preparation for labor. Physical education was used for involving of rising generation in active life and fulfillment of obligations of adults, in preparation to war and hunting [4, 9, 14]. However, to large extent, it was connected with demand in safety, *independent* on historical period.

Theory of war can be regarded, starting from period of class society's origin, when there appeared *enmity and necessity in war.* Primitive person started to practice physical exercises and targeted physical functioning even in ancient time, though he did it *primitively, at level of instincts of survival.* He perfected his knowledge, skills by principle "from simple contemplation to abstract thinking" in conditions of permanent threats from environment.

Historical science relates appearing of physical education to initial period of development of primitive community [1, 5, 8]. While *demand in safety* appeared practically at the same time with *appearing of* human being. Gradually man *appreciated effect of exercises* and role of preliminary training in the form of certain physical exercises (actions), which could ensure his safety. He became to understand that in dangerous situations he needs *certain* physical qualities, on which his life depended on: quickness and dexterity – to promptly and adequately respond to situation (for example quickly climb tree, rock, hide in a cave and so on); quickness – to cover short distance in minimal time; endurance and speed endurance – to run to tree, cave or other shelter, if he turns out to be in open area; skills of self-defense and certain algorithm of behavior – for counter act to sudden attack of, for example, predatory animal.

Thus, theory of demand in safety envisages struggle of human being for survival and, at certain historic stage, includes: safety itself (personal safety, safety of family and so on). In process of military actions (defensive or attacking) man thinks also, first of all, about own safety and strive to ensure it by any means.

Conclusions:

Basing on principles of existentialism (philosophy of existence) it is evident that physical education and all that concerns regularities of human life's activity, especially at initial stage of *his appearing* and development (since ancient time), reflect his struggle for existence.

Demand in safety as one of *primary* (basic) demands takes one of key positions in *hierarchy of demands.* A. Maslow underlines that, when *basic demands* are satisfied in general, man starts to satisfy other, higher demands [6].

From this it follows that demand in safety is a primary one, while game, labor and other reasons are secondary. Thus, *theory of demand in safety*, which is determined by *regularities and conditions* of human existence shall be regarded as *main one*, as *primary reason* of appearing and development of physical education.

The prospects of further researches imply studying of martial arts' development at different stages of human civilization.

References:

1. Bondar A. S., Prikhod'ko G. I. *Istoriia fizichnoyi kul'turi* [History of physical education], Kharkov, FOP Brovin O.V., 2013, 222 p.
2. Goloshchapov B. R. *Istoriia fizicheskoj kul'tury i sporta* [History of physical education and sport], Moscow, Academy, 2010, 308 p.
3. Grigorevich V. V. *Vseobshchaia istoriia fizicheskoj kul'tury i sporta* [General history of physical culture and sports], Moscow, Soviet sport, 2008, 288 p.
4. Komarov S. N., Caturova K. A. Kuramshin Iu. F. *Istoriia fizichnoyi kul'turi* [History of physical education], Moscow, Academy, 2013, 240 p.
5. Kun L. *Vseobshchaia istoriia fizicheskoj kul'tury i sporta* [General History of Physical Culture and Sports], Moscow, Rainbow, 1982, 398 p.
6. Maslou A. *Motivaciia i lichnost'* [Motivation and Personality], Sankt Petersburg, Peter, 2010, 352 p.
7. Muntian V. S. *Fiziceskoe vospitanie studentov* [Physical Education of Students], 2011, vol.1, pp. 94–98.
8. Muntian V. S. *Prikladnye aspekty psikhologii deiatel'nosti cheloveka v ekstremal'nykh usloviiakh i situaciiakh* [Applied aspects of the psychology of human activities in extreme conditions and situations], Kharkov, Right, 2014, 248 p.
9. Pel'menev V. K., Koneva E. V. *Istoriia fizichnoyi kul'turi* [History of physical education], Kaliningrad, KNU, 2000, 180 p.
10. Stolbov V. V. *Istoriia fizichnoyi kul'turi* [History of physical education], Moscow, Education, 1989, 287 p.
11. Sutula V. A. *Slobozhans'kij naukovo-sportivnij visnik* [Slobozhanskyi Herald of Science and Sport], 2000, vol.2, pp. 120-122.
12. Khubbiev SH. Z., Baranova T. I. *Tematicheskij kurs lekcij po fizicheskoj kul'ture i sportu* [Thematic lectures on physical culture and sport], Sankt Petersburg, SSU Publ., 2013, 248 p.
13. Krucevich T. Iu. *Teoriia i metodika fizichnogo vikhovannia* [Theory and methods of physical education], Kiev, 2008, vol.1, 392 p.
14. Kholodov ZH. K., Kuznecov B. C. *Teoriia i metodika fizicheskogo vospitaniia i sporta* [Theory and methods of physical education and sport], Moscow, Academy, 2000, 480 p.

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COMPLEX INTEGRATED METHOD OF IMPROVEMENT OF SPORTS BALLROOM DANCE PERFORMANCE

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Annotation. *Purpose:* to elaborate complex integrated method of psychological influence upon sport ballroom dancers for their quick response to assumed mistakes by executing other steps in training mode in place of given compositions. *Material:* 20 senior sport ballroom dancers: 10 – experimental group, 10 – control group. At the I stage dancers for participation in the experimental group with regard to their hypnosis ability for facilitation teaching dynamic meditation were selected. Sportsmen with the 2nd -3rd stage of hypnosis were enrolled to the experimental group. At the II stage the experimental group was trained in the method of dynamic meditation. For this, the static meditation was performed first, after this the test persons opened their eyes and without leaving the achieved result with help of the static state of meditation, practiced in dynamic meditation. At the III stage training in sports ballroom dances with introduction new steps changing the composition program sequence to composition was held. The coach evaluated response of the test persons in the state of the dynamic meditation. *Results:* at the II stage of the research on training in dynamic meditation the dancers of the experimental group needed 3-7 repetitions. At the III stage of the research 8 test persons had trained to response adequately to changes in the compositions within 10-15 repetitions. In the control group if a partner changed steps during performance of the composition it led to stop of the dancing couple. For 8 test persons in the experimental group steps replacement didn't affect adversely the quality of the dance. The senior group of dancers studied new steps with great difficulty, their motion stereotype was formed badly, they preferred to dance compositions trained earlier. The seniors having insufficient technical background (2 persons) showed low abilities, they had bad memory, they spent 3 months for mastering new compositions. *Conclusions:* The methods elaborated by us providing for inclusion in the training process stand-alone dance steps in place of compensation steps, provided development of the dancers' ability to respond quickly to assumed mistakes during dance performance. Mastering dynamic meditation depended on typological features of the nervous system: the higher hypnosis ability degree the better mastering. Women-partners of the experimental group who had high hypnosis ability degree and mastered dynamic meditation could quickly adequately response to the rapid changes in the composition performed by dance partner during dance. Consideration of possible errors trains a woman-partner's ability to switch timely from one step to another. Using this method, improvement of professional skills of dancers accelerates greatly.
Keywords: dance sport, mistake correction, dynamic meditation, training.

Introduction

Sport ball dances have become still more popular among population. There are different methodological approaches to dances' training. If in some kinds of sports only final result is important, while technique, the basis of this result, does not render any influence on spectators, aesthetic component of sport ball dances is od first importance and considered by referees.

Free change of any figures in composition by any reason results in failure in movements of dancing pair. Mistakes in dances are periodically made by all dancers, but not all pairs are able to hide them from spectators.

Probability of errors can be calculated basing of theory of probabilities. Probability of correct fulfillment increases owing to numerous repetitions of compositions for working out of movements' stereotype.

The method of stereotypes' training and correction of sportsmen's mistakes with the help of hypnosis is well-known. The only difficulty of this method is that a hypnologist shall participate in training [7].

Peculiar trainings are required in any profession; for example actors' training by K.S. Stanislavskiy trains ability for quick emotional re-switching from one state to other [8].

Analyzing dynamic meditation in martial arts it is necessary to pay attention to the fact that it permits to momentarily use required techniques from accumulated sport arsenal of a sportsman at sub-conscious level in certain situation [1]. Quick responding to changes in combat is the basis of victory. Variable conditions of fight do not permit to make compositions with strict sequence of techniques. As far as sport ball dances concern, dancing pairs make variations and compositions in order to work out stereotype movements [2-4, 9, 10-15].

Dynamic meditation has many positive sides, such as method of dynamic meditation's integration with "conscious breathing" of Buddhists, which ensures improvement of psycho-emotional state, increases quality of dance's fulfillment [6].

Method of effective training of sport ball dancers with the help of complex, combined personality oriented psychological influence on the base of dynamic meditation [5].

In this work we show usefulness of dynamic meditation's application in sport ball dances, in case of training of pairs, making mistakes in compositions, owing to bad mastering of figures' sequence, scattering of attention, inability for concentration of attention and anxiety.

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The fact, that sportsmen periodically make mistakes in dances was the reason of creation of such dancers' training methodic, in which barriers of stereotypes would be overcome. The training methodic, permitting to smooth pair's mistake at the account of dancers' adequate responding to them has become urgent.

The work has been fulfilled in compliance with SRW plan of school of higher sportsmanship.

Purpose, tasks of the work, material and methods

The purpose of the research: is to work out methodic of influence on sport ball dancers for their quick responding to mistakes made by them. The trainees shall fulfill other figures instead of envisaged by compositions.

The object of the research: sport ball dancers – seniors' category.

The subject of the research: process of influencing on central nervous system of dancers, who make mistakes, with the help of figures, which are not stipulated by composition.

The tasks of the research:

1.Train dances to dynamic meditation, against the background of which we carried out trainings with intentional including of figures, not envisaged by composition, for working out of timely pair's response to possible mistakes.

2. Determine connection of hypnosis sensitivity with she-partner's ability to adequately respond to changes in dance, admitted by two partners.

The methods of the research: analysis of scientific-methodic literature, pedagogic observation, psychological influence.

Organization of the research: the research was conducted on base of School of higher sportsmanship in Nikolayev. It involved 20 persons, who trained sport ball dances in category "seniors". 10 of them were experimental group and 10 – control one.

At 1st stage we completed experimental group, considering their sensitivity to hypnosis, to make training of dynamic meditation easier. Sportsmen wit 2nd and 3rd degree of sensitivity to hypnosis were included in experimental group.

At the 2nd stage we trained experimental group to dynamic meditation. For this purpose, first we trained static meditation, then the tested opened eyes and continuing to be in meditation state, practiced dynamic meditation. Mastering of static meditation was carried out with the help of hypnotic suggestion.

At 3rd stage we trained sport ball dances with including new figures, changing sequence of composition. Coach evaluated response of the tested in dance in dynamic meditation.

The worked out by us methodic was realized in two directions:

1. Intentional making of mistakes for working out of reflex of adequate response to them.

2.We analyzed all possible mistakes in dance, determined similarity of figures by first steps and carried out trainings with consideration of possible mistakes.

Example1. All tested of experimental group were immersed in static meditation, in which they danced with opened eyes. It prepared dancers to quick immersion in changed state of consciousness, intrinsic to dynamic meditation.

Example2. Partner Sh. intentionally changed figure "closed change" by figure "wisk" in composition of slow waltz. She-partner S., danced "wisk" obeying to he-partner.

Example 3. Partner O. danced "double left spin" instead of "left turn" of slow waltz, she partner T. made the same.

Example 4. Partner N. danced figure "four step" instead tango figure "closed promenade", she-partner did the same, following her partner.

Example 5. Partner K. Danced "right turn" instead quick-step figure "pivot of right turn"; she partner also danced the same figure.

Results of the researches

At 2nd stage of the research experimental group dancers required from 3 to 7 repetitions for training dynamic meditation.

At 3rd stage of the research 8 dancers of experimental group mastered adequate responding to changes in composition after 10-15 trainings.

In control group change of figure by partner during fulfillment of composition resulted in stoppage of dancing pair.

In experimental group, in 8 dancers changes of figures did not render any negative influence on quality of dance.

For older group of dancers it was difficult to learn new figures; they had bad stereotype of movements and they preferred to dance earlier mastered compositions.

Seniors, who did not have sufficient technical arsenal (2 persons) showed low abilities, had bad memory and spent 3 months for mastering of new compositions.

Dancers have failures in execution of compositions, which result in stoppage of pairs. In case of mistake, which change compositional sequence of figures, she-partner shall quickly respond to this change, dancing the same with he-partner figure. This ability is facilitated by dynamic meditation, included in offered by us method against the background of full calmness and absence of neurotic symptoms, for she-partner to adequately respond to he-partner's sudden occasional change of compositional sequence of dance figures. But dynamic meditation can not exclude failures in dance completely because of presence of stereotype movements.

Mistakes in dances happen often, when composition has not been mastered sufficiently or when attention of he-partner is distracted to foreign objects. The art of she-partner implies timely fulfillment of figure, which is fulfilled by he-partner by mistake. She-partner shall feel her partner sufficiently and follow him so that dancers would feel that they are one, without hindering each other. Such feeling appears owing to many years' trainings.

Specific feature of dynamic meditation is that in martial arts sportsman does not expect some definite action from adversary; he is ready to resist any attack. That is why the best variant for she-partner is to be permanently in state of dynamic meditation As far as figures are danced without pauses; theoretically it is impossible to respond to change of figure, though multiple trainings permit to do it with speed, sufficient to make it invisible for spectator. Indeed, spectator do not see that she-partner fulfills movements with little delaying in order to obey he-partner and not to interrupt contact with him. Also spectator can not notice how additional figure (for better beauty of dance) change rhythm. For example with "spin-right turn" in slow waltz movement is accelerated so that to be a little bit longer at point of maximal raise at count "2" in second tact.

Some figures are similar and danced with the same start; exactly this similar part can be the reason of failures of he-partner. For example, figure "chaccet- left turn" is not recommended to be fulfilled after "one-quarter turn", because she-partner can make mistake and start "zigzag".

So, he-partner leads she-partner, making movement with torso; she-partner shall follow he partner with little delay, equal to parts of second. This period is sufficient to re-switch to other figure, in case of he-partner's mistake, if to be in state of dynamic meditation and if elements of figure are not stereotype. But in case of she-partner's mistake, he-partner does not have these parts of second and quality of dance will depend on ability of partner to quickly respond to compositional change. To avoid such situations, she-partner made intentional mistakes at trainings and he-partner, being in dynamic meditation, tries to respond them in due time and make it invisible for spectator.

Usually at performance composition is repeated 2-3 times. After successful first fulfillment of composition, he-partner can weaken his attention owing to tiredness or distraction of his attention, hoping that further execution will be successful also. That is why, at trainings it is purposeful to include new figures in composition without agreement with she-partner and realize them in second repetition of the composition.

This method does not describe mistakes in fulfillment of some figures, but says about loss of some figures form compositional sequence.

It should be noted that dynamic meditation is a natural process, which often appears at subconscious level in dance process. But as far as in dances acts reflex mechanism of composition's fixing in stereotypes our methodic with intentional introduction of mistakes develops adequate partners' response for maintenance of quality and aesthetic of dance.

However, excessive introduction of new figures, which do not correspond to initial composition, can result in creation of new stereotype, which will significantly complicate elimination of possible mistakes. This principle has way out: inclusion of new figures only in one and the same place not very often and use them chaotically. Such approach will result in adaptation of she-partner to any mistake of her partner and increase ability to adequately respond to them.

Specific feature of worked out by us method is the fact that in contrast to martial arts, where there is no strict sequence of techniques' fulfillment in ball dances there executed variations and compositions, formed beforehand and they are fulfilled until stereotype of movements is mastered. That is why, is in martial arts, in dynamic meditation sportsman responds to adversary's actions by certain techniques at subconscious level, then dynamic meditation in ball dances is insufficient for she-partner's quick adequate response to he-partner's mistake, because her performance is realized on the base of mastered stereotypes. The only way out is to intentionally introduce he-partner's mistakes at trainings and she-partner should train to quickly respond to them.

After arbitrary change of figure there appears a difficulty in continuation of dance because not all figures match each other. That is why successful continuation of dance will depend on what combination of figures will be used by he-partner. Such combinations of variations shall be composed beforehand.

If to regard martial arts then we see that in fight there is no compositions; all happens spontaneously; there is no stereotype of movements, combinations, composed of different techniques in contrast to dance. It is better if movements are not fixed in stereotypes. For avoiding of stereotypes in combinations of figures it is better to train separate figures but not their combinations. It will resemble dynamic meditation in martial arts.

In experimental group change of figures did not influence on quality of dance, except cases, when we trained dance figures previously with further combining them in compositions without fixing movements in stereotypes. This was because absence of stereotype, in its tuen, increased probability of mistakes.

Conclusions

The methodic, worked out by us and stipulated introduction of separate dance figures in training process instead of compositions, ensured development of dancers' ability to quickly respond to mistakes, made in dancing.

Mastering of dynamic meditation depended on typological features of nervous system: the higher degree of hypnotic sensitivity was, the better was mastering.

Quick adequate responding to compositional changes, realized by he-partner in dance could be demonstrated by she-partners from experimental group, having high hypnotic sensitivity and practicing dynamic meditation.

Analysis of possible mistakes trains she-partner's ability to timely re-switch from one figure to other.

This method facilitates significant acceleration of improvement of dancers' sportsmanship.

Further researches will be oriented on determination of the worked out methodic influence on dancers of other age categories.

References

1. Gagonin S.G. *Sportivno-boevye edinoborstva* [Sports and martial arts], Sankt Petersburg, SAPC, 1997, 352 p.
2. Koroleva E.A. *Sovetskaia etnografiia* [Soviet ethnography], 1975, vol.5, pp. 147-155.
3. Mur A. *Peresmotrennaia tekhnika evropejskikh tancev* [Revised European dance technique], Sankt Petersburg, 1993, 48 p.
4. Mur A. Bal'nye tancy [Ballroom dancing], Moscow, Astrel, 2004, 320 p.
5. Omel'ianenko V.I. *Pedagogika, psihologia ta mediko-biologicni problemi fizicnogo vihovanna i sportu* [Pedagogics, psychology, medical-biological problems of physical training and sports], 2014, vol.1, pp. 46-50. doi:10.6084/m9.Figshare.894390.
6. Omel'ianenko V.I. *Pedagogika, psihologia ta mediko-biologicni problemi fizicnogo vihovanna i sportu* [Pedagogics, psychology, medical-biological problems of physical training and sports], 2014, vol.2, pp. 42-47. doi:10.6084/m9.figshare.923513
7. Omel'ianenko V.I. *Teoriia i praktika fizicheskoj kul'tury* [Theory and practice of physical culture], 1990, vol.11, pp. 47-48.
8. Stanislavskij K.S. *Akterskij trening* [Actor training], Moscow, Astrel, Poligrafizdat, Prime Evroznak, 2010, 448 p.
9. Endrius T. *Magiia tanca* [Magic of dance], Moscow, REFL – book, Kyiv, Wack - Guard rails, 1996, 256 p.
10. Connolly M.K., Quin E., Redding E. dance 4 your life: exploring the health and well-being implications of a contemporary dance intervention for female adolescents. *Research in Dance Education* 2011, vol.12(1), pp. 53-66. doi:10.1080/14647893.2011.561306.
11. DeMers J.D. Frame matching and ΔP**T**ED: a framework for teaching Swing and Blues dance partner connection. *Research in Dance Education* 2013, vol.14(1), pp. 71-80. doi:10.1080/14647893.2012.688943.
12. Kerr C.E., Jones S.R., Wan Q. Effects of mindfulness meditation training on anticipatory alpha modulation in primary somatosensory cortex. *Brain Research Bulletin*. 2011, vol.85(3-4), pp. 96-103. doi:10.1016/j.brainresbull.2011.03.026.
13. Omelyanenko V.I. Autoand heterosuggestion in boat rowing. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2013, vol.12, pp. 53-57. doi:10.6084/m9.figshare.880618
14. Pulinkala J. Integration of a professional dancer into college. *Research in Dance Education*. 2011, vol. 12 (3), pp. 259-275. doi: 10.1080/14647893.2011.614331.
15. Sood A., Jones D.T. On Mind Wandering, Attention, Brain Networks, and Meditation. EXPLORE: *The Journal of Science and Healing.* 2013, vol.9(3), pp. 136-141. doi:10.1016/j.explore.2013.02.005.

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PSYCHOPHYSIOLOGICAL METHODS AND CRITERIA FOR THE SELECTION OF INDIVIDUAL METERED LOADS IN ATHLETES OF TAEKWONDO SECTION

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Annotation. *Purpose:* scientific rationale approaches Express-diagnostics for athletes of taekwondo section by psychophysiological parameters. *Material:* Total surveyed 84 people, including 68 boys and 16 girls. Were defined backup capabilities, exercise tolerance and selection of adequate individual dose of loads in preparation for the international competition, participants - taekwondo athletes. Was attended by representatives of Ukraine, Russia and Lithuania. Age groups of participants: 6 - 16 years. Athletes have different levels and different schools of training. *Results:* evaluation of exercise tolerance and definition of an adequate level of motor mode in taekwondo athletes in terms of the difference of lability (DL) before and after training, revealed: high and very high nervous system (NS) lability. These figures correspond to high and very high tolerance to physical loads. The respondents who had difference of liability (DL) <0, were well-trained athletes and their high points of strength of nervous system testified about good backup capabilities (withstand great and continuous loads). In 78 % of the tested load was chosen adequately. Less than 20% of the respondents noted the average backup capabilities. They need individual correction dose loads to increase adaptive capacity. Insignificant 10%, the share of respondents had low exercise tolerance at the average values NS strength, which indicates a good backup capabilities. The direct dependence: respondents with high levels on state of health, activity and mood - low levels of anxiety, frustration, aggression and rigidity. *Conclusions* The proposed optimized approach Express-diagnostics according to psychophysiological parameters allow you to determine the level of physical endurance, speed adaptation athletes in the sections taekwondo and adequate response to the loads.
Keywords: taekwondo, exercise, tolerance, express, diagnostics, physiological, parameters.

Introduction

According to official statistics, physical inactivity among young people is 60-80% of the required level [http://zakon2.rada.gov.ua/laws/show/963%D0%B0/98]. It is proved that physical endurance depends not only on the physical development of the person, but also on psycho-physiological properties of the nervous system [10-12]. But, despite the rather large contribution of scientists to the problem of improving the health of the younger generation, and improve performance in athletes, not developed standardized criteria for determining individual optimal physical activities, taking into account these parameters [7-9].

Wide promotion of healthy lifestyles, aims population of all ages to the sport. However, over the past 1.5 - 2 decades has increased significantly the number of cases of serious deviations in the health of athletes [1,6].

According to Erich Doyzer modern great sport has little to do with the health of an athlete and is now becoming more and more justified. Sports-medical practice confirms this position [13-15]. In today's sports coaches considered only the physical health athlete, and not always taken into account the psychophysiological status at the time of expansion of individual loads (Report on the situation in the field of non-communicable diseases in the world, 2010 Executive Summary. - WHO: Geneva, 2011. - 20 p.) [1-5]. To achieve performance in sport is not always taken in consideration individual psychological characteristics and physiological capabilities athlete that has defined the goal of our study.

Purpose, tasks of the work, material and methods

Objective: scientific rationale approaches "Rapid diagnostic individually-dosed physical load" for Taekwondo athletes section on physiological parameters.

Objectives and methods. The main methods used are:

1. To develop criteria for "quick control" of individual optimal dose loads during training, and in the period of intensive training regime, on the eve of the competition, Taekwondo, used the technique of diagnosing the properties of the nervous system on psychomotor performance E. P. Ilin modified by G. V. Ohromiy.

Determined by the lability of the nervous system (LNS) - the rate of reaction to the load and the strength of the nervous system (SNS) - spare capacities athlete, that is, the ability to hold the pace and workload [Pat. 75615 A61B 5/16 (2006.01)/ u 2012 05608; Pat. 77886 A61B 5/16 (2006.01)].

The essence of the method of assessment of lability is to perform fast stereotyped movements with the hand with drawing dots on paper with a pencil (tapping). Tapping can be measured at an optimal pace of rapping, i.e. when the rhythm, preferably for the test, and at maximum pace. Frequency is a measure of the maximum tapping energetic component activity, manifested in the physical endurance fatigue. The present study used the maximum dimension tapping as described below.

In the study of athletes during the passage of stress tests tapping was measured twice - before and after a recovery period of stress test. To conduct tapping test used special forms depicting 6 squares of 5x5 cm and arrows indicating the direction of the transition. Purpose of assignment formulated as applying a maximum possible number of dots within 30 seconds, each square must be completed within 5 seconds. Before starting the tests you need to put a

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pencil in front of the first square and the command "Go!" To move it to the first square and begin a quest. Transition to the next square is made every 5 seconds at the command "Go!" Conducting the survey.

Processing of test results included counting the number of pixels in each box, and plotting efficiency: the abscissa 5-second intervals, and the ordinate - number of points in each square. The resulting variants dynamics maximum rate may be divided into the following types (Fig. 1):

METHOD

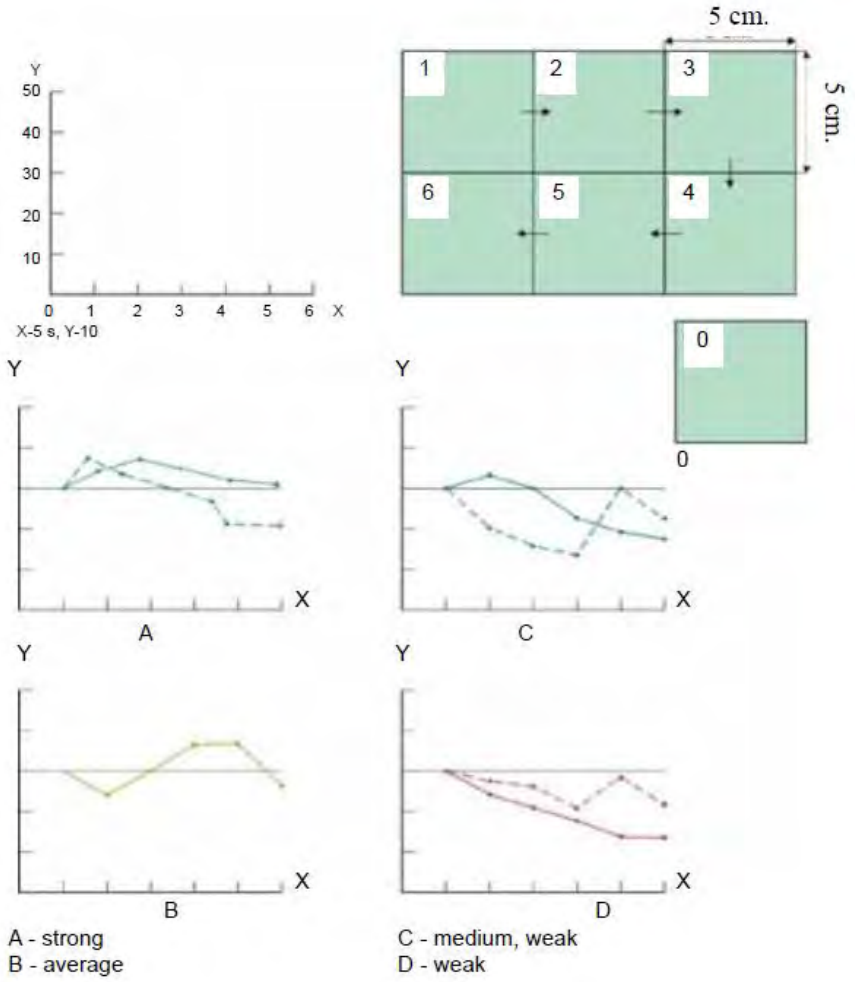

Fig. 1 Types of dynamic maximum rate movements

Conclusion on the lability of sensorimotor analyzer case on the total amount of points. An estimation of the lability of the nervous system, the number of points is translated into points by the following table (Table 1).

Table 1

Definition of lability by symbols and points

Number of dots	<74	75 □129	130□151	152□162	163□172	173□183	184□195	196□204	205□210	>210
Points	1	2	3	4	5	6	7	8	9	10
Lability	Low			Medium			High			Very High

Proposed author's index (to align the system of points from 1 to 10), calculated by the formula, in preliminary studies was more informative than the simple sum of the deviations as E. P. Ilin described:

$$strength\ indicator = 5 + \frac{S_2 + S_3 + S_4 + S_5 + S_6 + 5 \cdot S_1}{S_{1-6}} \cdot 10$$

S_1,S_2,S_3,S_4,S_5,S_6 – the number of points in squares 1-6 respectively, S_{1-6} - the total number of points.

In the process of tapping multiple testing in studies from the author the idea to automate the process of evaluation of the functional state of the central nervous system with a special device. The idea of the author has been implemented development team of the company «Comet» in Dnepropetrovsk. As a result, the device is designed to automate the process of Tapping Test and program for processing the test results issued patent. This device was tested and applied in the process of further research of the author.

1. By the method of Eysenck H. were studied self esteem mental states: aggressiveness (characteristic of the subject, reflecting its predisposition to behavior which is intended to anger); Frustration (a condition resulting from failures); rigidity (unwillingness to change the program of action in accordance with the new situational demands); anxiety (individual psychological peculiarities manifested in human propensity often experience intense anxiety over relatively small occasions).

2. Diagnosis of health, activity and mood (SAN) athlete during training and before the competition.

Materials research. The study was conducted on the basis of the Camp «Eaglet», located on the Black Sea coast of Feodosia (Crimea). Participants athletes of different age groups from 6 years - 16 years. Boys and girls have different levels of training. Much importantly, the presence of coaches from different schools and approaches to the training process. Were presented to countries such as Ukraine, Russia, Lithuania. Exercise duration 1.5 hours. The study was conducted over 4 days using different methodologies. Total surveyed 84 people, including 68 boys and 16 girls.

Results of the researches

Evaluation of exercise tolerance (ET) was determined by the difference of lability (DL) of the nervous system (NS) before and after exercise and the deviation from the average figure (5 points).
for the index:

DL> 1 - tolerance is reduced (36-50%);

DL = 1 - tolerance moderately reduced (51-70%);

DL = 0 - tolerance maintained (71-85%);

DL <0 - tolerance is high (86-100%).

The results of evaluation exercise tolerance and to determine the adequacy of the amount of motor mode on the results of radar identified:

1. After physical loads (PL) (workout and exercise) in 24% of cases, there is a high (8 ± 1 point) and in 7% of cases is very high (9 ± 1 point) the lability of the NS. These figures correspond to high (86% or more) and very high (up to 100%) tolerance PL. The calculated rate DL <0 for these respondents fluctuated in the range of (1) to (4) points, which indicates a good fitness of this share of athletes.

Detected in this category of persons and a high ball strength NS. It ranged from 8 ± 1 point to 9 ± 1 point. These athletes good backup capabilities. They can withstand large in magnitude and long load.

2. Preservation of tolerance (71-85%), DL = 0, was detected in 40% of cases and is 4/10 of the total number of patients. Average SNS corresponded 6 ± 1 score. For this category of individual athletes adequately matched load.

3. Athletes (19%) with moderately reduced tolerance (51-70%), the difference lability (DL) = 1. Identification of SNS indicators in some cases had minor deviations as downward (4 ± 1 point) and upward (5 ± 1 point) from the standard average value equal to the SNA 5 points. This category of middle backup capabilities. They are at risk, in need of correction of individual dosage burdens and increase adaptive capabilities.

4. 1/10 share of respondents had low exercise tolerance (36-50%), DL> 1. However, in determining the SNS in more than half of the respondents identified SNS indicators corresponded to the average of (5 ± 1 point), and in some cases above the average value (6 ± 1 point). This suggests that athletes have good backup capabilities, but the approach should be individualized. Each change of load, in our opinion, should be adapted and secured in a longer time interval.

Developed model «Method of determining human tolerance to stress» on the difference of lability (DL) is unified and can be applied to the definition of tolerance and physical stress (Table 2).

To determine the tolerance to physical loads on the main horizontal scale models determine baseline lability of the nervous system in the test scores using «Tapping-test». After a given physical activity carried out follow-up study of the nervous system lability test (using «Tapping-test») and by determining the lability of the nervous system in points, find value in the vertical column corresponding to the first indicator. Determine the difference between the baseline lability index and after exercise by substituting the parameters in the horizontal and vertical column, respectively. Based on these factors determine the tolerance to physical exertion.

Example. Carry out «Tapping-test». Indicator lability of the nervous system to the load - 156 points. By main scale model **«Method of determining human tolerance to stress»** is defined baseline lability of the human nervous system, equal to - 3 points (156 dots). After exercise is carried out repeatedly «Tapping-test». Indicator lability of the nervous system after exercise - 178 dots. The vertical scale in the first indicator (156 dots, 3 points) define indicator lability human nervous system after exercise equal - 5 points (178 dots). Correlate human lability of nervous system before and after physical load on a scale determined by the index of tolerance tolerance, it is equal to DL<0. Conclusion: exercise tolerance is high 86-100 %.

Model helps determine the speed of reaction to mental and physical stress in the educational process, the switching speed of the attention of students on various activities in learning environments in higher education.

Table 2

Model «Method of determining human tolerance to stress»

											1	Lability of the nervous system before Load	DL>1	36-50%
										1	2		DL>1	36-50%
									1	2	3		DL>1	36-50%
								1	2	3	4		DL>1	36-50%
							1	2	3	4	5		DL>1	36-50%
						1	2	3	4	5	6		DL>1	36-50%
					1	2	3	4	5	6	7		DL>1	36-50%
				1	2	3	4	5	6	7	8		DL>1	36-50%
			1	2	3	4	5	6	7	8	9		DL=1	51-70%
		1	2	3	4	5	6	7	8	9	10		DL=0	71-85%
	Lability of the nervous to stress	**1** >75 **1**	**2** >129 **2**	**3** >151 **3**	**4** >162 **4**	**5** >172 **5**	**6** >183 **6**	**7** >195 **7**	**8** >204 **8**	**9** >210 **9**	**10** <210 **10**	**Lability of the nervous system to Stress**		
71-85%	DL=0	1	2	3	4	5	6	7	8	9	10			
86-100%	DL<0	2	3	4	5	6	7	8	9	10				
86-100%	DL<0	3	4	5	6	7	8	9	10					
86-100%	DL<0	4	5	6	7	8	9	10						
86-100%	DL<0	5	6	7	8	9	10							
86-100%	DL<0	6	7	8	9	10								
86-100%	DL<0	7	8	9	10									
86-100%	DL<0	8	9	10										
86-100%	DL<0	9	10											
86-100%	DL<0	10												

Lability of the nervous system after load

DL>1	Low tolerance to stress	**36-50%**
DL=1	Moderately low tolerance to stress	**51-70%**
DL=0	Saved tolerance to stress	**71-85%**
DL<0	High tolerance to stress	**86-100%**

*DL – Difference of lability

Determine the tolerance of students to physical stress by index of **LNS** and **SNS** can and our model (Table 3) **«Method for determining the physical human endurance»**. In the model of two scales : the left and right scale lability of the nervous system, inside - the scale of nervous system strength and performance of physical activity due in watts (W).

To determine exercise tolerance is diagnosed properties of the nervous system of humans on psychomotor performance by «Tapping-test».

Modeled find lability score score nervous system and nervous system strength. At the intersection of performance and power LNS and SNS define threshold physical load in watts. The corresponding figures for the cycle ergometer.

Example. Carry out diagnosis of nervous system by using «Tapping-test». Indicator lability of the nervous system - 7 points (187 dots), the index of nervous system strength - 3 points . Using model "Method for determining the physical human endurance" find correspondence between the scale and the scale of the lability of nervous system strength. Get the result - the threshold load - 298 watts. You can define the deviation from the mean: median of LNS - 5 points, the mean of SNS - 5 points, the load on the intersection - 330 watts. The difference 330 - 298 = 32 W, the deficit threshold of physical activity 32 watts.

Table 3

Model «Method of determination the physical endurance»

Lability of the nervous system	**The strength of the nervous system**										**Lability of the nervous system**
1 point	**1 point**	**2 points**	**3 points**	**4 points**	**5 points**	**6 points**	**7 points**	**8 points**	**9 points**	**10 points**	**1 point**
<74 dots	66 W	107 W	148 W	189 W	230 W	271 W	312 W	353 W	394 W	435 W	<74 dots
2 points	**1 point**	**2 points**	**3 points**	**4 points**	**5 points**	**6 points**	**7 points**	**8 points**	**9 points**	**10 points**	**2 points**
75-129 dots	91 W	132 W	173 W	214 W	255 W	296 W	337 W	378 W	419 W	460 W	75-129 dots
3 points	**1 point**	**2 points**	**3 points**	**4 points**	**5 points**	**6 points**	**7 points**	**8 points**	**9 points**	**10 points**	**3 points**
130-151 dots	116 W	157 W	198 W	239 W	280 W	321 W	362 W	403 W	414 W	485 W	130-151 dots
4 points	**1 point**	**2 points**	**3 points**	**4 points**	**5 points**	**6 points**	**7 points**	**8 points**	**9 points**	**10 points**	**4 points**
152-162 dots	141 W	182 W	233 W	264 W	305 W	346 W	387 W	428 W	469 W	510 W	152-162 dots
5 points	**1 point**	**2 points**	**3 points**	**4 points**	**5 points**	**6 points**	**7 points**	**8 points**	**9 points**	**10 points**	**5 points**
163-172 dots	166 W	207 W	248 W	289 W	330 W	371 W	412 W	453 W	494 W	535 W	163-172 dots
6 points	**1 point**	**2 points**	**3 points**	**4 points**	**5 points**	**6**	**7 points**	**8 points**	**9 points**	**10 points**	**6 points**

Lability of the nervous system	The strength of the nervous system										Lability of the nervous system
						points					
173-183 dots	191 W	232 W	273 W	314 W	355 W	396 W	437 W	478 W	519 W	560 W	173-183 dots
7 points	**1 point**	**2 points**	**3 points**	**4 points**	**5 points**	**6 points**	**7 points**	**8 points**	**9 points**	**10points**	**7 points**
184-195 dots	216 W	257 W	298 W	339 W	380 W	421 W	462 W	503 W	544 W	585 W	184-195 dots
8 points	**1 point**	**2 points**	**3 points**	**4 points**	**5 points**	**6 points**	**7 points**	**8 points**	**9 points**	**10points**	**8 points**
196-204 dots	241 W	282 W	323 W	364 W	405 W	446 W	487 W	528 W	569 W	610 W	196-204 dots
9 points	**1 point**	**2 points**	**3 points**	**4 points**	**5 points**	**6 points**	**7 points**	**8 points**	**9 points**	**10points**	**9 points**
205-210 dots	266 W	307 W	348 W	389 W	430 W	471 W	512 W	553 W	594 W	635 W	205-210 dots
10 points	**1 point**	**2 points**	**3 points**	**4 points**	**5 points**	**6 points**	**7 points**	**8 points**	**9 points**	**10points**	**10 points**
>210 dots	291 W	332 W	373 W	414 W	455 W	496 W	537 W	578 W	619 W	660 W	>210 dots

Following the procedure of SAN and the Eysenck tested 33 leading athlete (Table 4). Investigating health, activity and mood to the SAN method we can say that: more than half of the athletes - in 56% (17 people). Highest rate of health, 31% (10 people) Average and 13% (6 people) low. A large proportion of individuals 56% (17 people). Had high activity, 43% (14 people). Medium and 1% (2 people) Low. Extensive evidence of high mood was observed in 69% (21 people), 30% (10 people). Medium and 1% (2 people) Low, which affected the good results in athletes. High and medium level of anxiety among athletes is not revealed. In 100% of cases diagnosed with low levels of anxiety. Athletes are not noted the poor condition resulting from failure (frustration). Low state of frustration in 99% (31 people). Cases. In most cases identified aggressiveness lowest 87% (29 people), Middle 13% (4 people), respectively. Low rigidity marked almost all the respondents 98% (30 people).

Table 4

Performance of the SAN and Eysenck methods

S	A	N	Power	Anxiety	Frustration	Aggression	Rigidity
56%	56%	69%	High	0%	0%	0%	0%
31%	43%	30%	Average	0%	1%	13%	21%
13%	1%	1%	Low	100%	99%	87%	98%

Thus, according to the results of the procedure can be controlled run and stabilize the adequacy of training and support activities in the period of training in the sections taekwondo.

Conclusions:

1. In selecting individual metered loads revealed that the volume of motor mode does not match the criteria threshold load the athlete if the received indicators remain at the same level. Such physical loads, in our opinion, somewhat overstated and will not increase the tolerance to such persons should be a special approach in training.

2. Growth indices lability and strength of the nervous system with repeated measurements testified about correct selection mode of physical loads.

3. Growth performance and reduced lability and strength of nervous system force with repeated measurements suggest proper selection of the mode of exercise. However, the reserve capacity of the organism is very low.

4. Unchanged or decreased lability and strength of nervous system force growth index during the second dimension, in our opinion, evidence of correct selection of individual metered loads and good backup of an athlete.

5. The proposed methodology can be used: to determine the speed of adaptation of athletes in the classroom in the sections, an adequate response to the load; determine the level of physical endurance aggression and rigidity.

Recommendations: on the results of the procedure can be monitored the adequacy and effectiveness of training and supporting activities in the training period and the beginning of the competition in the sections taekwondo.

References:

1. Apanasenko G. L. *Kniga o zdorov'e* [Books on health], Kiev, Medical Book, 2007, 132 p.
2. Balakirieva O. *Zdorov'ia ta povedinkovi oriientaciyi ukrayins'koyi molodi* [Health and behavior of Ukrainian youth], Kiev, 2005, 256 p.
3. Bezmaternykh L.E., Kulikov V.P. *Fiziologiia cheloveka* [Human physiology], 1998, vol.3, pp. 79-85.
4. Vojtenko V.A. *Zdorov'e zdorovykh* [Health of healthy], Kiev, Health, 1991, 187 p.
5. Bresciani G., Cuevas M.J., Garatachea N. Monitoring biological and psychological measures throughout an entire season in male handball players. *European Journal of Sport Science* 2010, vol.10(6), pp. 377-384. doi:10.1080/17461391003699070.
6. Gloria R., Tatiana D., Constantin R.B., Marinela R., Gabriel M. Study Regarding the Order of Psychological Processes and the Importance of the Psychological Factors of High Performance for the Sports Branch Karate. *Procedia - Social and Behavioral Sciences* 2013, vol.84, pp. 1228-1232. doi:10.1016/j.sbspro.2013.06.734.
7. Huzar V., Shalar O., Norik A. Relationship as an aspect of psychological climate of women's soccer team. *Physical Education of Students* 2014, vol.2, pp. 8-12. doi:10.6084/m9.figshare.906307.
8. Kharchenko G. Basic principles of renewal of sportsmen with myofascial by a pain syndrome taking into account the psychological aspect of their rehabilitation. *Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports* 2014, vol.8, pp. 29-33. doi:10.5281/zenodo.9760.
9. Law B., Ste-Marie D.M. Effects of self-modeling on figure skating jump performance and psychological variables. *European Journal of Sport Science* 2005, vol.5(3), pp. 143-152. doi:10.1080/17461390500159273.
10. Medvidchuk K.V., Korobeynikov G.V., Mazmanian K.R. Formation characteristics of psychophysiological functions in combat sports athletes. *International Journal of Psychophysiology* 2008, vol.69(3), pp. 247. doi:10.1016/j.ijpsycho.2008.05.144.
11. Omelyanenko V. Express-method of sportsmen's psychological tune-up. *Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports* 2014, vol.6, pp. 37-41. doi:10.6084/m9.figshare.1004938.
12. Oliveira P.A., Araújo D., Abreu A.M. Proneness for exercise, cognitive and psychophysiological consequences of action observation. *Psychology of Sport and Exercise* 2014, vol.15(1), pp. 39-47. doi:10.1016/j.psychsport.2013.09.008.
13. Omelyanenko G.A. The modern state of formed level of readiness of bachelors of physical education and sport to research activity. *Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports*. 2011, vol.1, pp. 98 - 101.
14. Stanger N., Kavussanu M., Willoughby A., Ring C. Psychophysiological responses to sport-specific affective pictures: A study of morality and emotion in athletes. *Psychology of Sport and Exercise* 2012, vol.13(6), pp. 840-848. doi:10.1016/j.psychsport.2012.06.004.
15. Tessier D., Sarrazin P., Ntoumanis N. The effect of an intervention to improve newly qualified teachers' interpersonal style, students motivation and psychological need satisfaction in sport-based physical education. *Contemporary Educational Psychology* 2010, vol.35(4), pp. 242-253. doi:10.1016/j.cedpsych.2010.05.005.

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THE PROBLEM OF SEARCH SAFE AND EFFECTIVE METHOD IN REDUCING INJURIES IN BODYBUILDING STAGE OF SPECIALIZED BASIC TRAINING

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Annotation. *Purpose:* To identify the most frequently used coaches and athletes in bodybuilding principles that can help to reduce the injuries of athletes while maintaining the progressivity results. *Material*: a survey participated 86 coaches and 120 athletes, bodybuilders from 5 to 8 years. *Results*: It was found that most of the coaches used in the course of employment principles generally accepted system of training. In such circumstances, the risk of injury to athletes is large enough. When using pre-exhaustion principle to increase the intensity of the training process increases the risk of overloading the body athletes. *Conclusions*: Athletes with a longer training experience (about 8 years), more likely to use the principle of prior exhaustion. In this case athletes try using this principle to reduce the operating parameters of volume load. This helps to reduce the level of injury and maintain positive dynamics performance.
Keywords: training, specialized, basic, fatigue, bodybuilding, injuries, fitness.

Introduction

The development of a modern bodybuilding requires new methods of training process optimization which allow to lower a traumatism level. The importance of this problem solution is connected with continuous increase of physical activities that at systematic use considerably increases the traumatism level in the course of training activity [5, 7, 8, 9, 10].

According to information from the leading world bodybuilding trainers and also the scientists specializing in this area [7, 10, 11], it is established that approximately 68,3% of accidents in bodybuilding occur at a stage of a specialized basic training. This circumstance confirms the fact that exactly at this stage of a long-term training maximum and extreme strength training, mainly anaerobic type, necessary for a "rough" set of muscles, are generally used, that quite often promotes the increase of a traumatism level in a sport [9, 10].

At the same time, in the process of bodybuilding development, the attempts of training process optimization were made to lower the traumatism level in this kind of sport, but the main solutions of this problem were only the decrease of amount and intensity of physical activities that not always positively influenced the growth of athletes efficiency [1, 8]. Even so, the use of basic and isolating exercises in the process of athletes training, and also values of size of their influence on effectiviness level, especially at a stage of a specialized basic training in bodybuilding, are studied insufficiently.

Work is performed within the research work scope of the Olympic and professional sport department at the Petro Mohyla Black Sea State university "Variability of training work indicators in bodybuilding and their influence on dynamics of athletes organism functional condition", number of the state registration 0109U004555.

Purpose, tasks of the work, material and methods

The purpose of research is determination of most often used training principles in bodybuilding which allow to reduce traumatism level as much as possible, saving progressiveness of the results.

Methods, organization of researches.

86 trainers and 120 bodybuilders aged 22-24 years (experience in bodybuilding - 5 and 8 years) from Nikolaev took part in the survey. The survey was carried out to achieve the goal. Participants answered such questions: what training principles in bodybuilding allow to reduce traumatism level of athletes, what stage of a long-term training is the most traumatic, what training methods allow to have against progressiveness of results a minimum traumatism level among athletes, most often used training principles at the stage of a specialized basic training, in what cases and at what stages of a long-term training the principle of preliminary exhaustion is used?

Results of the researches

Primary results of the survey were subjected to general and statistical calculations and graphically displayed in figures 1-4.

In fig. 1. the results of the survey which allow to determine the preference of training principles usage not only for efficiency increase, but also for lowering traumatism level are displayed.

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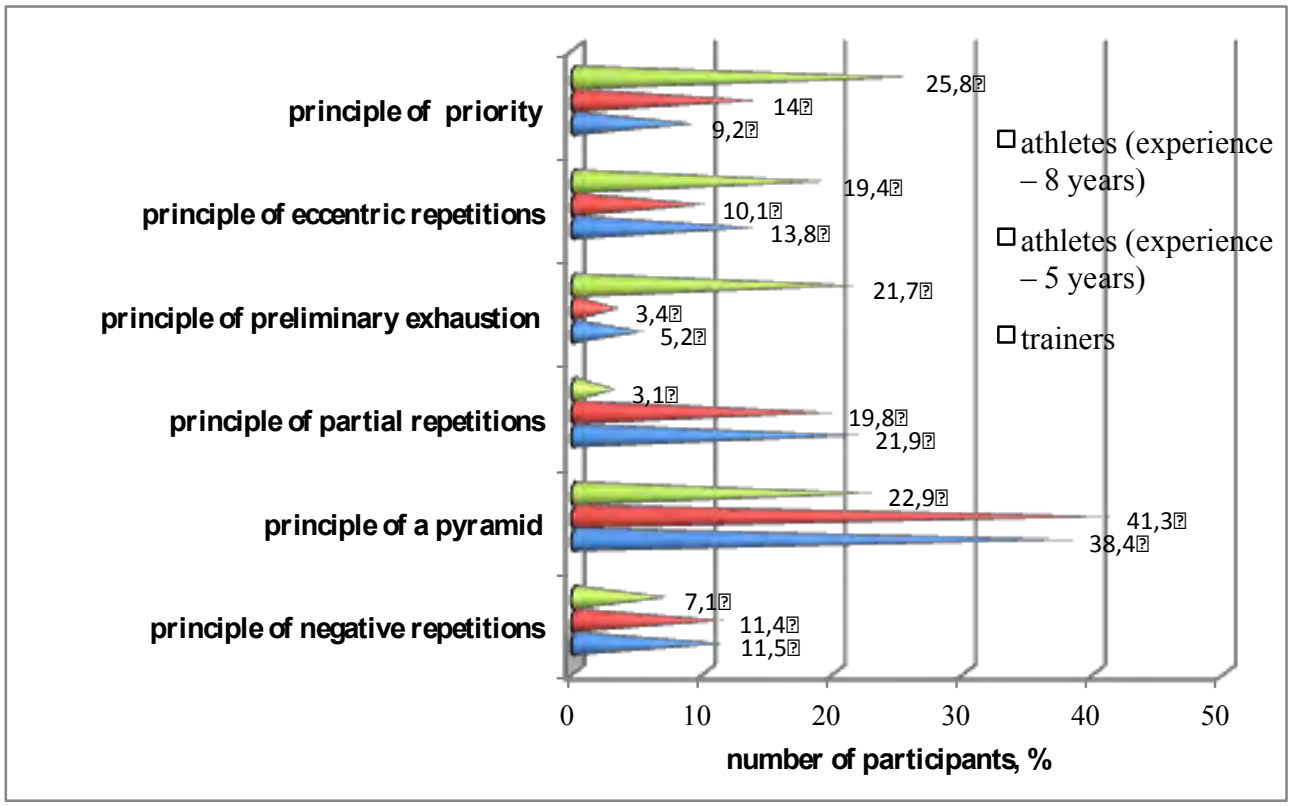

Fig. 1. The training principles which are used to lower traumatism level at the stage of a specialized basic training, n=206

The analysis of the survey results testifies that a significant amount of the trainers (38,4%) consider that the use of the principle of a pyramid during trainings will promote the increase of fitness level against a low rate of traumatism. However, only 5,2% of the trainers consider that the positive solution of this problem in bodybuilding can be promoted by application in the process of training the principle of preliminary exhaustion.

The results of the survey among athletes (experience in bodybuilding is about 5 years) show almost similar answers to the questions among trainers.

In turn, despite the identity of the survey results among trainers and athletes, the group of athletes (experience in bodybuilding is more than 8 years) show completely opposite answers to the questions.

This circumstance testifies that in connection with growth of fitness level athletes begin to search new ways of training process optimization. One of the main directions of this search is the use mainly those training principles which allow to reach the maximum dynamics of results without significant extension of physical activity, and to lower traumatism level in bodybuilding.

Modern requirements for the training process of athletes in bodybuilding demand not only maximum results at a certain stage, but also possibility of its increase throughout a long-term competitive activity [1, 7, 10]. At the same time, the achievement of a long-term positive dynamics of results is possible only on a low traumatism level and the high level of adaptation processes that isn't practically possible without the use of non-standard (specific) methods, principles and means of training [7, 9].

One of the most specific and at the same time low-studied training principles in strength sports is the principle of preliminary exhaustion. At the same time the question concerning efficiency and need of its use by trainers and athletes in bodybuilding, especially at the stage of a specialized basic training, was not practically studied.

In fig. 2. the results of the survey allowing to determine frequency and nature of the principle of preliminary exhaustion use in training activity at the stage of a specialized basic training are graphically displayed.

The analysis of the survey results testifies that 72,1% of trainers and 76% of athletes (experience in bodybuilding is about 5 years) don't use the principle of preliminary exhaustion in training. At the same time, among athletes (experience in bodybuilding is more than 8 years) – only 27,7% of participants don't use this training principle in weight training.

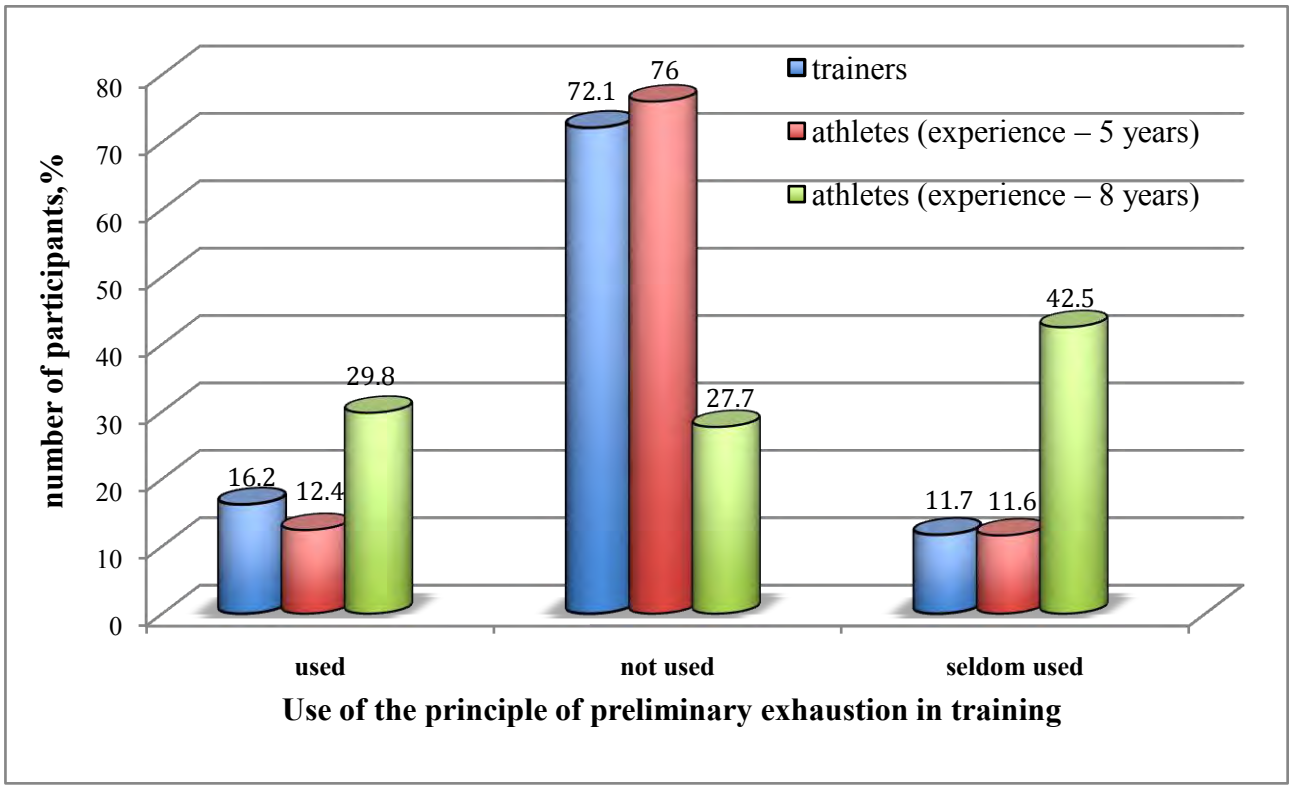

Fig. 2. Features of the principle of preliminary exhaustion use by trainers and athletes in bodybuilding at the stage of a specialized basic training (according to the survey results), n=206

Thus, on the basis of the results analysis it is possible to assume that with the experience increase in bodybuilding (after 7-8 years of trainings) most athletes start using specialized principles in training on another way (they rely more on their own knowledge and feelings than on trainers experience) that fully changes the general system of the training activity.

The applications of techniques in bodybuilding is caused by the need of solution of training and competitive activity problems, connected not only with the lack of efficiency, but also with specific features of changes adaptation in athletes organism and possible negative consequences of inadequate weight training (big level of traumatism).

The definition of origin of the principle of preliminary exhaustion use by trainers and athletes in bodybuilding at the stage of a specialized basic training allows to understand and adjust the mechanism of training activity management more precisely (fig.3).

However the analysis of the survey results testifies that opinions of its participants concerning the need of the principle of preliminary exhaustion at this stage of training are rather contradictory. So, 40,4% of athletes (experience in bodybuilding is about 5 years) and 31,1% of trainers consider that this principle needs to be used only in the conditions of positive dynamics lack throughout a long period. About 32% of this contingent is sure that this principle is needed only to solve the problem of the intensity of training process increase.

In turn, the results in a group of athletes (experience in bodybuilding is more than 8 years) testifies that the principle of preliminary exhaustion is needed only to solve the problem of gap in the development of a certain muscle group (45,9%). Thus, only 9,4% consider that this principle needs to be used only in conditions of insufficient level of training process intensity.

Thus, the results indicate the need to carry out more profound and prolonged complex researches concerning expediency and efficiency of this training principle use at the stage of a specialized basic training, and also for athletes with various experience in bodybuilding.

In modern system of bodybuilding some types of the principle of preliminary exhaustion are used depending on the purposes and problems of training process, an athlete level of proficiency and his individual function capabilities of an organism. Mainly, two most widespread options of preliminary exhaustion are used in the training activity at the stage of a specialized basic training. In the first case, series of the isolating exercise and then the basic one are carried out at the beginning. In the second case, sets of the isolating and basic exercises alternate without rest intervals between them.

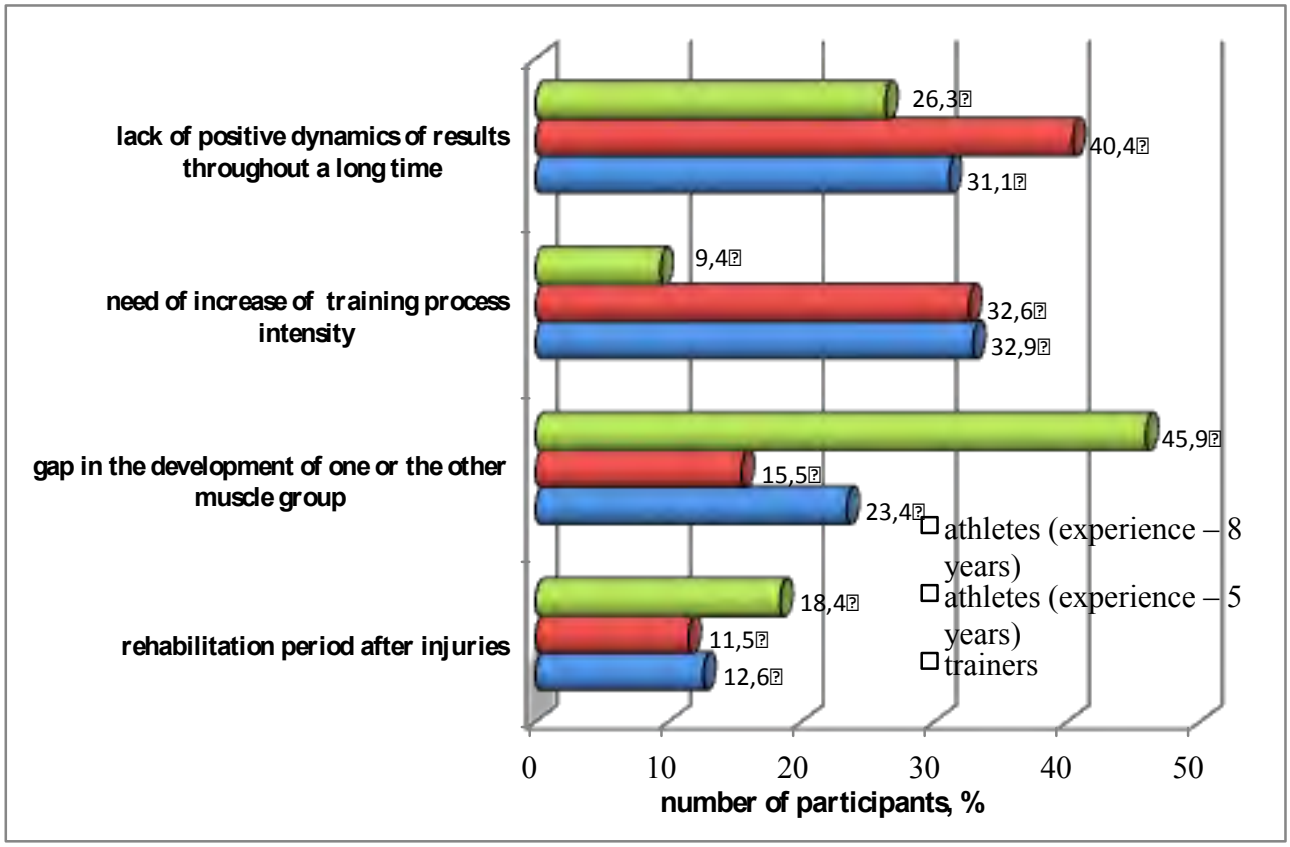

Fig. 3. The main reasons for application of the principle of preliminary exhaustion by trainers and athletes in bodybuilding at the stage of a specialized basic training (according to the survey results), n=206

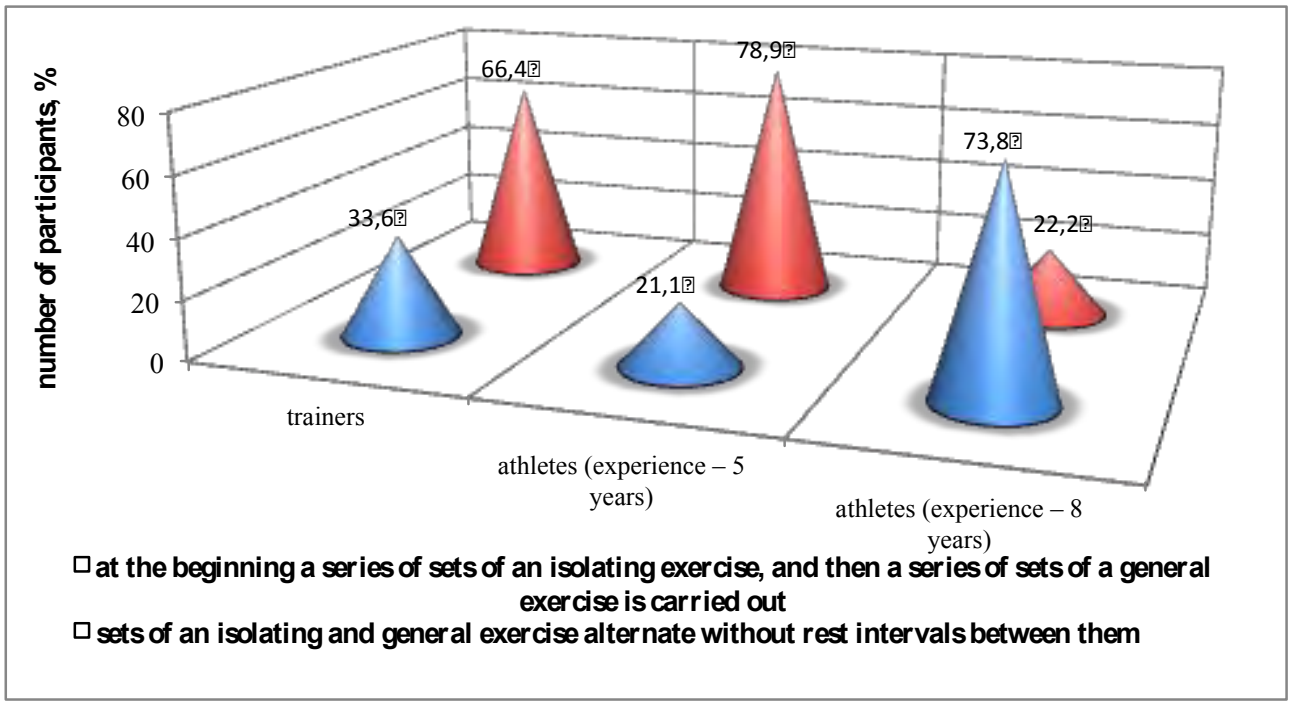

Fig. 4. Types of preliminary exhaustion and the level of its use by trainers and athletes in bodybuilding at the stage of a specialized basic training (according to the survey results) , n=206

In fig. 4 results of the survey allowing to establish the preferences of use of the principle of preliminary exhaustion in the course of training by participants are displayed.

The analysis of the received results testifies that 66,4% of trainers and 78,9% of athletes (experience in bodybuilding is about 5 years) mainly use the most intensive type of preliminary exhaustion in training (sets of the

isolating and basic exercises alternate without rest intervals between them). However, among athletes (experience in bodybuilding is more than 8 years) –the type of principle of preliminary exhaustion based on the scheme of the primary one - is carried out a series of sets of isolating exercise, and then a series of a general exercise on a certain muscle group is used frequently (73,8%).

This fact specifies that more experienced athletes (experience in bodybuilding is about 8 years) at the beginning of training try to tire the main working muscle group due to initial performance of a series of isolating exercise sets. As a result of such exhaustion, while performing general exercise, the working weight of burdening will be decreased by at least 20% that will allow to reduce also traumatism level during weight training. Unfortunately the use of an intensive type of preliminary exhaustion (sets of the isolating and basic exercises alternate without rest intervals between them), especially at the stage of a specialized basic training during intensive weight training, promotes the increase of athletes traumatism level due to rather high intensity of work at total lack of rehabilitation periods between sets.

Conclusions:

1. It is determined that most of trainers at the stage of a specialized basic training use a standard system of the training principles with a great traumatism level. Even so, in those insignificant cases when trainers try to use the principle of preliminary exhaustion during training to increase the intensity of a training process, it only increases the risk of an organism overload.

2. It is revealed that athletes (experience in bodybuilding is more than 8 years) compared with other participants of the survey, not only use the principle of preliminary exhaustion frequently, but also try to reduce physical activity by means of this principle that will allow to lower the traumatism level keeping positive dynamics of efficiency.

Prospects of further researches. The lack of information in scientific and methodical literature concerning efficiency and expediency of the principle of preliminary exhaustion use at the stage of a specialized basic training, doesn't allow to determine accurately the possibility of training process optimization for a long-term dynamics of efficiency growth in the conditions of burdening reduction in general exercises at the expense of preliminary training of working muscle group by the isolating exercise. Correspondingly, the prospect of the principle of preliminary exhaustion complex use at this stage of training, will give the chance to reduce training physical activities keeping positive dynamics results, and also will allow to minimize the risk of pathological processes development in the conditions of muscle tension. The solution of these questions will give the chance for scientific justification of planning, control and management of a long-term training process in bodybuilding.

References:

1. Vejder D. *Sistema stroitel'stva tela* [The system of construction of the body], Moscow, Physical Culture and Sport, 1991, 112 p.
2. Bondarchuk A.P. *Upravlenie trenirovochnym processom sportsmenov vysokogo klassa* [Management training process high-class athletes], Moscow, Olympia Press, 2007, 272 p.
3. Vorob'ev A.N., Sorokin Iu.K. *Anatomiia sily* [Anatomy of force], Moscow, Physical Culture and Sport, 1980, 178 p.
4. Vorob'ev A.N. *Trenirovka, rabotosposobnost', reabilitaciia* [Training, operability, rehabilitation], Moscow, Physical Culture and Sport, 1989, 272 p.
5. Gordon S.M. *Sportivnaia trenirovka* [Sports training], Moscow, Physical Culture and Sport, 2008, 256 p.
6. Laputin A.N. *Atleticheskaia gimnastika* [Athletic gymnastics], Kiev, Health, 1990, 176 p.
7. Matveev L. P. *Osnovy obshchej teorii sporta i sistemy podgotovki sportsmenov* [The general theory of sport and the system of training athletes], Kiev, Olympic Literature, 1999, 320 p.
8. Oleshko V.G. *Pidgotovka sportsmeniv u silovikh vidakh sportu* [Training athletes in power sports], Kiev, DIA, 2011, 443 p.
9. Platonov V.N. *Sistema podgotovki sportsmenov v olimpijskom sporte* [The system of preparation of sportsmen in Olympic sport], Kiev, Olympic Literature, 2004, 808 p.
10. Khartman Iu., Tiunnemann Kh. *Sovremennaia silovaia trenirovka* [Modern strength training], Berlin, Shtortferlag, 1988, 335 p.
11. Chernozub A.A. *Pedagogika, psihologia ta mediko-biologicni problemi fizicnogo vihovanna i sportu* [Pedagogics, psychology, medical-biological problems of physical training and sports], 2012, vol.8, pp. 114 – 120.
12. Chernozub A.A. Peculiarities of cortisol level changes in the blood of athletes and untrained boys in response to heavy power training loads. *European International Journal of Science and Technology*. 2013, vol.2(9), pp. 52 – 57.
13. Hatfield F.C. *Bodybuilding a scientific approach Chicago*. Contemporary book, 1984, 272 p.
14. Hatfield F.C. *Hardcore Bodybuilding*. Scientific Approach, McGraw-Hill., 1993, 448 p.
15. Tesch P.A. *Training for Bodybuilding*. Strength and power in Sport. Blackwell Scientific Publications, 1991, pp. 370 – 381

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THE SYSTEM OF WORLD GOLF RANKING AMONG AMATEUR PLAYERS - WAGR

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Annotation. *Purpose:* justify the particular rating-WAGR and determine its value. *Material:* More than 40 references, including analysis of 8 protocols of Ukraine competition in golf. *Results:* The features and significance of the world rankings in golf among amateur players. Displaying ranking tournaments in accordance with the system of WAGR and justified the use of the conversion of the results to determine the specific places the player in the rankings. In Ukraine, held six WAGR-Tournament, the first tournament was held in 2011. Today in the world ranking of amateur players is one player from the Ukraine. Conclusions: It was found that the top-WAGR determines the level of development of the national golf federations and influence in the international arena. For the selection of athletes for the summer Youth Olympic Games is used world-rated golf amateur players (WAGR) among boys and girls.
Key words: golf, rating, WAGR, amateur, player.

Introduction

Nowadays amateur sports are spread much less than in the past. R&A Rules Limited (R&A) and Association of USA golf (USGA) control golf and golf rules in the whole world; they have been reviewing profoundly Golf rules, in particular for amateurs, during recent four years [7, 19].

At present, in Ukraine all-Ukrainian golf competitions are conducted for amateurs, but with every year we can see change in competition schedules, in which tournaments for professionals appear. Just owing to this fact we took for study analysis of world amateur ranking (WAGR), but not ranking for professionals.

For amateur golf player it is prestigious to be in WAGR [www.wagr.com].

In Ukraine the problem of amateur golf players is insufficient information. Since 2011 in Ukraine competitions, included in WAGR [www.ukrgolf.org] schedule have been conducting but players can not mark out for themselves competitions of priority for season. Some players-amateur choose commercial, fan competitions. In world practice a number of specialists deal with this direction [4, 11, 17, 18, 20]; statistical data are published. In Ukraine there have been no such researches; significance and place of WAGR tournaments have not been studied and these make our topic rather urgent.

The present work has been fulfilled in compliance with combined plan of SRW in sphere of physical culture and sports for 2011-2015 and as per approved topical plan of Ministry of education and science, youth and sports of Ukraine by topic 1.2. “Modern professional sports and the ways of their development in Ukraine”.

Purpose, tasks of the work, material and methods

The purpose of the work is to analyze principles of WAGR and determine its meaning.

The methods of the research: systemic analysis, analysis of scientific-methodic and specialized literature, internet resources, comparison and abstracting.

Analysis of literature sources and internet resources permitted to generalize modern views in respect to world ranking for amateur golf players and determine its importance.

Results of the research

The fact that golf player is an amateur is a condition of his participation in golf competitions everywhere in the world. The person, who violates rules, can be deprived of amateur status and, as a result, loose right to participate in amateur competitions. According to golf rules, approved by R&A Rules Limited and by US Golf Association for 2012-2015 amateur player is any person, who plays golf not professionally but to test himself; not for having financial profit, but only to pass leisure time [7, 19].

World Amateur Golf Ranking (WAGR) – is the only ranking for amateur players, which was founded by R&A for evaluation of golf players’ level and coordination of international tournaments [www.wagr.com].

In 2004 R&A creates WAGR as criterion of selection for amateur championships. In 2007 the ranking was, for the first time, presented for everybody, i.e. amateur golf started to unite around single ranking quite recently. To day ranking for male players is formed on the base of results of 1 800 test tournaments in 70 countries of Europe and includes more than 5 000 players. Female ranking was created in 2011; it covers 1 350 test tournaments and includes 3 100 players [1, 5, 7, 17].

World ranking of amateur golf is realized on the base of thousands of amateur tournaments. Ranking system selects the best sportsmen in the world and it is based on mean quantity of scores, received by sportsmen, considering competitions of cycle for recent 52 weeks.

Nowadays WAGR is analogue, which is the most approximated to world golf professionals’ ranking - Official World Golf Ranking [www.wagr.com].

Every week ranking is renewed: every Wednesday at 12:00 by Greenwich. Thus, the ranking is not only the most complete as on to day, but it promptly reflects changes in distribution of players’ levels on sport golf arena.

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Introducing of a tournament in official schedule of European competitions is followed by its ranking in compliance with WAGR. Tournament's ranking depends on its status and importance, on level of golf's progress in country, on handicaps of players-participants and etc.

WAGR categories are divided into:

1) elite tournaments: The Amateur, Asian Amateur, European Amateur and US Amateur Championships (Men's WAGR) and Ladies 'British Amateur, NCAA Championship, US Women's Amateur и Women's European Amateur Championship (Women's WAGR).

2) tournaments of categories A-F, awarded by results of WAGR ranking:

- A = 1-30 places;
- B = 31-100 places;
- C = 101-200 places;
- D = 201-300 places;
- E = 301-400 places;
- F = 401 place and lower.

Further, tournament's category determines place of its winners or participants in WAGR ranking [www.usga.org].

For example, category «F» is initial one and winners, who take 1st and 2nd places by results of this category's tournament, get in WAGR ranking. To compare with: in tournaments of category "E" (one level higher) not 2 but 4 first places go in ranking; For category "A" – 40 first places. Participants of elite tournaments, listed above, shall pass only qualification for getting in WAGR [3, 14].

Committees of golf tournaments use ranking as one of conditions of players' selection and their admission to registration. It concerns both national championships, federation tournaments (members of EGA) and international tournaments of higher level, like British Amateur Championship and European Golf Amateur Championship. For example, for participation in European amateur championship (Sweden, August 3rd – 6th, 2011) golf player should have taken 1-1200 position in WAGR [www.kievgolfclub.com].

So, it was determined that quantity of players of country who got in ranking (WAGR - ranking players) determines level of national golf progress and weight of federation on international arena. Quantity of WAGR – players also is one of conditions, owing to which country receives right to accept great international golf competitions, including elite championships of amateur golf.

In order to get in ranking player shall take place of credit at one of WAGR-tournaments. Having taken place in ranking, golf player can further improve it, taking part in WAGR tournaments.

For determination of certain player's place in ranking they use system of results' converting Stroke Play (or Match Play) in scores Stroke Play Ranking Points (or Match Play Ranking Points). Besides, they consider accumulated bonus scores and total quantity of played test rounds Match Play and Stroke Play. Calculation formula is presented on site WAGR [1, 11, 12, 13].

In February 2011 WAGR ranking was officially recognized as the greatest national golf federation United States Golf Association (USGA) [www.usga.org]. It became an approval of its competitiveness and objectivity in comparison with other international rankings of amateur golf players.

Cooperation of R&A and USGA in unification of ranking of amateur golf players in all the world witnesses that golf world in conditions of globalizing encourages international contacts and strives to find reasonable balance between two poles of golf culture – of Europe and USA.

For example, already in 2011 50 best players in male WAGR ranking could take part in US Open tournament without qualification. Earlier format of qualification rounds (in 1 day) complicated significantly access of European players to this tournament.

In 2014 for the first time golf was included in program of 2nd summer Junior Olympic Games (Nanjing, China). For selection and qualification of sportsmen they use world ranking for amateur golf players (WAGR) cfor boys and girls for last 52 weeks up to July 8th, 2014. 26 of National Olympic committees and federations will receive qualification places for participation in individual and team competitions at 2nd Junior Olympic Game 2014. Using WAGR ranking, as on 08.06.2014, they will summarize ranking scores of girls and boys of every country. So 26 countries with the best indicators will be admitted to qualification [http://olympic.ru].

WAGR- tournaments have been conducted in Ukraine since 2011. The first was women golf tournament Ukrainian Ladies Open Amateur Championship 2011. Since that time Ukraine accepted six WAGR- tournaments and place in WAGR ranking was taken by seven Ukrainian players (see table 1). To day, after Open Ukrainian golf championship 2014 in WAGR ranking there is only one player from Ukraine and he takes 5691 position [www.ukrgolf.org].

Table 1

Ukrainian golf tournaments, which were included in WAGR schedule

Description	Date
Ukrainian Open Club Cup Trophy	August 12-14, 2011
Women tournament of series of European tour LETAS 2012 (Golfstream Ladies Open: Ladies European Tour Access Series)	April 22-24, 2012

Description	Date
Ukrainian Open Amateur Championship, 2012	July 6-8, 2012
Ukrainian Open Club Cup Trophy, 2012	August 3-5, 2012
Ukrainian Open Amateur Championship, 2013	July 5-7, 2013
Ukrainian Open Amateur Team Championship, 2013	August 2-4, 2013
Ukrainian Open Amateur Championship, 2014	July 4-6, 2014
Ukrainian Open Amateur Team Championship, 2014	July 1-3, 2014

Conclusions:

1. Quantity of players of a country, who got in ranking (WAGR - ranking players) determines progress level of national golf and weight of federation on international arena.

2. Quantity of WAGR – players is one of conditions, under which a country receives right to accept great international golf competitions, including elite championships of amateur golf.

3. For selection of sportsmen for summer Junior Olympic Games they use world ranking of amateur golf players (WAGR) for girls and boys.

The prospects of further researches in this direction imply determination of main trends of golf's development in the world.

References:

1. Gallakher B., Uilson M. *Gol'f dlia nachinaiushchikh* [Golf for beginners], Moscow, Fair-Press, 2005, 192 p.
2. Krejg D., Vins S. *Anatomiia gol'fa* [anatomy golf], 2011, 200 p.
3. Makgimpsi K. *Gol'f: istoriia miacha* [Golf: The story of the ball], Moscow, ID "Anatolia", 2006, 526 p.
4. Makgimpsi K., Nich D. *Gol'f* [Golf], Moscow, ID "Anatolia", 2006, 176 p.
5. Michuda Iu. *Teoriia i metodika fizichnogo vikhovannia i sportu* [Theory and methods of physical education and sport], 2005, vol.1, pp. 30-35.
6. Platonov V. N., Bubka S. N. , Bulatova M.M. *Olimpijskij sport* [Olympic Sports], Kiev, Olympic Literature, 2009, T.2, 696 p.
7. *Pravila gol'fa i Pravila liubitel'skogo statusa 2012-2015* [Rules of Golf and amateur status rules 2012-2015], Moscow, Russian Golf Association, 2012, 210 p.
8. Andrea Sartori. *Tendencii razvitiia industrii gol'fa.* [Tendencies of development of the golf industry], KPMG, 2013, 12 p.
9. Edmund N. Gol'f [Golf], Moscow, Astrel, 2007, 400 p.
10. Fomin Iu.A. *Sport vysshikh dostizhenij: sostoianie, aktual'nye problemy i perspektivy razvitiia* [Elite sport: state, current problems and prospects of development], Dokt. Diss., Moscow, 1992. - 403 c.
11. Anderson M. Annotation: Conceptions of intelligence. *Journal of Child psychiatry,* 2001, vol.42(3), pp. 290-298.
12. Bradbeer R., Morrison I. *The ultimate Golfer.* N.-Y., Smithmark, 1993, 256 p.
13. Coakley J. *Sport in Society: Issues and Controversies*. New York, McGraw-Hill, 2004, 240 p.
14. Giulianotti R., Robertson R. *Globalization and sport*. Blackwell Publishing, 2008, 144 p.
15. *Golf advisory practice in EMA*. KPMG, 2011, 6 p.
16. Meister C. *75 th Anniversary. European Golf Association*. Zwitzerland , 2012, pp. 100-101.
17. Miller D. *Olympic revolution*. London, Pavilion Book Ltd., 1992, 226 p.
18. Rihm D. *The games of golf*. – N.Y., 1990, 98 p.
19. *Rules of Golf and the Rules of Amateur status 2012-2015* [32end edition]. R&A Rules Limited and The United States Golf Association, 2012, 208 p.
20. Woods R. *Social issues in sport.* Champaign, Human Kinetics, 2007, 384 p.

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BIOMECHANICAL MODELING OF THE PHYSICAL TRAINING OF GIRLS DURING AEROBIC ACTIVITIES IN NON-SCHOOL EDUCATIONAL INSTITUTIONS

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Annotation. *Purpose*: to validate the effectiveness of biomechanical modeling of physical training of girls. *Material*: the study involved 90 girls aged 16-18 years (60 girls and recreation groups and 30 - sporting group aerobics). *Results*: during the study of quantitative biomechanical characteristics of the physical training of girls was identified the quantitative biodynamic and coordination structure of motor characteristics during aerobics. When comparing girls identified the best girls sports group thus constructed biomechanical model. For the considered model biodynamic structure includes the following indicators: GRAD; Fz max; Tmax; F max; Tsum; G; Tps. To the graphic model of the coordination patterns included the following indicators: EllS; MO(x); LY mm; Lx mm; JEF %;V mm/s; IV; R mm. *Conclusions*: obtain the quantitative biomechanical model of indicators of physical training of girls, which is the basis for objective justification and development of a technique of aerobics, and to use these biomechanical models as a control and the future of forecasting.
Keywords: biomechanics, aerobics, achievement, motive, preparedness, girls.

Introduction

Control over girls' health strengthening and preservation, formation of their demand in motion functioning and healthy life style are one of main tasks of the present time.

Modern life style of school age girls is in contradiction with their organism's physiological demands and deficit of motion activity results in increasing of morbidity and weakening of their learning potential. Computerization and rather difficult educational programs intensify educational process and sharply restrict motion functioning. Alongside with deficit of motion functioning we observe reduction of girls' motion fitness.

Nowadays there happens active implementation of innovative methodic in order to achieve and maintain human optimal status in compliance with person's motivation and individual features (M.M. Bulatova [3], V.B. Zinchenko [6], Yu.A. Usachov [9]). Analysis of scientific-methodic literature witnesses that at present all forms of health related physical education are pointed at solution of first priority problem: formation, development and strengthening of health exactly with the newest means of physical education and sports.

Analysis of health related activity problems witnesses that one of the most popular kinds of health related physical education is aerobic, owing to its accessibility, emotionality and effectiveness. Just at aerobic trainings positive emotional background is created, level of motion fitness rises as well as interest to physical exercises' practicing.

But, as on to day in practice of health related aerobics there are no objective methodic of measurement and quantitative evaluation of girls' motion fitness that is an obstacle to working out and correction of aerobic trainings.

Exactly method of simulation in pedagogic researches is a mean of information's ordering and permits to deeper and more completely study the essence of researched phenomenon [2]. The problems of simulation in pedagogic activity were regarded in works by S.I. Arkhangelskiy [1], A.N. Dakhin [5], N.V. Kuzmina [7] et al.

Construction of comprehensive model permits to receive new information about object's behavior, to reveal interconnections and regularities, which can not be found with other methods of analysis [11]. Exactly simulation makes possible to briefly render required information. Simulation has its own nature and functions and is a mean of systemic approach, in the basis of which there is researching of objects as systems; the value of this method is that it permits to naturally combine quantitative and qualitative analysis [4].

In physical education simulation is one of modern and promising branches of educational process's improvement, which permits for us to create a structure of indicators of girls' motion fitness.

The progress of modern bio-mechanical methodology opens certain prospects for further perfection of training's means and methods [7, 12-15]. Development of technologies and methods of measurement, application of computer systems in researches significantly widen potentials of physical exercises in this direction. That is why it is of certain interest to work out aerobic trainings, considering bio-mechanical characteristics of girls' motion fitness.

The work has been fulfilled in compliance with priority direction of scientific researches of Chernigov pedagogic university, named after T.G. Shevchenko "Didactic foundations of formation of motion functions of physical education and sports' trainees" (state registration number 0108U000854 dt. 19.12.2008) and in compliance with university's topic "Pedagogic ways to formation of healthy life style of different age school children" (state registration number 0112U001072 dt. 18.01.2012).

Purpose, tasks of the work, material and methods

The purpose of the work is to ground effectiveness of application of girls' motion fitness's bio-mechanical simulation at aerobic training in out-of-school educational instit6utions.

For solution of this task we used method of theoretical analysis and generalization of literature sources, devoted to this problem; simulation, stabilography, strain dynamometry, mathematical statistics.

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In our research 90 girls of 16-18 years old age participated (60 of them practiced health related aerobic and 30 – sport aerobic).

The researches were conducted on the base of training center of vocational-6ecnical education in Chernigov region (Regional public organization "Federation of aerobics of Chernigovschina" and in Chernigov national pedagogic university, named after T.G. Shevchenko.

Results of the research

As a result of complex examination of girls, who train aerobic in health related and sport groups in out-of-school educational establishments of Chernigov we received great quantity of indicators of their motion fitness, which required ordering. It forced us to apply method of simulation and models' construction.

Thus, correlation analysis resulted in determination of the most informatively significant indicators, which had the greatest quantity of interconnections and, consequently, significantly influenced on girls' motion fitness. With the help of simulation method, on the base of received data we constructed graphic-analytical models for realization of quantitative and qualitative control of girls' motion fitness at aerobic trainings in out-of-school educational institutions.

On the base of the most informative bio-mechanical indicators, received with strain dynamometry method, we built graphic-analytical model of bio-dynamic structure of high jump from the spot (see fig.1): the most informative indicators of strength's gradient (GRAD), which was 9.34%; the second by informative meaning indicators of maximal push off force in respect to vertical axis (Fz max) was 8.38%; the third was impulse of force (I) - 7.62%; The forth was indicator of maximal time of action's fulfillment (Tmax) – 7.54%; the fifth was maximal meaning of support resistance responses' components (F max) – 7.5%; the sixth by importance was total time of action's fulfillment (Tsum), which was 7.41%; the seventh – indicator of body weight (P) -7.19%; the eights was indicators of time of half squatting (Tps) – 7.01%.

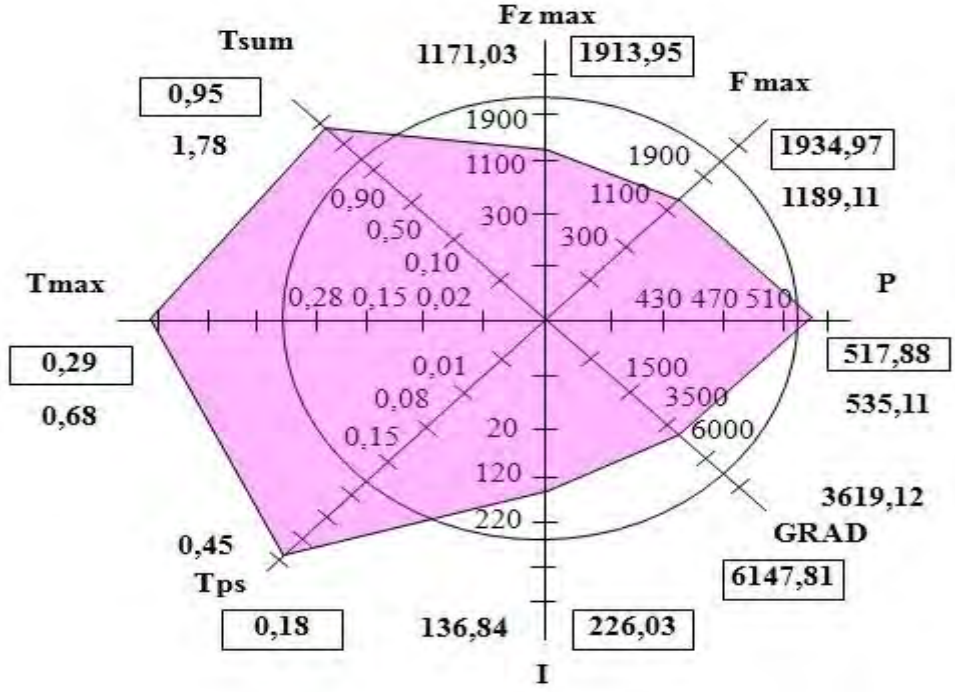

Fig.1. Graphic-analytical model of bio-dynamic structure of high jump from the spot, fulfilled by girls.

As a result of stabilography method's application [9] we received indicators, which composed graphic-analytical model of coordination structure (see fig.2).

Thus, the most significant in girls' coordination fitness was indicator of ellipse's area (EllS), which was 9.02%; the second by significance was indicator of mean displacement in respect to frontal axis (MO (x)), which was 7.91%; the third by quantity of connections was indicator of trajectory length in respect to sagittal axis (LY) – 7.82%; the forth place was taken by indicator of trajectory length in respect to frontal axis (Lx) – 7.81%; the fifth was indicator of balance function (ЯФР) -7.16%; the sixth was indicator of mean velocity of GMC travelling (V) – 7.08%, the seventh place was taken by indicator of velocity(IV) – 6.98% and the eighth place – indicator of mean scattering (mean radius) of MC (R) deviation – 6.86%.

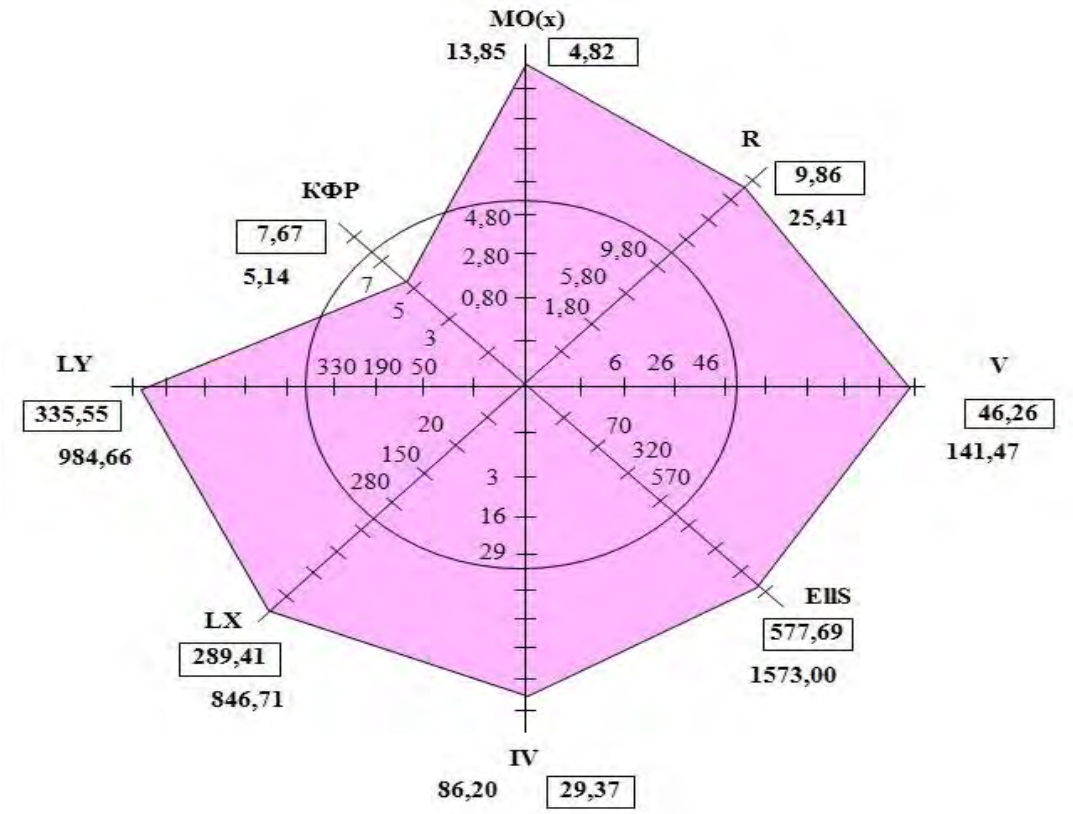

Fig.2. Graphic-analytical model of girls' coordination structure

Conclusions:

Thus, the received data permit to provide basis for selection of means for aerobic trainings on the base of prognostic bio-mechanical models. Besides, bio-mechanical monitoring makes it possible to correct girls' motion fitness, to provide control over aerobic trainings and to make further prognosis.

References:

1. Arkhangel'skij S.I. *Uchebnyj process v vysshej shkole, ego zakonomernye osnovy i metody* [The educational process in higher education, its legitimate principles and methods], Moscow, Pedagogy, 1989, 368 p.
2. Babans'kij E.B., Gurfinkel' V.S., Romel' E.L. *Fiziologicheskij zhurnal SSSR* [Physiological journal of the USSR], 1955, vol.12(3), pp. 423-426.
3. Bulatova M.M. *Teoriia i metodika fizichnogo vikhovannia i sportu* [Theory and methods of physical education and sport], 2007, vol.1, pp. 3-7.
4. Gamalij V.V. *Biomekhanicheskie aspekty tekhniki dvigatel'nykh dejstvij v sporte* [Biomechanical aspects of the art of motor actions in sport], Kiev, Scientific World,, 2007, 211 p.
5. Dakhin A.N. *Standarty i monitoring v obrazovanii* [Standards and monitoring in education], 2004, vol.4, pp. 46-60.
6. Zinchenko V.B., Usachev Iu.A. *Fitnes-tekhnologii v fizicheskom vospitanii* [Fitness technology in physical education], Kiev, NAU, 2011, 152 p.
7. Kuz'mina N.V. *Formirovanie sposobnostej* [Formation of abilities], Leningrad, 1979, 200 p.
8. Nosko M.O., Arkhipov A.A. *Visnik Chernigivs'kogo derzhavnogo pedagogichnogo universitetu* [Bulletin of the Chernihiv State Pedagogical University], 2013, vol.107(2), pp. 67-70.
9. Usachev V.I. Sposob kachestvennoj ocenki funkcii ravnovesiia. Patent na izobretenie 2175851 [A method for qualitative assessment of balance function. A patent for an invention 2175851], Moscow, 2001, 4 p.
10. Shestakov M.P. *Ispol'zovanie stabilografii v sporte* [Using stabilography in sport], Moscow, TVT Divisjon, 2007, 112 p.
11. Shennon R. *Imitacionnoe modelirovanie sistem* [Simulation modeling systems], Moscow, World, 1978, 402 p.
12. Adashevskiy V.M., Iermakov S.S., Logvinenko Y.I., Cieślicka Mirosława, Stankiewicz Błażej, Pilewska Wiesława. Individual athletes' biomechanical features of interaction with objects in art gymnastics. *Pedagogics, psychology, medical-biological problems of physical training and sports,* 2014, vol.6, pp. 3-10. doi:10.6084/m9.figshare.1004089
13. Adashevskiy V.M., Iermakov S.S., Firsova Iu.Iu. Physical mathematical modelling of difficult elements of acrobatic rock-and-roll. *Physical Education of Students*, 2013, vol.3, pp. 3-10. doi:10.6084/m9.figshare.662463

14. Prusik Krzysztof, Prusik Katarzyna, Kozina Zh.L., Iermakov S.S. Features of physical development, physical preparedness and functional state of boys and girls – students of Polish higher educational establishments. *Physical Education of Students,* 2013, vol.1, pp. 54-61. doi:10.6084/m9.figshare.96415
15. Żukowska Hanna, Szark-Eckardt Mirosława, Muszkieta Radosław, Iermakova T.S. Characteristics of body posture in the sagittal plane and fitness of first-form pupils from rural areas. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2014, vol.7, pp. 50-60. doi:10.6084/m9.figshare.1015583

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BASIC TECHNICAL SKILLS (THROWS) IN 17-19-YEAR-OLD JUDOKAS

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Annotation. *Purpose:* The purpose of the research was to determine basic technical skills (throws) in 17-19-year-old judokas and the level of their performance. *Material:* The study involved 30 judo athletes (aged 17-19). *Results:* To determine the athletes' basic technical skills (throws), an analysis of source materials and a diagnostic survey were used. To determine the level of technical skills, the method of expert assessment was applied. Statistical software package Statistica 8 was used in the statistical analysis. In the coaches' opinion, 17-19-year-old judokas have a specific, characteristic of this age group, set of basic technical skills (throws) aptly defining their technical preparation. *Conclusions:* The tested group of judokas exhibited the highest level of demonstrating throws of the koshi-waza (hip) group, and the lowest one of the ashi-waza (foot) group.
Keywords: judo, skills, technique, throws.

Introduction

In the modern depiction of the basic theory of combat sports [9] the notion of technique has been explained in many ways. The combat technique, corresponding with sports technique, is the entirety of resources and skills that allow performing any action falling within the scope of human activity. For the needs of the theory and practice of martial arts, the combat technique has been defined as "such a sports technique used which, due to the assimilated motor habits, facilitates achieving the objectives of the fight, or else it is a use of such an even unpractised before motor solution that the fighting person believes to be the best at any given moment" [9].

Judo techniques as the entirety of skills have been divided into three groups [10, 11]: nage-waza – throwing (67 techniques), katame-waza – grappling (29 techniques), atemi-waza – striking at vital points of the body (24 techniques).

Throws (nage-waza) are divided into those performed in a standing position (tachi-waza) and those during which the athlete loses his balance himself (sutemi-waza). Depending on the involvement of various parts of the body in the performed technique, tachi-waza are divided into: hand (te-waza) – 15 throws; hip (koshi-waza) – 11 throws; foot (ashi-waza) –21 throws.

Sacrifice throws (sutemi-waza) are two groups of techniques: with the fall on one's back (ma-sutemi-waza – 5 throws) and falling on one's side (yoko-sutemi-waza – 15 throws).

Many scientists [2, 4, 5, 12, 13, 15] researched technical preparation of athletes practicing judo. However, the question of what arsenal of techniques an athlete should master at each stage of training is still open.

With this in view, the aim of the study was to determine basic technical skills (throws) in 17-19-year-old judokas and getting to know the level of their performance.

Research material and methods

The results of measurements from the years 2006-2008 carried out in the Laboratory of Physical Effort at Gdańsk University of Physical Education and Sport in Gdańsk were used in the research. The Bioethics Commission at the Regional Medical Chamber in Gdansk accepted information on the research without objections. The study does not have hallmarks of a medical experiment on a human being.

30 athletes practicing judo (aged 17-19) participated in the study. These were pupils of the Comprehensive Sports Secondary Schools Complex from judo classes and athletes training in clubs of the Pomeranian and the Warmian-Masurian Voivodeships. The examined judokas' age, on average, amounted to 17.83 ± 0.64 years, while their body weight to 69.66 ± 12.33 kg.

On average, the subjects had trained judo for 7.05 ± 2.46 years. 4 athletes had the first sports class, 12 athletes the second one, and 14 the third one. Two judokas were members of the national team of younger juniors; 8 athletes were members of the juniors team of the voivodeship.

To determine the basic technical skills (throws) for judo athletes at the age of 17–19 years, an analysis of source materials (research reports and the Olympic Games and the World Championships protocols) were used as well as a diagnostic survey using a questionnaire, which was completed by 30 judo coaches of the championship and the first class.

To determine the level of technical skills, the method of expert assessment was used. Each technique (throw), indicated by the coaches in the previously carried out diagnostic survey, was assessed on a scale of 1-10 (divided into tenths of a point). Every mistake and failure to comply with the model had adequate point penalties as referred to in a specially prepared evaluation protocol. Three experts assessed the conformity of the demonstrated skills (throws from four groups) with the model. The task of each subject was to demonstrate with his partner (equal in terms of height and weight) of all the indicated throws from the right-hand posture. All the experts' evaluations were then averaged.

Basic indices of the software package Statistica 8 were applied in statistical analysis.

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Research results

On the basis of the judo coaches' opinions and an analysis of the source materials, a set of technical skills (throws) in four groups was developed, which subsequently were subjected to evaluation of the level of their performance.

In the group of hand throws (te-waza) the subjects obtained the lowest value of the performance level in the uchi-mata-sukashi throw – 7.95 point (79.5%) with the spread of results 5.7, and the highest one in ippon-seoi-nage – 9.45 points (94.5%) with the spread of results 3.2 (Tab. 1).

The subjects obtained the lowest value in the Ashi-waza group in the sasae-tsurikomi-ashi throw – 7.82 points (78.2 %) with the spread of results of 4.8, and the highest one in the osoto-gari throw 9.35 point (93.5%) with the spread of results 3.9.

In assessing the level of performance of hip throws Koshi-waza, the lowest average arithmetic mean in the group was achieved by the subjects in the utsuri goshi throw – 7.89 points (78.9%) with the spread of results of 3.6, and the highest one in the o-goshi throw 9.8 points (98%) with the spread of results of 3.1.

The subjects achieved the lowest value in the group of sacrifice throws Masutemi-waza, Yoko-sutemi-waza in the yoko-guruma throw – 7.85 points (78.5%) with the spread of results of 5.3, and the highest one in tomoe-nage – 9.1 points (91%) with the spread of results of 5.1.

Table 1.

Basic technical skills (throws) in 17-19-year-old judokas and the level of their performance (points).

Te-waza		Ashi-waza		Koshi-waza		Ma-sutemi-waza, Yoko-sutemi-waza	
Throws	Level , pts.	Throws	Level , pts.	Throws	Level , pts	Throws	Level , pts.
IPPON-SEOI-NAGE	9,45	OSOTO-GARI	9,35	O-GOSHI	9,8	TOMOE-NAGE	9,1
SUKUI-NAGE	9,25	UCHI-MATA	8,95	KOSHI-GURUMA	9,65	SUMI-GAESHI	9
SEOI-NAGE	9,15	OUCHI-GARI	8,95	HARAI-GOSHI	9,2	OSOTO MAKIKOMI	8,9
KUCHIKI-TAOSHI	9,05	DEASHI-HARAI	8,75	USHIRO-GOSHI	8,95	SOTO MAKIKOMI	8,8
KIBISU-GAESHI	8,7	KOSOTO-GARI	8,6	HANE-GOSHI	8,95	YOKO GAKE	8,7
TAI-OTOSHI	8,7	OKURI-ASHI-HARAI	8,55	TSURIKOMI-GOSHI	8,9	UCHIMATA MAKIKOMI	8,65
KOUCHI-GAESHI	8,65	HIZA-GURUMA	8,3	SODE-TSURIKOMI-GOSHI	8,7	URA-NAGE	8,6
SEOI-OTOSHI	8,25	OSOTO-OTOSHI	8,1	UKI-GOSHI	8,2	TANI-OTOSHI	8,4
MOROTE-GARI	8,12	KOUCHI-GARI	8,01	TSURI-GOSHI	8,08	YOKO OTOSHI	8,3
UCHI-MATA-SUKASHI	7,95	SASAE-TSURIKOMI-ASHI	7,82	UTSURI-GOSHI	7,89	YOKO GURUMA	7,85

Discussion

Judo is an acyclic sport, classified as a speed-strength discipline with a complex coordination structure. For this reason, a judoka's victory is determined by many factors. However, it is technical preparation that has the greatest

contribution to obtaining high sports results. Thus, the study of the most appropriate technical preparation is a key element of judokas training at various stages of long-time sports training [6, 7].

The authors use a variety of ways to assess the technical skills of throws. Adam et al. [1] defined the dominant techniques (throws) during a sports fight using the number of attacks which resulted in ippon, the total number of effective attacks and the average ippon, waza ari and yuko score obtained during the fight. To determine the dominant and the most effective techniques, values of indices calculated from two formulas were used. The authors observed an increase in the quality of performance of foot throws and uki waza (different ways of performance). In the case of this study, the situation was different. The highest rating was obtained in the hip throws group Koshi-Waza – 9.8 points (o-goshi) and the lowest one in the group of foot throws Ashi-waza – 7.82 point (sasae-tsurikomi-ashi). An identical situation occurred in the case of the average result of all assessments in the groups of throws. In the group of foot throws the studied judokas obtained the lowest average results of 8.53 while in the group of hip throws – 8.83.

Franchini et al. [3] assessed technical and tactical actions during a simulated sports fight of judo using the number of attacks and the number and the type of the applied throwing techniques.

Jonczyk and Adam [8] presented a set of techniques (throws) which are the most effective in a group of winners of the Olympic Games and the World Championships. They specified the percentage of the contribution of individual groups of throws (Te-Waza 24.9%, Sutemi-Waza 8.3%, Koshi-Waza 5.7%, Osae-komi-Waza 18.3%, Ashi-Waza of 34.1%, Shime-Waza 4.2%) and the percentage values for individual throws.

Sadowski and Gierczuk [14] defined the level of performance of technical elements in a group of studied wrestlers using the method of objective judges' assessment – highly qualified wrestling coaches. It was based on the average of three evaluations. The extreme results (the lowest and highest ones) were rejected. The coaches evaluated technical elements using a scale from 1 to 5 points. The starting and finishing positions, the correctness of grappling, the smoothness and harmony of movement and the amplitude in the case of throws were taken into consideration.

This method of assessment of technical skills is very similar to the method used in our research. The difference only occurred in the number of objective judges (3) and the point scale (1-10).

Conclusions

Taking into account the results of the research and the practical experience, one can draw the following conclusions:

1. Judokas' technical preparation constitutes one of the most important elements of their training at different stages of long-time sports training.
2. In the coaches' opinion, 17-19-year-old judokas have a specific, characteristic of this age group, set of basic technical skills (throws) aptly defining their technical preparation.
3. The examined group of judokas demonstrated the highest level of presenting throws from the koshi-waza (hip) group, and the lowest one from the ashi-waza (foot) group.

References

1. Adam M., Smaruj M., Tyszkowki S. The diagnosis of the technical-tactical preparation of judo competitors during the World Championships (2009 and 2010) in the light of the new judo sport rules. *Archives of Budo*, 2011, vol.7(1), pp. 5-9.
2. Dominy E. Contest techniques and tactics. London. 1966, 200 p.
3. Franchini E., Yuri Takito M., de Moraes Bertuzzi R.C. Morphological, physiological and technical variables in high-level college judoists. *Archives of Budo*, 2005, vol.1, pp. 1-7.
4. Geesink A. *My championship judo*. London. 1966, 240 p.
5. Hoare S. *The A-Z of judo*. London. 2004, 244 p.
6. Jagiełło W. The long-term judo training [Długofalowy trening judoków]. *Trening*, 1993, vol.1(17), pp. 86-98.
7. Jagiełło W. *The multi-annual training judokas* [Wieloletni trening judoków]. Library Trainer. Sports Centre, Warsaw 2000, 106 p.
8. Jonczyk F., Adam M. Evolution of effectivenes of judo techniques in the opinion of the World leading judo trainers. *Research Yearbook Jędrzej Śniadeci University of Physical Education*, 1997, vol.4, pp. 91-96.
9. Kalina R.M. *Theory of combat sports* [Teoria sportów walki]. Library Trainer, Warsaw, 2000, 200 p.
10. Kano J. *Kodokan Judo*. Kodansha International Tokyo, New York, London. 1994, 280 p.
11. Kawamura T., Daigo T. *Kodokan new Japanese-English dictionary of judo*. The Fundation of Kodokan Judo Institute, Tokyo. 2000, 248 p.
12. Kobayashi K., Sharp E.H. *The sport of judo as practiced in Japan*. Charles E. Tuttle Co, Tokyo. 1956, 160 p.
13. Koizumi G. *My study of judo: the principle and the technical fundamentals*. Fulsham & Co. Ltd, London. 1960, 164 p.
14. Sadowski J., Gierczuk D. Correlations between selected coordination motor abilities and technical skills of Greco-Roman wrestlers. *Archives of Budo*. 2009, vol.5, pp. 36-39.
15. Sterkowicz S., Lech G. The commencement age of training and its effects on technical preferences and achievements attained by judo contestants. *Human Movement*. 2004, vol.5(1), pp. 42–47.
16. Sterkowicz S., Maślej P. Analysis of the fighting judo under its term structure, comparative studies [Analiza przebiegu walki judo na podstawie jej struktury czasowej, badania porównawcze]. *The high-performance sport* [Sport Wyczynowy]. 1999, vol.7–8, pp. 33–37.

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PHYSICAL AND MOTOR DEVELOPMENT OF THE STUDENTS ENROLLED AT THE UNIVERSITY OF WARMIA & MAZURY IN OLSZTYN, POLAND, IN RELATION TO THEIR FINANCIAL AND URBANIZATION STATUS

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Annotation. *Purpose*: The purpose of this study was to assess the state of development of physical and motor characteristics of youths aged 19-20 years, students of the University of Warmia and Mazury in Olsztyn, in view of their place of residence and monthly income. *Materials and Methods*: The study was conducted at the end of the summer term 2012 at the mandatory physical education classes. Attended by 361 youth from 250 randomly selected student groups full-time study. Status of physical development of the respondents rated in terms of height, weight, body mass index. To test the level of motor development has been used 13 tests. *Results*: It was found that the place of residence and monthly income does not affect the body mass index. Residence also has no effect on growth, while the monthly livelihood of more than 2000 zlotys per month influence. In the vast majority of motor tests are not observed links between the results and the residence of students, with the exception of the test - lifting the neck barbell over his head back and forth. Monthly livelihoods are significantly different from most of the subjects in the motor tests: long jump from their seats, raising the neck barbell over his head back and forth, Cooper test (12 min.) On the rowing ergometer 1 and 3 min. In such tests as: Burpee test, throw the medicine ball (4 kg) forward and behind his back, pulling up on the bar, the best performance among students with high incomes. *Conclusions*: It is likely that the monthly livelihood students significantly stronger associated with the physical development of students as compared to their places of permanent residence. The blurring of differences in the physical and motor development of students of different degree of urbanization may arise from the specificity of Warmia and Mazury, which are the least developed areas and having the highest unemployment rate in Poland.
Keywords: students, physical, motor, urbanization, financial.

Introduction

Human processes of development depend on genetic potential as well as the surrounding environment. The nature of the organism's response to the stimuli of the environmental factors is the function of the factor type, their intensity, duration, the body's resistance and their specific structures [1].

A person's biological development depends largely on a group of factors among which socioeconomic status [2] with urbanization as its key element deserves special attention [3, 4]. Most researchers believe that there are significant differences in the physical development of individuals depending on their place of residence, be this city, a small town or a rural area [5].

Accelerated maturation of children living in the city may result from better care and living conditions such as proper nutrition, adequate hygiene and professional health care [6].

Fulfilment of every person's basic needs depends to a large extent on the amount of income per family member. Therefore, an individual's monthly budget exerts an influence on his or her personal development [7]. In consequence, a lower monthly budget per family member generates additional obstacles to the involvement in physical activity, which may include transport difficulties, inability to pay coaches' fees or provide safe environment on sporting facilities, which can be particularly observed in inner cities [8]. By way of contrast, children raised in privileged environments are marked by an accelerated biological development in comparison to the children growing up in less educated and lower income environments [9]. For this reason, while assessing the influence of environmental factors on the level of a person's motor development it can be stated that individuals of upper and middle class origin are favourably conditioned in comparison to individuals of working class and rural origin [10].

Biological condition of every single individual as well as the whole populations is expressed by their physical, mental and social health [11, 12]. In the economically developed societies motor fitness is a reliable measure of a person's biological state [10]. Motor fitness has grown significantly in importance over the recent decades as a result of continuous decrease in the level of human physical activity, particularly in the societies of economically developed countries [13]. The level of motor fitness is largely determined by a person's physical activity [14]. Numerous research studies indicate that the amount of more intensity physical efforts both in the professional field and in other activities is dramatically decreasing, which results in a handicap of people's biological features and their adaptive abilities, or even leads to heightened susceptibility to falling in with a range of so called diseases of civilization [15]. This negative phenomenon has been also observed among university students [16, 17].

The data concerning students' motor fitness has been well documented in the Polish [18, 19, 20] and foreign scientific literature [21, 22, 23]. However, there is a considerably smaller amount of research on the level of students' motor fitness conducted regularly over a specific period of time (e.g. over a decade) [24] and in relation to selected socioeconomic factors [25].

The research on the relationships between the level of motor abilities of students beginning their studies and selected environmental factors is worth exploring since the time spent at university is the last stage of learning during which university authorities are given an opportunity to promote habits of an active lifestyle. This seems to be of

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primary importance in view of the fact that it is the intelligentsia that plays a leading role in promoting health culture and in shaping correct pro-health attitudes both in the individual and public health.

The aim of the research conducted with the students of the University of Warmia & Mazury as participants was to diagnose the level of motor and physical development of men aged 19-20, taking into consideration their place of permanent residence and their monthly budget.

Materials and Methods

Ethics

The research was carried out with prior consent from the Ethical Committee of UWM on student volunteers who agreed to participate in the study, which they confirmed by signing a written statement.

Participants

The research on the level of physical and motor development was conducted in 2012 at the end of spring semester during obligatory physical education classes and comprised only 1st-year male students enrolled at the University of Warmia & Mazury in Olsztyn (UWM). The research involved 361 students of full-time studies from 26 students groups randomly selected out of 250. As a result the participants were 19-20-aged students (mean age 19.7) who constituted over 96% of all the students allocated in selected 26 groups. Only those students who were absent on the day of the research were excluded from the experiment.

The majority of the students came from rural areas (32.7%), and the others from small and big towns (21.9% and 19.4% respectively). Nearly half of the participants (47.37%) had less than 1000 PLN at their disposal and a monthly budget of almost two-fifths of them (36.29%) ranged from 1000 – 1500 PLN a month. Slightly more than 11% of the participants had financial means between 1500-2000 PLN, and a smaller percentage of the subjects (5.26%) had their means over 2000 PLN per month (Table 1).

Table 1.

Urbanization and financial status of examined students

Place of permanent residence											
Village		Agglomeration (number of inhabitants)								Total	
		Small town (<20,000)		Big town (20-50,000)		Small city (50-100,000)		Big city (>100,000)			
N	%	N	%	N	%	N	%	N	%	N	%
118	32.7	79	21.9	70	19.4	51	14.1	43	11.9	361	100.0
Monthly budget											
<1000 PLN		1000-1500 PLN		1500-2000 PLN		>2000 PLN		Total			
N	%	N	%	N	%	N	%	N		%	
171	47.4	131	36.3	40	11.1	19	5.2	361		100.0	

It should be also noted that 1st-year students were deliberately selected as a sole study group as the research carried out in 2012 complemented the cross-sectional studies conducted biannually since 2000, the aim of which is to observe the level of 1st-year students' physical development and motor fitness [20].

Tools and procedures

In order to determine the level of physical development of the subjects, their basic anthropometric features such as body mass and height were measured using the RADWAG scale, on the basis of which their BMI was calculated. Thirteen motor tests such as: the standing long jump [cm], 4x10 m shuttle run [s], the skipping with clapping of hands – 8 s [number of claps], sit-ups – 30 s [number of sit-ups], the medicine ball (4 kg) forward throw [cm], the medicine ball (4 kg) backward throw [cm], pull-ups on bar [s], the downward bend from standing position [cm], 1 and 3 min. Burpee tests [number of cycles], and the forward-backward arm rotation over head holding a bar [cm] were applied to precisely assess the students' level of motor abilities. The accuracy and reliability of the motor tests specified above have been confirmed by numerous studies on this subject [26, 27]. Each of the students was instructed on the proper technique of executing every motor task during the lessons preceding the actual test dates and given ample time to practice them. Prior to performing the actual tests the participants took part in a 10-minute warm-up. For clearer interpretation of the results, we used the following categories to describe the residential environment: village or small town (< 20,000 inhabitants), big town (20,000 – 50,000 inhabitants), small city (50,001 – 100,000 inhabitants), and big city (> 100,000 inhabitants).

Statistical analysis

The variance analysis was used in order to assess the relationships between the level of physical and motor development and selected environmental factors (the place of permanent residence and the monthly budget). The Duncan test was used to compare means of the specific environmental factors. Statistical calculations were performed and the results were analyzed using the Statistica PL v. 10 Software package.

Results of the research

Table 2

Statistical characteristics of the students' anthropometric features in relation to their place of permanent residence and monthly budget (bold-faced - differences significant p<0.05)

Place of permanent residence $\overline{X}$ ± SD (min - max)						
Features	Village	Small town	Big town	Small city	Big city	*p*
Body height (cm)	178.39±6.64 (164-196)	184±6.89 (164-200)	179.63±6.07 (164-202)	181.25±6.63 (165-203)	178.86±6.87 (164-197)	0.0883
Body mass (kg)	75.61±10.40 (58-105)	84.0±8.99 (58-100)	75.41±10.20 (55-110)	74.98±8.39 (60-90)	73.44±8.023 (60-96)	0.7551
BMI [kg/m^2]	23.74±2.79 (18.72-30.42)	24.82±2.58 (18.02-31.02)	23.36±2.83 (19.20-34.72)	22.86±2.61 (18.59-29.05)	22.95±2.01 (18.99-27.68)	0.1693

Monthly budget $\overline{X}$ ± SD (min - max)					
Features	<1000 PLN (1)	1000-1500 PLN (2)	1500-2000 PLN (3)	>2000 PLN (4)	*p*
Body height (cm)	178.81±6.64 (164-203)	180.18±6.86 (164-202)	178.43±6.60 (164-190)	182.89±6.32 (175-197)	**0.0262 4> 1,2, 3 2 > 1,3**
Body mass (kg)	74.61±9.57 (58-110)	75.79±9.14 (58-105)	73.64±11.07 (55-105)	76.11±7.94 (65-92)	0.5229
BMI [kg/m^2]	23.35±2.82 (18.02-34.72)	23.32±2.24 (18.59-30.42)	23.13±3.34 (19.20-33.14)	22.77±2.27 (18.59-25.66)	0.8114

Neither the place of permanent residence nor the students' monthly budget significantly differentiates the subjects' body mass and their BMI. The place of permanent residence does not significantly differentiate their body height either, however, the students' monthly budget does. The students who have more than 2000 PLN (4) at their disposal are significantly taller than those whose monthly budget is below 2000 PLN (1, 2, 3). In addition, the students whose financial means were in the range of 1000-1500 PLN (2), were significantly taller than their peers whose means were below 1000 PLN (1), and between 1500-2000 PLN per month (3). In all the categories of the analyzed factors BMI values were about the norm (Table 2).

Table 3

Statistical characteristics of the students' motor abilities in relation to their place of permanent residence (bold-faced - differences significant p<0.05)

Motor test	Place of permanent residence $\overline{X}$ ± SD (min - max)					***p***
	Village 1	Small Town 2	Big Town 3	Small city 4	Big city 5	
Standing long jump[cm]	213.84±24.82 (156-280)	201.5±23.38 (146-273)	217.1±22.80 (147-270)	220.65±21.98 (174-275)	210.95±23.82 (165-260)	0.1750
Sit -ups – 30 s [number of sit-ups],	24.27±4.19 (14-35)	25.0±4.8309 (10-33)	23.64±3.38 (10-33)	25.22±3.01 (19-32)	22.93±3.78 (15-29)	0.0909
Zig-zag run [s]	25.18±2.42 (20.01-33.4)	26.72±2.75 (11.2-30.25)	25.52±2.81 (21-37)	25.14±2.34 (20.02-30.5)	25.34±2.12 (22.12-32.25)	0.2444
4x10 m shuttle run [s]	10.77±1.27 (3.66-14.6)	11.58±1.14 (9.2-15.4)	10.46±1.57 (2.74-13.84)	10.54±0.99 (8.58-14.28)	10.64±1.15 (6.12-13.12)	0.4754
Skipping – 8 s [number of claps],	28.57±4.95 (16-44)	24.00±4.29 (13-40)	29.04±4.13 (20-37)	28.16±4.54 (16-44)	26.91±3.55 (20-34)	0.1489
Downward bend from standing position [cm],	9.52±6.79 (-13-24)	7.0±7.07 (-15-25)	9.66±6.69 (-17-25)	10.08±6.52 (-3-25)	7.91±7.26 (-10-26)	0.5618
Forward-backward bar rotation [cm]	92.37±12.64 (66-127)	110.05±14.35 (63-130)	89.57±11.11 (62-115)	94.63±11.82 (76-120)	92.07±12.49 (71-133)	**0.0029 2>3**
Rowing ergometer 12 min [m]	2380.05±407.97 (1349-3254)	2770.5±341.42 (1345-2980)	2451.16±350.55 (1561-3130)	2446.08±347.17 (1788-3100)	2409.12±362.14 (1456-3254)	0.6838
3 min. Burpee tests [number of cycles],	58.65±9.45 (29-81)	69.00±7.50 (36-73)	60.64±7.65 (41-82)	59.90±7.24 (42-77)	58.02±8.82 (29-80)	0.2924
1 min. Burpee tests [number of cycles],	25.03±5.15 (13-40)	32.50±4.55 (15-35)	25.84±4.64 (16-40)	25.37±4.12 (16-36)	24.53±4.45 (14-36)	0.5114

Medicine ball (4 kg) backward throw [cm]	1021.54±216.54 (112-1550)	1060.0±233.31 (119-1638)	1040.53±217.40 (620-1750)	1017.06±179.66 (580-1420)	966.28±195.37 (110-1320)	0.1539
Medicine ball (4 kg) forward throw [cm]	825.76±152.35 (310-1220)	800.0±176.77 (480-1360)	844.64±193.78 (200-1300)	832.73±192.25 (109-1230)	816.40±166.09 (310-1250)	0.2895
Pull-ups on bar [number of pulls]	6.24±4.13 (0-18)	10.0±4.79 (0-20)	6.76±4.51 (0-18)	6.65±4.88 (0-19)	4.67±3.66 (0-16)	0.1624

As can be seen from table 3, in the majority of cases the place of permanent residence does not significantly differentiate the results obtained in the motor tests applied in the study. Only in the case of the flexibility test i.e. the forward-backward arm rotation over head holding a bar trial, the men residing in small towns (2) scored better than those living in big towns (3) (Table 3).

Table 4

Statistical characteristics of the students' motor abilities in relation to their monthly budget (bold-faced - differences significant $p<0.05$)

Motor test	Monthly budget $\overline{X}$ ± SD (min - max)				*p*
	<1000 PLN (1)	1000-1500 PLN (2)	1500-2000 PLN (3)	>2000 PLN (4)	
Standing long jump [cm]	212.01±22.27 (146-275)	218.03±24.76 (156-280)	221.40±23.97 (170-273)	231.00±19.76 (200-270)	0.0013 4>1
Sit -ups – 30 s [number of sit-ups]	23.74±4.17 (10-32)	24.12±4.01 (14-35)	24.28±5.08 (13-33)	25.84±3.76 (17-31)	0.2092
Zig-zag run [s]	25.33±1.88 (21.0-31.03)	25.30±2.15 (21.0-32.91)	24.88±3.62 (20.0-37)	24.59±4.16 (20.0-32.25)	0.6533
4x10 m shuttle run [s]	10.77±1.68 (2.74-17.85)	10.74±0.91 (9.12-14.6)	10.53±1.22 (9.05-13.84)	10.31±1.39 (6.12-13.12)	0.4558
Skipping – 8 s [number of claps],	28.07±4.49 (13-44)	28.08±4.56 (16-44)	29.15±3.71 (21-38)	29.63±5.12 (22-37)	0.2748
Downward bend from standing position [cm],	8.86±6.39 (-17-26)	9.69±7.16 (-15-25)	10.38±6.64 (-13-25)	13.11±8.08 (-10-25)	0.0504
Forward-backward bar rotation [cm]	91.89±12.29 (69-126)	91.65±11.42 (62-123)	99.90±14.53 (76-127)	102.16±16.07 (79-133)	**0.0000 4,3>1,2**
Rowing ergometer 12 min [m]	2300.65±366.17 (1345-3224)	2494.52±328.92 (1349-3254)	2521.23±379.34 (1456-3130)	2570.00±369.63 (2000-3254)	**0.0000 4>1**
3 min. Burpee tests [number of cycles],	56.40±8.45 (29-82)	61.15±6.76 (29-80)	61.35±9.45 (39-79)	63.11±8.25 (51-80)	**0.0000 4,3,2>1**
1 min. Burpee tests [number of cycles],	23.69±4.57 (13-40)	26.09±4.24 (13-39)	26.83±5.11 (18-39)	27.21±4.63 (22-36)	**0.0000 4,3,2>1**
Medicine ball (4 kg) backward throw [cm]	970.94±205.79 (110-1470)	1030.45±179.85 (119-1550)	1183.33±261.24 (690-1750)	1190.53±137.98 (890-1450)	**0.0000 4,3>1,2**
Medicine ball (4 kg) forward throw [cm]	789.18±151.33 (200-1220)	846.06±158.10 (109-1200)	972.25±190.77 (540-1360)	976.32±208.31 (650-1320)	**0.0000 4,3>1,2**
Pull-ups on bar [number of pulls]	5.67±4.12 (0-19)	6.22±4.12 (0-20)	7.63±5.26 (0-18)	9.63±5.60 (1-20)	**0.0004 4>1,2**

As can be shown in table 4, the students monthly budget significantly differentiated the level of their motor abilities in the majority of the motor tests including: the standing long jump, the forward-backward arm rotation over head holding a bar, the Cooper's test (12 min.) on a rowing ergometer, 1 and 3 min. Burpee test, the medicine ball (4 kg) forward and backward throws, and pull-ups on a bar. Fluctuations of the results obtained by the students were mainly gradient in character, i.e. the higher urbanization status the better stores in the above tests. In the other tests such as: sit ups– 30 s, the zig-zag run, the 4x10 m shuttle run, the skipping with clapping of hands – 8 s, and the downward bend from standing position no significant differences were observed (Table 4).

Discussion

The influence of socioeconomic status on the biological development of young people in the 1980s was the subject of numerous studies including Wolański et al. [28]. This research indicated the difference in the level of physical and motor development between the individuals living in rural and city environment [29, 30]. Similar results were obtained in the research by Mleczko [31], who indicated that 15-19-aged male residents of the city were characterized by a significantly higher body fat than their peers from rural areas, which in consequence marked them with a significantly lower level of aerobic capacity. The author in question proved that the subjects' financial means are one of the key factors determining eating habits and the level of physical activity of young men. Further research by

Mleczko, on the other hand, showed the blurring of differences in the motor and somatic development of 15-19-aged male residents of Małopolska, Poland [32], which was also confirmed in the research by Jaworski et al. [33]. They revealed that the place of permanent residence did not significantly differentiate the level of selected coordination abilities of the students enrolled at the Academy of Physical Education in Cracow in the years 2006-2008. According to the authors of the above research the reason behind this tendency can be civilization upgrading of rural areas in Poland and economic growth of these areas, as a result of which the financial status of rural families has been improved, being parallel with the impoverishment of urban families particularly in small towns.

The role of the place of permanent residence (urbanization level) in human biological development is unquestionable and thus has been highlighted in numerous studies [5, 34, 35, 36]. It should be noted, however, that socioeconomic status of the Poland of 1980s is incomparable to the Poland after 2000, which the research studies above indicated [32, 33]. A similar phenomenon can be observed in the developing countries of Africa such as Botswana. The research conducted with secondary school students as participants showed that the students marked by low socioeconomic status living in so called rural villages devoted more time to physical activity, which resulted in their smaller relative body mass, overweight/obesity [37].

The research conducted worldwide over the last decades shows that negative influence of low physical activity of children and youngsters on the level of their motor abilities is recorded both in the economically developed [38, 39, 40, 41] and underdeveloped regions [42, 43]. This negative phenomenon observed over the last two decades refers not only to children and adolescents but also to young people between 19 and 28 years old [44], including university students [22, 45, 46, 47]. Polish students can be classified as physically inactive individuals irrespective of their place of permanent residence [48], which results from their very low level of physical activity, virtually restricted to participation in obligatory Physical Education classes [18, 19, 20].

In addition, it should be also taken into account that the place of permanent residence is firmly correlated with other socioeconomic factors such as educational background and the kind of occupation. In the light of the above relationships, environmental conditioning of men's somatic development and motor fitness should be analyzed in terms of integrative interaction of a group of factors [49]. According to Conley & Glauber [50], most research have revealed that body mass is significantly, or minimally correlated with adult men's socioeconomic status including industrial category. In the opinion of researchers, however, there is a difference in ecosensitivity between the features under investigation such as body mass, body height and BMI index calculated on the basis of these parameters. An individual's body height is under a strong influence of cumulative and irreversible effects of environmental factors which affect him or her throughout his or her life. That is why body height is to a greater extent genetically determined than body mass whereas relative body mass and dependent on it BMI undergo other physiological mechanisms regulating their values. For this reason these parameters are more sensitive to the current environmental stimuli and their values may increase over relatively shorter periods of time.

A stronger impact of socioeconomic factors is more discernible in underdeveloped regions with a high unemployment rate [51] such as Warmia & Mazury. The financial status of the majority of families dwelling in towns of 20 up to 40,000 of inhabitants is similar to those residing in the country as a result of the blurring of differences in the region characterized by 30% unemployment rate and agriculture and tourism oriented economy. Moreover, a marginal number of bigger agglomerations (only two cities of 150-200,000 inhabitants) are under a strong influence of the surrounding agriculture and tourism oriented environment.

This observation has been confirmed by the research conducted with UWM students as participants on the relationships between the 1st-year students' body height and mass and their BMI, and the place of permanent residence, which was carried out biannually between 2000-2006. It revealed that in 2000, 2002 and 2006 no differences in the level of subjects' body fat were observed irrespective of their place of permanent residence. Only in 2004 significant differences were observed showing that the students residing in the country were marked by significantly higher BMI values (24.1 kg/m^2) in comparison with their peers from small towns (BMI – 22.9 kg/m^2), big towns (22.8 kg/m^2), and big cities (22,9 kg/m^2), whereas the values of the slimness indicators did not significantly differ in all the years [52]. Inverse relationships between adiposity and urbanization have been previously reported in Swedish [53], American [54], Canadian [55] and Danish [35] male populations. Cross National Student Health Survey (CNSHS), consisting of 5,900 records of university students from seven countries in Europe including Germany, Poland, Bulgaria, Spain, Lithuania, Denmark, and Turkey, indicated that the students coming from Eastern European countries (Poland, Bulgaria and Lithuania) showed a tendency toward lower BMI as compared with the Southern and Western Europe countries (Germany, Denmark and Spain) (max. difference of 2.5 kg/m^2, d=0.78), with 72-84% BMI in the normal category. No considerable differences, on the other hand, were observed in the body height of men [56]. The research conducted with the students from Thailand revealed that they were marked by lower mean values of body mass (0.93 kg) and higher values of body height (1.54 cm) in comparison to their peers coming from highly developed countries [57]. In contrast, the research on the influence of SES on the level of somatic development of 11-18-year-old adolescents from South-Eastern Nigeria showed that the parameters of the boys' body mass and height were strongly correlated with the SES factors such as: parents' educational background and their monthly budget. This means that the individuals with a higher status were characterized by higher values of body height and lower values of body mass thus slimmer [58]. The above data revealed that students who live in underdeveloped regions of the countries marked by a smaller national gross per one person are generally slimmer in comparison to those coming from developing and developed countries. On the other hand, the research conducted in Nigeria confirmed the assumption put forward by Jopkiewicz [49], in which he opts for integrated influence of a group of factors. The Global Database on BMI indicators relating to the differences in urban-rural areas from about 100 countries and regions which comprised about 88% of the world population showed that males residing in urban areas were characterized by significantly higher obesity and pre-obesity

rates than their rural counterparts, with mean differences of 2.2% [59]. The analysis of the level of motor fitness in relation to the students' place of permanent residence showed that out of the 13 motor tests applied in the study, in the majority of cases no significant differences in the level of specific motor abilities were observed except for one test which aimed at measuring the mobility by means of the shoulder girdle forward - backward arm rotation over head holding a bar trial. Therefore, it should be stated that the place of permanent residence is a factor which does not differentiate the level of motor fitness of 19-20-aged students residing in the region of Warmia & Mazury.

The effect of blurring of the differences between more developed and underdeveloped areas, which was observed in our research, can result from the improvement of living conditions in the country and the apparent deterioration of such conditions in the urban areas. Such an assumption was confirmed by the earlier research conducted with the UWM students as participants. The first research carried out in 2000 showed that the only significant differences in the results obtained by the students referred to the downward bend from standing position trial in favour of the men residing permanently in the country [20], whereas the research in 2002 showed significant differences in the following tests: 4x10 m shuttle run, the skipping with clapping of hands – 8 s, 1 min. Burpee test, the medicine ball (4 kg) backward throw, as well as the pull-ups on a bar [60]. In contrast, the research conducted in 2004 [61] and 2006 [62, 63. 64, 65], showed no differences in the tests measuring flexibility, strength, speed and endurance abilities. A similar tendency of blurring of the differences in the level of motor fitness in the men living in the rural and urban areas was observed between 2000 and 2006 [66, 67].

Unlike in the results above there is a noticeable relationship between the level of the students' motor fitness and their monthly budget. Out of the 13 motor tests, 8 cases showed statistically significant differences. What is more, these relationships indicated that the increase in the monthly budget positively affects the level of the students' motor abilities in particular in the strength tests such as: the standing long jump, the medicine ball backward and forward throws, pull-ups on a bar; the hybrid tests [68] including speed-strength and endurance-strength (1 and 3 minute Burpee tests respectively) [69] as well as endurance tests (Cooper test [12 min.] on a rowing ergometer).

For the reason that adult individuals' motor fitness depends on their level of physical activity, which is influenced by a range of environmental factors such as sociocultural, psychological, and biological [70, 71], and on the basis of the results above it can assumed that students' monthly budget affects their level of physical activity in a gradient manner, and therefore determines their motor fitness more significantly in comparison to their place of permanent residence.

Conclusions

- The place of permanent residence does not differentiate significantly the students' height, body mass and their BMI, nor the results obtained in the majority of motor tests except for the forward-backward arm rotation over head holding a bar trial.
- The students' monthly budget was shown to differentiate only the students' height, which was the highest in the students with over 2000 PLN a month at their disposal. The monthly budget, however, significantly differentiates the level of the majority of motor abilities examined in the tests such as: the standing long jump, the forward-backward arm rotation over head holding a bar trial, Cooper test (12 min.) on a rowing ergometer, 1 and 3 min. Burpee tests, the medicine ball (4 kg) backward and forward throws, and pull-ups on a bar. This dependence is gradient in nature, in favour of those individuals who have a more substantial monthly budget at their disposal.
- The blurring of differences in the level of physical and motor development of the students marked by distinct urban status may result from the specificity of Warmia & Mazury, which is one of the poorest and most underdeveloped regions in Poland with the highest unemployment rate nationwide.
- The fact that the relationship between the students' monthly budget and the results obtained in the majority of motor tests was gradient in nature might be explained by a more intensive physical activity, hence more costly physical activity observed among more affluent individuals.

References:

1. Wolański N. *Biological Human Development* [Rozwój Biologiczny Człowieka]. PWN Press, Warszawa, 2005, 573 p.
2. Tanner J.M. Growth as a mirror of the society: secular trend and class distinction. In: A. Demirjian and M. Brault Dubuc, editors. *Human growth: A multidisciplinary review*. Taylor and Francis Press, London & Philadelphia, 1986, pp. 3-34.
3. Eveleth P.B., Tanner J.M. *World Wide Variation in Human Growth*. Cambridge University Press, Cambridge, 1990, 311 p.
4. Eiben O.G., Barabás A., Kontra G., Pantó E. Differences in growth and physical fitness of Hungarian Urban and rural boys and girls. *Homo*, 1996, vol. 47, pp. 191-205.
5. Komlos J. Preface. In Komlos, editor, *Stature, Living standards, and Economic Development. Essays in anthropometric history*. University of Chicago Press, London, 1994, pp. 9-11.
6. Eiben O.G., Mascie-Taylor C.D.N. Children's growth and socio-economic status in Hungary. *Economics and Human Biology*, 2004, vol. 2, pp. 295-320.
7. Powell L.M., Slater S., Chaloupka F.J., Harper D. Availability of Physical Activity – Related Facilities and Neighborhood Demographic and Socioeconomic Characteristics: A National Study. *American Journal of Public Health*, 2006, vol. 96(9), pp. 1676-1680.
8. Crespo C.J., Smit E., Anderson R.E., Carter-Pokras O., Ainsworth B.E. Race/ethnicity, social class and their relationship to physical activity during leisure time: results from the Third National Health and Nutrition Examination Survey, 1988-1994. *American Journal of Preventive Medicine*, 2000, vol.18, pp. 46-53.
9. Vandendriessche J.B., Vandorpe B.F., Vaeyens R., Malina R.M., Lefevre J., Lenoir M., Philippaerts R.M. Variation in sport participation, fitness and motor coordination with socioeconomic status among Flemish children. *Pediatric Exercise Science*, 2012, vol. 24(1), pp. 113-128.

10. Eiben O.G., Panto E. 1986. The Hungarian national growth standards. *Anthropological Bulletin* [Anthropologiai Kökuzlemények], 1986, vol. 30, pp. 5-23.
11. Tanner J.M. Introduction: growth in height as a mirror of the standard of living. In: J Komlos, editor. *Stature Living Standards and Economic Development*. University of Chicago Press, Chicago-London, 1994, pp. 1-6.
12. Eiben O.G. Growth and maturation problems of children and social inequality during economic liberalization in Central and Eastern Europe. In: S.S. Strickland and P. Shetty, editors. *Human Biology and Social Inequality*. Cambridge University Press, Cambridge, 1998, pp. 76-95.
13. Flegal K.M., Carroll M.D., Ogden C.L., Curtin L.R. Prevalence and trends in obesity among US adults, 1999-2008. *Journal of American Medical Association*, 2010, vol. 303, pp. 235-41.
14. Ford E.S., Merritt R.K., Heath G.W., Powell K.E., Vashburn R.A., Kriska A., Haile G. Physical Activity Behaviors in Lower and Higher Socioeconomic Status Populations. *American Journal of Epidemiology*, 1991, vol. 133(12), pp. 1246-1256.
15. Bertsias G., Linardakis M., Mammas I. Kafatos A. Fruit and vegetables consumption in relation to health and diet of medical students in Crete, Greece. *International Journal for Vitamin and Nutrition Research*, 2005, vol. 75, pp. 107-17.
16. Sidnik J., Andrijašević M., Ćurković S. Relation of students' attitude toward leisure time activities and their preferences toward sport recreational activities. *Acta Cinesiologica*, 2009, vol. 3(1), pp. 54-8.
17. Gómez-López M., Granero-Gallegos A., Baena-Extremera A., Ruiz-Juan F. The abandonment of an active lifestyle within university students: Reasons for abandonment and expectations of re-engagement. *Psychologica Belgica*, 2011, vol. 51(2), pp. 155-75.
18. Lisicki T. 2002. *General physical fitness of the first year students and their attitudes to health prophylaxis and motor activity. On the example of university students of Threecity (Gdańsk, Sopot, Gdynia)* [Ogólna sprawność fizyczna oraz postawy wobec profilaktyki zdrowotnej i aktywności ruchowej studentów I roku. Na przykładzie studentów szkół wyższych Trójmiasta]. AWFiS Press, Gdansk, 2002, 296 p.
19. Umiastowska D. *Change of model of physical education at universities in the light of researches on participation in physical education of students from Szczecin* [Zmiana modelu akademickiego wychowania fizycznego w świetle badań uczestnictwa szczecińskich studentów w kulturze fizycznej]. University of Szczecin Press, Szczecin, 2007, 272 p.
20. Podstawski R. *Physical ability and opinions on health prevention among 1st year students of the University of Warmia and Mazury in Olsztyn in academic year 1999/2000* [Sprawność fizyczna i opinie na temat profilaktyki zagrożeń dla zdrowia studentów pierwszego roku Uniwersytetu Warmińsko-Mazurskiego w Olsztynie w roku akademickim 2001/2002]. UWM Press, Olsztyn, 2006, 110 p.
21. Tamotsu Y., Yoshihide T., Minoru I. Secular trends in physique and physical fitness in Japanese students during the last 20 years. *American Journal of Human Biology*, 1989, vol. 1, pp. 581-587.
22. Negasheva M.A., Mishkova T.A. Morphofunctional Parameters and Adaptation Capabilities of Students at the Beginning of the Third Millennium. *Journal of Physiological Anthropology and Applied Human Sciences*, 2005, vol. 24(4), pp. 397-402.
23. Cuberek R., Machova I. The motor performance progression of future undergraduate students of physical education. *Acta Universitatis Polackianae Olomucensis. Gymnica*, 2009, vol. 39, pp. 15-24.
24. Cleassens A.L., Lefevre J. Secular trends in somatic and motor characteristics of physical education students. *American Journal of Human Biology*, 1992, vol. 4(3), pp. 301-11.
25. Gill M., Deol N.S., Kaur R. Comparative Study of Physical fitness components of Rural and Urban Female Students of Punjabi University, Patala. *Anthropologist*, 2010, vol. 12(1), pp. 17-21.
26. Pilicz S. *Measuring the general level of physical fitness. Studies and Monographs* [Pomiar ogólnej sprawności fizycznej. Studia i Monografie]. AWF Press, Warszawa, 1997, 123 p.
27. Szopa J., Chwała W., Ruchlewicz T. Investigations on Structure of „Energetic" Motor Abilities and Validity of Their Testing [Badania struktury zdolności motorycznych o podłożu energetycznym i trafność ich testowania]. *Journal of Kinesiology and Exercise Sciences* [Antropomotoryka], 1998, vol. 17, pp. 3-41.
28. Wolański N., Tomonari K., Januszko L., Liocheva V., Chung S., Tsushima S. Comparative study on socio-economic and biological properties of families from Bulgaria, Japan, South Korea and Poland. *Studies of Human Ecology*,1991, vol. 9, pp. 151-66.
29. Wolański N. Biological Traits of Spouses: Socio-Cultural and Economic Context in the Urban and Rural Environments. *Studies of Human Ecology*, 1992, vol. 10, pp. 323-34.
30. Wolański N., Chung S., Czarzasta T., Dickinson F., Harada S., Liocheva V., Seiva H., Tomonari K, Tsushima S. Family characteristics and offspring growth in various countries. Frequency of various family types in Bulgaria, Japan, Korea, Mexico and Poland. *Studies of Human Ecology*, 1994, vol. 11, pp. 5-11.
31. Mleczko E. Influence of Socio-economic Factors on the Differentiation of the morpho-functional and Development Level of Children and Youths of Southern Poland [Wpływ czynników społeczno-ekonomicznych na zróżnicowanie poziomu rozwoju morfo funkcjonalnego i motorycznego dzieci i młodzieży z Małopolski]. In: A Jopkiewicz, editor. *Auxology and Health Promotion* [Auksologia a Promocja Zdrowia]. KTN Press, Kielce, 2000, pp. 95-108.
32. Mleczko E. Children and Youth in South Poland – a Preliminary Report [Stopień urbanizacji a poziom rozwoju somatycznego oraz motorycznego dzieci i młodzieży z Małopolski – doniesienie wstępne]. Degree of Urbanization and Level of Somatic and Motor Development of *Journal of Kinesiology and Exercise Sciences* [Antropomotoryka], 2002, vol. 23, 53-75.
33. Jaworski J., Tchórzewski D., Bujas P. The urbanization factor as the element that differentia te the level of selected coordinative motor skills by the ex ample of results of computer tests solved by Cracow Physical Education University students [Czynnik urbanizacyjny jako element różnicujący poziom wybranych koordynacyjnych zdolności motorycznych na przykładzie wyników testów komputerowych studentów AWF w Karkowie. In: A. Jopkiewicz, editor. *Auxology and Health Promotion* [Auksologia a Promocja Zdrowia]. KTN Press, Kielce, 2010, pp. 113-121.
34. Bogin B. *Patterns of Human Growth, second ed*. Cambridge: University Press, Cambridge, 1999, 442 p.

35. Roche A.F., Sun S.S. *Human Growth: Assessment and Interpretation*. Cambridge University Press, Cambridge, 2003, 304 p.
36. Nielsen T.L., Wraae K., Brixen K., Hermann A.P., Andersen M., Hagen C. Prevalence of overweight, obesity and physical inactivity in 20- to 29-year-old, Danish men. Relation to sociodemography, physical dysfunction and low socioeconomic status: the Odense Androgen Study. *International Journal of Obesity*, 2006, vol. 30, pp. 805-815.
37. Malate L., Motlhoiwa K., Shaibu S., Wrotniak B.H., Maruapula S.D., Jackson J., Compher C. W. Body Image dissatisfaction Is Increased in Male and Overweight/Obese Adolescents in Botswana. *Journal of Obesity*, 2013, Article ID 763624, DOI: 10.1155/2013/763624 (Version on line).
38. Lobstein T., Frelut M.L. Prevalence of overweight among children in Europe. *Obesity Review*, 2003, vol. 4, pp. 195-200.
39. Ogden C.L., Carroll M.D., Curtin L.R., McDowell M.A., Tabak C.J., Flegal K.M. Prevalence of overweight and obesity in the United States, 1999-2004. *Journal of American Medical Association*, 2006, vol. 295, pp. 1549-1555.
40. Chiodera P., Volta E., Gobbi G., Milioli M.A., Mirandola P., Bonetti A., Delsignore R., Bernascomi S., Anedda A., Vitale, M. Specifically designed physical exercise programs improve children's motor abilities. *Scandinavian Journal of Medicine & Science in Sports*, 2008, vol. 18, pp. 179-87.
41. Chiolero A., Paradis G., Madeleine G., Hanley J.A., Paccaud F., Bovet P. Discordant secular trends in elevated blood pressure and obesity in children and adolescents in a rapidly developing country. *Circulation*, 2009, vol. 119(4), pp. 558-665.
42. Krombholz H. The motor and cognitive development of overweight preschool children. *Early Years*, 2012, vol. 32(1), pp. 61-70.
43. Stodden D.F., Goodway J.D., Langendorfer S.J., Roberton M.A., Rudisill M.E., Garcia C., Garcia L.E. A developmental perspective on the role of motor skill competence in physical activity: An emergent relationship. *QUEST*, 2008, vol. 60(2), pp. 290-306.
44. Gordon-Larsen P., Adair L.S., Nelson M.C., Popkin B.M. Five year obesity incidence in the transition period between adolescence and adulthood: the National Longitudinal Study of Adolescent Health. *American Journal of Clinical Nutrition*, 2004, vol. 80, pp. 569-75.
45. Douglas K.A., Collins J.L., Warren C., Kann L., Gold R., Clayton S., Ross J. G., Kolbe L. J. Results from the 1995 National College Health Risk Behavior survey. *Journal of American College Health*, 1997, vol. 46(2), pp. 55-66.
46. Bray S.R., Born H.A. 2004. Transition to university and vigorous physical activity: implications for health and psychological well-being. *Journal of American College Health*, 2004, vol. 52, pp. 181-188.
47. Gao Z., Hannon J.C., Newton M. Effect of Curricular Activity on Students' Situational Motivation and Physical Activity Levels. *Research Quarterly for Exercise and Sport*, 2011, vol. 82(3), pp. 536-44.
48. Choszcz D., Podstawski R., Konopka S. Modeling of anthropometric determinant of rowing ergometer performance on a distance of 500 meters for physically inactive males. *Journal of Physical Education and Sport*, 2012, vol. 12(3), pp. 274-83.
49. Jopkiewicz A. 1998. *Variability of men's physical fitness as well as its genetic and environmental determinants* [Zmienność sprawności fizycznej mężczyzn oraz genetyczne i środowiskowe jej uwarunkowania]. WSP Press, Kielce, 1998, 161 p.
50. Conley D., Glauber R. Gender, body mass and socioeconomic status: new evidence from the PSID. *Advances in Health Economics and Health Services Research*, 2007, vol. 17, pp. 253-75.
51. Prista A., Marques A.T., Maia J.A.R. Relationship between Physical Activity, Socioeconomic Status, and Physical Fitness of 8 – 15-Year-Old Youth from Mozambique. *American Journal of Human Biology*, 1997, vol. 9, pp. 449-57.
52. Podstawski R. The impact of selected environment al factors on the secular trends of height, weight, BMI and SI among first year male students at the university of Warmia and Mazury in Olsztyn in the years 2000-2006 [Wpływ wybranych czynników środowiskowych na kierunki trendów sekularnych wysokości, masy, BMI i SI studentów I roku studiów Uniwersytetu Warmińsko-Mazurskiego w Olsztynie w latach 2000-2006]. In: J. Tatarczuk, R. Asienkiewicz and E. Skorupka, editors., *Ontogenesis and Health Promotion in the Aspects of Medicine, Anthropology, and Physical Education* [Ontogeneza i promocja zdrowia w aspekcie medycyny, antropologii i wychowania fizycznego]. Uniwersytet Zielonogórski Press, Zielona Góra, 2011, pp. 179-94.
53. Kuskowska-Wolk A., Bergstrom R. 1993. Trends in body mass index and prevalence of obesity in Swedish men 1980-89. *Journal of Epidemiology & Community Health*, 1993, vol. 47, pp 103-108.
54. Mokdat A.H., Ford E.S., Bowman B.A., Dietz W.H., Vinicor F., Bales V.S., Marks J. S. Prevalence of obesity, diabetes, and obesity related health risk factors. *Journal of American Medical Association*, 2003, vol. 289, pp. 76-79.
55. Cairney J., Wade T.J. Correlates of body weight in the 1994 National Population Health Survey. *International Journal of Obesity and Related Metabolic Disorders*, 1998, vol. 22, pp. 584-991.
56. Mikołajczyk R.T., Maxwell A.E., Ansari W., Stock Ch., Petkevicience J., Guillen-Grima F. Relationship between perceived body weight and body mass index based on self- reported height and weight among universitv students: a cross-sectional study in seven European countries. *BMC Public Health*, 2010, vol. 10:40, DOI: 10.1186/1471-2458-10-40 (Version on line).
57. Lim L.L.Y., Seubsman S., Sleigh A. Validity of self-reported weight, height, and body mass index among university students in Thailand: Implications for population studies of obesity in developing countries. *Population Health Metrics*, 2009, vol 7, 15, doi: 10.1186/1478-7954-7-15 (Version on line).
58. Maruf F.A., Akinpelu A.O., Aronu U.O., Akinpelu A.O. Socio-Economic Differentials In Height, Weight And Body Mass Index Of School Adolescents In Nnewi, South-Eastern Nigeria. *Internet Journal of Biological Anthropology*, 2011, vol. 4:2, DOI: 10.5580/18da. (Version on line).
59. Mascie-Taylor C.G., Goto R. Human Variation and Body Mass Index; a Review of the Universality of BMI Cut-offs, Gender and Urban-rural Differences, and Secular Changes. *Journal of Physiological Anthropology and Applied Human Sciences*, 2007, vol 26, pp. 109-112.
60. Podstawski R., Denaburski J. Physical ability of the 1st year students studying at the University of Warmia and Mazury in Olsztyn in the academic year 2001/2002 [Sprawność fizyczna studentów I roku Uniwersytetu

Warmińsko-Mazurskiego w Olsztynie w roku akademickim 2001/2002]. In: T. Lisicki, B. Wilk and A. Walentukiewicz, editors. *Healthy life style. Social conditioning* [Prozdrowotny Styl Życia: Uwarunkowania Społeczne]. AWFiS Press, Gdańsk, 2005, pp. 439-46.
61. Podstawski R. Physical ability of the first year students of the University of Warmia and Mazury in Olsztyn in 2003/2004 [Sprawność fizyczna studentów I roku studiów kulturowych Uniwersytetu Warmińsko-Mazurskiego w Olsztynie w roku akademickim 2003/2004 w odniesieniu do warunków społeczno-środowiskowych]. *Physical Activity of People at Different Age* [Aktywność Ruchowa Ludzi w Różnym Wieku], 2008, vol 12, pp. 208-15.
62. Podstawski R. The level of flexibility of the first year students of the University of Warmia & Mazury in Olsztyn in 2005/2006 [Poziom zdolności gibkościowych studentów I roku Uniwersytetu Warmińsko-Mazurskiego w Olsztynie w roku akademickim 2005/2006 w odniesieniu do miejsca zamieszkania i typu ukończonej szkoły]. *Physical Activity of People at Different Age* [Aktywność Ruchowa Ludzi w Różnym Wieku], 2009a, vol. 13, pp. 422-432.
63. Podstawski R. The level of strength abilities of the first year students of the University of Warmia & Mazury in Olsztyn in 2005/2006 [Poziom zdolności siłowych wśród studentów I roku studio Uniwersytetu Warmińsko-Mazurskiego w Olsztynie w roku akademickim 2005/2006 w odniesieniu do miejsca zamieszkania I typu ukończonej szkoły]. *Physical Activity of People at Different Age* [Aktywność Ruchowa Ludzi w Różnym Wieku], 2009b, vol. 13, pp. 434-445.
64. Podstawski R. The level of endurance of the first year students studying at the University of Warmia and Mazury in Olsztyn [Poziom zdolności wytrzymałościowych studentów uniwersytetu Warmińsko-Mazurskiego w Olsztynie w odniesieniu do warunków społeczno-środowiskowych]. In: R. Muszkieta, M. Napierała, A. Skaliy and W. Żukow, editors. *Support of Human Development and Education through Tourism, Sport and Recreation* [Wspomaganie rozwoju i edukacji człowieka poprzez turystykę, sport i rekreację]. WSGwB Press, Bydgoszcz, 2009c, pp. 429-38.
65. Podstawski R. The level of speed abilities of the first year students studying at the University of Warmia and Mazury in Olsztyn in reference to environmental conditions [Poziom zdolności szybkosciowych studentów I roku studiów Uniwersytetu Warmińsko-Mazurskiego w Olsztynie w odniesieniu do warunków społeczno-środowiskowych]. In: R. Muszkieta, M. Napierała, A. Skaliy, and W. Żukow, editors. *Support of Human Development and Education through Tourism, Sport and Recreation* [Wspomaganie rozwoju i edukacji człowieka poprzez turystykę, sport i rekreację]. WSGwB Press, Bydgoszcz, 2009d, pp. 471-476.
66. Podstawski R. Direction of changes in the level of strength among 1st year female students at the University of Warmia & Mazury in Olsztyn between years 2000-2006 [Kierunki zmian w poziomie zdolności siłowych studentek I roku Uniwersytetu Warmińsko-Mazurskiego w Olsztynie w latach 2000-2006]. In: J Urniaż, editor. *Brief outline on the history of sport and physical fitness* [Szkice z historii sportu i sprawności fizycznej]. OSW Press, Olsztyn, 2009e, pp. 171-80.
67. Podstawski R, Kasietczuk B, Boraczyński T, Boraczyński M, Choszcz D. Relationship Between BMI and Endurance strength abilities Assessed by the 3 Minute Burpee Test. *International Journal of Sports Science*, 2013, vol. 3(1), pp. 28-35.
68. Raczek J. *Kinesiology. Outline of the theory of human motor* control [Antropomotoryka. Teoria motoryczności człowieka w zarysie]. PZWL Press, Warszawa, 2010, 337 p.
69. Podstawski R., Borysławski K., Choszcz D. Secular trends observed in anaerobic performance of students accounting for the place of permanent residence. *Research in Kinesiology*, 2013, vol. 41(1), pp. 4-11.
70. Wenthe P.J., Janz K.F., Levy S.M. 2009. Gender similarities and differences in factors associated with adolescent moderate-vigorous physical activity. *Pediatric Exercise Science*, 2009, vol. 21(3), pp. 291-304.
71. Morrissey J.L., Wenthe P.J., Letuchy E.M., Levy S.M., Janz K.F. Specific Types of Family Support and Adolescent Non-School Physical Activity Levels. *Pediatric Exercise Science*, 2012, vol. 24(3), pp. 333-346.

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THE EFFECT OF SLEEP DEPRIVATION ON SERUM IGG RESPONSES TO AEROBIC ACTIVITY IN COLLEGE STUDENT ATHLETES

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Annotation. *Background & Aims:* Sleep is a restorative process for the immune system. There are many situations in which sleep is disturbed prior to an athletic event. However, the effect of sleep deprivation on immune indices in response to exercise remains unknown. The aim of this study was to investigate the effects of sleep deprivation on serum IgG responses to aerobic activity. *Materials & Methods:* In this quasi-experimental study, 10 male physical education students were voluntarily participated. Study was performed in two separate occasions; control and experimental within two weeks. In the control occasion, normal sleep and aerobic activity and in the experimental occasion, sleep deprivation and aerobic activity was applied. Aerobic activity was performed on bicycle ergometer for 30 minutes at intensity of 70 to 75 percent of maximum heart rate. Changes in serum IgG concentrations in pre-test, before and after aerobic activity in both occasions were analyzed by the two repeated measures ANOVA and dependent T-test using SPSS software. *Results:* The results showed that sleep deprivation not significantly effect on Serum IgG response to aerobic activity (p=0.130). Also, aerobic activity not significantly effect on Serum IgG concentration (p=0.357). But sleep deprivation caused a significantly increase in serum IgG concentration (p=0.035). *Conclusion:* No significant effect of sleep deprivation on serum IgG concentrations response to aerobic activity.
Keywords*:* sleep, deprivation, Immune, IgG, serum, aerobic.

Introduction

Sleep loss can have profound effects not only on supports immune function but upon human performance [5, 6, 20, 22, 40]. Many studies indicate that sleep deprivation disrupts cellular immunity [3, 7, 8, 12, 14, 27, 35]. The changes in sleep time across the circadian pattern. Such as during shift work [1, 11, 28] or air travel (jet-lag syndrome resulting from changing time zones) [41]. As seen in study of Gleeson et al (2007), missing one night of sleep is not uncommon amongst athletes travelling across time zones, recreational athletes with nocturnal work habits and military personnel during training and operations [9]. Several factors such as type, duration, intensity, and program of exercise have also important effects on immune response to exercise [32]. Karacabey et al (2005) showed that aerobic exercise led to changes in immunoglobulin's associated to elevated level of cortisol hormone level [18]. Also, not only in the recent studies of human subjects didn't showed exact mechanism of affecting systemic immunity by sleep or sleep deprivation but also the exercises and Sleep deprivation related studies that have examined changes in immunoglobulin responses are in conflict. Some studies have shown decreases or no change [7, 10, 14, 23, 24, 33, 35]; some have shown increases [13, 30, 34, and 36]. Therefore, the aim of this study was determine the effect of sleep deprivation on serum IgG responses to aerobic activity in college student athletes.

Materials and Methods

Participants: The subjects were selected randomly among college student athletes who have been training aerobic activities three times a week for 90 minutes each for at least 2 years and volunteered to participate in this study. They gave written informed consent before participating in this investigation and met the following criteria: none smoking; healthy and free of active infection and symptoms; medication-free; no medical history. Descriptive characteristics of the subjects such as weight, body mass index and body fat percentage analysis by using a body composition analysis (ZEUS 9.9, making South Korea). Descriptive characteristics of the subjects are presented in Table 1.

Descriptive characteristics of the subjects

	Mean	S.D	Min	Max
Age (year)	21/60	1/07	20/00	24/00
Height (cm)	177/5	6/55	169/00	192/00
Weight (kg)	69/98	7/39	54/50	78/10
BMI (kg/m^2)	22/22	2/00	19/10	25/00
Body fat (%)	10/95	3/58	6/60	16/40

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Sleep protocol

This research was semi-experimental with two independent occasions which were as follows: the first section is control occasion and the other section is experimental occasion with two weeks interval. Protocol of control occasion have been exerted for eight hours sleeping and in protocol of experimental occasion after two weeks interval (with using games, reading, watching TV and without drinking coffee or tea) sleep deprivation have been exerted for 24-h. Furthermore, all of the athletes had been implicated than keeping regular sleep-wake schedules for at least a week period before entry into the study. Subjects in control occasion had been waked up at 07:30 $_{AM}$ on the day before and following that have been carried out (sleep at $23:30_{PM}$- $07:30_{AM}$). Aerobic test is taken at 08:00- 08:30 AM. Subjects have been waking up at 07:30 (the day before) to the end of aerobic test at 08:30. Figure 1 illustrates changing patterns of sleep time.

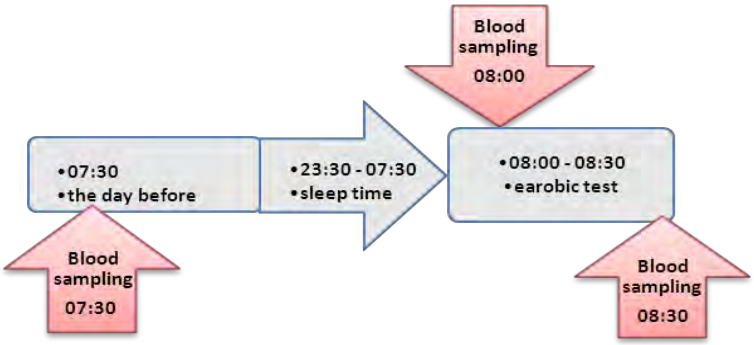

Figure 1: protocol of control occasion

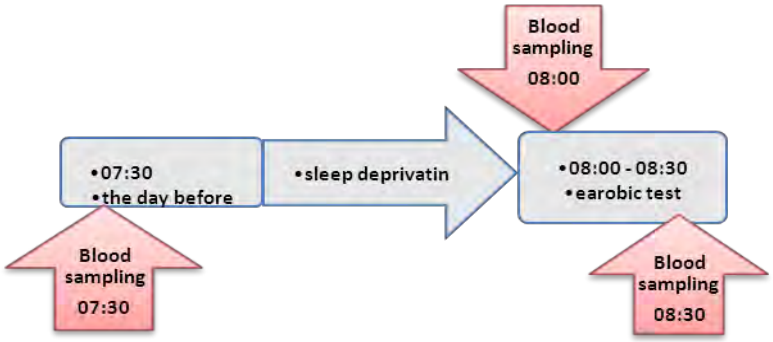

Figure 2: protocol of experimental occasion with two weeks interval

Subjects have received same recipe and they were deprived from napping, used drug and any heavy activities at three days ego. As well as, in the experimental occasion the athletes had been deprived of eat and drink since $24:00_{pm}$ forward.

Aerobic activity: aerobic activity was performed on bicycle ergometer (Monark E839 made in Sweden) for 30 minutes. In this case, the subjects first 10 minutes as a warm-up began with 70 watts and 20 minutes with a steady heart rate of 70 to 75 percent of maximum heart rate rode. Speed of 60 rpm was riding across activities. In end three minutes of warm-up occasion, power added until final minute at the end of the stage to warm up, the heart rate reached 70 to 75 percent of maximum heart rate.

Blood sampling

The blood samples have been collected for three times: a) Pre-test at $08:00_{AM}$ (on the day before), this section of blood sampling were carried out in both of occasions (control and experimental), b) After sleep (control occasion) and sleep deprivation (experimental occasion) at $08:00_{AM}$, c) After aerobic test (Post-test) at $08:30_{AM}$ (in both of occasions). Thus, in this study, blood samples were measured in both of the control occasion and the experimental occasion for six times. Whole blood samples were collected by venepuncture from an antecubital vein (5 ml). Blood samples were placed at room temperature (-70) for 30 minutes to be completely clotted and centrifuged to separate serum. Serum IgG level were measured by using nephelometry which is based on the light scattering properties of antigen-antibody complexes in solution and were used Minineph^{TM} Human IgG Kit.

Statistical analyses

Descriptive statistics were used to calculate the mean and standard deviation. The average and standard deviation of data were calculated after checking the data distribution normalcy using Kolmogorov-Smirnov test and two factors of variance analyses method and then examined by repeated measures. As well as, changes in serum IgG concentration in pre-test and post-test were analyzed by dependent t-test using SPSS 18 software at a levels significantly lower than 0.05 *(P*<0.05) was considered.

Results

The results showed that there has not been a meaningful change in IgG levels of athletes during the control occasion. Therefore, aerobic activity not significantly effect on Serum IgG concentration (p=0.357) in Table 2.

Table 2

Serum IgG concentration (g/l) in pre-test and post-test (control occasion)

08:00 (pre-test)	08:30 (post-test)	T	P[1]
12.08±2.61	12.55±1.76	-0.970	0.357

1-The mean difference is significant at the P<0.05 level

According to table 3, 24-h sleep deprivation has been a meaningful change in IgG levels of subjects during the experimental occasion. Therefore, aerobic activity had a significant impact on Serum IgG concentration (p=0.035).

Table 3

Serum IgG concentration (g/l) in pre-test and post-test (experimental occasion)

08:00 (pre-test)	08:30 (post-test)	T	P[1]
12.05±2.09	13.57±3.23	-2.476	0.035*

Table 4 and 5 depict there has not been a meaningful change among the effect of sleep deprivation on serum IgG levels responses to aerobic activity in athletes during both of the occasions (control and experimental).

Table 4

Concentrations of serum IgG (l/g) at the pre and post test in both of occasions

	Pre-test	**Post-test**
Sleep	11.60±2.**174**	10.80±1.**557**
Sleep deprivation	12.60±2.**481**	08.8**5**±1.**904**

Table 5

Two factors of variance analyses and repeated measure

	F	**P**
Sleep	0.986	0.746
Sleep deprivation	5.364	0.045
Sleep × aerobic activity	2.772	0.130

Discussion

In this study was observed 30 minutes sub maximal aerobic exercise on a bicycle ergometer no significantly effect on serum IgG concentration. Generally in exercise immunology, a raise in immunoglobulin level has usually been interpreted to represent increased immunity, and a decrease is usually explained as immunosuppression (Mackinnon, 1999) [25]. In this case, Poortmans (1979) found a significant 12% increase in serum IgG immediately after a progressive cycle ergometer test to fatigue (mean duration 21 minutes) [37]. These results are inconsistent with the findings of this study that may it was been because of performance style, time during or intensity. Nieman and Nehlsen-Cannarella (1991) found that IgG decreased during recovery after a three hour run at marathon, reaching its lowest point at one and half hours (27.6 percent) and increasing to baseline concentration 21 hours after exercise [34], Poortmans and Haralambie (1979) reported a significant 7% increase in IgG immediately after a 100 km race. In contrast with, Israel et al. (1982) reported that 25 hours after a 75 km run at high intensity, IgG was decreased by 22%. Exercise induced decreases in IgG have been reported [16]. Mashiko et al. (2004) found a significant decrease in IgG (28%) after a 20 day rugby exercise, exercise six days a week with 2 hours a day [26]. Results of this study, however, is approximately consistent with the research of Karacabey et al (2005) that suggesting the no significantly change in the level of serum IgG concentration after aerobic exercise [18]. As an example, Subjects in the Ganga study were marathon runners, their mean activity duration was 2.7 hour but activity duration in the present study was 30 minutes. As well as, intensity of activity in Ganga study was maximal but intensity of activity in the present study was sub maximal (70 to 75 percent of maximum heart rate) [10]. Aerobic activity in Karacabey study was 30 minutes running on treadmill with intensity 60 to 70 percent of maximal oxygen uptake that is very similar to the present study in terms of intensity and duration [18]. Factors like type, duration, intensity, and program of the exercise and the use of different subjects, various complex mechanisms including hormonal, metabolic and psychoneural stress are also known to have effects on the immune system and discrepancy between this study and other studies[32]. According to the conducted studies, it has been determined that body activities are one of the effective factors in changing of immune system process, which depends on the intensity, time, training plan, and body athleticism. This study concludes that sub maximal aerobic activity does not affect on serum IgG concentration. The findings in this study also indicated that sleep deprivation have affected on serum IgG concentration while none affect on serum IgG responds to aerobic activity at least in same intensity that we employed. The data deriving from the human studies are inconsistent or contradictory [7, 17]. While it is evident that sleep loss exerts an influence on the immune system [2], it remains unclear whether the influence is beneficial or detrimental. The present studies also show that sleep loss influences the measure of cellular

immunity and B-cell immunity and alters the nocturnal secretion of the proinflammatory cytokines such as IL-6 [38, 15]. IgG, IgA and IgM concentrations were found to increase after 24-hour wakefulness [13], Boyum et al showed that sleep deprivation decreased the level of human immunoglobulins [4]. We didn't find any study that had been surveyed the effect of sleep deprivation on serum IgG responses to exercise and we hadn't resources for comparing this study with those as well. However, we concluded that sleep deprivation on serum IgG didn't respond to aerobic activity, although probable mechanism the effect of sleep deprivation on immunoglobulins to aerobic activity is still unclear. We also concluded that Sleep deprivation increase IgG concentration at 70-75 % HR_{max}.

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References

1. Akerstedt T. *Shift work and disturbed sleep/wakefulness*. Sleep Med Rev. 1998, vol 2, pp.117–128.
2. Bentivoglio M., Kristensson K. Neural–immune interactions in disorders of sleep-wakefulness organization. *Trends Neurosci*. 2007, vol 30, pp. 645–52.
3. Born J., Lange T., Hansen K., Mölle M., Fehm H.L. Effects of sleep and circadian rhythm on human circulating immune cells. *Journal of Immunology*. 1997, vol.158, pp. 4454-4464.
4. Boyum A., Wiik P., Gustavsson E., Veiby O. P., Reseland J., Haugen A. H., Opstad P. K. The effect of strenuous exercise, calorie deficiency and sleep deprivation on white blood cells, plasma immunoglobulins and cytokines. *Scandinavian Journal of Immunology*. 1996, vol.43, pp. 228–235.
5. Bryant P.A., Trinder J., Curtis N. Sick and tired: Does sleep have a vital role in the immune system? *Nature Reviews Immunology*. 2004, vol.4, pp. 457-467.
6. Cohen S., Doyle W.J., Alper C.M., Janicki-Deverts D., Turner R.B. Sleep habits and susceptibility to the common cold. *Archives of Internal Medicine*. 2009, vol.169, pp. 62-67.
7. Dinges D.F., Douglas S.D., Hamarman S., Zaugg L., Kapoor S. Sleep deprivation and human immune function. *Advances in Neuroimmunology*. 1995, vol.5, pp. 97-110.
8. Fondell E., Axelsson J., Franck K., Ploner A., Lekander M. Short natural sleep is associated with higher T cell and lower NK cell activities. *Brain Behavior and Immunity*. 2011, vol.25, pp. 1367-75.
9. Gleeson M. Immune functions in sport and exercise. *Journal of Applied Physiology*. 2007, vol.10, pp. 693–699.
10. Gunga H.C., Machotta A., Schobersberger W., Mittermayr M., Kirsch K., Koralewski E. Neopterin, IgG, IgA, IgM, and Plasma Volume Changes During Long-distance Running**.** *Pteridines*. 2002, vol.13, pp. 13-20.
11. Harma M., Hakola T., Kandolin I., Sallinen M., Virkkala J., Bonnefond A. A controlled intervention study on the effects of a very rapidly forward rotating shift system on sleep– wakefulness and well-being among young and elderly shift workers. *International Journal of Psychophysiology*. 2006, vol.59, pp. 70–79.
12. Heiser P., Dickhaus B., Schreiber W., Clement H.W., Hasse C. White blood cells and cortisol after sleep deprivation and recovery sleep in humans. *European Archives of Psychiatry and Clinical Neuroscience*. 2000, vol.25, pp. 16-23.
13. Hui L., Hua F., Diandong H., Hong Y. Effects of sleep and sleep deprivation on immunoglobulins and complement in humans. *Brain Behavior and Immunity*. 2007, vol.21, pp. 308–310.
14. Irwin M., McClintick J., Costlow C., Fortner M., White J. Partial night sleep deprivation reduces natural killer and cellular immune responses in humans. *FASEB Journal.* 1996, vol.10, pp. 643-653.
15. Irwin M. Immune correlates of depression. *Advances in Experimental Medicine and Biology*. 1999, vol.46, pp. 1–24.
16. Israel S., Buhl B., Neumann G. Die konzentration der immunoglobulin A, G und M im serum bei trainierten und untrainierten sowie nach verschiedenen sportlicken ausdauerleistungen. *Sports Medicine (Berlin).* 1982, vol.22, pp. 225–231.
17. Jurkowski M.K., Bobek-Billewicz B. Influence of sleep deprivation on immunity. *Studies in Ethnicity and Nationalism*. 2002, vol.2, pp. 95–98.
18. Karacabey K., Peker I., Saygm O., Ciloglu F., Ozmerdivenli R., Bulut V. Effects of Acute Aerobic and Anaerobic Exercise on Humoral Immune Factors in Elite Athletes. *Biotechnology & Biotechnological Equipment*. 2005, vol.19, pp. 175-180.
19. Karacabey K., Saygin O., Ozmerdivenli R., Zorba E., Godekmerdan A., Bulut V. The effects of exercise on the immune system and stress hormones in sportwomen. *Neuroendocrinology Letters*. 2005, vol.26, pp. 361-366.
20. Killgore W.D., Killgore D.B., Day L.M. The effects of 53 hours of sleep deprivation on moral judgment. *Sleep*. 2007, vol.30, pp. 345-352.
21. Kwarecki K., Zużewicz K. Patterns of sleep and locomotor activity in shift workers with special reference to night shift. *Medycyna pracy*. 2002, vol.53, pp. 79–84.
22. Lim J., Dinges D.F. Sleep deprivation and vigilant attention. *Annals of the New York Academy of Sciences.* 2008, vol.29, pp. 305-322.
23. Mackinnon L.T., Hooper S.L. Mucosal (secretory) immune system responses to exercise of varying intensity and during overtraining. *International Journal of Sports Medicine*. 1994, vol.15, pp. 179–183.

24. Mashiko T., Umeda T., Nakaji S. Effects of exercise on the physical condition of college rugby players during summer training camp. *British Journal of Sports Medicine.* 2004, vol.38, pp. 186–190.
25. Mackinnon L.T. Immunoglobulin, antibody, and exercise. *Exercise Immunology Review.* 1996; vol.35, pp. 21–35.
26. Mashiko T., Umeda T., Nakaji S. Effects of exercise on the physical condition of college rugby players during summer exercise camp. *British Journal of Sports Medicine.* 2004, vol.38, pp. 186–190.
27. Moldofsky H, Lue FA, Davidson JR, Gorczynski R. Effects of sleep deprivation on human immune functions. *FASEB Journal*. 1989, vol.3, pp. 1972-1977.
28. Monk T.H., Welsh D.K. The role of chronobiology in sleep disorders medicine. *Sleep Medicine Reviews.* 2003, vol.7, pp. 455–473.
29. Mullington J.M., Simpson N.S., Meier-Ewert H.K., Haack M. Sleep loss and inflammation. *Best Practice & Research Clinical Endocrinology & Metabolism*. 2010, vol.24, pp. 775-784.
30. Nehlsen-Cannarella S.L., Nieman D.C., Jessen J. The effects of acute moderate exercise on lymphocyte function and serum immunoglobulin levels. *International Journal of Sports Medicine*. 1991, vol.12, pp. 391–398.
31. Gunga H-C., Machotta A., Schobersberger W. Neopterin, IgG, IgA, IgM, and Plasma Volume Changes During Long-distance Running. *Pteridines*. 2002, vol.13, pp.13-20. doi:10.1515/pteridines.2002.13.1.15
32. Nieman D., Miller A., Henson D., Warren B., Gusewitch G., Johnson R. Effects of high- vs moderateintensity exercise on natural killer cell activity. *Medicine & Science in Sports & Exercise*. 1993, vol.25, pp. 1126–1134.
33. Nieman D.C., Tan S.A., Lee J.W. Complement and immunoglobulin levels in athletes and sedentary controls. *International Journal of Sports Medicine.* 1989, vol.10, pp. 124–128.
34. Nieman D.C., Nehlsen-Cannarella S.L. The effects of acute and chronic exercise and immunoglobulins. *Sports Medicine.* 1991, vol.11, pp. 183–201.
35. Oztürk L., Pelin Z., Karadeniz D., Kaynak H., Cakar L. Effects of 48 hours sleep deprivation on human immune profile. *Sleep Research,* 1999, vol.2, pp. 107-111.
36. Petibois C., Cazorla G., Deleris G. The biological and metabolic adaptations to 12 months training in elite rowers. *International Journal of Sports Medicine.* 2003, vol.24, pp. 36–42.
37. Poortmans J., Haralambie G. Biochemical changes in a 100 km run: proteins in serum and urine. *European Journal of Physiology*, 1979, vol.40, pp. 245–254.
38. Renwine L., Hauger R.L., Gilln J.C., Irwin M. Effects of sleep and sleep deprivation on interleukin-6, growth hormone, cortisol, and melatonin levels in humans. *Journal of Clinical Endocrinology & Metabolism.* 2000, vol.85, pp. 3597–3603.
39. Ruiz F.S., Andersen M.L., Martins R.C., Zager A., Lopes J.D., Tufik S. Immune alterations after selective rapid eye movement or total sleep deprivation in healthy male volunteers. *Innate Immunity.* 2012, vol.18, pp. 44-54.
40. Taheri M., Arabamery M. The effect of sleep deprivation on choice reaction time and anaerobic power of college student athletes. *Asian Journal of Sports Medicine*, 2012, vol.3, pp. 15-20.
41. Tamagawa R., Lobb B., Booth R. Tolerance of shift work. *Applied Ergonomics.* 2007, vol.38, pp. 635–642.

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