ISSN 2308-7269

PEDAGOGICS
PSYCHOLOGY

Medical-Biological
Problems of Physical
Training and Sports
№03/2015

PEDAGOGICS, PSYCHOLOGY, MEDICAL-BIOLOGICAL PROBLEMS OF PHYSICAL TRAINING AND SPORTS

2015
03

Key title: Pedagogika, psihologia ta mediko-biologicni problemi fizicnogo vihovanna i sportu
Abbreviated key title: Pedagog. psihol. med.-biol. probl. fiz. vihov. sportu
ISSN 1818-9172 (Russian ed. Print), ISSN 1818-9210 (Russian ed. online).

Key title: Pedagogics, psychology, medical-biological problems of physical training and sports
Abbreviated key title: Pedagog. psychol. med.-biol. probl. phys. train. sports
ISSN 2308-7269 (English ed. online)
Founders: Kharkov National Pedagogical University.

Journal is ratified the Higher Attestation Commission of Ukraine: 1-05/3 from 08.07.2009 (physical education and sport); Ministry of Education and Science of Ukraine 6.11.2014 N1279 (pedagogical sciences)

Journal is reflected in databases:
Academic Journals Database
http://journaldatabase.org
AcademicKeys
http://socialsciences.academickeys.com/jour_main.php
BASE (Bielefeld Academic Search Engine)
http://www.base-search.net
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V.I.Vernadskiy National Library of Ukraine
http://nbuv.gov.ua
Electronic Library of Russia
http://elibrary.ru

Certificate to registration:
KB 20683-10483PR. 31.03.2014.
Frequency - 1 number in a month.
Address of editorial office:
Box 11135, Kharkov-68, 61068, Ukraine,
Tel. 38-057-755-73-58
http://www.sportpedagogy.org.ua
e-mail: sportart@gmail.com

Address of editorial office (Poland):
Sport str. 2, of.209, 85-064 Bydgoszcz, Poland
Editor-in-Chief: Sergii Iermakov, tel.: +48886680976
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CONTENTS

ACMEOLOGICAL APPROACH TO PHYSICAL EDUCATION OF STUDENTS OF SECONDARY SCHOOLS IN THE ASPECT OF PERSONALITY-ORIENTED TRAINING

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Annotation. *Purpose*: to identify the main ways to use acmeological approach to physical education students of secondary schools. *Material*: government documents, questionnaire, research scientists, monitoring the activities of teachers-practitioners. *Results*: identified actual problems of physical education of students. Theoretical aspects and conditions of implementation in a real learning process acmeological approach. The problems of setting goals and objectives to students considering acmeological approach. The approach includes the selection of a modern sports education content. Also, forms, methods and teaching aids that optimize the learning activities of each student. Proposes a system of evaluation of students' achievements based on acmeological approach. Examines the role of physical education of teachers to introduce acmeological approach in the learning process. *Conclusions*: the main aspects of acmeological approach to the organization of educational process on physical training. It is proposed to develop the content of sports education based on general didactic approaches. Approach that includes four components of social experience. The components of the educational process technology for physical culture. It is proposed to modernize the methods, forms and means of improving the system of assessing students' achievements in an integrated manner.
Keywords: acmeological approach, personal, training, educational process, evaluation.

Introduction

Health condition of pupils of comprehensive educational establishments has been troubling both specialists (pedagogues, medical doctors) and parents for several decades. One of reasons of pupils health' low level are significant disadvantages in organization of pupils' physical education, which is pointed at some "average level" pupil. This problem was elucidated for many times both in governmental documents (Law of Ukraine "On physical culture and sports", Law of Ukraine "On comprehensive secondary education". Conception of physical education in Ukrainian system of education, "Criteria of evaluation of pupils' progress in system of comprehensive secondary education", National doctrine of development of education, National doctrine of development of physical culture and sports, On reformation of physical education of pupils and students in Ukrainian educational establishments) and in scientific works [4, 5, 7, 8, 9, 10, 11]. In organization of different forms of physical education personality's features of every pupil, his (her) physical and mental condition, level of physical fitness, demands and bents to some kind of physical activity are not considered. Acmeological approach to organization of teaching envisages exactly determination of personality's bents and abilities of every pupil, examination of optimal level of physical and technical fitness. Acme envisages not just achievement of of maximal result among peers, but the highest personal result.

Acme theory of personality's functioning and development as a subject of functioning was worked out by a number of outstanding scientists both psychologists and pedagogues (K. Abulkhanova-Skavska [1], B. Ananyev [2], A. Asmolov [3], I. Bekh [6], L. Vygotskiy [12], O. Dusavitsky [13], I. Kon [17], O. Leontyev [21], A. Markova [22], A. Maslow [23] et al.

Recent decades acmeological approach has been widely propagating in training of students, teachers of different subjects during retraining, in sphere of preparation of administrators. Such approach nearly was not used in organization of educational process in comprehensive educational establishments. And if a number of academic subjects with main purpose – giving scientific knowledge to disciples (mathematics, physic, chemistry and etc.) we can notice such attempts, than in school physical education there is quite a little of such examples and they are fragmentary, if any.

The above mentioned conditioned the subject of our research. З

ДThe research was fulfilled in compliance with plan of scientific-research works of Municipal establishment "Kharkive humanitarian-pedagogic academy", of Kharkivska regional council for 2014-2015 academic year.

Purpose, tasks of the work, materials and methods

The purpose of the work is theoretical foundation of acmeological approaches to organization of physical education of

The object of the research is physical education of comprehensive educational establishments' pupils, while the subject of the research is theoretical principles of implementation of acmeological approaches to organization of pupils' physical education. The purpose conditioned the tasks of the research:

1. Determination of main functions of pupils' physical education (pupils of 1st, 2nd and 3rd grade).
2. Foundation of components of physical culture's content on the base of general-didactic approaches.
3. Determination methods, forms and means of teaching components, oriented on optimization of educational process.
4. Working out of components of physical and technical fitness's complex evaluation (pupils of 1st-3rd grades).

Analysis of governmental documents [18, 28, 29], scientific works and experience of pedagogues-practitioners [4, 5, 16, 31] witnesses that introduction of acmeological approach in physical education of

doi: 10.15561/18189172.2015.0301

comprehensive educational establishments' pupils has not been practically researched. For researching of this problem we used the following methods: theoretical analysis of literature sources, questioning of pedagogues, observations, mathematical statistic.

Results of the research

Conception of our research implies determination of components of acmeological approach to organization of pupils' physical education as a condition of achievement optimal intellectual, technical and physical fitness by every of them.

Main idea of the conception: physical education, as a process, shall be oriented on pupil's personality, his (her) acme, his (her) accepting as the highest value in society; provisioning of conditions for pupils' self-realization in educational process, their self-development, achievement of highest personal results in educational activity.

Analysis of acmeological psychological-pedagogic researches and educational practice permits to make conclusion: acmeological approach conditions new prospects of humanization and democratization of comprehensive secondary education, facilitates creation of new physical education's system, oriented on personality. General conception has two leading concepts: theoretical and technological.

Theoretical concept determines system of ideas, conceptions, main categories, definitions, without which understanding of the researched problem is impossible. It consists of the following:

- Scientific-theoretical foundation of physical education's content in comprehensive educational establishments and its main components;
- Organization of educational process in comprehensive educational establishments shall ensure personality oriented teaching;
- Integration of different forms of physical education (in school day, in out-of-class physical culture and sport measures and so on) shall increase level of pupils' progress;
- Monitoring of quality of intellectual, technical and physical training, pointed at formation of firm acmeological ideas in respect to self-education, self-development, self-perfection and etc.

Technological concept implies working out of content of teaching-educational process's technology (forms, methods and means) on basis of personality oriented approach.

General hypothesis of the research is that level of pupils' learning functioning, their physical fitness and, as a result, physical condition can be substantially improved, if to realize acmeological ideas of acme's achievement in pedagogic process, as well as intellectual and physical development of pupil's personality, formation of conscious functioning in mastering of content of physical culture.

General hypothesis was specified in partial assumption that in the course of learning in comprehensive educational establishment acmeological approach is realized, ensuring gradual character of it by stages of learning, realization of various physical education's functions for pupils of 1^{st}- 4^{th}, 5^{th}-9^{th}, 10^{th}-11^{th} forms; transition from monitoring of physical education's quality to self-monitoring of own achievements in the process of learning.

The subject of acmeology is laws of human development and self-development, development of creative readiness for future professional functioning. The sources of pedagogic acmeology are works by N.V. Kuzmina [19, 27] and successors of her scientific school.

L.S. Rybalko З теоретичних позицій Л. С. Рибалко [30] regards "Acme" from theoretical position as phenomenon of human nature, peak of maturity, multi-dimension characteristic of personality's state, process of achievement of the highest indicators in personal-social development, in creativity. Realization of acme's achievement facilitates understanding of purpose of self-realization by a personality, the main demand of whom is achievement of acme. Acmeological principles of personality's self-realization include also acmeologcal ideas of development, videlicet: "Self – conception" (self-cognition, self-perception, reflection, self-identification, self-determination,, self-restriction and so on); transformation of potentials into actual ones that requires actualization of human essential forces (opening, revelation of essential forces, self-prediction); achievement of optimum (state of self-provisioning, self-organization, self-control); quality of self-perfection at level of self training, self correction, self-regulation, self-estimation, self-development.

Specificities of acmeological approach's implementation in learning process can include a number of stages:

1. Diagnostic: observation over pupil's learning functioning, over positive or negative changes in control and evaluation of achievements; transition from external control and estima6tion to self estimation.
2. Motivation-stimulation: observation and stimulation of development of pupils' inner motivation and value orientations, pointed at opening and realization of own potential in process of physical education and achievement of own acme.
3. Information-control: collection and analysis of information about reasons of pupils' insufficient usage of own potentials.
4. Prognostication: observation over process of transformation of pupils' essential potentials into actual ones; transition from actualization to self-prognostication.
5. Projecting: observation and correction of pupils projecting functioning; transition from projecting and planning to self-realization of own programs of physical development and self-perfection.

The mentioned above stages are to be realized at different periods but they have certain specificities, considering functions of every learning stage and content of physical education.

Main directions of acmeological approach's realization can include: 1) motivation – value; 2) content-procedural; 3) reflexive – corrective.

In compliance with general didactic approaches to definition of learning functions of primary, secondary and higher schools and theoretical works in field of physical culture we specified the following main functions of physical culture at school:

1 stage (1-4 forms): introduction of pupils in world of physical culture; formation of "school of movements"; development of motion abilities according to sensitive periods;

2 stage (5-9 forms): active development of main motion skills; diagnostic-projecting, which stipulates determination of pupils' physical potentials and projecting of their further physical culture-sport functioning;

3 stage (10-11 forms): further increase of pupils' physical fitness level on the base of motion skills' development; formation of skills in making individual physical development and perfection programs.

According to mentioned above functions it is necessary to specify main targets and tasks for every form, considering qualitative invariant and variable components of academic program. Characteristic feature of acmeological approach shall be teacher's ability to specify educational, health related, developing and educational tasks in organization of learning process.

Organizational-pedagogic basis of physical education in secondary comprehensive school is discipline "Physical culture". Content of this subject is determined by curriculum, which shall be based on principles of prognostic pedagogic that is stressed by "Conception of physical education" in educational system of Ukraine (5), and consider gender and age characteristics of a pupil.

At present stage of development of school main target of its functioning is pupils' socialization. It implies pupils' mastering of social experience in field of physical culture. But authors of previous programs used only basic scope of physical culture knowledge and practical skills.

The problem of scientific foundation of content of learning as a didactic category was studied by some foreign authors [32, 33], but they did not define any specific components. Modern scientific-theoretical approaches to projecting of physical culture content in works of domestic scientists stipulate four components [20]: knowledge (about nature, society, human being in social and biological aspects); means of intellectual and practical functioning (social relations and etc.); experience of creative usage of functioning means in new, non traditional conditions; experience of emotional-value attitude to mastered material, to learning process, to understanding of world that permits to determine place and role by every pupil in own life activity and, as a result, to have steady world vision.

Main form of realization of physical education's content is physical culture lesson.

For implementation of acmeological approach lessons shall ensure certain level of pupils' competence in field of physical culture, which are conditioned by "State standards" [31]. Main characteristics of modern lesson are the following:

1) Pedagogically grounded strategy and tactic of learning0educational process by teacher;
2) Purposeful, tensed, but feasible, well-organized and efficient learning functioning of pupils;
3) Scientifically grounded selection and rational usage of learned material, methods and forms of organization of pupils' learning functioning;
4) Differential and individual approach to organization of pupils' learning functioning;
5) Comprehensive and objective character, safety of control and correction of pupils' achievements;
6) Creative "teacher-pupils" interaction, which is expressed in understanding of learning purposes, high workability, democratic relations, individual responsibility for learning results;
7) Proper material-technical base of learning process.

Besides lesson, system of school physical education stipulates usage of different forms of physical training (health related, training and sports) for ensuring optimal motion regime. Main criterion of these forms' implementation is provisioning of motion regime of scope 8-12 hours a week, application of various health related, physical culture and sport-mass measures, considering demands and bents of every pupil.

Important health related form of physical culture is training of special health group's pupils. Functioning of these groups is realized by special program, which is single for all schools, but acmeological approach envisages individual choice of means, methods and forms, considering diagnosis, sex and physical condition.

KBasing on general didactic approaches to classification of learning methods we specify three groups of methods: organization and realization of learning-cognitive functioning; stimulation and motivation; control and self-control. The first group includes: perception methods (perception, direct reflection of reality by sense perception); methods of giving and perceiving of information with the help of senses; verbal; visual; practical; logical (inductive, deductive, analogies and so on); Gnostic (organization and realization of mental functioning); problem, researching; reproductive; self-control of learning functioning.

Simulation and motivation methods include: methods of formation of interest to learning and feeling of duty and responsibility in learning process. Among methods of control and self-control we mark out different variant of oral, written and computer control of knowledge, tests, determination of motion skills' level with different tests and so on.

Regarding nomenclature of organizational forms of learning functioning, their properties and content we shall render own approaches to solution of this problem. In our opinion main organizational forms of pupils' functioning at physical culture lessons shall include: frontal (or total, for all pupils), group, pairs, individual, circular.

For realization of acmeological approach teacher shall deeply know not only forms of organization of pupils' learning functioning but carefully select individually physical load, considering different levels of physical fitness.

Normative provisioning of pupils' physical education is regulated by system of learning and control tests, which are criteria of learning process's quality and effectiveness. The task is evaluation of pupils' progress in compliance with requirements of "State standards of secondary education", level of pupils' competence at every step of learning

In order to ensure effective criteria of quality of pupils' progress and objectiveness of evaluation we use 12-points scale, built with consideration of increase of personal pupil's achievements.

Evaluation system includes [16]: primary evaluation (diagnostic) – determination of actual pupil's condition; current evaluation – actualization of existing achievements of pupils; topical evaluation; summarizing evaluation (at the end of semester or academic year).

When evaluating motion skills we distinguish stages of their understanding and fulfillment of movements (correct, with negligible mistakes, which do not break movement's structure,; with rough mistakes, which break rational technique and structure of movement; very rough mistakes, which significantly break structure of movement or its elements).

Determination of pupils' competence implies evaluation of theoretical knowledge, fulfillment of certain physical exercises, separate actions, combinations and etc.

Consideration of evaluation criteria is rather important. Depending on pupil's competence we distinguish four levels of learning achievements: low, meddle, sufficient and high. Evaluation plays important psychological function in solution of motivation stimulation tasks. That is why, besides quantitative indicators teacher shall evaluate theoretical knowledge, technical skills and system of every pupil's attitude to trainings.

Quality of acmeological approach's realization depends on teachers' readiness for implementation of new technologies. For determination of teacher's professional fitness we carried out appropriate research in 2013-2014. During retraining courses for physical culture teachers of Kharkivska region we analyzed theoretical level of pedagogues in didactic principles of teaching and implementation of innovations. Teachers answered the following questions: 1) physical culture's teaching as didactic system; 2) theoretical principles of modern physical culture of comprehensive educational establishments' pupils; 3) physical education of pupils as pedagogic system; 4) principles of purpose formation in modern system of school physical culture; 5) projecting of physical culture content as didactic problem; 6) modern approaches to selection and usage of teaching methods at physical culture lessons; 7) choice of optimal organization forms and means for physical culture lessons; 8) classification of physical culture lessons and choice of optimal structure of it; 9) evaluation system for pupils' achievements at physical culture lessons; 10) modern approaches to analysis of learning-educational process in physical culture; 11) modern innovative approaches to organization of learning-educational process at physical culture lessons; For determination of influence of teacher's experience on quality of theoretical knowledge we compared indicators of pedagogues with different periods of working: 1-5, 5-10, 11-15, 16-20, 21-25, more than 25 years. Indicators of theoretical knowledge are given in table 1. In every column we show percentage of correct answers to certain question.

Table 1.

Indicators of theoretical knowledge

Question	1-5/15 persons	6-10/ 18 persons	11-15/ 22 persons	16-20/18 persons	21-25/16 persons	More than 25/ 12 persons
1	12	35	38	40	27	18
2	15	33	35	33	25	15
3	16	29	28	30	20	14
4	10	25	25	22	18	11
5	8	33	26	18	24	17
6	13	24	24	24	18	15
7	15	18	19	25	21	12
8	17	32	29	30	23	17
9	11	25	28	30	22	18

Question	1-5/15 persons	6-10/ 18 persons	11-15/ 22 persons	16-20/18 persons	21-25/16 persons	More than 25/ 12 persons
10	13	22	25	27	20	16
11	8	15	17	18	16	10
Mean indicator	12.545	26.455	26.728	27.000	21.272	14.181

Basing on received indicators we can show certain trend of theoretical level of physical culture teachers, depending on period of work (see fig.1). Theoretical level of many teachers is satisfactory. Only among teachers with period of work of 1-5 years theoretical level in unsatisfactory as well as among teachers, who work more than 25 years. In first case certain claims can be set to higher educational establishments, which train future teachers; in second case we can say about inability to accept innovations. Рівень теоретичних багатьох учителів фізичної культури носить задовільний характер.

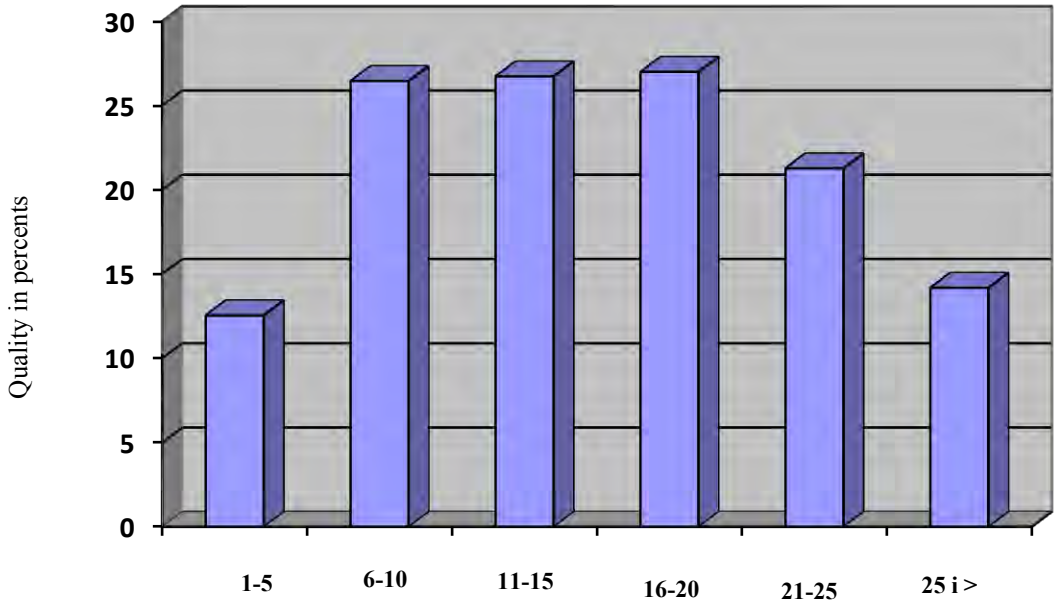

Fig.1. Level of theoretical fitness of physical culture teachers, depending on period of work.

Conclusions:

In our theoretical research we determined main aspects of acmeological approach to organization of physical culture training process at comprehensive educational establishments. We offered to work out content of physical education on the base of general didactic approaches, which include four component of social experience. We worked out technologies of learning process in physical culture and offer to upgrade methods, forms and means of training, to improve system of evaluation of pupils' progress on the base of complex approach. We determined that period of teacher's practical work influences on wish to implement innovative approaches.

The prospects of further researches imply analyzing of bents and demands of pupils of different grades in respect to kind of physical culture functioning. On the base of such researches it would be possible to upgrade content of physical education and specify learning material for every form in state programs on physical culture.

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Cite this article as: Vas'kov Y.V. Acmeological approach to physical education of students of secondary schools in the aspect of personality-oriented training. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2015, no.3, pp. 3-9. http://dx.doi.org/10.15561/18189172.2015.0301

The electronic version of this article is the complete one and can be found online at: http://www.sportpedagogy.org.ua/html/arhive-e.html

Received: 16.01.2015
Accepted: 16.02.2015; Published: 23.02.2015

ASSESSMENT OF FUNCTIONAL STATUS AND QUALITY OF LIFE OF STUDENTS AFTER ACUTE RESPIRATORY VIRAL DISEASES

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Annotation. *Purpose*: explore the functional status and quality of life of students after acute viral infectious diseases. *Material*: a total of 25 students aged 19-22 years after the acute respiratory viral infections and 20 healthy people. *Results*: It was found that the students observed a significant increase in heart rate at rest compared with healthy. Also deteriorates the functional state of the respiratory system. Overall performance of such students 60-80% lower than in healthy persons. Students after acute respiratory viral infections found increased tone autonomic nervous system. This impairs their function. *Conclusions*: after acute respiratory viral diseases in students the deterioration of the functional state. Significant deterioration in the quality of life of students is associated with reduced physical and social activity, peaking emotional problems.
Keywords: functional, state, students, quality, life, respiratory, diseases.

Introduction

Every year more than 90% of people catch cold. Every year from 9 to 16 million of people catch flu or other acute virus respiratory infections (AVRI) that is 25-30% from all morbidity and about 80-90%from infectious morbidity in Ukraine [http://www.umj.com.ua/article/8047/principi-diagnostiki-ta-likuvannya-xvorix-na-gostri-respiratorni-virusni-zaxvoryuvannya]. Prevalence of these diseases on the earth, covering of great number of people by epidemic process (sometimes with heavy after-effects), significant economic losses condition importance of respiratory infections' problem for mankind. Every adult person suffers from flu or other AVRI twice a year, schoolchild – three times a year, children of pre-school age – 6-10 times. Constant circulation of viruses among population, annual season increasing of morbidity is an integral component of people's existence [6, 9, 13]. By the data of world health protection organization (WHPO) every year 1.5 billion of people suffer from flu or other AVRI , i.e. every forth inhabitant of the earth [10].

That is why flu and other AVRI , which are registered in all countries of the world, are of great medial, social and economic importance, influencing negatively on health of population and resulting in undesirable medical, psychological and social after effects [17, 18]. It is known that flue and other AVRI have been remaining rather a problem of health protection for many countries, while economic losses, directly or indirectly connected with flu and AVRI epidemics, are hundreds of billion of dollars [8, 12, 14].

Alongside with it there has appeared strong trend in increasing of quantity of students with weak health; many students have initial stages of diseases. For the period of studying students' health worsens. With every year quantity of students – members of special health groups – is increasing [1, 3, 11].

Both junior and senior students show unserious attitude to personal physical fitness, to own health; they manifest absence of desire to use means of physical culture and sports in everyday life. There are many cases, when students get medical certificates, permitting release from physical loads, while such students belong to main health group [2, 16].

Main reasons of such students' attitude to physical exercises' practicing are: harmful habits; deficit of time for preparation for other classes; absence of desire to practice physical culture; absence of conditions for practicing of physical culture [2, 4].

In existing conditions of life we observe steady worsening of health, weakening of organism's functional reserves, systemic disordering of posture, presence of different abnormalities in supporting-motor system, reduction of physical fitness's level and etc.

Scientists have determined that recent years we can observe increasing of special health groups' contingent at the beginning of studying at HEE and their replenishment by the last year of teaching of physical culture [1, 7, 8]. Such trend takes place against the background of weakening of nervous system's functions in the process of studying and examination session that negatively influences on health of future specialists [4, 5, 8]. It is known that healthy way of life is an important factor of formation and strengthening of students' health, which depend on it by 50% and more. The most active components of healthy life style are: rational students' work, rational eating, rational motion functioning, hardening, personal hygiene, absence of harmful habits [2, 4, 17].

To day there exists a number of scientific works by domestic and foreign scientists, which are devoted to students' health and factors, influencing on it [14, 16, 19, 20]. Nevertheless we have not found scientific information about influence of respiratory diseases on students' functional state and about demand in appropriate specialists' response to existing changes in functional state. Research of this problem is especially urgent for students, who study at specialized sport establishments and physical culture faculties.

http://dx.doi.org/10.15561/18189172.2015.0302

This fact is still more acute because after respiratory diseases students immediately start not only theoretical studying but also physical work envisaged by academic process. This fact is undoubtedly a risk factor for their health, as far as AVRI, which they suffered from, significantly weaken functional state of their organisms.

In our opinion determination of functional changes after acute respiratory diseases is urgent and demanded. This problem requires additional researches oriented on correction of physical loads' scopes. It is possible to include additional correction means for maintenance and improvement of students' health and life quality.

The present work has been fulfilled in compliance with plan of scientific-research works of Prikarpatskiy national university, named after Vasil Stefanik, for 2010-2015 and is a fragment of complex scientific topic of department of sport-pedagogic disciplines "Organizational-methodic principles of sport-pedagogic technologies' application for improvement of health of different population strata" (state registration number 0114U002625). The author is an executor of this topic's fragment.

Purpose, tasks of the work, materials and methods

The purpose of the work is researching of students' functional state and life quality after acute virus respiratory diseases. For achievement of this purpose we formulated the following tasks:

1. Estimation of cardio-vascular and respiratory systems' functional state of students, who suffered from acute virus respiratory diseases.
2. Determination of level of vegetative provisioning of students' inner organs functioning after acute virus respiratory diseases.
3. Characteristic of life quality of students, who suffered from acute virus respiratory diseases.

For achievement of our purpose and realization of our tasks we conducted work among students of physical education faculty of Prikarpatskiy national university, named after Vasil Stefanik and Prikarpatskiy faculty of Academy of Home Affair of Ukraine. 25 2-4 years' students, who suffered from acute virus respiratory diseases, of age from 19 to 22 years were involved in our researches. They were experimental group (EG). Control group consisted of 20 2-4 years' students, who, by the moment of examination, were practically healthy and were not ill during last 3-4 months.

Determination of heart beats rate (HBR) we conducted with pulping of radial artery during 1 minute after 5-7 rest in lying on back or sitting position. Blood pressure was measured with sphygmo-manometer by M.S. Korotkov's (1905) method and under regulations of WHPO (1996). We registered systolic (SBP) and diastolic (DBP) pressure.

Stange's test (breathing pause after inhale) was conducted after 3-5 minutes' rest. Genchi's test was conducted for determination of period of pause after exhale by analogous methodic. Interval between registrations of time of exhale/inhale pauses was not more than 5 minutes.

James's test was conducted for determination of general physical workability and level of its reduction among students, who suffered from acute virus respiratory diseases. Student ascended one step with frequency of about 20 times per minute. The height of step depended on mass of body. For mass of 70 kg step height was 20 cm; for mass from 50 to 70 kg – 25 cm; for mass less than 50 kg – 30 cm. The test was evaluated basing on quantity of ascending up to shortness of breath.

For evaluation of inner organs' vegetative provisioning of students, who suffered from AVRI, we conducted Ortho- and clinical-static tests.

For determination of life quality (LQ) we conducted questioning with the help of SF-36 questionnaire, which was worked out by J. Ware et al. in 1993 році [5, 15]. It consists of 36 questions, grouped in 8 domains: "physical functioning", "role of physical problems in restriction of life activity", "physical pain", "general attitude to health", "life-potentials", "social functioning", "role of emotion problems in restriction of life activity", "mental health". Points were calculated with the help of calculation table. Indicators can vary from 0 to 100; with it 100 is the best from all possible values.

Results of the researches

The received results of testing of cardio-vascular and respiratory systems' functional state (students after AVRI) are given in table 1.

Table 1

Results of testing of cardio-vascular and respiratory systems' functional state (students after AVRI)

Indicator	Control group n=20	Experimental group, n=25
Heart beats rate, b.p.m.	76.3±1.3	84.3±2.1**
Systolic BP, mm, merc.col.	123.2±1.11	131.1±2.3*
Diastolic BP, mm, merc.col.	82.4±2.1	92.3±1.2*
Stange's test	46.3±1.3	18.7±2.4***
Genchi's test	27.3±1.8	10.2±2.7**
James's test	87.5±3.2	17.6±1.4***

Note: confidence of indicators in comparison with the same of control group: * - p <0.05; ** - p<0.01; *** - p<0.001

The received results of functional tests witness that students, who suffered from AVRI, had confidently higher HBR in rest (p<0.01) in comparison with control group. Students of EG showed confidently higher mean values of SBP and DBP (p<0.05) in comparison with values of practically healthy students, who had these indicators in the range of normal.

Results of tests for breathing pauses showed that EG students had mean values of these indicators confidently lower (p<0.001) in comparison with the same in CG that witnessed about unsatisfactory functional state of respiratory system.

James's test showed that students, who suffered from AVRI (EG), had lower quantity of ascending on step than the same in control group (p<0.001) and witnessed about worsening of workability by 60-80%.

Evaluation of vegetative provisioning of inner organs' functioning of students is given in table 2.

Table 2

Evaluation of vegetative provisioning of inner organs' functioning of students after AVRI

Indicator	Control group, n=20	Experimental group, n=25
Ortho-static test, the 10th minute		
HBR increment, b.p.m	7.6±0.13	18.3±2.1*
Reduction of SBP, mm, merc.col.	8.6±0.17	17.5±1.7*
Clinical static test, the 10th minute		
HBR increment, b.p.m	8.7±0.15	22.5±2.7***
Reduction of SBP, mm, merc.col.	6.5±0.19	30.8±3.1***

Note: confidence of indicators in comparison with the same of control group: * - p<0.001

Evaluation of tonus of vegetative nervous systems' links (students after AVRI) showed that they have much higher mean values of HBR increment and SBP reduction during Ortho-static test in comparison with control group. HBR increment in CG was evaluated by us as satisfactory and decreasing of HBR – as condition, close to disease. Mean values of HBR increment and SBP reduction during clinical static test (students after AVRI) were confidently higher (p<0.001) comparing with the same in control group and were evaluated by us as "unsatisfactory" or "pathology" accordingly.

Results of testing by SF-36 questionnaire are given in table 3.

Table 3

Results of testing by SF-36 questionnaire

Indicator	Control group, n=20	Experimental group, n=25
Physical functioning	97.3±2.1	34.9±10.56***
Role functioning	92±3.1	12.7±2.08***
Pain	100±2.1	74.8±5.19*
General health	94±1.3	57.5±8.84***
Life potentials	99.6±3.4	51.3±4.29***
Social functioning	97±5.4	68.4±5.13**
Role of emotional problems	89±3.2	32.2±4.63***
Mental health	94±3.1	50.1±5.18***

Note: confidence of indicators in comparison with the same of control group: * - p <0.05; ** - p<0.01; *** - p<0.001

The fulfilled questioning with SF-36 questionnaire witnessed reduction of life quality of students, who suffered from AVRI in comparison with practically healthy students, by all tested characteristics. The worst are such aspects of life as role functioning, physical functioning, social functioning; role of emotional problems increases.

Conclusions:

So, by results of the fulfilled testing of students after AVRI, after comparison of the received data with the data of practically healthy persons we can say that after respiratory diseases functional state of cardio-vascular system worsens, that is characterized by increasing of HBR in rest, increasing of SBP and DBP mean values. Weakening of

respiratory system's functional state is proved by negative results of tests for breathing pauses and reduction of general workability by 60-80% (as per James's test).

Students, who suffered AVRI, showed imbalance of vegetative regulation of inner organs with increasing of sympathetic part's tonus and with significant increasing of parasympathetic part of vegetative nervous system; by the data of different authors it plays rather important role in worsening of bronchial tree's drainage function.

Significant worsening of life quality of students, who suffered from AVRI, is connected with reduction of their physical and social functioning as well as with sharpening of emotional problems.

Research of introduction of physical education means, which would correct cardio-vascular and respiratory systems' functional state, vegetative nervous system, which would improve quality of students' life, seems to be promising in the future.

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Cite this article as: Hnyp I.Ya. Assessment of functional status and quality of life of students after acute respiratory viral diseases. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2015, no.3, pp. 10-14. http://dx.doi.org/10.15561/18189172.2015.0302

The electronic version of this article is the complete one and can be found online at: http://www.sportpedagogy.org.ua/html/arhive-e.html

Received: 16.01.2015
Accepted: 16.02.2015; Published: 23.02.2015

DISCUSSION ON THE CONCEPTS OF "COORDINATION" AND "AGILITY" IN TERMS OF PHYSICAL EDUCATION

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Annotation. In the scientific and methodological literature and practice of physical education concepts of "coordination" and "agility" are often used synonymously. And discussion about the appropriateness distinguish these concepts is mainly analytical character. *Purpose*: to evaluate the nature of the relationship metrically between indicators kinesthesia (which characterize the internal processes of interaction in the neuro-muscular system - coordination) and the efficient delivery of a complex exercise (in cooperation man in the external environment of physical education - agility). *Material*: 77 students surveyed. Students performed on 100 strikes the ball into the goal in terms of golf (10 control measurements). The experiment was conducted for 8 months. 7700 measurement precision of centimeters processed statistically. Calculated reliability of measurements: 100 comparability repetitive beats, accuracy hitting the ball into the goal and the pace of learning in terms of the impact of blows. *Results*: the total volume measurements was characterized by high variability (V% = 53,5), indicating that the low status of kinesthesia surveyed. This reduces the reliability of the correlation coefficients according to 30 and then 10 of the best students in the general rank in terms of reliability of measurements. Significant correlation occurred only in terms of performance beats the purpose of learning the technique and pace (0,417; n = 30, p <0,05; and 0,677; n = 10, p <0,05). *Conclusions*: Overall, the results of our study showed that the concept of "coordination" and "agility" should still be distinguished. In some cases, students with a good level of kinesthesia occurred and high mobility in complex locomotion. If we recognize it expedient to continue this discussion, then we must rely on objective, metric information. This information should be obtained in studies with a broad contingent surveyed, consistently show good concentration and high reliability results in a series of repeated measurements.

Keywords: concepts, coordination, agility, differences, discussion, physiology, physical education.

Introduction

In special literature on physical education in many cases one can see publications, in which conceptions “coordination” and “dexterity” are used as synonyms [1, 2, 5, 12, 13, 14]. Probably it stimulates still continuing discussion about sense of these conceptions, which had begun in the middle of the past century [6,7]. By the present time these conceptions have been come, to some extent, to opinion that “coordination” reflects mainly internal processes of nervous-muscles formations’ interactions in separate muscles and processes of synergetic muscles as well as antagonistic ones in conditions of elementary local motions. While conception “dexterity” characterizes effectiveness of the fulfilled human motion functioning in conditions of external interactions of specific for different life aspects, including kinds of sports; and it is evaluated in wide spectrum of quantitative (metric) and qualitative units [6, 8, 10, 11].

It can be assumed that main position for such discussion is idea that initially human physical quality is based on explanation of specific physiological mechanisms, conditions of manifestation, units of measurement and peculiar approaches in process of perfection. Certain difference in conceptions “coordination” and “dexterity” can be connected with certain units of measurements and conditions of registration. For example, for measurement of internal processes in nervous-muscular system electric myography methods and appropriate units of measurement are used, while in conditions of physical education- quite different methods. But in this case we also assume that coordination and dexterity can be evaluated in the same conventional units of measurements, characterizing rate of perfection quantitatively in percents (%) or qualitatively in terms “high”, “middle” or “low”. Because, in general, in the base of conceptions “coordination” and “dexterity” there are general physiological mechanisms, which regulate accuracy of differentiation of power, time and space characteristics of both elementary and complex local motions, quickness of their mastering in different conditions, including in physical education. This assumption is grounded in fundamental works of known specialists and is undoubted [1, 5]. In our opinion specifying of conceptions “coordination” and “dexterity” can be realized by means of metric evaluation of interconnection between internal processes in nervous-muscular system (“coordination”) and processes, which influence on effectiveness of complex, multi-joints human local motions in external conditions (“dexterity”).

Purpose, tasks of the work, material and methods

The purpose of the work is to realize metric evaluation of interconnection between kinesthesia indicators, characterizing internal processes in nervous-muscular system (coordination) and effectiveness of complex exercise, which characterize interactions of a person in external conditions of physical education (dexterity).

All logic of the research was the following: first, we considered that human kinesthesia (muscular sense) reflects the most objectively nervous-muscular processes, have genetic and phenotypic character and can correspond to conception “coordination”; second, in case of our determination of confident correlation between kinesthesia indicators and external effect of behavior of the tested in conditions of physical education (dexterity), these conceptions can be understood as synonyms. Then, with evaluation of every of this conception it could be possible to use common means,

http://dx.doi.org/10.15561/18189172.2015.0303

methods and units of measurement. If there is no substantial, metrically proved interconnections between these conceptions, they shall be understood as different and different conditions and units of measurements shall be used for their evaluation.

The main *task* for realization of our purpose was determination of level of correlation interconnection between kinesthesia indicators, as ability to reliably reproduce nervous-muscular efforts in series of repeated control exercise and indicators of efficiency and rate of mastering of complex, multi-joint exercise, as ability to adapt to external environmental conditions.

The methods of the research: in our research 77 physical education students of Olshtynskaya higher school participated. All they did not know golf techniques. During eight months we conducted 10 control sessions with 3-4 weeks' intervals. In every control session student fulfilled 10 strikes on ball in target from 9 meters' distance, in conditions of game's imitation. This test was carried out in gym, on synthetic floor covering, on which target of strike (hole) and target, calculated in centimeters in sagittal and frontal planes from hole were marked. It permitted to register accuracy of ball strike in general field of target in permanent climatic and space conditions. In total of 10 control sessions we received 7700 results from 77 tested students. These results were processed with the help of program STATISTICA 71. We calculated correspondence of total mass of measurements to requirements of static distribution of Gauss. Reliability, as comparability of ball strikes' accuracy in scope of 40 consequent measurements of every student, was calculated with in-test correlation method (r_{tt}) [3, 4, 9]. These data permitted to classify the contingent of the tested in compliance with commonly accepted metrological requirements for evaluation of measurements' reliability by scale "low" – 0.69-0.60; "acceptable" – 0.79-0.70; "middle" – 0.89-0.80; "good" – 0.94-0.90; "excellent" – 0.99-0.95.

Basing on these data we ranged contingent of the tested by indicators of measurements' reliability, which characterized kinesthesia and permitted to indirectly judge about level if internal processes in nervous-muscular system of this contingent.

In the same way we ranged only 30 participants, measurements' reliability of whom met the required metrological requirements also by two other indicators: efficiency of strikes and rates of mastering of strikes' accuracy in the process of testing. For calculation of interconnection between these two indicators we used method of range correlation by Spirman.

Results: As we can see in table 1 total results of strikes' accuracy of every from 77 tested, in conditions, imitating this exercise (in 10 control tests – 7700 strikes) were highly various and, as a result, they were low reliable (in series of 100 consequent strikes – within 53.5%).

Table 1.

Mean results of ball strikes' accuracy (in target) I first (1-2) and finalizing (9-10) tests n=77)

Results, cm	1 - 2	9 - 10	M	Rate of mastering	
				cm	%
M	80.9	63.4	72.2	17.5	27.6
±δ	39.6	36.8	38.2	2.8	7.6
min	200	10.0	15	10.0	50.0
max	147	140	143	7.0	5.0
V%	48.9	58.0	53.5	9.1	18.6

Mean rates of technique's mastering by indicator of strikes' accuracy were only 27.6% by the end of testing. It is interesting that high rate of strikes accuracy's increment (up to 50%) was demonstrated by little part of those participants, who had higher indicator of reliability already in first control tests. Those, who initially were at the end of group's range by this indicator, were the last also by rates of mastering. Rate of increment of these students' results was only 5.0%.

Thus, content of all group of the tested turned out to be quite different by level of muscular sense (kinesthesia), which was initially taken as characterizing internal processes in nervous muscular system (coordination). We did not think it to b correct to carry out further statistic calculations by these data. Such situation forced us to choose from 77 of the tested only that part, members of which had results in first and second series the most comparable and reliable in respect to metrological requirements (see table 2).

Basing on material of this table, in order to solve the tasks of our research, for further statistic operations we chose group from 30 participants, whose measurements' reliability corresponded to good (n-1), middle (n-6) and acceptable (n-23) criteria. It permitted to consider that the following statistic calculations of interconnection between internal mechanisms of nervous-muscular system and effectiveness of complex local motions' formation in conditions of external environment can be objective. Results of this part of the research are given in table 3, where we can see, to what extent certain internal processes, including kinesthesia (coordination) influenced on formation of motion functioning – efficiency of strikes and quickness of technique's mastering (in our case golf technique) (dexterity).

Table 2.

Kinesthesia of the tested (n=77) in respect to metrological requirements of measurements' reliability (r_{tt}) in first (1-2) u and finalizing (9-10) testing

Criteria of reliability (r_{tt})	Quantity of the tested	
	1 -2	9 - 10
High - 0.95-0.99	-	-
Good - 0.90-0.94	1	1
Middle - 0.80-0.89	4	6
Acceptable - 0.70-0.79	26	33
Low - 0.60-0.69	46	37

By the control data of 30 participants from 77 (the best in range, kinesthesia of whom corresponded to acceptable criteria of measurements' reliability (r=0.70-0.79), we did not find confident correlation with efficiency of ball strikes in target and rate of mastering in series of ten consequent control measurements (in total 100 strikes) (r=0.354 and 0.279; p>0.05). In this group there was confident interconnection only between accuracy of strikes in target and rate of technique's mastering by indicator of accuracy in ten series (r=0.417; p<0.05).

Table 3.

*Results of correlation analysis of kinesthesia indicators, efficiency of ball strikes in target and quiclnes of technique's mastering in sub groups **A** n-30 and **B** n-10*

Подгруппа **A**

Indicators	1	2	2
1 kinesthesia (reliability of measurements)	X	0.354	0.279
2 efficiency of strikes in target	0.588	X	**0,417**
3 rate of technique's mastering	0.602	**0.677**	X

Subgroup **B**

Notes: statistical confidence of correlation coefficient R_s, for n-30 p<0.05=0.361; for n-10 p<0.05=0.632

Uncertainty of correlation analysis results forced us to duplicate this method on material of the tested with indicators in the frames of "middle" 0.80-0.89 and "good" 0.90-0.94 reliability. Results of analysis of this category in content of ten tested are given in lower left part of correlation matrix (see table 3). As we can see in table 3 interconnection between reliability indicators, which characterize kinesthesia of the tested, efficiency and rate of technique's mastering turned out to be higher. However, in this part of matrix confident correlation was only in indicators of efficiency and rate of mastering range (r=0.677; p<0.05).

Discussion

Before starting our researches we hoped to obtain confident metric proof of interconnection of kinesthesia of the tested with ability to accurately fulfill complex movements (golf strike) and quickly master technique of this exercise. The basis for such assumption was fundamental knowledge in physiology of organization of human free movements. Basing on this knowledge kinesthesia, in out opinion, could be regarded as a basis, formed in conditions of accumulation of human motion experience in ontogeny, indirectly influencing on formation of complex motions' skills. Generally speaking results of our researches do not permit to prove this idea owing to a number of objective reasons.

First of all, total mass of measurements (7700 ball strikes made by 77 tested) witnessed about extremely low reproducing and comparability of repeated measurements (V%=53.5) and, as result, about weak kinesthesia of this contingent. It reflected also in results of correlation analysis, where we did not find confident correlation between kinesthesia and motion abilities even in 30 the best from 77 tested.

Secondly, we should pay attention to the fact that low reliability, reproducing of measurements in conditions of durable testing was connected with complexity of stabilizing of mental state of the tested, oriented on maximal concentration of attention in every from 100 ball strikes in target.

However, calculations of interconnection between tested abilities by best kinesthesia data in ten of the range resulted in higher correlation coefficients. Three first from the tested in this rage (by kinesthesia indicators) turned out in their positions also by indicators of efficiency of strikes in target and quickness of mastering by the end of testing.

Conclusions

In general, results of our research witnessed that conceptions "coordination" and "dexterity" shall be differentiated. However in some cases, when we worked with students, having high kinesthesia, we registered also high indicators of dexterity in complex motions. If continuation of this discussion is purposeful, it would be necessary to

base on objective metric information, received in researches with wider contingent of the tested, who would demonstrate stable concentration of attention and high reliability of results in repeated measurements.

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Cite this article as: Zaporozhanov V.A., Boraczynski Tomasz. Discussion on the concepts of „coordination" and „agility" in terms of physical education. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2015, no.3, pp. 15-19. http://dx.doi.org/10.15561/18189172.2015.0303

The electronic version of this article is the complete one and can be found online at: http://www.sportpedagogy.org.ua/html/arhive-e.html

Received: 01.02.2015
Accepted: 20.02.2015; Published: 23.02.2015

SPECIFIC DESCRIPTIONS OF FUNCTIONAL PROVIDING OF THE SPECIAL ENDURANCE OF BOXERS

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Annotation. *Purpose:* to determine the specific characteristics of functional and metabolic support of special endurance of qualified boxers. *Material:* in research took part 16 boxers of high qualification at the age of 19-26 years. To estimate special endurance is used technique of detection the basic parameters of performance boxers "Spuderg-10." To estimate the response of cardiorespiratory system during the test "3x3" is used portable ergo-spirometry complex «Meta Max 3B» (Cortex, Germany). *Results:* It is shown that the range of individual distinctions of indexes of capacity and functional providing of the special endurance increased in every round under act of accumulation of fatigue. It is related to distinctions of kinetics of the cardiorespiratory system (by the increase of pulmonary ventilation) in the first round, by the consumption of O_2 (by a capacity for the achievement of VO_2 max) - in the second and by power of reaction of respiratory indemnification of metabolic acidosis - in the third. These distinctions are registered in default of reliable distinctions of quantitative descriptions of acidemic changes in an organism, increasing in the process of the test job processing. *Conclusions:* in different periods (rounds) in boxers high grade found differences of manifestation and combinations of properties features of functional readiness.
Keywords: boxing, capacity, special endurance, cardiorespiratory system, energy providing.

Introduction

In modern system of sport training of high class boxers there have been formed clear ideas about functional provisioning of their special workability. It is witnessed by data of boxers' workability in zones of physical loads' intensity, which facilitate realization of aerobic and anaerobic energy supply, of power characteristics of work. Provided in special literature quantitative and qualitative parameters of boxers' functional potentials to certain extent characterize potential of qualified boxers. Alongside with it, it is well known that even with high level of power, kinetics, stability and saving character of functional and metabolic reactions it is necessary to seek specific components of sportsmen's functional fitness, which would characterize specificities of realization of sportsman's functional and energetic potential. It is connected with demand in consideration of quantitative and qualitative characteristics of special motion functioning in every kind of sports. Exactly this specificity forms structure of organism's response to load and puts forward requirements to special physical workability and, as a result, to sportsman's special functional fitness. That is why analysis of characteristics of functional provisioning, quantitative and qualitative characteristics of responses of organism's functional systems to loads, simulating conditions of competition functioning in boxing are of special scientific interest. Especial interesting is assessment of cardio-respiratory system's (CRS) response to different loads. It is well known that different parameters of CRS power and kinetics characterize those sides of organism's responsive abilities, which ensure realization of sportsmen's potentials in conditions of great physical loads.

Such kind of information permits to optimize specialized orientation of training process and, on this base, to form principally new basis for further working out and integration of new training techniques in sport training of qualifies boxers.

The work has been fulfilled as per combined plan of scientific & research works in field of physical culture and sports for 2011-2015 by topic " Individualization of training process of qualified martial arts sportsmen" (State registration № 0111U001723), by topic "Building of training and competition functioning of sportsmen in Olympic cycles and at stages of many years' perfection" (State registration № 0112U003205), by topic "Criteria of assessment of high class sportsmen's functional potentials" (State registration № 0114U001482).

Purpose, tasks of the work, material and methods

The purpose is to determine specific characteristics of functional and metabolic provisioning of qualified boxers' special endurance.

The methods and organization of the researches: the researches were conducted in laboratory of theory and methodic of sport training and reserve potentials of sportsmen (National university of physical education and sports of Ukraine). In the research 16 highly qualifies boxers of 19-26 years old age participated.

For assessment of sportsmen's special endurance we used methodic of registration of main parameters of boxers' workability "Spuderg-10": quantity of punches; power of punches (kg); time (msec), tonnage (kg), strength of punches, gradient of punches' effectiveness (GPE). It permitted to assess functional potentials of boxers in process of simulation of competition functioning in test 3 rounds (3 minutes each) (test 3x3).

For assessment of cardio-respiratory system's response in conditions of test "3x3" we used portable ergo spirometric complex «Meta Max 3B» (Cortex, Germany) and methodic approach for determination of aerobic and anaerobic organism's potentials. In real time scale ("breath by breath") we determined main characteristics of respiratory system's response: lung ventilation (V_E), frequency of breathing (F_T), breathing volume (V_T), concentration

http://dx.doi.org/10.15561/18189172.2015.0304

of CO_2 and O_2 in exhaled (F_EO_2, F_ECO_2) and in alveolar air (F_AO_2, F_ACO_2), O_2 consumption (VO_2), secretion of CO_2 (VCO_2), gas-metabolism correlation ($VCO_2 \cdot VO_2^{-1}$), ventilation equivalents for O_2 ($EQO_2=V_E \cdot VO_2^{-1}$) and for CO_2 ($EQCO_2=V_E \cdot VCO_2^{-1}$), partial tension of carbon dioxide (P_ACO_2) and oxygen (P_AO_2) in alveolar air and so on. Considering the fact that measurements were carried out in open system, indicators of external breathing are reduced to conditions of BTPS (Gas at Body Temperature and Pressure, Saturated (with H_2O)), and gas metabolism – to conditions a газообмена - STPD (Standard Temperature (0°C), Pressure (760 mmHg), Dried of gas). Registration heart beats rate (HR, b.p.m^{-1}) was carried out with the help of "Sport Tester Polar" (Finland). Concentration of lactate (HLa) in capillary blood was determined by enzymatic method ("Dr. Lange-400") at 10th second and at 3rd and 10th minutes of recreational period after test «3x3».

Testing was conducted after one day rest in conditions of standardized diet and water taking. Sportsmen were informed about content of tests and agreed to participate in them. Complex biological examinations of sportsmen obeyed to health protection Laws of Ukraine and Helsinki Declaration 2000, Directive of European Community 86/609 about participation of people in medical-biological researches.

Statistical processing of results was carried out with the help of computer programs "Microsoft Excel", "Statistica-6" with determination of main statistic indicators: mean arithmetic (M), mean square deviation (SD), variation coefficient (CV), minimal and maximal values in sample, median and etc.

Results of the research

Analysis of workability and character of changes of boxers' functional provisioning was estimated in process of fulfillment of every form three test rounds. In table 1 we present indicators of first round (initial part of test "3x3"). Thus, by most of indicators their mean values were rather high. By strength and time of punches' realization individual distinctions were statistically not confident, with variation coefficient more than 15% (CV>15%) by quantity of punches, tonnage and gradient of punches' effectiveness. There are some reasons to think that mentioned distinctions are connected with individual manner of fighting. At the same time individual differences of functional provisioning (CV 6.2%−12,6%) are not great. With it the lowest levels of differences of the presented data were registered by characteristics, which determine high degree of tension of work's functional provisioning (HR, P_ACO_2). It is necessary to note that these indicators have high and middle levels of values.

Table 1

Indicators of workability and cardio-respiratory system's response of qualified boxers in first round (initial part) of test «3x3» (n=16)

Statistical indicators	Indicators of punches' effectiveness						Indicators of CRS response							
	Quantity	Strength, kg	Time, msec	Tonnage, kg	Power	GPE	HR bpm^{-1}	$V_{El.min}^{-1}$	$P_ACO_{2mm\ merc\ col}$	VCO_2, l.min^{-1}	VO_2, ml.min^{-1} kg^{-1}	EQO_2	$EQCO_2$	V_E/P_ACO_2
M	236.9	30.5	359.2	3538.8	0.491	0.072	188.3	133.5	37.2	4.4	59.4	46.6	31.9	3.7
median	238.0	31.6	359.8	3290.5	0.454	0.070	188.0	137.2	37.8	4.4	60.5	45.1	33.0	3.9
SD	53.0	4.1	29.2	996.1	0.117	0.016	11.7	18.2	3.6	0.5	5.9	5.9	3.3	0.8
Minimal value	169.0	24.7	298.9	2327.1	0.370	0.051	169.0	99.0	31.4	3.6	50.0	40.0	26.9	2.5
Maximal value	306.0	35.3	396.4	5166.7	0.700	0.092	213.0	159.7	42.5	5.1	68.0	58.9	37.6	5.1
25%	188.0	25.5	349.3	2695.3	0.388	0.058	183.0	120.7	34.2	3.9	57.0	42.0	28.8	3.1
75%	287.0	33.7	385.3	4437.1	0.564	0.088	191.0	146.0	39.6	4.7	62.0	50.3	33.5	4.2

With assessment of individual distinctions of indicators exclusion was correlation of increment of lung ventilation in respect to standard increment of partial pressure CO_2 – correlation $\Delta V_E/\Delta P_ACO_2$, which characterizes sensitivity of ventilating reaction to hypercapnia and has expressed individual distinctions (CV=22.5%). Increased (in

respect to mean group indicators) levels of lung ventilation of some sportsmen with reduced level of reaction in respect to group are connected with this fact.

Analysis of correlations showed that thee are statistically confident correlations of lung ventilation indicators and indicators of power of work and gradient of punches' effectiveness (correlations at level r = 0.67–0.70). At the same time we determined trend to connection of ventilation equivalent by O_2, which characterizes effectiveness of lung ventilation (correlation at level r = 0.45–0.50, $p<0.05$).

The values of mentioned components of special boxing work's functional provisioning are proved by results of factorial analysis. For example, we specified a group of characteristics of CRS response, with specific weight of 57.0% from total sample and which included indicators of lung ventilation level, ventilation equivalents by O_2 (EQO_2) and by CO_2 ($EQCO_2$), sensitivity of lung ventilation to hypercapnia (correlation $\Delta V_E/\Delta P_ACO$). It is interesting that those characteristics of boxers' functional potentials became significant, which to largest extent influence on stability of their workability. Confident connection of special workability's main parameters is registered with maximal level of partial tension of CO_2 in alveolar air and maximal level of lung ventilation. Characteristics of lung ventilation's effectiveness for utilization O_2 and CO_2 emission have statistically confident correlation with workability with analyzing of round's mean values, as well as relations of mean and maximal values of reaction. The latter witnesses about CRS stability as one of informative factors, which determine the level of boxers' special functional fitness.

From table 2 we can see that in second round by most of indicators CRS response and characteristics of workability also had rather high level.

Table 2

Indicators of workability and response of cardio respiratory system of boxers in middle part (second round) of test «3x3» (n=16)

Statistical indicators	Quantity	Strength, kg	Time, msec	Tonnage, kg	Power	GPE	HR bpm $^{-1}$	$V_{El.min}$ $^{-1}$	$P_ACO_{2mm\ merc\ col}$	VCO_2, l.min^{-1}	VO_2, ml.min^{-1} kg^{-1}	EQO_2	$EQCO_2$	V_E/P_ACO_2
	Indicators of punches' effectiveness						Indicators of CRS response							
M	232.0	31.0	361.8	3536.8	0.487	0.077	189.9	142.7	36.2	4.5	61.9	40.7	34.5	4.1
median	218.0	31.5	365.2	3571.2	0.428	0.077	188.0	146.4	36.1	4.4	63.4	40.5	34.6	3.9
SD	61.4	5.2	37.5	1031.5	0.125	0.021	10.2	19.7	2.9	0.7	5.9	5.4	5.8	0.6
Minimal value	156.0	23.4	287.4	2159.1	0.364	0.048	177.0	97.8	31.9	3.3	52.0	30.9	27.8	3.5
Maximal value	326.0	40.0	411.6	4857.2	0.669	0.107	214.0	165.7	40.9	5.8	72.0	48.2	48.3	5.2
25%	178.0	28.2	338.7	2669.4	0.380	0.061	186.0	137.1	34.4	4.2	57.0	37.6	30.3	3.6
75%	293.0	33.1	390.1	4503.8	0.642	0.093	193.0	155.3	38.2	4.9	65.0	43.5	35.4	4.5

It is interesting that by most of characteristics there is increase of special workability's level. With it, differences of integral indicators of workability such as tonnage, power of punches, gradient of punches' effectiveness, were within CV 25.7%−29.2%. In comparison with first round, difference between values of strength of punches increased (CV<10.4%). By time of punching individual distinctions, like in first round, were statistically not confident (CV<15%).

With it character of work's functional provisioning nearly did not change according to individual data. Some sportsman demonstrated increase of lung ventilation's response, one of sportsmen showed increasing of level of O_2 consumption (in respect to model values for this kind of sports) 72.0ml.min^{-1}kg^{-1}. Level of individual differences of sensitivity of ventilator reaction to hypercapnia remained rather high (by $\Delta V_E/\Delta P_ACO_2$).

Correlation analysis showed that level of correlations of O_2 consumption withy indicators of special workability is statistically confident. By some indicators, such as strength of punch, time of punching, tonnage, level of correlation was within r = 0.55–0.66 ($p<0.05$). It is necessary to pay attention to high level of interconnection of partial

tension CO_2 with mentioned above characteristics of workability (r = 0.70–0.80, p<0.05), that witnesses about increasing of acidosis influences in organism on boxer's special endurance. With it we did not find confident correlation of lung ventilation in its maximal and mean values as well as calculated indicators of correlation of lung ventilation and CO_2 emission with characteristics of workability. On the one hand it witnesses about domination of metabolic, mainly aerobic processes, on the other hand – about weakened expressiveness of reaction of metabolic acidosis compensation.

Such conclusions proved results of factorial analysis, where only one factor (specific weight 38.2%) was marked out, which included indicators of O_2 consumption and partial tension CO_2.

In table 3 we provide indicators of third round (final part of test "3x3"). Mean level of special workability's indicators increased. However the character of individual differences between workability's indicators did not confidently change. By most of indicators high level of individual differences remained. Differences of indicators of workability's functional provisioning were registered only by correlation of increment of lung ventilation to increment of partial tension CO_2 (by $\Delta V_E/\Delta P_ACO_2$). These differences are characteristic for all three rounds, during which changes of CRS responses took place.

Table 3

Indicators of workability and response of cardio respiratory system of boxers in final part (third round) of test «3x3» (n=16)

Statistical indicators	Quantity	Strength, kg	Time, msec	Tonnage, kg	Power	GPE	HR bpm^{-1}	$V_{El.min}{}^{-1}$	$P_ACO_{2mm\ merc\ col}$	VCO_2, $l.min^{-1}$	VO_2, $ml.min^{-1}\ kg^{-1}$	EQO_2	$EQCO_2$	V_E/P_ACO_2
	Indicators of punches' effectiveness						Indicators of CRS response							
M	258.1	30.4	349.5	3838.4	0. 63	0.085	196.1	146.9	34.4	4.7	60.5	38.7	33.0	4.3
median	271.5	31,6	348.5	3991.9	0.553	0.087	194.5	148.4	34.8	4.8	62.0	37.5	34.4	4.4
SD	61.2	6.0	41.0	1018.8	0.120	0.015	151	21.6	3.7	0.8	6.1	4.9	3.9	0.9
Minimal value	174.0	18.7	275.0	1747.9	0.442	0.063	179.0	97.8	26.8	3.3	48.0	31.6	26.6	2.6
Maximal value	339.0	41.0	418.4	5066.8	0.747	0.111	234.0	171.5	40.4	5.7	68.0	45.2	38.0	5.4
25%	190.0	28.8	322.0	3273.7	0.450	0.074	189.0	142.4	32.5	4.1	57.0	35.9	30.2	3.6
75%	296.0	32.2	386.7	4684.4	0.702	0.095	199.0	161.9	37.1	5.3	65.0	43.8	36.1	4.8

Assessment of indicators' mean values witnesses that tension of functional mechanism, ensuring boxers' special endurance, significantly increased. It is illustrated by increase of heart rate mean level with CV 7.7%. At the same time, there appears a trend to insignificant reduction of O_2 consumption. One can think that it is connected with activation of anaerobic glycolitic processes and, as a result, with increasing of part of anaerobic energy supply in general energetic balance of work. We can make conclusion that it resulted in increasing of power ergo metric characteristics of workability, which were accompanied by acidosis shifts in organism. With it, level of lung ventilation's response of most of sportsmen increased insignificantly that witness about certain preconditions of too early not compensated tiredness.

It is necessary to pay attention to character of workability's indicators correlations and functional provisioning of work. By maximal values of indicators P_ACO_2, VO_2, EQO_2 and $\Delta V_E/\Delta P_ACO_2$ values of correlation coefficients were on level 0.6−0.8 (p<0.05), by response of lung ventilation r = 0.5−0.6 (p<0.05). By mean indicators level of correlations was on confident level for ventilation equivalent by O_2 and by CO_2, that witness about effectiveness of lung ventilation and stability of workability's functional provisioning (r = 0.5−0.7, p<0.05). Value of the last factor was proved by factorial analysis, where factor of stability was marked out with specific weight 37.7%, which includes effectiveness of lung ventilation for O_2 and CO_2.

Significance of factor of functional stability especially increases, when level of metabolic shifts in organism influences on effectiveness of functional provisioning of special endurance. It is well known that metabolic shifts render both stimulating and inhibiting influence on speed of aerobic processes in energy supply and on effectiveness of functional provisioning of special endurance. In process of work, level of excessive CO_2, in certain period of work is accompanied by icreased level of blood lactate. Its increasing over level of anaerobic glycolitic threshold results in active accumulation of lactate in blood in quantity, which causes progressing tiredness. It can be resisted by sufficient reserve of power of organism's buffer systems, which have own markers and are used for assessment of such kind of sportsmen's special endurance. In system of functional diagnostics, in this very case, we analyzed CRS response, first of all by power of lung ventilation response and stability of achieved level of O_2, consumption as well as by speed of utilization of blood lactate. The latter was estimated by dynamic of lactate's utilization during 7 minutes of recreational period after test "3x3". Results of change of lactate concentration in blood are given in table 4.

Table 4

Change of lactate concentration in blood in recreational period after three rounds' test «3x3» (n=16)

Statistical characteristics	Lactate concentration in blood in recreational period, m.mol.l $^{-1}$		
	Period of blood sampling		
	10 sec	3 min	7 min
M	12.8	11.1	9.9
median	12.4	10.8	9.6
SD	2.5	2.3	1.9
Minimal value	9.5	7.9	7.3
Maximal value	16.9	15.0	12.7
25%	10.4	9.5	8.4
75%	14.5	12.9	11.9

From table 4 we can see that mean values of lactate indicators were high (CV 19.0%−21.0%). That is why it is necessary to consider that fact that in the third round significance of anaerobic metabolism increases; with it corresponding compensatory responses in this group are demonstrated not by all sportsmen. It is seen by differences of lung ventilation responses and by differences between indicators of lung ventilation's correlation with indicators of increasing of partial tension CO_2 in alveolar air and CO_2 emission. Difference of metabolic acidosis compensation was demonstrated by those sportsmen, who, on the one hand, had identical levels of lactate in blood and, on the other hand, different indicators of speed of lactate utilization during 7 minutes recreational period after test «3x3», that is connected with manifestation of stability of functional reactions in the third round.

Discussion

The conducted research permits to say that structure of functional provisioning of boxers' special endurance has complex structure. We noted difference between functional provisioning of different structural elements of special motion task, which simulates boxers' competition functioning. Distinctions of functional provisioning of special endurance at the beginning, in the middle and at the end of duel form differences of structure of special physical training, put forward requirements to functional orientation of special training means. Modern requirements to assessment of sportsmen's functional potentials also regard differences between different sides of reactive CRS properties. In the process of competition functioning in kinds of sports, which cause expressed tiredness, they manifest as increase of respiratory reaction at the beginning of competition functioning, increasing of O_2 consumption in the middle of work and in activation of reaction of respiratory compensation of metabolic acidosis in final part of duel. Such regularities of optimization of CRS reaction's structure and aerobic energy supply are in accordance with increased level of anaerobic metabolism and, as a result, with accumulation of tiredness under influence of lactate acidosis. It agrees with commonly accepted conception of perfection of functional provisioning of special endurance, represented in special literature.

Distinctive feature of data, received in testing of high class boxers, are differences in manifestation and combinations of properties of boxers' functional fitness in different periods (rounds) of duel. Consideration of power characteristics of work shall be regarded as general property. Power characteristics shall be supported during all duel in conditions of difference of CRS reaction's structure, aerobic and anaerobic energy supply in different periods of duel. In first round we noted demand in consideration of differences of respiratory responses to increase of CO_2 concentration in organism. Increased level of reaction witnesses about high mobilizing potentials of organism and high ability for

realization of sportsmen's anaerobic (alactate) energetic potential rational usage of anaerobic reserve, pre conditions to high quickness of aerobic energy supply appearing. In the middle of work the achieved level of O_2 consumption has special importance as well as lactate concentration in blood and stable level of ventilation reaction. This type of reaction witnesses about presence of high reactive properties of respiratory system, in particular about achievement and preservation of stable aerobic and anaerobic energy supply, extraction of excessive CO_2 from organism. In final stage of work especially important is maximal reaction of lung ventilation. In this period realization of organism's anaerobic reserve takes place. Levels of blood lactate concentration become maximal. In this connection increase of reaction of excessive ventilation witnesses not only about ability to remove excessive CO_2 from organism but also about high responsiveness of systems of organism's metabolic acidosis during tensed work in period of accumulation of tiredness.

All above mentioned witness about need not only in perfection of system of control over functional provisioning of boxers' special endurance but also in realization of assessment system as function of management of boxers' special physical training. It can be implemented as working out of training regiments on the base of traditional means of boxers' special training, under condition of optimization of working regimes and application of special criteria of loads, mainly aerobic and anaerobic orientation, optimization of specific sides of CRS responsiveness.

Conclusions:

1. The received results permit to form new methodic approach to organization of highly qualified boxers' special physical training, which would be based on assessment of boxers' special endurance, reaction of cardio respiratory system, evaluation of correlation of aerobic and anaerobic processes in special workability.

2. The range of individual differences of workability and functional provisioning of special endurance increased in every following round under influence of progressing tiredness. It is connected with differences of kinetics of cardio respiratory system's reactions (increasing of lung ventilation) in first round, level of O_2 consumption and ability for achievement of VO_2max level in the second round and with power of reaction of metabolic acidosis respiratory compensation in the third round.

3. In first round we marked out indicators of cardio respiratory system with specific weight of total sample 57.0%. It included characteristics of lung ventilation, ventilation equivalents for O_2 and for CO_2, sensitivity of ventilation reaction to hypercapnia (by $\Delta V_E/\Delta P_ACO_2$). In second round we marked out factor (specific weight 38.2%), which included indicators of O_2 consumption and partial pressure CO_2. In third round we marked out factor with specific weight 37.7%, which includes indicators of correlation V_E, O_2 and CO_2 in inhaled and exhaled air. These characteristics are criteria for evaluation of functional provisioning of boxers' special endurance and are bench marks for correction of boxers' special physical training.

The prospects of further researches in this direction: there is a basis for working out of training means, oriented on formation of special realization potential of highly qualified boxers under special loads.

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Cite this article as: Kiprich S.B., Berinchik D.Y. Specific descriptions of functional providing of the special endurance of boxers. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2015, no.3, pp. 20-27. http://dx.doi.org/10.15561/18189172.2015.0304

The electronic version of this article is the complete one and can be found online at: http://www.sportpedagogy.org.ua/html/arhive-e.html

Received: 17.02.2015
Accepted: 22.02.2015; Published: 23.02.2015

THE CONCEPT OF INDIVIDUAL APPROACH IN SPORT

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Annotation. *Purpose*: prove the concept of individual approach to sports training. Develop a common scheme ways individualization process of training athletes. *Material:* the study involved 149 athletes: 38 volleyball players and 111 players. Was carried out comprehensive testing athletes for 33 pedagogical, psycho-physiological, biochemical parameters. Also conducted an analysis of indicators of competitive activity. *Results*: we propose the following areas of the individualization process of preparation of athletes: 1 - systematization of mathematical indicators of preparedness and condition of the athlete in a single point in time; 2 - regression analysis of the dynamics of individual game performance athletes; 3 - the use of universal methods of individualization of various aspects of the training process. It is established that the individual characteristics of players in basketball and volleyball are connected not only with the anthropometric data, but also depend on the physiological and psychophysiological indicators. In this aspect there is provided use of cluster and factor analysis for the construction of individual training programs for players. It was found that the dynamics of the gaming performance is described by quadratic, cubic and sinusoidal functions. In the case of sinusoidal oscillation period of regression models in girls is 25-30 days, 31-38 days in boys. This allows to determine the most preferred times of increasing and reducing the efficiency of competitive. *Conclusions*: the concept of individual approach in sport involves the separation of a wide range of indicators leading factors in the individual structure of athletes, in the analysis and prediction of individual dynamics of competitive performance, to develop universal methods of individualization with the activation of awareness of various aspects of the training process.
Keywords: concept, individualization, sports, prognosis, preparedness.

Introduction

Sports always have been being a concentrated model of life in all its variety. In sports there are situations, when a person is at extreme of his (her) potentials, but overcomes him (her) self and reaches his aim. Sportsman shall be able to quickly and correctly take decisions against the background of maximal or close to maximal physical loads and physiological shifts in organism. In sports it is necessary to subordinate everything to achieving of purpose (to "construct" own life and even destiny) [13, 16, 17, 19].

Principle of individualization is one of main principles of sportsmen's training. Individual approach implies selection of necessary training means and methods, suitable for certain sportsman. It is a necessary condition for achievement of desired high result [22, 27, 30, 33, 36, 37, 38]. This problem is important for all stages of sport training. For example at stage of port selection [2] it is necessary to determine what kind of sport a child should practice. At stages of initial training [36, 37, 38], of sport perfection [5, 7, 11, 12, 18, 24], and, especially, at stage of highest sportsmanship [20, 21, 23, 26] construction of individual training programs for sportsmen is especially required. There is no "universal" sportsman, for whom standard training programs would be ideal. May be one sportsman shall make accent on power exercises or some other physical quality, other – sportsman should perfect technique; the third needs better understanding of strategy and tactics [1, 14, 15]. With consideration all these factors determination of how to train exactly for this sportsman and what direction to choose in training process is rather a difficult task.

The same picture is often observed in other spheres of life activity: every person always meets a problem of choice of own way, suitable and the only correct exactly for him.

In sports exists a problem: what is better to train? In other spheres of life – the problem is the same – what profession to choose? If this choice has been made, it is necessary to choose way of further functioning. Decisions are taken about what features (physical and mental) shall be trained and what skills shall be perfected. It is also necessary to determine what shall be accentuated: improvement of "delaying" qualities or perfection of leading ones. If both these aspects are considered then proportions and quantitative characteristics of required loads are determined.

Thus, problem of individual approach in sports expands far behind of sport frames and is spread on all spheres of human life. It includes: learning, choice of kind of functioning and method of self perfection in it. It is also choice of specificities of following of any life direction and in general any choice in life.

http://dx.doi.org/10.15561/18189172.2015.0305

That is why working out of algorithms for determination of sportsmen's individual features with specifying of individual structure and dynamic of different indicators' development or factors of fitness is important not only for sports but also for other spheres of human life functioning.

The research has been fulfilled in compliance with:

- "Combined plan of scientific research works in sphere of physical culture and sports for 2011-2015" by topic 2.4 "Theoretical methodic principles of individualization in physical education and sports" (state registration № 0112U002001);
- Scientific research works of Ministry of education and science of Ukraine for 2013-2014 and for 2014-2015 "Theoretical-methodic principles of application of informational, pedagogic and medical-biological technologies for formation of healthy life style" (state registration № 0113U002003);
- "Theoretical-methodic provisioning of healthy life style's formation in conditions of educational establishment in context of European integration" (state registration № 0114U001781).

Purpose, tasks of the work, material and methods

The purpose of the work is to ground conception of individual approach in sport training.

The tasks of the work:

1. Analyze existing opinions concerning nature of individuality and its manifestation in sport functioning.
2. To formulate and ground conception of individual approach in sports.

The methods of the research: theoretical analysis of literature sources, physiological, psycho-physiological, bio-chemical, pedagogic methods of research, pedagogic experiment, methods of mathematical statistic.

In our research 149 sportsmen participated; among them – 54 players of men combined basketball team (Kharkov), 12 players of men basketball team of Ukrainian super league "Politechnik", 23 female basketball players of Ukrainian first league team, 22 players of women basketball team of KhNPI, named after G.S. Skovoroda, 38 volleyball players of supreme league of Ukraine.

Results of the research

Individual approach in sports covers wide range of problems: from sport selection at all stages of training to determination of individual programs of sportsmen's training. At the same time individual approach in sports is a reflection of every personality's individuality, which determined human choice of kinds of functioning and way of life in general.

That is why individual distinctive features of people have caused interest of scientists since ancient time. View on nature of individual features reflected cultural, religious and world vision ideas of people.

For example in India individual features of a person were explained by stronger activity of one chakra in comparison with other (http://chakrachka.ru/chakr/test.htm). Chakras in Indian philosophy are energetic formations in biological field of a person, the so called points of energy concentration; they are centers of consciousness, of physical and psycho physical regulation. In opinion of Hindu people every person has seven chakras. But not all of them are equally active (http://priroda.inc.ru/biopole/biopole89.html). Most frequently one of three lower chakra, which determine health, social relations, self assurance, mental stability and so on, is the most active. Relatively more rare are cases of higher chakras' activity, which are responsible for spirituality, creativity, supreme manifestations of consciousness. May be there is certain practical sense in this theory. That is why with appearing of adequate methods of registration of human energetic centers, researchers of human individuality will receive effective tool for diagnostic of human individual features.

Besides, in Vedic they use concept "Atman is Brahman" for revealing of nature of individuality [3, 4, 10, 35], i.e. individuality, personality *(atman) is a reflection of certain Absolute Consciousness (analogue to Holy Spirit or "Father" in Christianity). Atman is the essence of individual soul. Atman originated from Brahman (God emanatory), who "inspired" Atman in every person. That is why according to pantheistic Vedic conception Atman seeks his Source; when it find the Source, Atman will combine with Him and disappear in Him. Such principles have also subjective character and, consequently, subjective diagnostic. However, with presence of methods of objective diagnostic of Atman's relation to Absolute "Brahman", mankind will receive additional tool of determination of individuality's features. It is important for all spheres of life, including sports.

There are other ancient opinions of nature of human individuality. For example, Christian religion says about three planes: spirit, soul and physical body [31]. Exactly Spirit determines individuality and way of life of a person; hat is why main task of a person is to understand his mission and take decisions as adequate to his mission as possible.

If there are analogues to these conceptions in modern science has still been unknown. However, determination of ways for maximal realization of human individuality (in sport functioning) is an urgent task.

Opinions about nature of individuality have long history in science. In European scientific tradition, which originated from antique time, there exist different theories of individuality [41, 43, 45, 46, 48], the most wide spread of which are: theory of tempers, individual distinctions by type of thinking, perception of information and so on [13, 39, 40, 42, 44, 47].

Sport is one of the brightest manifestations of individuality. At present time there have been worked out conceptions of individualization in different kinds of sports and physical culture (outdoor games, martial arts, track and field events and etc.) [9, 17, 25, 28, 29, 32, 34]. However, nowadays especially urgent is working out of single conception of individualization in sports.

Many authors dealt with problem of sportsmen training's individualization [6, 9, 13, 36, 37, 43], but nearly all the accentuated only one certain indicator or group of indicators (potentials of nervous system, level of physical condition, specificities of somatic type and etc). These authors actually did not consider individual structure of a personality as system, combining different aspects (indicators of individuality). These indicators have certain links between each other and form certain structural units. In a number of works [13, 16, 17, 19] we presented algorithm of determination of individual abilities of sportsmen in game kind of sports according to their complex factorial structure of fitness and dynamic of separate indicators' progressing as well as sport result in general. In this work we generalized received earlier data in order to modify system of sportsmen training's individualization, training of sportsmen in game kinds of sports in conception of individualization in sports.

For working out of scientific-methodic principles of sportsmen training's individualization it is necessary to base on methodological principles of scientific research. The following principles can be named from them [13, 16, 17, 18, 19]:

1. Systemic approach combines physiological, psycho-physiological, psychological structures and functions in connections with external world;
2. Laws of information's development and its connection with time. That is why progressing of a person obeys to general laws of informational exchange and connection of information with time.
3. Usage of mathematical simulation for determination of individual features of sportsmen.
4. Usage of fundamental sciences for determination of sportsmen's individual features..

It is quite natural that account and registration of different indicators is rather a difficult task. These indicators reflect level of different systems' functioning in their interconnection and dynamic of changes. However, its solution corresponds to requirements of modern sports, which implies systemic approach to solution of any questions and corresponds to principles of complex scientific research.

On the base of generalization of literature data, own experiments and fulfilled theoretical analytical work we worked out general schema of individualization of sportsmen's training [13, 17].

The first direction of these series of researches implies creation of algorithm of mathematical systemizing and processing of wide spectrum of indicators, reflecting separate sides of fitness and sportsman's condition as a system. Such approach regards sportsman's condition at certain period of time. We assume determination of group (team) and individual structure of sportsmen's fitness. On the basis of found leading and delaying factors in individual structure of fitness in respect to general structure of sportsmen's fitness we construct training process. It implies to accentuate development of leading (60-80% of total means) and delaying factors (20-40% of means)[13, 17].

The second approach to scientific provisioning of training process is connected with analysis of factors, which condition individual dynamic of sportsmen's game efficiency. This approach implies construction of regression models of competition effectiveness's dynamic and application of these models for prognosis of competition results and management of training process.

The third direction of the researches in this field is connected with development of universal methods, which permit to individualize different aspects of training process. This direction implies that there are also universal methods of training. They initially contain systemic approach: they influence on all organism in the whole and are suitable for sportsmen of different qualification, age, anthropometrical data. These methods indirectly lead organism to individually optimal mode of functioning and create conditions for realization of correct for certain man actions.

Such methods can include regulation of physical load's intensity by subjective sensations, method of autogenic and mental control trainings, natural means of workability's rehabilitation [13, 17]. Besides, they can be exercises, built of movements by power lines of human electro magnetic field.

It should be noted that improvement of organization of such self organized system (as sportsman or team) can be realized in interaction with higher organized system. For example combined training with more qualified sportsman

or observation over his technical tactic actions. For this purpose, video records of world level sportsmen's performances can also serve. Observation over movements of qualifies master creates favorable background in consciousness for manifestation of own individual potentials.

Besides, using of autogenic training with concentration of natural images facilitates improvement of human organism's functioning and increasing of all systems' and organs' effectiveness. Also we can include improvement of separate techniques, increasing of quickness of operative thinking. Such influence of natural images is connected with the fact that they are reflection of higher organized system (nature) in comparison with individual [18, 19].

Thus, basing on the above said we can conclude that there are universal methods of individualization of sportsmen's training. These methods are all methods, oriented on connection with more organized system. In respect to human being more organized systems are: nature; cosmos; elite sportsmen.

Working out of theoretical methodic principles of sportsmen training's individualization expands range of training principles. In particular, principle of individualization progresses in system. Such system contains: theoretical conception and ways of its realization; complex of algorithms and methods, which permit to quickly and effectively determine individual features of sportsmen, prognosticate competition result and develop individually adequate training programs.

With the help of worked out conception we applied modern analytical apparatus to field of sportsmen training's individualization; it implies using of wide complex of research methods, effective generalization of received data, determination of leading factors in sportsmen's fitness, construction of individual regularities of competition efficiency's dynamic, working out of universal programs of training's individualization.

Algorithms of worked out theoretical conception were successfully applied in different sport games [13, 17, 19-22], Judo [23], sport orientation [32], that proves effectiveness of worked out principles.

Results of realization of the worked out conception of sportsmen training's individualization in different kinds of sports are as follows: our research showed effectiveness of practical realization of worked out principles of training's individualization in different kinds of sports. Effectiveness of this conception's application was shown in men basketball team (1^{st} grade players) [13], in women basketball team of Supreme league of Ukraine "BK-KhAI" [20] in women basketball team (players of 1^{st} and 2^{nd} grade) [19], in women volleyball team of Supreme league "Kharkovchanka" [17, 19, 21, 22].

We have determined [13, 19], that individual characteristics of basketbakk players and their specializations are not always connected with purely anthropometrical data. They also depend on a number of other physiological and psycho-physiological factors, which are confidently different for different specializations. Claster and factorial analysis permitted to work out individual programs of training of highest grade basketball players. Constuction of training process by these programs showed its effectiveness in results of pedagogic experiments.

Regressive analysis of individual regularities of competition functioning shows that individual competition functioning can be described by different non-linear functions with rather high confidence [19, 20].

Non-linear regression analysis showed that dynamic of game efficiency is described by, square, cube and sinusoid functions. Period of oscillations of female basketball players is 25-30 days (periods of physical and emotional bio-rhythms, period of ovarian –menstrual cycles) the same of male basketball players equals to 31-038 days (periods of intellectual and intuitive bio-rhythms). The most accurate regressive models of competition functioning's effectiveness are sinusoidal regressive models. They permit to determine rather exactly time, when competition efficiency can rise or fall. [19, 21].

As an example of determination of individual dynamic of competition functioning we can supply the received by us regularity. It is described by cubic function. The tested players of women basketball team of first league dependence of game functioning's effectiveness on time interval of game obeys to square ($y = b0 + b1x + b2x^2$) or cubic ($y = b0 + b1x + b2x^2 + b3x^3$) functions.

For example, this dependence of player X-t is described by cubic equation of regression (see fig.4), which looks like as follows (see fig.1):

$$S+ = 12,87 + 0,085T - 0,002T^2 + (5,618\ E\text{-}06)T^3 \qquad (1)$$

Where $S+$ -quantity of "positive" scores.

T – time interval, i.e. nmber of day from the first analyzed game.

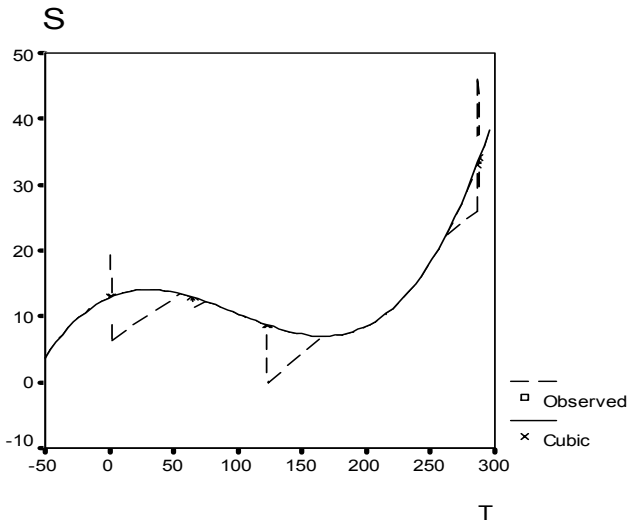

Fig.1. Cubic regression of iterconnection of "positive" scores' quantity, gained in game (S) and time interval of game (T) of player X-t (Observed- values, which were observed), Cubic- value of cubic function).

Table 1

Results of regression analysis of "positive" scores' quantity, gained in game (S) and time interval (T) of player X-t

The set variable	F criterion	Significance	b0	b1	b2	b3
t CUB	3.47	0.01	12.87	0.09	-0.002	5.618 E-06

Individual regularities of competition functioning's dynamic obey general laws of self-organizing systems' development. One of aspects of such regularities is oscillating processes. Dynamic of competition functioning depends on structure of sportsmen's fitness, leading and delaying factors. Besides, individual regularities of competition functioning's dynamic are determined by a number of factors, which can be divided conventionally into internal and external. These groups of factors are interconnected. With it internal factors, with their sufficient development, can block negative influence of external factors. Main factor of influence on dynamic of competition functioning is level of different kinds of fitness. May be there are also non-specific factors, which condition exactly laws of peaks and falls in sportsmen's competition functioning.

The conducted research showed that there are also universal methods of training, which initially contain systemic approach: influence on all organism in general and are suitable for sportsmen of different qualification, age, constitution. These methods directly lead organism to individually optimal mode of functioning and create conditions for realization of correct for certain person in certain situation actions.

Building of training process, basing on individual features of every sportsman, considering their individual structure of fitness rendered positive influence on level of players' special physical and technical fitness [19], on effectiveness of their competition functioning [19, 20].

Experimental group players (female basketball players of high class) demonstrated increasing of game effectiveness in comparison with prognosis by sinusoidal and cubic functions, which were determined before experiment [13, 19, 20].

Besides, we registered confident increase of game actions' effectiveness of separate players and all experimental group. In control group such picture was not registered. Coeefficient of variations of games actions' effectiveness reduced in experimental group. It witnesses about increasing of reliability of players' competition functioning [13, 19].

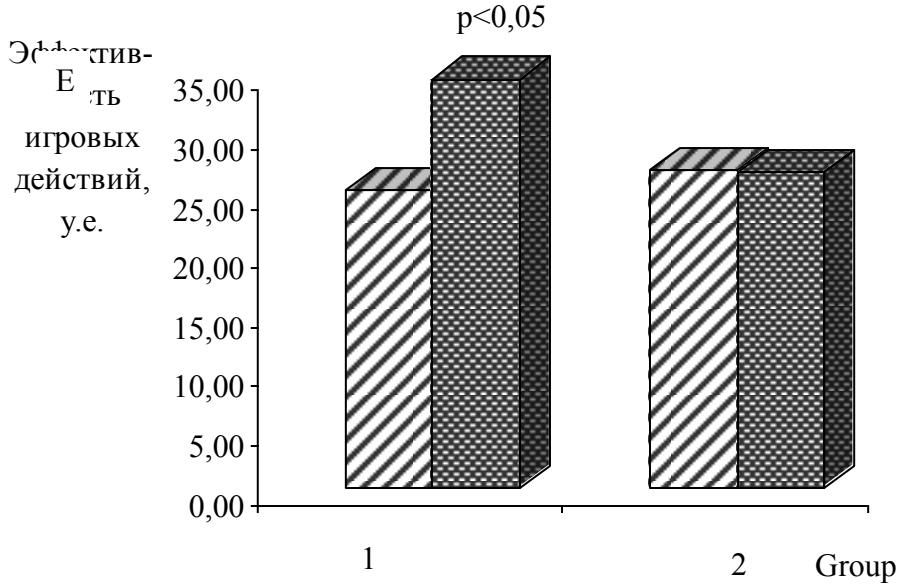

Fig.2. Individual effectiveness of games actions in experimental and control groups before and after experiment (quantity of games before experiment - 10, after experiment - 10):

* - p<0.05; - before experiment; - after experiment; E – effetiveness of competition actions, conv.un. 1 – experimental group; 2 –control group

Discussion

Analysis of literature and our own results showed that this work is the first, meaning development of theoretical-methodic principles of individualization of sportsmen's training. With it authors touch on working out of certain parameters of individualization of sportsmen's training and do not regard process of individual training from the point of view of system; analysis of wide complex of fitness's [7, 11, 12, 24, 25]. Before the present research individualization of sportsmen's training was regarded as specific problem [26, 27, 36], without creation of theoretical conception, principles, algorithms, apparatus of indicators' analysis, methods of research and certain methodic of optimization of training process. From this point of view our research is a novelty and is significant not only for theory and practice of sport training but also for other sciences (pedagogic, psychology, physiology and so on). That is why this work is a novelty, in which principle of individualization transforms in system with own structure, algorithm and mathematical apparatus.

Analysis of literature data [3, 4, 7, 30, 31] showed that problem of individual distinctions has long history and comes far behind the frames of single science (including theory and methodic of physical education and sports. From this point of view our work is an extension and addition of existing knowledge about individual nature of human being.

The most widely this problem is presented in psychology and psycho physiology [7, 42, 44, 45, 46]. Classic conceptions of individuality either reduce temper to different features of lower level of individuality or define temper as coming from higher planes of individuality – plane of personality. In out opinion our research permits to coincide these two approaches, add them with physiological parameters of individual distinctions, regard them in the light of certain manifestations in fulfilled actions.

Authors [42, 46, 48] regard problem of individual distinctions purely basing on psychological distinctions. They do not touch problem of individualization and analysis of a person as a system, which combine complex of different indicators. That is why, from this points of view our work is a novelty. We offer algorithm of construction of individual models of sportsmen's complex fitness. The models permit to assess individual distinctions in general, combining all measured indicators in single system.

Conclusions:

1. Analysis of literature witnesses about long history of determination of human individual features. This problem comes out of sports. It has natural, cultural, religious roots. We have shown interconnection of human individual features and his way of life with individual approach to sport practice.

2. We worked out conception of individual approach in sports. It implies marking out of leading factors in individual structure of sportsmen's fitness. One more aspect of this conception is analysis of regularities and prognosis of individual dynamic of competition efficiency. Working out of universal methodic of training's individualization is an

important parameter of the conception; the methodic imply activation of understanding of different aspects of training process.

2. We determined that application of system of individual approach in sports rendered positive influence on indicators of special physical and technical fitness and competition effectiveness.

In the future we offer to practically realize the worked out system of individualization of training process in different kinds of sports in domestic and foreign teams of high class.

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Cite this article as: Kozina Zh.L., Prusik Krzysztof, Prusik Katarzyna. The concept of individual approach in sport. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2015, no.3, pp. 28-37. http://dx.doi.org/10.15561/18189172.2015.0305

The electronic version of this article is the complete one and can be found online at: http://www.sportpedagogy.org.ua/html/arhive-e.html

Received: 17.01.2015
Accepted: 21.02.2015; Published: 23.02.2015

PHYSICAL DEVELOPMENT AND PHYSICAL PREPAREDNESS OF STUDENTS OF SPECIAL MEDICAL GROUP WITH THE DISEASE OF VEGETATIVE-VASCULAR DYSTONIA OF MIXED TYPE

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Annotation. *Purpose*: theoretically and experimentally substantiate the effect of the author's physical rehabilitation program to the level of physical development and physical fitness of students. *Material*: the study involved 40 students. Conducted teacher testing: sprinting, flexion and extension arms in emphasis lying on the floor, the rise in the saddle for 1 min., long jump from their seats, jump up from their seats, shuttle run (4 x 9 meters), torso forward from position sitting. *Results*: author's physical rehabilitation program includes physiotherapy, therapeutic massage, aqua gym, fitball gymnastics, acupressure and health food. The educational process is aimed at: the normalization of blood pressure and heart rate; balance of excitation and inhibition in the central nervous system; reducing the number of relapses; prevention of complications and hardening of the body; increase the level of physical fitness and health; acquire the necessary professional for students of applied skills. At the workshops, special attention is paid to the medical control, self-control and physical exercise techniques, taking into account contraindications. General and professionally applied physical preparation is carried out taking into account the features of students. *Conclusions*: It is recommended to attract students to self-realization of physical rehabilitation at home.

Keywords: vegetative-vascular dystonia, students, special medical groups, physical training, physical development.

Introduction

Recent years, in Ukraine there has been observed steady trend to increasing of morbidity of vascular system – from 2512.2 cases per 100 000 persons in 1991 to 4972.0 in 2013, i.e. twice; while prevalence of these diseases increased three times: from 19 607.5 to 58 429.0 cases per 100 000 persons [3, pg. 8–9]. Morbidity of vascular system and prevalence of these diseases take first place in structure of diseases. During 2005–2013 such kind of nosology increased by 12.2% in Sumskay region [4, c. 69–72].

Vegetative vascular dystonia (VVD) is most widely spread pathology, which repeats in population with frequency from 4.8 to 29.1 %. According to medical statistic of Ministry of health protection (MHP) of Ukraine, as on to day 631 thousand of patients with such pathology have been registered. Every year from 1500 to 1700 new cases of this disease are registered. It includes up to 15–20 % – of functional disorders of cardio vascular system. Among youth about 30 % of patients have VVD. It is considered that this disease is unpredictable by variety of its manifestations and after effects [6, pg. 102–105; 19, pg. 19–22]. This disease can progress, facilitating such heavy somatic diseases as ischemia of heart, hyper tonic disease, bronchial asthma, ulcer of stomach and so on. Correction of such disorders in due time permits to preserve heath and prevent from progressing of other diseases [2, pg. 9; 16, pg. 139–146; 17, pg. 17–20]. Main factors, which cause appearing of VVD, are: hereditary-constitutional features of vegetative nervous system's functioning (автосомно- dominant type of inheritance); diseases of endocrine glands (thyroid gland, adrenal glands, sex glands); endocrine reconstruction of organism [18, pg. 442–449; 20, pg. 208–225]. Often VVD is the most expressing in periods of hormonal reconstruction, for example in period of puberty. Besides, it is manifested: with stresses, neurosis, psycho-emotional tension, infections (tonsillitis, caries, sinusitis and so on). Besides, mental and physical overtiredness, inadequate physical loads, hyper dynamia can facilitate VVD. All mentioned result in sharp weakening of tolerance during dynamic loads. The other reasons of VVD can be the following: scoliosis, cervical osteochondrosis; disorders in mineral metabolism (especially Ca and Mg); unfavorable weather conditions, excessive mass of body, spending too much time to TV and PC [2, pg. 9–10; 14, pg. 17–34; 15, pg.119–130].

Recent time percentage of youth, who are members of special health groups (SHG), has been increasing. Some authors Ye.V. Bismak and O.V. Peshkov 2012) note that 60% of students can be related to main health group, 12-30% - preparatory group and 20-45% of students - to SHG. With it the problem of SHG completing has been still unsolved. Some authors (N.I. Shlyk, 1991; V.I. Dubrovskiy 1998) Offer to divide students by kinds of morbidity. They prove their position by the fact that indications and counter indications differ depending on character of morbidity [1, pg. 89–93; 13, pg. 36–40]. In opinion of other authors principles of students' distribution by medical groups shall include morbidity, level of physical fitness and physical workability, functional state of all organism's systems [5, pg. 29–32; 12, pg. 3–5].

Alongside with it problem of SHG completing is still an urgent one. Besides, here exists the problem of rational approach to physical culture classes in combination with physical rehabilitation means. All these are required for quicker rehabilitation of organism's functions, health improvement and increasing of physical and mental workability of SHG students. That is why working out and implementation of complex program of SHG students' physical rehabilitation, considering functional state of VS is an important scientific problem of to day.

The work has been fulfilled as per plan of scientific research works of Department of human health and physical rehabilitation of Sumy state pedagogic university named after A.S. Makarenko, of Ministry of education and

http://dx.doi.org/10.15561/18189172.2015.0306

science of Ukraine by topic :Theoretical methodological and organizational methodic problems of health, physical rehabilitation and correcting pedagogic" (state registration No, 0107U002826).

Purpose, tasks of the work, maqterial and methods

The purpose of the research – prove theoretically and experimentally influence of author's physical rehabilitation program on physical condition and physical fitness of SHG students with VVD of mixed type.

The tasks: analysis of author's physical rehabilitation program; determination of physical condition levels and physical fitness.

The methods of the research: theoretical analysis and generalization of scientific literature; analysis of medical records; pedagogic observation; pedagogic testing (sprinter run, pressing ups in lying position, rising in sitting position during 1 minute. Long jump from the spot, high jump from the spot, shuttle run (4 x (meters); forward torso bending from sitting position); methods of mathematical statistics.

The research was conducted on the base of Ukrainian bank academy of National bank of Ukraine (UBA NBU). In the research students – members of SNG , who had VVD of mixed type participated. We formed two homogeneous groups: main (MG) and control group (CG); each group consisted of 20 persons.

Main group was trained by author's physical rehabilitation program (PR), which included therapeutic gymnastics, therapeutic massage, aqua gymnastic, point massage, fit ball and health related eating. CH as trained as per traditional for SHG students' with cardio vascular diseases program.

Training process was oriented on the following: normalization of BP and pulse; balancing of excitation and inhibition processes in nervous system; reduction of repeated diseases; prevention from complications and hardening of organism; increase of physical fitness and workability; acquiring of important for students professional applied skills. At practical classes special attention was paid to medical control, self control and methodic of physical exercises, considering counter indications. General and professional-applied physical trainings were fulfilled considering students; functional potentials.

In MG trainings were conducted in individual or in small group method. Every class was built on the following principles: accessibility (selection of exercises and methods in compliance with students' self-feeling), gradual character (from simple to complex), repeated and systemic character – three timers a week.

Results of the research

Methodic of application of *therapeutic gymnastic* with VVD in different periods of rehabilitation envisaged usage of special physical exercises: static, speed-power, power, isometric, breathing and coordination exercises. They facilitated normalizing of BP, increase of chest's mobility and breathing rhythm, recreation of vestibular system's functioning, working out of correct stereotype of posture. The most favorable for organism were isometric exercises of little, middle and high intensity of 5-60 seconds' duration. Maximal vegetative effect was registered after 1-3 minutes after finishing of isometric exercises (phenomenon of Leonardo). Total duration of static exercises' fulfillment was determined by functional state of patient, period of rehabilitation, condition of muscular groups. Isometric exercises were alternated with breathing and relaxation exercises. For increasing of workability we used aerobic cyclic loads: dozed walking, run [8, pg. 54–56].

Fit ball gymnastic helped to balance excitation and inhibition processes in CNS, increase its controlling role in coordination of main organs and systems' functioning. Under influence of dozed physical exercises of fit ball gymnastic indicators of lipid metabolism are normalized, compensatory adapting potentials of vascular system. Trainings improve mood, reduce headache, giddiness, feeling of heaviness in heart. Training was started from therapeutic gymnastic (10-15 min.). Main part (40–45 min.) included fit ball gymnastic at middle rate (90–120 b.p.m.). Finalizing part included breathing exercises with fit ball and without it and breathing gymnastic by A.N. Strelnikova (15–20 min.). Fit ball gymnastic was arid out 2 times with quantity of repetitions of every exercises – 6-8 times with 1-3 starts. At first stage (September) we solved the following theoretical and practical tasks: formation of knowledge about fit ball and mechanism of its influence on organism; we trained under water exercises without ball; learned main initial positions on ball: sitting, lying, lying on abdomen. Heart rate of exercises' fulfillment was 90–120 b.p.m. At second stage (October – November) we formed knowledge of correct initial positions on ball in combination with upper limbs' movements, as well as exercises of different orientation and breathing exercises by A.N. Strelnikova. Every training had musical accompaniment, which also considered taste and interests of students. When training complex of exercises we used middle heat rate (123–126 b.p.m.). At third stage (December – May) we formed theoretical knowledge about improvement of motion functioning in fit ball and effectiveness of exercises. We included power exercises for different muscular groups, exercises for flexibility and coordination [10, pg. 288–296].

Main tasks of *therapeutic massage* are: prevention from relapse; normalization of BP; weakening of headache; improvement of psycho- emotional state. Methodic of therapeutic massage includes massage of upper part of back, neck, back of head and its part, covered with hairs. Besides, it includes massage of acupuncture points. We used stroking, rubbing, kneading, vibration, pats and "cutting". The course of massage includes10-12 sessions with pauses of 3-4 months between course [8, pg. 54–56].

Point massage was fulfilled as tone up (influencing on every point -0,5–1 min.) and as a relaxing one (influencing on every point – 4–5 min.). The course of massage consists of 12 sessions, which are conducted through the day. If required this course can be repeated, but not earlier than after one week. Students were trained at the end of every class 304 points every training. We recommended to students practicing of point massage independently in domestic conditions after 3-4 months or use it as emergency aid with vegetative crisis [7, pg. 15–23].

Aqua gymnastic trains heart muscle, vessels, stabilize BP, increase organism's adaptation to environment and to external irritators. In water exercises increase gas exchange and saturation of blood with oxygen; they gradually strengthen muscles, which stimulate work of heart-vascular and respiratory systems, the gastrointestinal tract and facilitate improvement of psycho-emotional state. Aqua gymnastic trainings were conducted in SHG 1-2 times a week (1training – 1 hour). Practical swimming training is composed of three parts: preparatory, main and finalizing [11, 289–293].

Program of swimming trainings in special health groups of HEE takes 9 months and is divided in 3 periods: 1) preparatory period (September-November). It is oriented on improvement of physical condition, acquiring of main motion skills, improvement of functional fitness; 2) main period (December- February). It is oriented on mastering of special exercises; 3) finalizing period (March – May). It is oriented on steady fixing of physical rehabilitation results, self analysis of therapeutic effect, objective analysis of functional fitness's changes, preparation of methodic recommendations and plans for aqua gymnastic for such contingent.

Health related eating is most important element of complex rehabilitation. When determining eating therapy we considered stage of disease's progress, state of digestion, presence of accompanying diseases or complications. We recommended for students to eat food, containing salts of magnesium, which have vessels' expanding, anti spastic effect, increase inhibition processes in brain, remove spasms of smooth muscles and vessels. They are cereals: wheat, buckwheat, oats; nuts, beans, carrot, parsley, dill. We also recommend to exclude from everyday eating pickles, marinade; to restrict taking salt up to 4,5 g per day, restrict usage of strong tea, coffee, chocolate, which excite central nervous system [9, pg. 66–70].

So, modern model of health related eating is of pyramid-like form. Basing on it and considering recommendations of health related eating we worked out diet for every student. The basis of this pyramid is bread, cereals and pasta, rice and potato (6-11 units a day). Source of energy, carbohydrates, fiber, vitamins of group B, iron is 1 unit (1 piece of bread, 150–200 g of porridge, 300–400 g of potato, 300–400 g of soup. Next level of our pyramid is: vegetables and fruits (5-8 units a day). They are source of fiber, vitamins and minerals. The more various vegetable and fruits are used (not less than 400 units a day) the better eating is balanced. I unit is 1 vegetable or fruit of middle size. 300–400 g of boiled or uncooked vegetables, 300–400 g of vegetable soup, 150 g of fruit juice. At next stage we recommend to eat chicken and fish, beans, eggs, nuts (2 – 3 units a day). Meat with fat we replaced by beans or by meat without fat. 1 unit is 85–90 g of meat, 0.5 of chicken breast, 300 g of sliced fish, 300 g of beans, 0.5 of egg, 2 spoons of nuts. The next go milk food (milk, kefir, yogurt, curd and cheese). This level of pyramid is a source of proteins and calcium. We recommend to use milk and milk food with low content of fats and salt. 1 unit is 250 ml of 1-% milk or yogurt, 30 g of cheese with fat not less than 20%. At the top of pyramid there are fat, oils, butter (rather seldom 2 – 3 units a day). They are source of vitamins A, E, D, K.

Pedagogic testing of physical fitness was conducted twice: at the beginning and at the end of every academic year. Working out of physical fitness's system envisages: determination of informational meaning of test; testing in group, homogeneous by sex, age and fitness.

So, MG students were offered complex program of physical rehabilitation, which includes all required elements of health improvement and is oriented on improvement of morphological functional and physical condition of such contingent.

Dynamic of physical condition progress (PCP): comparing PCP after PR course showed high level of 19 MG students (95%) and 1 student (5%) – had level above middle. Mean indicator of group was 0.730±0.08 conv. un. (by Shapiro –Wilka – 0.904±0.05.). In CG mean indicator was 0.664±0.08 conv. un. (by Shapiro –Wilka –0.970±0.77). 3 CG students (15%) had this indicator above middle and 17 students (85%) - high PCP (see table 1).

Table1

Dynamic of PCP indicator in period from 2011 to 2014

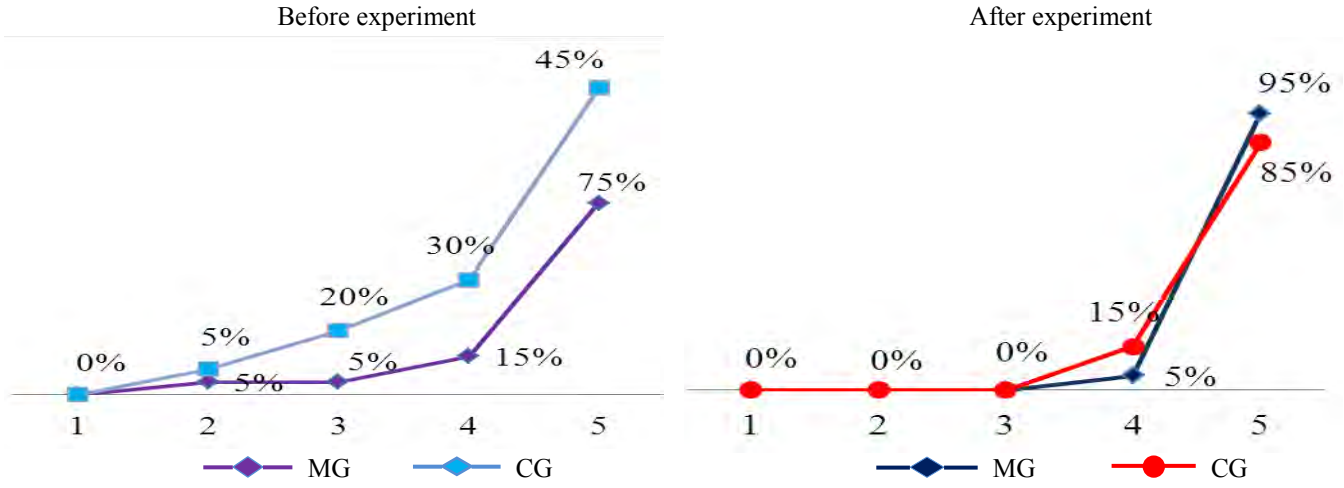
Mean indicator $\bar{x} \pm S$	MG			CG		
	1	2	3	1	2	3
2011–2012	0.612±0.1	0.681±0.1	0.714±0.1	0.551±0.1	0.625±0.1	0,632±0,1
Criterion of Shapiro – Wilka (W±p)	0.825±0.04	0.945±0.6	0.800±0.02	0.916±0.5	0.896±0.3	0,986±0,9
2012–2013	0.630±0.1	0.670±0.1	0.713±0.1	0.528±0.1	0.567±0.1	0,604±0,1
Criterion of Shapiro – Wilka (W±p)	0.917±0.3	0.906±0.2	0.951±0.6	0.948±0.6	0.892±0.1	0,932±0,4
2013–2014	0.622±0.1	0.709±0.1	0.727±0.1	0.561±0.1	0.620±0.1	0.659±0.1
Criterion of Shapiro – Wilka (W±p)	0.907±0.2	0.905±0.2	0.873±0.1	0.935±0.3	0.961±0.7	0.914±0.2

During 2011–2012 mean indicator of MG increased from 0.612±0.1 conv.un. to 0.714±0.1 conv.un. At the same time PCP increased by 22.2%. By the end of year PCP has become 100%. In control group this indicator changed only in one student (20%) and reached high PCP. 4 students (80%) showed no changes (I students with middle and 3 students with high PCP). Mean indicator increased a little – 0.551±0.1–0.632±0.1 conv. un.

1 student of MG (10%) improved PCP to 90% – high and 10% above middle PCP. Mean indicator increased by 0.616±0.1–0.713±0.1 conv.un. In 2012–2013 CG students showed the following improvement: quantity of students with high PCP – by 30%, mean indicator of group increased to 0.542±0.1–0.611±0.1 y.o.

In MG changes took place in 2013–2014: quantity of students with high PCP increased by 27.2% (total quantity - 10 students). Only 1 student (9.1%) showed above middle indicator of physical condition. Mean indicator of group changed to 0.62±0.1–0.87±0.1. PCP of CG students changed indicator "above middle" by 15.4% in 2013–2014. At the end of this period PCP was the following: 3 students (23%) – "above middle" and 10 students (77%) – high PCP. In CG we registered no middle level.

Having analyzed dynamic of PCP change in 2011–2014 of MG students, we came to conclusion that "high level" indicator increased by 20%. Indicator "above middle" reduced by 10%. Such levels as below middle and middle were not registered at all. In CG, in the same period indicator "high" level was 85%, "above middle" – reduced by 15%. Such levels as below middle and middle were not registered at all. So, the received results witness about improvement of PCP in both groups but with MG domination (see fig.1).



Notes: 1 –low; 2 – below middle; 3 – middle; 4 – above middle; 5 – high

Fig.1. Dynamic of changes of physical condition's levels during experiment

Physical fitness of special health group students: 2 times a year we conducted pedagogic testing and estimated influence of PR program, worked out by us, on development of speed-power qualities of SHG students with VVD of mixed type (see table 2 and table 3).

Table 2

Dynamic of main group students' physical fitness for 2011–2014

№/№	Indicators	2011–2012 n=9 $\bar{x} \pm S$		2012–2013 n=10 $\bar{x} \pm S$		2013–2014 n=11 $\bar{x} \pm S$	
		1	2	1	2	1	2
1.	100 meters' sprinter run (sec.)	21.7±0.55	21.4±0.5	21.9±0.5	21.5±0.6	21.9±0.4	21.6±0.5
2.	Pressing ups in lying position (times)	18±3.0	21.0±3.3	17.8±2.0	19.0±1.8	24.8±1.8	29.9±2.1
3.	Torso lifting from lying position in sitting one during 1 min. (times)	21.7±1.4	24.0±1.7	27.2±1.2	22.0±3.1	28.3±1.4	32.0±1.4
4.	Long jump from the spot (cm)	152±3.7	155±3.7	165±4.2	160±3.6	166±4.3	169±4.3

5.	High jump from the spot (cm)	25.0±1.4	29.0±1.4	28.2±1.6	27.0±2.2	29.1±1.9	34.9±1.3
6.	Shuttle run (4x9 meters), sec.	12.9±0.1	12.6±0.1	11.9±0.2	11.8±0.3	12.0±0.2	11.7±0.2
7.	Forward torso bending from sitting position, cm.	14.4±2.3	20.2±2.5	21.0±2.5	17.8±1.9	22.9±2.3	26.8±2.7

Pedagogic testing included: 100 meters' sprinter run, pressing ups in lying position, torso lifting from lying position in sitting one during 1 min, long jump from the spot, high jump from the spot, shuttle run (4x9 meters) and forward torso bending from sitting position.

Table 3

Dynamic of control group students' physical fitness for 2011–2014

№/№	Indicators	2011–2012 n=9 $\bar{x} \pm S$		2012–2013 n=10 $\bar{x} \pm S$		2013–2014 n=11 $\bar{x} \pm S$	
		1	2	1	2	1	2
1.	100 meters' sprinter run (sec.)	22.0±0.5	21.5±0.6	21.3±0.4	41.9±19.9	20.3±0.6	20.4±0.3
2.	Pressing ups in lying position (times)	16.0±1.7	19.0±1.8	21.3±1.8	26.3±2.0	25.8±1.3	31.1±1.3
3.	Torso lifting from lying position in sitting one during 1 min. (times)	15.6±3.0	22.0±3.1	24.9±2.1	29.5±1.5	27.8±1.3	31.3±1.5
4.	Long jump from the spot (cm)	157±3.4	160±3.6	165±4.0	168±4.5	169±5.9	176±7.0
5.	High jump from the spot (cm)	23±1.5	27±2.2	24±1.6	27±1.3	28±0.7	50±18.9
6.	Shuttle run (4x9 meters), sec.	12.4±0.3	11.8±0.3	12.0±0.2	11.6±0.2	11.9±0.1	11,6±0.1
7.	Forward torso bending from sitting position, cm.	13.8±1.9	17.8±1.9	20.7±1.2	23.9±1.5	20.6±2.2	24.8±2.6

Comparing results of sprinter run we came to conclusion that this indicator remained unchanged in both groups. In MG mean indicator was 21.4±1.5 sec (0.88±0.01 by Shapiro Wilka) and in CG – 20.5±1.3 sec. (0.83±0.002 by Shapiro-Wilka). Pressing ups in lying position improved in both groups in average by 6±0.1 times. In MG mean indicator was 26.1±9.2 times (0.93±0.15 by Shapiro-Wilka) and in CG – 28.6±7.1 times (0.91±0.09 by Shapiro-Wilka).

Torso lifting from lying position in sitting one during 1 min. in MG: improvement happened at the end of PR course in average by 3.5 times. Mean indicator was 28.9±6.1 times (0.94±0.27 by Shapiro-Wilka). In CG this indicator increased, in average, by 6.5 times. Mean indicator was 30.7±5.3 times (0.97±0.85 by Shapiro-Wilka).

After PR course long jump from the spot of MG students increased by 4.4 cm. Mean indicator was 163.1±14.3 cm (0.95±0.39 by Shapiro-Wilka). In CG this indicator increased at the end in average by 9.7 cm. Mean indicator was 172.2±21.6 cm (0.82±0.002 by Shapiro-Wilka).

High jump from the spot in MG increased, in average, by 6.6 cm and by 4.5 cm in CG. Mean indicator, accordingly, was 32.7±4.9 cm (0.95±0.49 by Shapiro-Wilka) and 29.6±3.8 cm (0.96±0.64 by Shapiro-Wilka).).

Indicator of shuttle run (4 x 9 meters) in MG and CG remained unchanged and was 12.1±0.8 sec. (0.96±0.64 by Shapiro-Wilka) and accordingly 11.5±0.6 sec. in CG (0.90±0.05 by Shapiro-Wilka).

Forward torso bending from sitting position increased in average by 4.1 cm in MG and by 4.2 cm in CG. Mean indicator was 23.8±9.0 cm (0.95±0.43 by Shapiro-Wilka) and, accordingly, by 22.9±8.9 cm (0.95±0.42 by Shapiro-Wilka).

After PR course level of MG students' physical fitness was: 7 students (35%) had low level and 13 students (65%) – below middle. There happened improvement in 1 student (5%), which reached below middle level of physical fitness. In CG: 25% (5 students) had low and 75% (15 students) – below middle level of physical fitness.

Discussion

Having analyzed dynamic of PCP changes in MG in period 2011–2014 we came to conclusion: indicator "high level" increased by 20%, "above middle" – reduced by 10%. Such levels as "below middle" and "middle" were not registered at all. There happened changes in following indicators: pressing ups in lying position increased by 6 times; torso lifting from lying position in sitting one during 1 min. improved by 3.5 times; long jump from the spot improved by 4.4 cm; high jump from the spot – by 6.6 cm; стрибок у довжину з місця збільшився на 4,4 см; стрибок вгору з місця на 6,6 cm; forward torso bending from sitting position improved by 4.1 cm; shuttle and sprinter run remained unchanged. Physical fitness level in this group changed only in 1 student (5%), which reached below middle level.

In CG in the same period PCP was high in 85% of students, indicator "above middle" reduced by 15%. Such levels as "below middle" and "middle" were not registered at all. Improvements were in the following indicators of physical fitness: pressing ups in lying position improved by 6 times; torso lifting from lying position in sitting one during 1 min – by 6.5 times; long jump from the spot increased by 9.7 cm; high jump from the spot – by 4.5 cm; forward torso bending from sitting position improved by 4.2 cm; shuttle and sprinter run remained unchanged. Level of physical fitness was perfected by 2 students (10%), who reached below middle level.

Theoretical analysis and generalization of special scientific and methodic literature sources [1-7, 17-20] showed that in the most often cases VVD appears under influence of mental over tension, hereditary factors and wrongly organized regiment of studying and rest. The mentioned above has been proved by conducted by us researches.

So we grounded, for the first time, and tested new complex program of physical rehabilitation for SHG students with VVD of mixed type. The program corresponds to modern principles of physical rehabilitation, considering previous achievements in this field. The worked out by us complex program is oriented on the following: overcoming of VVD symptoms in period of remission; normalization of BP and pulse; general hardening of organism, reduction of duration and quantity of disease's recurrence; improvement of physical fitness and physical condition indicators; involvement of students in self realization of physical rehabilitation in domestic conditions.

We have proved that worked out by us complex physical rehabilitation program for SHG students with VVD of mixed type is effective and purposeful at different stages of physical rehabilitation. The program contains modern approaches to physical rehabilitation of such contingent and combines traditional and non-traditional means of health's recreation.

Conclusions:

In the course of our researches we proved that it is necessary to work out health related rehabilitation program for special health group students, who have vegetative vascular dystonia of mixed type, in connection with deficit of programs for such contingent of persons.

We proved that quantity of persons with vegetative vascular dystonia of mixed type is increasing.

We have practically tested effectiveness of author's program for SHG students with VVD of mixed type and recommend them to move in main group.

The prospects of further researches imply perfection and implementation of author's program of physical rehabilitation for special health group students with vegetative vascular dystonia of mixed type in higher educational establishments.

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Cite this article as: Olchovik A. V. Physical development and physical preparedness of students of special medical group with the disease of vegetative-vascular dystonia of mixed type. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2015, no.3, pp. 38-45. http://dx.doi.org/10.15561/18189172.2015.0306

The electronic version of this article is the complete one and can be found online at: http://www.sportpedagogy.org.ua/html/arhive-e.html

Received: 17.01.2015
Accepted: 17.02.2015; Published: 23.02.2015

PSYCHOLOGICAL AND PSYCHO-PHYSICAL TRAINING AS A FACTOR OF PERSONAL ANXIETY AT STUDENTS

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Annotation. *Purpose*: to test the hypothesis that the proposed content of the psychological and psycho-physical preparation of students of railway high schools in the physical education is effective in terms of reducing the high level of personal anxiety. *Material*: the study involved 120 students who had high levels of trait anxiety. Age of study participants was 17 - 19 years. Psychological diagnostics level of personal anxiety in students was conducted using a scale assessing the level of reactive and personal anxiety Ch.Spilberger. *Results*: the use in psychological and psycho-physical training in the classroom for physical education for men (significant sports - athletics and powerlifting) and girls (aerobics and Sahaja Yoga) significantly influenced the decline in their personal anxiety. *Conclusions*: It is recommended that training on physical education to carry out the following structure. Preparatory part of the class - 10 minutes. Basically - 75 minutes. Of these, 25 minutes - to solve the traditional problems of physical education students to build their motor skills and the development of physical qualities. 20 minutes - was given to the students to perform specific exercise. 30 minutes devoted to the main part of a busy professional significant sport. The final part - 5 minutes.
Keywords: psychological, psycho-physical, preparation, physical education, personality, anxiety.

Introduction

From the points of view of professional significance such feature (characteristic) of specialist as personal anxiety is of special interest for railway transport. In psychology it is regarded as individual psychological feature, which is manifested in person's bent to frequent and intensive feelings of alarm; in low threshold of its appearing. In its turn alarm is interpreted as feeling of emotional discomfort, connected with expectation of misfortune or danger. In psycho therapy attention is paid to connection of this feature with neurotic behavior of people [3, pg.40]. It also rather influences on such characteristic of modern specialist as his (her) emotional stability. The latter in many cases determined effectiveness of functioning and is regarded as person's ability to preserve psychic and psycho-motor processes, for maintaining of professional effectiveness under influence of emotion causing factors.

In some professional characteristics of railway specialties anxiety is noted as quality, hindering from effective professional functioning (organization of transportation and management on railway transport, bridges and transport tunnels). In our opinion high indicators of students' personal anxiety shall be reduced.

The problem of anxiety was studied by Z. Freud, K. Horny, Ch. Spilberger, R. May, A.M. Prykhozhan, F.B. Berezin, Yu.L. Khanin et al. Recent years different aspects of the problem have been studying by T.A. Arutiunyan [1], I.V. Vozhentseva [2], Ye.M. Kaliuzhna [5], O.V. Kuznetsova [6], G.A. Mamadaliyeva [7] et al. Among foreign works it should be noted [11-20] and many other.

In physical education there also exists interest to this problem. In this context we should note researches by Ya.S. Yermolayev [4]. Analysis of above mentioned works shows that, in spite of obvious results, there have remained still more questions. To full extent it concerns possibility of usage of physical culture means for weakening of students' high personal anxiety. In the frames of researching of formation of personality's professionally important features in process of psychological and psycho-physical training we determined its influence on weakening of students' personal anxiety.

The work was fulfilled in compliance with topical plans of scientific research works of physical education department of Dniepropetrovskiy national university of railway transport, named after academician V. Lazaryan. It is a component of topic "Theoretical-methodological and pedagogic principles of psychological and psycho-physical training of students in process of physical education" (state registration number 0113U006237).

Purpose, tasks of the work, material and methods

The purpose of the research is testing of assumption that the offered content of psychological and psycho-physical training of railway students in process of physical education is effective in reducing of personal high anxiety.

The tasks of the research:

1. Testing of assumption that psychological and psycho-physical students' (boys) training in process of physical education (which includes athletic gymnastics and power lifting) positively influence on reduction of personal anxiety's level.
2. Testing of assumption that psychological and psycho-physical girl students' training in process of physical education (which includes aerobics and sahadzha yoga) positively influence on reduction of personal anxiety's level.

In the research 120 students of Dniepropetrovskiy national university of railway transport, named after academician V. Lazaryan participated. They were 60 boys and 60 girls. Age of participants was 17-19 years. Sample was formed in the following way. At the beginning of academic year we carried out psychological diagnostic for

http://dx.doi.org/10.15561/18189172.2015.0307

determination of first year students' situational and personal anxiety. By results of materials' processing we determined students with high level of personal anxiety. These students were offered to take part in the research. We formed one experimental and one control groups of boys and one experimental and one control groups of girls. Every group consisted of 30 persons.

Results of the research

Assumption that athletic gymnastic and power lifting (included in block of psychological and psycho-physical training of railway students) effectively influence on weakening of boys' personal anxiety and aerobics and shadzha yoga have the same effect on girl students became experimental hypothesis.

As independent variable we accepted: for boys – fulfillment of athletic and power lifting exercises by boys and aerobics and sahadzha yoga exercises by girls at physical culture lessons. In the course of trainings we used also other blocks of psychological and psycho-physical training of railway students.

Statistically "zero" hypothesis was assumption that shift between indicators of students' personal anxiety of experimental and control groups at initial and final stage did not differ from zero significantly.

As alternative we made assumption that shift between indicators of students' personal anxiety of experimental and control groups at initial and final stage differ from zero significantly.

For statistical processing of the obtained data we used t-criterion of Stjudent for the samples.

Students (both boys and girls) of experimental groups were involved in physical education trainings, which included studying of worked out by the author principles of psychological and psycho-physical training of railway students [8, 10]. The classes included:

1. Studying of theoretical material, included in part of psychological education.
2. Practicing of kinds of sports, which in the author's opinion can improve students' self-confidence and as a result weaken level of personal anxiety. For boys they were athletic exercises and power lifting; for girls – aerobics and sahadzha yoga.
3. Application of psycho-training means for development of attention.
4. Application of special physical exercises for development of psycho-motor abilities.
5. Participation in sport competitions.
6. Exercise for self-regulation of mental state (autogenic training).

In the process of academic classes we also solved traditional tasks of physical education on formation of motion skills and development of students' physical condition.

Control group students were trained only as per academic program for higher educational establishments.

The structure of academic classes on physical education in experimental groups was as follows: 10 minutes – warming up; 75 minutes – main part. From 75 minutes 25 were devoted to traditional tasks of physical education on formation of motion skills. 20 minutes were devoted to special physical exercises or psycho-training, or self- regulation exercises. In structure of certain lesson we used only one from the mentioned blocks. 30 minutes of main parts were devoted to professionally important kind of sports. Final part took 5 minutes.

Psychological diagnostic of students' personal anxiety was fulfilled with the help of scale for evaluation of level of responsive and personal anxiety by method of Ch. Spilberger.

Students of experimental groups had to master program of psychological and psycho-physical preparation. They were explained that mark for this section was a component of general mark for "physical education" discipline.

3By the result of first cross section we formed experimental and control groups. Their characteristics are given in table 1.

Table 1.

Level of personal anxiety of experimental and control groups' students before experiment (N=120)

	Boys		Girls	
	Experimental group	Control group	Experimental group	Control group
Mean arithmetic	49.6	49.6	53.1	52.96
Median	48.5	48.5	52	52
Mode	46	46	61	61
Standard deviation	3.69	3.62	5.34	5.49

As we can see in the table experimental and control groups had close indicators of students' personal anxiety before experiment.

Repeated cross section was fulfilled at the end of forth semester. Experimental and control groups had characteristics, given in table 2.

Table 2.

Level of personal anxiety of experimental and control groups' students after experiment (N=120)

	Boys		Girls	
	Experimental group	Control group	Experimental group	Control group
Mean arithmetic	48.2	49.43	52.23	53.13
Median	48	48.5	52	52
Mode	46	46	60	61
Standard deviation	3.94	3.69	5.99	5.61

Secondary statistical processing of experimental data was carried out with Stjudent's t criterion for dependent samples. As a result of this work we determined: a) indicators, which were in zone of insignificance (control groups of boys and girls); b) indicators in zone of significance (experimental groups of boys and girls). On the base of it: a) we made conclusion about validity of zero hypothesis concerning boys' and girls' control groups; b) concerning experimental groups of boys and girls we refused this hypothesis and proved validity of alternative one.

Planning experiment, we based on the fact that professional functioning at railway transport often is accompanied by significant emotional tension, which is connected with high responsibility for life of passengers and safety of loads. It negatively influences on specialists' workability, results in mistakes, negatively influences on specialists' health.

Discussion

Studying of professional characteristics of railway specialties showed that for important railway specialties, such as "Organization of transportation and management at railway transport", "Electric transport", "Bridges and transport tunnels" and other there is a list of personality's features, hindering from effective professional functioning. Among them there was personal anxiety. The author's researches showed that high indicators of personal anxiety were manifested by 14 % of boys and 49 % of girls, who study at railway HEE [9]. This situation requires appropriate response, conducting of work on weakening of personal anxiety in this category of student. In our opinion psychological and psycho-physical training of railway students in process of physical education can reliably help in solution of this problem. For testing of this assumption we conducted experiment. In our experimental hypothesis we assumed that psychological and psycho-physical training in process of physical education, oriented on weakening of personal anxiety would significantly reduce students' personal anxiety. For testing of this assumption we conducted experiment, in which four groups of students participated: two experimental (boys and girls) and two control (boys and girls). Control groups' students mastered traditional physical education program for HEE students (HEE of third and forth accreditation levels). Experimental groups' students had to master, except mentioned traditional program, block of psychological and psycho-physical exercises, oriented on weakening of personal anxiety.

Experiment's results on dynamic of personal anxiety's change witness about the following: in control groups (boys and girls, who trained traditional exercises of physical education) there happened no substantial (statistically confident) reduction of personal anxiety's level. It is proved by absence of appropriate statistical indicators. In our opinion it is explained by insufficient usage of exercises for reduction of personal anxiety in traditional sport and physical culture functioning.

As far as experimental groups concern (boys and girls) in them, at the end of experiment, we received statistical data, which show substantial reduction of personal anxiety's level. Dynamic of these changes was statistically determined with the help of Stjudent's t-criterion for dependent samples. It showed that they are located in zone of significance. With it in experimental group of boys we registered more intensive reduction in comparison with girls' experimental group. In our opinion it can be explained by different influence of means, used in trainings, on boys and girls.

The received in experimental groups results permit to say that experimental hypothesis has been proved. Usage of athletic and power lifting exercises for boys and aerobics and sahadzha yoga exercises for girls, in process of psychological and psycho-physical trainings, statistically confidently influenced on weakening of students' personal anxiety.

The received in experiment data prove opinion of V.I. Garbuzov. He thinks that in complex, unconscious perception of "Self" "muscular sense" plays important role. Strong skeleton, developed muscles cause person's self-confidence [3, pg. 43]. For girls acquiring of dexterity and slimness is of the same importance. In our opinion exactly experimental group students' self-confidence caused reduction of personal anxiety's level.

Conclusions:

The main conclusions of experiment are as follows:

1. Hypothesis that psychological and psycho-physical training in process of physical education is and effective mean of reduction of students' personal anxiety has been experimentally proved.

2. In boys' experimental group effectiveness in reducing of personal anxiety was showed by athletic and power lifting exercises. They were main block of system of this category students' psychological and psycho-physical training.

3. In experimental group of girls with high level of personal anxiety effectiveness in its reducing was demonstrated by aerobics and sahadzha yoga exercises. They were main block of system of this category students' psychological and psycho-physical training.

The prospects of further researches we connect with determination of purposefulness of other kinds of sport and physical culture functioning for weakening of students' personal anxiety.

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Cite this article as: Pichurin V.V. Psychological and psychophysical training as a factor of personal anxiety at students. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2015, no.3, pp. 46-51. http://dx.doi.org/10.15561/18189172.2015.0307

The electronic version of this article is the complete one and can be found online at: http://www.sportpedagogy.org.ua/html/arhive-e.html

Received: 28.01.2015
Accepted: 17.02.2015; Published: 23.02.2015

THE DYNAMICS OF THE FOCAL QUALITIES IN GIRLS AGED 10-15 YEARS

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Annotation. *Purpose*: determine the dynamics of focal qualities in girls of secondary school age. *Material*: is used stabiloanalizer with biofeedback STABILAN-01. The study involved 254 girls (age - 10-15 years). To assess the temporal and spatial parameters of motor actions reproduce the trajectory of the girls (which is shaped like a triangle) and the rate of passage. *Results*: the obtained data on averages percent error when playing a temporal and spatial parameters of motor actions girls. Revealed that girls have a better ability to manage spatial than temporal parameters of motor coordination. A high coefficients of variation in all parameters. *Conclusions*: the results indicate large individual differences in the level of development of coordination abilities of girls at this age. This is reflected in the effectiveness of teaching motor actions. Also confirms the assumption about the possibility of taking into account these indicators as criteria for selecting a method of differentiated teaching motor actions of girls of secondary school age.
Keywords: spatial, temporal, parameters, criteria, differential, learning, motor, girls, age.

Introduction

Effective solution of pedagogic tasks, oriented on formation of schoolchildren's motion functions at physical culture classes has been acquiring great significance in connection with society's demand in increasing of quality of rising generation's physical fitness [8, pg. 9]. In this aspect theory of control (by V.V. Petrovskiy) can be of great use. This theory bases on principle that coordination is characterized as person's ability to control movements [5, pg. 129]. A little bit different statement is delivered in work by M.O. Bernstein, in which coordination is determined as "overcoming of excessive steps of freedom of our motion organs and transformation of them in controlled systems" [2, pg. 54].

It is known that process of movements' training is closely connected with development of coordination. Also it is regarded as specific form of delivering of knowledge about movements and mastering of special skills, which reflect motion experience of previous generations [11, pg. 30]. It should be supplemented by the fact that level of coordination's development is a basis of successes in different spheres of human motion functioning [10, pg. 1]. In its turn appropriate sides of person's motion qualities are conditioned by previous motion experience and are realized in conditions of fulfillment of actions with complex coordination. Their result depends on accuracy of differentiation of space, time and power motion's parameters [8, pg. 52]. They are ensured by complex interaction of central and periphery links of motor system on the base of back apperentice (transmitting of impulses from working centers to nervous ones) and have expressed age and gender specificities (V.S. Farfel, 1975; Ye.P. Ilyin, 1976; V.V. Filatov, 2009) [15, pg. 48].

On the other hand complex character of physiological mechanism of human motion functioning's organization and complexity of its quantitative evaluation resulted in the fact that in conditions of physical education and sports, system of evaluation of coordination requires further scientific foundation [18, pg. 52]. Alongside with it researches of scientists (V.S. Farfel, 1959-1975; M. Prasilova, 1981; I. Yurinova, 1982; L.Ye. Liubomyrskiy, 1983; V.I. Liakh, 2006; A.M. Kolumbet, **2012**) showed that development of coordination goes in hetero- chronic way; on the age from 7 to 9 years old indicators of coordination increase the most intensively as well as in the age from 9 to 11-12 years old. [16, pg. 63]. In this aspect the most important are biomechanical regularities of motion actions, the base of which are works by V..K. Baksevych, N.A. Bernstein, D.D. Donskoy, V.M. Zatsiorskiy, V.B. Korenberg, V.I. Liakh, L.P. Matveyev, N. A. Fomina.

It is known that level of coordination's development of a person depends on level of central and periphery nervous systems' development (to be more exact – on sensor-motor analyzers): visual, hearing, vestibular and kinetic-static. Interaction of these complex physiological mechanisms is reflected in ability to accurately differentiated power, time and space parameters of person's movements. They are integral indicators of coordination of human organism's Відомо, що рівень розвитку координаційних якостей людини залежить від рівня розвитку центральної та motion functions [14. pg. 110]. That is why, when characterizing memories efficiency, mistakes in motion actions can depend on effector reasons that inevitably spoil indicators of memorizing [4, pg. 4]. As per theory of functional systems by P.K. Anokhin, useful result (motion skill) will be a system forming factor for transformation and fixing of central mechanisms of coordination [1].

As it was noted by some researches (M.M. Bogen, V.I. Goncharov, D.D. Donskoy, N.V. Zymkin, T.Yu. Krutsevych, G.F. Korotko, V.M. Pokrovskiy, V.V. Frolov) motion coordination means accordance of body links in space, time and by power parameters, which corresponds to fulfilled motion task in certain condition. It actualized problem about purposefulness of consideration of motion coordination as criterion of differentiation of middle school age girls' training to motion skills.

The research has been fulfilled in compliance with combined plan of scientific research works of Chernigov national pedagogic university, named after T.G. Shevschenko "Didactic principles of motion function's formation of

http://dx.doi.org/10.15561/18189172.2015.0308

persons, practicing physical culture and sports" (state registration number 0108U000854 date February 19th, 2008) and in compliance with state financed topic "Pedagogic ways of health life style formation of different age schoolchildren (state registration number 0112U001072 date, January 18th, 2012).

Purpose, tasks of the work, material and methods

The purpose: determination of dynamic of coordination's development of 10-15 years old girls.

The material and methods: analysis of scientific methodic literature; application of stability analyzer with biological feedback "Sabilan-01". The research was carried out on the base of Chernigov national pedagogic university, named after T.G. Shevchenko. In the research 254 girls of middle school age participated: 44 girls of 10 years old; 36 girls – 11 years old; 50 girls – 12 years old; 34 girls – 13 years old; 44 girls – 14 years old; 46 girls – 15 years old.

We used automatic measuring complex "Stabilograph", which permitted to quickly evaluate coordination in the process of movement.

We chose this complex, basing on the fact that indicators of coordination permit to prognosticate level and quickness of motion skills' formation [11, pg. 130].

For evaluation of time and space parameters of girls' movements we used methodic "Triangle" with the help of stability analyzer with biological feedback "Stabilan-01". It included two stages: training and analysis. At the stage of training the teasted reproduced trajectory of movement (triangle by shape) and temp of passing, while at the stage of analysis – passing of trajectory without markers, in the set temp. By this methodic we studied time parameters of movement by the following parameters: dispersion of passing periods (stage of training (LenQTest,sec.) and stage of analysis (LenQAnal, sec.)), dispersion of quickness of passing (training stage (SpdQTest, mm.p.sec.) and stage of analysis та (SpdQAnal, mm/p/sec.)) and space parameters by indicators: dispersion of triangles' area (training stage (SqrQTest, mm ^{2}) and stage of analysis (SqrQAnal, mm ^{2})), random error of triangle's center by axis X (training stage (MdRndXTest, mm) and stage of analysis (MdRndXAnal, mm), random error of triangle's center by Y axis (training stage (MdRndYTest, mm) and stage of analysis т (MdRndYAnal, mm)).

Results of the researches

As a result of experiments we received mean indicators of errors' percentage found with reproduction of time parameters of middle school age girls' movements (see table 1).

Table 1

Time parameters of 10-15 years' old girls' movements

Stages	Age / Indicators	10 years	11 years	12 years	13 years	14 years	15 years
Training stage	LenQTest, sec.	9,11± 0,50	8,87± 0,88	9,02± 0,70	9,13± 0,42	8,81± 0,68	8,71± 0,39
	SpdQTest, mm.p. sec.	4,.62± 1.77	3.73± 0.48	4.01± 1.13	4.96± 1.97	4.91± 1.53	3.95± 1.40
Analysis stage	LenQAnal, sec.	11.36± 0.80	11.34± 0.94	11.43± 0.68	12.07± 0.95	11.31± 0.70	11.29± 0.83
	SpdQAnal, mm.p. sec.	4.74± 1.77	3.70± 1.44	3.97± 1.21	4.76± 1.66	3.34± 1.33	3.28± 0.87

In group of 10 years' old girls percentage of errors in dispersion of passing periods in training stage (LenQTest, sec.) was 9.11±0.50%, at analysis stage it increased up to 11.36±0.80%. In group of 11 years' old girls, at training stage it was 8.87±0.88% and at analysis stage – 11.34±0.94%. For 12 years' old girls percentage of the same errors was 9.02±0.70%, at analysis stage – 11.43±0.68%; for 13 years old girls - 9.13±0.42% and 12.07±0.95%. In period 12-13 years' old age these indicators worsen that is connected with intensive growth of body's bio-links and period of puberty (appearance of menarche). In 14-15 age period these indicators were at training stage 8.81±0.68%, 8.71±0.39%. At analysis stage (11.31±0.70%, 11.29±0.83%) they improve in connection with relative stabilizing of growth of girls' organism.

Percentage of dispersion of triangles' passing quickness for 10-11 years old girls was at training stage 4.62±1.77% and 3.73±0.48%, and at analysis stage 4.74±1.77% and 3.70±1.44%. In period of puberty these indicators increase (12-13 years' old age) at training stage up to 4.01±1.13% and 4.96±1.97% and at analysis stage to 3.97±1.21% and 4.76±1.66%. In period of 14–15 years old age indicators of errors' percentage reduce: at training stage to 4.91±1.53% – 3.95±1.40%, at analysis stage – to 3.34±1.33% – 3.28±0.87%.

Variation coefficients of the researched indicators are rather different with analysis of indicators of time parameters' reproduction.

For 10 years' old girls variation coefficient of errors' percentage in periods of passing was at training stage 5.49% and at analysis stage – 7.04%. At age of 11, 12 and 14 years old variation coefficient increased and at training stage it was accordingly: 9.92%, 7.76% and 7.71% at analysis stage – 8.21%, 5.95% and 5.80%. In age of 13 and 15 years old variation coefficient reduced: at training stage to 4.60% and 4.48%; at analysis stage – to 7.87% and 6.92%. Variation coefficient for quickness of passing at training stage was the highest in age group of 10, 13, 14 and 15 years' old – 38.31%, 39.72%, 31.16% and 35.44%, they are quite less in age group of 11 and 12 years old – 12.87% and 28.18%. At analysis stage variation coefficients of certain indicator nearly in all age groups are high: 10-14 years – 37.34%, 38.52%, 30.48%, 34.87%, 39.82%, a little less they are in 15 years age group – 23.64%.

Variation coefficients for time parameters are highly variable, in particular in age of 12-13 years. It witnesses about morphological changes in organisms in this period and about purposefulness of consideration of time parameter in training of girls to motion skills.

Besides, as a result of experimental research we received mean indicators for space parameters of movements (see table 2).

High level of errors of triangles' area dispersion at training stage (SqrQTest,mm ^{2}) was in age of 10, 11 and 13 years – 508.96±211.96%, 500.94±82.92% and 467.22±141.29%. Lower percentage of the same errors at training stage was in age of 12, 14 and 15 years– 380.76±137.23%, 402.43±136.65% and 401.65±65.38%. At analysis stage (SqrQAnal, mm ^{2}) in all age groups they vary within limits from 230.74±70.81% to 298.88±117.33%.

Table 2

Space parameters of 10-15 years' old girls' movements

Stages	Age / Indicators	10 years	11 years	12 years	13 years	14 years	15 years
Training stage	SqrQTest, mm	508,96± 211,96	500,94± 82,92	380,76± 137,23	467,22± 141,29	402,43± 136,65	401,65± 65,38
	MdRndX Test, mm	3.62± 1.59	3.43± 1.13	2.80± 0.74	2.63± 0.93	2.52± 0.62	2.56± 0.87
	MdRndY Test, mm	2.63± 0.72	2.60± 0.44	2.23± 0.41	2.15± 0.48	2.11± 0.43	2.07± 0.86
Analysis stage	SqrQAnal, mm ^{2}	298.88± 117.33	251.43±46.18	235.60± 66.72	287.63± 132.20	235.63± 84.27	230.74±70.81
	MdRndX Anal, mm	2.04± 0.75	1.65± 0.35	1.49± 0.32	1.51± 0.31	1.47± 0.27	1.52± 0.27
	MdRndY Anal, mm	1.84± 0.67	1.52± 0.21	1.36± 0.38	1.36± 0.33	1.28± 0.27	1.21± 0.54

At training stage variation coefficients of 10 years' old girls – 41.65%, 12- years' old girls – 39.04%, 13 years' old – 30.24%, and 14 years old – 33.96% are rather high; they are lower in groups of 11 years old girls – 15.44% and 15 years old girls – 15.62%. At analysis stage we can notice high variability: 10 years' old age – 39.26%, 11 – 18.37%, 12 – 28.32%, 13 – 45.96%, 14 – 35.76% and 15 – 29.41% .

Also we determined percentage for random errors of triangle center by X axis. We noticed dynamic of improving of this indicator at training stage (MdRndXTest, mm); according to every following age period: 10 years old age – 3.62±1.59%, 11 – 3.43±1.13%, 12 – 2.80±0.74%, 13 –2.63±0.93%, 14 – 2.52±0.62% and 15 years old – 2.56±0.87%. At analysis stage MdRndXAnal, mm) we noticed wave-like character of indicators. The least percentage

of errors was in groups of 12-15 years old age – from 1.47±0.27% to 1.52±0.27%, the highest – in group of 10 years old girls – 2.04±0.75%.

Variation coefficients in percentage of random errors of triangle center by axis X in training period was in 10 years group – 43.92%, in 11 years' group – 32.94%, 12 years – 26.43%, 13 – 35.36%, 14 – 24.60% and 15 – 33.98%. At analysis stage it was for 10 years old girls – 30.76%, 11 years' – 19.39%, 12 – 21.48%, 13 – 20.53%, 14 – 18.37% and 15 – 17.76%. It witnesses about the highest variability among all other indicators and about rather high individual specificities of middle age school age girls' development.

We also determined percentage of random errors for triangle's center by Y axis. At training stage (MdRndYTest, mm) we see a trend to reducing of errors' percentage with every age period: 10 years – 2.63±0.72%, 11 – 2.60±0.44%, 12 – 2.23±0.41%, 13 – 2.15±0.48%, 14 – 2.11±0.43% and 15 – 2.07±0.86%, that is quite logic. At analysis stage (MdRndYAnal, mm) we can see nearly the same picture, except equal indicators in period of 12-13 years' age (1.36±0.38%).

The determined variation coefficients of percentage of random errors of triangle's center by Y axis at training stage in 10 years' group – 16.48% and 13.82% accordingly, in 12 years group– 18.39% and 27.94%, in 13 years group – 22.33% and 24.26%, in14 – 18.61% and 18.24% and in 15 years group – 31.85% and 33.54%.

Discussion

The carried out research proved results of a number of authors about coordination in process of motion [7, 8, 10, 13, 18]. We considered that indicators of movement's coordination permit to prognosticate level and quickness of motion skills' formation [11]. In compliance with it we determined dynamic of coordination's development among girls of 10-15 years' old age with the help of stability analyzer "Stabilan-1".

Alongside with it the fulfilled researches specified data about mean indicators of errors' percentage with reproduction of time and space parameters by middle school age girls. For example it was found that girls of the tested age control better space parameters of motion than time ones. Basing on our researches we determined high variation coefficients by all indicators. Statistic processing of the received results resulted in high varying of indicators in reproducing of time and space parameters. It witnesses about significant individual distinctions of the tested in their coordination abilities that rather influence on mastering of motion skills and requires differentiated approach.

The obtained data permit to think that exactly great individual distinctions in coordination of this age girls' influence on effectiveness of training to motion skills. Besides, they prove that it is possible to consider space and time parameters as criteria in methodic of differentiated training of middle school age girls to motion skills.

In the whole materials of the research can be practically used in practical functioning of physical culture instructors with studying of curriculum's sections, devoted to mastering of motion skills.

Conclusions

So we determined that girls of middle school age have better bents for controlling of space parameters of movement's coordination than time ones. We found high variation coefficients by all indicators. It witnesses about great individual distinctions by level of coordination of this age girls that can not but influence on effectiveness of motion skills' mastering. It proves assumption that it is possible to consider these indicators as criteria for choosing of methodic of differentiated motion skills' training for middle school age girls.

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Cite this article as: Samonenko S.B. The dynamics of the focal qualities in girls aged 10-15 years. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2015, no.3, pp. 52-57. http://dx.doi.org/10.15561/18189172.2015.0308

The electronic version of this article is the complete one and can be found online at: http://www.sportpedagogy.org.ua/html/arhive-e.html

Received: 30.01.2015
Accepted: 20.02.2015; Published: 23.02.2015

SPECIAL ASPECTS OF MOTIVATION OF THE STRUCTURAL SUBDIVISIONS OF THE STATE EMERGENCY SERVICE OF UKRAINE IN TERMS OF PHYSICAL SELF-CULTURE

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Annotation. *Purpose:* to determine the motivation of employees of structural subdivisions of the State Emergency Service of Ukraine to improve their level of professional competence by means of physical training. *Material:* questionnaire survey of 130 rescue workers aged 25 to 40 years. *Results:* the main motives of rescue team personnel for physical culture and sports activities are gain in physical health and professional competence, while performing rescue missions. It was established that, when on duty, most of the firefighters and rescue workers are not engaged in physical exercise at all; household chores and poor state of health in case of men prevent rescue team employees from doing exercises outside of working hours. It was found that fire-rescue specialists give preference to the development of muscle strength during professional physical trainings and would like to perform power exercises. *Conclusions:* the low level of motivation of current fire-rescue workers for physical self-improvement requires optimization of control over professional physical education in departments of the State Emergency Service of Ukraine.
Key words: firefighter, rescue worker, physical training, motivation, muscle strength.

Introduction

Modern development of Ukraine is characterized by rapid changes in all spheres of social life. They can not but concern system of firefighting-rescue officers' training. It conditions seeking of innovative technologies, oriented on rising of effectiveness of pedagogic management and specialists' professional training organization in State services on emergency situations (SSES) of Ukraine structures.

Problems of professional training are regarded in works of many domestic and foreign scientists that is a basis of conceptual principles and scientific methodic grounds of emergency situations specialists' training. Professional functioning of rescuer is realized in extreme conditions, which require constant and effective training [6]. Physical fitness of specialists and their readiness for fulfillment of service tasks are especially significant [12] and they are interconnected with psychological assurance [8].

Effectiveness of rescue works directly depends on defense of rescuers themselves against traumas [19]. In this connection professional perfection requires specialized programs and standards of physical training [11] considering individual features [17]. Besides, application of special equipment in rescue works requires certain strength from rescuers [1]. That is why it is quite reasonable that physical training shall be conducted with application of such equipment [16]. If influence of physical exercises on cardio-respiratory efficiency of firefighters' work has been studied rather profoundly, then functioning of supporting motor system has been remaining not completely researched. That is why power training requires more attention [14].

Among specificities of future SSES of Ukraine specialists' professional training great attention is paid to physical readiness of HEE cadets for future work [2, 3]. With it some authors pay attention to insufficient level of future specialists' physical fitness and low level of their motivation [7, 10]. At the same time only few publications are devoted to problems of perfection of physical training methodic of acting officers and rescue specialists [4, 5, 9, 13, 15]. With it, training of domestic specialists of SSES of Ukraine to certain extent differs from foreign analogues [18, 20].

Management of firefighting-rescue specialists' training is regulated by a number of governmental orders and decrees. From them one can see that rescuers shall constantly maintain good physical condition and perfect it (Order of SSES of Ukraine No. 444, dt. 01.07.2009 "On approval of instructions on organization of professional training and extra mural education of soldiers and officers of civil defense subdivisions"). Just physical training is one of main kinds of service training (Order of SSES No.10, dt. 05.08.2004 "On approval of instructions on physical training of SSES of Ukraine staff"). However, only 102 academic hours a year are assigned for general and special physical training of operative units of subdivisions, shift (watch), group, squad (Order of SSES of Ukraine No. 601, dt 01.09.2009 "On approval of Regulations on Organization of civil defense subdivisions' staff service training"). All these requirements can not ensure full fledged training. Hat is why the rest of classes shall be conducted independently in officers' free time. It will require their additional motivation.

Considering the existing problem we tried to determine motivation of manpower of SSES of Ukraine subdivisions for power physical exercises' practicing in process of their professional training.

The research was fulfilled in compliance with combined plan of scientific-research works in sphere of physical culture and sports for 2011-2015 by topic "Scientific theoretical principles of innovative technologies in physical education of different strata of population" (state registration number 0111U001169). Also this work is in compliance with complex plan of scientific-research works of Cherkassy institute of fire safety, named after Heroes of Chernobyl and Kharkov university of civil defense of Ukraine in field "Operative tactic functioning of detachments of civil defense operative rescue subdivisions".

http://dx.doi.org/10.15561/18189172.2015.0309

Purpose, tasks of the work, material and methods

The purpose of the research is to determine motivation of SSES of Ukraine officers for increasing of own professional competence by means of physical training.

The methods of the research: in order to achieve our purpose we used the following methods: theoretical analysis and generalization of scientific literature; studying of instructions and documents, regulating organization and realization of special physical training of SSES of Ukraine personnel staff; questioning; statistical analysis.

Materials of the research: the research was conducted on base of Cherkassy structural subdivisions of SSES of Ukraine. 130 firefighters and rescuers (118 men and 12 women) participated in questioning. They were of age from 25 to 40 years old.

Results of the research

Studying motives of firefighting-rescue specialists for physical culture – sport perfection and their significance in professional functioning, we determined that the most important motives for both male and female rescuers were the following: improvement of own health (1st rank), increasing of professional fitness (2nd rank); care of life and health of victims (3rd rank).

For men motives care of own health and life during rescue operations were less important (4th rank); motives of care of colleagues' health and life during rescue operations took 5th rank and improvement of own body constitution took 6th rank.

For women improvement of body constitution was less important (4th rank); care of own life and health in rescue functioning took 5th rank, care of colleagues' life and health in rescue functioning took 6th rank.

Motives for increasing of confidence in own potentials and increasing of colleagues' respect, which took 7th and 8th rank accordingly, were also not substantial for SSES of Ukraine officers.

It was determined that rescuers care of own health during physical training. Such care, in their opinion, facilitates rising of professional competence during rescue functioning and, consequently, promote saving of victims' lives and health.

We also determined that 62% of men and 73% of women do not practice physical training at all, when being on duty. Other part of personnel spends insignificant time for physical self perfection in respect to duration of working day. It points at extremely low motivation of SSES of Ukraine officers for perfection of physical condition. Probably such indicator is connected with fulfillment of service duties, absence of qualified instructors in physical training. Also it is connected with little quantity of hours assigned for sport functioning.

As we found, only 31% of men and 22% of women practice improvement of physical fitness in their free time. Episodically physical perfection is practiced by 50% of rescuers-men and 67% of women. With it 19% of men and 11% of women do not practice physical training at all.

Considering above mentioned we tried to determine reasons, which do not facilitate rescue personnel to improve professional competence by means of physical training in working hours. As a result of questioning we determined that large part of SSES of Ukraine officers is prevented from improvement of professional competence by means of physical means in free time. The questioning helped to determine that for large part of SSES of Ukraine think that family affairs and business (55% of men and 74% of women) and improper health condition (27% of men and 3% of women) are important reasons for not practicing of physical training. We determined that absence of motivation does not permit for 9% of men and 17% of women to physically train. 9% of men and 6% of women noted other reasons (see fig.1).

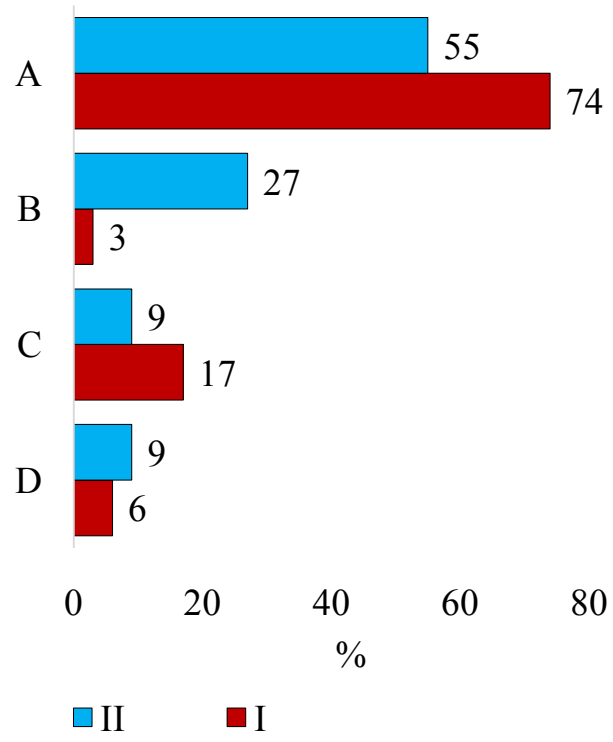

Fig.1. Factors, which prevents SSESU from physical training in free time: A – family affairs and business; B – physical condition; C – absence of motivation; D – other; I – women, II – men.

Effective fulfillment of rescue works requires rather high motion abilities from modern specialists in emergency situations. In connection with it we tried to determine: which physical abilities are required for firefighters and rescuers for more effective fulfillment of tasks in extreme conditions by them.

As a result of questioning we determined (see fig.2) that men officers consider endurance (43%) and muscular strength (31%) to be the most important for professional functioning. Respiratory functions (14% of them) and quickness (12%) are considered to be less important. It should be noted that only 10% of specialists in emergency situations consider their motion skills as sufficient for fulfillment of combat tasks.

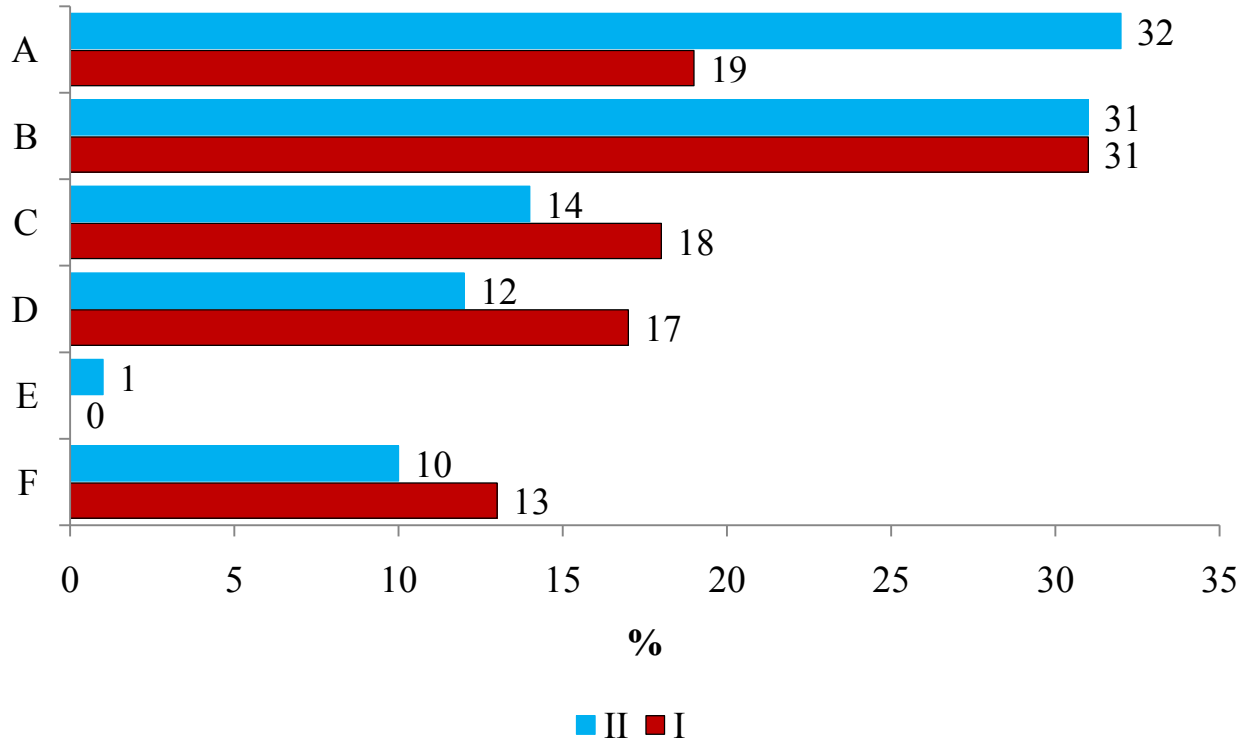

Fig.2. SSESU officers' answers to question: "What would you perfect for more effective fulfillment of rescue works?": I - women, II – men. A - endurance, B – muscular strength, C – respiratory functions, D – quickness, E – other, F – my fitness is proper.

Women also consider muscular strength to be necessary for firefighter (31%). Less required is, in their opinion, endurance (19%), respiratory functions (18%) and quickness (17%). It should be noted that only 13% of women estimate own physical fitness as sufficient for fulfillment of firefighting-rescue tasks.

It is obvious that rescue personnel think that it is necessary to train physical skills by means of different kinds of sports for improvement of own professional competences (see fig.3).

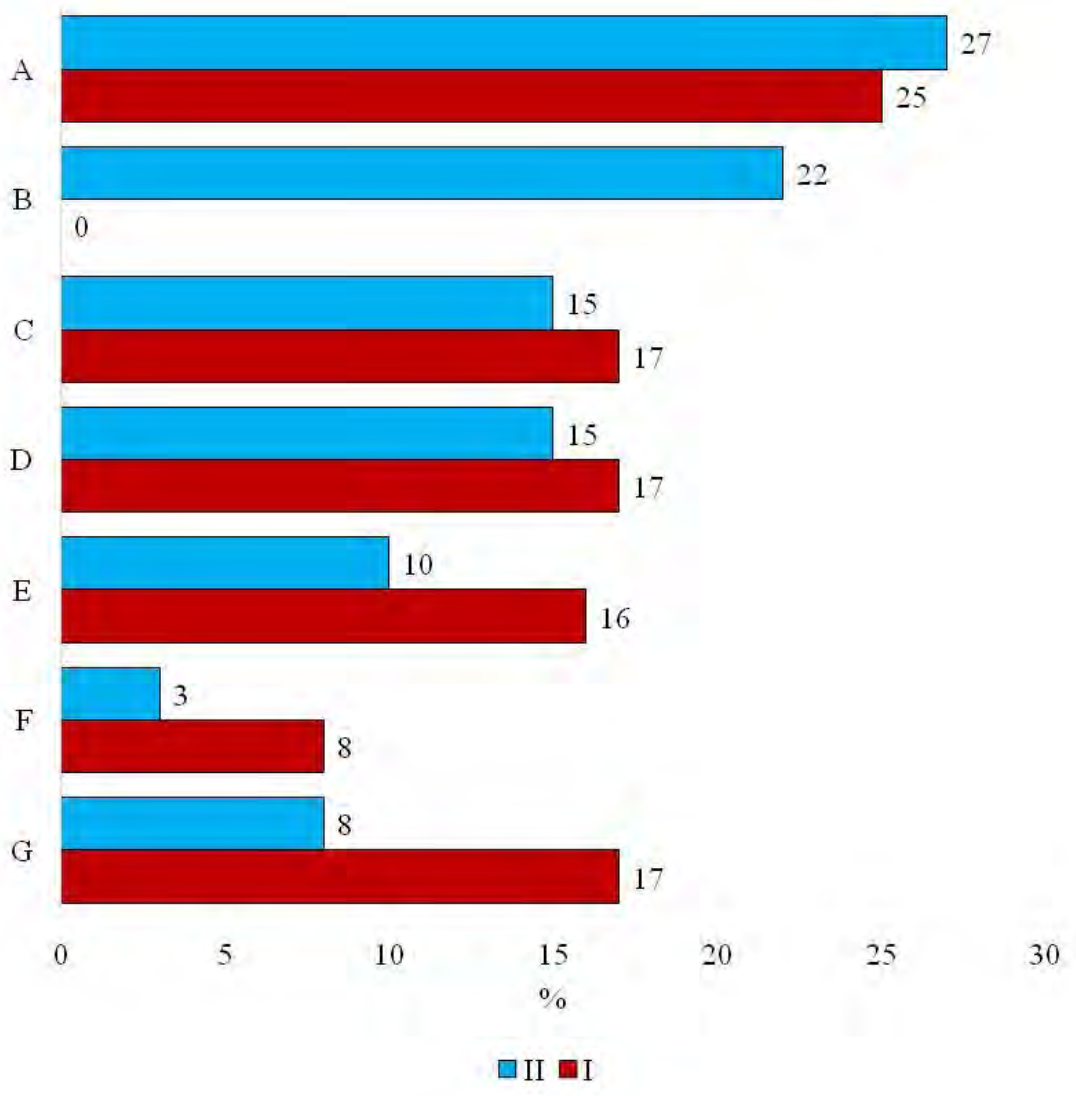

Fig.3. Kinds of motion functioning, which SSESU officers would like to practice additionally: A – exercise with weights. B – football, C – volleyball, D – martial arts, E – track and field events, F – firefighting applied sports, G – other. I – women, II – men.

That is why for further improvement of professional physical fitness firefighting and rescue specialists chose trainings with power oriented exercises (27% of men and 25% of women).

Football was chosen by 22% of men, volleyball – by 15%, martial arts – 15%, track and field events – 10%, other kinds of sports – 8%. Unexpectedly little quantity of specialists chose firefighting sport (3%) and this fact requires special research.

Concerning women-officers by 17% of the questioned chose trainings of martial arts, volleyball and other kinds of sports. Track and field events were preferred by 16% of women and firefighting sport – by 8%.

Analysis of rescuers' preferences of motion functioning kinds permits to affirm that for increase of own professional competences they prefer power oriented exercises. In opinion of the questioned exactly development of muscular strength can improve indicators of professional physical fitness that will ensure effective fulfillment of rescue tasks in extreme conditions in emergency situations.

Discussion

The received by us results about special importance of power physical training for rescuers are proved by other scientists [1, 14, 16]. For the first time motives for physical self perfection of domestic rescuers have been studied as well as conditions, in which special physical training is practiced. Results of our research point at demand in improvement of organizational-management mechanisms, oriented on rising of rescuers professional functioning's quality.

Conclusions:

1. Level of modern firefighting-rescue specialists' motivation for physical self-perfection is extremely low that is caused by different factors.
2. Main motives, which force firefighters and rescuers for physical culture-sport activity can be:

– Improvement of own somatic health and professional competences; preservation of victims' lives and health during liquidation of emergency situations' after effects and fulfillment of rescue tasks with high quality.

3. Most of officers prefer working out of muscular strength.
4. Management of professional physical training in subdivisions of SSES of Ukraine requires optimization.

The prospects of further researches in this direction envisage working out and experimental testing of effectiveness of modified standards to physical training and management-organizational model of SSES officers' special physical training.

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Cite this article as: Stetsenko A.I., Arhipenko V.A. Special aspects of motivation of the structural subdivisions of the state emergency service of Ukraine in terms of physical self-culture. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2015, no.3, pp. 58-63. http://dx.doi.org/10.15561/18189172.2015.0309

The electronic version of this article is the complete one and can be found online at: http://www.sportpedagogy.org.ua/html/arhive-e.html

Received: 09.02.2015
Accepted: 22.02.2015; Published: 23.02.2015

FEATURES OF COMPETITIVE ACTIVITY OF HIGHLY QUALIFIED GRECO-ROMAN STYLE WRESTLER OF DIFFERENT MANNER OF CONDUCTING A DUEL

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Annotation. *Purpose:* to analyze the technical and tactical training of Greco-Roman style wrestlers. *Material*: an analysis of 75 fights fighters winners (25 fight each style). *Results*: identified 10 main technical activities that are most commonly used in today's competitive activity of highly skilled fighters. It was found that for all the groups most fighters is received on the ground is a coup coasting. In the front - takedowns. Determined that in order to achieve victory GAME WRESTLERS use high-impact technical actions. POWER AND TEMPO - simple techniques. It was found that high-class fighters may lead the fight in different styles of confrontation. It depends on the personality of the opponent, subjective judging period, cramping, accounts for the fight and the level of competition. *Conclusions*: It was found that the most informative in assessing the technical and tactical capabilities fighters carries the final part of the competition. It is determined by the efficiency, effectiveness, technical arsenal.
Keywords: fight, training, productivity, individualization, styles match.

Introduction

Level of sportsman's technical-tactic actions (TTA) determines mainly his success in duel [4, 7, 10, 17-20]. Scientific methodic provision of qualified wrestlers' training requires more effective TTA and their further improvement. It is conditioned by the fact that content and structure of efficient TTA quickly change in sport practice. That is why for training of highly qualified sportsmen it is important to inform wrestlers and coaches about promising directions of wrestling's development in due time. With it analysis of competition functioning of modern advanced wrestlers is rather urgent [1, 5, 8, 13]. Besides, problem of individualization of training has always been remaining important as a direction of researches [6, 11, 12, 15]. In Greco Roman wrestling problem of individualization is especially important. High sport result can be achieved by different wrestling styles. Specialists in sport wrestling specify three main styles of wrestling: game wrestling, power and tempo [2, 3, 9].

Wrestler's style is formed as firm and reliable, if in process of its formation requirements of competition functioning and general trends of Greco Roman wrestling's development as a kind of sports, are considered. For example it is necessary appearing of new effective methodic of motion skills' training, new technical and tactic actions [6, 8, 14, 16]. That is why it is purposeful to regard pracxtical ussage of techniques at competitions of the highest rank.

Purpose, tasks of the work, material and methods

The purpose of the research: determination of competition functioning of highly qualified Greco Rome wrestlers with different styles of wrestling.

The tasks of the work:

- to analyze competition functioning of highly qualified wrestlers;
- to determine level of technical tactic fitness of highly qualified wrestlers;
- to find out contradictions in technical tactic fitness of highly qualified wrestlers with different wrestling styles;
- to carry out pedagogic observations over competition functioning of highly qualified wrestlers.

The objects of the observations were competitions on Greco Rome wrestling: European championship (EC) 2014; World championship (WC) 2014; Final Golden Grand Prix (GP) 2014 and large international tournaments in 2014. In total we analyzed 75 duels of wrestlers (25 duels of every style).

Results of the researches

Analysis of technical arsenal of highly qualified wrestlers' modern competition functioning permitted to specify 10 main technical actions, which are most often used: turnovers– 67 times (32.5 %), back throws – 28 (13.6 %),turnovers and back throws– 2 (1 %), counter actions in ground work– 6 (2.9 %), change over – 20 (9.7 %), throws by arching - 11 (5.3 %),throws by sub turn – 19 (9.3 %), knocking down – 18 (8.7 %), pushing out of mat – 28 times (13.6 %), counter actions in stance – 7 times (3.4 %). In total there were fulfilled 206 TTA: 103 actions in stance and 103 actions in groundwork (see table 1).

Then we determined TTA, fulfilled by sportsmen of certain style. We found that for both groups of wrestlers the most frequently used as groundwork are turnovers. The most successfully they were realized by "power" wrestlers - 35 times (41.7 %), then- by "tempo" wrestlers - 17 times (32 %) and "game" wrestlers - 15 times (21.7 %).

Analysis of TTA in stance showed that percentage of change over differs insignificantly for all styles and is: for "power" wrestlers – 10.7 %, for "tempo" wrestlers – 9.5 % and for "game" wrestlers – 8.7 %. Such indicators for different styles are explained by the fact that change over techniques are initially wide spread and are improved by all styles' wrestlers.

http://dx.doi.org/10.15561/18189172.2015.0310

Table 1

Analysis of technical tactic fitness of highly qualified Greco Rome wrestlers with different wrestling styles

Wrestling styles/ Technical actions	"game" wrestlers		"tempo" wrestlers		"power wrestlers		Σ	%
	Σ	%	Σ	%	Σ	%		
Groundwork: 1. Turnovers	15	21.7	17	32	35	41.7	67	32.5
2. Back throws	15	21.7	9	17	4	4.7	28	13.6
3. Turnovers and back throws	-	-	2	3.8	-	-	2	1
4. Counter- actions	4	5.8	1	1.9	1	1.2	6	2.9
Total in groundwork	34	49.2	29	54.7	40	47.6	103	50
Stance: 5. Change over to groundwork	6	8.7	5	9.5	9	10.7	20	9.7
6. Throws by arching	7	10.2	2	3.8	2	2.4	11	5.3
7. Throws by sub-turn	12	17.3	4	7.5	3	3.6	19	9.3
8. knocking down	7	10.2	4	7.5	7	8.3	18	8.7
9. Pushing out of mat	-	-	7	13.2	21	25	28	13.6
10. counter actions	3	4.4	2	3.8	2	2.4	7	3.4
Total in stance:	35	50.8	24	45.3	44	52.4	103	50
Total in stance and in ground work	69	100	53	100	84	100	206	100
Anticipated victories	17	68	11	44	12	48	40	53

Also we determined that for achieving victory "game" wrestlers mainly use efficient (3 points and 5 points) TTA: back throws, throws by sub turn, throws by arching and knocking down. High percentage of these techniques' application is explained by the fact that "game" style wrestlers have high coordination. This advantage of "game" wrestlers permitted to fulfill more counter techniques in stance and in groundwork. "Power" and "tempo" wrestlers usually fulfill simple (1 point and 2 point) TTA: Pushing behind mat, change over and turnovers.

"Game" wrestlers have the highest quantity of anticipatory victories - 17 (68 %), then "power" wrestlers go - 12 (48 %) and "tempo" wrestlers - 11 (44 %).

Analysis of table 2 permitted to find that effectiveness of attack in stance and in groundwork is insignificantly different for all styles of wrestling: it varies from 45 % ("tempo" wrestlers) to 58% ("power" wrestlers). "Game" wrestlers have the most effective defense (in stance – 85 %, in groundwork – 86 %). Efficiency of "game" wrestlers is also the highest and is in stance– 3.83 points per one person and in groundwork– 3.95 points per one sportsman.

Table 2

Technical tactic indicators of Greco-Rome wrestlers with different wrestling styles

Wrestling styles/ Technical actions	"game" wrestlers	"tempo" wrestlers	"power wrestlers
Effectiveness of attack in stance	55 %	45 %	51 %
Effectiveness of groundwork attack	49 %	50 %	58 %
Effectiveness of defense in stance	85 %	79 %	84 %
Effectiveness of groundwork defense	86 %	71 %	63 %
Efficiency in stance (points)	3.83	1.92	2.8
Efficiency of groundwork (points)	3.95	2.96	3.16
Interval of attack in 1st period (sec.)	32 sec.	94 sec.	43 sec.

Wrestling styles/ Technical actions	"game" wrestlers	"tempo" wrestlers	"power wrestlers
Interval of attack in 2nd period (sec.)	61 sec.	59 sec.	60 sec.
Interval of successful attack in 1st period (sec.)	62 sec.	187 sec.	93 sec.
Interval of successful attack in 2nd period (sec.)	118 sec.	127 sec.	84 sec.
Mean time of duel (sec.)	216 sec.	287 sec.	289 sec.

It should also be noted that interval of attack and interval of successful attack of "game" wrestlers and "power" wrestlers are higher in first period than in the second, "Tempo" wrestlers have better indicators in the second period.

Mean time of duel of "game" wrestlers was 216 sec. (a little more than one period); of "power" wrestlers - it was 289 sec. and "tempo" wrestlers – 287 sec. (nearly two full periods).

Discussion

We have proved the data of specialists in sport wrestling (G.S. Tumanian, B. Goranov, 2012) saying that sportsmen most often use three main styles of wrestling: game, power and tempo. Every style has its peculiarities (G.B. Bardamov, 2008; S.V. Layshev, 2013): "game" wrestlers have high efficiency of techniques, "power" wrestlers – highly effective attacks and "tempo" wrestlers increase quantity of attacks with every minute of duel. Alongside with it we specified modern trends and peculiarities of high efficiency's achievement by sportsmen of different styles. We have determined that highly qualified wrestlers can conduct duel in different styles. It depends on personality of adversary, subjectivism of refereeing, period of duel, score during duel and level of competitions.

Conclusions:

1. We have determined that final part of competitions, which is conditioned by efficiency, effectiveness and technical arsenal, is the most informative for assessment of highly qualified wrestlers' technical-tactic level.

2. Analysis of modern competition functioning of highly qualified wrestlers permitted to specify 10 main techniques, which are used the most often: turnovers, back throws, turnovers and back throws, counter actions in stance and in groundwork, change over, throws by arching and by sub turn, knocking down and pushing out of mat.

3. We also determined that wrestlers' groups the most frequent techniques in groundwork are turnovers, but they are most successfully realized by "power" wrestlers - 35 times (41.7 %), then – by "tempo" wrestlers - 17 times (32 %) and "game" wrestlers - 15 times (21.7 %).

Analysis of techniques, used in stance showed that percentage of change over in total quantity of TTA differs insignificantly for all styles: for "power" wrestlers it is 10.7 %, for "tempo" wrestlers – 9.5 % and for "game" wrestlers – 8.7 %.

Besides, we found out that achievement of victory "game" wrestlers mainly use efficient (3 points and 6 points) actions: back throws, throws by sub turn, throws by arching and knocking down.

"Power" and "tempo" wrestlers mainly apply simple (1 point and 2 points) techniques:

"Game" wrestlers have the highest quantity of anticipatory victories - 17 (68 %), then "power" wrestlers 12 (48 %) go and "tempo" wrestlers 11 (44 %).

Effectiveness of attack in stance and in groundwork insignificantly different: it varies 45 % ("tempo" wrestlers) to 58 % ("power" wrestlers). "Game" wrestlers have the most effective defense (stance - 85 %, groundwork– 86 %). Efficiency of "game" wrestlers is also the highest and was in stance – 3.83 points per one sportsman and in groundwork – 3.95 points per a sportsman.

It should also be noted that in the first period interval of attack and interval of successful attack of "game" and "power" wrestlers is higher than in the second, while "tempo" wrestlers' intervals of attacks are better in the second period than in the first.

Mean time of "game" wrestlers' duel was 216 sec. (a little more than one period); "power" wrestlers – 289 sec. and "tempo" wrestlers - 287 sec. (nearly full two periods).

Further researches will be oriented on determination of physical fitness's specific features of different styles' wrestlers.

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Cite this article as: Tropin Y.N., Pashkov I.N. Features of competitive activity of highly qualified Greco-Roman style wrestler of different manner of conducting a duel. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2015, no.3, pp. 64-68. http://dx.doi.org/10.15561/18189172.2015.0310

The electronic version of this article is the complete one and can be found online at: http://www.sportpedagogy.org.ua/html/arhive-e.html

Received: 13.02.2015
Accepted: 22.02.2015; Published: 23.02.2015

THE EVOLUTION OF THE WINTER PARALYMPIC GAMES AND SPORTS

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Annotation. *Purpose:* The aim of this research was to record and the evolution of the winter paralympic games and sports since 1976 until 2010. The history of the Winter Paralympic Games is relatively recent compared to that one of the Olympic Games. The first Games were held in 1976 in Ornskoldsvik, Sweden and the most recent, 38 years later in 2014, in Sochi, Russia. This article will examine the Winter Paralympic Games up until the ones in 2010 in Vancouver, Canada. During these years, there have been many changes in relation to the Games itself, the governing body of the Paralympic Movement, the sports' facilities, the sports involved and sports' categories. The motivation for writing this paper was the need to record and gather all of these items in one paper. Gathering information for the Winter Paralympic Games will be an important theoretical background. This information will create a database for the structure of the governing body of the Paralympic Games, for the organization of the Games [Local Organizing Committee (LOC), venues and equipment], for the evolution of the Winter Paralympic Sports and the categories of the athletes, as well as the evolution of the athletes' and sports' participation. *Material*: The research material that was used was mainly from the bibliography and records of the International Paralympic Committee (IPC), from the Official Post Games Reports and the Internet, while the research method that was used was descriptive. Moreover, the use of diagrams will depict the distribution of the participation of athletes and countries in each Games. *Results*: The participation of countries grew continuously and steadily from 16 to 44, during the years of 1976 to 2010 respectively. Regarding the athletes' participation, starting in the first Games with 198 athletes, they reached the number of 502 in the 2010 Vancouver Winter Paralympic Games. The participation percentages of the athletes coming from Europe constituted the bulk of the total participation from the Continents throughout the journey of the Games (1st Winter Paralympic Games: 95% - 10th Winter Paralympic Games: 61%). The proportion of men was at all events greater than that of the women. Starting with only two categories of impairment being part of the first Games (athletes with amputation and athletes visually impaired), in the 2010 Winter Paralympic Games in Vancouver, almost all categories were included (except the athletes with an intellectual disability). *Conclusions*: The sports included in the 1st Paralympic Games were the events of Alpine Skiing and one event of Cross Country Skiing, while in the 10th Paralympic Games were included all the disciplines of Alpine skiing and Cross-Country Skiing, Ice Sledge Hockey and Wheelchair Curling.
Key words: Winter Paralympic Games, evolution, sport, program, competition.

Introduction

Since the ancient times, people realized the importance of exercise for a good health of the human being. Nevertheless, the concept of sport for people with a disability developed relatively recently. The academic interest developed in the early 20th century as a result of the First World War, where many soldiers wounded by the War, could profit from the benefits of sport by using the latter as a means of rehabilitation in military hospitals. However, the great revolution in sport for people with a disability, it was only imminent after the Second World War [http://www.disaboom.com/adaptive-skiing/from-rehab-tool-to-elite-sport-a-history-of-adaptive-skiing]. Dr. Ludwig Guttmann, who is considered to be the father of modern sport for the athletes with a disability, campaigned to incorporate sports for people with a disability within the Olympic Games [21]. The organization of the Paralympic Games is being held today by the International Paralympic Committee (IPC), which is based in Bonn, Germany. The IPC is responsible for organizing the Summer and Winter Paralympic Games. In addition, it serves as an International Federation for nine sports, for which it supervises and co-ordinates the World Championships as well as an international competition calendar. The IPC was established in 1989 in Dusseldorf, Germany, organizing for the first time the 6th Winter Paralympic Games in 1994 [http://www.paralympic.org/IPC]. Originally, the term «Paralympic» was a combination of the words «Paraplegic» and «Olympic» fact, that was contradicting with the spirit of Olympism, which represents the excellence and perfection of the body. Over time, there was a redefinition of the term, and today it is considered to have its origins in the ancient Greek word «Para-» which means parallel and the word «Olympic». Thus, the Paralympic Games that are taking place alongside to the Olympics. The Greek Paraolympic Committee uses the term "Paraolympic" and disagrees with this use of the term [http://www.paralympic.org/IPC].

According to Table 1, the athletes can be divided into three categories. In the category of "Standing" athletes with a disability on the upper and / or lower extremities (Standing), the category of athletes who are sitting and have a disability in the lower limbs (Sitting) and the category of athletes with an impairment in the vision (Visually Impaired). The smaller their number of group is, the more severe the disability is [8].

doi: 10.15561/18189172.2015.0311

Table 1.

Alpine/ Nordic Skiing Athletes' Categories [6, 8, 14].

Alpine/ Nordic Skiing Athletes		
Standing athletes with a disability in the lower and upper extremities. (Standing - STA)	Sitting athletes with a disability in the lower limbs. (Sitting - SIT)	Athletes visually impaired. (Visually Impaired- VI)
LW 1, LW 2, LW 3, LW 4	LW 10	B1
LW 5/7, LW6/8	LW 11	B2
LW 9/1, LW 9/2	LW 12	B3

Definitions

This study examines the evolution of the Winter Paralympic Games and Sports in relation to the countries and athletes participating in each Games, as well as the development of their organization.

As *Winter sports* are defined the sports included in each Winter Paralympic Games respectively, which are the following: Alpine Skiing, Biathlon, Cross Country Skiing, Ice Sledge Hockey, Ice Sledge, Speed Racing and Wheelchair Curling.

As *Nordic Skiing* is defined the Cross Country and Biathlon [http://www.ipc-nordicskiing.org/About_the_Sport/].

The *Winter Paralympic Games* are the ones that are recognized by the International Paralympic Committee (IPC) as «Paralympic» even though the first two Games do not have in their naming the word «Paralympic». In this article, the Winter Paralympic Games may also be referred to as the Games.

The *classification of the athletes* into categories is the separation of the athletes depending on their disability and their placement into groups with similar characteristics. In winter sports, we have three categories: athletes with visual disturbances (Visually Impaired - VI), athletes who use wheelchairs (Sitting - SIT) and athletes with amputations (Standing - STA) [http://www.paralympic.org/Sport/Classification].

Finally, it should be clarified that, for brevity reasons, and given that this article does not concentrates on the study of the Summer Paralympic/ Olympic Games or the Winter Olympic Games, the words "Winter" and "Paralympic" will be omitted. All references to the "Games" will refer to the Winter Paralympic Games. Exceptions might be eminent in the paragraphs that concentrate on the differences between the Winter Paralympics/ Olympics, in which the name of each of the Games are referred to specifically and separately.

Purpose

The aim of the study was to collect information for the Winter Paralympic Games, which will give an important theoretical background for the so far evolution of the winter sports for the specific population. This information will create a database in relation to the organization of the Paralympic Games from the very first ones in 1976 until the ones of 2010. Thus, the reader will have the opportunity to follow the evolution of the second largest sporting event (after the Olympics) for athletes with a disability, the changes in the conditions of the organization, as well as the state of the sports in these 10 Paralympic Games.

Research Questions

The motivation for writing this study was the need to review and record all of the Winter Paralympic Games until 2010, as well as to collect data on the number of participating athletes, the sex, the country of origin and the sport that the athletes competed in. The hypothesis made in this study can be depicted in the following research questions:

1. How has the organization of the Winter Paralympic Games been developed?
2. How have the Winter Paralympic Sports and Games been evolved?
3. How did the participation of the athletes and countries evolve?

MATERIAL AND METHODS

The collection of the Greek and foreign literature was conducted from the internet, the library of the University of Athens (Department of Physical Education & Sports Science), the library of the International Paralympic Committee (IPC), personal library, as well as articles from specialized journals on Skiing. The methods that were used in this study were the descriptive and the comparative methods. From 1976 to 2010, there have been 10 Winter Paralympic Games, on which there have been examined the following fields: Naming of the Games, Local Organizing Committees (LOCs), Venues and Sports' Equipment, Logo / Mascot, categories of athletes with a disability over time, the number and percentage of the participating countries / athletes cumulatively and separately in each sport such as: Alpine skiing, Cross-Country Skiing, Biathlon, Ice Skating (Sledge Hockey, Skating and Curling).

RESULTS

1. Presentation of the historical development of the Winter Paralympic Sports

The pool of people with a disability that started training in the adapted skiing were coming mostly after a severe accident or the War. In 1942 -1943 the german athlete, Franz Wendel was the pioneer of the paralympic sport «three track skiing». The sport has spread outside of Germany, in Austria, Switzerland, Scandinavia, America etc. Subsequently, the athletes' equipment evolved according to the needs of the type of disability «four track skiing», «bi ski» and «mono ski» [10].

The first winter sport that was developed was the Alpine Skiing for people with a disability in one leg, who were using the so-called «outrigger» - crutches with ski tips (http://www.ipc-alpineskiing.org/About_the_Sport/). Due to its nature, this sport has its roots in Switzerland, Germany and Austria, but was quickly spread throughout Europe. Towards the end of 1950s, a ski school for people with amputated body parts was founded, in Salzburg, and at the same time, the first technical manuals on «Special Skiing Techniques» were published. This sport movement spread rapidly in the US, where in the early 1960s, took place the first test events on Alpine Skiing with outriggers, using borrowed equipment from Austria. During the winter period of 1962-1963, the first official coaches of Alpine Skiing with outriggers were trained from the Norwegian Department of Skiing Union of the United States of America [10]. Following that, Skiing for people with a disability evolved in the US into a competitive sport and in 1972 took place the first National Championship [http://www.disaboom.com/adaptive-skiing/from-rehab-tool-to-elite-sport-a-history-of-adaptive-skiing].

During the period of 1950-1960, other winter sports came under the scope of attention such as Ice Skating (Ice Skating Speed Racing), Ski Touring (Hiking with skis), Cross-country Skiing, Sledge (Tobogganing) and Curling. As different types of winter sports were entering the competitive field, more opportunities were given to people with different type of disability to take part in the Games. For example, in 1960, visually impaired athletes started to participate in Alpine Skiing. The sport movement for athletes on a wheelchair evolved only in the late 1960s, when we had the first experiments on the construction of a Sled Ski [3].

Out of the most reliable information we have, the first sled model, was constructed by the German Josef Schrall, in 1967. Three years later, the Norwegian paraplegic Widar Jonson, built a plastic seat, which allowed him to use the sled during the winter months, to play Ice Hockey and to enjoy Cross-country Skiing. His discovery, inspired the Swiss Peter Gilomen, who built a sledge for Cross-country skiing, which consisted of two normal skis, attached to the seat. During 1970-1980, many different forms were given on the sled from countries like Norway, Germany and Austria up until 1980, when the Asians constructed the very first type of mono-ski. This type of sledge is being used today, with the consequent changes that came with the evolution of technology. Nevertheless, the actual evolution in the development of the sledge for the athletes on a wheelchair, took place after the International Winter Summit in Engelberg, Switzerland, in 1985, during which 85 persons on a wheelchair were gathered from 14 countries in order to demonstrate the equipment that they were using [4].

The growth in popularity of the winter sports, led to the introduction of new events of different categories for persons with a disability. The first National Winter Championships were held in 1948 for Skiers with an amputation with outrigger in Germany and Austria [10].

Just one year later, in 1949, the first World Championships were organized for visually impaired athletes. In 1970, as part of "Ridderrennet" (Knights' Competition) in Beitostolen of Norway, a combined event of Cross-country skiing and Shooting (Winter Biathlon) took place for visually impaired athletes. Two years later, in 1972, the first Norwegian Winter Championships was held for the same specific group of persons with a disability. Due to the late development of sports' equipment, athletes on a wheelchair did not participate in an international winter competition, until the end of 1980s. Following the 1986 World Championships for sit Skiers (skiers on a wheelchair) as well as for athletes on a sledge organized by Norway- in 1988, it was the first time that events on mono-ski were included in the Winter Paralympic Games in Innsbruck, Austria [4].

Due to the fact that Sport for persons with a disability had become quite popular in an international level during the decade of 1970, and given the vast evolution of the Paralympic Movement and the Summer Paralympic Games, evidently, came the time of the realization of the idea to organize the first Winter Paralympic Games. However, because of the required weather conditions for winter sports, the latter, were originally developed only in countries with a tradition to winter sports [4].

2. Presentation of the historical development of the Winter Paralympic Sports

Table 2 shows the dates and locations of the Winter Paralympic Games during the period 1976-2010. We can notice that the vast majority (7 times, percentage of 70%) took place in Europe, 2 times in America (percentage of 20%) and 1 time in Asia (percentage of 10%). The predominant dates for conducting the Games was during the month of March with a percentage of 60%, followed by February and January with 20% each one respectively [http://www.disaboom.com/adaptive-skiing/from-rehab-tool-to-elite-sport-a-history-of-adaptive-skiing].

Table 2.

Dates and locations of the Winter Paralympic Games, 1976-2010 [http://www.disaboom.com/adaptive-skiing/from-rehab-tool-to-elite-sport-a-history-of-adaptive-skiing].

Date	City	Country
21-28 February 1976	Ornskoldsvik	Sweden
01-07 February 1980	Geilo	Norway
14-20 February 1984	Innsbruck	Austria
17-24 February 1988	Innsbruck	Austria
22 March- 04 April 1992	Tignes- Albertville	France
10-20 March 1994	Lillehammer	Norway
05-14 March 1998	Nagano	Japan
07-16 March 2002	Salt Lake City	USA
10-19 March 2006	Turin	Italy
12-21 March 2010	Vancouver	Canada

In table 3, one can see the sports or disciplines, as they were added in Winter Paralympic Games during the period of 1976- 2010. We notice that Alpine Ski and Cross Country Ski were included from the very first Games of 1976 until the ones in 2010. Table 4 demonstrates the most representative categories of the athletes with a disability, as they were shaped during the Winter Paralympic Games of 1976-2010. During the years 1984-1998 the categories of the athletes with a disability remained the same [http://www.disaboom.com/adaptive-skiing/from-rehab-tool-to-elite-sport-a-history-of-adaptive-skiing].

Table 3.

Sports or disciplines, as they were added in the Winter Paralympic Games of 1976-2010 [http://www.disaboom.com/adaptive-skiing/from-rehab-tool-to-elite-sport-a-history-of-adaptive-skiing].

Winter Paralympic Games	Sports or Disciplines
Ornskoldsvik, Sweden 1976	Alpine Skiing Cross- Country
Geilo, Norway 1980	Alpine Skiing Cross- Country Ice Sledge Racing
Innsbruck, Austria 1984	Alpine Skiing Cross- Country Ice Sledge Racing
Innsbruck, Austria 1988	Alpine Skiing Nordic Skiing (Cross-Country, Biathlon) Ice Sledge Racing
Tignes- Albertville, France 1992	Alpine Skiing Nordic Skiing (Cross-Country, Biathlon)
Lillehammer, Norway 1994	Alpine Skiing Nordic Skiing (Cross-Country, Biathlon) Ice Sledge Racing Ice Sledge Hockey
Nagano, Japan 1998	Alpine Skiing Nordic Skiing (Cross-Country, Biathlon) Ice Sledge Racing Ice Sledge Hockey
Salt Lake City, USA 2002	Alpine Skiing Nordic Skiing (Cross-Country, Biathlon) Ice Sledge Hockey
Turin, Italy 2006	Alpine Skiing Nordic Skiing (Cross-Country, Biathlon) Ice Sledge Hockey Wheelchair Curling
Vancouver, Canada 2010	Alpine Skiing Nordic Skiing (Cross-Country, Biathlon) Ice Sledge Hockey

	Wheelchair Curling

Table 4.

Categories of athletes with a disability, as they were developed during the Winter Paralympic Games of 1976-2010 [http://www.disaboom.com/adaptive-skiing/from-rehab-tool-to-elite-sport-a-history-of-adaptive-skiing].

Winter Paralympic Games	Categories
Ornskoldsvik, Sweden, 1976	Amputees Visually Impaired
Geilo, Norway 1980	Amputees Visually Impaired Spinal Injuries
From Innsbruck, Austria, 1984 to Lillehammer, Norway 1994	Amputees Visually Impaired Spinal Injuries Cerebral Palsy Les Autres
Nagano, Japan, 1998	Amputees Visually Impaired Spinal Injuries Cerebral Palsy Les Autres Intellectually disabled
Turin, Italy, 2006	Amputees Visually Impaired Spinal Injuries Cerebral Palsy Les Autres
Vancouver, Canada, 2010	Amputees Visually Impaired Spinal Injuries Cerebral Palsy Les Autres

Logos

Logos (Fig. 1) and maskots is the easiest way of making the corporate symbol easily recognizable by the vast public. In fact, logos are more expressive than words and favor on spectator's mind, the connection between the Games and the organizing country [4]. The emblem that was used in the first Winter Paralympic Games, has many symbolisms. The outer ring is bearing the paternity of the Games (ISOD), the name and year of the Games, as well as the organizing city. The inner ring, depicts the symbol of the organizing city, Ornskoldsvik, a Cross Country Skier on the left and an Alpine Skier on the right.

A B

Fig. 1. The first (A) and second last logos (B) of the Winter Paralympic Games in 1976 (Ornskoldsvik) and 2010 (Vancouver) respectively [http://www.disaboom.com/adaptive-skiing/from-rehab-tool-to-elite-sport-a-history-of-adaptive-skiing].

In figure 2 and 3, it is shown the participating countries and athletes during the Winter Paralympic Games from 1976 to 2010. Observing the percentages of the participating countries and athletes, the largest number of nations took part in 2010 in Vancouver, Canada, while the highest participating number of athletes was in 1998 in Nagano, Japan.

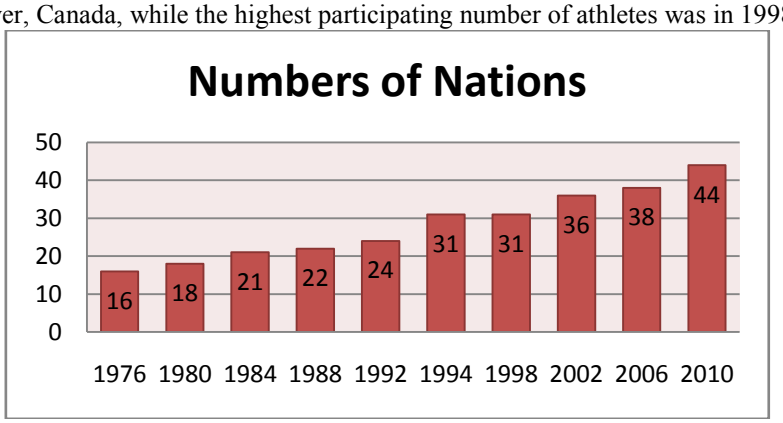

Fig. 2. Participation of nations in the Winter Paralympic Games from 1976 to 2010 [http://www.disaboom.com/adaptive-skiing/from-rehab-tool-to-elite-sport-a-history-of-adaptive-skiing].

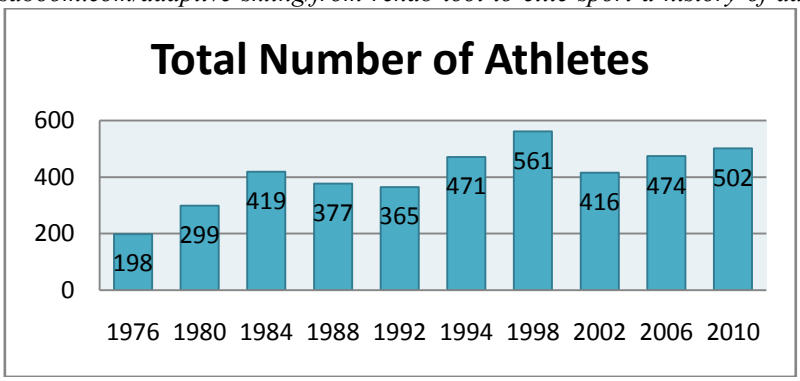

Fig. 3. Participation of athletes in the Winter Paralympic Games from 1976 to 2010 [http://www.disaboom.com/adaptive-skiing/from-rehab-tool-to-elite-sport-a-history-of-adaptive-skiing].

In figure 4 and 5, we can see the numerical and percentage participation of the athletes per continent during the Winter Paralympic Games during 1978-2010 respectively. Looking closely at the participation rates of the Continents, it is easily recognizable that Europe is dominating from the very first Games of 1978 until the ones in 2010. In aggregation, from the 1st Winter Paralympic Games until the 10th, we see that the European continent has a fall in participation from 94% initially, to 61%, a difference of 31%- whereas the Americas, has quadrupled its participation rate- from 4% to 20%.

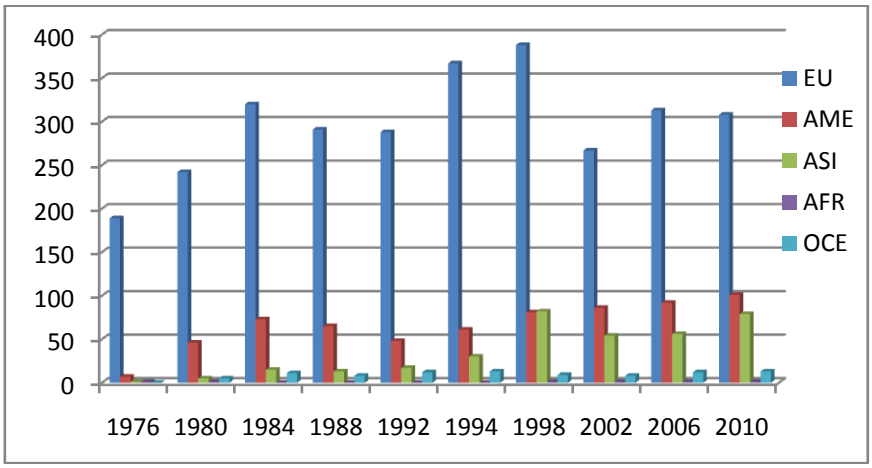

Fig. 4. Numerical participation of the athletes per Continent during the Winter Paralympic Games of 1976-2010 [http://www.disaboom.com/adaptive-skiing/from-rehab-tool-to-elite-sport-a-history-of-adaptive-skiing].

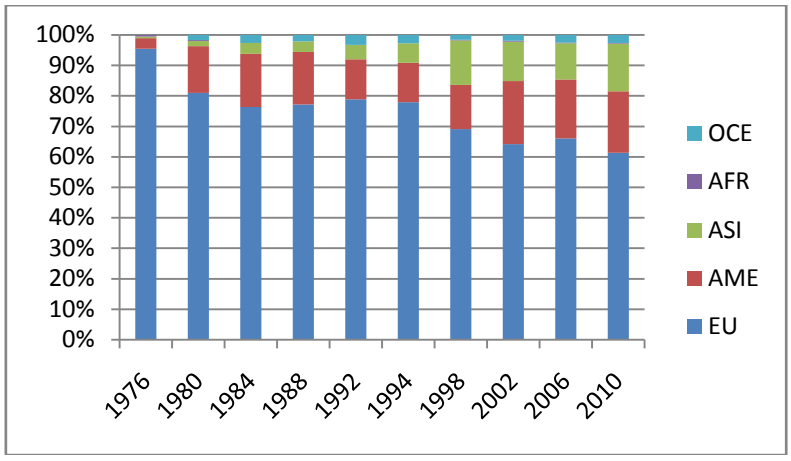

Fig. 5. Participation rate (%) of the athletes per Continent during the Winter Paralympic Games of 1976-2010 [http://www.disaboom.com/adaptive-skiing/from-rehab-tool-to-elite-sport-a-history-of-adaptive-skiing].

In figure 6, the number of athletes is presented as a total, as well as the number of men and women that took part in Alpine Ski.

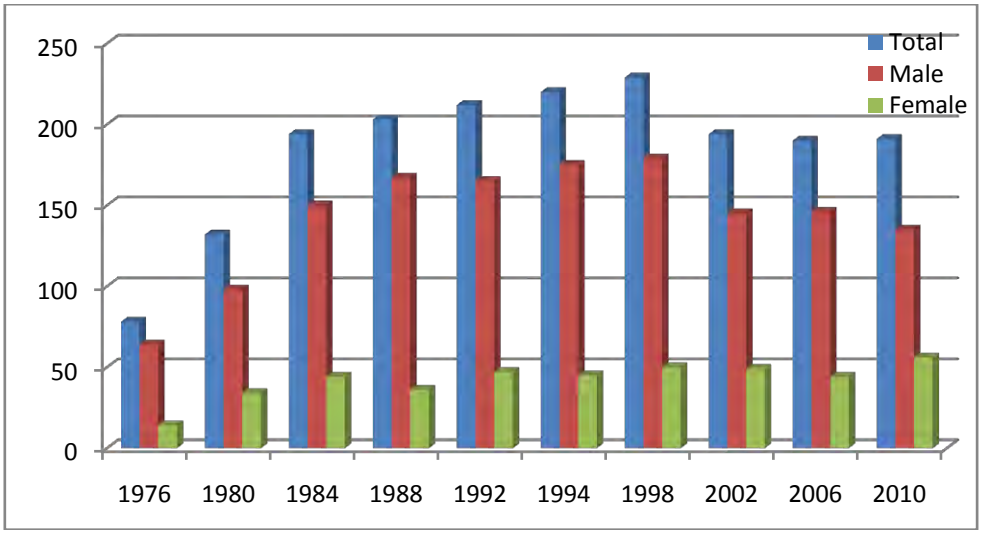

Fig. 6. Participation of athletes (total, men and women) in Alpine Ski [http://www.disaboom.com/adaptive-skiing/from-rehab-tool-to-elite-sport-a-history-of-adaptive-skiing].

In figure 7, it is shown the participation of the athletes in Cross Country Ski (total, men and women). In figure 8, it is shown the participation of athletes in Biathlon (total, men and women).

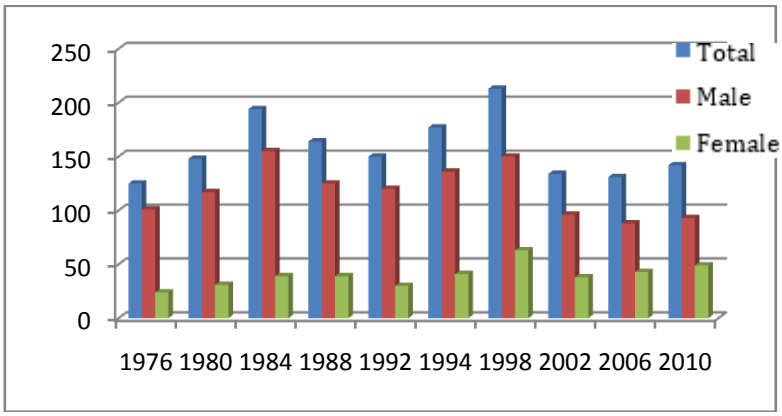

Fig. 7. Participation of athletes (total, men and women) in Cross Country Ski [http://www.disaboom.com/adaptive-skiing/from-rehab-tool-to-elite-sport-a-history-of-adaptive-skiing].

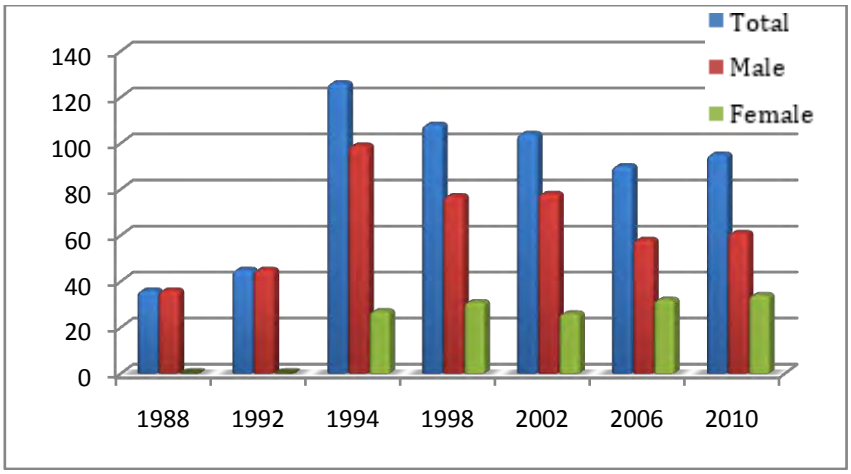

Fig. 8. Participation of athletes (total, men and women) in Biathlon [http://www.disaboom.com/adaptive-skiing/from-rehab-tool-to-elite-sport-a-history-of-adaptive-skiing].

As it is shown in the diagram, Biathlon, was included for the first time in the 4th Winter Games in Innsbruck in 1988 only for men, while the first female participation was only apparent in the 6th Winter Games in Lillehammer, 1994. In these Games we had the largest participation of total athletes and male athlete participation.

In figure 9, it is illustrated the participation of the athletes in Ice Sledge Racing (total, man and women).

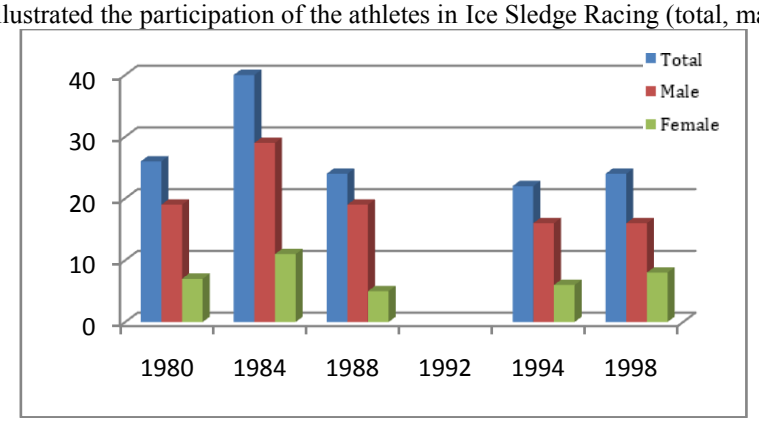

Fig. 9. *Participation of athletes (total, men and women) in Ice Sledge Racing [http://www.disaboom.com/adaptive-skiing/from-rehab-tool-to-elite-sport-a-history-of-adaptive-skiing].*

In Ice Sledge Hockey we can see that there is a small number of athletes participating compared to other sports. This sport reached its pick in the 3rd Winter Paralympic Games in 1984, with a number of 29 participating male athletes and 11 female (40 athletes in total). In the following Games that it was included, the participations were half in numbers and there were no significant differences in variant. In 1992, it was not included in Games because there were no sufficient infrastructure, while after 1998, it was removed from the program of the Paralympic Games.

Figure 10 shows the athletes' participation (total, men and women) in Ice Sledge Hockey. One of the most favorable sports by the spectators in the Winter Paralympic Games, Ice Sledge Hockey, radically increased athletes' participation in the 2nd Games that was included, while the participation of athletes' were doubled in the Vancouver Games of 2010 with a total athletes' number of 117. Unfortunately, there were no female participation in the specific sport until these Games.

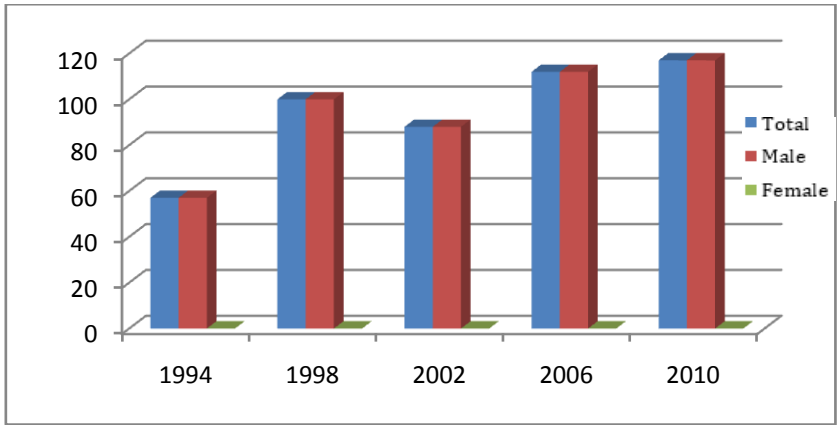

Fig. 10. Athletes' participation in Ice Sledge Hockey (total, men and women) [http://www.disaboom.com/adaptive-skiing/from-rehab-tool-to-elite-sport-a-history-of-adaptive-skiing].

In figure 11, it is illustrated the athletes' participation in Wheelchair Curling (total, men and women).

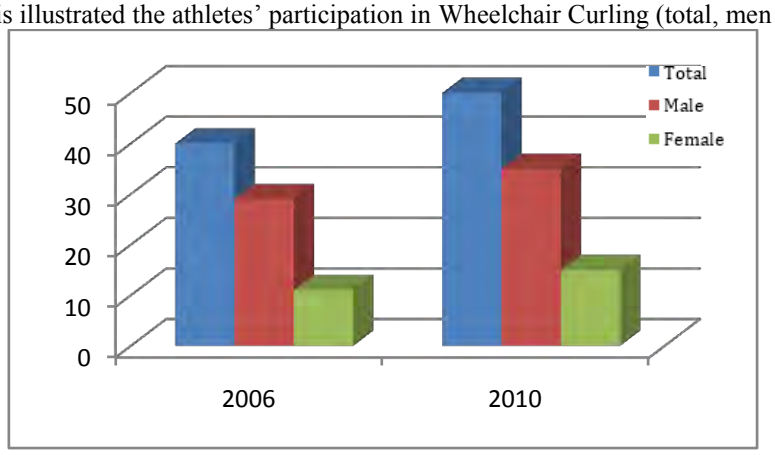

Fig. 11. Athletes' Participation in Wheelchair Curling (total, men and women) [http://www.disaboom.com/adaptive-skiing/from-rehab-tool-to-elite-sport-a-history-of-adaptive-skiing].

Wheelchair Curling, has been included in the Paralympic Games of 2006 and 2010 and on the second time, the participation increased by 10% in the total number of athletes. The number of men and women participants was increased respectively.

Discussion

Up until today, the international literature for the Winter Olympic Games, refers to the athletes' training [17, 9, 5], the biomechanical analysis of sports movement [15, 2], the athletes' nutrition [18], as well as to the reasons that cause sport injuries during the Games [22, 23, 24], Few are the articles and researches that have been conducted for the history of the Winter Paralympic Games. The main sources are derived from the post Games reports of the Local Organizing Committees that are drafted after each Games. These reports started to become more systematic and reliable after the Paralympic Games in Nagano, in 1998 (Vanoc official reports, 2007; Vanov official post review, 2010; http://www. International Paralympic Committee, 2010) [16, 19].

Due to the non-existence of a united International Committee for persons with a disability until 1989, the systematic collection and collation of data was very difficult and the reports that were gathered up until then was with the initiative of the Local Organizing Committees in cooperation with International Organization for persons with a disability in force at that time, who was granting the rights for the organization of the Games. Of significant importance were the testimonies of people and different stakeholders that were active members during the organization and staging of the Games, such as the athletes, especially for the first 4 Winter Paralympic Games [22]. Due to this absence of systematic data collection, there are several inconsistencies in the numbers of participating countries and athletes per event, depending on the origin of the source [3].

This research was based solely on official figures and information coming from the International Paralympic Committee's files [http://www.disaboom.com/adaptive-skiing/from-rehab-tool-to-elite-sport-a-history-of-adaptive-skiing].

From the first Winter Paralympic Games in Ornskoldsvik up until those in Vancouver, 34 years have passed. During these years, significant evolutions and progress have been made for the entire Paralympic Movement. The Winter Paralympic Games have been transformed from small events, mainly based on a voluntary initiative, into professional, enormous range events, that require a large and long-term preparation, as well as a sufficient number of permanent and specialized staff.

The first Paralympic Games can hardly be compared to the ones of today, as they were organized by the existing Organizations for persons with a disability (IOSD, ISMGF, ISMWSF, ISOD) and the respective Local Organizing Committee, who for the first 4 Winter Paralympic Games were working on a volunteering basis [22]. The selection process of the host country changed in 1988, when the IOC President-in-office, Mr. Samaranch, proposed for the Paralympic Games to take place right after the Olympic Games, in the same country. Following this agreement and the 1992 Games, we observe a variety of changes in the quality of the organization and infrastructure. The Olympic facilities (sports, medical, accommodation and events), were used now for the Paralympic Games as well, from different at first, Organizing Committees, yet still, under the monitoring of a common President. This change brought closer the IOC and IPC, the two governing bodies of the two biggest sporting events worldwide, and encouraged the cooperation between them. Today, the candidate hosting countries when submiting the bidding document, are obliged to answer to specific questions on the organization of the Paralympic Games in their proposal for the Olympic Games.

The next important step for the Games, was made when the two Committees for the organization of the Olympic and Paralympic Games merged into one united team, which was first applied in the 8th Games in 2002. Having these Games as a starting point, the first medical surveys started to emerge, orienting towards the study of the

frequency and type of injuries that appear in the Games, targeting to create a holistc and thorough content of the risks that may appear and how they can be avoided in future organizations. Moreover, the organizing committee, is being called to answer to increasingly more and bigger challenges, as both of these two sporting events, have many aspects that need to be taken into consideration [7]. Volunteering has helped enormously the respective Organizing Committees to carry out successfully the Games [1]. The governments of each hosting country help to cover the costs, but the sponsors have a great contribution as well [20]. However, reciprocal benefits are expected through advertising, for the organizing country and donors. A weak spot that the organizing country is called to resolve is the issue of the violation of human rights that may be affected during the Games, and that is caused due to the increasing number of athletes' participation [11]. An unfortunate fact that also emerges due to the evolution and impact of the Games, is the need of the athletes to drastically improve their performance, which several times, leads to doping [4]. The second part of the development of the Games is consisted of the participation of the athletes and countries, as well as the evolution of the sports and the categories of the athletes that nowadays are integrated into the program of the Games. In the first Paralympic Games the program was composed by two paralympic sports, while in the ones in Vancouver 2010, four additional sports were included. Over the course of the Games, some sports were added and some were removed because of low participation of athletes around the world and the lack of proper infrastructure. Moreover, from the 16 countries that initially participated in the Games, with a continuous upward trend of participation, in the Paralympics of Vancouver 2010, 44 countries were represented and the number of participating athletes increased from 198 in the first Games of 1976, to 502 participants at the Games in Vancouver, 2010. In addition, while in the first Paralympic Games we had only two categories of persons with a disability that were eligible to participate, from 1984 onwards, almost all categories of persons with a disability could take part in the Games. Exclusively in the 1998 Paralympic Games the athletes with mental disorders were included in the program as well.

In conclusion, the Winter Paralympic Games have managed to evolve from a small organization, into a massive and prestigious event. This whole process has been described in this study to a greater or lesser extent. This is an important fact because, only through the knowledge of the past we can develop and support the Paralympic Movement and its vision, which is: "To Enable Paralympic Athletes to Achieve Sporting Excellence and Inspire and Excite the World" (http://www. International Paralympic Committee, 2010) [12, 13].

Conclusions

Taking into consideration the results that are illustrated above, we are driven to the following conclusions:

1) The sports included in the 1st Paralympic Games were the events of Alpine Skiing and one event of Cross Country Skiing, while in the 10th Paralympic Games were included all the disciplines of Alpine skiing and Cross-Country Skiing, Ice Sledge Hockey and Wheelchair Curling.

2) The will and strength of the persons with a disability has touched many nations, for which reason they began to organize Games between the countries.

3) The most important goal in the training of the educators of customized ski, is to make them to be able to provide knowledge, skills and experiences to persons with a disability in order to live a healthy and productive life.

4) Since 1982, an evaluation system has been adopted in order to classify a large number of athletes. Now, the skiers with different kind of disability are able to compete based on this system to their corresponding category. The "A" athletes (elite) will qualify for the national and international championships.

5) There should be no confusion with the organization of the Special Olympics, which refer to the athletes with mental disorders. The Special Olympics, are more entertaining and educational orianted, and they are strictly differentiated from the competitive philosophy of the Paralympic Games.

6) Based on the literature, the participation of persons with a disability in various competitions and races of adapted skiing, contribute to the social, professional, therapeutic and personal rehabilitation.

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Cite this article as: Vasilios Giovanis, Eriketti Margari. The evolution of the winter Paralympic games and sports. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2015, no.3, pp. 69-79. http://dx.doi.org/10.15561/18189172.2015.0311

The electronic version of this article is the complete one and can be found online at: http://www.sportpedagogy.org.ua/html/arhive-e.html

Received: 05.02.2015
Accepted: 22.02.2015; Published: 23.02.2015

PHYSICAL ACTIVITY AS A HEALTH FACTOR MODIFYING HEART RATE VARIABILITY (HRV)

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Annotation:
Purpose: The aim of the research was the evaluation of the selected HRV factors of the training volleyball players in two training periods and non-training people. *Materials and methods*: The study involved 8 leading volleyball players aged 20-23 and 13 non-training persons aged 19-26. The study of the training players was conducted twice: in the pre-competition and in the competition period. The study for the non-training persons was conducted once. The selected factors of the spectral analysis have been evaluated: TP [ms^2], share of LF and HF power [n.u], LF/HF indicator and time analysis factors: RR [ms], HR [1/min], RMSSD [ms]. *Results*: Statistically significant differences appeared only in the selected time analysis factors (RR, HR), between the group of the training and non-training persons. Other differences in the evaluated parameters were not statistically significant. *Conclusions*: Physical activity influences on the HRV growth. HRV measurement may serve for the control of the changes taking place in the AUN under the influence of the physical activity.
Key words: Autonomic nervous system (AUN), heart rate variability (HRV), health, physical exercise adaptation.

Introduction

Silvetti M. S. et al. [1] state that HRV is an important tool which can provide data about a modulatory influence of the autonomic nervous system (AUN) on the sinus node. The prognostic value of the heart rate variability (HRV) is used in the clinical medicine and sport [2]. As a result of the surveys, it has been stated that there is a correlation between disorders in the AUN and various diseases. HRV reduction has been noted in the cardiac disease e.g. chronic heart failure and non-cardiac e.g. diabetes [3, 4]. The factor influencing on HRV growth is physical activity.

Heart rate variability (HRV) is a normal, involuntary reaction to the changing environment conditions. The analysis of the heart rhythm variability gives the possibility to evaluate the activity of the sinus node [5]. HRV provides non-invasive information about AUN, evaluating the changes in the sympathetic and parasympathetic system at the sinus node level [6, 7, 2].

HRV is used in diagnosing many diseases, because it provides information about AUN and it is the factor of the changes in the cardio-vascular system [8]. HRV drop reflects the reduction of the vagus nerve tension and/or leads to electrical destabilization of the heart. Reduced HRV has been noted with people after a past heart attack, persons with hypertension, diabetic neuropathy, tetraplegia, depression [2, 9].The risk of the chronic diseases such as diabetes, hypertension, circulatory system diseases are frequently connected with obesity. Parasympathetic domination in the modulation of the heart rate appears with health people at rest, however, sympathetic domination predominates with people with heart diseases. HRV changes appear together with hypertension, AUN balance moves towards parasympathetic part. Analogical changes have been observed together with abdominal obesity evaluated on the base of waist circumference measurement and waist/hip indicator, on the other hand, such a dependence has not been noted relative to BMI factor [10]. According to Hottenrott K et al. [8], HRV factor can be used for the measurements of the endurance training effects. Furthermore, in the authors' opinion, HRV can be a marker diagnosing overtraining and exhaustion [11]. Kiviniemi A.M. et al. [12] share similar opinion evaluating 26 young men divided into groups differentiated by the physical activity types. Additionally, the authors state that individually matched training may contribute to HRV growth. Quoted authors citing Hautal A.J. et al. [13] state that HRV growth in the high frequency band (HF: 0,15-0,4Hz), reflecting parasympathetic activity, is connected with growth of the VO_{2max} factor. Bernardi L. et al. [14] state that changes in the levels of the physical activity are significant heart modulators. HRV higher values, extended intervals RR are connected with a higher activity of the vagus nerve. According to Buchheit M. et al. [15] moderate training raises vagal heart activity and contributes to reducing mortality caused by arrhythmia.

It is assumed that HRV is an effect of the different factors impact. The main factors affecting the sinoatrial node (sinus node pacemaker) are:

(a) tension oscillations between sympathetic and parasympathetic branch of the AUN, changes in the autonomic balance affect the amplitude spectrum proportions of low and high frequency,
(b) physical activity [2, 16].

Sport training, long-term physical activity trigger endobiotic changes which consolidate giving the image of the exercise adaptation [14, 16]. Numerous data from the written work prove that resting heart rate is lower with people doing sports than with not physically active ones [17, 18]. It is commonly believed that resting bradycardia appearing with athletes is caused by an increased tension of the vagus nerve. Such an observation may result from numerous surveys proving that hard (but not extreme), multi-month physical training of the athletes preparing for competitions leads to an increase in the activity of the parasympathetic component of the autonomic nervous system [19, 20].

http://dx.doi.org/10.15561/18189172.2015.0312

O'Sullivan S.E. and Bell C. [21] state that duration of the exercise, and/or training type affects significantly the value of the HRV factors.

Materials and Methods

Ethics

The study was conducted in accordance with the Helsinki Charter of Human Rights and it was approved by Ethics Committee of State Higher Vocational School in Raciborz. Each participant was willing to participate in the study voluntarily and confirmed that with a written agreement.

The study was conducted in the group of 8 contestants training volleyball. The study was carried out in two training periods: pre-competition and competition . The control group consisted of 13 physically inactive people.

The measurement of the tested persons was conducted with the use of Sport-Tester type Polar S 810i in the morning hours (7:00 – 10:00). The subjects were instructed to avoid physical activity, maintain a current food intake, with the exception of the consumption of alcohol and caffeine for 48 hours before testing. On a test day, the athletes were on empty stomach and the HRV measurement were made in the lying down position. The record of the systoles frequency lasted 15 minutes. Standard test conditions were kept for all of the contestants (temperature 20-22^{o} C – thermo-neutral conditions) with keeping basic procedures compulsory in the sports metrology.

The record of the systoles frequency was transmitted to the computer memory and was processed in the statistics field with the use of the Polar Precision Performance 3 computer program, which is compatible with the HRV Analysis Software program (developed by The department of Applied Physics University of Kuopio in Finland). The methods of the spectral and time analysis were used for the development of the results. In the HRV Analysis program, the given incidence ranges were calculated: total power (TP – the range of the total power which is the sum of the ranges: ULF, VLF, LF, HF. The range between 0,01-0,5 Hz can be described as the sum of the ANS activity [22]), very Low Frequency (VLF – a band ranging within 0,0033 Hz – 0,05 Hz), LF (Low Frequency – a band ranging within 0,05 Hz - 0,15 Hz), HF (High Frequency – a band ranging within 0,15 Hz – 0.4 Hz) were calculated [23, 24].

From all the registered parameters, for further analysis the following indicators were chosen: TP [ms^2], VLF [ms^2, %], LF, HF [ms^2, %, nu, the value LF/HF. In the time analysis were calculated: HR average [HR/min] systoles intensity. RR [ms] – the average time RR intervals between sinus stimulations, RMSSD [ms] – square root from the average sum of squares of differences between the next RR intervals [7, 25].

According to many authors, the component HF reflects mainly the influence of the parasympathetic system (vagal influence) [26]. They prove in many studies that LF factor shows the influences of both autonomic system branches i.e. sympathetic and parasympathetic parts [11]. The values of LF and HF can be given in the normalized units (nu). According to Malliani [27], the power of the LF and HF spectrum, especially when expressed in normalized units, reflects the balance between sympathetic and parasympathetic control. Moreover, sympathetic-parasympathetic balance is evaluated by the LF/HF indicator [28]. Hynen E. [29] states that the interpretation of the LF/HF indicator is doubtful, but it is applied as an indicator of the voltage state of an autonomic nervous system. The average RR interval time is a derivative of the systole HR incidence. The RMSSD indicator reflects the tension of the parasympathetic system. The factors of the spectral analysis: HF and time analysis: RMSSD, pNN50% correlate with each other, depend directly proportionally on the vagus nerve tension [2].

The results of the HRV analysis were juxtaposed in tables making standard statistical calculations according to the descriptive statistics module. Arithmetic mean, standard deviation and the significance of the differences between particular groups were calculated. In view of the small group size (8 and 13 people) and in case of some parameters in which the distribution was strongly agonic, to calculate statistically essential differences between the groups the non-parametric U Mann-Whitney test was used to compare two independent groups. For the level of significance, the value of $p<0,05$ has been accepted. The calculations were made in the Statistica Pl v. 10 program [30].

Table 1

Somatic characteristic of 8 contestants training volleyball in the pre-competition and competition period and 13 young men from the control group.

Parameters	Pre-C period	C period	Control group
	Mean ± standard deviation (min- max)		
Age [yrs]	21,4 ± 1,14 (20 - 23)	22 ± 1,14 (20,6 - 23,6)	20,9 ±1,93 (19 - 26)
Training experience [yrs]	7,2 ± 2,28 (5 - 11)	7,8 ± 2,28 (5,6 - 11,6)	
Body mass [kg]	86,35 ± 7,57 (76,9 - 97,2)	88,5 ± 6,52 (81 - 100)	82,4 ± 12,04 (65,7 - 107)
Body height [cm]	194,6 ± 4,96 (190 - 201)	194,5 ± 4,92 (190 - 201)	183,5 ± 4,85 (175 - 192)
BMI [kg/m^2]	22,80 ± 1,9 (20,6 - 25,8)	23,37 ± 1,02 (22,2 - 24,8)	24,4 ± 2,76 (19,4 - 29)
Rohrer index [g/cm^3]	1,17 ± 0,11 (1,03 - 1,36)	1,20 ± 0,06 (1,12 - 1,30)	1,33

Table 2

Selected parameters of the spectral and time analysis in the tested volleyball players group in the pre-competition period and non-training people.

Parameters	Volleyball players, pre-competition period	Control group	Statistics
	Mean ± standard deviation (min – max)		The level of significance p<0,05
TP [ms^2] group	1994,7 ± 1652,24 (548 - 5316)	1186,2 ± 1009,21 (156,4 - 3691,0)	0,264969
Share of LF power [n.u] group	57,9 ± 22,07 (23,1 - 81,1	69,0 ± 12,87 (46,6 - 82,9)	0,302001
Share of HF power [n.u] group	42,1 ± 22,07 (18,9 - 76,9)	31,0 ± 12,87 (17,1 - 53,4)	0,302001
LF/HF group	1,96 ± 1,40 (0,30 - 4,29)	2,8 ± 1,35 (0,9 - 4,8)	0,302001
RR [ms] group	1027,6 ± 168,92 (807 - 1305	638,0 ± 131,00 (424,2 - 808,8)	0,000328
HR [1/min] group	60,2 ± 9,66 (47 - 75)	101,3 ± 26,83 (74,6 - 148,9)	0,000328
RMSSD	70,6 ± 532,95 (18 - 18)	42,9 ± 30,01 (10,7 - 109,8)	0,173059

Table 3

Selected parameters of the spectral and time analysis in the tested group of volleyball players in the competition period and non-training people.

Parameters	Volleyball players, competition period	Control group	Statistics
	Mean ± standard deviation (min - max)		The level of significance p<0,05
TP [ms^2] group	2141,0 ± 2126,34 (856 - 7253)	1186,2 ± 1009,21 (156,4 - 3691,0)	0,148455
Share of LF power [n,u] group	64,2 ± 18,70 (30,2 - 83,3)	69,0 ± 12,87 (46,6 - 82,9)	0,649723
Share of HF power [n,u] group	35,8 ± 18,70 (16,7 - 69,8)	31,0 ± 12,87 (17,1 - 53,4)	0,649723
LF/HF group	2,4 ± 1,56 (0,43 - 4,98)	2,8 ±1,35 (0,9 - 4,8)	0,649723
RR [ms] group	944,5 ± 103,20 (753 - 1076)	638,0 ± 131,00 (424,2 - 808,8)	0,003754
HR [1/min] group	64,9 ± 7,60 (56 - 80)	101,3 ± 26,83 (74,6 - 148,9)	0,000611
RMSSD	61,8 ± 51,73 (30 - 187)	42,9 ± 30,01 (10,7 - 109,8)	0,173059

The evaluation by HRV of the changes taking place in AUN, affected by a long-term physical training volleyball players in the pre-competition and competition period and the control group showed that there were statistically significant changes in the field of the time analysis factors RR [ms] and HR [1/min]. In the physically inactive persons group there has been insignificant domination of the sympathetic part, in comparison to the physically active persons (LF n.u, LF/HF). In the volleyball players group, in the tested training periods, an insignificant growth in total power has been observed in comparison to the control group.

Discussion

Genetic and environmental factors affect a man's health [5]. Andrew M.E. et al. [31] state that physical activity and a proper diet can prevent diabetes, atherosclerosis, osteoporosis, circulatory insufficiency and other diseases. It must be emphasized that too intensive physical activity may trigger negative changes in the heart [32]. Numerous studies prove that a long-term endurance (oxygen) training cause changes in the sympathetic-parasympathetic balance

in the sinus node and may cause a resting bradycardia observed with endurance athletes [33]. Stein R.M.C. et al. [34] state, in turn, that changes in the internal mechanisms of the sinus node, and not AUN, are responsible for a resting bradycardia. In our own research, there has been a decrease in heart rate with the volleyball players group, as a result of a long-term training. Both in the pre-competition and competition period, in comparison to the non-training group, decrease in heart rate (HR) and RR intervals showed a statistically significant difference. Baggish A.L. and Wood M.J. [35] state that heart rhythm disorders and changes in conduction, in trained athletes' heart are well known. According to the cited authors, sinus bradycardia of the contestants is asymptomatic. It is caused by an increased activity of the parasympathetic system, and especially an increased activity of the vagus nerve. However, some data suggest that systematic, hard, but not extreme physical training can lead to internal chronotropic changes of the sinus node. Some of the changes may be treated as lesions [36, 37]. We cannot clearly determine where the heart's adaptive changes finish in response to a long-term, regular physical effort. It may be assumed that cardiac changes with the people practicing sports professionally, do not need to be adaptive changes [38]. In our own researches, decreased heart rate in the group of people with an increased physical activity, has not been proved by the spectral analysis factors. In the obtain tests results, both in the contestants' and control group, a sympathetic domination has been observed. However, in the contestants' group, in the tested training periods, an insignificantly lower tension of the sympathetic part has been observed in comparison to the control group. In the competition period, a period of a high physical activity, in the volleyball players' group, growth trends of the sympathetic part tension appeared in comparison to the pre-competition period. According to Iellamo F. et al. [20] growth of the sympathetic component, as a result of an intensified physical activity confirms good contestants' preparation for starts and achieving high performances. Authors quoted above state that longer maintaining of sympathicotonia can contribute to contestants' overtraining. Mourot L. et al. [39] confirm that too intensive trainings are connected with a balance shift in AUN towards sympathetic direction. The authors examined persons of a different physical activity (8 healthy men, 8 training, 7 with overtraining symptoms). On the base of the researches and the obtained results, it has been stated that the contestants with the overtraining symptoms showed an increase in sympathetic activity accompanied by the drop in parasympathetic activity and total power. Such a situation is connected with an overtraining of the Basedow type, which can appear with contestants [40]. Together with the training intensity reduction, the balance in AUN is restored. Nowosielska-Swadźba D [38]. examined boys aged 14-16 training athletics, volleyball and swimming. The results were compared to the physically inactive control group. A small domination of the sympathetic part has been marked in the control group. However, in the swimmers' group, subjected to more physical load, there has been a trend reversal, from a characteristic vagotonia to sympathicotonia. In our own research, in the control group, with the sympathetic domination, a shortened RR intervals have been observed and a high frequency of the heart rate in comparison to volleyball players group. LF and LF/HF factors testify the balance shift towards sympathetic direction in the control group. In the control group, the average value of the heart rate was 101,3/min and it was 41,1 beats higher in comparison to the people training volleyball. In the control group, sympathetic predominance, low total power value may be the result of the reduced physical activity [2]. Karjalainen j. et al. [41] write that tachycardia is caused, among others, by an increased activity of the sympathetic system. Rajab M. et al. [42] state that the reduction of high-frequency component (HF) in the total heart rate variability may be a diabetes complication, a risk factor for a sudden death.

Many researchers believe that physical activity shifts the AUN balance towards parasympathetic direction, through which it reduces mortality among others in cardiac diseases [2]. Nowosielska-Swadźba D. [38] examining boys aged 10-12 with the increased physical activity and physically inactive stated that in the experimental groups, there has been an increase in the heart rate variability. At the same time, in the group with an increased physical activity, longer RR intervals and lower heart rate frequency have been marked. Sacknoff d. M. et al. [43] examining trained people and a control group state, that an endurance training raises vagal activity, which is connected with a reduction of a resting frequency of heart rate. Levy W. c. et al. [44] were examining two groups of people, a younger one, aged 24- 32 and older, aged 60-82. After a six-month sport training in the examined groups, they found a resting bradycardia through an increase in the vagal activity and sympathetic tension drop. A chronotropic activity drop has been observed. A resting HR drop and a growth of the resting HRV have been noticed in the examined group. Carter J.B. [45] came to similar observations examining mixed, recreational groups (6 men and 6 women) aged 19-21 and 40-45, in two periods before and after 12-month training. On the base of the heart rate variability record, he observed heart rate reduction and the total power growth with the examined persons. After the training period, the younger group showed a bigger growth of the total power. Melanson E.L. and Freedson P.S. [46] was examining men with the mean of age 36,6. After 16-month controlled, moderate power training, there has been a growth of the time and spectral analysis factors. However, many authors believe that HRV factors interpretation is often ambiguous. The surveys of the sportsmen showed that both HRV growth and drop can be connected with negative adaptation to exercise. Together with a positive adaptation of the circulatory system, a drop in the HRV value has been observed in the sportsmen group [47].

Evaluating somatic construction of the examined persons: physically active and non-training, it can be observed that body mass of the control group was lower in comparison to training group. Wierzbicka-Damska I. [48] writes that the main component of the body composition are: lean body mass (LMB -lean body mass), fat body mass (FBM-fat body mass), water content (TBW - total body water). Many authors state that long-term physical activity affects body composition (lean body mass participation, fat body) [49]. Systematic physical exercise reduces body fat and contributes to active tissue growth. On the base of the conducted studies and the obtained results it can be deduced that in the body composition, in the training persons group active tissue predominates. Evaluating weight-height factors

(BMI, Rohr factor) in the examined groups, it can be stated that both groups have a proper body weight and athletic type. However, in the group with a reduced physical activity, BMI factor is at the limit of the standard and overweight while Rohr factor is at the limit of the athletic and pyknic type (WHO Raport www.WHO.com) [50]. In the examined control group, with the lack of physical activity, BMI growth trends may occur.

Conclusions

1. HRV is an important tool which can provide data about the modulatory influence of the AUN on the sinus node.
2. Under the influence of a long-term sport training, there appear changes in the sinus node which is reflected in a resting bradycardia.
3. Physical activity affects total power growth which has a positive effect on health.
4. Sport training influences on a balance shift towards parasympathetic direction.
5. Too intensive physical exercise strengthens sympathetic domination.

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Cite this article as: Nowosielska-Swadźba Danuta, Zwolińska Danuta, Jendrysek Marek, Podstawski Robert. Physical activity as a health factor modifying heart rate variability (HRV). *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2015, no.3, pp. 80-86. http://dx.doi.org/10.15561/18189172.2015.0312

The electronic version of this article is the complete one and can be found online at: http://www.sportpedagogy.org.ua/html/arhive-e.html

Received: 28.01.2015
Accepted: 22.02.2015; Published: 23.02.2015

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SCIENTIFIC EDITION (journal)
Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports. 2015, no.3, 90 p.

designer - Masterova Y.
editing - Iermakova T.
editing - Kriventsova I.
designer cover - Bogoslavets A.
administrator of sites - Ulanchenko Y.

———————————————————————

passed for printing 23.02.2015.
Format A4.

Red Banner str., 8, Kharkov, 61002, Ukraine.
PRINTHOUSE (B02 № 248 750, 13.09.2007).
61002, Kharkov, Girshman, 16a.