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CONTENTS

INFLUENCE OF MOTOR SKILLS' TRAINING METHODIC ON SENIOR PUPILS' SPEED-POWER AND ENDURANCE QUALITIES AT LIGHT ATHLETIC TRAININGS WITH APLICATION OF INTERDISCIPLINARY CONNECTIONS

Al-Ravashdeh Abdel Baset[1], Kozina Zh.L. [2], Bazilyuk T.A. [3], Ilnickaya A.S. [2]
[1]Taras Shevchenko National University of Luhansk
[2]H.S. Skovoroda Kharkiv National Pedagogical University
[3]Kiev National University of Technology and Design

Abstract. *Purpose:* to determine influence of technology of integral motor and intellectual aspects' impact on development of senior pupils' motor skills. *Material:* in the research 2 groups of pupils participated: control (n=34 – boys) and experimental (n=34 – boys). *Results:* confident changes in light athletic skills have been registered. In experimental group confident changes in indicators of motor fitness were registered in tests for speed-power qualities and endurance (short and long distance run, jumps, throws). We also found that it is necessary to take into account dozing of exercises, when training motor actions. *Conclusions:* it is recommended to use approaches to creation of holistic idea of movement. Theoretical part shall be oriented on deep understanding of physical principles of movements' rational technique.
Keywords: abilities, skills, athletics, students, methods.

Introduction

At present the most difficult is to overcome psychological inertia, which hinders regular practicing of motor functioning [2; 3; 5; 12]. Especially it is characteristic for light athletic, which is traditionally considered to "difficult" kind of motor functioning and sports [17; 19; 22; 24]. Modern world is connected with intellectual work of men [4; 6; 8; 9; 10; 11]. That is why development of methodic, activating intellectual component of light athletic movements' mastering is a topical and important task. Its significance is actualized also by the fact that educational tasks are reduced to receiving required scope of knowledge by senior pupils. This scope of knowledge will permit to use physical culture means independently and consciously after leaving school during all life [28; 30; 32; 33; 34].

The problem of perfection of schoolchildren's motor training was dealt with by many authors [26; 27; 29; 31]. V.A. Trofimov and G.N. Shishkin [22] described modern requirements to physical education lesson in conditions of humanization of educational process. They offered innovative methodic of light athletic lessons' conducting: assessment of pupils' physical workability and fitness by 12-points' scale. Effectiveness of workability and pupils' fitness training depends on targeted and consequent actions in this direction. It requires strict observation of systemic approach to schoolchildren's run training, systemic and comprehensive structure of run training. N.A. Frolova [24] elucidated application of light athletic exercises for formation of junior schoolchildren's sport life style. She analyzed scientific literature on this problem. Light athletic means have wide spectrum of impact on organism. They facilitate solution of health related, educational and teaching tasks in process of physical education. Besides, they form the basis for mastering of school program. It has been proved that application of light athletic means facilitates initial sport training of children in conditions of comprehensive school.

However, in modern physical education of schoolchildren there exist a number of contradictions: between demands in development of senior pupils' motor skills and reduction of interest to physical culture. There is also contradiction between demand in creation of motor and functional basis for further development (basic kinds of motor functioning: run, jumps, throws) and difficulties in provisioning of light athletic lessons' effectiveness (subjective "difficulty" of such kind of sports). These contradictions can be removed by working out of methodic, permitting to effectively train senior pupils to light athletic motor actions. Such methodic shall cover physical education information, interdisciplinary connections (biology, physics, mathematic and other natural and humanitarian sciences) with the help of modern information technologies [13; 14; 15; 16; 18]. It will ensure wholeness and harmonious character of adolescent's growth, his deep understanding of laws of rational movements' construction on the base of fundamental sciences [23]. All these conditioned topicality of our research.

Purpose, tasks of the work, material and methods

The purpose of the work is to determine influence of technologies of motor and intellectual integral impact on development of senior pupils' motor skills.

For determination of influence of the authors' methodic of senior pupils' motor skills development we conducted pedagogic experiment. The experiment was conducted at lessons and circle light athletic trainings in period from September 2013 to May 2014. Control (n=34 – boys) and experimental (n=34 – boys) groups consisted of senior pupils from secondary school Mu'tah, Al-Karak, Jordan.

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Results of the research

We have worked out methodic of training to main light athletic movements. Main peculiar feature of this methodic is application of analogies from biology and physics. This information was presented in oral and printed forms, as methodic recommendations and video-aids.

Let us regard application of interdisciplinary connections and information technologies for training of light athletic elements on example of run (jumps) and throws. As the basis of interdisciplinary connections we chose approach, elucidated in works by N. Romanov [17]. This approach is recommended by the author for mastering of the so-called "postural method of run". This approach implies increase of effectiveness of run technique's mastering at the cost of mastering of necessary main body positions, as well as at the account of ability to contract and relax required muscular groups. For realization of this idea the author refers to analogies from animate nature, laws of physics, movement of wheel on inclined plane and so on.

For training throw technique we took methodic of initial throws' training in game kinds of sports by Zh.L. Kozina as the base [7]. Analogies from animate nature and literature are used in this methodic. Necessity of forces' addition for turn-by-turn muscles' "switching", staring from legs is explained.

At informatics, geometry and biology lessons pupils watched educational cartoon. This cartoon illustrated analogies with rule of vectors' addition in laws of bio-mechanical forces' addition when passing ball with any collective targeted action, on example of tale "Turnip" [7].

With it pupils were explained in detail the rule of forces addition by vectors with examples of forces addition by vectors. Among such examples there was demonstration of correct throw technique, with which all muscles shall work. Thus, with correct "switching" in work muscles create force, which facilitates accurate and strong throw of ball to target. This force is a result of addition of all forces' vectors, ensuring this movement. That is why when throwing all muscles shall compulsory work. It is important also from the point of view that the most frequent mistake of pupils is stance on straightened legs when throwing ball. In such stance it is not possible to fulfill speed-power component of strong and accurate throw. This material is presented in the form of cartoon, combining materials from geometry, physics, biology and physical culture that strengthen pupils' understanding.

Such approaches to creation of holistic image of movement, deep understanding of physical principles of rational movements' technique are rather effective. It was proved by the conducted research. This material was offered to pupils with the help of modern multi media technologies that increased effectiveness of its perceiving.

Application of motor skills' training with the help of interdisciplinary connections and information technologies during one academic year resulted in registration of confident improvement of results' improvement of pedagogic tests for motor fitness in experimental group. Confident changes were in results of tests for main light athletic skills. Besides, we observed confident improvement of theoretical knowledge.

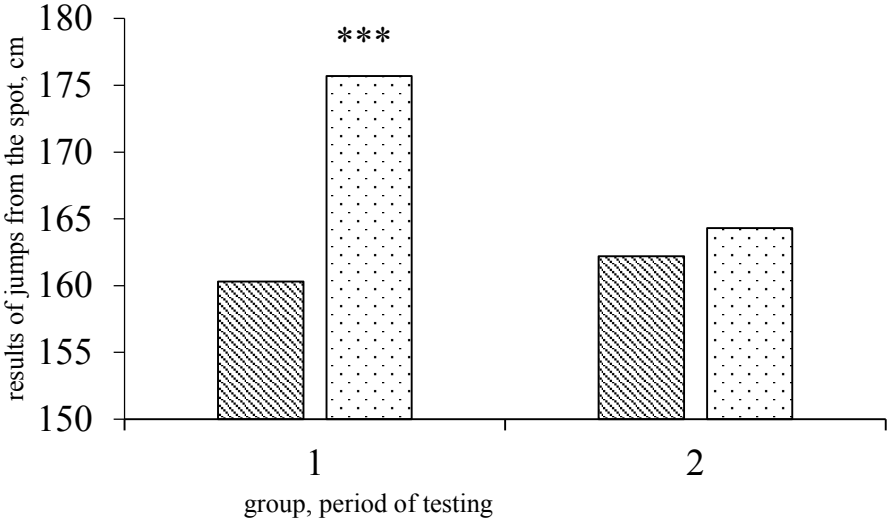

Fig. 1. Results of test "Long jump from the spot" of experimental (n=34) and control (n=34) groups before and after experiment:

1 –experimental group;
2 –control group;
*** –differences are confident with $p<0.001$;
-before experiment;
- after experiment

In experimental group of boys confident change of motor fitness indicators were registered in tests for speed-power qualities and endurance (short and long distance run, jumps, throws) (see figs. 1-4).

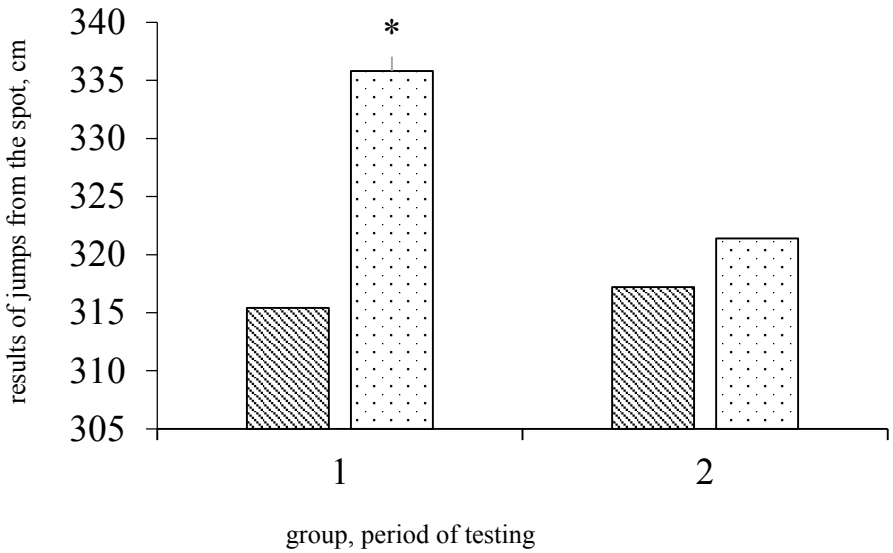

Fig. 2. Results of test "Long jump from run" of experimental (n=34) and control (n=34) groups before and after experiment:

1 –experimental group;
2 –control group;
*** –differences are confident with p<0.05;
-before experiment;
- after experiment

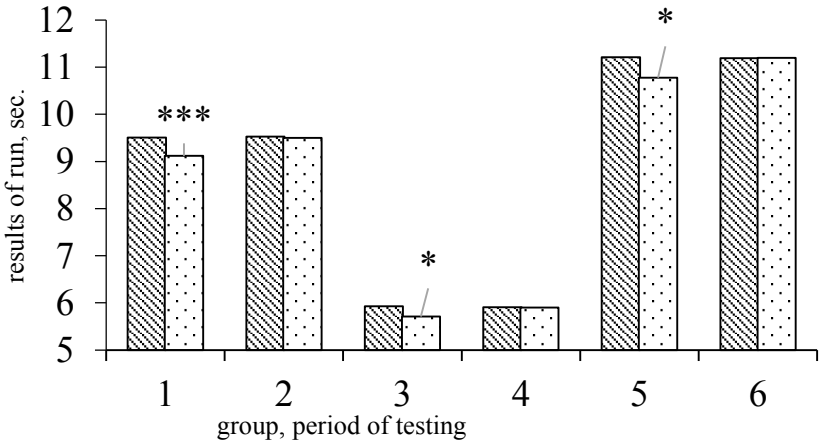

Fig. 3. Results of run tests of experimental (n=33) and control (n=34) groups before and after experiment:

1 – Run Бег 3×10 m, experimental group;
2 – Run 3×10 m, control group;
3 – Run 30 m, experimental group;
4 – Run 30 m control group;
5 – Run 60 m experimental group;
6 – Run 60 m, control group;
* – differences are confident with p<0.05;
*** – differences are confident with p<0.05;
- before experiment;
- after experiment

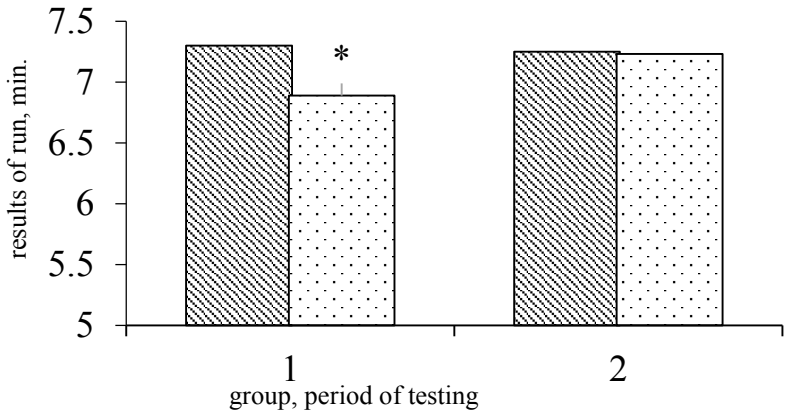

Fig. 4. Results of test "1000 meters' run" of experimental (n=33) and control (n=34) groups before and after experiment:

1 –experimental group;
2 –control group;
*** –differences are confident with $p<0.05$;
-before experiment;
- after experiment

The received results convincingly show validity and purposefulness of application of methodic of motor skills' training with the help of interdisciplinary connections and information technologies at light athletic lessons of senior pupils.

Discussion

The conducted research expands the data about construction of motor skills' training process for senior pupils. In scientific-methodic literature there is a lot of works, devoted to alternation of load and rest periods when training speed, speed-power and endurance of schoolchildren and junior sportsmen [1; 8; 10]. In the authors' opinion loads, in training of children, shall correspond to functional potentials of growing organism. With it, it is necessary to dose them and increase gradually.

As it was noted by L.P. Sushchenko [20] and Ye.A. Tabakova [21], even insignificant deviations in health in certain conditions can hinder achievement of high sport results. With orientation on children's ability to master movements one should not forget about their functional potentials. Otherwise their organisms can be overloaded. Training of junior sportsmen's motor skills is more effective, when excessive loads are not used in training process. Also effectiveness reduces with insufficient rest periods between loads [21]. From this point of view the offered by us methodic of senior pupils' training to motor skills considers psychological features of children and implies rational dozing of exercises.

Our work confirms the researches of V.A. Liakh [12]. In his researches, he showed that in period of accelerated growth (critical period) special training gives different pedagogic effect (higher in period of natural "ascend" of some motor abilities). From this point of view senior school age is the most favorable for training of strength and endurance but not very favorable for training of quickness and coordination [34-37]. In this connection rational methodic of motor skills' training (offered in our research) facilitates partial solution of problem of motor skills' training in relatively unfavorable age periods at the account of more rational technique.

Conclusions

1. We have worked out methodic of motor skills' training for senior pupils at light athletic lessons with application of interdisciplinary connections, information and interactive technologies. In our methodic, holistic approach is the main direction of motor skills' development. It implies mastering of basic movements on the base of analogies with rational and economic movement in animate nature, laws of mechanics. It conditions receiving of more deep understanding of correct technique of light athletic movements.

2. As a results of application of motor skills' training methodic during 1 academic year we registered confident improvement of pedagogic tests' for motor fitness results in experimental group's pupils.

The prospects of further researchers imply perfection of methodic of skills' formation in schoolchildren with the help of integral impact of interdisciplinary connection and information technologies.

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Conflict of interests

The authors declare that there is no conflict of interests.

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Information about the authors:

Al-Ravashdeh Abdel Baset; http://orcid.org/0000-0002-8851-3374; Zhanneta.kozina@gmail.com; Taras Shevchenko National University of Luhansk; area Gogol, 1, Starobelsk, 92700, Ukraine.

Kozina Zh.L.; http://orcid.org/0000-0001-5588-4825; Zhanneta.kozina@gmail.com; H.S. Skovoroda Kharkiv National Pedagogical University; Artema str. 29, Kharkov, 61002, Ukraine.

Bazilyuk T.A.; http://orcid.org/0000-0002-6244-6302; baziluk@rambler.ru; Kiev National University of Technology and Design; st. Nemirovich-Danchenko, 2, Kiev, Ukraine.

Ilnickaya A.S.; http://orcid.org/0000-0001-5835-8847; anita487@mail.ru; H.S. Skovoroda Kharkiv National Pedagogical University; Artema str. 29, Kharkov, 61002, Ukraine.

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PEDAGOGIC CONDITIONS OF HEALTH SAVING FUNCTIONING ORGANIZATION OF COMPREHENSIVE EDUCATIONAL ESTABLESHMENT'S HEADMASTER

Gres O.V.
Kharkiv National Pedagogical University

Abstract. *Purpose:* substantiation of pedagogical conditions of health saving functioning organization of comprehensive educational establishment's headmaster. *Material:* publications on topic of the research. 50 literature sources have been analyzed. *Results:* it has been found that pedagogic conditions of effective health saving functioning of comprehensive educational establishment headmaster are: influence of interconnection of district educational administration's teaching-methodic departments; activation of headmaster's personality; understanding of values by headmaster and his acquiring of health related knowledge and knowledge about health saving in process of education; realization of self-education by headmaster; renewal and acquiring of new knowledge and experience, which would ensure personal-professional growth of headmaster and facilitate increase of quality of pupils' education and teaching. *Conclusions:* self-education provides wide opportunities for improvement of administrative, communicative and reflexive qualities and skills as well as gives proper tools for independent and creative solution of health saving tasks in favor of pedagogic process's subjects.
Key words: teaching, administrator, health saving, pedagogic, administration, education.

Introduction

One of he most important factors of comprehensive educational establishment (CEE) headmaster's professional competence is his ability to effectively solve the task of personality's health through education. It is conditioned by the fact that just headmaster directly influences on implementation of such significant aspects of health pedagogic as: organization of pedagogic process, oriented on strengthening and maintaining of pupils' health; urging and mobilization of teachers and the whole pedagogic staff for health saving of pupils; stimulation of school pedagogues for conscious attitude to own health to be the example of healthy life style practicing.

Study of scientific sources witnesses that the problem of health saving functioning of CEE headmaster is researched in the following context:

- Implementation of valueology as factor, increasing effectiveness of educational-teaching process in educational environment [6-13];
- Development of personality's health through education, formation of health culture, schoolchildren's healthy life style [19, 26-22].

In foreign researches the following problems are solved: relations between administrations of educational districts and administrations of culture [40]; creation or correction of national profile of children's readiness for school by program Head Start [20-25, 29, 30, 35, 37-39]; increase of teachers' professional level [31, 32]; implementation of innovative approaches to management of school [32- 34, 36]; participation of family in children's preparation to school [21, 22]; teaching orphans [29].

Our previous researches permitted to reveal the essence and structural components of health saving functioning of comprehensive educational; establishment headmaster. An integral component of his administrative-pedagogic functioning is directed on creation of health-cultivating environment (physical, psychological-communicative, teaching-educational0 in educational establishment. Besides, it implies ensuring of support, maintenance and strengthening of health of all pedagogic process's participants (schoolchildren, parents, pedagogues). Constant pedagogic monitoring permitted to assess effectiveness of educational work of establishment by its achievement of the set tasks and make proper corrections in health saving functioning of pedagogic process's participants [3]. It was determined that the most important pedagogic condition of successful health saving functioning of headmaster was his self-education [5]. It was found that headmaster's health saving functioning is an integral component of his administrative-pedagogic activity and shall be directed on creation of health saving environment (physical, psychological-communicative, teaching-educational) in educational establishment; on support, maintaining and strengthening of all pedagogic process's participants (schoolchildren, pedagogues, teachers) [3].

Alongside with it effectiveness of health saving functioning of CEE headmaster have not become a subject of special research in psychological-pedagogic science.

Purpose, tasks of the wok, material and methods

The purpose of the article is substantiation of pedagogical conditions of health saving functioning organization of comprehensive educational establishment headmaster.

Results of the research

The conducted scientific search, own pedagogic experience witness that success of CEE headmaster's health saving functioning is impossible without person pedagogue's understanding of need in self-change and in self-education

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as a kind of professional functioning. It requires from organizers of scientific-methodic work with CEE headmasters to create specific conditions, which would stimulate pedagogue's work over him (her) self [3-5].

Creation of pedagogic conditions for effective realization of CEE headmasters' health saving functioning implies interconnected and interacting complex of pedagogic measures, oriented on assistance in personal progress as well as on stimulation of administration worker's individual activity, on development of personality's motivation for self-perfection. This aspect of conditions results from peculiarities of administration-pedagogic contingent, importance of satisfaction of their expectations, demands. These pedagogic conditions shall approach educational-cognitive work of CEE headmaster o character of his (her) professional functioning as well as to facilitate his (her) transition to higher level of pedagogic-administration activity. Pedagogic conditions of health saving functioning effective realization shall include the following: influence of interconnection of district educational administration's teaching-methodic departments; self-education work of CEE headmasters.

Let us regard it more specifically.

Study of psychological-pedagogic sources witnesses that most important task of district educational administration's teaching-methodic departments (DEA) is facilitating re-understanding of scientific-methodic work with pedagogic workers' content and its projecting: from separate teachers and pedagogic collectives to CEE headmasters [16, 17]. Interconnection of district educational administration's teaching-methodic departments and CEE shall be oriented on activation of headmaster's personality as well as on understanding of values by headmaster and his acquiring of health related knowledge and knowledge about health saving in process of education. ECC headmaster's functioning influences directly on practical realization of health saving pedagogic ideas, technologies. It creates conditions for healthy progressing of disciples.

For ensuring of actual assistance to CEE administration from DEA in achievement of proper professional competence level, operative mastering of the newest achievements of pedagogic science and advance experience it is necessary: to avoid formal approach to realization of interconnection and interaction in link "CEE-DEA"; to ensure wholeness of scientific-methodic work (it shall consist of interconnected and inter-conditioned components), voluntariness and availability of scientific-methodic work. That is, participation in certain its forms is determined by every pedagogue-administrator individually, considering his (her) potentials, demands, interests and etc.

Main forms of scientific-methodic works with CEE administrations shall include: meetings of methodic district and school pedagogues' associations by specialty; schools of young specialists (school headmaster); creative groups (pedagogues' associations by principle of realization of common pedagogic idea); creative unions (self-governed and voluntary pedagogues' associations, whose interaction facilitates increase of qualification and solution of pedagogic problems); targeted, constantly acting practical seminars; scientific-practical conferences; pedagogic readings; schools of advanced experience; schools of pedagogic skillfulness; mentoring; internship; fair-exhibitions of pedagogic ideas; competitions of pedagogic skillfulness; weeks (days) of "open doors" [16, 17].

Success of scientific-methodic work requires its certain organization, oriented on improvement of management system and comprehensive facilitating CEE headmasters' qualification: providing with methodic day; moral and material encouragement; providing wit methodic recommendations and consultations, opportunities for internship; direct professional-pedagogic communication by means of different measures. Conduct of all measures for rising of administration staff qualification at proper level is of not less significance as well as creation of required material base. Special DEA attention shall be paid to constant enriching and renewal of pedagogic knowledge and experience sources. In this aspect district methodical study, resource of which facilitates pedagogues' familiarization with advanced pedagogic experience and achievements of pedagogic science, is the most important. Methodic study orients the process of informational provisioning of educational establishments' administration on the following: expansion of world vision; renewal and substantial enriching of available psychological-pedagogic knowledge; study of new technologies of pedagogic process's organization; generalization and implementation of pedagogic and innovative experience of the best CEE headmasters of district (city, region, country).

Information provisioning system permits to familiarize practical administrators with methods of solution of possible organizational-administration problems. It instructs them to set proper aims, analyze difficulties, assess advantages and disadvantages of certain administrative solutions. Proper level of informational provisioning envisages:

- Perfection of legal, normative, recommendation and instructive documents devoted to secondary education in Ukraine;
- Availability of pedagogic periodicals (newspapers, magazines and so on), psychological-pedagogic literature, the newest editions of reference literature;
- Creation of electronic data base with banks of best up-to-date pedagogic experience, scientific-methodic materials on problems of health pedagogic, education innovative technologies and etc.

Forms of assessment of scientific-methodic work's effectiveness with CEE headmasters can be as follows:
Testing of CEE headmasters; experts' assessment of educational-teaching process quality in CEE; control "slicers" of children's health and general condition levels; working out of recommendations on correction of pedagogues-administrators' qualification and so on.

Self-education is rather important form of CEE headmaster's qualification improvement. It is a leading factor of successfulness of administrator's functioning. From this point of view it is regarded by us as the second pedagogic condition of success of CEE headmaster's health related functioning.

Let us regard it more specifically.

In modern society constant self-education is still more becoming a pre-condition of success in professional functioning. On the other hand (and it is very important) it defends personality from intellectual impoverishment. The mentioned above directly concerns pedagogic staff: pedagogue (especially school headmaster) shall be ready for constant changes that require self-education work. This work shall be oriented on deepening of theoretical knowledge and practical skills, improvement of pedagogic skillfulness. Ability of CEE headmaster for self-education is a pledge of maximal usage of teachers' creative potential at school. Professional self-perfection of teachers shall positively influence on healthy development of disciples.

Generally speaking, self-education is understood as human independent cognitive functioning, oriented on achievement of certain, significant for a personality, aims: satisfaction of general-cultural demands; cognitive interests in any sphere of activity; increase of professional qualification. At the same time self-education is a mean of self-control. It facilitates working out of commitment, insistency in achieving of a purpose, internal organization, ability to hard work and other moral qualities.

In context of the present research self-education of CEE headmaster shall be understood as independent, voluntary, self-governed, continuous mastering of up-to-date health related ideas and approaches, renewal and acquiring of new knowledge and experience. All these ensure personal-professional perfection of administrator and facilitate increase of schoolchildren's teaching and education quality [5].

Pedagogue will compulsory achieve high skillfulness if he is oriented on profession and strive for personal and professional perfection and self-education. For this purpose it is necessary to understand and solve the following tasks: consideration of changes in professional environment, which take place under influence of information technologies' expansion processes, social-economic reforms; constant work for perfection of own professionalism; renewal of knowledge and skills, which would ensure creative self-realization and ability to actively apply modern achievements and experimental searches; seeking of ways and active application of self-education, self-development and self-perfection methods.

Self-education fulfills a number of functions, which interact and supplement each other through adaptive (permitting for pedagogue to constantly adapt to variable world and new conditions of professional functioning); compensatory and informational (which are realized in process of acquiring of professional knowledge, skills, in widening of world vision, mastering of new information, independent accumulation of knowledge); developing (envisages formation of ability for active and competent participation in self transformation and in transformation of pedagogic functioning, continuous enriching of creative potential) [1, 2, 5, 14, 15, 18].

Process of pedagogue's self-education can be regarded as consisting of the following components:

- Self-assessment (ability to assess own potentials);
- Self-determination (ability to find place in life, in society, ability to understand own interests);
- Self-organization (ability to find the source of cognition, adequate to own potentials, to choose forms of self-education, ability to plan, to organize working place and functioning);
- Self-realization (realization of own potentials);
- Self-criticism (ability to clearly see advantages and drawbacks of own functioning);
- Self-development (result of self-education).

Realization of self-education is directly connected with level of pedagogic administrators' the following pedagogic skills:

- Studying of required literature and advanced pedagogic experience;
- Mark out the main actual principle, facts, phenomena, conditioning increase of theoretical and methodic level, from literature;
- Select ideas and methodic findings from the read literature for testing in own pedagogic functioning;
- Systemize and work out scientific-methodic generalizations;
- Implement achievements of psychological-pedagogic science and school practice in own practical functioning.

Content of pedagogues self-education work covers: systemic study of scientific, popular science literature, manuals, fiction and other literature, periodicals, Internet sources; take direct part in work of school, inter-school and district methodic associations, seminars, conferences, pedagogic readings; develop problems, connected with perfection of education-teaching work; prepare reports; reviews and abstracting of pedagogic and methodic magazines, digests. Self-education also envisages application of auxiliary means: listening to lectures, reports, concerts; consultations of specialists, attending of theatres, museums, exhibitions; watching films, TV programs; different kinds of practical activity (experiments, researches, simulation and etc.).

Discussion

Realization of the mentioned above pedagogic approaches witnessed that self-education results in effective after effects with its purposeful, uniform and systemic realization. It envisages making individual plan of self-education, which shall include the following components: list of literature for studying; forms of self-education; target day of work completion; expected results (preparation of reports, presentations at meetings of methodic association, description of experience of work, arrangement of results in the form of reports and so on).

The results of our research confirm and supplement the data of T.S. Iermakova [6, 7], O.M. Ionova [8-13], M. Knyazieva [14], L. Melnichuk [16], Eggum-Wilkens N.D. [23], Halle T.G. [25] concerning role of administrator in increasing of educational-teaching process's effectiveness.

Control of CEE headmaster's self-education process was, by its structure, several consequent stages, content of which was connected with practical functioning and summing up. Such main stages were: setting of functioning aims, formation of adequate tasks, collection of information about object of control, determination of tasks of work, programming and planning; organization of functioning and connections, analysis of process, its correction, analysis of results' effectiveness, determination of new aims.

Self-education of CEE headmaster shall be stimulated by district administration of education (DEA), though self-education work shall be independent and self-controlled. Main forms and methods of headmasters' urging for self-education were: systemic explanation of self-education role; organization of pedagogues' exchange of experience; individual talks of DEA officers with headmasters about main directions of self-education; mutual discussions of important topics and self-education programs by DEA officers and CEE headmasters; stimulation of the most qualified CEE headmasters for scientific-research work; completing and enriching of libraries with literature, devoted to self-education problems; conduct of lecture cycles, group and individual consultations, seminars; systemic summing up of self-education work of CEE headmaster (interviews, reports at teachers' meetings and at meetings of methodic associations); determination of tasks and content of self-education for coming academic year, analysis of qualitative totals of educational-teaching process.

In methodical study of DEA there was formed bank of materials to assist CEE headmasters in their self-education works: lists of literature, recommended for independent studying; material about advanced pedagogic experience; different variants of self-education plans; texts of reports; samples of essays on after effects of self-education functioning; literature sources' synopsis samples; new of psychological-pedagogic literature and etc.

Conclusions:

The conducted research permits to make the following conclusions. It was determined that pedagogic conditions of effective realization of CEE headmaster's health saving functioning were the following:

а) influence of district educational administration's teaching-methodic departments' interconnection with CEE. All these were oriented on activation of headmaster's personality, understanding of values and mastering of knowledge about human health and health saving in teaching process by him;

б) realization of self-education work by head master. That is independent, voluntary, self-controlled, continuous mastering of up-to-date health saving educational; ideas and approaches, renewal and acquiring of new knowledge and experience. All these ensure personal-professional growth of administrator and facilitate increase of pupils' teaching and education quality. Quality is increased by practical solution of personality's health saving tasks through education.

Self-education work opens opportunities for ensuring of perfection of administrative, communicative, reflexive qualities and skills as well as gives tools for independent and creative solution of health related tasks of pedagogic process's subjects.

The prospects of further researches imply analysis of readiness of comprehensive educational establishments' headmasters for health saving functioning.

Conflict of interests

The author declares that there is no conflict of interests.

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Information about the author:

Gres O.V.; http://orcid.org/0000-0001-8860-3305; o_gres@list.ru; Kharkiv National Pedagogical University; Artema str., 29, Kharkiv, 61002, Ukraine.

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FORMATION OF SCHOOLCHILDREN'S HEALTHY LIFE STYLE CULTURE AS ONE OF KEY PROBLEMS OF MODERN COMPREHENSIVE EDUCATIONAL ESTABLISHMENT

Davydova T.M.
Education and Science Department Chernihiv Regional State Administration

Abstract. *Purpose*: optimization of educational-teaching process in modern comprehensive educational establishment in context of pupils' health protection. *Material:* in experiment 1012 pupils (of age from 11 to 15 years old), 532 students of higher educational establishments, 176 teachers, 34 methodologists and representatives of educational establishments' administrations participated. *Results:* positive influence of schoolchildren's healthy life style on general health condition has been determined. Model of formation of adolescents' health culture, which consists of four sub-systems: health protection technologies; health related technologies; technologies of teaching to healthy life style; formation of personalities' qualities, facilitating health strengthening, has been offered. It has been found that the presented model orients pupils on formation of positive, firm, individual picture of health as the necessary condition of their viability. *Conclusions:* it has been established that formation of positive motivation for healthy life style is connected with demand in reducing of secondary education system to modern conditions of renewed content of education, forms and methods of work in comprehensive educational establishments.
Key words: health-protective, educational, technologies, life style, health culture.

Introduction

The problem of population's health protection is understood by representatives of educational system as profesionally significant more and more often. It I conditioned by the fact that the conception "health" itself is now being interpreted wider than simply as absence of disease. It starts covering social-cultural sense.

Attention to schoolchildren's health has grown significantly. Importance of rising generation's health strengthening is reflected in many statements of Declaration of children's rights, which was adopted by General Assembly of UN. By the data of Ministry of education and science of Ukraine and Ministry of health protection of Ukraine only 4-5% of school leavers can be considered to be practically healthy. Analysis of structure of schoolchildren's morbidity shows that with every academic year in educational establishment frequency of digestive organs', respiratory system's, eyesight diseases increases; quantity of children with posture abnormalities, nervous-psychic disorders rises. Unfavorable character of some factors in this sphere has been discussed already for long time but to day this problem is especially acute. Recent time there have appeared new factors, which negatively influence on schoolchildren's health: increase of academic load, spending leisure time for watching films or for computer games.

According to researches of World health protection organization human health depend by 51% on life style, by 17-20% on genetics, by 20% on environment, by 8-9% on system of health protection. Child's health, his (her) physical and psychic condition, social-psychological adaptation are to large extent determined by conditions of his (her) life, conditions of being at school. The period of child organism's intensive development accounts for child's years of studying at school.

In modern pedagogic science theoretical pre-conditions for development of holistic social-cultural conception of health protective activity in educational establishments have been created. In works by G. Apanasenko, Ye. Kazin, V. Kaznacheyev, G. Kurayev, T. Boychenko one can find ideas of holistic approach to definition of "health" phenomenon, reasons and mechanisms of its formation, protection and strengthening. Works by V. Bondin, L. Dykhan, G. Zaytsev, V. Kukushkin, M. Smirnov, O. Trusjkin are devoted to problems of organization of health protection activity on the base of systemic and complex approaches [8, 10, 11]. Researchers O. Vasylyeva and F. Filatov analyzed the most popular scientific and social ideas about health with accent on its psychological and social aspects [1].

Modern status of health formation education of society permits to detect obvious contradictions between positive settings and actual level of health related education of a person. In this connection formation of healthy life style culture of schoolchildren in modern educational establishments is one of complex and key problems in pedagogic.

Purpose, tasks of the work, material and methods

The purpose of the research is optimization of educational-teaching process in modern comprehensive educational establishment as pre-condition for pupils' health protection by formation of health culture. *The tasks are:* to test experimentally model of formation of schoolchildren's health culture, which would orient pupils on self-cognition and sled development as well as on high level of health culture. In process of setting the tasks we used conceptual approaches to planning experiment.

The methods and organization of the researches: we used analysis and generalization of scientific-methodic literature, pedagogic testing, methods of simulation, method of independent experts' assessments, methodic of O. Smirnov.

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Results of the researches

Worsening of school age children's health is not only medical but also pedagogic problem. The main task of comprehensive educational establishment shall be protection and strengthening of pupils' health; formation of their responsible attitude to own health.

It would be a mistake to say that school does not try to find way out from the existing situation. Recent decades health departments (valueologic departments) have been being created in schools. Besides, specialists, responsible for pupils' health are trained. Different forms and technologies of health strengthening are offered and tested. In many comprehensive educational establishments special work on formation of health culture only by one certain direction is practiced.

With such approach "school" reasons of health disorders are not removed; only attempts to reduce their negative influence are made. This work can be effective only under condition of its systemic, complex character, reasonable and professional approach to this problem.

That is why it would be correct to specify such concepts as "health protective technologies", "life style" "health culture".

Scientists and practical specialists (A.M. Mytiayeva, M.K. Smirnova, M.I. Stepanov) [13] think hat concept "health protection technologies" combines all directions of educational establishment's functioning on formation, preservation and strengthening of pupils' health. Actually: the purpose of modern school is preparation of children for life. Every schoolchild shall receive knowledge, which will be necessary for him (her) in future life.

Achievement of the mentioned purpose can be realized with the help of health protection technologies, which are regarded as combination of organizational techniques and methods of teaching-educational process without any harm for pedagogues' and schoolchildren's health.

Analysis of pedagogic literature on valueology showed the following: problem of choice of life style is becoming a leading one in protection and strengthening of health. With it life style is regarded as main reason of preservation or loss of health. When regarding this problem, conception of academician Yu. Lisitsin is the most frequently cited, which shows cause – effect dependence between human health and life style. Besides, in it, it is noted that the greatest influence on human health is rendered by life style (50-55%). Influence of other factors is distributed in the following way: ecological - 20-25%, genetics – 20%, quality of medical servicing – 10% [8, 10, 13].

Way of life belongs to social-biological factors. Its components are the following group of indicators: level, quality and style of life. Level of life is conditioned by human economical potentials. Quality of life is determined by demands and satisfaction of person's demands. It is not difficult to understand that both these indicators depend on material economical conditions of life of society and every family. Here there is nothing to be done by school. But life style is formed on the base of psychological and psycho-physiological features of person's behavior. And it is a wide field for school's functioning. Just school can teach children since early age to love themselves and take care of own health. Results of such teaching will manifest in adult life, making level and quality of life high.

Recent years specialists have been paying special attention to the fact that cultivation of health culture of educational establishments' pupils shall become a component of system of cultivation of human general culture.

Having analyzed researches of concept "health culture" (by authors N. Poltavtseva, V. Tsarevskiy, I. Novosiolova, N. Gorkusha, V. Gorashchuk) we come to the following conclusions:

- Health culture is realized in constructive behavior of a person; it facilitates health protection and strengthening;
- Value potential of health culture is combination of spiritual-moral and social values;
- Active, long life with realization of inner potential becomes a value of health culture;
- Person's value based attitude to own health is the basis of health culture;
- The necessary condition for formation of health culture is compulsory observation of healthy life style;
- Health culture is inevitable component of general human culture, which expresses in sufficient physical, mental, spiritual-moral and social development.

Undeniably, high level of youth's health culture does not appear by itself. It results from active systemic work of pupils with themselves and purposeful interaction with surrounding people and pedagogues. That is why the process of cultivation of rising generation's health culture envisages existence of teachers with high health-protection competence and level of health culture. All these are important components of their general and professional culture.

For solution of problem of health protection and strengthening we offer model of health culture formation for schoolchildren (see fig.1). It is interaction of four sub-systems, which supplement each other:

1. Implementation of health related educational technologies, which create optimal conditions for preservation of pupils' health and facilitate increase of educational progress.

2. Health related work in curriculum and extra-curriculum time. Success in this work is ensured by creation of a number of measures, which facilitate improvement of brains' functioning and increase of workability. They renew tonus of muscles, which ensure correct posture. They release tension from eyes and ears, from tired fingers, create conditions for development of physical potentials. All these are very important for improvement of progress in learning.

3. Implementation of technologies, teaching to healthy way of life and cultivating health culture; which facilitate health strengthening, formation of ideas about health as a value; which increase motivation for healthy life style, increase responsibility for personal health and health of family.

4. Formation of pupils' life competences in process of their teaching, creation of favorable conditions for development of schoolchild's personality with high health culture, capable to form own life potential.

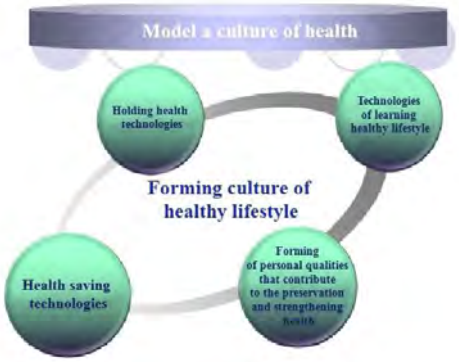

Fig.1. Model of formation of schoolchild's health culture

The presented model is based on principles of preservation, strengthening and formation of health, on interconnection of theory and practice. The model orients pupils on self-cognition and self-development of personality and high level of health culture.

Alongside with it teaching-educational process of comprehensive educational establishment shall be oriented on solution of the following tasks:

- Creation of favorable conditions for creative mastering of certain sum of basic knowledge by pupils; formation of pupils' skills in independent mastering of new knowledge in their future lives;
- Consideration modern governmental requirements to content and level of pupils' learning progress, projected on expected final results of teaching; combining of personality-oriented, active and competence approaches;
- Analysis of psychological-pedagogic and methodic literature on formation of healthy life style and development of pupils' health culture;
- Ensuring of development of pupils' self-governing, involving of pupils in organization of teaching process, development of social activity, organization of pupils' healthy life style;
- Increase of quality of physical education and pupils' medical servicing;
- Working out and implementation of system of continuous valueological education;
- Introduction of diagnostic and monitoring of pupils' and teachers' health in educational process;
- Increase of effectiveness of all academic disciplines' usage for formation of pupils' competent attitude to own health; cultivation of their healthy life style, health culture;
- Organization of extra-curriculum work with pupils;
- Application of medical and health related procedures;

For testing of the offered model's effectiveness we created control and experimental groups of teachers. Every component of development of teacher's health related competence is presented in the form of system of parameters, which were to be assessed by teachers themselves and by independent experts. On the base of assessments of independent experts we observed dynamic of development of main structural elements of experimental and control groups' teachers' readiness: axiological, cognitive, activity and personality's components (see table 1, fig.2).

Table 1

Distribution of experimental and control groups' teachers by level of health related competence at the beginning and at the end of forming stage of experiment

Levels	Experimental group				Control group			
	Before experiment		After experiment		Before experiment		After experiment	
	Abs. value	%	Abs. value	%	Abs. value	%	Abs. value	%
High	32	19.4	67	38.1	36	20.7	43	24.9
Sufficient	80	44.3	90	51.1	83	47	92	51.9
Average	64	36.3	19	10.8	57	32.3	41	23.2
Total	176	100	176	100	176	100	176	100

Generalization of forming experiment's results was fulfilled with the help of a complex of methods (methodic of O. Smirnov). This methodic is based on application of point scales and relative frequencies, which permitted to calculate level of formation of each tested component.

Analysis of forming experiment's results witnessed effectiveness of the offered model concerning development of teachers' health related competence and methodic of its stage-by-stage realization. It is seen in positive dynamic of every component's level.

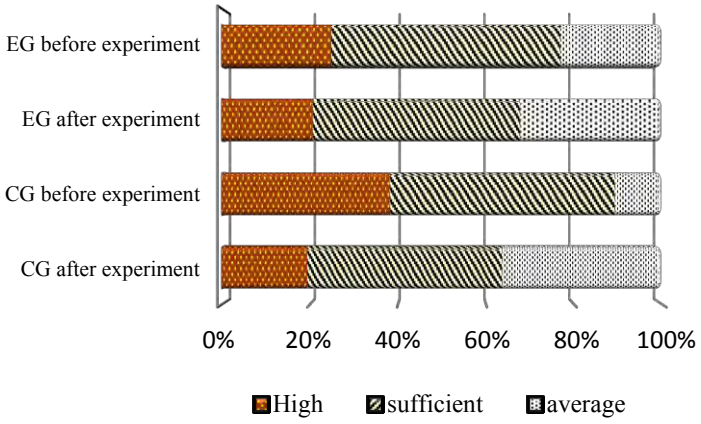

Fig.2. Distribution of experimental and control groups' teachers by levels at the beginning and at the end of experiment

At the beginning of experimental work the quantity of respondents with high level was 19.4%, with sufficient - – 443%, with average – 36.3%. After experiment the quantity of respondents changed in the following way: high level – 38.1%, sufficient – 51.1%, average – 10.8%. By results of experiment quantity of respondents with high and sufficient levels of readiness to development of health related competence reached 89.2%. It witnesses about effectiveness of the offered model and methodic of its stage-by-stage realization. Application of model of teachers' health related competence development in system of comprehensive school methodic work was assessed positively by participants of teaching educational process.

The received results permit to state that increase of level of teachers' health related competences positively reflects in the following: formation of schoolchildren's health culture; their physical, mental, spiritual and social health condition; practicing of healthy life style by them, increase of workability. All these result in better learning progress.

Discussion

Results of the research witness that in the offered model the sub-systems are quite sufficient and optimally combined for formation of schoolchildren's health culture. They expand idea about educational establishment's role in organization of health related functioning by means of combining of all directions of its work. Besides, importance of health related technologies in preservation and strengthening of pupils' health in conditions of modern education is confirmed [2, 3, 6, 8, 10].

We also confirmed academician Yu. Lisitsin's conception about cause-effect dependence between human health and way of life. The received data supplement the data of different authors [5, 7, 12] about formation of healthy life style and human health culture.

Conclusions:

Pedagogic understanding of educational work management in school with formation of pupils' healthy life style permits to create specific educational environment. In this case the process of formation of disciples' positive firm individual picture of health becomes a necessary condition of their viability. Only in such case culture creating symbol "health" can transform into pupils' sense of life.

The prospects of further researches imply perfection of formation of health's individual picture by the following characteristics:

- High general level of understanding of own life;
- Prevalence of value regulation over consuming one;
- Localization of leading bench marks in the future and taking own life at present as interesting, emotional and full with sense.

Conflict of interests

The author declares that there is no conflict of interests.

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Information about the author:

Davydova T.M.: tanechka_davydova_93@mail.ru; http://orcid.org/0000-0003-2235-8508; Education and Science Department Chernihiv Regional State Administration, Shevchenko str. 34, Chernihiv, 14013, Ukraine.

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STRUCTURAL MODEL OF IN-GROUP DYNAMIC OF 6-10 YEARS OLD BOYS' MOTOR FITNESS

Ivashchenko O.V., Yermakova T.S.
H.S. Skovoroda Kharkiv National Pedagogical University

Abstract. *Purpose:* to determine structural model of in-group dynamic of 6-10 years old boys' motor fitness. *Material:* in the research 6 years old boys (n=48), 7 years old (n=45), 8 years old (n=60), 9 years' age (n=47) and10 years' age (n=40) participated. We carried out analysis of factorial model of schoolchildren's motor fitness. *Results:* we received information for taking decisions in monitoring of physical education. This information is also necessary for working out of effective programs of children's and adolescents' physical training. We determined model of motor fitness and specified informative tests for pedagogic control in every age group. In factorial model of boys' motor fitness the following factor is the most significant: for 6 years – complex development of motor skills; for 7 years - also complex development of motor skills; for 8 years – strength and coordination; for 9 years – complex development of motor skills; for 10 years – complex development of motor skills. *Conclusions:* In factorial model of 6-10 years old boys' motor fitness the most significant are backbone and shoulder joints' mobility, complex manifestation of motor skills, motor coordination. The most informative tests for assessment of different age boys' motor fitness have been determined.
Key words: factorial analysis, informative indicators, modeling, motor fitness, boys.

Introduction

The problem of motor functioning and health improvement is important both in Ukraine and in European space [26, 27, 28, 42, 44, 46, 47, 48]. Health strengthening and increase of children's and adolescents' workability depend on optimal motor functioning, which is ensured by physical education at school (V.K. Baltsevych [2]; T.Yu. Krutsevych, G.V, Bezverkhnia. [9]).

One of conditions of schoolchildren's motor fitness improvement is organization of pedagogic control at physical culture lessons [4, 5, 6, 17, 19, 33, 34, 35, 36, 37], in conditions of sport training 3, 18, 16, 17, 27]. Effectiveness of pedagogic control depends on the presence of object of control and informative indicators characterizing change of its state. In recent publications it has been determined that modeling is an effective method for receiving of new information concerning current and finalizing control on the base of testing of children's and adolescents' motor fitness [13, 33, 34, 35, 36, 37]. One of methods of statistical modeling is factorial and discriminant analysis. Effectiveness of their application is witnessed by the data of scientific literature [29, 30, 31, 32, 33, 34, 35, 36, 40]. The mentioned works note that it is necessary to search methodological approaches to solution of motor fitness problems and pedagogic control of children and adolescents.

So, determination of motor fitness factorial model is of practical importance for taking decisions in monitoring of physical education as well as for working out of effective programs for children's and adolescents' physical training.

Purpose, tasks of the work, material and methods

The purpose of the research: is to determine structural model of group dynamic of 6-10 years old boys' motor fitness.

The methods of the research: for solution of our tasks we used such methods as analysis of scientific literature, pedagogic testing and methods of mathematical statistic. Factorial analysis was used as method of modeling.

In planning of the research we used conceptual approaches to working out scientific researches' programs in physical education and sports [1, 8, 12, 14].

Testing program included commonly known tests [10, 11, 21, 22] for assessment of 6-10 years old boys' motor fitness. We registered results of motor tests. The results are presented in table 1.

In the research 6 years old boys (n=48), 7 years old (n=45), 8 years old (n=60), 9 years' age (n=47) and10 years' age (n=40) participated.

Results of the research

For determination of structural model of in-group dynamic of boys' motor fitness we carried out factorial analysis by 15 indicators. Results of analysis are given in table 1.

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Table 1

Structural model of in-group dynamic of 6-10 years old boys' motor fitness. Method of rotation. Varimax with normalization of Kaiser

№	Description of test	Age	N	Factors					h^2
				1	2	3	4	5	
1	Static posture on one foot (sec.)	6	48	689				-426	789
		7	45		668				524
		8	60			846			789
		9	47				782	318	776
		10	40			758			587
2	Walking on hexagon segments (steps)	6	48	687				468	801
		7	45	557					395
		8	60				640		448
		9	47		654				466
		10	40	751					686
3	Exercises for combining of arms' torso's and legs' movements (points)	6	48				-907		829
		7	45		778				703
		8	60			754		-330	748
		9	47	-702					597
		10	40				898		830
4	Walk on straight line after 5 rotations, deviations (cm)	6	48					924	866
		7	45		-606				511
		8	60					775	633
		9	47				837		743
		10	40	428		-544	414	334	791
5	Shuttle run 4x9 m (sec.)	6	48			921			912
		7	45	-814					729
		8	60	732					576
		9	47		-645				486
		10	40		608			390	611
6	30 meters' run (sec.)	6	48			489		582	636
		7	45	-805					703
		8	60	651				349	596
		9	47	692	-485				745
		10	40		-844				756
7	Frequency of arms' movements (times)	6	48		732		497		892
		7	45					900	838

№	Description of test	Age	N	Factors					h^2
				1	2	3	4	5	
		8	60		672		322		756
		9	47	-675			330		618
		10	40	-700			435		696
8	Seizing of falling Dietrich's stick (cm)	6	48			659	499	434	911
		7	45				840		776
		8	60		679			333	635
		9	47	320	375	596		-349	805
		10	40	642			387	444	867
9	Long jump from the spot (cm)	6	48		824	-318			855
		7	45	740					582
		8	60	-519	414		430		680
		9	47		787				641
		10	40		779				722
10	300 meters' run (sec.)	6	48	-878					858
		7	45	-787					700
		8	60	712					589
		9	47	663					505
		10	40	314		723			701
11	Chin ups on rope in mixed hanging (times)	6	48	764	379	-306	-381		968
		7	45	682					584
		8	60	-828					748
		9	47		357	-689			651
		10	40	389	528			-470	696
12	Rising into sitting position during 1 minute (times)	6	48	783				307	733
		7	45	508			383	435	678
		8	60	-713					616
		9	47		557	-562			666
		10	40	423		-600			701
13	Torso bending from sitting position (cm)	6	48		835		-433		911
		7	45			-778			632
		8	60	-516	544				730
		9	47					865	787
		10	40	-402	-398		643		759

№	Description of test	Age	N	Factors					h^2
				1	2	3	4	5	
14	Index mark of backbone mobility (bridge)	6	48		-601	747			957
		7	45			736			579
		8	60				-656		441
		9	47			733			595
		10	40					938	891
15	Index mark of shoulder joints' mobility	6	48		-310	375	632		688
		7	45		-338	399	572		669
		8	60			-606			545
		9	47	430			324	-433	562
		10	40	693					521
	Full dispersion, % of dispersions	6	48	20.678	17.552	17.124	14.823	13.860	
		7	45	24.557	11.795	10.131	9.177	8.355	
		8	60	22.562	12.361	9.947	9.690	8.300	
		9	47	15.544	15.483	12.351	11.735	9.174	
		10	40	18.435	15.355	13.413	12.519	11.865	

As a result of analysis in group of 6 years' age boys we marked out five factors, which explain 84.037% of dispersion's variation.

First factor (informative potential 20.678%) has the highest correlation with results of tests № 10 (-0.878), № 11 (0.764), № 11 (0.783). The factor characterizes level of endurance and strength itself.

Second factor (informative potential 17.552%) has the highest correlation with results of tests № 13 (0.835), № 9 (0.824), № 7 (0.732). The factor characterizes complex development of flexibility, speed power and dexterity.

Third factor (informative potential 17.124%) has the highest correlation with results of tests № 5 (0.921), № 14 (0.747), № 8 (0.651). The factor was named general coordination of movements.

Forth factor (informative potential 14.823%) has the highest correlation with results of test № 3 (-0.907). The factor was named coordination of movements of different body parts.

Fifth factor (informative potential 14.823%) has the highest correlation with results of test № 4 (0.924) and it characterizes vestibular stability of 6 years old boys.

Thus, in factorial model of motor fitness the following is marked out: complex development of motor skills (factors 1,2); general coordination (factors 3); coordination of movements of different body parts (factor 4) and vestibular stability (factor 5). Analysis of communities (h^2) showed that tests № 11 (0.968), № 14 (0.957), № 5 (0.912), № 13 (0.911), № 8 (0.911) have the highest informative potential for assessment of 6 years boys' motor fitness. .

In group of 7 years old boys, analysis marked out also five factors, which explain 64.015% of dispersion's variations.

First factor (informative potential 25.223%) has the highest correlation with results of tests № 5 (-0.814), № 11 (0.764), № 16 (-0.805), № 10 (-0,787). The factor characterizes development of general motor coordination, dexterity and endurance. This factor is a complex one and takes priority place.

Second factor (informative potential 13.112%) has the highest correlation with results of tests № 3 (0.778), № 1 (0.668), № 4 (-0.606). The factor characterizes motor coordination.

Third factor (informative potential 9.891%) has the highest correlation with results of tests № 13 (-0.778), № 14 (0.736). The factor was named flexibility.

Forth factor (informative potential 8.279%) has the highest correlation with results of tests № 8 (0.840), № 15 (0.572). The factor was named dexterity.

Fifth factor (informative potential 7.511%) has the highest correlation with results of test № 7 (0.900) and it characterizes dexterity of 7 years old boys. The factor was named dexterity.

Thus, in factorial model of motor fitness the following is marked out: complex development of motor skills (factors 1); general coordination (factors 2); flexibility (factors 3) and dexterity (factor 4, 5). Analysis of communities (h^2) showed that tests № 7 (0.838), № 8 (0.776), № 5 (0.729), № 3 (0.703), № 6 (0.703) have the highest informative potential for assessment of 7 years boys' motor fitness.

In group of 8 years old boys' analysis marked out also five factors, which explain 62,861% of dispersion's variations.

First factor (informative potential 22.562%) has the highest correlation with results of tests № 11 (-0.828), № 5 (0.732), № 12 (-0.713). The factor characterizes strength and coordination.

Second factor (informative potential 12.361%) has the highest correlation with results of tests № 8 (0.679), № 7 (0.672), № 15 (-0.606). The factor characterizes complex development of dexterity.

Third factor (informative potential 9.947%) has the highest correlation with results of tests № 1 (0.846), № 3 (0.754). The factor was named motor coordination.

Forth factor (informative potential 8.3%) has the highest correlation with results of tests № 14 (-0.656), тест № 2 (0.640). The factor was named motor coordination.

Fifth factor (informative potential 8.3%) has the highest correlation with results of test № 4 (0.775) and characterizes vestibular stability of 8 years old boys. The factor was motor coordination.

Thus, in factorial model of 8 years old boys' motor fitness strength and coordination are marked out. Analysis of communities (h^2) showed that tests № 1 (0.789), № 3 (0.748), № 11 (0.748), № 13 (0.730), № 9 (0.68) have the highest informative potential for assessment of 8 years boys' motor fitness.

In group of 9 years old boys, analysis marked out also five factors, which explain 64.286% of dispersion's variations.

First factor (informative potential 15.544%) has the highest correlation with results of tests № 3 (-0.702), № 6 (0.692), № 7 (-0.675). The factor characterizes dexterity and motor coordination.

Second factor (informative potential 15.483%) has the highest correlation with results of tests № 8 (0.679), № 7 (0.672), № 15 (-0.606). The factor characterizes complex development of dexterity.

Third factor (informative potential 12.351%) has the highest correlation with results of tests № 14 (0.733), № 11 (-0.689), № 8 (0.596). The factor characterizes flexibility, strength and dexterity.

Forth factor (informative potential 11.735%) has the highest correlation with results of tests № 4 (0.837), № 1 (0.782). The factor was named motor coordination.

Fifth factor (informative potential 9.174%) has the highest correlation with results of test № 13 (0.865) and characterizes flexibility of 9 years old boys. The factor was flexibility.

Thus, in factorial model of 9 years old boys' motor fitness the following are marked out: compels development of motor skills (factors 1, 2, 3), coordination (factor 4), flexibility (factor 5). Analysis of communities (h^2) showed that tests № 8 (0.805), № 13 (0.787), № 1 (0.776), № 6 (0.745), № 4 (0.743) have the highest informative potential for assessment of 9 years boys' motor fitness.

In group of 10 years old boys, analysis marked out also five factors, which explain 71.586% of dispersion's variations.

First factor (informative potential 18.435%) has the highest correlation with results of tests № 2 (0.751), № 7 (-0.700), № 15 (0.693). The factor characterizes dexterity and motor coordination.

Second factor (informative potential 15.355%) has the highest correlation with results of tests № 6 (-0.844), № 9 (0.779), № 5 (0.608). The factor characterizes complex development of dexterity, coordination and flexibility.

Third factor (informative potential 13.413%) has the highest correlation with results of tests № 1 (0.758), № 10 (0.747), № 8 (0.651). The factor characterizes complex development of dexterity, coordination and flexibility.

Forth factor (informative potential 12.519%) has the highest correlation with results of tests № 3 (0.898), № 13 (0.643). The factor was named motor coordination of different body parts.

Fifth factor (informative potential 11.865%) has the highest correlation with results of test № 14 (0.938) and characterizes flexibility of 10 years old boys. The factor was flexibility.

Thus, in factorial model of 9 years old boys' motor fitness the following are marked out: compels development of motor skills (factors 1, 2, 3), motor coordination of different body parts (factor 4), flexibility (factor 5). Analysis of communities (h^2) showed that tests № 14 (0.891), № 8 (0867), № 3 (0.830), № 4 (0.791), № 13 (0.759) have the highest informative potential for assessment of 10 years boys' motor fitness.

Discussion

The received results supplement the data about application of factorial and discriminant analysis for determination of children's and adolescents' motor fitness structure [4, 5, 6, 31, 39, 29, 40,]. Like in the works of Geoffrey D. Broadhead and Gabie E. Church [30], O.M. Khudolii, A.A. Titarenko [23], Khudolii O.M., Iermakov S.S., Ananchenko K.V. [37], Zh.L. Kozina, N. Popova [7] we observed high prognostic significance of factorial analysis in determination of models and informative indicators of junior school age children.

The materials, presented in table, witness that as a result of analysis of motor fitness factorial models there was received information, which is required for taking decisions in physical education monitoring as well as for working out of effective programs for junior schoolchildren's physical training.

So, factorial analysis permitted to determine models of motor fitness and specify informative indicators for pedagogic control in every age group.

Conclusions:

In factorial model of boys' motor fitness the most important are:

- 6 years – complex development of motor skills (factor 1), coordination (factor 2), flexibility (factor 3), dexterity (factors 4, 5);
- 7 years - complex development of motor skills (factor 1), coordination (factor 2), flexibility (factor 3), dexterity (factors 4, 5);
- 8 years – strength and coordination;
- 9 years - complex development of motor skills (factor 1,2,3), coordination (factor 4), flexibility (factor 5);
- 10 years - complex development of motor skills (factor 1,2,3), motor coordination by different body parts (factor 4), flexibility (factor 5);

The most informative tests for assessment of boys' motor fitness are:

6 years old boys:

- № 11 " Chin ups on rope in mixed hanging" (0.968);
- № 14 " Index mark of backbone mobility (bridge)" (0.957);
- № 5 "Shuttle run 4x9 m" (0.912);
- № 13 " Torso bending from sitting position " (0.911);
- № 8 " Seizing of falling Dietrich's stick " (0.911);

7 years old boys:

- № 7 " Frequency of arms' movements (times) " (0.838);
- № 8 " Seizing of falling Dietrich's stick (cm)" (0.776);
- № 5 "Shuttle run 4x9 m" (0.729);
- № 3 " Exercises for combining of arms' torso's and legs' movements (points)" (0.703);
- № 6 " 30 meters' run (sec.)" (0.703);

8 years old boys:

- № 1 " Static posture on one foot (sec.) " (0.789);
- № 3 " Exercises for combining of arms' torso's and legs' movements (points)" (0.748);
- № 11 " Chin ups on rope in mixed hanging" (0.748);
- № 13 " Torso bending from sitting position " (0.730);
- № 9 "Long jump from the spot" (0.680);

9 years old boys:

№ 8 " Seizing of falling Dietrich's stick (cm)" (0.805);

- № 13 " Torso bending from sitting position" (0.787);
- № 1 " Static posture on one foot (sec.) " (0.776);
- № 6 "30 meters' run" (0.745);
- № 4 " Walk on straight line after 5 rotations, deviations" (0.743);

10 years old boys:

- № 14 " Index mark of shoulder joints' mobility " (0,891);
- № 8 " Seizing of falling Dietrich's stick " (0.867);
- № 3 " Exercises for combining of arms' torso's and legs' movements " (0.830);
- № 4 " Walk on straight line after 5 rotations, deviations" (0.791);
- № 13 " Torso bending from sitting position" (0.759).

The prospects of further researches imply determination of structural model of in-group dynamic of 6-10 years old girls' motor fitness.

Conflict of interests

The authors declare that there is no conflict of interests.

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Information about the author:

Ivashchenko O.V.; http://orcid.org/0000-0002-2708-5636; tmfv@tmfv.com.ua; H.S. Skovoroda Kharkiv National Pedagogical University; Artema str. 29, Kharkov, 61002, Ukraine.

Yermakova T.S.; http://orcid.org/0000-0002-3081-0229; yermakova2015@gmail.com; H.S. Skovoroda Kharkiv National Pedagogical University; Artema str. 29, Kharkov, 61002, Ukraine.

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STUDY OF MUSCULAR SKELETAL APPARATUS'S FUNCTIONAL STATE OF JUNIOR SPORTSMEN-POWER LIFTERS, WHO HAVE BACKBONE VERTERBRAL ABNORMALITIES

Ilmatov V.R.
Odessa State Environmental University

Abstract. *Purpose:* determination of abnormalities and disorders of muscular skeletal apparatuses' status of power lifters, who have vertebral abnormalities of backbone. *Material:* 58 junior sportsmen participated in the research. 36 sportsmen were the main group of the research and had vertebral disorders in backbone. For posture testing visual examination was used. Backbone mobility was tested with goniometry method. Flat feet were registered with plantography method. *Results:* we determined posture abnormalities in sagittal and frontal planes; feet flat, limited maximal movements in thoracic and lumbar spines. It was determined that the most limited were rotational movements and backbone unbending. The next were side bents. These limitations were accompanied by pain syndrome. These observations indirectly confirmed theory of direct interaction of backbone structures with nervous structures. It is also a confirmation of vertebral abnormalities' presence in junior sportsmen. *Conclusions:* it was found that in junior sportsmen – power lifters with backbone pathologies in 100% of cases symptoms are determined by local limitations of backbone mobility with pain syndrome. In 35% of cases they are accompanied by posture's disorders and feet flat. Orientation and methodic of rehabilitation of such sportsmen have been determined.

Keywords: rehabilitation, muscular, skeletal, posture, backbone, abnormalities.

Introduction

As on to day percentage of sportsmen with backbone traumas, caused by incorrect lifting of great weights, has been still remaining rather high. As a result changes of tissues' structural functional parameters appear. It can result from not only mechanical disorders but be direct reason of them. Mechanical factor is considered the main reason of backbone abnormalities [5, 6, 13]. Insufficient load on backbone is dangerous due to atrophy of its components and possible disorders in metabolism. Overloading of backbone also influences negatively on its functional state. With it (as a rule) one or another backbone structure suffers that, in the future, results in trauma. Sometimes, trauma appears due to disproportions in muscles' development and changes of natural backbone's profile [6, 7]. Recent time among all diseases of peripheral nervous system specific weight of backbone osteochondrosis has constantly been rising. In 5.3 – 21% of cases these pathology affects persons of young age. This pathology substantially restricts physical and functional potentials, which are especially important for sportsmen in conditions of constantly increased loads [4, 5]. Up to the present time there have existed a lot of questions of this disease's pathogenesis, especially in young people. In particular the question of backbone pathology's influence on sportsmen's motor potentials has not been solved, as well as the problems of objective diagnostic of early (pre-clinical) reflex symptoms of sportsmen's backbone osteochodrosis [8, 10, 11, 15].

Young, growing organism of sportsman has significant processes in bone tissues with uneven ossification and final formation of bones and joints in 20-25 years' age. Zones of growth also remain not closed. Bones are pliant to changes and are easily deformed with physical overloading (especially static). The processes of bone tissue's growth and development can be accelerated or decelerated. It is a result of hormones oscillations, which determine character of bone tissue's development [18, 19]. In growth and formation of bones substantial role is played by physical exercises. Static loads cause changes of ions content and cells' polarization in these tissues. They are compulsory condition for mineralization of bones at the account of absorbing of ionizes forms of required micro-elements [15, 16]. Significant loads, excessive muscular efforts in this age are reflected in development of bones and joints. They change their shape and structure to larger extent than in case of adult person [7]. That is why during training it is necessary to consider existing age specificities. Multilateral character of trainings, observation of "step-by-step" principle, exercises' adequacy, exercises' alternation by different movements are compulsory as well as application of backbone, pelvis and lower limbs' relaxing exercises. It is directed on prevention from possible unfavorable deviations in adolescent's growth; on stimulation of growth and normal development of bone-ligament tissue. Thus, junior sportsmen shall be paid special attention to, who already have abnormalities in muscular skeletal apparatuses; in particular – posture's abnormalities and early backbone osteochondrosis.

Purpose, tasks of the work, material and methods

The purpose of the work is to determine abnormalities and limitations in muscular skeletal apparatuses of junior sportsmen – power lifters, who have vertebral abnormalities of backbone.

The methods and organization of the research: we tested 58 junior power lifters of 12-13 years' age, who were divided in main and control groups. Postures were examined visually. Backbone mobility was tested with method of goniometry. Pantograph method was used for detection of feet flat.

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Results of the research

Among 12-13 years' age adolescents there is observed great number of backbone and feet pathologies. It is manifested as feet flat and posture's abnormalities. As per opinion of different authors they are from 57.0% to 65.4% of cases, depending on age [8, 12]. Considering high level of such pathologies' manifestation we conducted deepened examination of junior 12-13 years' age power lifters' muscular skeletal apparatuses. The examination included detail study of main parameters, characterizing posture, backbone mobility, symmetry of indicators as well as foot arc.

Analysis of visual examination data showed high percentage of posture abnormalities (see table 1). By the results of our researches it was found that most of sportsmen (in our research – 34 persons) have asymmetric location of shoulder girdle and blades. Location of blades and shoulder girdle is influenced by localization and direction of backbone warp.

Table 1

Analysis of junior power lifters' visual examination data

Age	Quantity of sportsmen	Posture		
		Asymmetric	Round-concave back	Flat back
12	15	7	-	8
13	19	9	6	4
Total	34	16	6	12

Our researches permitted to find, in most cases, dislocations of shoulder girdle and blades from the right of torso in upward direction. Backbone warps in upper and middle thoracic spines is accompanied by pulling of blade and shoulder girdle upward at the side of bulge. It depends on warp, points of fixing of rhomboid and trapeziums muscles of certain side. So, dislocation of shoulder girdle and blades happen in compliance with general bio-mechanical principle [21-25]. This principle is rather clearly expressed with scoliosis, when blade and shoulder girdle are lower on concave side of thoracic warp and higher on convex side.

Blades' inclination forward was characteristic for all sportsmen with round concave back. Blades' lower angles were at certain distance from ribs. It was obvious strengthening of thoracic kyphosis. Position of shoulder girdle and blades of sportsmen with flat backs was not always of the same type. For example for the most of sportsmen blades' keeping up with chest was characteristic. With asymmetric posture (girdle's warp to the left) shoulder girdle and blade were higher to the right. In case of scoliosis they are lower at the left side. In case of backbone deformation in lumbar spine shoulder girdle and blades are located symmetrically.

In most of sportsmen with asymmetric postures we observed asymmetry of waist triangles. Smoothing of waist triangle takes place from the side of raised shoulder girdle. Asymmetry of waist triangles of sportsmen with round-concave back was expressed in less quantity of sportsmen and not so clearly. Torso dislocation in respect to pelvis was detected in 4 sportsmen. With it in 3 sportsmen it was to the left side and in 1 – to the right. Pelvis location in frontal plane was symmetric in most of sportsmen. But in sagittal plane we registered increase of angle of forward pelvis inclination. In sportsmen with flat back we found waist triangles' asymmetry in 7 children, torso dislocation to warp side – in 6 persons, asymmetry of pelvis position in frontal plane – in 4. Angle of forward inclination of pelvis was less and was $30\text{-}40^0$.

Asymmetric position of pelvis in frontal plane was detected in 28 sportsmen (mainly to left side). Pelvis side inclination was conditioned in most cases by weakness of abdomen oblique muscles.

Head forward inclination was detected in 13 tested sportsmen with asymmetric posture head inclination forward and to the left was registered in 7 sportsmen; forward and to the right – in 4 sportsmen. Straight head position was found in 2 sportsmen. Head position influences greatly on all complex bio-mechanical chain, including backbone and posture as it is. Forward head inclination is usually connected with increasing of thoracic kyphosis. Vertical head position is observed in sportsmen with flatted backbone profile in sagittal plane.

In sportsmen with round-concave back head forward inclination was registered in 5 boys.

Rather often in sportsmen with posture's abnormalities relative shortening of lower limb was detected. It should be noted that rather often it characterizes status of lower limbs' muscular skeletal apparatus. This feature witnesses about asymmetric tension of lower limbs' muscles and is accompanied by pelvis warp in frontal plane. From total quantity of the tested (34 persons) relative shortening of one of limbs was found in 13 boys.

Thus, with the help of visual examination we conducted analysis of junior power lifters' postures with registration of certain symptoms of posture abnormalities and made up individual posture profile of every tested sportsman.

Discussion

In testing of foot arc we found hypotonic type of foot (feet flat) in 26% of the tested sportsmen. In 38% of sportsmen we observed hypertonic type (tensed feet). 45% of sportsmen had dystonic type of foot (clubfoot). Normal type of foot belonged only to 4% of sportsmen. The received results confirm the data of other authors, who note that there is high percentage of foot arc's disorders, which differ by level: from 52.9 to 73.7% - in boys and from 44 to 58.8% - in girls [9, 12].

Thus we confirmed the data of authors [11, 12, 15], that as on the present time most of children and adolescents have abnormalities in muscular skeletal apparatus and are carriers of many markers of ligament tissue's dysplasia. In this connection such children are the group of risk, meaning appearing and stabilization of functional and in the future organic deformations of backbone. With it significant asymmetry of lower limbs' length in junior representatives of different sport specializations exceeds the same in children, who do not practice sports. Sport practicing in children and adolescent age does not depend on specific features of muscular functioning and to certain extent remove postural muscular imbalance and deviations in pelvis position. The latter appears at the account of functional blocking in sacrum – pelvis area. Owing to frequency of appearing of high functional fixings in cervical spine they result in hyper-mobility in cervical spine. It can be accompanied by a number of clinical symptoms.

Results of our researches confirm the mentioned facts. For example, maximal backbone movements were limited in thoracic and lumbar spines (see table 2 and table 3).

Table 2

Angles of maximal movements in thoracic spine of junior sportsmen

Backbone movement	Angle of movement (degrees)		Probability of changes	
	Forward / to the left	Backward/to the right	t	P
Bending in sagittal plane	27.0±1.4	17.2±1.6	-	-
Bending in frontal plane	12.4±3.7	14.0±2.9	0.34	> 0.5

Table 3

Angles of maximal movements in thoracic and lumbar spines of junior sportsmen

Backbone movement	Angle of movement (degrees)		Probability of changes	
	Forward / to the left	Backward/to the right	t	P
Bending in sagittal plane	78.4±5.4	61.5±5.3	-	-
Bending in frontal plane	47.8±5.7	52.4±6.0	0.56	>0.1
Rotation	32.2±5.3	34.1±6.9	0.22	>0.5

The most restricted were maximal and snatch rotational movements of all backbone. It was: to the side of prevailing symptoms of vertebra segment's osteochondrosis in average 32.2 ± 2.3° and 41.9 ± 2.0; in opposite side – 34.1 ± 1.9° and 44.5 ± 2.1°. These indicators confidently differed from normal ($p < 0.001$). Analogous regularities were observed also for side mobility of backbone (in average, accordingly 50.1 ± 4.8 ° and 21.3 ± 4.4, $p < 0.01$). Distinctions between side bents were not confident ($P > 0.05$).

We also found substantial variability of angle of "snatch" movements in three successive attempts. In junior sportsmen with backbone pathologies (mainly in second and third movements) the angle did not exceed the value of the first movement. With expressed pain syndromes dispersion of values was 20-30%. It can be explained as "saving" of backbone, resulted from pain syndromes. The most limited were rotational movements and unbending. The next were bents to sides. Bending of thoracic spine in combination with lumbar spine practically was not limited ($P > 0.05$).

This fact indirectly confirmed theory of direct interaction of backbone anatomic structures with nervous structures: with forward bents inter-vertebral space expands and "free" nervous structures. On the other hand it confirms

the opinion of a number of authors [5, 9, 17], that bending movements are risk factor, which shall be considered when working out complexes of therapeutic gymnastic for persons with backbone pathologies.

Thus, profound testing of junior sportsmen power lifters' muscular skeletal apparatuses helped to find out great percentage of sportsmen with functional disorders. Among them the most frequent were posture's abnormalities and feet flat. We marked out characteristic features of certain posture's abnormalities and made up individual profile of posture for every tested sportsman. The received data confirm authors' opinion about presence of such abnormalities in 12-13 years' age children. They are from 57.0% to 65.4% cases [8, 12]. We have supplemented the data of K. Bukup [3], IU.L. Pshetakovski [14], Yu.V. Bobrik. [1], I.I. Bonchuk [2], that pain in back and limitations of backbone mobility are direct sign of degenerative-dystrophic changes in backbone.

Our observations showed that not all sportsmen with posture abnormalities felt pain and had limitations of backbone mobility. That is why initial signs of backbone osteochodrosis can not always be connected with posture's disorders and feet flat. But in confirmation of authors [11, 12, 15] we can affirm that such abnormalities of muscular skeletal apparatus can be carriers of significant quantity of markers of ligament tissue's dysplasia. They are additional reasons of early backbone osteochodrosis. In this connection such children are in risk group, meaning risk of appearing and stabilization of functional and, in the future, organic, backbone's deformations.

Conclusions:

We have registered rather high percentage of junior sportsmen-power lifters with morphological functional disorders of muscular skeletal apparatus. Such abnormalities are: disorders of postures, feet flat and possible pathologies of backbone. On the base of conducted researches it was proved that junior sportsmen- power lifters with pathologies of some motor segments of backbone clinical symptoms of early osteochondrosis is manifested in local limitations of backbone mobility. They are accompanied by pain syndromes and vegetative disorders in affected segment of backbone. On the base of the received data we determined physical rehabilitation methodic for junior sportsmen-power lifters with vertebral disorders of backbone.

The prospects of further researches imply working out of program of junior sportsmen-power lifters' physical rehabilitation from vertebral backbone abnormalities.

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Conflict of interests

The author declares that there is no conflict of interests.

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Information about the author:

Ilmatov V.R.; http://orcid.org/0000-0002-2847-5281; vladmilan@mail.ru; Odessa State Environmental University; Lvov str., 15, Odessa, 65016, Ukraine.

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EFFECTIVENESS OF 14-15 YEARS OLD TENNIS PLAYERS' COMPETITION FUNCTIONING CONSIDERING CORRECTION OF THEIR PSYCHOLOGICAL FITNESS

Makuts T.B.
Lvov State University of Physical Culture

Abstract. *Purpose:* to determination influence of individualized psychological training on effectiveness of 14-15 years old tennis players' competition functioning. *Material:* in the research 24 tennis players of 14-15 years' age participated. Individualized psychological training consisted of 15 sessions of total duration of 1.5 months. *Results:* We substantiated necessity of individualized approach to tennis players' psychological training. Individual psychological profiles for tennis players, which determined content of psychological training and their selection, were worked out. Informative indicators for assessment of 14-15 years old tennis players' competition functioning were determined: 1) percentage of won and lost scores at the account of own actions; 2) integral criteria of tennis players' competition functioning assessment (coefficient of stability and effectiveness; complex indicator of efficiency). *Conclusions:* it is recommended to consider individual potentials and bents of sportsmen in the course of psychological training.
Key words: competition, psychological, individualized, tennis, coefficient of effectiveness.

Introduction

Organization of game in tennis shall be built with consideration of laws, principles and factors of game conduct. These phenomena are constantly acting and influence purposefully on process of competition. Specificity of competition functioning in tennis is manifested in active counter-actions of opponent that requires quick change of realization of player's plan. Sportsmen have to act in conditions of expressed time deficit with quick changes of game situations; if necessary to find adequate response. Effectiveness of game functioning to large extent depends on quick assessment of game situation and choosing of appropriate game techniques. It implies presence of highly developed psychological and psycho-physiological functions [1-4, 8, 14, 16-18].

Important feature of tennis is the fact that sportsmen shall to fulfill a lot of competition actions – game techniques. For achievement of the expected results these techniques shall be fulfilled many times in one game and it dictates presence of reliability and stability of skills. Achievement of sport result is realized by numerous techniques and actions, combined in specific for tennis system [7, 9, 11-13].

Competition functioning of tennis players takes place in situations, which constantly and quickly change. In such cases sportsmen use great number of different actions oriented on achievement of victory. Owing to great amount of competitions sportsmen shall quickly response to every situation by adequate actions. Even at meeting with well known opponent tennis player never faces exact replica of time, space and other characteristics, Functional state of tennis player significantly changes even within the frames of one competition. It is connected with indefinite time of match duration [5-6, 19-21].

Many of components of tennis players' competition functioning are very often weakly connected with each other. Only after determination of perfection level of every of component it is possible to objectively assess strong and weak sides in structure of competition functioning of a sportsman as well as to work out competition functioning model and individual training program for him.

Multi-sided knowledge about structure of competition functioning, presence of proper functional potentials and sportsman's technical tactic fitness are preconditions for achievement of sport results, as well as level of special motor skills and psychological fitness of players [4, 8].

In specialists' works significant influence of junior tennis players' psychological features on success of their sport functioning. The researches, conducted by T.S. Ivanova, showed that level of attention and thinking of 15-16 years old tennis players directly influence on effectiveness of their game actions during tennis match [6]. Similar data were received by K.Kh. Nguien as a result of comparison of junior 13-16 years old tennis players with their psychological fitness [9].

However, in process of tennis players' psychological training no one considers two important principles: 1) consideration of sportsman's individual features; It facilitates more efficient opening of their abilities, effective mastering of technical-tactic skills and rising of sportsmanship; 2) application of systemic approach in the course of researching of players' psychological potentials and their further development [11-13, 21]. In this connection the researched problem is topical and practically significant for tennis.

Purpose, tasks of the work, material and methods

The purpose of the work: to determination influence of individualized psychological training on effectiveness of 14-15 years old tennis players' competition functioning.

In the research 24 sportsmen – disciples of children-junior sport schools in Kiev and Lvov- participated. Sportsmen were divided into two equivalent groups: control and experimental (12 players in every group). The research

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lasted for 1.5 month. Experimental group's tennis players endured 15 (separate) psychological trainings of 30 – 50 minutes' duration. Control group's tennis players were psychologically trained in traditional form (mainly at trainings and before competitions). For every player of experimental group individual psychological profiles were made up, which determined choice of means and methods of training. The content of the offered trainings completely depended on individual features of every sportsman. Prevalence or "weakness" of psychological fitness's certain sides influenced on choice of trainings' means and methods. For every player we worked out individual programs of psychological training, which included fifteen separate sessions. We formed main types of psychological trainings, which were orientated on specialization: 1) – orientation on motivation-will sphere; 2) – training of prevailing development of memory functions (short-term and long-term); 3) – trainings, oriented on prevailing of sportsmen's cognitive resources. Training of different parameters of attention and mental workability; 4) – combination of motivation-will sphere and training of attention; 5) – trainings, oriented on increase of tennis players' self estimation; 6) – trainings of analytical-projecting character; 7) – increase of stress-resistance and optimization of players' anxiety.

Results of the research

For determination of the offered individualized approach's influence we analyzed players' performance in Cup of Ukraine (Petrovske village). Performances' results were compared with competition data, achieved in previous competitions (championship of Ukraine (Bucha). Sportsmen of experimental group demonstrated better competition results, in comparison with control group's players.

For assessment of competition functioning we used the following criteria:

1) percentage of won and lost scores at the account of own active actions;

2) integral criteria (coefficient of effectiveness, coefficient of stability and complex indicators of efficiency).

The mentioned above criteria do not exhaust all combination of data, which can be used for such assessment. In comparison with other data they are rather informative. The applied criteria create holistic picture about successfulness of players' main competition actions.

After specialized psychological training, experimental group's sportsmen had confidently better percentage of won scores at the account of own active actions and less percentage of lost scores (see fig.1).

It was found that percentage of won scores at the account of own actions of experimental group's tennis players at the beginning of experiment was – 25.67±3.65%. After experiment this indicator became confidently higher (32.40±4.7%). Quantity of scores, lost at the account of own actions, confidently reduced ($p<0.05$). The level of this indicator significantly exceeds model characteristics for junior players (14-15years old). It witnesses about more rational and balanced game at match.

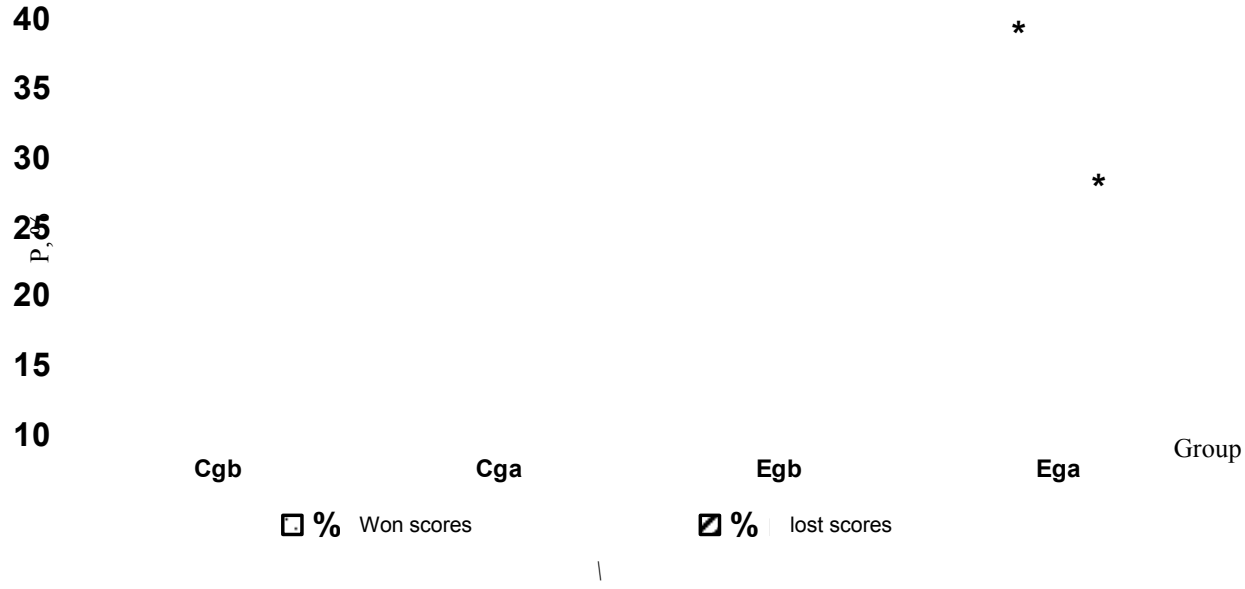

Fig.1. Percentage of won and lost scores by 14-15 years' old tennis players at the account of own active actions before and after experiment:

P –percentage of scores, %; Cgb – control group before experiment; Cga – control group after experiment; Egb – experimental group before experiment; Ega – experimental group after experiment* - $p<0.05$

At the beginning of experiment percentage of lost scores was 28.91±5.36% and after its finishing – 19.70±5.50% (for comparison: for adult sportsmen 15% of lost scores at the account of own actions is considered to be a model level). Besides, increase of manifestation of integral game effectiveness criteria was observed (see fig.2).

Tennis players of experimental group demonstrated higher coefficients of stability (CS) and effectiveness (CE) as well as complex indicator of efficiency (CIE) at receiving services and serves with rebound (see fig.3).

However, these distinctions were confident only for coefficients of stability and complex indicator of efficiency ($p<0.05$).

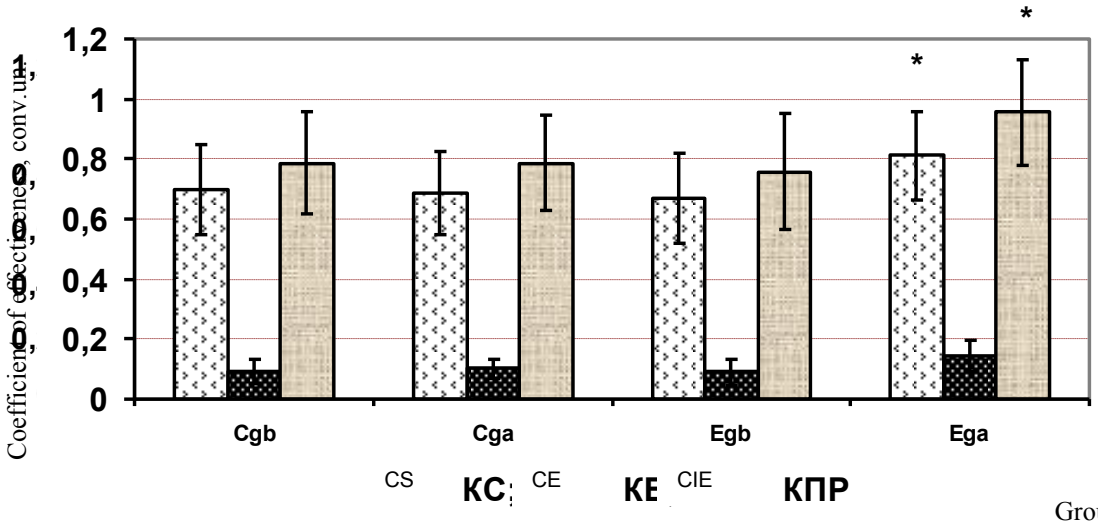

Fig.2. Integral indicators of receiving of services by 14-15 years' old tennis players before and after experiment: Cgb – control group before experiment; Cga – control group after experiment; Egb – experimental group before experiment; Ega – experimental group after experiment* - $p<0.05$

Coefficient of effectiveness at receiving of services and in with rebound also improved (0.05±0.02 and 0.09±0.04 before experiment; 0.10±0.04 and 0.14±0.05 after experiment). However these positive changes were not confident. The reason to it was high level of coefficient of data variation. It reflected significant individual distinctions in manifestation of this integral indicator.

Sportsmen of control group did not confidently improve any of the mentioned indicators, analyzed by us. Increase of competition effectiveness is extremely important indicator. It witnesses correctness of the chosen direction of work and importance of individualized psychological training of sportsmen.

Discussion

In this work we confirmed the data of specialists (T.S. Ivanova, 1998; K.Kh. Nguien, 2008;) about influence of psychological features of junior 14-15 years old tennis players on successfulness of their training and competition functioning. We also supplemented the data of Ye.V. Vasina, 2008; M.V. Ibrayimova, 2011; T.I. Knyazieva, 2010), about difficulty of competition functioning in tennis and necessity to use reliable criteria for its assessment.

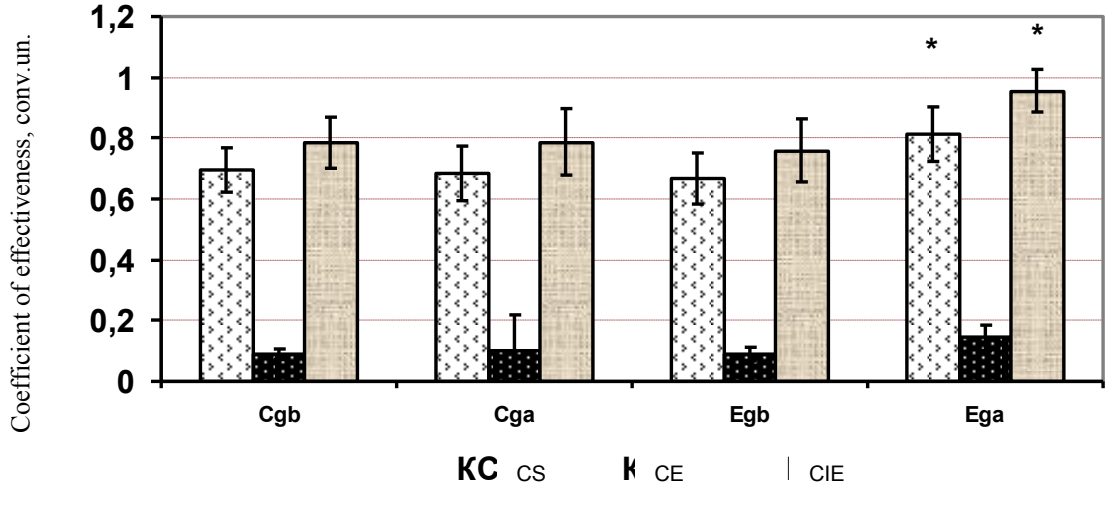

Fig.3. Integral indicators of services with rebound fulfilled by 14-15 years' old tennis players before and after experiment:

Cgb – control group before experiment; Cga – control group after experiment; Egb – experimental group before experiment; Ega – experimental group after experiment* - $p<0.05$

In process of assessment of junior tennis players it has been offered to use integral indicators of successfulness and model values, which reflect percentage of won and lost scores at the account of own active actions. In our work, for the first time it is offered to use individualized psychological training and its influence on competition functioning of junior 14-15 years old tennis players.

It has been found that after course of specialized sessions sportsmen had confidently higher indicators of effectiveness of competition functioning. The received data permit to affirm that it is necessary to continue researches of sportsmen's individualized psychological training influence at different stages of many years perfection.

Conclusions:

1) Application of psychological training means is a topical direction for increase of competition functioning's effectiveness. Individualization of psychological training permits to consider specific features of every player when choosing means and methods of work as well as to choose required style for communication with a sportsman and plan his (her) future perfection.
2) Implementation of individualized approach and psychological training programs in training process influenced positively on effectiveness of tennis players' competition functioning. Tennis players of experimental group demonstrated higher level of coefficients of stability (CS), coefficients of effectiveness (CE) and complex indicator of efficiency (CIE) in receiving of serves and in serves with rebound.
3) Percentage of won scores at the account of own active actions significantly improved in experimental group (from 25.67±3.65% to 32.40±4.7; $p<0.05$). Also we observed confident reduction of percentage of scores, lost at the account of own active actions (at the beginning of experiment – 28.91±5.36%, after its finishing – 19.70±5.50%).

The prospects of further researches are connected with implementation of individualized psychological programs in training of elite tennis players.

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Conflict of interests

The author declares that there is no conflict of interests.

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Information about the author:

Makuts T.B.; http://orcid.org/0000-0002-2329-7527; tmakuts@mail.ru; Lvov State University of Physical Culture; Kostyushko str. 11, Lvov, 79007, Ukraine.

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PHYSICAL HEALTH OF YOUNG AND MIDDLE AGE WOMEN UNDER INFLUENCE OF STEP-AEROBICS EXERCISES

Masliak I.P.
Kharkiv State Academy of Physical Culture

Abstract. *Purpose:* to determine the degree of step-aerobics exercises' influence on 20-35 years age women's health. *Material:* in the research 28 women of 20-35 years old age participated. Anthropometric indicators, heart beats rate in rest and after load (20 squats for 30 sec.), blood pressure, vital capacity of lungs, hand dynamometry were registered. *Results:* level of physical health has been determined; influence of step-aerobics on women's health has been found; age differences in the tested indicators have been analyzed. It was found out that step-aerobic trainings influence greatly on the following indicators: body mass, circumferential sizes and cardio vascular system; on functioning of respiratory system, strength of hand's flexors and regulation of 31-35 years age women's cardio-vascular system. *Conclusions:* application of step-aerobic exercises positively influenced on health of 20-35 years old women.
Key words: physical education, health, women, step-aerobics.

Introduction

Recent time, in Ukraine steady tendency to worsening of young and adult population's health has been being observed. Social-economical instability, strengthening of psycho-emotional tension noticeably increase requirements to functional and physical condition of workable population, which is main labor and resource potential of the state[2]. Physical culture, which dominates in increasing of population's motor functioning, takes one of priority places.

By opinion of a number of authors fitness has great health related effect and is one of progressive kinds of motor functioning [13, 14, 15, 19].

In process of our researches we found positive influence of different forms of fitness on health, physical fitness, organism's functional state, mental and physical workability of schoolchildren [12], students [8, 10, 16-18, 21], 15-16 years old boys and girls [4], men of young and middle age [1].

A number of researches dealt with studying of influence of fitness and its kinds (aerobics, aqua-aerobics, body-fitness) on women's organism [3, 5-7, 11, 20]. With it influence of step-aerobics exercises on physical health of young and middle age women's health has not still been cleared up.

Purpose, tasks of the work, material and methods

The purpose of the research is to determine the degree of step-aerobics exercises' influence on 20-35 years age women's health.

The methods of the research: theoretical analysis and generalization of scientific-methodic literature, pedagogic experiment, methods of mathematical statistics. For determination of physical health level we used methodic of G.L. Opanasenko and N.A. Naumenko [9]. We registered anthropometric indicators; heart beats rate in rest and after loads (20 squats for 30 sec.); blood pressure; vital capacity of lungs; hand dynamometry.

The researches were conducted on the base of fitness-club "Zviozdniy", Kharkov. 28 women of 20-35 years' age participated in the research. They composed two experimental groups: first group – 20-30 years old women; second group – 31-35 years old women. In the course of experiment, in their training program step-aerobics exercises with application of step platforms were included. From these exercises we made complexes to be fulfilled in different positions and travels.

Results of the research

The received results were compared with assessment scale, presented by V.A. Romanenko [9] (see table 1). We found that health condition of both groups' women correspond to "low level".

Analysis of results in age aspect showed absence of confidence distinctions with general tendency to increase indicators with age ($p>0.05$). Results of measurements of waist circumference, which decrease with age, were the exclusion.

It was found out that body mass and circumferential sizes' indicators of both groups' women significantly changed: weight and hips and waist circumferences noticeably reduced in comparison with initial data (see table 2). These changes are confident ($p<0.05 – 0.001$). For example, reduction of 1st group's body mass indicators was 4.3%, of 2nd group – 6.3%; waist circumference – 2.0 and 8.7%, hips circumference – 1.1% and 7.6%. Thus, indicators of body mass and circumferential sizes changed in the most noticeable way in women of 31-35 years old age. Indicators of body length did not changed significantly in all tested groups ($p>0.05$).

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Table 1

Physical health of 20-35 years old women before and after experiment

Groups		Body mass (body length (cm)	VCL/body mass (ml/kg)	Hand dynamometry/body mass (%)	HBRx BP/100	Time of HBR restoration (min/sec)	Points	General assessment of health
		Before experiment						
1 group	$\overline{X}$	36.7	38.1	36	50.9	3.2	-	Low
	points	-2	-1	-1	5	-2	-1	
2 group	$\overline{X}$	38.3	37	40	51.7	3.4	-	Low
	points	-2	-1	-1	5	-2	-1	
After experiment								
1 group	$\overline{X}$	35.1	50.2	42.9	47.2	2.03	-	Below average
	points	-2	1	0	5	1	5	
2 group	$\overline{X}$	35.9	49.4	45.6	42.8	2.31	-	Below average
	points	-2	1	0	5	1	5	

Notes: VCL– vital capacity of lings; HBR – heart beats rate; BP – blood pressure.

Table 2

Physical health indicators of 20-35 years old women before and after experiment

№	Indicators	1 group		t	p	2group		t	p
		Before experiment	After experiment			Before experiment	After experiment		
		$\overline{X}$ ± m				$\overline{X}$ ± m			
1.	Body mass, kg	60.3±3.9	57.7±3.71	6.38	<0.001	64.8±3.56	60.7±2.95	6.18	<0.001
2.	Body length, cm	164.8±2.07	164.8±2.07	–	–	169.4±2.09	169.4±2.09	–	–
3.	Waist circumference, cm	73.5±2.58	72.0±2.63	2.58	<0.05	71.8±3.02	65.5±3.01	11.11	<0.001
4.	Hips circumference, cm	99.0±3.10	97.7±3.05	4.12	<0.01	100.0±2.27	92.4±2.06	8.45	<0.001
5.	HBR, b.p.m^{-1}	39.7±1.82	37.8±1.43	2.63	<0.05	40.2±1.30	35.1±1.18	4.72	<0.01
6.	$BP_{syst,}$ mm.merc.col.	128.4±3.19	125.0±1.88	2.12	>0.05	128.7±2.63	122.0±1.04	2.78	<0.05
7.	VCL, l	2.3±0.16	2.9±0.16	3.65	<0.01	2.4±0.20	3.0±0.18	6.16	<0.001

№	Indicators	1 group		t	p	2group		t	p
		Before experiment	After experiment			Before experiment	After experiment		
		$\overline{X}$ ± m				$\overline{X}$ ± m			
8.	Right hand dynamometry, kg	21.8±1.95	24.8±2.13	3.93	<0.01	26.4±2.85	27.7±2.78	2.25	>0.05
9.	Left hand dynamometry, kg	21.4±1.30	23.5±1.39	2.84	<0.05	21.5±2.58	22.8±2.61	2.29	>0.05
10.	Time of HBR restoration after load, min.sec.	3.20±0.18	2.03±0.15	3.51	<0.01	3.40±0.18	2.31±0.18	2.8	<0.05

Notes: VCL– vital capacity of lings; HBR – heart beats rate; BP_{syst} – systolic blood pressure.

Analysis of repeated results of cardio-vascular system showed improvement of heart beats rate and systolic blood pressure in both age groups (p<0.05;0.01). For example, improvement of HBR in 1st group was 4.8%; in 2nd group – 12.6%; BP – 2.6 and 5.2%. Thus, the highest changes took place in group of 31-35 years old women.

It was detected that vital capacity of lings in both groups significantly and confidently improved (p<0.01; 0.001). Increment of indicators was: 20.6% – in 1st group and 20.0% – ion 2nd group. Thus, the most significant changes took place in group of 20-30 years old women.

Analyzing indicators of hand flexors' strength we found that in both tested groups results improved after experiment. However, differences were confident only in indicators of 1st group (p<0.05; 0.01). For example, increment of right hand dynamometry indicators in 1st group was 12.0%, left hand – 8.5%; in second group – 4.7% and 5.7% accordingly.

Thus the most significant increment of dynamometry of both hands took place in group of 20-30 years old women.

Analysis of indicators of heart beats rate restoration after definite dosed load sowed that results of both groups' women improved confidently (p<0.05, 0.01). Indicators' improvement in 1st group was 36.5%, and in second – 32.0%. Thus, indicators of cardio-vascular system's regulation changed most significantly in 20-30 years old women.

Analysis of repeated physical health indicators in age aspect did not reveal any substantial changes in comparison with initial data. Exclusions were: hips circumference indicators; systolic blood pressure and left hand dynamometry. Results of 2nd group's women became better after experiment than in 1st group. However, these differences are not statistically confident (p>0.05).

Comparison of experimental results with standard data [9] (see table 1) shows that in both groups' women physical health level increased and correspond to level "below average".

Thus, results of the conducted researches witness about positive influence of step-aerobics trainings on health of 20-35 years' age women. It was found that step-aerobics influences on the following indicators:

- body mass and cardio-vascular system of 31-35 years' age women;
- functioning of respiratory system, strength of hand flexors and regulation of cardio-vascular system of 20-30 years' age women.

Discussion

Analysis of scientific-methodic literature showed that there is a number of works, devoted to influence of different kinds of fitness on health condition, physical fitness, mental and physical workability of different age contingent [1, 12, 16-18, 21].

On the base of this analysis and generalization of the results of our research we expanded data [3, 5-7, 11, 20] about influence of different kinds of fitness on women's organism. We supplemented data [4, 8, 10] about step-aerobics positive influence on human organism. For the first time we determined influence of step-aerobics exercises on physical health of 20-35 years old women. The most sensitive to step-aerobics exercises parameters of physical health have been

detected. The most favorable age periods for development of certain physical health indicators under influence of step-aerobics have been also determined.

Conclusions:

1. Initial data of physical health parameters permitted to determine "low" level of 20-35 years' age women's health and they do not differ in age aspect.
2. Application of worked out by us step-aerobics exercises in trainings positively influenced on physical health of young and middle age women. Their health level improved from "low" to "below average". 31-35 years old women demonstrated substantial changes of body mass indicators, circumferential sizes and functioning of cardio-vascular system. In 20-30 years old women indicators of respiratory system, strength of hand flexors and cardio-vascular system's regulation noticeable improved.

Further researches in this direction can be realized by means of determination of step-aerobics influence on physical workability of young and middle age women.

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Conflict of interests

The author declares that there is no conflict of interests.

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Information about the author:

Masliak I.P.; http://orcid.org/0000-0003-1306-0849; ira.maslyak@mail.ru; Kharkiv State Academy of Physical Culture; Klochkivska str. 99, Kharkiv, 61058, Ukraine.

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RESULTS OF EXPERIMENTAL TESTING OF SYSTEM OF FUTURE PHYSICAL CULTURE TEACHERS' TRAINING FOR ART PEDAGOGIC MEANS' APPLICATION IN PEDAGOGIC FUNCTIONING

Nizhevska T. V.
H.S. Skovoroda Kharkiv National Pedagogical University

Abstract. *Purpose:* the research is devoted to seeking of ways to rising of quality of future physical culture teachers. *Material:* in experiment 436 students and 29 teachers participated. *Results:* it was found that readiness of future physical culture teachers for application of art pedagogic means in professional functioning is achieved through realization of appropriate block system. Such system ensures mastering by students of the following: theoretical principles of art pedagogic; mastering of art pedagogic skills in teaching and quasi professional functioning; acquiring of practical experience of art means' application in period of pedagogic practice at schools. It was also determined that training system of future teachers includes the following three blocks: conceptual-target, knowledge-procedural; control-correcting. *Conclusions:* it is recommended to use such criteria of students' readiness for application of art means in pedagogic functioning: motivation-axiological, cognitive-active, personality's-reflexive.
Key words: teacher, physical culture, art pedagogic, vocational training, structure, system, training.

Introduction

On modern stage of society's progress ensuring of comprehensive education of rising generation is becoming more and more topical. Efficiency of this process to large extent depends on quality of physical culture teachers' professional functioning. Discipline "physical culture" is one of school disciplines, which is taught during all period of pupils' studying at school that confirms significant role and leading place of physical culture in formation of comprehensively developed personality, strengthening and preservation of person's health.

In this sense problem of increasing of future physical culture teachers' quality is becoming rather topical. One of ways to solution of this problem is ensuring of physical culture students' readiness for application of art pedagogic means in their future pedagogic functioning.

Scientists have already researched certain aspects of the mentioned problem [2, 12, 14, 15, 17, 18], though it is necessary to say that training of future physical culture teachers for application of art means in pedagogic functioning was not special topic of separate pedagogic research.

Purpose, tasks of the work, material and methods

The purpose of the research is to experimentally test system of future physical culture teachers' training for application of art pedagogic means in professional functioning.

The hypothesis of the research implies that future physical culture readiness for using of art pedagogic means in future professional functioning is achieved through realization of appropriate block training system. Such system ensures mastering by students of the following: theoretical principles of art pedagogic, mastering of art pedagogic skills in teaching and quasi professional functioning; acquiring of practical experience of art pedagogic means' application during pedagogic practice at schools.

Organization of the research: for testing of our assumption we conducted pedagogic experiment. This experiment was conducted in period 2009 – 2012 on the base of H.S. Skovoroda Kharkiv National Pedagogical University and Kharkiv State Academy of Physical Culture. For experiment we formed experimental (217 persons) and control (219 persons) groups of students. Besides, in experimental work 29 teachers participated.

In experimental work we used the following criteria of students' readiness for application of art means in pedagogic functioning: motivation-axiological, cognitive-active, personality's-reflexive as well as appropriate indicators. Experiment included three stages: initial, forming and control.

At initial and control stages of experiment we used the following methods of the research: observation over students' academic functioning; questioning (with application of author's questionnaire, questionnaire by N.Yu. Sergeyeva on determination of students' attitude to art; questionnaire by N.Yu. Sergeyeva on express diagnostic of efficiency of students' training for application of art pedagogic means). Besides, we also applied: testing (with the help of author's test for diagnostic of students' knowledge about principles of art pedagogic, "scales for assessment of affirmations" by N.Yu. Srgeyeva) [13]; diagnostic with the help of diagnostic method for empathy assessment (V. Boyko) [11]; methodic of poly-motivational tendencies' diagnostic "Self-concept" of personality by N. Shumakova [18]; methodic of "unfinished sentence" for diagnostic of students' motives; method of experts' assessment.

At initial stage of experiment it was found that levels of the mentioned above readiness do not significantly differ in experimental and control groups. With it these level were insufficient for effective pedagogic functioning in the future.

At forming stage of experiment in experimental group we implemented the worked out (block) system of future physical culture training for application of art means in professional functioning. Experimental work covered in-class lessons, as well as pedagogic practice and students' extra-curriculum activity.

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Mastering of motivation-value component of the mentioned above readiness by students envisaged their understanding of art means' pedagogic potential, development of their motivation for mastering these means, as well as formation of value attitude to development of pupils' physical culture on the base of art works' usage. For this purpose different methods and forms of work were used. In particular, in process of pedagogic interaction different problems of art pedagogic were discussed with students. Pedagogic potentials of art means' application in curriculum and extra-curriculum physical culture teacher's functioning were analyzed. Attending of theatres and museums, art exhibitions, sport competitions and different festivals were organized for future physical culture teachers. It permitted for young people to receive emotional-aesthetic enjoyment from art pieces, to better understand art influence on personality. Besides, on this stage of experiment we conducted meetings with specialists in art pedagogic: with teachers-innovators, who widely use art means in their work. For activation of motivation for mastering of these means students were able to attend the lessons of these teachers in school. Also the students convinced in practice in high efficiency of art masterpieces as means of pedagogic influence.

Mastering of cognitive-functional component of readiness for application of art means in professional functioning by future specialists envisaged acquiring of required knowledge and skills by them. In order to form students' art pedagogic knowledge of strategic level and appropriate analytical skills we enriched lectures and seminars with proper material of art pedagogic orientation. In particular, at classes questions about essence of art pedagogic, role and place of art in development of personality, main advantages of art means' application in pedagogic functioning were discussed. Besides, we conducted extra-curriculum measures on the mentioned problem.

For students' mastering of art pedagogic knowledge and analytical skills of complex level we practiced in-class: talks, disputes, "vernal duels", 'round tables', quiz, oral magazines; imaginary travels, devoted to certain topic. Besides, students received information about pre-prepared collections of music master pieces, collections of reproductions, different didactic multi media materials for schools.

At practical classes students also mastered knowledge of local level about usage of art means during teaching of specific topics at physical culture classes as well as during extra curriculum work with pupils. Besides, at these classes formation of students' art pedagogic skills of local level happened. It was realized with the help of such methods; art-sport exercises, role games; complexes of aerobic exercises, shaping, etc; art-physical culture workshops; art pedagogic trainings; art sport competitions, exhibitions, festivals; competitions on pedagogic skillfulness. It should also be noted that during pedagogic practice students conducted lessons and extra curriculum measures with application of different art means' complexes. It permitted for them to acquire practical experience in such application. For example, within experimental work students organized with primary school pupils music sport exhibitions by motives of known tales.

The mentioned above methods and forms of work activated also students' mastering of personality's component of readiness for application of art means in professional functioning. It envisaged formation of students' appropriate professional-personality's qualities: creativity, artistry, empathy, reflexivity, as well as adequate self assessment of these qualities' readiness. Besides, for improvement of self-assessment's adequacy students were involved in different kinds of portfolio.

In control group formation of mentioned above readiness was realized with the help of traditional for domestic pedagogic HEEs methods and forms of students' educational functioning.

Results of the researches

On the base of comparison of different specialists' views [1, 4, 5, 6, 7, 8, 9, 10,] we determined that structure of physical culture teachers' readiness for art means' application in professional functioning includes the following elements: motivation-value, cognitive-functional and personality's [19].

In its turn, on the base of scientists' conclusions [3, 16] we made conclusion that system of training of future physical culture teachers for art means' application in professional functioning, as a kind of pedagogic system, includes the following three blocks: conceptual target (theoretical-methodological principles of research, purpose and task of the mentioned training, principles and realization0, cognitive-procedural (content of training on strategic, complex and local levels, methods and forms of realization) and control-correcting (control over state and current results of this process as well as correction, if required) [20].

For determination of confidentiality of pedagogic experiment's results we used Pirson's criterion. The researched parameters were measured by scale of three levels: high, average and low
(c = 3). Statistic value T_{exp} is calculated by formula:

$$T_{\exp} = \frac{1}{N_1 N_2} \sum_{i=1}^{3} \frac{(N_1 Q_{2i} - N_2 Q_{1i})^2}{Q_{1i} + Q_{2i}}$$

Where N_1 – quantity of experimental group's students;
N_2 – quantity of control group's students;
Q_{1i} і Q_{2i} – quantity of students, who are at certain level of the mentioned kind of readiness: at high (i = 1), average (i = 2), low (i = 3) in experimental and control groups accordingly.

For level of significance $\alpha = 0.05$ and quantity of degrees of freedom v = c-1 = 2 critical value of statistic T_{cr} = 5.99. Distinctions in distribution of experimental and control groups' students by level of readiness for art means'

application are statistically significant ($p<0.05$).

Analysis of presented in table 1 generalized results of experiment permits to make conclusion that by all specified criteria and indicators experimental group's students demonstrated more substantial positive changes in readiness for art means' application in professional functioning than control group's students.

Table 1

Generalized data about levels of students' readiness for art means' application in professional functioning

Levels of readiness	Experimental group (n=217)		Control group (n=219)	
	Initial stage	Control stage	Initial stage	Control stage
1	2	3	4	5
High	6.9 % (15students)	23.8 % (52 students))	6.7 % (15 students)	8.9 % (19 students)
Average	40.8 % (89 students)	65.4 % (142 students)	41.4 % (90 students)	44.5 % (98 students)
Low	52.3 % (113 students)	10.8 % (23 students)	51.9 % (114 students)	46.6 % (102 students)

Discussion

Fragmented ideas about art means' application in school pedagogic process were expressed by scientists in different time [2, 3, 9, 13, 15]. Though, recent time scientists' interest to this problem has noticeably increased. In spite of many years development of art pedagogic ideas the term "art pedagogic" itself was used for the first time in 1997 in teaching-methodic manual "Principles of art therapy and art pedagogic in work with children and adolescents" (authors: Yu. Shevchenko and A. Krepytsia). However, this concept became widely spread only after publishing of work "Art pedagogic and art therapy in special education" [2]. Scientists researched different aspects of this problems but training of future physical culture teachers for art means application in pedagogic functioning was not the topic of separate research.

In our work on this problem we specified criteria and indicators of readiness levels of future physical culture teachers for art pedagogic application in professional functioning, worked out and experimentally tested block system of appropriate training.

Conclusions:

Experimental realization of the worked out system has proved its effectiveness. Practical significance of the received results implies possibility of their application in process of vocational training of future physical culture teachers, increasing of pedagogic stuff qualification, creation of manuals and scientific-methodic recommendations, writing of course and magister works and diplomas.

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Conflict of interests

The author declares that there is no conflict of interests.

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Information about the author:

Nizhevska T.V.; http://orcid.org/0000-0002-1161-6658; nizhevski@gmail.com; H.S. Skovoroda Kharkiv National Pedagogical University; Artema str. 29, Kharkov, 61002, Ukraine.

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SEASON PHYSICAL FUNCTIONING DYNAMIC OF MEN WITH DIFFERENT PHYSICAL CONDITION

Prushva O.B.
Lesya Ukrainka Eastern European National University

Abstract. *Purpose:* study season peculiarities of physical functioning of men with different physical condition. *Material:* in the research 53 men of 41-55 years' age without chronic disease, who practiced healthy life style, participated. It was assessed: daily physical functioning of different intensity with the help of bio-register BASIS B1; body mass index; adaptation potential of Bayevskiy. *Results:* we determined that men with normal adaptation potential have less quantity of highly intensive steps than men with excessively tensed adaptation potential of cardio-vascular system. Men with tensed adaptation potential have less expressed season changes in physical functioning. *Conclusions:* We found the following optimal correlations: total quantity of steps per day; quantity of steps with average intensity (80-86 steps per min.); total run steps of high intensity (140-145 steps per min.); quantity of low intensity steps (8-10 steps per min.).
Key words: physical functioning, season character, life style, men, steps.

Introduction

Longevity, health and physical condition of men depend on many factors of their life style: physical functioning, eating, rest, as well as on other physiological processes in organism, conditioned by environmental factors. Physical functioning (PF), specificities of its scope and intensity play important role in this process. Their studying during long period of time, against the background of season (natural and social;-personal changes) can permit to understand peculiar features of men's PF and their appropriate physical condition.

Dependence of human organism's on season changes of environment was noticed by many researchers [2, 3]. In some works it is noted that eating depends on season [10, 20]. Other scientists studied season changes of body weight [12, 19] depending on genetically formed internal processes in human organism [8, 21]. There are rather few researches of human PF in different seasons of year. Only increase of PF in summer, in comparison with winter, was confidently confirmed [13, 15]. In other researches [17, 18] season changes of adolescents' PF were analyzed.

Purpose, tasks of the work, material and methods

The purpose of the work is to study season peculiarities of physical functioning of men with different physical condition.

Organization and methods of the researches:

In the research 53 men (urban inhabitants) of 41-55 years' age without chronic disease, who practiced healthy life style, participated. The research was conducted in the south of Ukraine in 2014 – 2015 during 7 summer days and 7 winter days. Physical functioning was studied with the help of bio-register BASIS B1 [5, 23]. We registered total quantity of steps per day: quantity of steps with average intensity (80-86 steps per min.); total run steps of high intensity (140-145 steps per min.); quantity of low intensity steps (8-10 steps per min.). Besides, we measured mean day heart beats rate (HBR). For general characteristic of men's physical condition [16] we determined body mass index (BMI) *(kg/m^2)*. Physical condition was assessed with the help of index of cardio vascular system's (CVS) adaptation potential of Bayevskiy (APB) [1]. APB was measured every evening before sleep. The received results were noted in individual diaries. At every season stage of researches man's results were formed by mean week indicator of individual APB (see tables 2 and 3) and by mean year individual indicator APB (see table 1). Statistic processing was carried out with methods of non parametrical statistic as far as results did not correspond to normal distribution. We determined: inter-quartile range (IR), median (Me). Comparison of mean year and season indicators of different groups of men was conducted with the help of criteria of iconic grades by Wilkinson. We used programs **EXEL and Statgraphics16.**

Results of the researches

As a result of grouped data for one year quantity of members of group with APB <1.80 conv. un. was 28 men (see table 1). In group with APB >1.80 conv. un. there were 25 persons. BMI of both groups' members was above normal more than by 2.56 *kg/m^2*. We can assume that excessive weight was conditioned by trained muscles but not by fact. BMI in first group was confidently less. Distribution into groups was carried out by APB. In the first group APB was by **0.12** conv. un. lower than normal. It witnessed about normal status of CVS in this group. In the second group APB was confidently higher than in the first group. APB was by 0.11 conv. un. higher than recommended standard. It points at certain tension of CVS in second group. Mean day HBR in both groups characterizes satisfactory physical condition of members. In first group HBR was confidently less than in second group. It was detected that total quantity of steps per day (without confident differences between groups) was much less than recommended 10 000 steps. It puts some questions concerning physical condition. Especially it concerns the members of first group. Separately, we calculated quantity of low intensity steps of first group men. It was confidently less than in the second group. Quantity of average intensity steps in the first group was confidently higher than in the second group. Quantity of high intensity steps had no confident distinctions between groups.

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Table 1

Physical functioning of men with different APB in average per year

№	Indicator	APB <**1.80** **(n=28)**	**APB >1.80** **(n=25)**	**W**	**p**
		Me (95%IR)	**Me (95%IR)**		
1.	BMI (*kg/m²*)	27.54 (25.48;29.59)	27.86 (25.79;29.93)	2898	<0.05
2.	APB (***conv. un.)***	1.68 (1.57;1.79)	1.91 (1.89;1.92)	2408	<0.05
3.	HBR per day (*b.p.m.*)	55.65 (53.37;57.93)	58.73 (56.39;61.09)	2056	<0.05
4.	Ordinary steps *(quantity)*	5955.29 (3573.17;8337.4)	5960.19 (3595.84;8324.54)	891	>0.05
5.	Low intensity steps *(quantity)*	2295.17 (2144.24;2446.1)	2551.06 (2372.28;2729.84)	2059	<0.05
6.	Average intensity steps *(quantity)*	3356.76 (3031.1;3682.43)	3004.67 (2744.08;3265.27)	1948	<0.05
7.	High intensity (run) steps *(quantity)*	398.47 (294.33;502.61)	484.34 (359.66;609.01)	778	>0,05

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Analysis of the conducted research in winter months showed change of quantity of experiment participants in groups. For example, in first group only 21 persons remained (see table 2) and in second group – 32 persons. In winter period BMI of first group's men was confidently less than in the second group. In both groups BMI was by 2.7kg/m^2 above standard**.** APB of first group men witnessed normal state of CVS. In second group APB was by 0.15 conv. un. above standard. It points at existing tension of CVS in men of the second group. Mean day HBR in winter period in first group was also confidently less. PF in winter was confidently higher in second group by quantity of ordinary steps. Quantity of low intensity steps was less in first group (without confident statistical confirmation). Quantity of average intensity steps was confidently less in first group by 694.57 steps per day. Quantity of high intensity steps in first group's men was by 272.48 steps confidently less then in the second group.

Table 2

Physical functioning of men with different APB in winter months

	Indicator	APB <**1.80** **(n=21)**	**APB >1.80** **(n=32)**	**W**	**p**
		Me (95%IP)	**Me (95%IP)**		
1.	BMI (*kg/m²*)	27.66 (2.57;29.74)	28.06 (25.98;30.14)	2023	<0,.05
2.	APB (***conv. un.)***	1.71 (1.62;1.80)	1.95 (1.81;2.09)	2584	<0,.05
3.	HBR per day (*b.p.m.*)	56.23 (53.54;58.90)	59.58 (56.94;62.22)	2496	<0.05
4.	Ordinary steps *(quantity)*	4766.3	5918.65	2579	<0.05

	Indicator	APB <**1.80** **(n=21)**	**APB >1.80** **(n=32)**	**W**	**p**
		Me **(95%IP)**	**Me** **(95%IP)**		
		(3046.35;6486.26)	(4223.16;7614.14)		
5.	Low intensity steps *(quantity)*	2185.71 (1934.93;2436.5)	2435.79 (2133.59;2738.0)	1011,5	>0.05
6.	Average intensity steps *(quantity)*	2529.28 (1913.74;3144.83)	3223.85 (2721.0;3726.69)	2321	<0.05
7.	High intensity (run) steps *(quantity)*	160.94 (31.13;290.75)	433.42 (220.55;646.29)	1506,0	<0.05

In summer months quantity of the tested in groups changed: in first group quantity increased to 35 persons (see table 3); in second group quantity reduced to 18 persons. In summer period in both groups BMI was by 1.13kg/m^2 above normal. BMI was confidently less in first group. APB of first group's men reduced in comparison with winter period by 0.09 conv. un. In second group it reduced by 0.13 conv. un. APB exceeded the recommended norm by 0.02 conv. un. and was confidently higher than in first group.

Table 3

Physical functioning of men with different APB in summer months

№	**Indicator**	APB <**1.80** **(n=35)**	**APB >1.80** **(n=18)**	**W**	**p**
		Me **(95%IP)**	**Me** **(95%IP)**		
1.	BMI (*kg/m^2*)	27.13 (25.02;29.24)	27.36 (25.18;29.54)	1934.5	<0.05
2.	APB (***conv. un.)***	1.62 (1.60;1.63)	1.82 (1.80;1.84)	2078	<0.05
3.	HBR per day (*b.p.m.*)	54.58 (53.08;56.07)	56.33 (54.37;58.30)	1914.5	<0.05
4.	Ordinary steps *(quantity)*	6730.36 (5862.06;7598.66)	5420.19 (4239.57;6600.8)	1675	<0.05
5.	Low intensity steps *(quantity)*	2075.72 (1722.89;2428.56)	1953.03 (1560.88;2345.18)	901	>0.05
6.	Average intensity steps *(quantity)*	4253.07 (3533.0;4973.15)	3002.97 (2081.57;3924.38)	1925	<0.05
7.	High intensity (run) steps *(quantity)*	606.13 (317.75;894.52)	840.75 (346.36;1335.14)	694.5	>0.05

Mean day HBR in summer period in first group was confidently less than in second group. HBR reduced by 1.65 b.p.m. comparing with winter period. Quantity of ordinary steps per day in summer increased in first group of men by 1964.06 steps per day, comparing with winter period; in second group it reduced 498.46 steps. Accordingly, PF of second group's men was confidently less. Quantity of low intensity steps in summer period had not confident distinctions. In comparison with winter period, in first group the quantity of low intensity steps reduced by 109.99 steps per day. In

second group the quantity of such steps reduced by 482.76 steps. Quantity of average intensity steps in first group was confidently higher (by 1250.1 step), comparing with second group. Comparing with winter it increased by 1723.79 steps. In second group the quantity of average intensity steps reduced by 220.88 steps. Quantity of high intensity steps in both groups had no confident distinctions. In comparison with winter their quantity increased in first group by 445.19 steps per day and in the second group – by 407.33steps.

Discussion

The contingent of the tested consisted of men of mainly second maturity, who have no harmful habits and practice weakly mobile [6, 9]**,** urban way of life. The men observe principles of healthy eating and practice fitness.

Analysis of combined season results of BMI, APB and HBR witnessed that the results of the first group are confidently better. Mean year BMI exceeded standard [22] in both groups. Mean day HBR in rest corresponds to relatively age standard of physically healthy persons in both groups. Confident reduction of HBR in the first group in complex with other physiological indicators witness about more economic functioning of CVS.

Mean year results of men's PF have not confident distinctions by quantity of ordinary steps and highly intensive steps. Confidently higher quantity of low intensity steps is observed in second group. Against the background of weakly mobile way of life such quantity of steps witnesses about absence of positive influence of such kind of PF on men's physical condition. Confident majority of average intensity steps in first group confirms previous researches [4] about positive influence on men's physical condition.

Season dynamic of total quantity of men's steps changes significantly during year. Also there are substantial changes between experimental groups. Changes of men's PF are confirmed by previous researches [7, 11]. In these researches increase of PF in summer, in comparison with winter, is confirmed. Natural factors are considered to be the reason of such PF increase [14]. Confident changes in groups we observe in winter and in summer. Group with normal APB has lower indicators of total quantity of steps in winter and the highest indicators in summer (in comparison with group of men with APB above normal).

Season dynamic of quantity of average intensity steps during all seasons has confident distinctions (comparing groups): reduction of quantity of steps in winter and increase of quantity of steps in summer in group of men with normal APB.

Season dynamic of highly intensive steps has confident distinctions (comparing groups) only in winter. Men with normal APB have lower quantity of highly intensive steps than group of men with tensed adaptation potential of CVS.

Conclusions:

As a result of long-term PF study of mature men we observed confident distinctions, depended on their physical condition. Men with normal adaptation processes of CVS have confidently less quantity of low intensity steps per day. They have confidently higher quantity of average intensity steps per day than men with over-tension of CVS.

Confidently higher activity of men with normal APB in summer can be related to season specificities. It is manifested in total quantity of average intensity steps. These men also have confidently less quantity of total quantity of steps in winter with exclusion of low intensity steps.

Study of season PF dependence of men with different physical condition proves higher influence of natural, season PF changes in group with normal APB. Men with tensed adaptation potential of CVS have less expressed season changes of PF.

The prospects of further researches imply study of season influence on PF of different age categories' men.

Conflict of interest

The author declares that there is no conflict of interest.

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Information about the author:

Prushva O.B.; http://orcid.org/0000-0002-3727-5142; ooobc@yahoo.com; Lesya Ukrainka Eastern European National University; Volya Avenue 13, Lutsk, 43025, Ukraine.

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APPROACHES TO REALIZATION OF YEAR CYCLE OF IRAQ FOOTBALL PLAYERS' SPORT TRAINING

Khalaf Sadek Drevel, Diachenko A.U.
National University of Physical Education and Sport of Ukraine

Abstract. *Purpose:* to substantiate ways of increase of Iraq football players' training process effectiveness, depending on calendar of events. *Material:* analysis of technical-tactic actions was conducted by quantitative and qualitative characteristics of football players in every match. The analysis was presented by mean indicators of matches of the first (n=15) and second (n=15) rounds of championships of Iraq premier league 2011-2014. *Results:* we realized conception of periodization of Iraq elite football players' sport training. Specific conditions of periodization of Iraq sportsmen's training have been worked out and substantiated. Scientific-methodic basis of perfection of Iraq football players' training process management has been formed. On the base of heuristic simulation we formulated algorithm of realization of Iraq premier league football players' year cycle training. It is recommended to use higher and more significant loads with correlation 50% and 30% from total scope of training sessions. *Conclusions:* On principles of rational combination we built hierarchy of macro-cycles' structural components, combined in single, formed year cycle during long term competition season.

Key words: technique, tactic, fitness, football, periodization.

Introduction

Social-economical and political problems of Iraq have not permitted to realize, recent decades, the accumulated empirical experience of Iraq specialists. It resulted in recession of this kind of sports [5, 9].

At present, in system of Iraq football players' training there are absent systemic principles of sport training organization [1]. Absence of systemic approach to realization of structure of sport training's year cycle reduces opportunities for realization of coaches' empiric knowledge (experience). This experience is based on wide arsenal of football players' special training means and methods, on ability to organize training session. Methodic approaches to football players' training are not combined in single system and do not obey to principles of sport training's periodization. It weakens possibility of rational construction of training process in micro-, meso- and macro-structures of year cycle. Besides, effectiveness of control of adaptation processes in compliance with targets of training and competition functioning in certain periods of sport training's year cycle also reduces [2].

Analyzing opportunities for perfection of sport training system, we considered that this system shall be built on the base of general theoretical principles of training process's construction, considering specificities of regional sport system [7, 12]. With it, it is underlined that formation of such approach can be influenced by various factors. They are [6, 11, 17]: structure of national championship and Cup of country; calendar of international tournaments of advanced clubs and combined team; level of competition in national championship; legal relations between federation, clubs and combined teams; professionalization and commercialization of this kind of sports; social-economical laws of country and other factors.

For Iraq it is of principle importance to have political stability and therefore opportunity to organize full fledged sport training during long term competition season. It creates main conditions for rational building of training process on systemic principles of sport theory [8, 12, 16] and on organizational-methodic principles of training process in football. In this case it is also necessary to consider opportunities for their realization in specific conditions of Iraq. It was determined that in theory and practice of Iraq football players' training there is deficit of scientifically substantiated approaches to organization of training process during year. Especially it is noticeable in those links of training, where influence is rendered by scientific-methodic provisioning of Iraq football players' training. Absence of scientifically grounded principles of periodization of sport training in Iraq football does not permit to build training process considering formation of sportsmen's favorable adaptation during year cycle of training [18, 20]. It is still more difficult because this process shall develop considering calendar of events, sportsmen's participation in important matches during long-term competition season [19].

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In this connection solution of this problem is rather urgent direction of researches for Iraq. This solution is rather interesting for perfection of System of Iraq football players' training. It is a supplement for theory of sport games, which devoted to realization of systemic principles of sport theory in specific conditions of sport training.

Purpose, tasks of the work, material and methods

The purpose of the work is to substantiate ways of increase of Iraq football players' training process effectiveness, depending on calendar of events.

The analysis of football players technical-tactic actions was presented by mean indicators of matches of the first (n=15) and second (n=15) rounds of championships of Iraq premier league 2011-2014.

Results of the researches

It has been found that differences between methodic approaches to building of Iraq and Ukrainian football players' sport trainings are connected with specificities of training loads system's formation in preparatory and competition period, videlicet:

- ✓ Scope of Iraq football players' training work in one week is less than the same of advanced world football players: 17.3±1.2, Different experts' opinions were expressed through coefficient of indicators' difference (CV): CV=6.9% hours in training micro-cycles; 16.3±4.1 hours, CV=24.5% in competitions' micro-cycles.
- ✓ Amount of training sessions, oriented on recreation of Iraq football players in advanced and competition micro-cycles is not sufficient: 1.7±1.0, CV=60.1% hours a week in preparatory period; 1.8±0.7 hours a week, CV=36.1% in competition period.
- ✓ Amount of two-times training sessions has not been determined. Statistically unconfident distinctions point at absence of systemic approach to usage of two-times sessions. Differences of experts' opinions were 77–81.6%.
- ✓ Technology of systemic usage of training sessions with great, significant, moderate and low loads is absent. 22.5% of respondents noted that it is necessary to use great and significant loads with correlation 50% and 30% from total scope of trainings. More than 50% of respondents could not definitely answer concerning place, time and conditions of training loads systemic application in system of advanced and recreational micro-cycles.

The presented data witness about absence of systemic approach to building of training process on the base of rational combining of different training loads and orientation in preparation of Iraq football players.

Ways of this problem's solution

On the base of heuristic simulation we formulated algorithm of realization of year cycle realization for Iraq premier league football players. It includes specially organized sequence of actions:

1) Choice of strategy of sport training during year – analysis of calendar structure;
2) Marking out of phase of acquiring, preservation or loss of sport form; determination of amount and structure of micro-cycles (depending on calendar density, periods of pre-competition training and pauses between structural components of championship, first and second rounds);
3) Formation of training periods and stages;
4) Formation of sport training's structure at levels of micro-, meso-structures; formation of training sessions' system; realization of advanced, one-peak and multi-peaks competition micro-cycles on this base.

We have determined orientation of sport trainings in different periods of year cycle. It was formed, considering laws of short-term and long-term adaptation reactions' processes in acquiring, preservation and loosing of sport form. Also specificity of formation of first and seconds training micro-cycles was determined. It is a difference between sport training's orientation between first and second macro-cycles.

First macro-cycle (first round of championship) implies formation of organism's functional reserves; provisioning of achieved potential's positive transition with passing from preparatory to special work; perfection of special endurance; perfection of technical-tactic sportsmanship.

Transition period is period of temporary loss of sport form.

Second macro-cycle (second round of championship) implies restoration of reserves of special endurance's functional base; perfection of special endurance; perfection of technical-tactic sportsmanship.

Considering realization of sport theory principles and specificity of calendar of events we have worked out model of sport training of football players of professional club Al Naft, Basra, Iraq in season 2013–2014 (See fig.1).

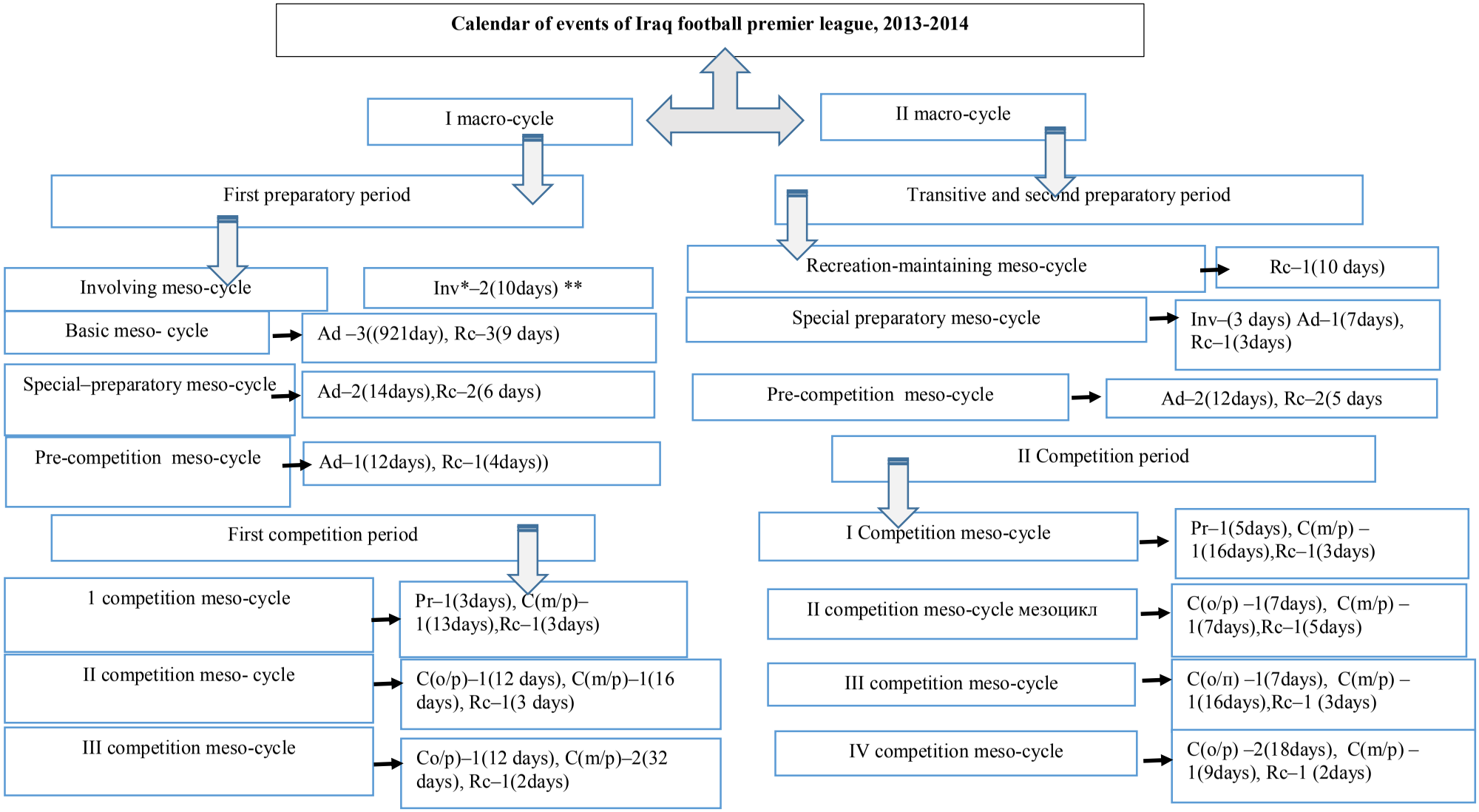

Fig.1. Model of year cycle of sport training of team from Al Naft, Basra, Iraq, season 2013–2014:
Notes:* –micro-cycles: Ad –advanced, Rc – recreational, Inv. – involving, Or.- preparatory, C(o/p)- competition one-peak, C(m/p) –competition, multi-

As a result of optimization of year cycle structure of Iraq premier league football players' training we received confident changes of qualitative indicators of sportsmen's technical-tactic actions. These data are presented in figs. 2 and 3.

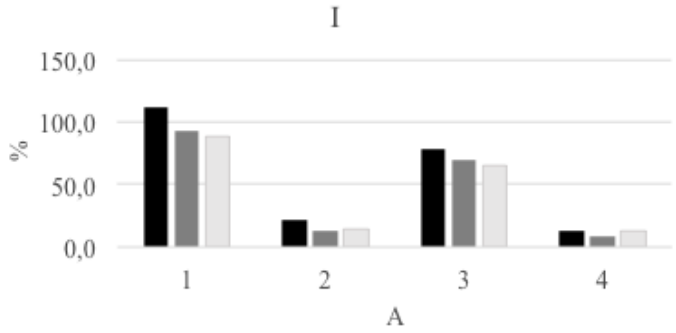

Fig.2. Structure of TTA in attack in first and second rounds of championship of Iraq (premier league):

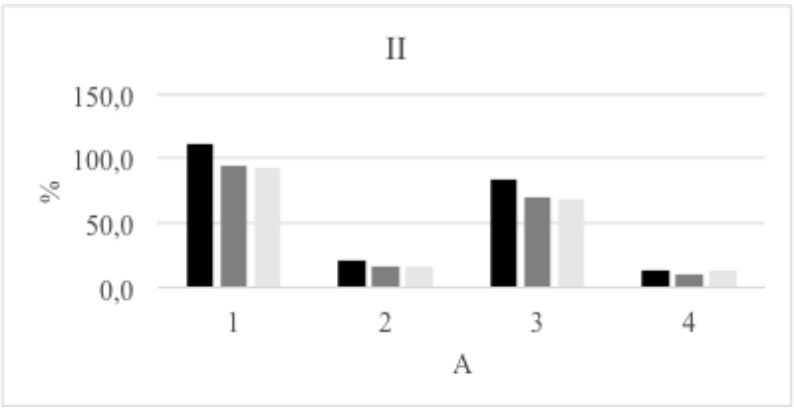

Fig.2. Structure of TTA in attack in first and second rounds of championship of Iraq (premier league):

I –first round; II –second round; A – technical-tactic actions in attack; 1–total of attacks; 2 – quick attacks; 3 – positional attacks; 4 – attacks from standards;

–season 2013-2014;

–season 2012-2013;

–season 2011-2012

The presented model is based on realization of systemic principles of sport training's periodization. The model permitted to systemically approach to training process organization, considering interconnection of two the most important factors – calendar of events and laws of formation of short-term and long term adaptation reactions in specially organized sport training system. In fig.1 we can see that I process of one year sport training all phases are considered: acquiring, preservation and loss of sport form. On this basis we worked out structure of two micro-cycles, which included: preparatory and competition periods, stages of training, special structure of competition period.

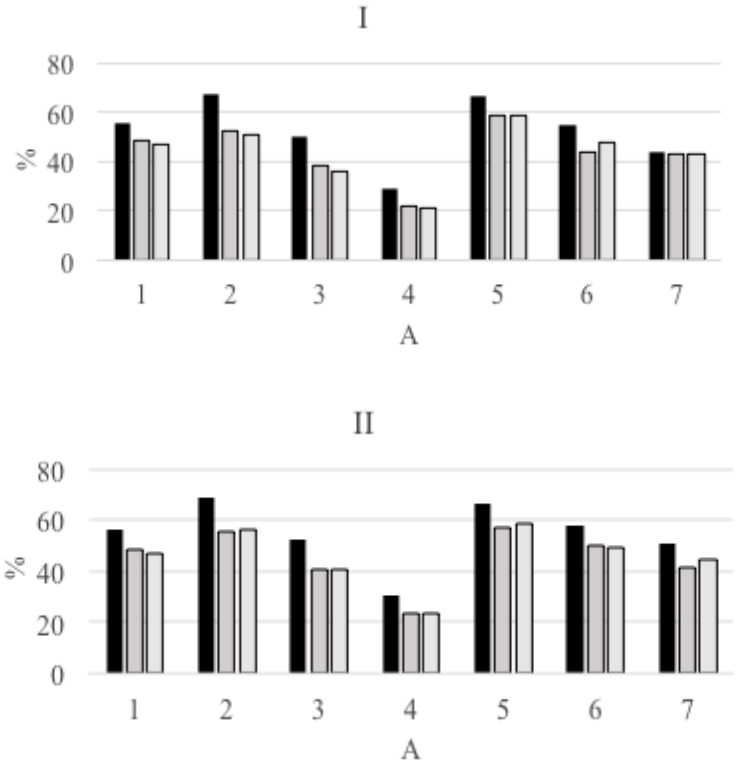

Fig.3. Structure of TTA in attack in first and second rounds of championship of Iraq (premier league):

I –first round; II –second round; A – technical-tactic actions in attack; 1–holding of ball in %; 2 – passes, % of accurate; 3 –passes in penalty box, % of accurate;; 4 – kicks in target, % of accurate; 5 – strokes, % of accurate; 6 – duels, won from top, %; duels, won from below.

–season 2013-2014;
–season 2012-2013;
–season 2011-2012

In figs. 2 and 3 we gave dynamic of technical-tactic actions (TTA) of football players in attack and in general in match (mean indicators of first and second rounds of premier league championship) in process of competition seasons of Iraq premier league 2011–2014, 2012–2013, 2013–2014. In fig. 2 TTA are given as different attacks. One can see in the figure that in season 2013-2014 there was registered higher quantity of attacks and quick and positional attacks than in season 2011-2013 ($p<0.05$). Coefficients of differences between indicators (CV) did not exceed 15%, and were within 2.2-4.7% by most of indicators.

In fig.3 we present quantitative and qualitative TTA characteristics in first and second rounds of championship. In figure it is shown differences between TTA of Al Naft team 2013–2014 season and in 2011-2013 season ($p<0.05$). Coefficients of differences between indicators (CV) did not exceed 15% and were within 1.7-3.7% by most of indicators.

Discussion

Choice of strategy of periodization in football is the most difficult process. It is conditioned by duration of competition period (up to 10 months in year) [10]. In the base of training year cycle structure's organization there is analysis of calendar of events as well as marking out of periods of acquiring, preservation and temporary loss of sport form in year cycle 15]. Realization of this process is based on consideration of laws of short-term and long term adaptation reactions in process of perfection and improvement of sportsmen's, special for football, physical conditions [4, 13, 14]. On this base we determined periods of sport training, during which sportsmen prepare for season or participate in main competitions of season.

In this connection at the very beginning of sport training process's building holistic structures of sport training shall be marked out – macro-cycles. Macro-cycles are system-formation factor of realization of micro and meso-structures

of sport training. They ensure all complex of sport training measures on preparation and participation of sportsmen in competitions [2, 3].

In this connection for Iraq solution of this problem is based on searching of ways of realization of sport theory systemic principles, considering specificity of Iraq football players' sport training. Theses directions were realized in the present research with implementation of theory of sport training's periodization [12] in conditions of Iraq football players' training. Working out and substantiation of specific conditions of training periodization for Iraq permitted to form scientific-methodic basis of management system's perfection at several levels. This is a system of planning, simulation prognostication and control. Besides, we worked out system of training impacts.

Realization of sport theory systemic principles resulted in working out of approaches to periodization of sport training of Iraq elite football players of premier league. They include certain algorithm of actions on organization and planning of sport training system as well as some systemic principles of combination of micro-, meso- and macro-structures of elite football players' sport training. On this base we perfected structure of premier league team's sport training.

Systemizing of methodic principles of training process's planning for year cycle resulted in improvement of sport results. It was observed against the background of advanced football players' withdrawal and rejuvenation of the team. Optimization of sport training structure permitted to increase effectiveness of year cycle training system, to form pre-conditions for systemic enriching of the worked out structure with definite means. With it we considered laws of realization of micro-, meso- and macro-structures of meso-cycle.

Conclusions

1. Conception of sport training periodization for Iraq elite premier league football players had been realized. It includes algorithm of actions on organization and planning of sport training system. This algorithm is based on systemic principles of sport theory, which ensure rational combination of micro- meso- and macro structures of elite football players' sport training. It also considers specificities of sport training organization in Iraq.
2. It has been shown that sport training structure of Iraq football players was perfected in such way that it became a system. In this system reduction or increase of one of system's components effectiveness reduces or increases effectiveness of all system of sport training in year cycle. Hierarchy of macro-cycles' structural components, combined in integral formed year cycle during long term competition seas has been built on these principles.
3. Basing on realization of principles of sport training periodization during year cycle we received confident changes of sportsmen technical-tactic actions' quantitative and qualitative indicators: in attacks, in accuracy of passes, in kicks to target, in effectiveness of stroke, in won duels. Application of periodization system resulted in increase of most of technical tactic indicators by 8.2–14.5%. ($p<0.05$).

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Conflict of interests

The authors declare that there is no conflict of interests.

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Information about the author:

Khalaf Sadek Drevel; http://orcid.org/0000-0003-3321-9730; adnk2007a@ukr.net; National University of Physical Education and Sport of Ukraine; Fizkultury str. 1, Kiev, 03680, Ukraine.

Diachenko A.U.; http://orcid.org/0000-0001-9781-3152; adnk2007@ukr.net; National University of Physical Education and Sport of Ukraine; Fizkultury str. 1, Kiev, 03680, Ukraine.

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CHARACTERISTICS OF FUNCTIONAL TENSION OF QUALIFIED SKIERS WHEN PASSING RISES OF DIFFERENT DIFFICULTY

Khmelnytska J.K., Filippov M.M.
National University of Physical Education and Sport of Ukraine

Abstract. *Purpose:* studying of main functional changes in organism of qualified female skiers when passing rises of different difficulty. *Materials:* 12 female skiers of combined team of Ukraine of 21-34 years' age were tested. Pedagogic observation included: speed metering (system of GPS- navigation), pulse metering (telemetric register of heart beats rate Polar RS800). In process of ski track passing we registered content of exhaled air (radio-telemetric gas-analytic complex MetaMax 3B, Cortex). Sportswomen fulfilled control passing of competition 6 km distance (2 circles, 3 km each) in classic style on ski rollers. Ski track was determined by coach. In the course of track's passing we registered indicators of speed and track profile with discreteness 1 sec. Assessment of special workability and realization of functional potentials was determined by characteristics of external breathing at the end of each rise. *Results:* it was found that the highest correlation belonged to the following indicators: frequency of breathing (r = 0.38); oxygen consumption (r = 0.29); ventilation equivalent by O_2 (r = 0.68). We detected high interconnection between length of distance and ventilation equivalent by CO_2 (r=0.61). It was determined that factors of organism's anaerobic efficiency change according to relief of track. They increase on rises and reduce on descends. With it increase on long rises is much higher than on middle size rises. *Conclusions:* effectiveness of different difficulty rises' overcoming depends on potentials of anaerobic mechanisms and their realization that, to certain extent, influence on sport efficiency.
Key words: skiing, functional fitness, relief, ski track, aerobic, anaerobic.

Introduction

As on to day, in skiing, there have been observed steady growth of contest in parallel with complicating of competitions' conditions that requires seeking of new reserves of elite sportsmen's efficiency. That is why problem of skiers' functional fitness and its realization in complex competitions' conditions has still been insufficiently studied. For example, it was determined that realization of sportsmen's individual potentials in skiing is conditioned by special conditions of competition functioning and depends on level of sportsmen's functional fitness. It shall be considered when planning training means and methods in skiing [1, 6, 4].

Leading specialists in skiing, such as G.G. Khokhlov [18], O.I. Kamayev [4], V.V. Mulyk [12], T.I. Ramenska [16] et al. note that for regular and purposeful functional training for highest sport achievements skiers racers shall consider metrical and time parameters of competition load on different components of tracks' relieves.

With it in ski racings just rises are the elements of track where even insignificant advantage can significantly improve competition result. In opinion of authors [13, 14, 16, 18] total length of rises reaches 50% of distance and sportsmen spend 43-51% of all racing time for their passing.

Rises are the most difficult and important parts in ski racings. They require increased functional, will and tactic fitness of sportsmen. Depending on correlation of rises of different length and their steepness, flat parts and descends, tracks are classified as flat ones, moderately rough, rough and strongly rough. With increasing of sport qualification level, skiers pass to more and more difficult, by relief, tracks. Characterizing parameters of tracks' difficulty, most of authors [1, 2, 4, 6] quite correctly relate to them steepness and length of rises, sum of height difference, difficulty and harmony.

Depending on energetic supply of skiers' organisms all rises on tracks can be conventionally divided into three groups: short (time of passing up to 18 sec.; work is fulfilled mainly at the account of anaerobic a-lactate processes); middle (time of passing – up to60 sec.; anaerobic glycolytic processes prevail); long (time of passing – up to 150 sec.; anaerobic glycolytic productivity reaches maximum, but role of aerobic energy sources increases) [7]. With it total time for passing of these rises is different, though aerobic metabolism at competitions in ski racings is main energy source [6]. On rises of certain length and steepness role of anaerobic mechanisms manifests to the fullest and they to certain extent determine competition result of skier-racer.

Analysis of special literature and practical experience witnesses that up to the present time there have been nearly no scientifically substantiated recommendations on passing of different parts of tracks. Besides there is no requirements to functional fitness of skiers for passing of rises of different difficulty.

Purpose, tasks of the work, material and methods

The purpose of the research is to determine main model characteristics of elite female skiers' functional fitness when they pass rises of different difficulty.

Materials and methods: in our work we used the following methods: theoretical analysis and generalization of data of special scientific-methodic literature. Pedagogic observation included: speed metering (system of GPS-navigation), pulse metering (telemetric register of heart beats rate Polar RS800 - Finland). Besides, in process of ski track

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passing we registered content of exhaled air and spirometry parameters (radio-telemetric gas-analytic complex MetaMax 3B, Cortex, Germany).

Testing of sportswomen's functional potentials in simulated conditions of passing of competition distance was carried out on training-sport base "Tysovets" (Lvivska region) at the beginning and at the end of training period. In the research 12 sportswomen of 21-34 years' age participated. All they were masters of sports and international masters of sports and members of National combined ski racing team of Ukraine.

In the course of the researches sportswomen fulfilled control passing of competition 6 km distance (2 circles, 3 km each) in classic style on ski rollers. The track was determined by coach. In the course of track's passing we registered indicators of speed and track profile with discreteness 1 sec. Assessment of special workability and realization of functional potentials was determined by characteristics of external breathing at the end of each rise.

Results of the research

The distance included 5 rises in every circle and had the following characteristics:

- total length of rises was 47% of distance length;
- maximal rise was 30 meters;
- sum of height differences – 148 m;
- steepness: 1st rise – 2.03%; 2nd rise - 5.68%; 3rd rise – 7.33%; 4th rise - 6.40%; 5th rise – 1.95%;
- mean steepness of rises – 4.79%.
- length: 1st rise - 558 m; 2nd rise - 193 m; 3rd rise - 337 m; 4th rise -184 m;; 5th rise - 272 m.

Total length of descends was 32.7% of distance length.

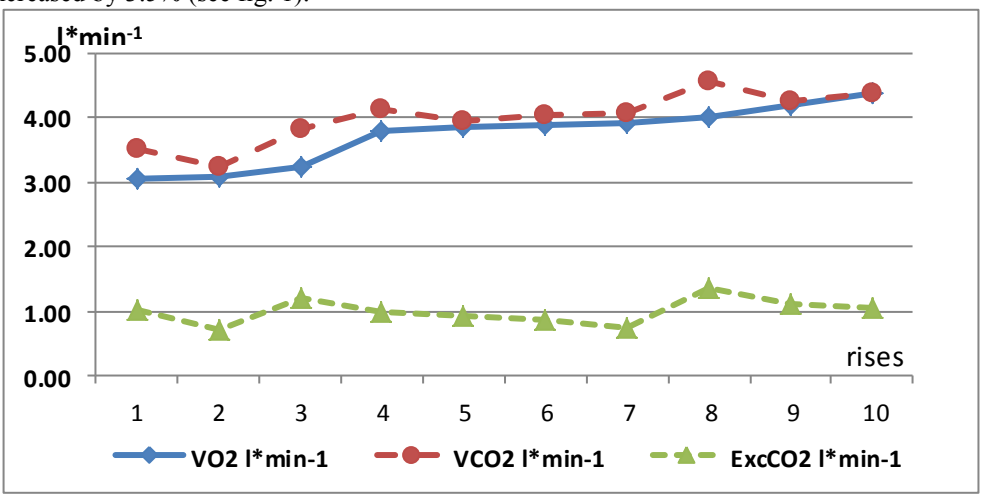
Correlation of total sum of all rises' length to total sum of all descends' length determines harmony of the track. It was 1.41 conv.un. The value, more than 1 conv.un., means, that in such track long rises combine with short descends. At every kilometer of competition distance female skiers ascended in average by 25 meters (difficulty of track).

Basing on the received measurements of track relief we found that the track corresponds to weakly rough profile. We also determined that mean speed on rises was within 3.55 – 5.19 meters per sec.; on descends – from 7.76 to 15. 5 m.p.sec. Speed of international competitions' winners is 6.0-6.4 m.p.sec.

For determination of the most important track's influences on sportsmen's functional fitness we carried out correlation analysis. We have found that the highest correlation belonged to the following indicators: frequency of breathing (r = 0.38); oxygen consumption (r = 0.29); ventilation equivalent by O_2 (r = 0.68). We detected high interconnection between length of distance and ventilation equivalent by CO_2 (r=0.61).

For sportswomen the following maximal values of indicators, which characterize realization of functional potential in simulated conditions of competition distance passing, are characteristic: breathing volume per minute - 140.5±17.4 $l \cdot min^{-1}$; oxygen consumption 3.8±0.3 $l \cdot min^{-1}$ (66.8±5.1 $l \cdot min^{-1} \cdot kg^{-1}$); release of carbon dioxide – 4.2±0.3 $l \cdot min^{-1}$; breathing coefficient 1.4±0.1 conv.un.; heart beats rate - 195.3±5.3 b.p.m; oxygen pulse – 24.08±8.7 $ml \cdot s^{-1}$. Analysis of the research's results witness that factors of skiers racers' anaerobic efficiency change according to relief of the track. They increase on rises and reduce on descends. With it increase on long rises is much higher than on middle size rises. Results of the researches are given in tables 1 and 2.

In assessment of sportswomen's functional potentials at the beginning and at the end of training period we determined maximal power of their work, which was 383.7±3.2 W and 402.6±7.5 W; so oxygen consumption on different rises increased by 2.8%. Release of carbon dioxide (CO_2) and its excess ($ExcCO_2$) on short rises reduced by 1.8% and on main rises it increased by 3.5% (see fig. 1).



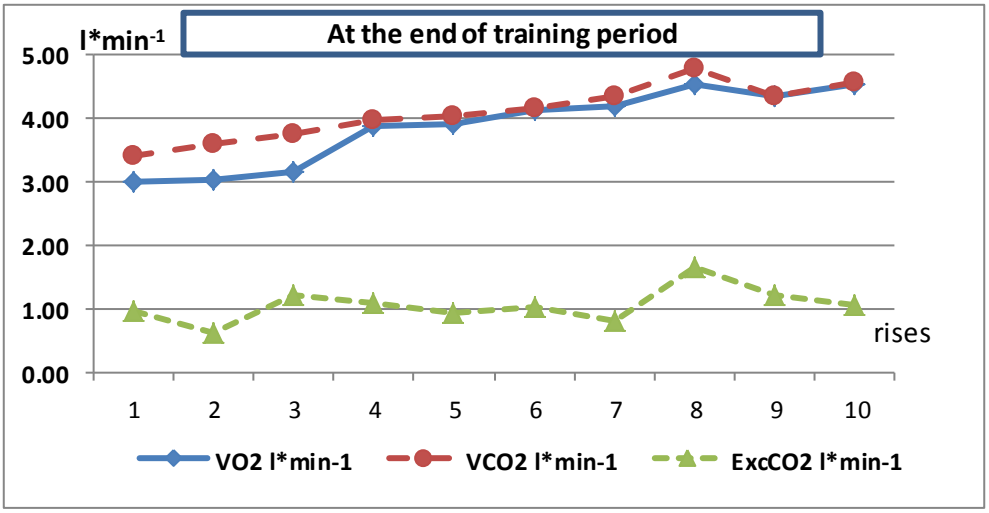


Fig.1. Dynamic of changes of oxygen consumption indicators (VO_2), release of CO_2 (VCO_2) and its excess ($ExcCO_2$) in elite female skiers on rises of different difficulty at the beginning and at the end of training period.

Lung ventilation reached 92% of maximum. Heart beats rate (HBR) reached to maximal values (especially at the end of training period). The received data witness that passing of main and short rises with maximal speed results in significant increase of functioning of anaerobic and aerobic mechanisms of metabolism in sportswomen's organisms. On the base of the received data we determined model characteristics of elite female skiers' functional fitness when passing rises of different difficulty (see fig.2.)

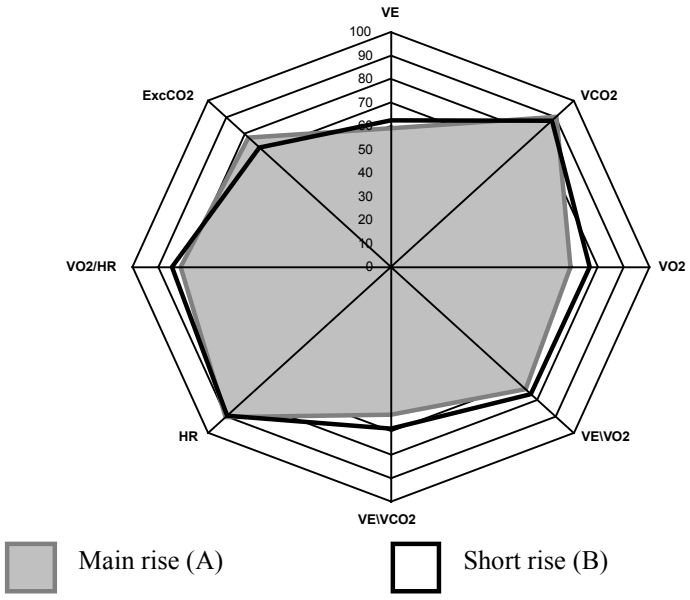


Fig.2. Model functional characteristics of female skiers on rises of different difficulty (% from maximal value)

The most intensive energy supply of organism was on main rises. With it contribution of anaerobic mechanisms increased. It was witnessed by higher values of carbon dioxide release (VCO_2) as well as its excess ($ExcCO_2$). On short rises oxygen consumption was the highest.

Table 1.

Indicators of female skiers' functional fitness in conditions simulating passing of competition distance at the beginning of training period

Part of distance and time of measurement		Speed	Angle	Body mass	P	VT	f	V_E	V_{O2}	V_{CO2}	V_{O2}	RQ	V_E\ V_{O2}	V_E\ V_{CO2}	HR	V_{O2}/ HR	ExcCO2
		Km.p.hr	%	kg	W	l	1*min^{-1}	1*min^{-1}	1*min^{-1}	1*min^{-1}	ml/min/kg	Conv.un	Conv.un	Conv.un.	b/p/m^{-1}	ml*beats^{-1}	1*min^{-1}
1rise	01:37,00	17.19	2.03	56.1	235.9	1.7	49.8	109.7	3.05	3.51	54.4	1.2	35.9	31.2	178.3	17.1	1.03
2 rise	03:03,00	15.30	5.68	56.1	285.5	1.7	48.3	106.1	3.08	3.24	54.8	1.1	34.5	32.8	183.0	16.8	0.70
3 rise	00:04:49	13.68	7.33	56.1	286.1	1.6	54.9	118.5	3.25	3.83	58.0	1.2	36.4	30.9	186.8	17.4	1.20
4 rise	05:48,00	19.08	6.40	56.1	374.8	1.7	49.1	110.8	3.80	4.14	67.7	1.1	29.1	26.7	181.0	21.0	0.99
5 rise	06:56,00	18.72	1.95	56.1	257.0	1.6	56.5	114.3	3.85	3.95	68.6	1.0	29.7	28.9	183.0	21.0	0.93
6 rise	00:10:10	17.10	2.43	56.1	245.2	1.7	54.9	114.0	3.90	4.05	69.5	1.0	29.2	28.1	188.8	20.7	0.87
7 rise	11:18,00	14.58	6.18	56.1	282.0	1.5	58.5	118.8	3.91	4.08	69.7	1.0	30.4	29.1	173.8	22.5	0.74
8 rise	13:07,00	13.32	7.70	56.1	284.7	1.5	59.3	119.5	4.00	4.58	71.3	1.1	29.9	26.1	192.8	20.8	1.36
9 rise	13:59,00	17.73	6.30	56.1	347.5	1.5	58.4	116.9	4.19	4.25	74.7	1.0	27.9	27.5	187.5	22.3	1.10
10 rise	15:12,00	19.26	1.75	56.1	260.0	1.5	56.2	109.5	4.39	4.40	78.2	1.0	24.9	24.9	188.3	23.3	1.03

Table 2.

Indicators of female skiers' functional fitness in conditions simulating passing of competition distance at the end of training period

Part of distance and time of measurement		Speed	Angle	Body mass	P	VT	f	V_E	V_{O2}	V_{CO2}	V_{O2}	RQ	V_E\ V_{O2}	V_E\ V_{CO2}	HR	V_{O2}/ HR	ExcCO2
		Km.p.hr	%	kg	W	l	1*min^{-1}	1*min^{-1}	1*min^{-1}	1*min^{-1}	ml/min/kg	Conv.un	Conv.un	Conv.un.	b/p/m^{-1}	ml*beats^{-1}	1*min^{-1}
1rise	01:51,00	17.28	1.60	55.0	224.9	1.7	48.5	106.3	3.01	3.41	54.7	1.1	35.3	31.2	179.0	16.8	0.96
2 rise	03:06,00	14.94	5.20	55.0	263.9	1.6	47.8	101.3	3.02	3.61	54.9	1.2	33.5	28.1	183.3	16.5	0.61
3 rise	05:02,00	13.68	7.20	55.0	277.7	1.5	57.3	116.9	3.16	3.77	57.5	1.2	37.0	31.0	187.8	16.8	1.21
4 rise	05:57,00	18.45	5.70	55.0	338.8	1.6	50.9	108.9	3.89	3.98	70.7	1.0	28.0	27.4	181.5	21.4	1.07
5 rise	07:09,00	18.27	1.40	55.0	232.2	1.5	59.5	116.3	3.90	4.05	70.9	1.0	29.8	28.7	183.3	21.3	0.94
6 rise	10:23,00	17.19	3.00	55.0	254.2	1.7	54.3	114.7	4.12	4.15	74.9	1.0	27.8	27.6	189.3	21.8	1.02
7 rise	11:34,00	14.67	7.00	55.0	293.5	1.5	58.8	114.9	4.20	4.34	76.4	1.0	27.4	26.5	190.5	22.0	0.79
8 rise	13:23,00	13.41	7.20	55.0	272.4	1.5	59.7	118.5	4.54	4.78	82.5	1.1	26.1	24.8	193.0	23.5	1.64
9 rise	14:24,00	18.36	6.90	55.0	368.7	1.5	56.4	113.5	4.35	4.36	79.1	1.0	26.1	26.0	187.5	23.2	1.21
10 rise	15:29,00	19.44	2.70	55.0	280.6	1.4	57.8	107.2	4.53	4.58	82.4	1.0	23.7	23.4	188.5	24.0	1.04

Discussion

Results of the researches confirmed the data of other authors [19-28] about demand in determination of optimal parameters of sportsmen's special workability. As a result of the conducted researches it was found that work during ski racing competitions on rough tracks has variable character. The main source of energy supply is organism's aerobic potentials, the level of which reaches 92-95% of maximal values. Alongside with it passing of different by length and time of passing rises, flat parts and descends causes different intensification of aerobic metabolism. It was also found that during passing of rises significant role in energy supply of ski racers is played by anaerobic sources. Their volume reaches 80% of their maximal values.

Thus, correlation of metabolic processes conditions prevalence of adaptation changes of leading functional systems, which ensure special workability of elite female skiers. Functional potentials of sportswomen with high level of realization of aerobic and anaerobic reserves approach to proper values of functional fitness. That is why in preparation of elite female skiers it is necessary to pay attention to their training.

Conclusions

On the base of systemizing of sportswomen's special workability indicators we determined model characteristics of quantitative values of functional fitness during passing different difficulty rises. We determined values of contributions of aerobic and anaerobic energy supply mechanisms. During passing rises they are key element for achievement of high sport results in ski racings.

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Conflict of interests

The authors declare that there is no conflict of interests.

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Information about the authors:

Khmelnytska J.K.; http://orcid.org/0000-0002-0231-1879; juliya_2008@bigmir.net; National University of Physical Education and Sport of Ukraine; Fizkultury str. 1, Kiev, 03680, Ukraine.

Filippov M.M.; http://orcid.org/0000-0001-5096-7445; filmish@ukr.net; National University of Physical Education and Sport of Ukraine; Fizkultury str. 1, Kiev, 03680, Ukraine.

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TECHNICAL PERFORMANCE ANALYSIS OF IRAN PREMIER LEAGUE SOCCER PLAYERS IN 2012-2013 SEASON

Mohsen Javani[1*], Mohammadreza Hamedinia[1], Kazem Khodaei[1]
[1] Department of Physical Education and Sport Science, Hakim Sabzevari University, Sabzevar, Iran

Abstract. *Background and purpose of study*: analysis of IRAN premier league soccer players' technical performance in season 2012-2013, using a computerized match analysis system (Borhan Mobin Development Management Co, IRAN). *Material and methods:* in this study, data were obtained from 120 players, who performed in competitions 90 minutes. The players were classified into 3 positional roles: defenders, midfielders and forwards. Technical performance variables analysis included: total passes, total successful passes, pass accuracy, total shots; total shots to target, shot accuracy, ball interception and ball losses. The data were statistically analyzed by one-way ANOVA, Kruskal-Wallis, Mann–Whitney U and Tukey post hoc test. *Results*: The findings of this study showed that players performed about 45 passes per competition. Midfielders and defenders had significantly higher number of passes than forwards. Pass accuracy was about 67% and there were no significant differences between positional roles. Also, the players performed about 0.8 shots per competition, forwards and midfielders had significantly higher number of shots than defenders. Shot accuracy was about 31%; midfielders and forwards had significantly higher shot accuracy than defenders. Forwards showed significantly lower ball interception and higher ball losses than other positions. *Conclusion*: The result of this study showed that there were significant differences between some technical actions in positional roles. Therefore, coaches can use this information for individualization of training according to playing positions and for optimization of training in the amateur game.
Keywords: Technical performance analysis, soccer, specific training, passing, shooting.

Introduction

Sports scientists, coaches and athletes are continuously looking for ways to easy and legal improvement of athletic performance (Nevill, Atkinson, & Hughes, 2008). Performance in soccer has been described as the interaction between several factors such as technical, tactical, physical and psychological ones (Stolen, Chamari, Castagna, & Wisloff, 2005). Coaches and scientists need to develop their knowledge about mentioned factors during competition with special reference to playing position. To obtain such information as well as to collect data, different methods have been proposed in the literature (Barros et al., 2007; Ferrario, Sforza, Dugnani, Michielon, & Mauro, 1999; Toki & Sakurai, 2005). Methods that often used include visual assessment (Bangsbo, Norregaard, & Thorso, 1991) and semi-automatic video analysis (Rienzi, Drust, Reilly, Carter, & Martin, 2000). Semi-automatic computerized technologies are replacing subjective assessment methods (Barros et al., 2007; Bradley et al., 2009; V. Di Salvo, Gregson, Atkinson, Tordoff, & Drust, 2009). These up-to-date systems allow collection of more quick and accurate performance data than other visual assessment methods (Drust, Atkinson, & Reilly, 2007).

Technical or skill-related abilities of players are important for success in soccer (Ermanno Rampinini, Impellizzeri, Castagna, Coutts, & Wisløff, 2009). However, while many studies have analyzed physical performance (Bangsbo, 1994; Bangsbo et al., 1991; Barros et al., 2007; Bradley, Di Mascio, Peart, Olsen, & Sheldon, 2010; V Di Salvo et al., 2007; Ekblom, 1986; Krustrup, Mohr, Ellingsgaard, & Bangsbo, 2005; Mayhew & Wenger, 1985; E. Rampinini et al., 2007; Reilly, 2003; Rienzi et al., 2000), very few studies have investigated technical performance of elite soccer players (Carling & Dupont, 2011; Dellal et al., 2011; Dellal, Wong, Moalla, & Chamari, 2010; Ermanno Rampinini et al., 2009; Russell, Rees, Benton, & Kingsley, 2011; Russell, Rees, & Kingsley, 2013). Dellal et al. (2011) (Dellal et al., 2011) have compared technical and physical performance in FA premier league and La Liga during the 2006-2007 season. They have found that La Liga players won more heading duels (49.32% vs. 48.68%) and performed the same proportion of successful passes (76.17%). In England Premier League, wide midfielders had 20% more ball touches per possession than their La Liga counterparts. Also, they have showed that defenders won more heading and ground duels. In another study, Dellal et al. (2010) (Dellal et al., 2010) have analyzed physical and technical activity of soccer players in French first league with special reference to their playing position. They reported that the players had possession of the ball between 55.5 sec. and 74.2 sec. per match played and midfielders performed successful passes ranging from 75% to 78%, whereas lower values were found for the forwards (71%) and central defenders (63%) respectively. Rampinini et al. (2009) (Ermanno Rampinini et al., 2009) have investigated technical performance during soccer matches of the Italian Serie A league and showed that involvements with the ball, short passes, successful short passes, tackles, dribbling, shots and shots to target were higher in the more successful teams (ranked in the first 5 positions) then in the less successful teams (ranked in the last 5 positions).

This information can provide more profound understanding of technical requirement and may have direct consequences for specific training regimes and talent identification schemes (Dellal et al., 2011). Also, these findings can be a useful

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tool for individualization of training according to the positional roles and provide a model for planning of training in amateur soccer players (Dellal et al., 2010). Dellal et al. (2011) (Dellal et al., 2011) proved that there are differences in various aspects of physical and technical performance of soccer players in the Spanish and English Leagues according to their playing positions. Therefore, it can be concluded that there are differences in some aspects of technical performance between various leagues and countries. This differences seem to be more obvious between Iran premier league and European leagues due to the differences in playing styles. Because of mentioned reasons in above and unavailability of match analysis studies in Asian leagues especially IRAN premier league, researchers intend to analyse technical performance of soccer players in IRAN premier league according to their playing position in the 2012-2013 season.

Material and methods

A total of observations of 330 players in the IRAN premier league for 2012-2013 season, who had participated in the matches played in Azadi stadium, was analyzed. Data were collected from these matches with the help of multiple-camera match analysis system (Borhan Mobin Development Management Co, IRAN). In this study, in order to compare players' technical performance, only the results of those outfield players, who participated in whole game (90 minutes) (n = 120 players) were used. The players were classified into 3 positional roles: defenders (n=53), midfielders (n=50) and forwards (n= 17). The recorded technical parameters were: total passes, total successful passes, passes accuracy, total shots as well as total shots to target, shots accuracy, ball interception, and ball lost.

All values are expressed as means of ± standard deviations. The normality distribution of the data was checked using the Kolmogorov-Smirnov and Shapiro-Wilk tests. Differences between the positional roles were determined with analysis of variance (ANOVA) and Kruskal-Wallis and Significant main effects of each factor were followed-up with post hoc Tukey pair wise multiple comparison and Mann–Whitney U test. Statistical significance was set at $P< 0.05$. All statistical analyses were conducted using SPSS (Version18.0; SPSS Inc., Chicago, IL, USA).

Results

The means ± standard deviations of variables, one-way ANOVA and Kruskal-Wallis results and Tukey post hoc and Mann–Whitney U tests' results are showed in Table 1. Technical analysis indicated that defenders and midfielders performed a significantly higher total number of passes than the forwards ($P = 0.009$, $P = 0.001$, respectively). They also, performed a significantly greater number of successful passes than forwards ($P = 0.01$, $P = 0.001$, respectively) whereas, various playing positions showed no significant difference in pass accuracy ($P=0.225$).

Midfielders and forwards completed significantly greater total number of shots than defenders ($P = 0.001$, $P = 0.004$, respectively). They also, completed significantly greater number of shots to target than defenders ($P = 0.001$, $P =0.009$, respectively). In addition, shots' accuracy was significantly higher for midfielders and forwards than the same of defenders ($P = 0.001$, $P = 0.016$, respectively).

Defenders and midfielders performed significantly greater number of ball interception in comparison with the forwards ($P=0.001$). Also, forwards showed significantly greater number of ball losses than defenders and midfielders. ($P = 0.003$, $P = 0.001$, respectively).

Table1.

Technical characteristics of IRAN Premier League professional soccer players in match

	Total of players (n=120)	Forwards (n=17)	Midfielders (n=50)	Defenders (n=53)	P Value
Total of passes	47.67±13.20	37.38±11.52¤†	47.97±13.06	50.68±12.38	0.001*
Number of successful passes	33.24±11.56	24.39±7.92¤†	33.63±11.74	35.72±11.16	0.002*
Passes' accuracy %	0.68±0.09	0.65±0.06	0.68±0.1	0.69±0.08	0.225
Total of shots	0.68±0.82	1.19±1.01¤	0.85±0.81¤	0.35±0.61	0.001*
Number of shots to target	0.33±0.55	0.69±0.68¤	0.44±0.63¤	0.12±0.30	0.001*
Shots' accuracy %	0.27±0.39	0.46±0.40¤	0.33±0.43¤	0.15±0.32	0.006*
Ball interceptions	14.44±6.01	7.94±6.16¤†	14.36±5.64	16.61±4.73	0.001*
Ball losses	1.61±1.74	3.14±1.72¤†	1.62±1.62	1.12±1.58	0.001*

*Significant difference set at $p< 0.05$
†Significant difference with Midfielders
¤Significant difference with Defenders

Discussion

The main purpose of this study was to analyze technical activity of IRAN Premier League professional soccer players in season 2012-2013. Results of present study show that players performed about 48 passes per competition. Also, midfielders, defenders and forwards performed about 48, 51 and 37 passes per competition respectively. Defenders and midfielders performed significantly greater total number of passes than the forwards. Also, players in this league need to achieve success rate 68% in passing the ball. However, midfielders, defenders and forwards attained pass accuracy about 68%, 69% and 65% respectively. Various positions showed no significant difference in pass accuracy. The current study

revealed different findings that differ considerably from other leagues' results, especially at European leagues level. Russell et al. (2013) have investigated technical demands of soccer match play in the English championship. They reported that players performed about 59 passes per competition, also, in the same way, they showed that percentage of successful passes was about 77% (Russell et al., 2013). On the other hand, our findings approximately were similar to the findings reported by carling and DuPont (2011) (Carling & Dupont, 2011). They reported that midfielders of one team in French league performed 43 passes per competition and percentage of successful passes was about 68%. In the other study, Dellal et al. (2011) (Dellal et al., 2011) compared physical and technical performance of players in FA premier league and La Liga and reported that passes' accuracy in both leagues was about 77%, that for midfielders, defenders and forwards in England league were 79, 78 and 70% respectively and in Spanish league it was 78, 78 and 74% respectively. According to the reports it seems that the observed differences in results of studies may be related to teams'playing styles in various leagues. Moreover, it seems that teams that prefer short passes and occasional use of long and direct passes have higher number of passes and also higher passes' accuracy. Therefore, in IRAN league passes' number and accuracy are less than the some European leagues and it may be related to more frequent use of long and direct passes, as well as to challenging playing styles of teams in IRAN league.

In present study, players performed about 0.7 shots per competition. The total of forwards' (1.19 shots per competition) midfielders' (0.85) shots was significantly higher than defenders' (0.35). This may be related to the fact that forwards and midfielders are close to the opponent's goal and have more opportunity for shots to the opponent's goal. Shot accuracy was about 27% for all players. The forwards' (46%) and midfielders' (36%) shot accuracy was significantly higher in comparison with defenders (15%). These differences can be explainable due to position-related technical tasks. Rampinini et al. (2009) have investigated technical characteristics of Italian Serie A league and reported that average of total shots for players of the more successful teams were 1.8 shots and for players of the less successful teams were 1.2 shots per competition (Ermanno Rampinini et al., 2009). This information shows that total number of shots in IRAN Premier League's players is even less than of the less successful teams (ranked in the last 5 positions) in Italian Serie A league. In another study, Carling and Dupont (2011) have investigated skill-related performance when competing in successive matches within short time. They reported that midfielders performed about 2 shots in the first match in the sequence and 1.3, 2.5 shots in the second and third matches respectively (Carling & Dupont, 2011). One of the other potential reasons is that IRAN premier league played the most times of match in center of field and less played in one third of the opponent's defense and for this reason the number of shots in IRAN Premier League are less than European Leagues.

In this study, quantity of ball interceptions was 14 per competition. Whereas, Russell et al. (2011) reported that mean number ball interception was 5 per competition in the soccer players from junior department of a club that competes in English championship. Also, in this study midfielders and defenders had significantly higher quantity of ball interceptions than forwards (Russell et al., 2011). This can be related to technical and tactical tasks of positional roles. Mean number of ball losses in present study was 1.6 per competition; forwards showed more balls losses than other playing positions. This result is similar to the findings reported by Dellal et al. (2010) (Dellal et al., 2010) that forwards showed greater ratio of ball losses in possession than the other playing position and central defenders had the lowest ratio of ball losses in possession. This can be related to positional characteristics of forwards, because they need to use dribbling more frequently and endure higher risk than other positions. Also, a ball loss by midfielder and particularly by defenders is very dangerous for the team because the opposing players are very close to the goal and have an unbalanced defense.

Conclusion

In general, the results of present study show the technical demands of IRAN premier league players according to their playing position and indicate that there are significant differences in some technical characteristics of positional roles. Consequently, coaches can use this information for individualization of training according to playing position and also for training optimization in the amateur game. Also, such information can be used by persons responsible for technical training of soccer players in order to increase the specificity of used before training procedure and during competitions. In addition, our findings exhibit that number of total passes, passes' accuracy, number of total shots, and shot accuracy of players in IRAN Premier League's players are lower than in European leagues such as English FA premier league, Spanish La Liga and Italian Serie A leagues. Therefore, Iranian coaches should emphases the mentioned technical actions to obtain better results.

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Information about the authors:

Mohsen Javani; http://orcid.org/0000-0003-1626-7060; mohsenjavani87@yahoo.com; Department of exercise physiology, Hakim Sabzevari University; Tovhid town, 9617976487, Sabzevar, Khorasan Razavi, Iran.

Mohammadreza Hamedinia; http://orcid.org/0000-0003-0646-5725; m.hamedinia@hsu.ac.ir; Department of exercise physiology, Hakim Sabzevari University; Tovhid town, 9617976487, Sabzevar, Khorasan Razavi, Iran.

Kazem Khodai; http://orcid.org/0000-0003-1566-2851; k.khodai@yahoo.com; Department of exercise physiology, Hakim Sabzevari University; Tovhid town, 9617976487, Sabzevar, Khorasan Razavi, Iran.

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PROBLEMS OF SAFETY AND RISK IN PHYSICAL EDUCATION

Podstawski Robert[1], Zwolińska Danuta[2], Nowosielska-Swadźba Danuta [2]
[1] Department of Physical Education & Sport, University of Warmia & Mazury in Olsztyn, Poland
[2] The Institute of Physical Culture, State Higher Vocational School in Racibórz, Poland

Abstract. *Purpose:* One of the methodology issues in Physical Education is providing children with safety. The purpose of this work is to present basic concepts of safety at Physical Education classes. *Material & Methods:* The issues connected with safety at classes of Physical Education have been discussed in the subsections, each of which focuses on different concepts such as: legal safety regulations, causes of hazards, theoretical models of preventing hazards at P.E. classes, nutrition programs related to exercise's fulfillment, prevention of heat disorders and dehydration. *Results:* According to experts' opinion, the causes of safety hazards at P.E. classes can be divided into three groups: caused by instructor, caused by a student, and finally hazards technical in nature. The number of accidents during P.E. classes is still substantial, and among most common hazards there are the following: fractures of upper and lower limbs, dislocations, contusions, tendonitis, muscle tear and cuts. Curiously, boys experience such injuries more frequently than girls. *Conclusions:* Even though safety rules at Physical Education classes are defined by specific regulations, children's absolute safety is never guaranteed. In order to diminish the number of misadventures, instructor is obliged not only to adhere to the norms but also to teach children to safety rules.
Key words: physical education, children, safety, risk, preventive measures.

Introduction

Safety of children and adolescents during school sports activities is the key issue in methodology of Physical Education (PE). For this reason, safety should be the subject of primary concern while planning PE activities [10]. Apart from basic safety rules and regulations observed in the school at PE, each physical activity (PA) has its own set of safety rules, with which all students should familiarize themselves [15]. Notwithstanding the rules, education and care, which more often than not minimize the occurrence of safety hazards, injuries, incurred during PE classes, are hard to be avoided. [50]. In the opinion of some sports instructors, misadventures are inevitable while performing physical activities as they are inherent part of movement, therefore anyone who is physically active should be aware of such risk.

Adequate safety control during classes of PE should be particularly addressed to primary school pupils [9, 28], physically [20, 36, 51] and mentally handicapped [3, 49]. Interestingly, the number of the physically handicapped is continuously growing, especially in the highly developed countries [24] as well as in many developing countries including Poland [38]. To illustrate this, the percentage of the overweight and the obese marked with a relatively low level of physical fitness (PF) is on the increase all over the world [2, 48, 57, 64]. Thus, at present such people are more frequently regarded as physically disabled or handicapped. In view of this fact, PE teachers are expected to be not only knowledgeable about their subject, but also display the proper sensitivity towards their students' size and body weight. Negative expectations towards obese students, expressed by teachers, may undermine or neutralize the effectiveness of actions, aimed at reducing overweight and obesity of children and young people [42]. First Lady Michelle Obama announced in her intentional letter that treatment of complications directly related to overweight and obesity amounts annually to the expense of 150 billion dollars [47].

Traumas and injuries incurred as a result of accidents make children unhealthy, that consequently hinders their development. Government administration must provide huge financial means for post accidental treatment. For instance, in Australia the expenses connected with post traumatic treatment exceeded 4 billion dollars in 2001 and 2002 [7]. In the USA, on the other hand, from 1991 to 1996 there were between 20,940 to 26,120 injuries caused as a result of strength training performed by young people under 21 [46]. As a result, the issues of traumatism also pertain to the child's motor development, which is closely related to the individual pace of learning and permanent acquisition of new motor skills (as a component of motor fitness) [59].

The purpose of this work is to raise awareness of safety issues at classes of Physical Education, and to stress on the importance of education in these aspects, in broad sense of this word.

Materials and Methods

Gathering literature: In order to gather adequate information on safety rules at classes of physical education, the authors used both private and public resources of Polish and foreign literature. The literary content of this work was also taken from the electronic databases which refer to the articles on the subject of safety at PE classes, published up to 2015. So as to obtain them, the following entries were applied: 'safety', 'children', physical education', and 'traumas and injuries' in the databases such as: EBSCO, DOAJ, PUB MED, and SCOPUS. As the overwhelming majority of works focused on methodology-related issues, the penetration of the literature was extended into the information stored in the specific websites.

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Presentation of the data: The problems of safety at classes of Physical Education have been arranged in subsections, each of which focuses on different concepts such as: safety rules and regulations, the causes of hazards at P.E. classes (caused by teacher, caused by a student, and finally hazards technical by nature), theoretical models of hazards' prevention at P.E. classes, nutrition programs related to exercise, prevention of heat disorders and dehydration.

Definition of safety: *Safety is the state of being "safe" (from French "sauf"), the condition of being protected against physical, social, spiritual, financial, political, emotional, occupational, psychological, educational or other types or consequences of failure, damage, error, accidents, harm or any* ***other event which could be considered non-desirable. Safety can also be defined to be the*** *control of recognized hazards to achieve an acceptable level of risk. This can take the form of being protected from the event or from exposure to something that causes health or economical losses. It can include protection of people or of possessions* [69].

Definition of physical activity: in the present work *physical activity is defined as any body movement, produced by skeletal muscles, that results in energy expenditure. The energy expenditure can be measured in kilocalories. Physical activity in daily life can be categorized into occupational, sports, conditioning, household, or other activities* [17].

Definition of physical education: *physical education is integral part of educational system being a fundament of physical culture, which should satisfy real-time needs of children and adolescents in terms of their physical and mental development*. Hence, this concept refers to the process, throughout which young people are educated how to take care of their physical fitness, once the course of their formal education is over (definition suggested by Podstawski based on: Grabowski [23].

Results

1. Rules and regulations

Safety rules at classes of PE are regulated by the relevant legal acts which are in force in a given country (in Poland, among others, Ministry of National Education and Sport dated from 31st December 2002 on safety and hygiene in public and private schools and institutions). According to The Polish Teachers' Charter (The School Teachers' Document on Pays and Conditions) *„the teacher is required to reliably perform tasks related to his/her post and the basic functions of the school such as teaching, educating and caregiving, including tasks related to the safety of students during activities organized by the school (...) "* [55]. In order to reduce the number of health hazards among children and adolescents, a variety of preventive measures are used, which in Poland, for instance, are developed and implemented by the relevant departments of the Ministry of National Education and Sports, as well as by direct supervision of schools [54].

Despite all the regulations and instructions on proper management of PE classes at schools, there is still a substantial number of accidents which take place at PE classes. The most common injuries are the following: fractures of upper and lower limbs, dislocations, contusions, tendonitis, muscle tear and cuts. Curiously, boys experience such injuries more frequently than girls [62].

2. The causes of hazards at classes of Physical Education.

The causes of hazards stem mainly from the fact that children and adolescents are unaware of the consequences of their own behavior, which frequently poses threat to their health or life. In opinion of Mazur and Wojnarowska [44], one of the reasons for this status quo is promotion of safety, oriented on the environment rather than on young people's lifestyle. One should also bear in mind that movement acts vary in terms of difficulty, which is the case not only in professional sport but also in school PE. This aspect is growing in significance due to the scientifically proved phenomenon of hypokinesis i.e. PA for which human body is programmed [27]. As a result of the sedentary lifestyle, people are becoming weaker in terms of their physical fitness, which consequently lowers the level of their motor skills and abilities such as speed, strength, endurance, coordination and flexibility [18, 58]. According to Olszowski [50], there are three causes of safety hazards in daily school practice:

A) caused by teacher,
B) caused by a student,
C) technical by nature.

Ad. A). Causes of safety hazards, caused by the teacher

Credentials and qualifications

As it is indicated by Calderhead [14] *PE teacher ought to have background knowledge in sport sciences and in the human movement sports studies of physical education. According to this study teaching P. E. can be an extremely difficult job, both physically and mentally, as 'there are many different roles and levels of responsibility to consider each day*. Classes of Physical Education can be conducted by a person skilled in the subject, who meets the requirements, specified in regulations issued by the government [30]. Apart from adequate qualifications in physical culture, PE teachers must be trained to first aid, the quality of which frequently affects the extent of post accidents complications and the pace of recovery [12]. Even in case of very serious accidents or injuries, the chances for survival significantly increase, if eye-witness is skilled in first aid [19]. For this reason, each PE teachers' staffroom should have a properly equipped first aid kit, the content of which is clearly indicated in the list of items including instructions for the use [62].

Badly-organized classes

This is unquestionably the weakest link of teacher's workshop, irrespective to his/her experience and career span, which is frequently connected with so-called stuck-in-the-rut approach to the classes. It is necessary to attract attention to the fact that students' safety should be guaranteed since the moment they arrive at the lesson (e.g. on their way to the swimming pool), or while they are getting ready for the classes in the changing room, or on their way to the gym or pitch [50]. It is also crucial that the teacher in charge is imaginative enough to predict the consequences of the students' behavior. Prior to the classes, the teacher should instruct students on safety rules, which are the part of methodology. He/she should gradually increase difficulty of exercises and provide assistance while performing more difficult tasks. An accident might happen as a result of teacher's delayed response to the hazardous situations, in which students find themselves. Children must be aware of safety of the tasks that they perform. Accidents might occur under the following circumstances: student is afraid of performing the task, refuses to follow teacher's instructions and suggestions, has no idea of movement and how to acquire it, has no adequate body posture while performing exercises, has ill comprehension of how to place movement in time, has no proper warm-up, inadequately holds sport gear, is insufficiently prepared to perform some tasks [50].

Poorly – planned lesson framework (ill methods of work) Uninteresting and badly-organized classes can cause too much chaos and disorder (badly-managed use of equipment) and can make students overactive. It should be borne in mind that each P.E. class or a training session consists of 3 parts: initial, main and final. In consequence, it is expected that student would go through an effective warm-up, then focus at the maximum during main part, and cool down properly during the final part [21]. The number of organizational and cleaning activities should be reduced to the minimum so as to devote the bulk of the time to motor activities. However, this stage might be effectively managed by presenting the roles of both teachers (trainers) and students during classes of PE [4]. It is necessary to discuss the code of conduct at PE classes, especially with the primary school pupils [30]. Finally, it is highly unacceptable to leave children unguarded during training session.

Lack of discipline and order

Discipline and order are essential elements in preventing from hazards, particularly while performing motor activities such as: gymnastics, martial arts (judo, karate) and swimming [66]. Lack of elementary discipline is often a cause of accidents, since the students, who start the classes without disciplining exercises (issued by means of commands), behave in a very flippant and disruptive way [45]. Teacher should create such supportive environment so that the students' emotional and physical needs are satisfied [31]. During the properly conducted classes every stage of the lesson is in perfect order. Classes, which are well-prepared and thought-over not only increase students' safety but also increase the pace of acquiring motor skills and abilities. Teacher is responsible for presenting not only the objectives of the classes but also health and safety rules in force in the classroom. Ill-planned and inadequately organized classes, which provide no safety of the place (running start, landing), gear and equipment (box, vaulting horse), often result in serious injuries [63].

Failure to comply with the applicable rules

It refers to the organization and conduct of the classes itself; also to the participation of the students, teacher's instructions on the use gear and the quality of gear, facilities, sports equipment; rules for the use of facilities, spatial devices (rules for the use of judo mats, gym, swimming pool etc.). To illustrate this, wrong arrangement of goals or floating baskets in the swimming pool may cause difficulty to participants of game while getting into and out of water.

Poor awareness of students' psychomotor abilities

This drawback is particularly discernible, when teacher deals with overcrowded groups of mixed motor fitness students [50].

Ad. B. The causes of accidents resulting from the student's personality

Experiencing injuries and traumas is quite a frequent occurrence during the school days [6]. Classes of PE should result in the child's proper psychomotor development. At PE classes student can manifest natural tendency to movement as such, to be very impulsive, unpredictable, and insufficiently imaginative so as to avoid safety risks. Moreover, as numerous research works have proved, participating in sports competition and selected forms of PE increases aggressive behavior of children and adolescents [25, 37, 41], yet this is strongly correlated with the type of PA, student's age and sex [8]. Apart from specialist's knowledge, teacher of PE should be able to predict potential hazards, should be exceptionally observant and have very good rapport with children. Such approach may prevent accidents which happen as a result of the following situations: the lesson is not preceded by a warm-up [35], students are in the state of emotional turmoil or apprehensive of the task they are about to perform, they are suffering from fatigue or/and exhaustion, they lead unhealthy lifestyle, they overestimate their abilities, they have insufficient knowledge of safety rules or another student's assistance, they experience unfriendliness on behalf of other students, they have domestic troubles.

Personal problems

It is not advisable to increase intensity of exercise when child experiences personal or domestic problems; he/she feels unwell, unhappy or is recovering from illness. Excessive excitement also poses risk of breaking safety rules, as the child wants to practise without protection, overestimating his/her physical abilities. It is usually expected that a warm-up shortens the time, necessary to adjust the body to optimal effort. It should also improve the effectiveness of respiratory system and circulation, and enhance the performance of nerve processes [40]. Anxiety, on the other hand,

stiffens the child's movements, making him/her unable to fully concentrate on the task and preventing him/her from evaluating the situation objectively. In order to prepare a child to face difficult, dangerous or frightening situations, it is necessary to develop comprehensive motor fitness of a child and to teach him/her about destructive consequences of negative thinking. The research showed that there is a strong feedback between child's sense of security and motor effects of his/her motor training [11]. What is more, physically fit children find it easier to assimilate in a peer group, and have fewer problems undertaking new roles, fulfilling tasks and instructions which are part of students' charter of rights and duties [26, 52].

When exposed to difficult or/and dangerous tasks, a physically fit person reacts anxiously as well, yet he/she finds it much easier to put up the defenses. Therefore it seems to be pointless to try to avoid challenges during classes of PE as it seems to be the sheer joy of overcoming one's limits that makes these classes so enjoyable. That's why, while realizing program, which involves more difficult motor tasks, the students' attention dwindles as a result of fatigue. As a result, they start to make more mistakes, which, in turn, may cause accidents [29].

Unhealthy lifestyle

By this we mean numerous factors which affect one's health and physical fitness, including malnutrition and bad eating habits. In this case, it is recommended to educate students to effects of appropriate nutrition and physical fitness on the proper functioning of the body. Recently, malnutrition has been also correlated with poverty caused by unemployment. Another issue is imbalance between work and leisure, as a result of which child ends up being overloaded with tasks at school and additional homework assignments at home. Security rules should be taught before each difficult task. Children, who are familiar with such rules, easily overcome fear, better comprehend the situation and faster learn specific motor tasks.

Ad. C. Causes of accidents, which are technical by nature

The causes of accidents, which are technical by nature, can be the following: inadequately prepared sports facilities, slippery and wet surface, insufficient gear and sports outfit, poor condition of the running start and take-off area (wrong board), bad state of track, uneven surface of the track, ill-fitting shoes and clothes, uncertified sports equipment, absence of basic safety rules knowledge concerning using the equipment, unreasonable choice of places for the purpose of sports activities, negligence of the traffic code. Material base and teaching aids are other factors which significantly affect the performance of P.E. classes and warrant security while conducting the classes. According to Ostrowska [53] the following places may pose threats to the students' safety:

- concrete or stone residues in the area immediately adjacent to the pitches, which in the light of the rules for team sports games disturb free security zone along the side and final lines of the pitch. Hypothetical hazards may include internal injuries or fractures incurred as a result of the student colliding with such objects,
- uneven (pre-bulldozed) surface of the pitch. Hypothetical hazards include ankle injuries, fractures of lower as well as upper limbs as a result of propping the body while falling, scratches and, in consequence, likelihood of infections,
- inadequate technical standards of athletic complexes e.g. faulty material of the board, unmarked and too high curbs, or the width of the long jump run smaller than 1,22 m. Hypothetical injuries include dislocations and fractures of lower limbs as well as pelvis injuries as a result of the slipping on the board or tripping over the curb,
- improper design and inadequate arrangement of the pitches being part of the sports complexes e.g. volleyball courts situated in the immediate proximity to the tennis courts, without any barrier. A hypothetical incident: a student playing volleyball invades the tennis court and having been hit with a tennis ball loses his sight and suffers from contusions,
- incomplete casing of the radiators placed along the wall lined with gym ladders. Hypothetical hazards include damage to the skin and soft tissue as a result of direct contact with the object or jamming of the feet between the ladder and the radiator.

Recently, 'sport simulators' have become quite popular in school environment. They are devices or groups of devices (e.g. atlas) which provide: specific conditions for the muscle workout, objective measurement of the specified motor parameters (e.g. *online*), and the possibility to program and adjust motor tasks [67]. Due to the fact that exercises on simulator may involve relatively big number of students, they should become commonplace while teaching PE to children and adolescents (68]. Each device of this kind should have instructions for use as well as attached safety rules, which shall be clearly demonstrated to students. This particularly refers to restrictions on the minimal age of users, for instance of electric treadmill. While operating this equipment, discharge of electrostatic force can occur and the device will be switched off. It is highly unacceptable to allow small children to enter such devices being unprotected. Teacher in charge of the classes should thoroughly present the technique of exercising on every single component of the device and explain to the students the purpose of each exercise.

2. Eating habits while performing physical activity

It is a widespread belief in our society that some sports drinks and their ingredients possess miraculous powers. To prove this, there appears more and more people in sport-recreational facilities, gyms and fitness clubs, who resort to supplements (e.g. isotonic liquids, energizing bars, fruit juices or mineral water) while practicing sport [13]. Such a tendency is also observed among school students, who bring various supplements to school so as to consume them during

the classes of PE. While analyzing the issues of safety at classes of PE in terms of proper nutrition, it should be highlighted that during the PA human body is more focused on energy outlet rather than intake [70]. Therefore, it is not always justified to consume an excessive amount of supplements while doing exercise, especially when the average time of physical effort rarely exceeds 45 minutes [43].

Analyzing the issue in terms of safety, it is necessary to refer to the basic rules of nutrition at physical training. First of all, larger portions of food such as breakfasts or lunches should be consumed 2-3 hours before training session or competitions. Eating directly before exercise can result in such negative reactions as vomiting or stomachache [33]. If exercise is scheduled for the morning, it is unadvisable to have heavy breakfast. Such food is left over in stomach, which significantly diminishes a person's motor abilities (by limiting ability of absorbing oxygen). In such case, it is strongly recommended to consume a small breakfast rich in carbohydrates (6,9%) or drink a solution of carbohydrates and electrolytes e.g. diluted fruit juice in the ratio 1:2, bearing in mind that gastric juices start to be produced no sooner than 1,5 h after waking up [56].

Preventing heat disorders and dehydration during physical activities

Regular fluid replacement prevents dehydration of the body through sweat [22]. Sweating appears due to activation of thermoregulatory mechanisms, by which heat is dissipated to the environment and organism maintains a constant body temperature (approx. 37 ° C). Increase of body temperature by 3^{o}C above the norm causes impairment of physical and mental functions. Further rise of body temperature may result in serious health disorders (heat illness, muscle cramps, heat syncope or heat strokes), and when body temperature exceeds 42^{o}C – even death [5]. During sports exercise sweat glands secrete between 1-2 l of sweat per hour, and the evaporation of 1 ml of sweat eliminates approx. 2,5 kJ of heat [39]. As a result, during intense physical exercise, the internal temperature of the body without thermoregulation increased at the rate of 1^{o}C per each 5-7 minutes [65].

While performing an intensive physical training, it is advisable to take 7-10 g of carbohydrates per each 1 kg of the body mass every 24 hours (60-70% of the total energy contained in food). During long-term efforts, especially at high temperatures, it is recommended to drink beverages which contain 4-8% of carbohydrates and electrolytes [32]. It is common practice to take fluids every 15-20 min in the amount of 200-250 ml. Children, whose body weight is less than 40 kg, should drink 7 ml of fluid (e.g. mineral water) per each kilo of their body mass every 15-20 minutes. However, in the case of physical efforts, which last longer than 1 hour, it is more beneficial to drink sport isotonic drinks [65]. Right after an exhaustive workout it is recommended to consume easily assimilated fluid carbohydrates so as to accelerate the recovery of glycogen in the muscles and liver [34].

Discussion

The issue of safety is so large that may bring together numerous factors ranging from those technical by nature to those referring to the psyche of child. In order to minimize risks, it is extremely important and urgent to establish 'theoretical models of how to prevent accidents', which would be aimed not only at the need in prevention but also at promotion of safety among students [54]. This is especially true in case of serious accidents, which lead to disability or even death.

One of the fundamental safeguards is insurance from accidents, which solves nothing but can be some kind of protection for the future. Despite the fact that students are insured by the insurance company, it is necessary to carefully check on how much their insurance policy is worth and to what accidents and injuries it applies. It may happen that in spite of disability, a person has failed to obtain full compensation because this type of injury was not specified in the insurance policy. In another case, the amount of compensation is in no way relevant to the loss of health due to the low value of the insurance.

Material base and facilities

PE instructor is primarily responsible for proper functioning of sports facilities, gear and equipment [1]. His/her duties involve regular control of the safety and technical condition of the places where the exercises are conducted such as gyms, pitches, running courses etc. The teacher is obliged to check safety of each item of the equipment every time when it is used during the classes. PE teacher can carry out minor maintenance works so as to sustain complete functionality of gym and other facilities; he/she must remove from the gym or pitch any equipment which presents risk to the students; or finally, he/she may decide on the necessity to carry out an overall technical review of school gear and equipment following the approval of the school authorities [60].

Certificates, approvals and guarantees

Sports gear and equipment being part of the gym or pitch should have valid certificates and approvals, which would guarantee proper functioning of all the elements in these places and facilities. The materials, used for production, the way in which all parts were assembled as well as the manner, in which sports equipment was arranged within the facilities, must have no faults or 'weaker links' but must meet the standards of health and safety protection.

Information boards and regulations of the gym, pitch and swimming pool

In every gym or on every pitch as well as in the areas designated for physical exercise and games, it is compulsory to display information boards laying down the rules for safe and proper use of gear and equipment in such places. Additionally, in order to increase safety, other information boards may be put on display laying down the rules

for specific use of gym, school pitch, mats, and other elements of the equipment (e.g. vaulting horse, box, springboard, baskets, ladders, bullets, medicine balls etc.).

Education of students

Despite basic safety rules, which are observed in daily practice of PE, each form of PA has its own set of safety regulations, awareness of which must be constantly raised among children [16]. Thus, issues concerning safety at classes of PE should be presented and implemented throughout the learning process.

Conclusions

1. Although safety rules at classes of PE are defined by specific provisions, they never fully guarantee children's safety.
2. In order to minimize the number of accidents, teacher is expected not only to adhere to the norms but also to educate the students on the subject of safety.

The subject of safety at classes of physical education should be continued, its range being expanded and focused on the specific forms of PA such as swimming, gymnastics, self-defense and tennis, to mention but a few.

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Information about the authors:

Podstawski Robert; http://orcid.org/0000-0002-1492-252X; podstawskirobert@gmail.com; University of Warmia & Mazury in Olsztyn; Prawocheńskiego 7, 10-720 Olsztyn, Poland.

Zwolińska Danuta; http://orcid.org/0000-0002-3353-2797; danuta.zwolinska@pwsz.raciborz.edu.pl; State Higher Vocational School in Racibórz; Słowackiego 55, 47-400 Racibórz, Poland.

Nowosielska-Swadźba Danuta; http://orcid.org/0000-0002-9476-3089; danuta.swadzba@pwsz.raciborz.edu.pl; State Higher Vocational School in Racibórz; Słowackiego 55, 47-400 Racibórz, Poland.

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CONTACT INFORMATION

box 11135, Kharkov-68, 61068, Ukraine
phone. 38-099-430-69-22
http://www.sportpedagogy.org.ua
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