

Social impact of sport loads as a motivator for the practice of sports activities in the educational environment of a higher education institution

La importancia social de las cargas deportivas como motivador para practicar deportes en el entorno estudiantil de una institución de educación superior

*Vitaliy N. Avsiyevich, *Zhassyn S. Mukhambet, **Ihor Yu. Robak, **Oleksandr V. Chernukha, ***Natalya V. Zakharchenko

*Kazakh Academy of Sport and Tourism (Almaty), **Kharkiv National Medical University (Kharkiv), ***Kazan Federal University (Elabuga)

Abstract. The present study shows that sport loads for student environment determine not only the possibility of successful educational or scientific activities, but also successful social activity. The paper's authors consider sports' social meaning in higher education institutions as a function of implementing applied activities with correlation with successful professional medium. The relevance of the paper is in that doing sports in education institution is perceived not only as a part of the pedagogical load of topics from the general professional cycle, but also as a means of students' socialization. The subject under study is students' predisposition to implement the postulates of independent exercising. As a novelty, the issues of the development of motivation for students to do sports were studied. The main thesis of the research is to form a general idea on possibilities and motivation, as well as to carry out a complex evaluation of students' readiness to do sports independently, without professors' participation. A promising input is the testing of organizational-pedagogic conditions, and the integration of physical education and independent sports.

Keywords: sports activities, educational institution, educational environment, professors, promotion of preparation.

Resumen. El trabajo muestra que las cargas deportivas para el entorno estudiantil determinan la posibilidad de actividades no solo educativas o científicas, sino también sociales. Los autores del artículo ven la importancia social del deporte en la universidad como una función de la implementación de actividades aplicadas con una correlación en el éxito del entorno profesional. La relevancia del trabajo parece ser que practicar deportes en una institución educativa se percibe no solo como parte de la carga pedagógica sobre temas del ciclo profesional general, sino también como un medio para socializar a los estudiantes. El tema del estudio es la disposición de los estudiantes para implementar los postulados de ejercicio independiente. Como novedad, se estudiaron cuestiones sobre el desarrollo de la motivación para practicar deportes entre los estudiantes. La tesis principal del estudio se define para formar una idea general de las posibilidades y la motivación, así como para realizar una evaluación integral de la preparación de los estudiantes para los deportes independientes sin la participación del profesorado. Dirección prometedora de investigación es la prueba de las condiciones organizativas y pedagógicas y la integración de la educación física y los deportes independientes.

Palabras clave: actividades deportivas, institución educativa, ambiente estudiantil, profesorado, promoción de preparación.

Introduction

Studentship especially at the initial stage of education in higher school is the most susceptible part of youth, since it faces a number of difficulties related to increase in academic load, high mental workload, low motion activity, relative freedom of student life, problems in social and interpersonal communication (Sigvartsen et al., 2016). Modern students are main labour reserve and genetic fund of our nation, therefore their health is a guarantee of well-being of the nation (Deliens et al., 2015). Numerous researches by Zelli et al. (2007) witness at large the insufficient level of students' motivation to go in for sport, as well as predominantly indifferent and sometimes negative attitude towards «Physical education» discipline. The low motivation level and the lack of demand for systematic motion activity are stipulated with weak organization of health-and-fitness and sporting mass work in higher education institutions.

In opinion of Hyndman (2017), one of the most important and difficult tasks of physical education in higher education institution is to form students' positive attitude towards educational subject, stable motivation for health promotion, demand for physical improvement, interest and habitude to

doing physical exercises. System of physical education within the process of studying under conditions of stable positive motivation should promote formation of student's personal culture being his integral property as the ground for effective educational and professional activities, as complex indicator of future specialist's professional culture (Silva et al., 2017). As Wu et al. (2014) states, the creation of effective theoretical constructs of students' education under conditions of higher school is stipulated with transformations taking place in our society at the present moment. Besides, the grounds for formation of demand for physical improvement are recognition of person's integrity and proper attitude towards own health (Kedra et al., 2017).

Jones et al. (2006) accentuates that physical improvement is considered an aggregate of techniques and types of activity defining and regulating person's position in regard of own physical development, physical fitness and state of health. In terms of pedagogical practice, it is important to define priority ways for increase of students' activity upon physical exercises performing, formation of demand for physical improvement. Virtually, the following levels of such demand are distinguished:

- passive – the demand for physical self-improvement is poorly expressed or absent;
- situational – characterized with unstable interest to sport activities;
- active – differs with rather high activity of person in

physical training and sport.

Formation of the demand for physical self-improvement, in opinion of Cowie & Hamilton (2014), is a complicated and long-term educational process, within which there are various positive and negative motives, external and internal factors. External factors include educator's personality, training content and teaching methodology, state, quality and presence of corresponding sports facilities, inventory. Internal factors, in turn, include motives, interests, values, level of personal qualities development, self-assessment of health state and physical fitness (Gomez-Marcos & Sanchez-Sanchez, 2019).

Students' positive motivation for motion activities, according to Vandeveld & Miyahara (2005), predetermines their orientation to creative digestion of physical education program, which, in turn, requires adequate influence on intellectual, emotional-volitional and world outlook spheres of youth. In this context of separate importance is the research of motives, interests and needs of modern young people upon performing physical exercises.

According to Springer et al. (2010), motive is an internal driving force inciting a person to act; a dynamic process of physiological and psychological nature that regulates one's behaviour and defines its orientation, organization, activity and stability. Being the driving factors motives define behaviour orientation and are expressed in the form of person's readiness for activity leading to definite goals. The basis of the process of formation of motives for any actions is represented with the principle of realization and activity. In opinion of Grygiel-Górniak et al. (2016), motivation predetermines reasons and mechanisms of human behaviour. It is the state that incites man to perform inherited or acquired actions aimed at satisfying various demands; creation of specific man's internal state defining his actions, behaviour and direction of activity. As a psychic phenomenon, motivation is an aggregate of motives. Its formation is influenced by external (conditions surrounding man) and internal (wishes, hobbies, interests and creeds of person) factors (Cabello Moyano et al., 2018).

According to researches of Gu et al. (2014), students' main motives for performing physical exercises are of the following nature: health-improving, action-oriented, competitive, aesthetic, communicative, cognitive-and-developing, creative, vocationally-orientated, educational, status-related, culturological, administrative and psychological. Activation of students' positive motives is performed due to a stimulus that mainly represents a reason for definite behavior (Czajkowski et al., 2018). Frequently the stimulus bears short-term character, however constant motives for action-oriented behaviour upon physical training become values. Such stimuli, for instance, can include: taking a good mark, favourable class times, wide range of opportunities upon choosing physical activity type, high pedagogical skill of teacher, sufficient sporting-material resources, promotion of health, improvement of body build, rest and entertainment, communication with herd mates, etc. (Seo et al., 2009).

Quintiliani & Whiteley (2016) suggest the following classification of motives stipulating students' active position in physical education:

- internal motives linked to satisfaction with process of activity (emotions, favourite physical exercises, novelty, opportunity of communication, interesting leisure and so on);
- external positive motives based on result of activity (acquiring of knowledge, skills, abilities, and active rest);
- motives related to prospects (promotion of health, correction of body build, development of movement skills);
- motives related to duty (necessity of attending classes);
- external negative motives (nolition of taking negative mark, etc.).

According to the data of Taub et al. (1999), questioning of students witnesses that when attending classes on physical education they do not think about the value of motion activity for their health and possibility of application of acquired movement skills and abilities out of physical training classes. Many students associate physical exercises with activity of purely mechanical character.

Materials and methods

Studying of peculiarities of psychophysiological development and their comparison with average norms and data of similar researches allowed us to distinguish advantages and disadvantages of students' psychophysiological preparedness. Thus, the strength of muscles of back and abdominals, general motion coordination, speed of visual-and-motor reactions, accuracy of movement time parameters reproduction, as well as attention and memory have insufficient level of development for successful performance of professional activity (Sone et al., 2017).

Effectiveness of implementation of any methods providing skills and abilities' formation to educational process is evaluated with account of two aspects: increase of teaching process effectiveness in higher educational institutions and students' preparedness to perform such activity together with level of corresponding competences' formation. In such a way, the effectiveness of implementation of methods providing formation of students' skills and abilities for individual doing sport to physical educational process should be evaluated with account of two conditions:

- formation of preparedness for carrying out of health and fitness activity including motivation level, theoretical and methodical preparedness and attraction to individual performance of sporting activities;
- increase of effectiveness of physical education process in higher education institutions, which is defined by positive dynamics of physical state, general professional-applied physical fitness.

Realization of the first condition implies formation of students' health and fitness competences, the level of which is defined by readiness to perform individual sports doing and evaluated in accordance with motivational, cognitive, practical and evaluative-reflexive criteria. Thus, we have determined:

- dynamics of motivation according to questioning data;
- level of theoretical preparedness (by means of testing);
- methodical preparedness by means of performance of tasks of content development and carrying out of various forms of individual sports doing;

– volumes of motion activity by the results of attending of obligatory classes on physical education and attraction to various forms of self-improvement.

The second condition of effectiveness of implementation of methods providing formation of students' skills and abilities for individual sports doing to physical educational process is defined by positive dynamics of physical state indicators, general motion activity and professional-applied psychophysiological preparedness of youth (Barnett et al., 2009). As a result of pedagogical experiment forming stage, we have carried out check of indicators of somatic health, physical performance, general and specific professionally important motion and psychophysiological indicators of organism development, evaluated their dynamics and defined its reliability for both groups.

To reach the objectivity of obtained results of pedagogical experiment the contingent had been selected in a way providing uniformity of experimental group (EG) and control group (CG). With help of statistical motivation, analysis of physical state and professional-applied psychophysiological preparedness it was defined that experimental and control groups of students were uniform ($p > 0.05$) by all the researched indicators.

Methods of formation of skills and abilities of individual sports doing had been planning in various forms of classes on physical education, particularly, as for obligatory classes (lecture and practical), as well as health and fitness and sporting mass affairs. Special attention had been paid to increase of motivation and motion activity, including physical self-improvement, formation of specific theoretical knowledge and methodical skills and abilities of planning and practical use of physical culture means within individual health and fitness activity on the basis of accounting of physical state, disadvantages of motion preparedness and professional trend (Akhmedova et al., 2011).

Besides general didactic principles of training and education the main principles of students' physical education refer to health-improving and professional-applied trends (DeVoe et al., 1998). The discipline of «Physical education» in higher education institutions is being obligatory irrespectively of educational institution dedication, however its main tasks are promotion of health and physical improvement of students, as well as their psychophysiological preparation to performance of future professional activity. Nevertheless, number of hours provided by curriculum as for students' physical education is, as a rule, insufficient to solve above-mentioned tasks, which makes the necessity of youth's individual training actual. Such individual training, in turn, requires students to have specified knowledge, skills and abilities of performance of physical improvement, which predetermines the necessity of application of corresponding measures within the process of physical education in higher education institutions (Bazylova et al., 2019).

We have developed a number of methods providing formation of students' skills and abilities for individual sports doing, which are aimed at preparation to individual health and fitness activity for the purpose of realization of physical education tasks in higher school. Thus, the condition for physical education effectiveness increase is represented with

development and implementation of methods providing formation of future teachers' preparedness to physical self-improvement, which is practically defined by positive dynamics of physical state, motion preparedness and professionally important indicators of young people's organism development.

Results and discussion

The analysis of students' somatic health conducted at summarizing stage of pedagogical experiment asserts the pedagogical professionalism level of majority of first courses students is below the average. Characteristics of youth's state of health are as follows (Figure 1). Thus, 6.8% of boys have low level of somatic health, 46.2% have the level below average, youths middle level of health makes 42.7%, and 4.3% have the level above average. There are no persons with high level of somatic health. The state of somatic health of girls is a bit different (Figure 2). More than a half of girls has the level of health below average (51.9%), while 7.8% have low level. The number of girls having average health level is less than in case of boys and makes 37.4%. There are only 2.9% of girls with the level of somatic health being

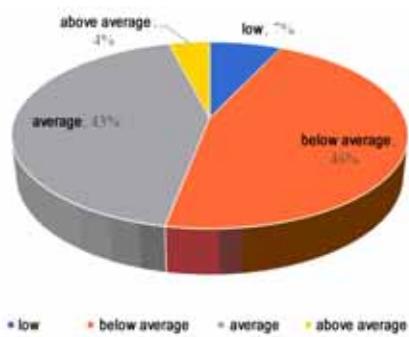


Figure 1. Characteristics of male students' somatic health

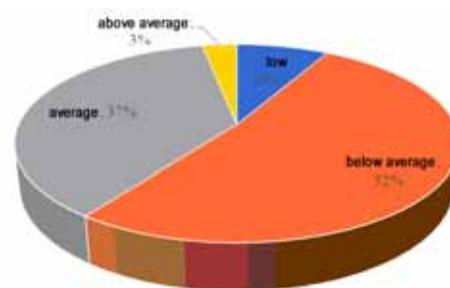


Figure 2. Characteristics of female students' somatic health

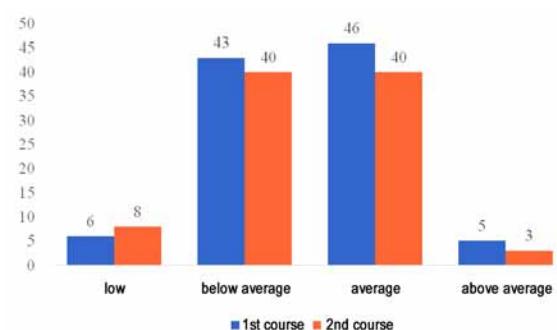


Figure 3. Comparative analysis of somatic health of 1 and 2 course male students

above average and no girls having high level.

Analysis of data obtained as a result of research of somatic health of boys and girls asserts the level of woman students' somatic health is lower than boys'. Comparing the researched indicators by years of studying we have revealed the level of somatic health of second course students is lower than first course students' (Figures 3, 4).

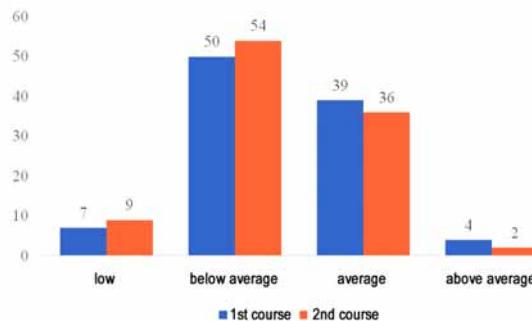


Figure 4. Comparative analysis of somatic health of one and two course woman students

Psychoemotional and mental loads have negative influence on students' health. It has been determined that in higher education institutions there is increase of number of special medical groups students with each year of studying, subsequently, the number of main group students reduces. Thus, attraction and preparation of students to individual performance of physical exercises provide additional opportunities for improving youth's physical state and, thereby, increase effectiveness of physical education process during studying in higher education institutions.

The important condition defining effectiveness of studying in higher education institutions is the high level of physical and mental performance of students and their educational and working activity. The physical and mental performance are interrelated. The performance of future specialist expresses in the ability of carrying out definite work and is stipulated with level of his physical and psychophysiological capabilities, as well as with state of health and professional preparedness. Many factors witness general decrease of students' physical performance due to objective reasons (social level of living, ecology, low level of health and motion opportunities, etc.). The quantitative characteristics of physical performance is necessary for organization of physical education process, forecasting and planning of teaching loads, organization of students' motion regime.

Research of physical performance is carried out with use of Kverg's complex functional test that allows determining

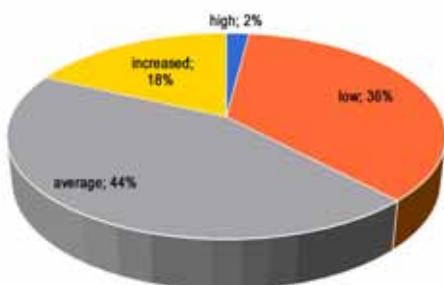


Figure 5. Characteristics of man students' physical performance

the degree of organism's adaptation to various loads, which, in turn, characterizes state of general fitness of organism and functional state of heart-vascular system. As a result of testing, we have determined the indicator of students' physical performance is within the range from low to satisfactory (Figure 5). Thus, 35.8% of man students have low physical performance, 44.2% – satisfactory, 18.1% – good, and only 1.9% have high indicators. Research of physical performance of girls has shown that only 20.1% have good physical performance, about a half (57.6%) of girls has satisfactory level, and 22.3% – low level (Figure 6). In general, the percentage ratio of girls with low level of physical performance is lower than boys' (20% and 32% correspondingly), with average level is higher (44% for boys and 58% for girls), however there are no woman students with high level of physical performance at all.

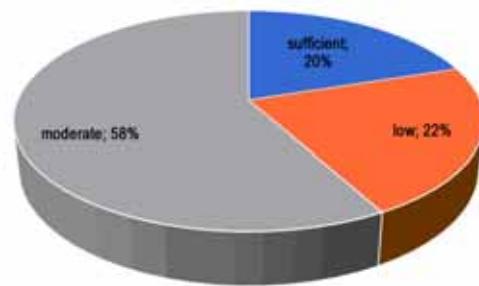


Figure 6. Characteristics of woman students' physical performance

Motion preparedness plays significant role in professional becoming of students. Thus, sufficient level of physical qualities' development is the basis for formation of professionally important skills and abilities, optimization of students' psychophysical state. It also increases effectiveness of professional education, provide educational and professional activity and is being one of the criteria of specialist's professional reliability. At the same time, insufficient level of physical preparedness stipulates low indicators of physical and mental performance, aggravates successful learning of professional skills.

Studying of motion qualities development indicators with help of selected control exercises has shown the physical preparedness of students is in general at rather low level. Thus, we have determined low indicators of stamina, speed and power qualities, as well as flexibility and dexterity. At that motion indicators of second course students are lower than first course students' (Table 1). The obtained data confirm results of similar researches of students' physical preparedness and witness the absence of trend to growth of the indicators during studying in higher education institution.

Table 1
Characteristics of students' general physical preparedness

Motion indicator	Girls				Boys			
	1 course		2 course		1 course		2 course	
	X \pm	V, %						
Stamina: running 3000/2000 m, min, s	14.3 \pm 1.9	13.0	15.6 \pm 2.3	14.9	16.2 \pm 1.2	7.4	16.3 \pm 1.6	10.0
Speed: running 100 m, s	17.2 \pm 0.9	5.4	17.6 \pm 0.8	4.5	14.0 \pm 0.6	4.4	14.2 \pm 0.7	4.9
Power qualities: pull-up/ arm-pumping exercises while lying, times	21 \pm 4	17.0	18 \pm 2	8.9	8 \pm 3	14	8 \pm 3	17
Standing long-jump, cm	174 \pm 20	11.6	160 \pm 14	9.1	228 \pm 20	8.9	218 \pm 21	9.7
Flexibility: trunk bending in sitting position, cm	17 \pm 5	27.5	16 \pm 5	34.0	13 \pm 5	35.5	10 \pm 6	14.5
Dexterity: shuttle run 4x9m, s	11.4 \pm 1.8	15.4	12.6 \pm 0.7	5.8	10.2 \pm 1.0	10.2	10.3 \pm 0.9	8.9

With help of commonly known and modified methods of evaluation of organism development psychophysiological indicators we have determined the main qualities of motility and psyche, which are professionally important for representatives of pedagogical profession, namely, the strength of basic groups of muscles (of abdomen and back), general motion coordination, speed of sensomotor reactions, static and dynamic equilibrium, accuracy of movements' time parameters evaluation, frequency of arm movements (fine motor skills), as well as power, mobility and equability of nervous processes, various types of memory, attention properties (Table 2).

Table 2
Characteristics of professionally important motion and psychophysiological indicators of students' organism development

Indicators	Boys		Girls	
	X±	V, %	X±	V, %
Motor, psychomotor and sensomotor indicators				
Dynamic stamina of abdominals muscles: trunk bending per 1 min, times	43±6	13.7	36±9	12.1
Static stamina of back muscles: keeping of trunk at an angle of 45° in lying position, s	86±44	31.2	98±38	33.7
General motion coordination, points	2±3	18.3	3±2	23.8
Simple reaction time, s	0.31±0.04	7.2	0.33±0.05	6.8
Complex reaction time, s	0.46±0.12	7.1	0.52±0.16	6.3
Static equilibrium, s	14.0±2.2	12.9	15.0±2.4	16.1
Dynamic equilibrium, s	28.0±5.0	13.0	28.0±5.0	17
Accuracy of short time intervals' evaluation, s	0.7±0.5	31.0	0.9±0.6	27.7
Accuracy of long time intervals' evaluation, s	2.1±1.9	47.2	2.3±1.6	43.5
Frequency of movement for 10 s, times	58±4	8.5	54±6	9.4
Features of neuropsychic processes behaviour				
Nervous activity power: dynamic performance, st. units	2.48±2.2	78.0	4.2±1.7	41.0
Speed of perception and processing of visual information, bit/s	1.67±0.34	20.1	1.77±0.24	13.3
Mental work accuracy	0.80±0.11	14.4	0.81±0.12	15.1
Attention scope, points	3±2	91	2±3	97
Memory distribution and switch, points	7±1	21	7±2	22
Short-term visual memory, points	7±1	13	7±2	11
Short-term memory dynamics, points	7±1	19	7±1	7

Comparing the psychophysiological indicators of students' organism with existing norms of the indicators for 17-21 years old people and data of similar researches we can estimate degree of their development and corresponding to age norms. Analyzing results of exercises linked to bending of trunk in lying position for one min from a perspective of state tests and standards of physical preparedness for 17-21 years old persons we can assert that stamina of abdominals is insufficiently developed (43 ± 6 ; 36 ± 9 times for one min as for boys and girls correspondingly).

The indicators of static stamina of back's muscles are within the range of 109 ± 41 s and 114 ± 54 s as for boys and girls correspondingly. In such a way, if we match students' data with above-specified indicators, we can say the strength of back's muscles is also insufficiently developed (86 ± 44 s and 98 ± 38 s as for boys and girls correspondingly). General motion coordination of students is within the range of 2 ± 3 points and 2 ± 3 points as for boys and girls correspondingly, which generally corresponds to «satisfactorily» mark. Speed of sensomotor reactions characterizes functional state of nervous system and motor apparatus of man. The latent time of simple reaction of untrained persons makes 0.4-1.5s depending on professional experience and individual psychophysiological peculiarities of organism.

Time of simple motor reaction to excitator of students' visual analyzer (0.31 ± 0.04 s and 0.33 ± 0.06 s as for boys and girls correspondingly) is within normal range. Time of complex visual-motor choice reaction (0.46 ± 0.12 s and 0.52 ± 0.16 s as for boys and girls correspondingly) is also within normal range. However, average indicators of students' sensomotor reactions speed are low in comparison with data of similar

researches. Average indicators of static equilibrium of 17-21 years old persons make 15s, while preservation of static equilibrium for 28s and more is considered standard. The indicators of static and dynamic equilibrium (14.0 ± 2.2 s and 15.0 ± 2.4 s – for static equilibrium of boys and girls correspondingly, 28.0 ± 5.0 s – for dynamic equilibrium of students of both sexes) characterizing functional state of vestibular apparatus are within normal range.

Accuracy of specialized sensations makes basis for man's movements control. High accuracy of time sense is the necessary factor in the profession. Results of measuring accuracy of reproduction of short and long time intervals witness the indicators of students' time orientation are in normal condition (the indicator of fifth-second reproduction accuracy makes 0.7 ± 0.5 s and 0.9 ± 0.6 s as for boys and girls, while the indicator of 20-second time period reproduction makes 2.3 ± 1.6 s and 2.1 ± 1.9 s as for boys and girls correspondingly) in comparison with data of similar researches. Besides, the accuracy of movements' time parameters reproduction is characterized by high variability (the variation coefficient for all indicators exceeds 27%). The frequency of hand's movement characterizes functional state of man's neuromuscular system and in standard makes 60-70 times for 10s, while in case of sportsmen the indicator often exceeds 70 times. Comparison of maximum rate of students' movements (58 ± 4 and 54 ± 6 times as for boys and girls correspondingly) with standard values and similar researches allows us to assert the present indicator is close to norm.

Speed of nervous processes flow and development of psyche properties have substantial significance for successful learning and performance of future professional activity. Power of man's nervous processes is characterized by indicators of dynamic performance. The higher the indicator, the weaker the nervous system. Average value of the present indicator by the scale of Ryzhkov makes five-six points (3.92 – 1.20st. units), while average value of students' dynamic stamina indicator makes 2.48 ± 2.24 st. units and 4.22 ± 1.71 st. units as for boys and girls correspondingly.

Despite the fact the standard indicator for visual information processing of adult persons is considered 1.6 ± 0.16 bit/s, it can be said in case of students the present indicator is also within normal range (1.7 ± 0.3 bit/s and 1.8 ± 0.2 bit/s as for boys and girls correspondingly). Accuracy of mental work correlates with attention concentration level. The closer the indicator to 1.0, the higher the concentration level. According to the results of attention researches, the accuracy of students' mental work makes 0.80 ± 0.11 st. units and 0.81 ± 0.12 st. units as for boys and girls correspondingly.

Attention volume is evaluated by number of mistakes made by person during testing. Results of testing witness sufficient level of development of attention switch ability (7 ± 1 points and 7 ± 2 points as for boys and girls correspondingly). The volume of short-term visual memory, as well as its dynamics (search actions ability under condition of time shortage) is also within normal range (7 ± 1 points and 8 ± 1 points as for boys and girls correspondingly).

Comparison of indicators of students' psychophysiological preparedness witnesses that girls due to some development peculiarities are one jump ahead of boys. Thus, the indicators of static stamina of back's muscles

and general motion coordination of girls are higher, as well as girls' attention and memory are more developed than boys'.

For the purpose of diagnostics of effectiveness of implementation of methods providing formation of skills and abilities of individual sports doing to educational process we have studied dynamics of students' motivational sphere by motivation-and-demand criteria – particularly, we have conducted questioning in the beginning and in the end of academic year and analyzed changes within the structure of motives and needs during academic year. Thus, there is increase of number of students, who systematically perform physical exercises at extracurricular time: 78% of students perform individual health and fitness activity. The forms of performed exercises are: martial arts, various physical exercises, pedestrians, bicycling, sport games. In the end of academic year significant changes in students' structure of motivation towards performance of physical exercises have been determined (Table 3).

Table 3
Dynamics of structure of students' motivation for performance of physical exercises during pedagogical experiment, %

Motives	Group	Before experiment	After experiment	Growth of indicator, %
Official	EG	64.1	53.1	-18.7
	CG	62.9	53.2	-16.7
Health-improving	EG	43.8	87.5	66.5
	CG	50.1	51.6	2.9
Aesthetic	EG	28.1	29.7	5.5
	CG	30.6	32.3	5.44
Social	EG	18.8	17.2	-8.9
	CG	19.4	20.9	7.4
Personal	EG	14.1	20.3	36.0
	CG	12.9	16.1	22.1
Sporting	EG	9.4	12.5	28.3
	CG	8.0	9.7	19.2

Thus, the leading motives inciting young people to attend classes on physical education in the beginning of academic year are official (64.1% and 62.9% for EG and CG correspondingly), health-improving (43.8% and 50.1% for EG and CG correspondingly), aesthetic (28.1% and 30.6% for EG and CG correspondingly), social (18.8% and 19.4% for EG and CG correspondingly), personal (14.1% and 12.5% for EG and CG correspondingly) and sporting (9.4% and 8.0% for EG and CG correspondingly). The repeated research of motivational state in the end of academic year has revealed increase of significance of health-improving motives of EG students (66.5%), while in CG the growth is insignificant (2.9%). Thus, as a result of pedagogical experiment, the priority motives for performance of physical exercises by EG students are health-improving (87.5%), official (53.1%), aesthetic (29.7%), personal (20.9%), social (17.2%), sporting (12.5%).

What is for students of control group – there are no significant changes in the hierarchy of motives. Analysis of the results of CG students' questioning witnesses that in general the structure of leading motives for attending classes on physical education remains unchanged: official (53.2%), health-improving (51.6%), aesthetic (32.3%), social (20.9%), personal (16.1%) and sporting (9.7%). It has been observed that in both groups of students there is reduction of motives of official character (by 18.7% and 16.7% for EG and CG correspondingly), increase of value of personal and sporting motives, which witnesses revaluation and shift of priorities during studying in higher education institutions to the area of personal achievements, self-esteem, increase of personal status in society.

Changes in the structure of EG students' motivation witness improvement of motivational and evaluative attitude towards physical culture and realization of its personal value as a result of formation of preparedness to individual performance of physical exercises. Analysis of attending of obligatory classes on physical education shows the present indicator has increased 26% in EG, while in CG it has decreased 10%. The present fact can be explained by insufficient attention to increase of motivation of physical education traditional program students at the background of increase of teaching load, divergence between sporting interests of youth and the content of classes, and other subjective factors.

To study effectiveness of students' preparation to performance of individual health and fitness activity with cognitive component we have analyzed dynamics of their theoretical preparedness during pedagogical experiment. For this purpose, students of pedagogical specialties in the beginning and in the end of academic year have been offered tests comprising of two blocks. The first block included standard tests from the set of tasks for state attestation on physical culture for 11th form, which correspond to the requirements to minimum of knowledge for leavers of regular schools by «Physical culture» discipline. The second block of tests differed with professional orientation in physical education of pedagogical specialties students. The result of theoretical testing was evaluated by 100-grade system.

Analysis of the results of students' testing in the beginning and in the end of academic year allows asserting positive dynamics of theoretical knowledge. However, the reliable increase of theoretical preparedness is observed in EG of students (42% at $p < 0.05$), while in case of CG students the quality of theoretical knowledge has increased 9.9% at $p > 0.05$, which witnesses positive influence of methods providing formation of skills and abilities of individual performance of physical exercises (Figure 7).

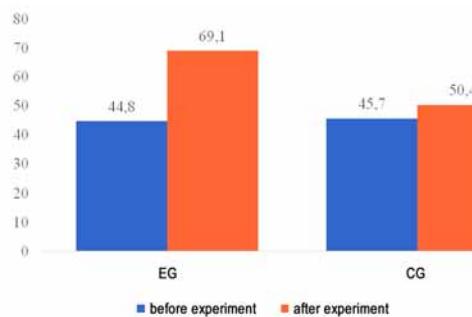


Figure 7. Dynamics of theoretical preparedness of students during experiment (by 100-grade system)

Thus, the G.P.A. used for evaluation of EG students' theoretical knowledge has increased from 44.8 to 69.1 points, which is reliable ($t_{temp} = 13.8$ at $p < 0.01$), and in CG – from 45.7 to 50.4, which is unreliable ($p > 0.05$). Besides, there is improvement of EG students' specialized knowledge regarding theoretical and methodical foundations of professional-applied preparation. Thus, evaluation of results on the second block of special orientation tests showed that EG students had taken at average 18.9 of maximum 28 points, while in case of CG students this indicator made 9.7 points.

Diagnostics of methodical skills and abilities of students had been performed in the beginning and in the end of

pedagogical experiment by evaluation of carrying out of planning tasks and performance of various forms of physical exercises during individual sports doing. Thus, students' methodical preparedness had been defined by the sum of points for methodical tasks. We have evaluated the level of methodical skills in making compendium plan and carrying out of five classes of various form and orientation in the beginning and in the end of academic year by 100-grade system. Evaluation of performance of tasks by the students in the beginning of academic year witnesses low level of methodical preparedness in both groups (28.8 and 29.4 points are the average indicators as for EG and CG correspondingly). In the end of academic year, the level of methodical skills and abilities had increased, however this increase is considered reliable only in EG (Figure 8).

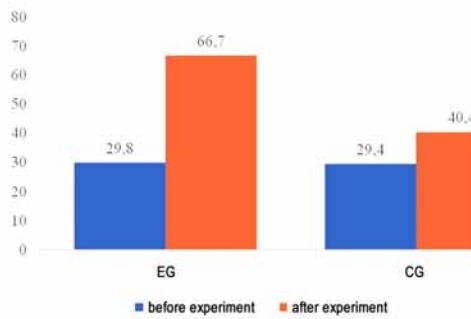


Figure 8. Dynamics of students' methodical preparedness during experiment (by 100-grade system)

Thus, the increase of EG students' methodical preparedness turned out to be reliable and made 76.5% at $p \ll 0.05$, while in case of CG it made 35.0% at $p > 0.05$. As a result, methodical preparedness of EG students had increased 66.7 points ($\Delta = 28.1$ at $p \ll 0.05$), while increase of CG students' increase of methodical skills and abilities had made 40.4 points, which is unreliable ($p > 0.05$).

Besides, evaluation of practical component of preparedness to physical self-improvement by evaluative-reflexive criteria, which included check of journals of individual performance of physical exercises, revealed that students were keeping records regarding dynamics of physical state indicators and tracking organism's response to physical loads. In addition, students were carrying out planning of various forms of health and fitness activities according to preliminarily developed content.

Thus, the check of the level of preparedness of students' skills and abilities of individual performance of physical exercises during academic year in accordance with motivational-and-demand, cognitive, practical and evaluative-reflexive criteria has revealed that in case of EG the level of preparedness had reliably increased by all the components, while the level of health and fitness competences of CG students differed with unreliable changes.

The check of EG and CG students' somatic health dynamics in the end of academic year has provided the following results (Table 4). Analysis of health indicators in the end of academic year has revealed positive dynamics of somatic health of both groups' students, however in case of boys of CG the increase is unreliable (4.1% at $p > 0.05$). What is for EG, the indicators of somatic health of boys and girls here have improved 25.8% and 27.1% correspondingly at $p \ll 0.05$. In such a way, we can state that individual

performance of physical exercises promotes improvement of EG students' health. Besides, this witnesses shortcoming of traditional program of physical education in higher education institutions due to ineffectiveness of solution of health-improving tasks.

Table 4
Dynamics of students' somatic health under conditions of pedagogical experiment

Groups	Level of somatic health (in points)		Growth of indicator, %	P
	Before experiment	After experiment		
Boys				
EG	7.1±3.0	9.2±2.4	25.8%	?=0.05
CG	7.2±3.8	7.5±2.5	4.1%	p>0.05
Girls				
EG	6.7±2.2	8.8±3.5	27.1%	?=0.05
CG	6.5±3.1	7.1±2.8	8.8%	?=0.05

Study of students' physical performance in the end of academic year has showed there were positive shifts in the level of the present indicator in both groups (Table 5). Thus, physical performance of EG boys has increased 2.9%, while in case of CG boys this indicator has made 1.4%. Physical performance of EG girls has also increased 2.9%, while CG girls have got 2.0% increase – however the results has turned out to be statistically unreliable. Results of testing of general physical preparedness of students has shown there was positive dynamics in the development of motion indicators in both groups (Table 6). In the end of academic year, the results of motion tests have also increased in case of students of both sexes in experimental and control groups. For EG students there was increase of indicators of stamina (boys – 15.0%, girls – 22.4% at $p \ll 0.05$), speed (boys – 3.5%, girls – 6.0% at $p \ll 0.05$), strength (boys – 36.4%, girls – 17.1% at $p \ll 0.05$), power qualities (boys – 7.1%, girls – 7.3% at $p \ll 0.05$), flexibility (boys – 5.0%, girls – 6.8% at $p \ll 0.05$).

Table 5
Dynamics of students' physical performance under conditions of pedagogical experiment

Groups	Level of somatic health (in points)		Growth of indicator, %	P
	Before experiment	After experiment		
Boys				
EG	94.8±3.8	97.6±2.6	2.9%	p>0.05
CG	95.0±4.0	96.3±3.7	1.4%	p>0.05
Girls				
EG	95.6±2.3	98.4±1.8	2.9%	p>0.05
CG	95.2±1.9	97.1±2.5	2.0%	p>0.05

Table 6
Dynamics of all-round fitness of students under conditions of educational experiment

Types of activity	Groups	Level of somatic health (in points)		Growth of indicator, %	P
		Before experiment	After experiment		
Boys					
Running 3000 m, min, s	EG	16.5±1.6	14.2±1.8	15.0%	?=0.05
	CG	16.3±1.4	16.7±1.3	-2.4%	?=0.05
Running 100 m, s	EG	14.4±0.8	13.9±0.4	3.5%	?=0.05
	CG	14.3±0.7	14.5±0.5	-1.4%	?=0.05
Pulling up, times	EG	9±5	13±4	36.4%	?=0.05
	CG	8±3	10±5	22.2%	?=0.05
Standing long-jump, cm	EG	219±20	235±15	7.1%	?=0.05
	CG	223±21	224±17	0.5%	?=0.05
Trunk bending in sitting position, cm	EG	10±4	13±5	26.1%	?=0.05
	CG	12±6	14±4	15.4	?=0.05
Shuttle run 4x9 m, s	EG	10.2±1.2	9.7±0.5	5.0%	?=0.05
	CG	10.3±1.0	10.0±1.0	3.0%	?=0.05
Girls					
Running 2000 m, min, s	EG	14.9±2.4	11.9±1.7	22.4%	?=0.05
	CG	15.0±2.1	14.7±2.0	2.0%	?=0.05
Running 100 min, s	EG	17.4±1.4	16.4±1.0	6.0%	?=0.05
	CG	17.4±0.9	17.0±1.2	2.3%	?=0.05
Arm-pumping exercises while lying, times	EG	16±3	19±3	17.1%	?=0.05
	CG	17±3	19±4	11.1%	?=0.05
Standing long-jump, cm	EG	17.1±2.1	18.4±1.8	7.3%	?=0.05
	CG	16.7±1.7	17.2±2.0	3.0%	?=0.05
Trunk bending in sitting position, cm	EG	15±6	18±5	18.2%	?=0.05
	CG	16±5	19±6	17.1%	?=0.05
Shuttle run 4x9 m, s	EG	12.2±1.4	11.4±1.0	6.8%	?=0.05
	CG	12.0±1.3	11.9±1.2	0.8%	?>0.05

Statistically reliable changes in motion preparedness of CG students are observed only in respect of indicators of strength (the increase of results makes 22% and 11.1% as for boys and girls correspondingly at $p \ll 0.05$) and flexibility

(the increase of results makes 15.3% and 17.1% as for boys and girls correspondingly at $p < 0.05$). Results of other motion tests performed by CG students have got unreliable increase, at that in case of CG boys indicators of stamina and speed have even reduced (2.4% and 1.4% correspondingly).

Since we have observed reliable increase of indicators of development of EG students' physical qualities in the end of academic year, we can assert the methods providing formation of skills and abilities of individual sports doing are quite effective. Diagnostics of development of professionally important motion and psychophysiological indicators of students' organism development under conditions of pedagogical experiment has revealed presence of reliable changes.

Thus, in the end of academic year EG students have demonstrated a trend to improvement of the majority of psychophysiological indicators. Particularly, in case of EG boys there are reliable improvement of indicators of dynamic stamina of abdominal muscles (17%), static stamina of back muscles (23.6%), general motion coordination (40.0%), speed of simple and complex visual-and-motor reactions (6.7% and 9.1% correspondingly), static and dynamic equilibrium (13.3% and 6.9% correspondingly), accuracy of reproduction of short time intervals (15.4%), frequency of movement (6.7%), accuracy of mental work (8.4%) at $p < 0.05$. Increase of the rest professionally important psychophysiological indicators, particularly, the accuracy of reproduction of long time intervals, power of nervous processes (dynamic performance), properties of attention and memory turned out to be unreliable ($p > 0.05$). What is for CG students, the positive changes here have been revealed only in indicators of dynamic stamina of abdominal muscles (17%), static stamina of back muscles (23.6%) and general motion coordination (66.7%) at $p < 0.05$.

In case of EG girls the trend for increase of psychophysiological indicators of organism development is as follows. There is reliable increase of indicators of dynamic stamina of abdominal muscles (17.7%), static stamina of back muscles (9.7%), general motion coordination (28.6%), speed of simple and complex visual-and-motor reactions (9.5% and 12.2% correspondingly), static and dynamic equilibrium (18.2% and 13.2% correspondingly), accuracy of reproduction of short and long time intervals (11.8% and 24.4% correspondingly), frequency of movements (7.1%) and accuracy of mental work (8.3%) at $p < 0.05$. Other researched indicators differ with unreliable change. What is for CG girls, the reliable increase pertains to such indicators as: dynamic stamina of abdominal muscles – 7.8%, general motion coordination – 28.6%, static and dynamic equilibrium – 5.7% and 6.2% correspondingly, accuracy of reproduction of short and long time intervals – 13.3% and 9.5% correspondingly. The rest researched indicators differ with unreliable change ($p > 0.05$).

Thus, the result of preparation of students to individual performance of physical exercises shows positive dynamics of physical state, particularly, of somatic health and motion preparedness, as well as increase of level of professional-applied psychophysiological preparedness, which witnesses its effectiveness from a perspective of increase of physical education process quality in higher education institutions.

Conclusions

Analysis of modern pedagogical theory and practice has shown the necessity of formation of students' skills and abilities of individual health and fitness activity was stipulated with insufficient amount of class hours dedicated to physical education in modern higher education institution, increase of role of individual educational activities of students within the context of new paradigm of higher education, low indicators of health and motion preparedness of modern youth and their negative dynamics throughout studying, as well as with influence of physical state on success of professional activity and results of educational activity of students. Together with existing programs of individual performance of physical exercises for students the issues of preparation and attraction to individual health and fitness activity with account of professional orientation and individual capabilities remain insufficiently covered in modern pedagogical theory and practice.

We have observed generally positive motivation of students to motion activity, if the content of classes on physical education corresponds to interests of youth. We have also determined the indicators of somatic health and physical performance of students are within the range from low to average. It was found out the level of somatic health of second course students are lower than first course ones'. In general, physical preparedness is at rather low level. Notedly low are the indicators of stamina, speed and power qualities, dexterity – at that the motion indicators of second course students are significantly lower than first course students'. We have studied the main qualities of motility and psyche, which are professionally important for students of pedagogical colleges, namely, muscular strength of abdomen and back, general motion coordination, speed of sensomotor reactions, static and dynamic equilibrium, accuracy of evaluation of movements' time parameters, frequency of arm movements, as well as power, mobility and equability of nervous processes, different types of memory, attention properties. It has been revealed the indicators of muscular strength of back and abdominals, general motion coordination and speed of visual-and-motor reactions are lower than average-aged standards. The carried out research does not cover all the aspects of students' physical education effectiveness increase. However, it provides prospects for future search of ways of professional reliability increase within the process of physical education.

References

- Akhmedova, O.O., Ovezgeldyeva, G.O., & Grigoryan, A.G. (2011). Psychophysiological condition of first-year students with different levels of physical activity. *Human Physiology*, 37(5), 588-593. <https://doi.org/10.1134/S0362119711040025>.
- Barnett, L.M., van Beurden, E., Morgan, P.J., Brooks, L.O., Zask, A., & Beard, J.R. (2009). Six year follow-up of students who participated in a school-based physical activity intervention: a longitudinal cohort study. *International Journal of Behavioral Nutrition and Physical Activity*, 6(1), 48. <https://doi.org/10.1186/1479->

- 5868-6-48.
- Bazylova, B., Zhusupova, Z., Kazhigalieva, G., Onalbayeva, A., & Kalinina, V. (2019). Subjective understanding of the student when using open educational resources. *Periodico Tche Quimica*, 16(33), 613-629.
- Cabello Moyano, A., Moyano Pacheco, M., & Tabernero Urbieto, C. (2018). Psychosocial processes in Physical Education: attitudes, strategies, and perceived motivational climate. *Retos*, 34, 19-24.
- Cowie, E., & Hamilton, K. (2014). Key beliefs related to decisions for physical activity engagement among first-in-family students transitioning to University. *Journal of Community Health*, 39(4), 719-726. <https://doi.org/10.1007/s10900-013-9817-3>.
- Czajkowski, S.M., Naar, S., Ellis, D., Towner, E., Powell, L., Dempsey, W., ... Perna, F. (2018). The «nuts and bolts» of behavioral intervention development: study designs, methods and funding opportunities. *Annals of Behavioral Medicine*, 52(S1), 1-2867. <https://doi.org/10.1007/s12160-017-9903-3>.
- Deliens, T., Deforche, B., De Bourdeaudhuij, I., & Clarys, P. (2015). Determinants of physical activity and sedentary behaviour in University students: a qualitative study using focus group discussions. *BMC Public Health*, 15(1), 201-211. <https://doi.org/10.1186/s12889-015-1553-4>.
- DeVoe, D., Kennedy, C., Ransdell, L., Pirson, B., DeYoung, W., & Casey, K. (1998). Impact of health, fitness, and physical activity courses on the attitudes and behaviors of college students. *Journal of Gender, Culture and Health*, 3(4), 243-255. <https://doi.org/10.1023/A:1023226530739>.
- Gomez-Marcos, G., & Sanchez-Sanchez, M. (2019). Description and differences in the psychological variables related to sports performance of triathletes and para-triathletes. *Retos*, 36, 22-25.
- Grygiel-Górniak, B., Tomczak, A., Krulikowska, N., Przyśawska, J., Seraszek-Jaros, A., & Kaczmarek, E. (2016). Physical activity, nutritional status, and dietary habits of students of a Medical University. *Sport Sciences for Health*, 12(2), 261-267. <https://doi.org/10.1007/s11332-016-0285-x>.
- Gu, X., Solmon, M.A., & Zhang, T. (2014). Understanding middle school students' physical activity and health-related quality of life: an expectancy-value perspective. *Applied Research in Quality of Life*, 9(4), 1041-1054. <https://doi.org/10.1007/s11482-013-9287-x>.
- Hyndman, B. (2017). *Measurement of students' playground activity levels*. Singapore: Springer Singapore.
- Jones, S.E., Merkle, S.L., Fulton, J.E., Wheeler, L.S., & Mannino, D.M. (2006). Relationship between asthma, overweight, and physical activity among U.S. high school students. *Journal of Community Health*, 31(6), 469-478. <https://doi.org/10.1007/s10900-006-9026-4>.
- Kedra, A., Kolwicz-Gańko, A., Kedra, P., Bochenek, A., & Czaprowski, D. (2017). Back pain in physically inactive students compared to physical education students with a high and average level of physical activity studying in Poland. *BMC Musculoskeletal Disorders*, 18(1), 501-512. <https://doi.org/10.1186/s12891-017-1858-9>.
- Quintiliani, L.M., & Whiteley, J.A. (2016). Results of a nutrition and physical activity peer counseling intervention among nontraditional college students. *Journal of Cancer Education*, 31(2), 366-374. <https://doi.org/10.1007/s13187-015-0858-4>.
- Seo, D.-C., Torabi, M.R., Jiang, N., Fernandez-Rojas, X., & Park, B.-H. (2009). Cross-cultural comparison of lack of regular physical activity among college students: universal versus transversal. *International Journal of Behavioral Medicine*, 16(4), 355-359. <https://doi.org/10.1007/s12529-008-9029-x>.
- Sigvartsen, J., Gabrielsen, L.E., Abildsnes, E., Stea, T.H., Omfjord, C.S., & Rohde, G. (2016). Exploring the relationship between physical activity, life goals and health-related quality of life among high school students: a cross-sectional study. *BMC Public Health*, 16(1), 709-715. <https://doi.org/10.1186/s12889-016-3407-0>.
- Silva, A.G., Sa-Couto, P., Queirós, A., Neto, M., & Rocha, N.P. (2017). Pain, pain intensity and pain disability in high school students are differently associated with physical activity, screening hours and sleep. *BMC Musculoskeletal Disorders*, 18(1), 194-201. <https://doi.org/10.1186/s12891-017-1557-6>.
- Sone, T., Kawachi, Y., Abe, C., Otomo, Y., Sung, Y., & Ogawa, S. (2017). Attitude and practice of physical activity and social problem-solving ability among university students. *Environmental Health and Preventive Medicine*, 22(1), 18-24. <https://doi.org/10.1186/s12199-017-0625-8>.
- Springer, A.E., Lewis, K., Kelder, S.H., Fernandez, M.E., Barroso, C.S., & Hoelscher, D.M. (2010). Physical activity participation by parental language use in 4th, 8th, and 11th grade students in Texas, USA. *Journal of Immigrant and Minority Health*, 12(5), 769-780. <https://doi.org/10.1007/s10903-009-9249-4>.
- Taub, D.E., Blinde, E.M., & Greer, K.R. (1999). Stigma management through participation in sport and physical activity: experiences of male college students with physical disabilities. *Human Relations*, 52(11), 1469-1484. <https://doi.org/10.1023/A:1016928901982>.
- Vandeveld, L., & Miyahara, M. (2005). Impact of group rejections from a physical activity on physical self-esteem among university students. *Social Psychology of Education*, 8(1), 65-81. <https://doi.org/10.1007/s11218-004-3951-9>.
- Wu, H., Fan, X., & Mou, D. (2014). *A team-learning of strategies to increase students' physical activity and motivation in sports community*. Dordrecht: Springer Netherlands.
- Zelli, A., Reichmann, S.K., Lucidi, F., & Grano, C. (2007). *A longitudinal investigation of physical activity and health behaviors in Italian university students*. Milano: Springer Milan.