

# Evaluating the effectiveness of the integrated use of sporting plays to optimize the cardiorespiratory system functional state of students 18–19 years old

Inna Cherednichenko

Zaporizhzhya National University, Zaporizhzhya, Ukraine

**Purpose:** to evaluate the effectiveness of the integrated use of sports in improving the functional state of the cardiovascular and respiratory systems of the 18–19 year-old students in the breakout sessions in terms of higher education.

**Materials & Methods:** the study included 25 female students aged 18–19 years who were engaged in sports games within the section physical education classes in high school. To assess the functional status cardiorespiratory physiological systems using traditional methods and computer program “Oberig”.

**Results:** the study of students experimental group ( $n=11$ ) who were involved in the program to the integrated use of means of sports (volleyball, basketball, handball) were recorded significantly higher, compared to the students in the control group ( $n=14$ ) who engaged in one kind of sports (volleyball), indicators of functional status of their cardiorespiratory system of the body.

**Conclusions:** the author confirmed the high efficiency program of physical education for students 18–19 years of integrated use of sports facilities, which contributes to a substantial optimization of the functional state of their body.

**Keywords:** the process of physical education classes, sectional, sports, students 18–19 years, experimental program effectiveness.

## Introduction

It is conventional that now one of the most urgent problems in the field of physical education of student's youth is insufficient efficiency of traditional forms of the organization of physical education classes in higher education institution which do not promote the essential optimization of physical preparedness, functional condition and physical health of students of various sex and age [3; 4; 6; 13].

Rather large number of researches, which authors proved experimentally the efficiency of inclusion in programs on physical education of students of different types of physical exercises, in particular, step-aerobics, fitball-aerobics, futsal, basketball, table tennis, swimming, athletic gymnastics etc., is devoted to the problem of improvement of the process of physical education of student's youth [1; 5; 7; 10; 11; 14; 15].

At the same time, the last changes in the system of physical education in higher education institutions – emphasis on section studies after hours with the simultaneous reduction of obligatory classes, give the grounds for the search of new ways of improvement of the process of physical education of students.

According to the number of authors, the integrated approach to the organization of section studies of student's youth, in particular, inclusion in the program of section studies of different types of physical exercises can be the perspective direction in the solution of this problem [2; 9; 12; 16].

The analysis of literary data on this problem allowed stating its

insufficient study that defines the relevance and the practical importance of the research.

## Communication of the researches with scientific programs, plans, subjects

The work is the part of scientific programs of the department of physical education and the department of the theory and the technique of physical education and sport of Zaporizhzhya national university and is executed within the subject “Theoretical and methodical bases of the formation of healthy way of life of various segments of the population of Ukraine by means of physical culture and tourism” (number of the state registration is 0111U007743) of the Consolidating plan of the RW of the Ministry of Education and Science of Ukraine for 2011–2016.

## The purpose of researches:

to give the assessment to efficiency of complex use of means of sports in the increase in functional condition of the cardiorespiratory system of girls of 18-19 years old in the course of the section studies in the conditions of higher educational institution.

## Material and Methods of the research

The research was conducted on the basis of Zaporizhzhya national university. 25 female students of 18–19 years old were divided into the control group ( $n=14$ ) and the experimental ( $n=11$ ) of group.

Students of the control group were engaged according to the

physical education program providing section studies in volleyball, and students of the experimental group – according to the program with the complex use of means of sports (volleyball, basketball, and handball).

The program is presented in the form of 4 modules covering the academic year from September till June. The following means of preparation were used: theoretical, general physical, technical, tactical and game. Total of hours on year section studies made, also as well as in the control group, 160 hours.

4 hours were allocated for theoretical preparation, 12 hours – for overall physical fitness, 10 hours – for special physical training, 20 hours – for technical training and 2 hours – for tactical preparation within the first module (September-November) (the total amount of section studies – 48 hours). The volume of game preparation made 6 hours.

The emphasis on game training of students was placed in the second module (December-February) (total amount – 48 hours) for what 14 hours were allocated. Also it was allocated on 12 for general and special physical training of students, 18 hours – for technical, 4 hours – for tactical and 2 hours – for theoretical preparation.

18 hours were offered to allocate for technical training of students, 2 hours – for tactical preparation, 8 hours for general and 4 hours for special physical training within the third module (March-April) of the experimental program (total of hours – 32). The total amount of game preparation made 10 hours.

The volume of special and overall physical fitness made respectively 4 and 8 hours, technical – 20 hours in the fourth module (May-June) (total of hours – 32). The total amount of game preparation made 14 hours. Classes on theoretical and tactical preparation were not provided in this module.

It should be noted that the first two weeks of every month of each of modules was devoted to section volleyball classes, the third week – to basketball classes and final, 4th week – to section handball classes.

The following indicators were registered at the beginning and at the end of the academic year at all girls for the assessment of level of functional condition of the blood circulatory systems and external breath: heart rate (HR,  $\text{bpm}^{-1}$ ); systolic (APs, mm Hg), diastolic (APd, mm Hg) arterial pressure; systolic (SBV, ml) and minute (MBV,  $\text{l}\cdot\text{min}^{-1}$ ) blood volumes, coefficient of profitability of blood circulation (CPB, conventional units, c.u.), index of Robinson or the double work (IR, c.u.), cardiac index (CI,  $\text{l}\cdot\text{min}^{-1}\cdot\text{m}^{-2}$ ), the general peripheral resistance of vessels (GPRV,  $\text{dyn}\cdot\text{s}\cdot\text{sm}^{-5}$ ), the vital capacity of lungs (VCL, ml), breath holding time on inhalation (Tin, s) and exhalation (Texh, s), indexes of hypoxia (IH, c.u.) and Skibinsky (IS, c.u.), the level of functional state of the cardiovascular (LFScvs, points) and respiratory (LFCres, points) systems of organism and the level of physical health (LPH, points). The determination of sizes of LFScvs, LFCres and LPH carried out with the use of the computer program "Oberig" [8]. Traditional physiological indicators (HR, APs, APd, VCL, Tin, Texh), and also the main anthropometrical parameters (length and body weight) are registered according to inspection algorithm according to this program at the examinee in condition of relative

rest. The registration of heart rate was carried out palpation, arterial pressure – the indirect method of N. S. Korotkov with the use of standard tonometer and phonendoscope, vital capacity of lungs – with the use of dry portable lung-tester, and breath holding time sizes on inhalation and exhalation with the use of tests of Stange and Genchi.

The automatic calculation of quantitative values of the following indicators is made after input of the listed indicators in active window of the program "Oberig".

The systolic volume of blood (SVB, ml) and minute volume of blood (MBV,  $\text{l}\cdot\text{min}^{-1}$ ), were calculated by the following formulas:

$$\text{SVB (ml)} = 0,53\cdot\text{APs} + 0,617\cdot\text{LB} + 0,231\cdot\text{BW} - 1,07\cdot\text{APd} - 0,698\cdot\text{Age} - 22,64,$$

where APs – arterial pressure systolic, mm hg; APd – arterial pressure diastolic, mm hg; LB – length of body, sm; BW – body weight, kg.

$$\text{MBV, l}\cdot\text{min}^{-1} = \text{HR}\cdot\text{SVB},$$

where HR – size of heart rate,  $\text{bpm}^{-1}$ ; SVB – systolic volume of blood, ml.

Size of index of Robinson (IR, c. u.) was calculated by the formula:

$$\text{IR} = \text{HR}\cdot\text{APs}/100,$$

where IR – index of Robinson, c. u.; HR – heart rate,  $\text{bpm}^{-1}$ ; APd – arterial pressure systolic mm Hg.

Coefficient of profitability of blood circulation (CPB, c.u.):

$$\text{CPB} = \text{HR}\cdot(\text{APs} - \text{APd}),$$

where CPB – Coefficient of profitability of blood circulation, c.u.; HR – heart rate,  $\text{bpm}^{-1}$ ; APs – arterial pressure systolic mm Hg; APd – arterial pressure diastolic, mm Hg.

Values of the general peripheral resistance of vessels (GPRV,  $\text{dyn}\cdot\text{s}\cdot\text{sm}^{-5}$ ) vessels and value of cardiac index (CI,  $\text{l}\cdot\text{min}^{-1}\cdot\text{m}^{-2}$ ) were calculated by the following formulas:

$$\text{GPRV (dyn}\cdot\text{s}\cdot\text{sm}^{-5}) = (\text{APd} + 0,33\cdot(\text{APs} - \text{APd}))\cdot 1333\cdot 60 / (\text{MBV}\cdot 1000),$$

where APs – arterial pressure systolic, mm hg; APd – arterial pressure diastolic, mm hg; MBV – minute volume of blood,  $\text{l}\cdot\text{min}^{-1}$ .

$$\text{CI (CI, l}\cdot\text{min}\cdot\text{m}^{-2}) = \text{MBV}/(\text{BW}^{0,425}\cdot\text{LB}^{0,725}\cdot 0,007184),$$

where MBV – minute volume of blood,  $\text{l}\cdot\text{min}^{-1}$ ; LB – length of body, sm; BW – body weight (kg).

IH (IH, conventional units, c.u.) and index of Skibinsky (IS, c.u.) were calculated on the following formulas for the assessment of functional condition of the system of external breath:

$$\text{IH (c.u.)} = \text{Texh}/\text{HR},$$

where  $T_{exh}$  – breath holding time on breath, s;  $HR$  – size of heart rate,  $bpm^{-1}$ .

$$IS \text{ (c.u.)} = (VCL \cdot T_{exh}) / HR,$$

where  $VCL$  – vital capacity of lungs, ml;  $T_{exh}$  – breath holding time on breath, s;  $HR$  – size of heart rate,  $bpm^{-1}$ .

The level of functional condition of the cardiovascular system (LFS<sub>cv</sub>, points) was calculated as the total indicator of the score on each of the parameters characterizing activity of the cardiovascular system (SBV, MBV, GPRV, APs, APd, CI) divided into the total of indicators (there are 6 in this case).

LFS<sub>cv</sub> = {assessment for SBV (points) + assessment for MBV (points) + assessment for GPRV (points) + assessment of APs (points) + assessment of APd (points) + assessment for CI (points)} / 6.

The level of functional condition of the system of external breath (LFC<sub>res</sub>) was calculated as the total indicator of the score on each of the parameters characterizing activity of the system of external breath (size of VCL, IH, IS, Tin, Texh), divided into the total of indicators (there are 5 in this case).

LFC<sub>res</sub> = {assessment for VCL (points) + assessment for IH (points) + assessment of IS (points) + assessment for Tin (points) + assessment for Texh (points)} / 5

The received quantitative values of LFS<sub>cv</sub> and LFC<sub>res</sub> are formatted on the following qualitative functional levels:

- LFS<sub>cv</sub> ≤ 33,1 points. The level of functional condition of the cardiovascular system or the system of external breath is “low”;
- LFS<sub>cv</sub> ≤ 49,6. The level of functional condition of the cardiovascular system or the system of external breath is “below the average”;
- LFS<sub>cv</sub> ≤ 66,1. The level of functional condition of the cardiovascular system or the system of external breath is “average”;
- LFS<sub>cv</sub> ≤ 82,6. The level of functional condition of the cardiovascular system or the system of external breath is “above the average”;
- LFS<sub>cv</sub> > 82,6. The level of functional condition of the cardiovascular system or the system of external breath is “high”.

All received results during the research were processed on the personal computer with the use of package of the program Statistika 6.0.

## Results of the research and their discussion

The comparative analysis of functional condition of the cardiorespiratory system of organism of girls of the control and experimental groups was carried out at the beginning of the experiment which was made for the purpose of the assessment of efficiency of the developed by us comprehensive program of the use of means of sport games in the course of physical education of students.

The results of the comparative analysis of reference values of indicators of the cardiorespiratory system of students of 18–19 years old of the control and experimental groups allowed stating their relative uniformity (tab. 1).

Low sizes of coefficient of profitability of blood circulation (3998,57±119,47 c.u. and 4273,64±148,51 c.u.), below the average – hypoxia index (0,31±0,01 c.u. and 0,32±0,01 c.u.) and index of Skibinsky (831,04±48,64 c.u. and 933,61±63,76 c.u.) and averages – index of Robinson (81,23±1,07 c.u. and 84,21±1,64 c.u.), systolic (51,36±1,75 ml and 54,89±1,90 ml) and minute (3,69±0,14 l·min<sup>-1</sup> and 4,00±0,14 l·min<sup>-1</sup>) volumes of blood, the general peripheral resistance of vessels (1680,26±71,44 c.u. and 1543,23±62,13 c.u.), levels of functional condition of the blood circulatory systems (58,68±3,12 points and 59,40±3,83 points), external breath (54,46±4,62 points and 53,51±5,10 points) and the level of physical health (52,12±5,07 points and 49,69±4,93 points) were noted irrespective of the group characteristic and students.

It should be noted that values of HR meeting physiological standard, systolic and diastolic arterial pressure, but hypokinetic type of regulation of warm activity were characteristic of all examined students.

The assessment of influence of the offered by us comprehensive program of the use of means of sports in the course of physical education of students of 18–19 years old was carried out on the basis of the analysis of the dynamics of indicators of functional condition of the cardiorespiratory system of their organism within the experiment (tab. 2).

It is shown that the reliable positive decrease in sizes of HR, systolic and diastolic arterial pressure, index of Robinson or the double work (to 77,55±1,35 c.u.) and the general peripheral resistance of vessels (till 1422,26±36,56 c.u.), and also the reliable growth of time of breath holding on breath and exhalation (respectively to 0,42±0,03 s and 28,73±1,45 s), indexes of hypoxia and Skibinsky (respectively to 0,42±0,03 c.u. and 1275,85±97,91 c.u.) were noted after the completion of the research at students of 18–19 years old which were engaged within the academic year according to the developed by us program of complex use of means of sports.

The reliable growth of the level of functional condition of the blood circulatory systems (to 78,10±1,89 points), external breath (to 79,25±3,41 points) and the level of physical health (to 71,52±4,44 points) became the result of the specified changes.

It is important to note that the levels of functional condition of the cardiovascular system, systems of external breath and physical health of students of the experimental group were considered as above the average after the completion of the experiment.

Also the results of the comparative analysis of indicators of the cardiorespiratory system of girls of the control and experimental groups after the completion of the experiment looked convincing (tab. 3).

It is shown that characteristic of students of the experimental group, than girls of the control group have sizes of diastolic arterial pressure (respectively 51,82±0,76 mm Hg and 55,00±1,17 mm Hg) and the general peripheral resistance of vessels (1422,26±36,56 c.u. and 1606,24±72,73 c.u.), but authentically higher values of vital capacity of lungs (respectively 3,05±0,093 l and 2,74±0,094 l), breath holding time on breath (45,45±1,57 s and 37,00±1,67 s), exhalation (28,73±1,45 s and 23,43±0,56 s), indexes of

Table 1

Indicators of functional condition of cardiovascular respiratory systems of organism of female students of 18–19 years old of the control and experimental groups at the beginning of the experiment,  $\bar{X} \pm S$

Indicators	Control group (n=14)	Experimental group (n=11)
HR, bpm <sup>-1</sup>	71,71±0,59	72,91±0,62
APs, mm Hg	113,21±0,85	115,45±1,71
APd, mm Hg	57,50±1,14	56,82±1,22
CPB, c.u.	3998,57±119,47 low	4273,64±148,51 low
IR, c.u.	81,21±1,07 average	84,21±1,64 average
VCL, ml	2692,86±99,15	2909,09±97,66
Tin, s	33,64±2,06	36,82±1,93
Texh, s	22,00±0,70	23,18±0,93
IH, c.u.	0,31±0,01 below the average	0,32±0,01 below the average
IS, c.u.	831,04±48,64 below the average	933,61±63,76 below the average
SBV, ml	51,36±1,75 average	54,89±1,90 average
MBV, l·min <sup>-1</sup>	3,69±0,14 average	4,00±0,14 average
CI, l·min <sup>-1</sup> ·m <sup>-2</sup>	2,25±0,07 hypokinetic	2,39±0,07 hypokinetic
GPRV, dyn·s·sm <sup>-5</sup>	1680,26±71,44 average	1543,23±62,13 average
LFScvs, points	58,68±3,12 average	59,40±3,83 average
LFCres, points	54,46±4,62 average	53,51±5,10 average
LPH, points	52,12±5,07 average	49,69±4,93 average

Table 2

Indicators of functional condition of the cardiovascular and respiratory systems of female students of 18–19 years old of the experimental group at the beginning and after the experiment,  $\bar{X} \pm S$

Indicators	Beginning	Ending
HR, bpm <sup>-1</sup>	72,91±0,62	69,64±1,14*
APs, mm Hg	115,45±1,71	111,36±0,7*
APd, mm Hg	56,82±1,22	51,82±0,76**
CPB, c.u.	4273,64±148,51 low	4144,55±94,56 below the average
IR, c.u.	84,21±1,64 average	77,55±1,35** above the average
VCL, ml	2909,09±97,66	3050,00±93,66
Tin, s	36,82±1,93	45,45±1,57**
Texh, s	23,18±0,93	28,73±1,45**
IH, c.u.	0,32±0,01 below the average	0,42±0,03** average
IS, c.u.	933,61±63,76 below the average	1275,85±97,91** average
SBV, ml	54,89±1,90 average	58,07±1,04 average
MBV, l·min <sup>-1</sup>	4,00±0,14 average	4,04±0,10 average
CI, l·min <sup>-1</sup> ·m <sup>-2</sup>	2,39±0,07 hypokinetic	2,42±0,06 hypokinetic
GPRV, dyn·s·sm <sup>-5</sup>	1543,23±62,13 average	1422,26±36,56 below the average
LFScvs, points	59,40±3,83 average	78,10±1,89*** above the average
LFCres, points	53,51±5,10 average	79,25±3,41*** above the average
LPH, points	49,69±4,93 average	71,52±4,44** above the average

Note. \* –  $p < 0,05$ ; \*\* –  $p < 0,01$ ; \*\*\* –  $p < 0,001$  in comparison with sizes of indicators at the beginning of the experiment.

hypoxia ( $0,42 \pm 0,03$  c.u. and  $0,33 \pm 0,01$  c.u.), Skibinsky ( $1275,85 \pm 97,91$  c.u. and  $913,53 \pm 45,68$  c.u.), systolic ( $58,07 \pm 1,04$  ml and  $52,90 \pm 1,55$  ml) and minute ( $4,04 \pm 0,10$  l·min<sup>-1</sup> and  $3,73 \pm 0,12$  l·min<sup>-1</sup>) volumes of blood, cardiac index ( $2,42 \pm 0,06$  c.u. and  $2,28 \pm 0,07$  c.u.) were lower at this investigation phase authentically.

Sizes of levels of functional condition of the cardiovascular system ( $78,10 \pm 1,89$  points and  $62,61 \pm 3,33$  points), systems of external breath ( $79,25 \pm 3,41$  points and  $57,50 \pm 4,88$  points) and physical health ( $71,52 \pm 4,44$  points and  $55,89 \pm 5,44$  points) were also authentically higher at students of the experimental group.

## Conclusions

In general the submitted data confirmed the undoubted positive influence of the complex use of means of sports on indicators of physical and functional fitness of students of 18–19 years old in the course of the section studies on physical education in higher education institution.

**Prospects of further researches in this direction.** Studying of the efficiency of use of the author's program of the complex use of means of sports in the course of physical education of female students of much senior courses is planned in future.

**Table 3**  
Indicators of functional condition of the cardiovascular and respiratory systems of female students of 18–19 years old of the control and experimental groups after the experiment,  $\bar{X} \pm S$

Indicators	Control group (n=14)	Experimental group (n=11)
HR, bpm <sup>-1</sup>	70,43±0,43	69,64±1,14
APs, mm Hg	111,07±0,77	111,36±0,7
APd, mm Hg	55,00±1,17	51,82±0,76*
CPB, c.u.	3952,86±112,26	4144,55±94,56
IR, c.u.	78,23±0,74	77,55±1,35
VCL, ml	2,74±0,094	3,05±0,093*
Tin, s	37,00±1,67	45,45±1,57**
Texh, s	23,43±0,56	28,73±1,45**
IH, c.u.	0,33±0,01	0,42±0,03**
IS, c.u.	913,53±45,68	1275,85±97,91**
SBV, ml	52,90±1,55	58,07±1,04**
MBV, l·min <sup>-1</sup>	3,73±0,12	4,04±0,10*
CI, l·min <sup>-1</sup> ·m <sup>-2</sup>	2,28±0,07	2,42±0,06*
GPRV, dyn·s·sm <sup>-5</sup>	1606,24±72,73	1422,26±36,56*
LFScvs, points	62,61±3,33	78,10±1,89***
LFCres, points	57,50±4,88	79,25±3,41***
LPH, points	55,89±5,44	71,52±4,44**

**Note.** \* –  $p < 0,05$ ; \*\* –  $p < 0,01$ ; \*\*\* –  $p < 0,001$  in comparison with sizes of indicators in the control group.

**Conflict of interests.** The author declares that there is no conflict of interests.

**Financing sources.** This article didn't get the financial support from the state, public or commercial organization.

## References

- Baziluk, T. A. (2013), *Inovaciina tehnologiya akvafitnesu z elementami basketbolu v phizichnomu vihovanni studentok: avtoref. dis...kand. nauk. z phis. vihovannya i sportu: 24.00.02* [Innovative technology with aqua elements of basketball in physical education students: PhD diss.], Kyiv, 22 p. (in Ukr.)
- Bakanova, O. Ph. (2013), *Organizatsiyni phyzichnogo vihovannya studentskoy molodi na suchasnomu etapi reformuvannya vizchih navchalnih zakladiv: avtoref. dis...kand. nauk. z phis. vihovannya i sportu: 24.00.02* [Organization of physical education of students at the present stage of the reform of higher education institutions: PhD diss.], Kharkiv, 20 p. (in Ukr.)
- Bashavechz, N. A. (2011), "Status of morbidity today's college students and ways to improve it", *Pedagogika, psikhologiya i mediko-biologicheskiye problemi phyzicheskogo vospitaniya i sporta*, No 7, pp. 6-10. (in Ukr.)
- Blavt, O. Z. (2012), "Information indicators of physical health and physical fitness of students university", *Pedagogika, psikhologiya i mediko-biologicheskiye problemi phyzicheskogo vospitaniya i sporta*, No 11, pp. 14–18. (in Ukr.)
- Gluzhenko, N. V. (2011), *Korekchiya phyzichnjgo stanu studentiv 19–20 rokov zasobami plavannya v prochzesi kondichziynogo trenuvannya: avtoref. dis...kand. nauk. z phis. vihovannya i sportu: 24.00.02* [Correction of the physical condition of students 19–20 years of swimming

facilities in the conditional training: PhD diss.], Dnipropetrovsk, 20 p. (in Ukr.)

6. Dudorova, L.Yu. (2005), "The social-pedagogical aspects of the organization of a healthy way of life of students", *Pedagogika, psikhologiya i medico-biologicheskiye problemi fizicheskogo vospitaniya i sporta*, No 8, pp. 24-30. (in Ukr.)

7. Maglovaniy, A.V., Shimechko, I. M., Boyarchuk, O. M. & Moroz, E. I. (2011), "Dynamics of indicators of physical health of students engaged in power exercises", *Pedagogika, psikhologiya i medico-biologicheskiye problemi fizicheskogo vospitaniya i sporta*, No 1, pp. 80-83. (in Ukr.)

8. Malikov, N. V., Bogdanovskaya, N. V. & Boichenko, K.Y u. (2009), [The computer program "OBEREG"], *Svidotchtzvo pro reestrachziu avtorskogo prava na tvir* [Certificate of registration of copyright in a model], No 28366. – 11 p. (in Ukr.)

9. Miroshnichenko, V. M. (2008), *Zastisuvannya fizichnih vprav riznogo spryamuvannya dlya vdoskonalennya fizichnogo zdorovya divchat z urahuvannyam somatotipu: avtoref. dis...kand. nauk. z phis. vihovannya i sportu: 24.00.02* [Using the exercise of different directions to improve the physical health of girls given somatotype: PhD diss.], Lviv, 22 p. (in Ukr.)

10. Oksiom, P. M. (2008), *Ephektivnist fizichnoi pidgotovlenosti studentok vzhzhogo navchalnogo zakladu zasobami mini-phutbolu: avtoref. dis. na zdobuttiya nauk. stupenya kand. nauk. z phis. vihovannya i sportu: 24.00.02* [The effectiveness of physical fitness of students in higher education by means of a mini-football: PhD diss.], Kharkiv, 28 p. (in Ukr.)

11. Petrov, O. P., Phedirko, A. O. & Alekseev, O. O. (2012), "Table tennis as a means of physical education students", *Suchasni problem fizichnogo vihovannya, sportu ta zdorovya ludini: zbirnik naukovih prazh*, Kamyanzrch-Podilskiy, No 3, pp. 159-161 (in Ukr.)

12. Poproshaev, O. V., Chumakov, O. V. & Kashinskiy, G. A. (2011), "The influence of traditional, traditionally-sectional and sectional forms of the organization of studies in physical education at the level of somatic health of students of 1–4 courses", *Pedagogika, psikhologiya i medico-biologicheskiye problemi fizicheskogo vospitaniya i sporta*, No 12, pp. 81-84. (in Ukr.)

13. Samoshkina, A. (2012), "The health status of students in higher education institutions", *Moloda sportivna nauka Ukraini: zbirnik naukovih prazh v galuzi fizichnjy kulturi ta sportu*, Lviv, No 2, pp. 184-187. (in Ukr.)

14. Sokolova, O. V. (2011), *Ephektivnist vikoristannya zasobiv step-aerobiki v sistemi zanyat z fizichnogo vihovannya studentiv 18–19 rokiv: avtoref. dis...kand. nauk. z phis. vihovannya i sportu: 24.00.02* [Efficiency means step aerobics classes in the system of physical education of students 18–19 years: PhD diss.], Dnipropetrovsk, 23 p. (in Ukr.)

15. Chernenko, O. E. (2012), *Pidvizchennya pyzichnogo stanu studentok 18–19 rokiv zasobami phytbol-aerobiki: avtoref. dis...kand. nauk. z phis. vihovannya i sportu: 24.00.02* [Improving the physical condition of students of 18–19 years means fitball-aerobics: PhD diss.], Dnipropetrovsk, 21 p. (in Ukr.)

16. Yadviga, Yu. P. (2011), *Fizichne vihovannya studentiv vzhzhogo navchalnogo zakladu ekonomichnogo profilyu v period transformazchii vzhzhoi osviti Ukraini v Evropeiskiy prostir: avtoref. dis...kand. nauk. z phis. vihovannya i sportu: 24.00.02* [Physical training of students of higher educational institutions of economic profile during the transformation of higher education in Ukraine in the European space: PhD diss.], Kyiv, 24 p. (in Ukr.)

Received: 11.06.2016.

Published: 31.08.2016.

**Inna Cherednichenko:** Zaporizhzhya National University: Zhukovsky str. 64, Zaporizhzhya, 69000, Ukraine.

**ORCID.ORG/0000-0002-9325-6405**

**E-mail:** missis.theredni4enko@yandex.ru