

The use of modern means of health improving fitness during the process of physical education of student youth

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Abstract:

The article studies the most popular means of health improving fitness among the female students of the I-II year of the Bila Tserkva National Agrarian University. 48 female students of the I-II year, aged 17-19 years with different levels of physical condition participated in the research. The purpose of the research was to determine the effect of means of health improving fitness on the physical condition of girls aged 17-19 years in the process of physical education. We found that trainings 2-3 times a week during a nine-month period have a health improving effect, which is due to the work of a large number of muscle groups with a mainly aerobics energy supply mechanism. In the article, on the basis of the pedagogical experiment, the positive dynamics of the effects of means of health improving fitness on physical development, functional state, physical capability and preparedness, as well as psycho-emotional state is presented. In the process of identifying the relation between the indicators of the psycho-emotional state and the studied personal fitness indicators, we established the existence of a significant number of reliable correlation interrelationships.

Key words: health improving fitness, physical condition, students.

Introduction

The process of physical education of student youth is one of the priority directions of the formation and the health promotion of the nation. Physical education is an integral part of the system of humanitarian education of the students, the formation of a general and professional culture of the personality of a future specialist. According to the data of the World Health Organization (WHO), young people aged 16 to 29 years account for about 30% of the world's population. Student youth are considered as a specific group of people, which has its own peculiarities in the way of life, value orientations, and standards of behaviour and motives of activity. The social significance of young people's health is due to the fact that they represent the closest reproductive, intellectual, economic, social, political and cultural reserve of society (Gorelov, 2009; Winter, 2017).

There is a steady tendency to deterioration of the health of the population of Ukraine and young people in particular. The decrease of the level of health and physical working capacity in student youth is a consequence of a significant psycho-emotional load, violations of the hygiene of regime of the day and nutrition, as well as low motor activity (Sapozhnyk, 2012; Andrieieva, 2017).

Motor activity reduction is considered as one of the main factors contributing to the development of a number of diseases, in particular: hypertension, atherosclerosis, coronary heart disease and myocardial infarction, vegetative-vascular dystonia, obesity, postural disorder with damage to the bone and muscle apparatus. The cardio-vascular system is especially vulnerable, that is manifested by a deterioration of the functional state of the heart and a decrease in the cost-effectiveness of its work. (Ivashchenko, 2008; Zhu, 2011).

In the conditions of the technogenic process of the society development, the problem of health preservation is of key importance. Today specially organized forms of motor activity are particularly in demand in the framework of the programs of physical culture and recreation classes, which can be performed both independently and under the guidance of the staff of fitness centres. Among all health forming technologies, the health improving fitness occupies a significant place. Its wide and multifaceted health-improving effect was confirmed by numerous scientific studies (Sapozhnyk, 2012; Kornosenko, 2013; Martyniuk, 2016; Galan, 2017; Ivashchenko, 2017).

The positive effect of physical activity is expressed in the normalization of the functional and morphological state of the body, increase of the physical condition and working capacity, the general physical condition of the persons involved. The revealed health improving effect has become the basis for scientific and methodological substantiation of the various fitness programs that are a practical embodiment of physical culture

and health improving technologies (Ivashchenko, 2008; Vengerova, 2009; Keating, 2010; Sapozhnyk O., 2012; Hodges, 2017).

Materials and Methods

The purpose of the study was to determine the effect of means of health improving fitness on the physical condition of girls aged 17-19 years in the process of physical education.

Methods of research: theoretical analysis and generalization of data of scientific and methodical literature; Anthropometric research methods; Physiological research methods; Pedagogical research methods; Statistical methods of processing of the received data.

From the characteristics of morphological status, body length (BL) and body weight (BW) were determined; the dimensions of different parts of the body were taken into consideration. In order to characterize the state of the cardiovascular system, the following functional parameters were determined in the work: heart rate at rest (HR_{rest}), arterial blood pressure systolic and diastolic (SBP and DBP). We analysed the respiratory system state according to the indicators of breath holding at inhalation (Shtange test) and breath holding at exhalation (Genchi test). To determine the level of physical capability of the female students we used the Ruffier-Dicson Index; to determine the static physical force of the hand muscles, the "Carpal Dynamometry" test was used. To characterize physical fitness, motor tests were used (running 60 m race, 2000 m race, shuttle running 4×9 m, bending forward from the sitting position, flexion and extension of arms in front lying support, standing long jump, rope jumping). To study the psycho-emotional state, the technique of "WAM" (well-being, activity, mood) was used. 48 female students of the I-II year of the Bila Tserkva National Agrarian University aged 17-19 years with different levels of physical condition participated in the research. According to the results of the medical examination at the beginning of the academic year, they are all classified into the main and preparatory medical groups. According to the results of the medical examination at the beginning of the academic year, they were all classified into the main and preparatory medical groups. The main criterion for determining the sample of recipients was the personal desire of girls to participate in the study.

Results

To determine the impact of means of health improving fitness on the physical well-being of the female students, a review based on the questionnaire was conducted, with the help of which top four the most popular means were selected: aerobics, step aerobics, stretching, Pilates. The peculiarities of their influence were determined in the course of the nine-month period of introduction of these means into the educational process (October-May). The results of the physical well-being testing of the female students before the beginning of the pedagogical experiment are presented in Table 1.

In the age period group of the female students aged 17-19 years, an increase in body length is almost over, morphological development processes are completed and all indicators reach their definitive values. Analysing the results of the physical development of the female students, we found that the average indicators of BL and BW correspond to the age standards. In 18.3% of the female students there is an excessive BW, and in 6.7% - a deficiency of body weight. At the same time, an increase in the parameters of the circumferential dimensions of the body, in particular waist and hips, was observed in 23.3% of the subjects.

Table 1. Average statistic indicators of physical condition of the female students aged 17-19 years before the beginning of the pedagogical experiment (n = 48)

Indicators	\bar{x}	S	ME	25%	75%	Min.	Max.
Age, years	17.4	0.62	17.0	17.0	18.0	17.0	19.0
BL, cm	165.4	6.41	165.0	162.0	170.0	149.0	179.0
BW, kg	61.8	7.32	62.0	53.0	63.0	43.0	93.0
Chest girth, cm	89.3	6.23	88.0	83.0	90.0	77.0	109.0
Pelvis girth, cm	98.5	6.51	97.0	92.0	102.0	81.0	111.0
Thigh girth, cm	53.4	5.22	52.0	48.0	55.0	43.0	68.0
Waist girth, cm	69.3	7.03	68.0	63.0	72.0	57.0	92.0
HR, beats /min ⁻¹	88.5	16.20	87.0	78.0	97.0	66.0	116.0
SBP, mmHg	114.2	7.28	110.0	110.0	120.0	100.0	140.0
DBP, mmHg	73.0	6.68	70.0	70.0	80.0	60.0	90.0
Genchi test, sec	22.7	10.81	21.5	14.5	27.5	5.0	54.0
Shtange test, sec	36.2	18.93	32.0	25.0	41.5	16.0	1.12.0
Ruffier index, nominal units	9.4	3.19	8.8	6.8	11.2	2.8	22.8
Dynamometry right, kg	18.2	5.37	18.5	15.0	21.5	9.0	30.0
Dynamometry left, kg	15.2	4.95	15.0	10.0	20.0	3.0	25.0
Running 60m, sec	10.7	0.51	10.6	10.2	10.9	9.8	12.4
Shuttle running 4×9 m, sec	10.8	4.25	10.5	10.1	10.8	9.3	12.6
Running 2000 m race, min sec	12.22	1.30	12.30	11.33	13.12	10.26	15.42
Standing long jump, cm	177.5	29.25	183.0	175.0	190.0	150.5	210.0
Flexion and extension of arms in front lying support, times	11.1	4.68	12.0	9.5	15.0	2.0	19.0
Sit-up from the back-lying position, times /1 min	30.1	4.53	30.0	27.0	34.0	23.0	40.0
Bending forward from the sitting position, cm	8.8	3.44	10.0	8.0	12.0	3.0	19.0
Rope jumping, times /1 min	111.5	13.43	110.0	110.0	123.0	70.0	140.0

The functional state of the cardiovascular system was determined by the value of its main indicators, which are presented in the table of the average statistical data of physical condition (Table 1). The index of heart rate in the condition of relative rest corresponds to age standards, an increase in the rate of SBP, which reached 130-140 mm Hg., was noted in 8.3% of the female students, only 41.7% of subjects under study were within the limits of the age average norms. According to the scientific literature, one of the criteria of the reserve and economization of the functions of the cardiovascular system is the Ruffier index, which is based on the results of the recovery of heart rate after a dynamic load. In our study, the following results were obtained: 2.1% of the participants had the high level only, 4.2% had the sufficient level, 14.6% had the average level, 54.2% had the satisfactory level and 24.9% of the female students under study had the unsatisfactory level.

Analysing the results of the breath holding tests on inhalation and exhalation, which characterize the state of the oxygen supply of the girls' body, it has been found that the average results correspond to the age standards.

According to the results of physical fitness testing, it emerged that the vast majority of the female students are not able to meet the control standards for their age group and to get high scores; the average results of motor tests are satisfactory and unsatisfactory, with the exception of jumps on a rope.

To assess the emotional state of the female students, we used the WAM technique, which contains three characteristics blocks, relating to well-being, activity and mood. The WAM technique allows measuring the emotional state of a person during periods of intense mental and physical activity. Characteristics of the well-being, activity and mood of students are indicators of adaptability to the peculiarities of activity, as well as to the collective. The abovementioned technique is used to identify, predict and timely correction of negative emotions, and in pedagogical practice - to assess the effectiveness of the proposed program. The average WAM results are presented in Table 2.

Table 2. Indicators of psycho emotional status of the female students aged 17-19 years before the beginning of the pedagogical experiment (n = 48)

Indicators	\bar{x}	S	ME	25%	75%	Min.	Max.
Well-being, points	4.03	0.73	4.45	3.90	5.00	2.40	5.70
Activity, points	4.01	0.76	4.30	3.65	5.00	2.80	5.70
Mood, points	4.22	0.62	5.00	4.40	5.45	3.90	6.00

The analysis of the statistical average results of well-being, activity and mood in the female students demonstrates their relatively low levels. This is explained by the presence of stress factors, which adversely affect the health of the respondents, creating some discomfort for perception of reality and an adequate assessment of the environment. Taking into account the results of the physical condition of the female students at the beginning of the pedagogical experiment, the intensity of training sessions with health improving fitness was limited by the level of tolerance of the cardiovascular and respiratory systems to physical workload, the periodicity of trainings was 4 hours a week compulsory and 2 hours additional in accordance with students' wishes during extracurricular time. As a result of the introduction of means of health improving fitness in the educational process, we have found that trainings 2-3 times a week during nine-month period have a positive effect on all components of the physical condition, as evidenced by the results obtained at the end of the pedagogical experiment (Table 3, 4). A comparative analysis of the initial and final indicators of physical development allows us to establish statistically significant changes in the BW of the female students, which decreased by 4.2 kg, which is 6.8% at $p < 0.05$ and the girth of the pelvis decreased by 5.2 cm, which is 5.3% at $p < 0.05$, respectively. Systematic aerobics and step aerobics exercises have produced a positive effect on the functional state of the cardiovascular and respiratory systems, as well as physical efficiency, in particular, we found statistically significant changes in the volumes of the heart rate at rest parameter. This indicator volume decreased by 7.9 beats per minute, which was 8.9% at $p < 0.05$. The Ruffier index improved by 11.7% at $p < 0.05$, it is worth noting that 52.1% of the female students met the average level and 31.2% - the satisfactory level.

Table 3. Average statistics of physical condition of the female students aged 17-19 years at the end of pedagogical experiment (n = 48)

Indicators under study	Before the experiment		After the experiment		$\pm\Delta$	$\Delta, \%$	p
	\bar{x}	S	\bar{x}	S			
BL, cm	165.4	6.41	165.9	6.32	0.5	0.3	>0.05
BW, kg	61.8	7.32	57.6	10.18	-4.2	6.8	<0.05
Chest girth, cm	89.3	6.23	86.0	7.19	-3.3	3.7	>0.05
Pelvis girth, cm	98.5	6.51	93.3	6.50	-5.2	5.3	<0.05
Thigh girth, cm	53.4	5.22	51.0	5.68	-2.4	4.5	>0.05
Waist girth, cm	69.3	7.03	65.7	8.11	-3.6	5.2	>0.05
HR, beats /min-1	88.5	16.20	80.6	8.39	-7.9	8.9	<0.05
SBP, mmHg	114.2	7.28	116.3	6.12	2.1	1.8	>0.05
DBP, mmHg	73.0	6.68	74.0	4.32	1.0	1.4	>0.05
Genchi test, sec	22.7	10.81	26.5	6.12	3.8	16.7	>0.05

Shtange test, sec	36.2	18.93	39.1	4.05	2.9	8.0	>0.05
Ruffier index, nominal units	9.4	3.19	8.3	2.10	-1.1	11.7	<0.05
Dynamometry right, kg	18.2	5.37	19.5	4.21	1.3	7.1	>0.05
Dynamometry left, kg	15.2	4.95	15.8	2.14	0.6	3.9	>0.05
Running 60m, sec	10.7	0.51	10.2	0.61	-0.5	4.7	>0.05
Shuttle running 4 × 9 m. sec	10.8	4.25	10.4	0.49	-0.4	3.7	>0.05
Running 2000 m race, min sec	12.22	1.30	11.03	1.18	-1.2	9.7	<0.05
Standing long jump, cm	177.5	29.25	189.6	15.52	12.1	6.8	<0.05
Flexion and extension of arms in front lying support, times	11.1	4.68	15.5	4.83	4.4	39.6	<0.01
Sit-up from the back-lying position, times /1min	30.1	4.53	38.7	3.71	8.6	28.6	<0.01
Bending forward from the sitting position, cm	8.8	3.44	12.4	3.81	3.6	40.9	<0.01
Rope jumping, times /1min	111.5	13.43	139.5	15.91	28.0	25.1	<0.01

Note: $\pm \Delta$ - the difference between students' performance before the pedagogical experiment and after in relative units; $\pm \Delta$, % is the difference between students' performance before the pedagogical experiment and afterwards in percentage.

Indicators of the blood pressure and breath holding tests have not undergone any significant changes.

Positive changes occurred in indicators of physical preparedness, statistically significant changes occurred with running 2,000 m race, the run time decreased by 1 min. 18 sec, which was 9.7% at $p < 0.05$ this fact demonstrates an improvement in overall endurance. The results of the standing long jump improved by 6.8% at $p < 0.05$, and the results of the rope jumping improved by 25.1% at $p < 0.01$, indicating the development of the speed-strength and power qualities.

Pilates exercises influenced the level of strength endurance of the hands and abdominal muscles. Positive dynamics is confirmed by the significant changes in the flexion and extension of arms in front lying support, by 39.6% at $p < 0.01$, and in sit-up from the back-lying position by 28.6% at $p < 0.01$.

Stretching exercises had positive influence on the development of flexibility, which was statistically reliably confirmed during the performance of the flexibility test (trunk-bending forward from the sitting position) by 40.9% at $p < 0.01$.

To study the influence of means of health improving fitness on the psychophysiological indicators of student youth, we analysed the changes in the emotional state (Table 4.)

Table 4. The indicators of psycho-emotional state of the female students aged 17-19 years (n = 48)

Indicators under study	Indicators value						
	Before the experiment		After the experiment		$\pm \Delta$	Δ .%	p
	\bar{x}	S	\bar{x}	S			
Well-being. points	4.03	0.73	5.22	0.11	1.2	29.5	<0.01
Activity. points	4.01	0.76	5.31	0.33	1.3	32.4	<0.01
Mood. points	4.22	0.62	5.83	0.13	1.6	38.2	<0.01

According to Table 4., at the end of the pedagogical experiment, positive dynamics are observed, in particular, the average result of the well-being improved by 1.2 points (29.5%. $p < 0.01$), activity in girls increased by 1.3 points (32.4%. $P < 0.05$), and the mood indicator had the highest increase, it was improved by 1.6 points (38.2% $p < 0.01$). Thus, the use of means of health improving fitness in physical education classes had a positive influence on the psycho-emotional state of the female students.

To find out the relationship between the indicators of the psycho-emotional state and the indicators that characterize physical development, the functional state of the cardiovascular system, physical work capacity and preparedness, we conducted a correlation analysis; the results are presented in Table 5.

Table 5. Correlation relations of the psycho-emotional state of the female students aged 17-19 years with the studied indicators.

Indicators under study	Well-being. points	Activity. points	Mood. points
BW, kg	-0.38*	-0.32*	-0.64**
HR _{rest} , beats /min ⁻¹	0.33*	0.12	0.07
Ruffier index, nominal units	0.31*	0.42**	0.53**
Running 2000 m race, min sec	0.30*	0.39**	0.52**

Notes: n = 48; R = 0.30 at $p < 0.05$; R = 0.39 at $p < 0.01$;

* - the correlation coefficient is statistically significant at the level $p < 0.05$;

** - the correlation coefficient is statistically significant at the level $p < 0.01$.

The analysis showed that there is a significant number of reliable correlation relationships; particular attention is attracted by a high reciprocal correlation relationship between BW and mood, and therefore, excess body weight causes negative emotions in the female students. A high correlation relationship is observed between the volumes of the Ruffier index, the 2000 m race running and the mood and activity indicators. We can argue that the female students perform motor tests much better if they have a good psycho-emotional state.

Reliable correlation relationship exists between the indicator of well-being and BW, HR_{rest}, the Ruffier index and 2000 m running, this dependence is, in our opinion, logical, since for performance of motor tests the index of well-being is one of the main, that is necessarily taken into account by pedagogical workers in the process of physical education.

Discussion

The analysis of the scientific and methodological literature and the results of the research of domestic and foreign authors give ground to assert that among the modern student youth, the concept of "health improving fitness" acquires the status of a significant phenomenon that forms a person on the basis of the healthy lifestyle principles system, psychophysical self-improvement, purposeful preparation and adaptation to study. The great interest of student youth in fitness trainings is due to the availability, efficiency and emotional component of its core programs and their implementation contributes to the continuous updating of the varieties of trainings. With all the diversity of programs, not all of them are equally popular. During the survey of the female students, we found that they prefer classical aerobics exercises, the second place is occupied by step aerobics, the third one is stretching and the fourth is Pilates. Such popularity of these exercises causes the presence of a large number of the scientifically grounded developments about their structure, the methodology of conducting of separate parts, the selection of musical accompaniment in accordance with the movements used during the trainings. An important feature of aerobics, step aerobics, stretching and Pilates exercises is the fact that they use a large number of different movements.

The results of the study confirmed and supplemented already known developments in terms of the studied problem. The data of the special literature about the significant health effects of trainings with the use of means of health improving fitness for students of higher education establishments was confirmed. In particular the improvement of their physical fitness (Gerasymenko, 2008; Romanova, 2010; Biletska, 2012; Hodges, 2017); information about body weight correction by means of health improving fitness (Pylypko, 2005; Moroz, 2012); data on the positive influence of aerobics exercise and step aerobics on the cardiovascular system (Biletska, 2012; Moroz, 2012; Martyniuk, 2016); information about the stretching exercises contribution to increase of the elasticity of the muscles and the amplitude of the joints movements (Vengerova, 2009); data on the positive effect of fitness exercises on psycho-emotional state of the female students (Kozakevych, 2008), data on the presence of a significant number of reliable correlation relationships of psycho-emotional state with BW, HR_{rest}, the Ruffier index and running 2000 m race.

Conclusions

The use of up-to-date means of the health improving fitness in combination with a wide range of motivational guidelines and taking into account the individual interests and needs of the female students, improved greatly the physical and psycho-emotional state of the subjects under study. The criteria of the health improving effect of the trainings were positive dynamics at the end of the pedagogical experiment. Positive changes are recorded in the indicators of physical development, functional state of the cardiovascular system, physical preparedness and psycho-emotional state. The level of physical work capacity during the experiment in the female students has increased significantly, so 6.3% of the girls had high level, 10.4% of them had a sufficient level, 52.1% of the female students had the average level, 31.2% had a satisfactory level of the physical work, it is worth noting that there were no people with unsatisfactory level at the end of the pedagogical experiment.

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