

Influence of modern fitness technologies on the state of health and development of motor abilities of 17-19-year-old female students

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Abstract

The article is aimed at investigating the influence of the methods of using general-physical fitness technologies including pilates and stretching techniques on the level of physical health and development of female students' motor abilities. Participants of the experiment: 84 female students of Khmelnytskyi humanitarian-pedagogical academy (aged 17-19; 1st and 2nd years of study). **Methods:** analysis, synthesis of educational standards, scientific and methodological sources, pedagogical modeling, pedagogical experiment. Assessment of the female students' physical health based on the express methods included the use of the following indices: life, strength, weight-growth, Ruffie's index, Martine's test, Robinson's index. **Results.** The positive effect of the training on the development of overall endurance (+5.45%), strength (+16.1%), strength endurance (+22.6%), coordination abilities (+8.5%), coordination of speed and strength movements (+13.15%) has been established. Neutral effect was reached in the development of speed (+2.08%), speed endurance (+2.87%), explosive strength (+4.94%) and agility (+2.16%). Negative effect is observed in the development of flexibility (-2.93%). As for the increase in the indicators of the experimental group students' motor abilities development in comparison with those of the control group, the following changes have been registered: strength endurance (+14.0%), coordination abilities (+12.37%), coordination of speed and strength movements (+10.58%), strength (+9.56%), overall endurance (+4.2%), speed (+3.49%), explosive strength (+2.78%), speed endurance (+1.7%), agility (+1.62%). **Conclusions.** The study of the impact of the methods of general-physical fitness technologies with the use of pilates and stretching techniques on the level of physical health and motor abilities development of female students aged 17-19 has confirmed more significant changes in the dynamics of physical fitness of the experimental group students. A comparative analysis has testified that the use of the proposed methods makes a 16.8% more effective impact on their assessment of the level of physical health. The most significant changes (+21.4%) occurred among female students who, at the beginning of the experiment, were in the "below average" physical health level group.

Key words: state of health, development, motor abilities, students, fitness technologies.

Introduction.

The current level of requirements for the process of students' physical education in the system of higher education requires, on the one hand, the use of health-improving learning technologies, and, on the other hand, improvement of motor abilities and functional capabilities of student youth (Kovalchuk, 2012).

The main task of physical education in higher educational institutions is to form youth health culture, to understand it as the highest value of a person and to instill a habit of conscious motor activity in order to

maintain the necessary physical shape throughout life (Zhigareva, 2016). The process of improving the methods of physical education stimulates the search for new, more rational and interesting forms of motor activity for young people, introduction of non-traditional means of organizing physical education lessons based on the developed experimental educational programs (Mazurchuk, Navrotskyi, 2011).

Studying the problem of the impact of the current physical education system on the health of young people in Ukrainian higher school, researchers emphasize its inability to solve the problem of inactive lifestyle of students, which is directly reflected in their state of health and development of motor abilities (Vostotska, Golovchenko, Osipova, 2014). Researches conducted on the organization of the physical education process, methods of conducting lessons and determining the of students' physical preparedness level confirm the negative changes in the indicators of development of motor abilities and of the state of physical health and motor activity of young people (Vlahii, Yachniuk, 2015, Pylypei, 2013; Ivashchenko, Yermakova, Cieslicka, Muszkieta, 2015). The study of the dynamics of students' physical development during the period of study at a higher educational institution shows that the growth of motor abilities is slowing down starting from the first year of study (Kryvobok, 2009; Romanova, 2010).

Part of the solution to this problem is to change priorities in meaningful and qualitative specialists' training in the sphere of physical culture and sports (Mozolev, Halus, Bloschchynskyi, Kovalchuk 2019) who are able to apply modern methods of conducting physical education lessons that contribute to the formation of a stable motivation of students for active physical exercises and lifestyle. Such methods include: modern fitness technologies (Yarmak, Halan, Huckman, Dotsyuk, Olexandra, Teslytskyi, 2017), the use of pilates (Myrgorod, 2016; Ilnytska, Kozina, Kabatska, Kostiukevych, Goncharenko, Bazilyuk, & Al-Rawashdeh, 2016), shaping (Shevtsov, 2008; Linetz, 2002), stretching training (Biletska, 2012; Wengerova, 2009).

The hypothesis of the study was the assumption that the use of modern fitness technologies of general physical orientation with the use of pilates, shaping and stretching (which is a training component of each lesson, lasting for 15-20 minutes) will contribute to increasing the level of physical health and development of motor abilities of female students aged 17-19.

Purpose and objectives. The purpose of the article is to investigate the influence of the methods of using general-physical fitness technologies including pilates, shaping and stretching techniques on the level of physical health and development of motor abilities (skills) of 17-19-year-old female students of Khmelnytskyi humanitarian-pedagogical academy (aged 17-19; 1st and 2nd years of study).

Objectives of the study: to assess the level of physical health of female students at each stage of the pedagogical experiment; to check the level of development of motor abilities of female students using a system of tests; to analyze the impact of the elaborated methodology on the level of physical health and development of motor abilities of female students.

Materials and methods

The participants of the experiment: 84 female students aged 17-19 of Khmelnytskyi humanitarian-pedagogical academy, who were divided into the control and experimental groups according to the level of physical health.

Organization of the research: The research work was carried out on the basis of the Khmelnytskyi humanitarian-pedagogical academy with students of the first and second years of study in the period from October 2017 to November 2018.

The basis of the developed methodology has the following provisions:

- the level of physical preparedness of students largely depends on the direction of the educational process, which determines its structure, content, methods and means of their implementation and control, which increases when the volume, intensity and direction of the training influence in the educational process are rationally combined (Zhula, 2011);
- the state of physical health and the development of motor abilities of female students is directly related to the lifestyle and level of their motor activity. The peculiarity is that the pace of biological development of the body of young females aged 17-19 is slowing, the formation of the musculo-skeletal system and the muscular system ends, resulting in adult's organism formation (Petryński, 2008);
- the physical qualities of the person are interrelated and cannot be isolated from each other, therefore, by finding and knowing the basic laws of the development of motor abilities, it is possible to exert complex influence on the development of various physical qualities using one exercise (Romanchuk, Bryskyn, Sydorko, Ostrovskyi, Pitin 2015).

Methods. To obtain the necessary information, we used the general scientific methods of theoretical level of research, namely: analysis, synthesis of educational standards, scientific and methodological sources, pedagogical modeling, pedagogical experiment (Sergienko, 2014).

Analysis and synthesis of educational standards, scientific and methodological sources were used to study the state of implementation of certain educational requirements for the physical education of students, the level of development of motor abilities of female students aged 17-19 at the present stage and the search for ways to improve this process.

Pedagogical modeling was used during the development of experimental versions of the content of physical education of female students, taking into account the retrospective and the current information obtained in the course of pedagogical experiment. At each stage of the pedagogical experiment, we carried out an assessment of the physical health of the female students using the express method, which included obtaining the results in the following indices: life, strength, weight-growth, Ruffie's index, Martine's test, Robinson's index (Denysova, Khmel'nitskaya, Kharchenko, 2008).

Methodology of Research

Testing was carried out one month after the beginning of the academic year, due to the process of adaptation to higher education, and at the end of the first, second and third semesters, using a system of tests that allowed assessing the main motor and coordination abilities of female students. The test system included:

- 1) running 30 m (speed);
- 2) running 100 m (fast endurance);
- 3) Cooper's test - 6-minute running at maximum distance (overall endurance);
- 4) bending and extension of the arms based on the bench (30 cm) in horizontal position (strength);
- 5) standing long-jump (explosive strength);
- 6) plank (strength endurance)
- 7) lifting arms behind the back using the measuring plank (flexibility);
- 8) holding balance on one leg (long fly vault) (coordination abilities, static balance);
- 9) Burpie's test (determines the development of the ability to general coordination of body movements combined with the differentiation of speed-strength parameters);
- 10) shuttle run of 4x9 m (agility).

Statistical analysis. To solve the set problems, we held a constitutive and formative pedagogical experiments. The first was organized by the Longitudinal method, which envisaged the study of changes in the set indicators among female students during the entire period of study. The obtained empirical data was studied by the comparison method in the related samples (Huba, Shestakov, Bubnov, Borysenkov, 2002). At this stage, the study of such data was semestral change in the indicators of physical health and physical fitness, the structure and interrelations between the growth of these indicators. The analysis of the interrelation between the change in the indicators of physical fitness contributed to the identification of the nature (positive, negative, neutral) of the transfer of the training effect in the development of physical qualities under the influence of the current and proposed teaching methods. The obtained data allowed to distinguish the physical qualities that at a certain period are marked by the greatest increase, the number of positive interactions with the change of other physical qualities, the improvement of which affects the change of physical health of female students the most.

Results of Research

The subject of the study was 84 students, aged 17-19 (1st and 2nd years of study) of Khmel'nitsky Humanitarian Pedagogical Academy with different levels of physical health. In particular, at the beginning of the study, 6 students had high, 14 had above average, 29 had average, 27 had below average and 8 had low levels of physical health. The results of physical fitness testing of students at control and experimental groups according to the chosen method are presented in Table 1.

Table 1. Parameters of the physical health of students, aged 17-19 at different stages of the experiment. Activity level (n = 84)

Levels of health	Training stages				Changes (%)
	At the initial stage	At the end of the 1 st semester	At the end of 2 nd semester	At the end of 3 rd semester	
Control group (n = 42)					
High	3	3	3	3	-
Above average	8	8	9	9	+2,4
Average	14	15	16	17	+7,0
Below average	13	12	10	10	-7,0
Low	4	4	4	3	-2,4
Experimental group (n=42)					
High	3	3	4	5	+4,8
Above average	6	7	8	11	+11,9
Average	15	16	18	19	+9,5
Below average	14	12	9	5	-21,4
Low	4	4	3	2	-4,8

Applying the Student's t-criterion, we found that as a result of the forming experiment, the indices of the physical condition level of female students increased significantly, namely: life t 1.62 (p <0.05), strength t 3.56 (p <0.01), Ruffie's index t 1.86 (p <0.05), Martine's test t 2.08 (p <0.05), Robinson's index t 2.48 (p <0.05). Only in the weight-height index there is no tendency for improvement, as during the experiment female students aged 17-19 did not undergo significant changes: t 0.87 (p > 0.05).

The obtained data testify to the presence of significant differences in the assessment of the physical health of students of the control and experimental groups using the express methods. The most significant differences are the strength index t 4.42 ($p < 0.001$), the Martine's test t 2.36 ($p < 0.01$), the Robinson's index t 2.82 ($p < 0.01$), which eventually affected the total score in assessing the level of physical health of students at 4.48 ($p < 0.01$).

A comparative analysis of the final results of the study shows that the use of the proposed method for carrying out physical education lessons for female students aged 17-19 has a more effective impact on assessment of the physical health of students than the current method of training. By the sum of the marks of the physical health levels assessment of the students in the control group, positive changes occurred within the range of 9.4% and mainly encompassed students with an average level of physical health. Students in the experimental group showed more significant changes. Positive impact was felt by 26.2% of female students of different groups. The most significant changes occurred among female students who, at the beginning of the experiment, were in "below average" group with a level of physical health - 21.4%. The dynamics of the changes in the physical health assessment of the students aged 17-19 is presented in Fig.1.

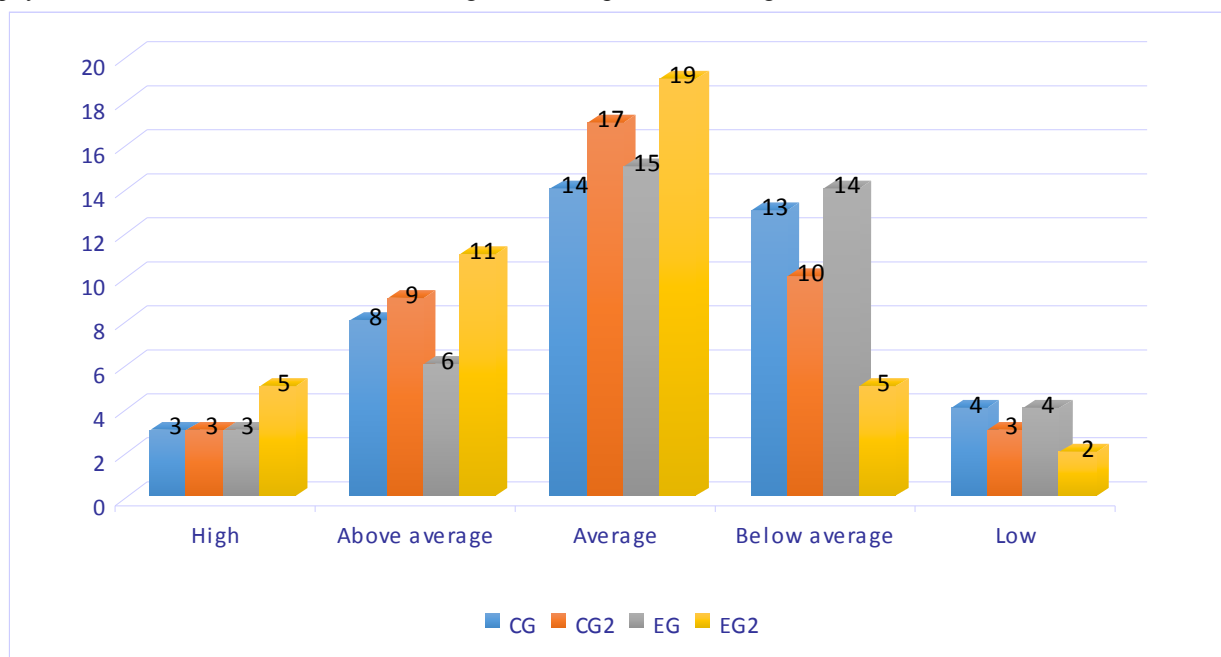


Figure 1: Dynamics of changes in the physical health assessment of the students aged 17-19

The study of the dynamics of motor abilities indices' development among female students of aged 17-19 in the control and experimental groups makes it possible to conduct a comparative analysis of the effectiveness of the proposed training method. Test results are presented in Table 2.

Table 2. Dynamics of motor abilities indices' development among female students aged 17-19 in control and experimental groups ($n = 84$)

№	Tests	At the beginning of the experiment		At the end of the experiment			
		Control group (n=42)	Experimental group (n=42)	Control group (n=42)	Changes (%)	Experimental group (n=42)	Changes (%)
		$\bar{x} \pm m$	$\bar{x} \pm m$	$\bar{x} \pm m$		$\bar{x} \pm m$	
1	Running 30 m (sec)	5,64±0,62	5,77±0,78	5,72±0,84	-1,41	5,65 ±0,75	+2,08
2	Running 100 m (sec)	17,5±1,8	17,4 ±2,0	17,2±1,6	+1,17	16,9±1,4	+2,87
3	Cooper's test (m)	1034±82	1026±96	1047±76	+1,25	1084±57	+5,45
4	Bench push-ups (times)	10,7±6,5	11,2±7,3	11,4±7,4	+6,54	13,0±7,0	+16,1
5	Standing long-jump (cm)	157,6±18,5	155,8±21,6	161±20,0	+2,16	163,5±21,5	+4,94
6	Plank (sec)	39,7±12,4	38,5±16,5	43,1±11,0	+8,56	47,2±14,5	+22,6
7	Lifting arms behind the back w/ a measuring plank (cm)	63,3±9,5	64,8±8,0	67,5±11,0	-6,63	66,7±8,5	-2,93
8	Balance holding (sec)	46,5±8,0	48,5±9,5	48,3±6,3	+3,87	54,5±11,5	+12,37
9	Burpie's test (times)	19,5±6,5	18,5±7,0	19,0±5,5	-2,57	21,5±4,5	+13,15
10	Shuttle run 4x9 m (sec)	11,12±0,64	11,16±0,76	11,06±0,66	+0,54	10,92±0,48	+2,16

Comparison of the results of the tests conducted in the control and experimental groups revealed a significant advantage of the proposed methodology in the development of overall endurance, strength, strength endurance, coordination abilities, coordination of speed-strength movements among female students. The changes in motor development indices was: in the Cooper's test + 5.45% compared with 1.25% ($p < 0.05$); bending and extension of the arms based on the bench + 16.1% vs + 6.54% ($p < 0.001$); plank +22.6% vs + 8.56% ($p < 0.001$); holding balance on one leg + 12.37% vs 3.87% ($p < 0.01$); Burpie's test +13.15% vs -2.57% ($p < 0.01$).

Insignificant changes occurred in the development of speed, speed endurance, explosive strength and agility. The study of changes in the indicators of development of motor abilities was: 30-meter-run + 2.08% vs - 1.41% ($p > 0.05$); 100-meter-run + 2.87% vs 1.17% ($p > 0.05$); standing long-jump + 4.94% vs 2.16% ($p < 0.05$); shuttle run 4x9 m + 2,16% vs +0,54% ($p > 0,05$).

There is a tendency of worsening the results of flexibility development, which is due to the anthropological processes of the completion of the musculo-skeletal system formation. The study of changes in the indices of Lifting arms behind the back w/ a measuring plank was: -2.93% in the experimental group versus - 6.63% in the control group ($p < 0.05$). The dynamics of changes in the level of physical fitness of students aged 17-19 is presented in Fig.2

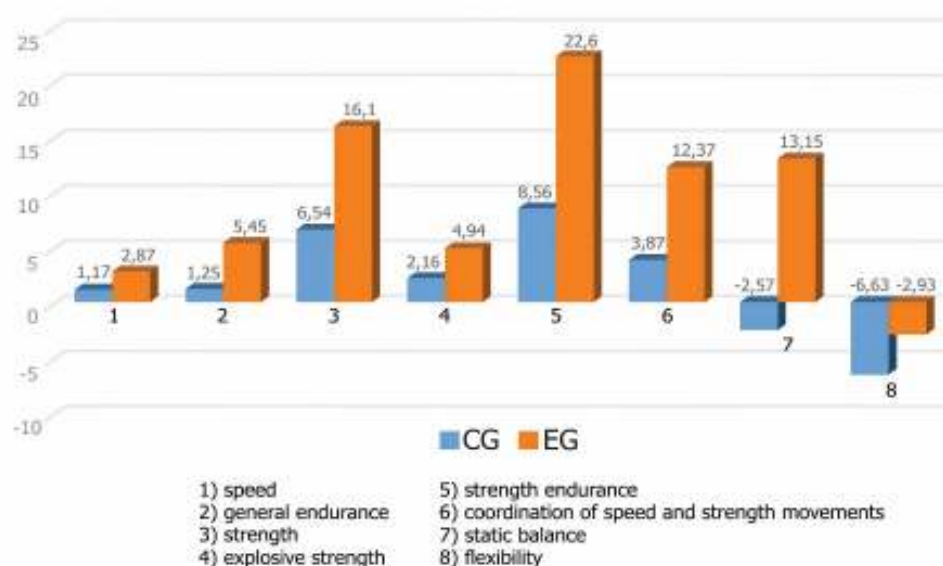


Figure 2: Dynamics of changes in the level of physical fitness of female students aged

Having investigated the influence of the methods of using general-physical fitness technologies with the use of pilates, shaping and stretching on the level of physical health and the development of motor abilities of female students aged 17-19, more significant changes were recorded in the dynamics of physical fitness among the experimental group students.

The comparative analysis of the study shows that the use of the proposed methods of conducting physical education lessons with female students aged 17-19 makes a 16.8% more effective impact on their physical health level. The most significant changes (+ 21.4%) occurred among female students who, at the beginning of the experiment, were in the "below average" physical health level group.

The positive effect of the training was established on the development of general endurance (+ 5.45%), strength (+ 16.1%), strength endurance (+22.6%), coordination abilities (+ 8.5%), coordination of speed-strength movements (+ 13.15%). Neutral effect was observed in the development of speed (+ 2.08%), speed endurance (+ 2.87%), explosive strength (+ 4.94%) and agility (+ 2.16%). Negative impact was recorded in the development of flexibility (-2.93%).

According to the increase in the indicators of development of motor abilities of the students of experimental and control groups, the following changes occurred: strength endurance (+ 14,0%), coordination abilities (+ 12,37%), coordination of speed-strength movements (+ 10,58%), strength (+ 9.56%), overall endurance (+ 4.2%), speed (+ 3.49%), explosive strength (+ 2.78%), speed endurance (+ 1.7%), agility (+ 1.62%).

Discussion

The analysis of the results confirms the research of scholars (Krivobok, 2009; Romanova, 2010) on the low level of motor activity of students and the lack of efficiency of lessons based on the current physical

education curriculum, which does not contribute to the physical development of students, and is aimed only at maintaining their physical condition.

A number of researchers (Anikeev, 2012; Koshmanyuk, 2013) pay attention to the negative dynamics of the state of physical health of students during training, which is associated with a decrease in their motor activity. A tight schedule of learning activities, new realities of students' life restrict the possibility of young people in finding free time for regular physical exercises. This state of the problem determines the need to find new scientific views on the organization of physical education system and introduction of innovative methods of conducting PE lessons.

According to the results of our study, the data concerning the technology of modernization of the educational process on physical education and the implementation of the methods of conducting lessons with the comprehensive use of modern fitness technology, pilates, shaping, stretching training have been scrutinized. Conducting physical education lessons on the basis of the principles of physical qualities improvement based on the pilates system contributed to the development of motor abilities of students, the state of physical health and motor activity of young people. The research data of Gordienko&Mirgorod (Gordienko, 2018; Mirgorod, D. 2016) on the introduction of pilates system as a health-improving type of gymnastics and its positive influence on the level of physical fitness of students have been expanded. The peculiarity of the development of general and physical culture and recreational motor activity of female students aged 17-19 was the use of fitness and shaping technologies (Lynetz, 2002) and stretching (Biletska, 2012), which are interesting for female students as they encourage students' motivation for physical activities.

The study confirmed and expanded scientific views on the need to systematically assess the level of physical health of students at each stage of training, which allows for timely changes and making adjustments to the training process (Dolzhenko, 2004).

Conclusions

The results of the study proved the effectiveness of the methods of using general physically-oriented fitness technologies with the use of pilates, shaping and stretching to assess the level of physical health of female students aged 17-19. Positive impact was felt by 26.2% of female students from different groups for physical health level assessment. The most significant changes (21.4%) occurred among the students who, at the beginning of the experiment, were in the "below average" physical health level group.

Introduction of the suggested methods of using general physically-oriented fitness technologies in the educational process contributed to the more effective development of motor abilities of students than the use of the existing methods of conducting lessons. The most significant changes ($p < 0.01$) occurred in the development of endurance, strength, strength endurance, coordination abilities, coordination of speed and strength movements among the students of the experimental group.

The comparative analysis of the research shows that the use of the proposed methodology of conducting physical education lessons for female students of aged 17-19 makes a 16.8% more effective impact on their level of physical health. There was an increase in the indicators of development of motor abilities of students of the experimental group in comparison with the control one, namely: strength endurance (+ 14.0%), coordination abilities (+ 12.37%), coordination of speed-strength movements (+ 10.58%), strength (+ 9.56%), overall endurance (+ 4.2%), speed (+ 3.49%), explosive strength (+ 2.78%), speed endurance (+ 1.7%), agility (+ 1.62%).

Conflicts of interest: No conflicts of interest exist.

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