

Influence of Pilates classes on the physical fitness of female students

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Abstract

In recent years, a lot of research has been conducted to study the issue of the content of physical education improving. The experts consider the decline in interest in traditional physical education classes as one of such issues. In particular, they emphasize that the reason for the low motivation of students to exercise is the lack of choice of forms of classes and dissatisfaction with the traditional content of the program material of physical education. One of the popular fitness systems offered to students for exercise is the Joseph Pilates exercise system, which aims to strengthen the stabilizing muscles that hold the spine, to develop a sense of balance, coordination, posture, and a sense of the body in space, development, and improvement of strength and endurance, improvement of the musculoskeletal system, cardiovascular and lymphatic systems. The article presents the results of determining the level of physical fitness of students of the National University of Water and Environmental Engineering who opted for the physical exercises elective discipline “Health fitness. The Pilates System”. The classes were held twice a week and were built on the basis of the classical Pilates system. Selected exercises are aimed at developing and strengthening the muscular system, improving the mobility of joints and spine, improving breathing, and as a result, strengthening the body as a whole. To determine the level of physical fitness of students, the testing was conducted at the beginning and end of the semester, which allowed obtaining, analyze and compare the main quantitative and qualitative indices of physical fitness of students compared to those at the beginning of the semester. The obtained data indicate an improvement in the results of testing at the end of the semester compared to those at the beginning of the semester. The strength dips up in plank position test at the beginning of the semester was performed by students 9.47 ± 0.63 times, at the end of the semester – 13.71 ± 0.56 times. The performance in the forearm plank position exercise has improved from 31.23 ± 1.88 seconds to 56.65 ± 3.83 seconds. The results in flexibility (trunk bending forward from a sitting position) doubled from 6.29 ± 0.76 cm to 12.23 ± 0.69 . At the end of the semester, the students perform strength crunch from a supine position to a sitting position exercise 36.71 ± 1.18 times, at the beginning of the semester this figure was 22.76 ± 1.25 times. It has been determined that the results of retesting had a significant value ($P < 0.05$) compared to the results at the beginning of the semester and indicate a positive effect of the proposed exercises of the Pilates system on the physical fitness of students.

Key words: female students, physical fitness, Pilates.

Introduction

Student health is important for modern society. Students are the future of our state, its mental potential. The intensive educational process in higher education institutions, increase of mental and psychic loads, suboptimal ratio of work and rest, irrational diet, bad habits, Internet addiction promote a decrease in physical activity of youth and have a negative impact on the general health of students. This trend harms the physical development, physical fitness, functional status, and health of young people in general (Diachenko-Bohun et al., 2020; Grygus, Petruk, 2015; Korol, 2014; Krutsevych, 2012; Bielikova, 2015; Bosenko, Kholodov, Koval, 2016).

Under such conditions, only the proper organization of the process of physical education in higher education institutions can help overcome the negative trends in the health and physical fitness of student youth (Hrynko, 2015; Larsson, Karlefors, 2015; Krutsevych, Panhelova, 2016; Lavrin et al., 2019). Physical education plays a special role in the complex and multifactorial formation of the individuality of a future specialist. It lays the health foundation as a basis for development of the other sides of personal culture and provides internal guarantees for the efficiency of educational activity. Moreover, the future professional activity of each specialist requires a certain development of physical qualities.

As experts state, the most promising area of physical education classes organization is to take into account individual interests in the free choice of forms of the sports classes (Hruzhevskiy, 2014; Koriahina, 2018).

Individually directed, complex training effect of physical activity on the main functional systems of the body allows to maintain human health at an optimal level primarily through the use of innovative technologies of health physical culture that meet its interests and needs (Korkh-Cherba, Sevastianenko, 2016; Tolmachova, Kuzmenko, Chekhovska, Zakharova, 2019; Kashuba, 2020; Panchuk, Panchuk, Kashuba, Kovalskyi, Torchynska, 2021).

The level of physical fitness of modern youth is low, as evidenced by the results of pedagogical testing. Scientists are actively searching for new ways of improvement due to the elaboration of physical education classes in higher education institutions. The researchers (Krutsevych, Panhelova, 2016; Tovkun, 2016) deepened into the issues of physical fitness of students. In their research, they point to increasing its level by changing the means, mainly those that affect certain motor skills.

Various health programs for physical culture have been designed to meet the requirements of different age groups and segments of the population. One of these areas of recovery is Pilates, which can be attributed to mental fitness ("smart body" or "consciousness and body"). Pilates classes are aimed at maintaining the optimal level of development of physical qualities, achieving internal balance, and improving the well-being and psycho-emotional state of those involved (Yerakova, Tomilini, 2015; Synytsia, 2018a; Synytsia, 2018b; Kashuba et al., 2020; Hordiienko, 2019; Dubynska, Petrenko, 2016).

The purpose of our study is to determine the impact of the proposed exercises of the Pilates system on the physical fitness of students of the National University of Water and Environmental Engineering (NUWEE). Such motor activity in the form of physical exercises can effectively form the necessary skills, physical capabilities, to optimize the training process, improve health, and to increase working capacity.

Materials and methods

The Pilates system has the greatest impact on the development of physical qualities such as strength, flexibility, balance, and coordination skills. The freedom of movement obtained through regular exercise contributes to the efficient functioning of the musculoskeletal, cardiovascular, and lymphatic systems, and has a positive effect on the mental state.

The Pilates system teaches to listen to your body and be aware of it. Most exercises are performed smoothly and slowly, which gives strength to weak muscles, lengthens short muscles, increases joint mobility. The uniqueness of the system lies in the fact that it provides a comprehensive effect on the body. No part of the body is beyond the focus. It is a complete and harmonious method of training. All exercises complement each other and provide the body with balance and a steady state (Pilates, 2014; Pilates, 2017).

The principles of the Pilates system:

1. Relaxation is performing exercises without muscle tension, in a relaxed and calm way.
2. Concentration is focused and conscious performance of movements. It is the ability to concentrate on certain areas of the body and muscles; interaction and joint work of physical and mental processes for the formation of the connection between the body and consciousness.
3. Alignment is proper positioning and aligning all parts of the body relative to each other.
4. Breathing is regular, in the usual rhythm. Inhale is made into the lower lungs and back. When performing the exercise: preparation for the movement – inhale, performance – exhale. Do not hold and do not speed up your breath.
5. Centering is the conscious inclusion of the body "center" (deep muscles that function as support of the spine and all vital organs – the abdominal muscles and pelvic floor muscles). Development of "Sources of Strength" – muscles of the trunk: abdomen, lower back, thighs, and buttocks. These muscles are the basis of the whole organism. J. Pilates called this area a framework of strength.
6. Coordination is the feeling of your own body and coordinated work of all parts of the body during exercise, coordination of movements.
7. Smoothness and accuracy are correct, smooth, slow, jerks less performing of exercises from a strong "center".
8. Regularity of performance and increasing complexity of exercises, as well as constant improvement of the body, contribute to the development of endurance.

According to Joseph Pilates theory, the learning exercises process consists of three successive stages: awareness of the correct movement ("think about the correct movements"); performing the correct movement ("practice the correct movements"); improving properly learned movement ("movements become automatic, habitual"). To achieve a positive result, there must be subconscious control of the mind to progress and go beyond the standard capabilities of the human body. "Always keep your mind under control and focus entirely on the exercise you are performing", says Joseph Pilates, the author of the system (Nakonechna, 2011; Pilates, 2014; Pilates, 2017; Samokhvalova, Meliushkyna, Hryb, Klemenchenko, 2018).

The Department of Theory and Methodology of Physical Education of the Educational and Scientific Institute of Health of the National University of Water and Environmental Engineering (NUWEE) held a study to determine the impact of the proposed Pilates exercises on the physical fitness of female students. The study involved 17 second- to fourth-year students who chose the elective discipline “Health Fitness. The Pilates system”. The classes were held twice a week and were built on the basis of the classic Pilates system. The selected exercises are performed based on a special technique and are aimed at developing and strengthening the muscular system, improving the mobility of the joints and spine, improving breathing, and as a result – strengthening the body as a whole.

To determine the level of physical fitness of students, the testing was conducted at the beginning and end of the semester, which allowed to obtain, analyze and compare the main quantitative and qualitative indices of physical fitness of students compared to those at the beginning of the semester.

The level of physical fitness of students was determined by the following test exercises:

- dip up in plank position – shoulder dip, times;
- forearm plank position, seconds;
- trunk bending forward from a sitting position, cm;
- crunch from a supine position to a sitting position, times.

Results

Physical fitness is the result of physical activity, its integral index, because performing physical exercises involves almost all organs and systems of the body, thereby increasing their level of functioning (Krutsevych, Bylychenko, 2012).

At the beginning of the semester, the female students were tested to determine their level of physical fitness; the results of the study are presented in Table 1. The data indicate that the performance of the strength dip up in plank position test in female students at the beginning of the semester is 9.47 ± 0.63 times. The students can perform the forearm plank position exercise an average of 31.23 ± 1.88 seconds. In the flexibility trunk bending forward from a sitting position test, the index is only 6.29 ± 0.76 cm and the strength crunch from a supine position to a sitting position exercise is performed by the students 22.76 ± 1.25 times.

Table 1

Indices of physical fitness of female students at the beginning of the semester

Tests	Average indices $X \pm m$ (n=17)
Dip up in plank position (times)	9.47 ± 0.63
Forearm plank position (sec)	31.23 ± 1.88
Trunk bending forward from a sitting position (cm)	6.29 ± 0.76
Crunch from a supine position to a sitting position (times)	22.76 ± 1.25

Table 2 shows the average indices of physical fitness of female students at the end of the semester. The obtained data indicate an improvement in the results of the test compared to those at the beginning of the semester. The strength dip up in plank position test at the beginning of the semester was performed by female students on average 9.47 ± 0.63 times, at the end of the semester – 13.71 ± 0.56 times. The performance in the forearm plank position exercise has improved from 31.23 ± 1.88 seconds to 56.65 ± 3.83 seconds. The results in flexibility (trunk bending forward from a sitting position) doubled from 6.29 ± 0.76 cm to 12.23 ± 0.69 . At the end of the semester, the students perform strength crunch from a supine position to a sitting position exercise 36.71 ± 1.18 times, at the beginning of the semester this figure was 22.76 ± 1.25 times.

Table 2

Indices of physical fitness of female students at the end of the semester

Tests	Average indices $X \pm m$ (n=17)
Dip up in plank position (times)	13.71 ± 0.56
Forearm plank position (sec)	56.65 ± 3.83
Trunk bending forward from a sitting position (cm)	12.23 ± 0.69
Crunch from a supine position to a sitting position (times)	36.71 ± 1.18

Table 3 shows the indices of physical fitness of female students at the beginning and end of the semester. The obtained results were processed with the use of mathematical statistics methods, comprising: calculation of arithmetic mean (\bar{x}), standard deviation (σ), a standard margin of error of the arithmetic mean (m), and determination of the significance of differences with Student’s T-test.

The obtained test results at re-determination were found to have a significant value ($P < 0.05$) compared with the results at the beginning of the semester.

Table 3

Indices of physical fitness of female students at the beginning and end of the semester

Indices Tests	Average indices (n=17)				
	X	σ	m	t	P
Dip up in plank position (times)	9.47	2.51	0.63	5.04	P<0.05
	13.71	2.23	0.56		
Forearm plank position (sec)	31.23	7.52	1.88	5.95	P<0.05
	56.65	15.32	3.83		
Trunk bending forward from a sitting position (cm)	6.29	3.06	0.76	5.82	P<0.05
	12.23	2.78	0.69		
Crunch from a supine position (times)	22.76	5.01	1.25	8.2	P<0.05
	36.71	4.73	1.18		

Discussion.

Studies of students' physical fitness have been repeatedly dwelled upon by researchers. The researchers have noted the poor health of student youth. About 50 % of students have poor physical fitness (Kanishevskiy, 1999; Tovkun, 2016; Krutsevych, Panhelova, 2016; Grygus, Petruk, 2015; Petruk, 2019). Scientists are actively searching for new ways to improve it through the improvement of physical education in higher education institutions (Platonov, 2006; Krutsevych, 2016).

As experts state, the most promising area of physical education classes organization is to take into account individual interests in the free choice of forms of the sports classes (Hruzhevskiy, 2014; Koriahina, 2018; Sereda et al., 2020). One of the directions of the classes organization is the Pilates system, which aims to develop such physical qualities as strength, flexibility, balance, and coordination skills and promotes the effective functioning of the musculoskeletal, cardiovascular, and lymphatic systems, has a positive effect on mental state and level of physical fitness.

The Pilates system is a set of exercises "conscious" in the process of training. Concentrating attention on each motion detail and conscious muscle control harmonizes mental and physical activity. The body is getting strong and activated, and a person – calm and stable.

The key point of a system lies in the certain poses, breathing and a specific load on those groups of muscles, which are not usually widely used. Conscious activity of small muscles is a key to the efficient practical application of the Pilates system.

Conclusions

To determine the effect of the proposed exercises of the Pilates system on the female students' physical fitness, there has been performed testing at the beginning and end of the semester. The research involved 17 female students of the II-IV years of study, who chose the selective discipline "Health related fitness. Pilates system" for physical exercises. Classes were held twice a week and were structured according to the Pilates system. The research made it possible to obtain, analyze and compare the main quantitative and qualitative indices of the female students' physical fitness.

There were identified and analyzed the data on physical fitness of students who during the semester practiced the classic Pilates system, which involves exercises aimed at developing and strengthening the muscular system, improving joint mobility and spine when improving breathing, and strengthening the body as a whole. When comparing the results of physical fitness of female students at the beginning and end of the semester, the best result is observed for strength exercises: dip up in plank position – from 9.47 ± 0.63 times to 13.71 ± 0.56 times; forearm plank position – from 31.23 ± 1.88 seconds to 56.65 ± 3.83 seconds; crunch from a supine position to a sitting position – from 22.76 ± 1.25 times to 36.71 ± 1.18 times. However, the flexibility trunk bending forward from a sitting position exercise shows double improvement in results – from 6.29 ± 0.76 cm to 12.23 ± 0.69 .

The obtained results testify to significant changes in the indices of testing results at the beginning and end of the semester ($P < 0.05$), and the positive influence of the proposed exercises of the Pilates system on the physical fitness of female students is determined.

Compliance with Ethical Standards

Conflict of Interest. The authors declare that there is no conflict of interest that could be perceived as interfering with the publication of the article.

Competing Interests. The authors declare that they have no competing interests.

Ethical Approval. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent. Informed consent was obtained from all individual participants included in the study. All subjects of the institutional survey gave consent for anonymized data to be used for publication purposes.

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References

- Bielikova N. (2015) Health improvement of students of a special medical group by means of aerobic fitness programs. *Physical education, sports and health culture in modern society. Lutsk: Lesya Ukrainka East European National University. 1 (29)*, 31-35.
- Bosenko A. I., Kholodov S.A., Koval O. H. (2016) Health related fitness for students: Manual. Edited by P.D. Palakhtii. *Kamianets-Podilskyy: Private company «Medobory-2006»*, 88.
- Diachenko-Bohun, M., Hrytsai, N., Grynova, M., Grygus, I., Skaliy, A., Hagner-Derengowska, M., Napierała, M., Muszkieta, R., & Zukow, W. (2020). Historical Retrospective of the Development of Scientific Approaches to Health-Saving Activity in Society. *International Journal of Applied Exercise Physiology*, 9(1), 31-38.
- Dubynska O., Petrenko N. (2016). Modern fitness technologies in the physical education of students: designing, development, specific features: *monograph. Sumy: Publishing house of Sumy State Pedagogical University named after A.S. Makarenko*, 566.
- Grygus, I. M., Petruk, L. A. (2015). Assessment of indices of physical development and functional status of female students of a special medical group. *Journal of Education, Health and Sport. 2015;5(10):158-169.***
- Hordiienko O. I. (2019) The effect of Pilates on the level of physical fitness of students. *Bulletin of Precarpathian University. Series: Physical education. No. 32*, 42-47.
- Hruzhevskiy, V. O. (2014). The expediency of using innovative technologies in the formation of personality-oriented motivation of students to physical education. *Pedagogy, psychology and medical and biological problems of physical education and sports*, 3, 19-24.
- Hrynko, V. M. (2015). Students' attitude to physical education and healthy lifestyle and their self-assessment of the level of physical fitness. *Slobozhanskyi Scientific and Sports Bulletin*, 1 (45), 55-59.
- Kanishevskiy, S. M. (1999). Scientific, methodical and organizational fundamentals of physical self-improvement of students. 270.
- Kashuba V, Tomilina Y, Byshevets N, Khrypko I, Stepanenko O, Grygus I, Smolenska O, Savliuk S. (2020). Impact of Pilates on the Intensity of Pain in the Spine of Women of the First Mature age. *Teoriâ ta Metodika Fizičnogo Vihovannâ*, 20(1), 12-17. <https://doi.org/10.17309/tmfv.2020.102>
- Koriahina, V. M. (2018). Physical education of students. *Lviv Polytechnic*, 494.
- Korkh-Cherba O. V., Sevastianenko L. V. (2016) The essence of application of the Pilates health system in the physical education of students. *Scientific journal of the National Pedagogical University named after M.P. Drahomanov. Edition 3K 1 (70)*, 53-56.
- Korol, S. A. (2014). Rating state of somatic health and physical fitness of students and the course of technical specialties. *Pedagogy, psychology and medical and biological problems of physical education and sports*, 11, 23-29.
- Krutsevych, T., Bylychenko, E. (2012). The attitude of boys and girls to physical education classes in higher education institutions. *Sports Bulletin of the Dnipro region*, 1, 114-119.
- Krutsevych, T., Panhelova, N. (2016). Current trends in the organization of physical education in higher education institutions. *Sports Bulletin of the Dnipro region*, 1, 109-114.
- Larsson H., Karlefors I. (2015). «Physical Education Cultures in Sweden: Fitness, Sports, Dancing ... Learning?» *Sport, Education and Society* 20 (5): 573–587.
- Lavrin, G.Z., Sereda, I.O., Kuczer, T.V., Grygus, I.M., Zukow, W. (2019). The Results of Student's Survey on Models of Physical Education in Universities and Motivations to Encourage for Active Participation in Physical Education. *International Journal of Applied Exercise Physiology*. 8 (2). 140-143.
- Nakonechna, A. (2011). Characteristics of modern variants of the J. Pilates system. *Modern problems of theory and methodology of gymnastics development*, 11, 41-45.
- Panchuk I. V., Panchuk A. P., Kashuba A. A., Kovalskiy V. V., Torchynska N. (2021) Fitness programs for increasing the motor activity of the students: research analysis. Innovation in education. *Collection of scientific papers (Ed.13): T.1*, 173-183.
- Petruk, L. A., Pidhurska, O. P., Pasevych, A. M., Biruk, I. D. (2019). Physical fitness of first-year female students. *Scientific journal of the National Pedagogical University named after M. P. Drahomanov. Series 15: Scientific and Pedagogical Problems of Physical Culture (Physical Culture and Sports)*. 6(114)19, 56-60.

- Pilates, J. H. (2017). *Your health*. 2 ed., 160.
- Pilates, J. H., Miller, W. J. (2014). Return to life through the Contrology, 151.
- Platonov, V. N. (2006). Preserving and strengthening the health of healthy people as a priority of modern health care. *Sports medicine*, 2, 3-14.
- Samokhvalova I. Yu., Meliushkyna V. V., Hryb T. O., Klemenchenko T. H. (2018) Introduction of Pilates exercises into the educational process of physical education of students of a special medical group of the agrarian university [Electronic source]. Actual problems of physical education and sports of different layers of the population: proceedings of the XVIII International Research and Practical Conference of young scientists. Sumy: Publishing house of Sumy State Pedagogical University named after A.S. Makarenko, 125-129.
- Sereda, I., Lavrin, H., Kucher, T., Grygus, I., Muszkieta, R., Napierała, M., Hagner-Derengowska, M., Ostrowska, M., Smoleńska, O., Zukow, W., & Skaliy, A. (2020). The Impact of Yoga Practice on the Development of Flexibility among the Female Student's Pedagogical Specialties in the Process of Physical Training of Higher Educational Institutions. *International Journal of Applied Exercise Physiology*, 9(1), 85-95.
- Synytsia, T. O. (2018a). The impact of a comprehensive program of health aerobics and mental fitness on the level of physical health of women of the first adult age. *Sports Science of Ukraine*, 6(88), 35-39.
- Synytsia, T. O. (2018b). Mental fitness as one of the modern directions of health physical culture. *Actual problems of physical education of different layers of the population*, 227-233.
- Tolmachova, S. Ye., Kuzmenko, N. V., Chekhovska, A. Yu., Zakharova, I. Yu. (2019). Physical education: Aerobics, 151.
- Tovkun, L. P. (2016). Physical readiness of students for physical exercises: current state of the problem. *Young scientist*. 9.1 (36.1), 157-160.
- Yerakova, L. A., Tomilina, Yu. I. (2015). Substantiation of approaches to the construction of Pilates fitness programs for women. *Bulletin of Chernihiv National Pedagogical University. Series: Pedagogical Sciences. Physical Education and Sports*. 129(3), 128-131.