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## Efficiency Of Classes On The Pilates System With Women Of The Second Mature Age.

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### ABSTRACT

32 women at the age of 39-48 years participated in researches. The first six classes were devoted to training in costal respiration and studying of the repertoire of Matwork exercises where 15 exercises of the basic level entered. The women did 15 exercises of the basic level with gradual increase or level lowering of complexity of exercises due to use of a small ball, an elastic tape, an isotonic ring in the subsequent 10 classes. Further modifications of other 19 exercises of the original version of Pilates only towards simplification were used. Roller was used as myofascial relaxation and also for mobilization of cervical, chest and lumbar departments of a backbone. Indicators: respiratory rate, hypoxemic Stange's and Hench's tests improved more than by 20%. At the beginning of the researches body weight of women averaged 74,3kg, at the end of researches this indicator decreased to 69,7. The gain made more than 100% in indicators of spine column mobility, stand in "plank" on hands, "Roll up with bent and direct legs", "Push up from one knee". These improvements have reliability of distinctions,  $p < 0,05$ .

**Keywords:** Pilates, females, training method, respiratory system, motor tests.

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## INTRODUCTION

Physical culture and sport is one of the real, checked by life factors of preservation and promotion of health of the modern woman [1]. The return morphological development of her organism which begins from 30-35 years in total with excessive social load with which modern society allocated the woman leads to her premature aging in every respect [2, 3]. Pilates takes the isolated place in the world modern fitness industry [4, 5]. Combining the mental and physical parties of education of the woman, Pilates is effective mean of improvement of quality of life of the woman [6]. Work of cardiovascular and respiratory systems returns to normal, arterial blood pressure is normalized as a result of classes on the Pilates system [7]. Pilates exercises unload joints, kill pain in the small of the back, increase flexibility of the woman [8, 9]. Important advantage of the Pilates system is that it, first of all, is directed to education of skills of the functional and safe movement, but not to performance of exercise for the sake of exercise [5, 6]. As practical persons note, pleasant effect of such training is an esthetic look – a tightened silhouette, a firm Pilates stomach, relief of external muscles [4, 5, 10]. Scientists and practical persons considerably deepen and extend methodical knowledge of this system, first of all, because of its advantages at skeletal and muscular frustration [9, 12-16]. Thus, Pilates as a special form of recreational and rehabilitation exercises, is the useful tool helping to improve physical fitness at different stages of life and at various physical state of the woman [11]. Pilates and its influence on physical state of women of the second mature age demand deeper studying questions of using exercises.

The purpose of the work began to investigate efficiency of influence of three-month courses of classes on the Pilates system on physical state of women of the second mature age.

Work tasks:

1. To define influence of Pilates exercises on functional state of the system of external breath of women.
2. To investigate change of indicators of development of separate physical qualities of women under the influence of exercises on the Pilates system.

## MATERIAL AND METHODS

**Participants.** 32 women at the age of 39-48 years, employees of scientific library and department of accounts department participated in these researches. Two groups were created: experimental (n=18) and control (n=14). Groups were divided by the random selection and hadn't significant statistical differences.

**Procedure.** Testing of women was held before a course of Pilates classes, after 12 classes and after its end. Pedagogical testing was held for the purpose of determination of the level of development of power abilities and mobility of a spine column of women by the following motive tests: trunk inclination forward from a sitting position, cm; stand in "plank" on hands, s; "the Roll up" with bent legs, number of times; "the Roll up" with direct legs, number of times; "the Push Up" from one knee, number of times. Functional tests were applied to definition of functional state of the system of external breath: vital capacity of lungs (VCL), respiratory rate (RR), Stange's and Hench's test. Body weight and bode length of participants of the experiment were defined from anthropometrical indicators. In this study, to obtain the statistical results, SPSS package was used

**Training method.** 36 classes were held in the experimental group: 3 times per week within three months. Classes lasted 60 min and had traditional structure: the preparatory part of 5-7 min., the main part 50 min., the final part – 3-5 min.

The first six classes were devoted to training in costal respiration and studying of the repertoire of Matwork exercises where 15 exercises of the basic level entered. In the preparatory part attention was paid to costal respiration and removal of axial tension from a spine column, involvement of multi-separate muscles of a back in work. The elastic tape was applied to activation of costal respiration, exercises were carried out in a sitting position and standing. One cycle of breath began from 6 accounts, gradually reaching an inspiration and exhalation into 16 accounts. The teacher kept rhythmical count, from "an inspiration, 2, 3, ... 6; an exhalation, 2, 3, ... 6", etc. till 16. Also exercises with use of Roller for Pilates were carried out for removal of axial tension

from a spine column [17]. In the main part 15 exercises of the basic level of complexity with the number of repetitions from 5 to 8-10 were carried out.

In the subsequent classes the women carried out the same 15 exercises of the basic level with gradual increase or level lowering of complexity due to use of a small ball, an elastic tape, an isotonic ring. Roller for Pilates was used as myofascial relaxation and also for mobilization of cervical, chest and lumbar departments of a backbone.

The women of the control group were engaged in physical culture independently. Classes had incidental character; all-developing exercises were applied generally.

**RESULTS**

Vital capacity of lungs characterizes functions of external breath and the norm is 4,0-3,5l for the investigated by us age contingent. As can be seen in table 1, at the beginning of the researches the indicator of VCL was much lower than the lower bounds of norm. The tendency to improvement was noted after 12 classes. The indicator of external breath authentically improved,  $p < 0,05$  on completion of 36 classes. The gain of this indicator made 22,5%. The result received by us didn't approach the upper bounds of norm.

**Table 1: Dynamics of the studied indicators of functional state of the external breath system of women throughout researches**

Indicators	Norm, lower and upper bounds	At the beginning of the research	After 12 classes	After 36 classes	Growth rate, %*	t*	p
VCL on an inspiration, l	4,0-3,5	2,98±0,16	3,12±0,1	3,65±0,1	22,5	3,5	<0,05
RR/min, times		18,23±1,5	16,5±1,4	14,11±1,	-22,6	2,1	<0,05
Stange's test, s	50 and higher – less than 40	32,7±3,2	38,9±3,1	42,5±1,5	29,9	2,7	<0,05
Hench's test, s	40 and higher – less than 35	19,4±1,8	20,1±1,6	24,8±1,6	27,8	2,2	<0,05
Body length, cm	-	168,4±4,0	168,5±3,9	169,0±3,9	0,3	0,1	>0,05
Body weight, kg	-	74,3±3,9	72,8±3,6	69,7±3,9	-6,2	0,8	>0,05

\* - comparison between indicators at the beginning of the researches and after 36 classes

The initial indicator of respiratory rate of adult women was, on average, 18 times/min. After 12 classes this indicator decreased. By the end of a course of classes this indicator decreased up to 14 times/min. and the relative gain made 22,6%.

The initial indicator of Stange's test, in comparison with norms, is very low. After one month of classes this indicator increased, on average by 6 s. The three-months course of classes led to increase in this indicator till 42,5 s. Improvement of this indicator has reliable character,  $p < 0,05$ . As can be seen in table 1, the test indicator with breath holding on an inspiration exceeded the lower value of norm and began to correspond to an average value of norm. In a percentage ratio the gain by the time of the termination of three-months course of classes made 29,9%.

The indicator of Hench's test received at the beginning of the researches is also very low. On the termination of three-months course of classes this indicator authentically grew,  $p < 0,05$  and the gain made 27,8%. Preceding from data of table 1, it becomes clear that the final indicator of test with breath holding on an exhalation is far from the lower value of norm.

Indicator of body length of women throughout the whole time of carrying out researches didn't change while the indicator of body weight underwent changes. So, body weight of women averaged 74,3kg at the beginning of the researches. After 12 classes weight was lost, but not significantly. At the end of researches the indicator of body weight of women began to equal 69,7kg. It should be noted that the reliability of differences in indicators of decrease in body weight isn't revealed,  $p > 0,05$ .

**Table 2: Dynamics of changes of indicators of development of separate physical qualities of women throughout a course of classes**

Motor tests	At the beginning of the researches	After 12 classes	After 36 classes	t*	p
	$\bar{X} \pm m$				
Trunk inclination forward from a sitting position, cm	3,3±2,7	5,4±2,1	8,7±1,9	1,6	>0,05
Stand in "plank" on hands, s	10,2±1,9	15,2±1,7	30,2±1,2	8,9	<0,01
Roll up with bent legs, time	2,8±0,6	3,5±0,5	7,3±0,7	5,3	<0,01
Roll up with direct legs, time	-	1,5±0,5	3,8±0,4	3,6	<0,05
Push up from knees, times	1,1±0,3	3,1±0,3	6,4±0,4	10,6	<0,01

\* - comparison between indicators at the beginning of the researches and after 36 classes

The mobility indicator of a spine column defined by the test exercise "trunk inclination forward from a sitting position" after 36 classes increased more than by 100% in comparison with the indicator at the beginning of the researches. It should be noted that increase in this indicator hasn't reliable character,  $p > 0,05$ .

We applied one of 34 exercises of the original version of the Pilates system - stand "in plank" on hands for determination of the level of development of power endurance of muscles of the whole body. The analysis of the obtained data confirms rather low level of power endurance at women at the beginning of the researches. After 3 months of classes the indicator considerably increased and the gain made more than 100%. Improvement of the indicator of power endurance has reliable character,  $p < 0,05$ .

Force of muscles of the center, so-called power house, we defined "Roll up with bent and direct legs" by test exercises. As can be seen in table 2, indicators of the test exercise "Roll up with bent legs" at the beginning of classes are rather low, make on average 2-3 times. After 3 months of classes the indicator authentically increased,  $p < 0,05$ , and the gain made more than 100%.

Performance of the test exercise "Roll up with direct legs" is rather difficult element of Pilates. The facilitated option use at the beginning of training – that is the previous exercise "Roll up with bent legs". Also different auxiliary stock is used: a rubber tape, an isotonic ring, a core band, etc. So, at the beginning of the researches any of women couldn't execute this test that speaks about the low level of development of muscles of "center" which enter: direct muscle of a stomach, cross and oblique muscles of a stomach. After 3 months of classes this indicator considerably grew – more than for 100% and this gain of force has reliable character,  $p < 0,05$ .

We received also very low initial indicators when testing force of muscles of a humeral belt, tab. 2. After 3 months of classes this indicator authentically grew,  $p < 0,05$ . In percentage terms this gain made more than 100%.

Considerable changes of indicators weren't noted in the control group of the engaged.

**DISCUSSION**

Pilates is not a whim of fitness, but holistic system (concept of the complete) which not only allows feeling in good physical shape, but also enriches with itself the whole way of life of the woman. Flexibility and balance of body improves at regular practice of Pilates. Classes influence body from a position of good health and youth, except that exercise help to prevent injuries, to get rid in certain cases of them [5; 10].

Women whose professional activity is connected with intellectual tension participated in our researches, takes place in a sitting position in general, with lack of sufficient volume of clean air and considerable interpersonal contact. Time of lunch break often fluctuates, and sometimes it is absent at all. The women showed complaints against the background of the listed features of professional activity before the researches. Complained about: frequent headaches, increased or lowered arterial blood pressure, back pains – as a rule in cervical and lumbosacral departments of a backbone, excess weight, feeling of stiff in the whole body, lack of time for active recreation. Though it is subjective feelings of women, but in the course of classes we paid attention to prevention of these complaints.

All women of the experimental group spoke reduction of the threshold of pain in lumbosacral department of a backbone on the termination of the course of classes. Our data have something in common with results of researches [18, 19, 20, 21, 22, 23, 24, 25] about decrease in pain after classes on the Pilates system.

Headaches became more rare to disturb engaged what also takes place in researches [26].

Considerable attention at classes is paid to breath processes. VCL, RR, Stange's and Hensch's test were used for the assessment of functional state of the system of external breath measurements [7, 27]. Violation of frequency, depth, rhythm of breath is short wind. Short wind can be physiological, for example, at rise on steps and also pathological – at diseases of cardiovascular and respiratory systems. VCL characterizes mainly force of respiratory muscles and elasticity of pulmonary tissue. Indicators of VCL fluctuate and depend on a number of reasons: body lengths, age, sex, weight, thorax size, features of professional activity, duration of physical culture classes. Hypoxemic tests give the assessment of respiratory system state and ability of the internal environment of an organism to be saturated with oxygen.

The considerable gain of indicators of hypoxemic tests can be explained with what in exercises of the Pilates system is featured active breath. Control of breath is exercised on three main aspects: "side breath", "observance of the rhythmic drawing" and "active breath" that makes effective impact on training of respiratory muscles [5, 7]. There are such specific exercises, such as "The Hundred" in which the exhalation becomes not just with effort, but also is faltering that promotes effective saturation of blood oxygen.

Flexibility – one of five main physical qualities of the person, body youth indicator. The purpose on Pilates classes is put to return normal elasticity of muscles and mobility of joints to the person. Hypodynamia, "professional style of sitting" at the computer and in the car, carrying high heels by women are constant satellites of most of modern women. As result – held-down movements, back pains, bad mood, risks of injuries and violations [2, 5, 8]. With age, after 30-35 years, along with deterioration in elasticity of muscles and ligaments, also muscular corset weakens, and it leads to muscular imbalance. Inelastic muscles shortened, therefore, are exposed to big loads that can lead to injuries. Muscular imbalance influences the whole musculoskeletal apparatus – posture changes, back pains appear, changes in work of internals occur, etc., [17].

Leading experts of the Pilates system rather often note that it isn't always possible to lose body weight by means of Pilates exercises. Investigating this fact and having obtained the above-stated data, we share opinion of experts [8, 10] that Pilates classes allow the woman to accept and understand her body, gradually changing it in the desirable direction.

Results of our researches coincide with data [15], advantages of Pilates which produced the evidence as forms of physical exercises at healthy adults, are effective for improvement of flexibility and dynamic balance and moderated for increase in muscular endurance.

## CONCLUSIONS

1. Having analyzed scientific and methodical literature, it is possible to draw a conclusion that irreversible processes of aging of an organism begin at women after 35 years. Pilates exercises are developed with emphasis on development of muscular force, especially on strengthening of deep muscles of a press and a back, improvement of flexibility and mobility in joints. The Pilates program helps development of positive thinking of the woman and with fight against stresses. Pilates teaches conscious control over performance of movements, self-checking, ability to feel the body, cultivates ease and grace.

2. At the beginning of carrying out the research we recorded quite low indicators of the external breath system and according to all motive tests. Any of women couldn't execute the est exercise "Poll up with direct legs".

3. Positive changes of indicators of external breath are observed at classes on the Pilates system. VCL indicator after 36 classes authentically increased by 22,48% in comparison with the indicator at the beginning of classes,  $p < 0,05$ . The indicator of respiratory rate also authentically changed, the gain made 22,5%. Indicators of hypoxemic Stange's and Hench's tests have the gain – 29,9% and 27,8% respectively. Body weight of women averaged 74,3kg at the beginning of the researches, the indicator decreased to 69,7,  $p > 0,05$  at the end of researches. We noted positive changes of results of all motive tests after 36 classes on the Pilates system. The gain made more than 100% in indicators of mobility of a spine column, "Roll up with bent and direct legs", stand in "plank" on hands, "Push up". Indicators of all motive tests grew authentically,  $p < 0,05$ . The exception was made by the test for mobility of a spine column.

4. The efficiency of Pilates classes with women of the second mature age is proved by results of the conducted researches.

#### REFERENCES

- [1] Kashuba V, Ivchatova T. The modern improving technologies which are used in the course of physical education of women of the first mature age. *Youth scientific herald* 2013; 11: 32-37.
- [2] Schastlivtseva IV, Veretennikova AV. Motivation of women to fitness classes. *Modern problems of science and education* 2013; 6:1-7.
- [3] Mytchyk O. Psycho-physiological aspects of physical education of women at mature age. *Physical education, sport and culture of health in modern society* 2012; 1(9): 60-64.
- [4] Lisitskaya T.S. Burkova O.V. Influence of classes on the system of Pilates on physical development and psycho-emotional state of women of middle age. *Theory and practice of physical culture*. 2008; 9: 71-77.
- [5] Pilates, J., Miller W. *Return to life through Pilates Contrology*. K.: Sammit-Kniga, 2014. 151p.
- [6] Patterson E. *Golden rules of Josef Pilates*. Rostov-on-Don: Phoenix, 2006. 224 p.
- [7] Tomilina Yu.I. Influence of Pilates on the respiratory system of women of the first period of mature age. *Physical education, sport and culture of health in modern society. Scientific journal*. 2016; 15 (6): 25-29.
- [8] Tomilina Yu. Features of physical state of women of the first period of mature age who are engaged on the Pilates system. *Young sports science of Ukraine*. 2016; 4: 153-157.
- [9] Royer, L. Pilates can be an effective rehabilitation intervention for low back pain, but better evidence is needed to grow the practice. *Rehabil. Manag. Interdiscip. J. Rehabil.* 2013; 26: 42–46.
- [10] Byrnes, Keira; Wu, Ping-Jung, Whillier, Stephney. Is Pilates an effective rehabilitation tool? A systematic review. *Journal of bodywork and movement therapies*. 2018; 22 (1): 192-202.
- [11] Di Lorenzo, C.E. Pilates: what is It? Should it Be used in rehabilitation?. *Sports Health*. 2011; 3: 352–361.
- [12] Gallagher, S. and Kryzanowska, R. *The Joseph H. Pilates Archive Collection*. Bain Bridge Books, Place, 2000.
- [13] Anderson, B. Fitting pilates into a rehabilitation practice: pilates could be the perfect fitness program to add to your PT practice. *Rehabil. Manag. Interdiscip. J. Rehabil.* 2010; 23: 24–26.
- [14] Dunleavy, K. Pilates fitness continuum: post-rehabilitation and prevention pilates fitness programs. *Rehabil. Manag. Interdiscip. J. Rehabil.* 2010; 23: 10–15.
- [15] Cruz-Ferreira, A., Fernandes, J., Laranjo, L., Bernardo, L.M., and Silva, A. A systematic review of the effects of pilates method of exercise in healthy people. *Arch. Phys. Med. Rehabil.* 2011; 92: 2071–2081.
- [16] Ierakova, L., & Tomilina, Yu. Features of using the system Pilates exercises in improving fitness. *Sports herald of the Dnieper region*. 2011; 2: 5-7.
- [17] Merkel, M., Kozik, Sh. *Pilates. Osteopathic exercises with a roll*. M: Publishing house "E". 2016. 224 p.
- [18] Gagnon, L. *Efficacy of Pilates Exercises as Therapeutic Intervention in Treating Patients with Low Back Pain*. (PhD)University of Tennessee, ; 2005
- [19] Donzelli, S., Di Domenica, E., Cova, A.M., Galletti, R., and Giunta, N. Two different techniques in the rehabilitation treatment of low back pain: a randomized controlled trial. *Europa Medicophysica*. 2006;42: 205–210.
- [20] Gladwell, V., Head, S., Hagggar, M., and Beneke, R. Does a program of Pilates improve chronic non-specific low back pain?. (313pp.) *J. Sport Rehabil.* 2006; 15: 338–350.
- [21] Marshall, P.W.M., Kennedy, S., Brooks, C., and Lonsdale, C. Pilates exercise or stationary cycling for chronic nonspecific low back pain: does it matter? a randomized controlled trial with 6-month follow-up. *Spine*. 2013; 38: E952–E959.

- [22] Miyamoto, G.C., Costa, L.O.P., Galvanin, T., and Cabral, C.M.N. Efficacy of the addition of modified Pilates exercises to a minimal intervention in patients with chronic low back pain: a randomized controlled trial. *Phys. Ther.* 2013; 93: 310–320.
- [23] Anand, A., Caroline, M., Arun, B., and Gomathi, L. A study to analyse the efficacy of modified Pilates based exercises and therapeutic exercises in individuals with chronic non specific low back pain: a randomized controlled trial. *Int. J. Physiother. Res.* 2014; 2: 525–529.
- [24] Lee, C.W., Hyun, J., and Kim, S.G. Influence of Pilates mat and apparatus exercises on pain and balance of businesswomen with chronic low back pain. *J. Phys. Ther. Sci.* 2014 Apr; 26: 475–477.
- [25] Natour, J., Cazotti, LdA., Ribeiro, L.H., Baptista, A.S., and Jones, A. Pilates improves pain, function and quality of life in patients with chronic low back pain: a randomized controlled trial. *Clin. Rehabil.* 2015; 29: 59–68.
- [26] Martins-Meneses, DT., Antunes, HKM., de Oliveira, NRC., and Medeiros, A. Mat Pilates training reduced clinical and ambulatory blood pressure in hypertensive women using antihypertensive medications. *Int. J. Cardiol.* 2015; 179: 262–268.
- [27] Karpman VL. Testing in sports medicine. M.: Physical culture and sport, 1988. 208 p.