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Effect Of Static Exercises With A Deflection On The Tone Of The Skeletal Musculature Of Middle-Aged Women.

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ABSTRACT

An important basis for the effective improvement of the human body and prevention of pathology development are non-medicamentous dosages and, in the first place, physical exercises. In previous numerous studies, their well-being were demonstrated in various pathological conditions. Adjust the effect of physical exercise on the body, ensuring their preventive or rehabilitative effect can be changing the modes of the muscles. The correct dosage of the effect, along with competently chosen exercises, is one of the main factors for the success of the treatment process. Performing the pose "deflection from the supine position with an emphasis on the forearms", made methodically is able to provide a physiological decrease in the tone of skeletal muscles innervated from the cervical and thoracic spine and the increase in the tone of the skeletal muscles innervated from the lumbar spine. Performing the same exercise by inexperienced practitioners who do not pay enough attention to methodological instructions, or those who are unable to perform all the elements of the exercise, does not allow the achievement of the desired balance between the tone of skeletal muscles in various sites of the back.

Keywords: exercises, static load, passive deflections, lying position with an emphasis on the forearms, myofasciography, muscle tone.

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INTRODUCTION

Modern science has long and actively pursues the search for various options for improving the person [1-5]. Traditionally, in the focus of her attention are the conditions that are the cause of frequent disabilities and premature death [6,7]. These include, first of all, cardiovascular diseases [8-10]. For this reason, a great deal of research has been devoted to their treatment and prevention [11-13], which have achieved certain successes [14,15] and allowed modern science to take a step forward [16,17]. Given that in recent years, various pathologies are increasingly affecting the most able-bodied part of the population - middle-aged people [18, 19], studies are increasingly devoted to various aspects of their physiology, as well as the treatment and prevention of any dysfunction in them [20,21].

Despite very great success in pharmacotherapy, which has shown the possibility of positively affecting the condition of patients in almost all pathological conditions [22,23], their ability to develop the pathology itself and prevent its complications is rather modest [24,25]. It becomes clear that the basis for effective recovery of the human body, especially in middle age and minimizing the risk of pathology, are non-drug effects [26,27,28] and, first of all, physical exercise [29,30]. They have shown themselves to be an important "competitor" of pharmacotherapy and as an effective remedy for various disease states [34-36].

It is recognized that physical exercises, being the basis of preventive or rehabilitation sessions of physical fitness, can be performed under various modes of muscle work [37,38]. A dynamic mode is well developed, when the exercises performed are the main means of affecting the musculoskeletal system in many rehabilitation programs of kinesitherapy [39, 40]. In this case, the correct dosage of exposure and proper selection of exercises are key to the success of the treatment process [41,42]. Static dynamic regimen is also actively used, which also, when properly performed, powerfully trains working muscles and stimulates metabolic processes [43]. Of great importance for recovery is also the static regime. In this case, the exercises are very active [44].

At the same time, static exercises have the greatest health potential. These exercises, motionless externally, "internally" consist of a constant static tension of the set of working muscles [45]. At the same time to track the work of each muscle, determine the strength of the tension and the demand for work in this particular position, sometimes it is very difficult. In this connection, it is of particular scientific interest to elucidate the dynamics, tone of the skeletal musculature in regularly performing static exercises. Given that it is more conscientious in the implementation of the recommendations to the exercise of a woman, it was rational to examine a female group performing static exercises.

Objective: to investigate the influence of static exercises with deflection on the tone of skeletal musculature in middle-aged women.

MATERIALS AND METHODS

The study was approved by the local ethics committee of the Podolsky Sports and Social Institute on September 12, 2015 (protocol No. 9). The work was carried out on the basis of the training center of additional professional education "Methods and practice of yoga". A control group (7 people) and an experimental group (8 people) were formed. The control group included women aged 30-40 years with a yoga experience of less than 3 months. The experimental group included women aged 30-40 years with more than 2-3 years of yoga experience. In the control and experimental groups of measuring the tone of skeletal muscles using the method of myofasciography (patent for invention No. 2424766 "Method for diagnosing the functional state of the muscles of the segments of the spine") were performed twice: at rest (from sitting on a chair, hands on knees) and, the performance of the posture. The applied technique allows to determine the functional state of muscles (including paravertebral musculature), which are innervated by all parts of the spinal cord. The technique is based on the classical conception of the segmental principle of muscle innervation, which makes it possible to quantitatively determine the segmental functional state of myotomic derivatives of the muscle corset of a human. As a test exercise, a pose was considered, representing a deflection back from the position of lying on the abdomen with support on the forearm (Figure 1)

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Figure 1. Deflection from a supine position with support on the forearm

In the yoga tradition, this exercise is called "Ardha bhujangasana" [46]. The main goal of the posture is to stretch the spine in the cervical and thoracic areas. For correct execution it is possible to use special devices (plastic blocks and belts), which prevent the elbows from growing to the sides. Methodical instructions for the execution of the posture: pushing the tightly pressed palms and forearms from the floor, turning the shoulders from the inside out, pull the spine forward and upward. The top of the head stretches to the ceiling, forming a smooth curve line with the body. The muscles of the back are relaxed, the pelvis is tightly pressed to the floor, the exercise is performed, mainly by working with hands [47]. The results are processed by the method of mathematical statistics.

RESULTS OF INVESTIGATION AND DISCUSSION

The results of the study in the control group, expressed in conventional units, characterizing the tone of the skeletal muscles innervated by all parts of the spinal cord, were processed by mathematical statistics using the T Wilcoxon test. The result of treatment is presented in the tables: 1 (cervical), 2 (thoracic), 3 (lumbar), 4 (sacral department).

Table 1. Cervical spine in the control group

Neck section of II - IV vertebrae. Control group.					
Member	before	after	shift	absolute value	rank
1	2,60	21,60	19,00	19,00	6
2	-8,10	5,20	13,30	13,30	4
3	-1,90	9,90	11,80	11,80	2
4	9,70	29,40	19,70	19,70	7
5	-33,00	-42,30	-9,30	9,30	1
6	-43,00	-57,70	-14,70	14,70	5
7	-2,10	10,80	12,90	12,90	3

A non-typical shift is a decrease in the value (highlighted in blue). The sum of the ranks of the atypical shift 6. In the analysis using the method of mathematical statistics using the T Wilcoxon test, it is possible to make the following assumption: since Tamp> 0.05, we accept the hypothesis But about the presence of similarity: the intensity of shifts in the typical direction does not exceed the intensity of shifts in the atypical direction.

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Table 2. Status of the thoracic region in the control group

Thoracic III - VII vertebrae. Control group.					
Member	before	after	shift	absolute value	rank
1	-21,30	-2,20	19,10	19,10	5
2	-8,50	-2,10	6,40	6,40	1
3	-21,60	0,40	22,00	22,00	6
4	12,50	50,60	38,10	38,10	7
5	3,40	-8,90	-12,30	12,30	3
6	-27,70	-46,40	-18,70	18,70	4
7	6,60	17,90	11,30	11,30	2

Atypical shift - decrease in value (highlighted in blue). The sum of the ranks of the atypical shift 7. When analyzing by the method of mathematical statistics using the T Wilcoxon test, it is possible to make the following assumption: since Tamp> 0.05, we accept the hypothesis But about the presence of similarity: the intensity of shifts in the typical direction does not exceed the intensity of shifts in the atypical direction.

Table 3. The condition of the lumbar region in the control group

Lumbar department. Control group.					
Member	before	after	shift	absolute value	rank
1	-14,10	-22,00	-7,90	7,90	4
2	-15,00	-1,80	13,20	13,20	7
3	-9,00	-4,20	4,80	4,80	2
4	-10,20	-20,40	-10,20	10,20	6
5	-2,70	5,70	8,40	8,40	5
6	-1,60	5,00	6,60	6,60	3
7	-12,70	-10,30	2,40	2,40	1

Atypical shift - decrease in value (highlighted in blue). The sum of the ranks of the atypical shift 10. When analyzing by the method of mathematical statistics using the T Wilcoxon test, it is possible to make the following assumption: since Tamp> 0.05, we accept the hypothesis But about the presence of similarity: the intensity of shifts in the typical direction does not exceed the intensity of shifts in the atypical direction.

Table 4. The condition of the sacral department in the control group

Sacrum department. Control group.					
Member	before	after	shift	absolute value	rank
1	-27,50	-42,10	-14,60	14,60	7
2	-15,10	-23,80	-8,70	8,70	4
3	-20,20	-19,70	0,50	0,50	1
4	-39,20	-26,80	12,40	12,40	6
5	5,20	4,50	-0,70	0,70	2
6	2,30	-6,00	-8,30	8,30	3
7	-3,30	-13,40	-10,10	10,10	5

Atypical shift - increase in value (highlighted in blue). The sum of the ranks of the atypical shift 7. When analyzing by the method of mathematical statistics using the T Wilcoxon test, it is possible to make the

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following assumption: since Tamp> 0.05, we accept the hypothesis But about the presence of similarity: the intensity of shifts in the typical direction does not exceed the intensity of shifts in the atypical direction.

The results of the experiment in EG, expressed in conventional units, characterizing the tone of the skeletal musculature innervated by all parts of the spinal cord, are processed by mathematical statistics using the Wilcoxon T test. The result of treatment is presented in the tables: 5 (cervical), 6 (thoracic), 7 (lumbar), 8 (sacral department).

The dark line of the graph is the tone of the skeletal musculature at rest, the light one at the moment of the posture. There is a decrease in the tone of the skeletal musculature innervated from the cervical and thoracic parts of the vertebral column.

Table 5. Cervical spine in the experimental group

Cervical section II - IV vertebrae. Experimental group.					
Member	before	after	shift	absolute value	rank
1	10,30	-14,30	-24,60	24,60	7
2	1,30	-19,20	-20,50	20,50	5
3	8,40	-10,80	-19,20	19,20	3
4	-0,60	-0,90	-0,30	0,30	1
5	-0,60	-22,70	-22,10	22,10	6
6	21,20	-18,40	-39,60	39,60	8
7	-21,30	-31,50	-10,20	10,20	2
8	-7,00	12,40	19,40	19,40	4

Atypical shift - increase in value (highlighted in blue). The sum of the ranks of the atypical shift 4. When analyzing by mathematical statistics using the T Wilcoxon test, it is possible to make the following assumption: since 0.05> Tamp> 0.01, we accept hypothesis H1 about the presence of a difference: the shear intensity in the typical direction exceeds the intensity of shifts in the atypical direction by confidence level of 5%.

Table 6. Status of the thoracic department in the experimental group

Thoracic III-VII vertebrae. Experimental group.					
Member	before	after	shift	absolute value	rank
1	8,30	3,10	-5,20	5,20	2
2	-25,70	-21,10	4,60	4,60	1
3	-3,10	-15,80	-12,70	12,70	5
4	7,50	-2,80	-10,30	10,30	3
5	7,50	-25,20	-32,70	32,70	8
6	9,90	-7,20	-17,10	17,10	6
7	-4,80	-24,20	-19,40	19,40	7
8	-6,70	4,90	11,60	11,60	4

Atypical shift - increase in value (highlighted in blue). The sum of the ranks of the atypical shift 5. When analyzing by mathematical statistics using the T Wilcoxon test, it is possible to make the following assumption: since 0.05> Tamp> 0.01, we accept hypothesis H1 about the presence of a difference: the shear intensity in the typical direction exceeds the intensity of shifts in the atypical direction by confidence level of 5%.

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Table 7. The condition of the lumbar spine in the experimental group

Lumbar department. Experimental group.					
Member	before	after	shift	absolute value	rank
1	-12,30	-18,20	-5,90	5,90	4
2	-11,50	-5,50	6,00	6,00	5
3	-5,40	0,40	5,80	5,80	3
4	-19,30	-16,40	2,90	2,90	2
5	-19,30	-0,80	18,50	18,50	8
6	-24,70	-15,30	9,40	9,40	6
7	-5,50	6,10	11,60	11,60	7
8	-8,60	-6,40	2,20	2,20	1

Atypical shift - decrease in value (highlighted in blue). The sum of the ranks of the atypical shift 4. When analyzing by mathematical statistics using the T Wilcoxon test, it is possible to make the following assumption: since 0.05> Tamp> 0.01, we accept hypothesis H1 about the presence of a difference: the shear intensity in the typical direction exceeds the intensity of shifts in the atypical direction by confidence level of 5%.

Table 8. The condition of the sacral department in the experimental group

Sacrum department. Experimental group.					
Member	before	after	shift	absolute value	rank
1	4,50	-10,90	-15,40	15,40	7
2	-17,70	-28,40	-10,70	10,70	3
3	-23,90	-17,10	6,80	6,80	2
4	-24,50	-11,00	13,50	13,50	4
5	-24,50	5,30	29,80	29,80	8
6	-22,40	-7,20	15,20	15,20	6
7	-15,70	-1,10	14,60	14,60	5
8	-21,70	-19,50	2,20	2,20	1

A non-typical shift is a decrease in the value (highlighted in blue). The sum of the ranks of the atypical shift 10. When analyzing by the method of mathematical statistics using the T Wilcoxon test, it is possible to make the following assumption: since Tamp> 0.05, we accept the hypothesis But about the presence of similarity: the intensity of shifts in the typical direction does not exceed the intensity of shifts in the atypical direction.

There is information about the potential danger of exercises with deflections [48]. Indeed, deflections lead to an increase in the compression forces acting on the intervertebral discs, which, with the existing lesions of the fibers of the fibrous ring, can provoke the formation of an intervertebral hernia. However, the complete exclusion of deflections from the arsenal of exercises of medical and recreational physical training is not absolutely correct decision. It is known that the total volume of flexion of the spinal column is about 110 °, the extension is 140 °, i.e. the total amplitude of motion is approximately 250 ° [49]. Do not use the movement of the spine in its entirety, leading to the atrophy of non-functioning muscle fibers of the paravertebral musculature. Atrophy of the muscles contributes to the violation of hemodynamics, resulting in a disruption in the nutrition of the intervertebral disc, dystrophy and, as a consequence, the defeat of the entire vertebral-motor segment [50].

A reasonable way out of this situation will be the qualitative performance of deflections according to the correct methodological instructions excluding the possibility of injury. The main task of the exercise is to

stretch the spine, which implies a reduction in the compression effect on the vertebral-motor segment, straightening (smoothing) the cervical and thoracic bends of the spinal column, reducing the tone of paravertebral muscles in the above sections of the spine. Only methodically correctly performed exercise can be the basis for the prevention of diseases of the musculoskeletal system.

CONCLUSION

The exercise "deflection from a supine position with an emphasis on the forearm", performed by experienced practitioners with the implementation of all methodological recommendations, with a confidence level of 5% leads to a decrease in the tone of skeletal muscles innervated from the cervical and thoracic spine and an increase in the tone of the skeletal Musculature innervated from the lumbar spine. Performing the same exercise by inexperienced practitioners who do not pay enough attention to methodological instructions or who are unable to perform certain elements of the exercise because of their inexperience or unpreparedness does not allow to achieve a physiological change in the tone of skeletal muscles innervated from all parts of the spinal column.

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