

NATIONAL SPORTS ACADEMY "VASIL LEVSKY"  
DEPARTMENT OF "SPORTS MEDICINE"



**Elena Zheleva**

**THE ROLE OF KINESITHERAPY IN IMPROVING THE  
QUALITY OF LIFE OF WOMEN WITH POSTURAL  
CERVICOTHORACIC PAIN SYNDROME**

**A U T O R E F E R A T**

of a dissertation  
for awarding the educational and scientific degree "Doctor"

Scientific supervisor: **Prof. Dr. Diana Dimitrova, Doctor**

Sofia, 2023

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**ABSTRACT**

of a dissertation for awarding the educational and scientific degree  
"Doctor" in the field of higher education 7. Health care and sports, professional  
direction 7.4. public health,  
scientific Kinesitherapy specialty

Scientific supervisor: **Prof. Dr. Diana Dimitrova, Doctor**

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Prof. Nikolay Emilov Popov, DSc

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The dissertation contains 163 pages. Illustrated with 35 tables, 95 figures, 4 appendices, and a scheme. The bibliography includes 178 literary sources, of which 61 by Bulgarian authors and 117 by foreign authors. The defense materials are available in the library of the Vasil Levski NSA and are published on the website of NSA „Vasil Levski“ - [www.nsa.bg](http://www.nsa.bg).

The official defense of the dissertation work will take place on 28.11.2023. from 2 p.m. in Hall A3 of the Vasil Levski National Sports Academy, Studentski Grad, Sofia, at a meeting of the scientific jury.

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## ABBREVIATIONS USED

**FMS** - Fibromyalgia Syndrome  
**GH** - General Health (General Health)  
**HRQOL** - Quality of Life (QOL) and Health-Related Quality of Life  
**MDT** - Mechanical Diagnosis and Therapy  
**MH** - Mental Health (Mental Health)  
**PF** - Physical Functioning  
**PRT** - Positional Release Techniques  
**QOL** - Quality of life  
**RE** - Role-Emotional  
**RP** - Role-Physical Functioning  
**SF** - Social Functioning  
**SF-36** - Short Form-36 Health Survey Questionnaire  
**TENS** - Transcutaneous Electrical Nerve Stimulation  
**VT** - Vitality  
**VAS** - Visual Analogue Scale  
**BP** - Intensity of pain (Bodily pain)  
**ADL** - Activities of daily living  
**SP** - Starting position  
**IPJ** – interphalangeal joints  
**QL** - Quality of life  
**KT** - Kinesitherapy  
**MBAL** - General hospital for active treatment  
**MET** - Muscle Energy Techniques  
**NMT** - Neuromuscular Techniques  
**PIR** - Post-isometric relaxation  
**SSE** - Static Strength Endurance  
**DSE** - Dynamic Strength Endurance  
**CNS** - Central Nervous System

Note: The numbers of the tables and figures correspond to the same ones in the dissertation work.

## **1. INTRODUCTION**

Postural pain syndrome is a common problem nowadays, especially in the cervicothoracic region. It is associated with posture disorders, as a result of which painful symptoms appear, which creates discomfort for the person.

Women, due to anatomical and functional features of the female organism, are prone to problems in the cervicothoracic region to a greater extent than men.

Timely and adequate treatment, including kinesitherapy, can prevent or minimize subsequent complications related to disability and loss of workability. Kinesitherapy is of great importance for reducing and eliminating symptoms, respectively improving the quality of life.

People with difficulties in daily life due to various pain syndromes are a major medico-social problem, requiring persistence in allocating time and resources to overcome it. Early diagnosis enables timely treatment, which is complex (medication, physical therapy, kinesitherapy). Kinesitherapy plays an important role in normalizing movements in the cervical region of the spine and balancing muscle tone. Various methods and approaches are used to optimize the treatment and recovery process of people with postural disorders.

Studies on increasing the effectiveness of treatment approaches are useful for kinesitherapy practice because the social significance of the problem is enormous. Therapeutic programs are different and specific. In our methodology, we focus on influencing the overall condition of the body, considering that this way the effect we achieve is greater and longer-term.

## **2. CONCLUSIONS FROM THE LITERATURE REVIEW**

In connection with the topic, 178 sources were examined and finally selected - sections of textbooks and manuals, dissertations, literature reviews, articles, reports, and summaries, based on which the following conclusions can be drawn:

1. Postural pain syndrome is a common problem nowadays, especially in the cervicothoracic region. It is associated with posture disorders, as a result of which painful symptoms appear, which creates discomfort for the person. Patients experiencing difficulties in their daily life as a result of these pain syndromes are a huge medico-social problem.
2. In the studied literary sources, there are different definitions regarding the posture of the person and the way of research. Normal posture is called the usual posture during rest and movement. From a morphological point of view, posture is determined by the shape of the spine and chest, the position of the head, the angle of the pelvis, and the condition of the limbs. At the same time, from a physiological point of view, posture is a motor habit that is developed gradually throughout childhood and adolescence depending on the lifestyle. In other words, the posture depends on the correct anatomical bone and connective structure of the spine, chest, shoulder girdle, and lower limbs, as well as the normal function of the muscles around the spine, abdominal muscles, plus the developed motor habit.
3. Balance between antagonistic muscle groups is mandatory for normal posture. A lack of balance between antagonistic muscle groups can lead to improper loading of the skeleton, lower limb joints, pelvis, shoulder girdle, and spine.
4. The load on the cervical lobe depends a lot on the posture. The load is the least in a neutral position with a retracted head position. Muscle imbalance can cause protracheal head posture, which is one of the most common postural deformities.
5. The main causes of chronic neck pain are six: nerve disturbances, ischemia, trigger points, biomechanical dysfunctions, trophic factors, and emotional state.
6. There are many reasons that can lead to pathological changes in posture. Some of them are functional and some are structural.

7. Kinesitherapy plays a major role in the treatment of postural disorders. Many authors recommend its regular application, combined with an individual approach, which leads to a permanent reduction of pain and other subjective complaints, as well as to the improvement of the patients' overall functional condition, and hence their quality of life.
8. Taking into account the biomechanical and physiological characteristics of the muscles of the cervical spine, isometric exercises are considered the most suitable for restoring the stabilizing function of the deep muscles, because these muscles carry small loads for a long time and control fine movements. In the later stages of recovery, it is necessary to combine isometric exercises with dynamic movements and complex motor activities.
9. Any sore spot found during a soft tissue assessment can be treated with positional release, knowing what strain is causing it and whether the problem is acute or chronic. The application of mobilizing massage and NMT for somatic dysfunctions in the cervicothoracic region of the spine is an excellent means of pain relief and functional recovery.
10. Conventional routine methods such as physical examination, radiological and laboratory tests may fail to describe the multidimensional problems associated with chronic diseases, including chronic musculoskeletal pain conditions. This necessitates additional information beyond that offered by conventional medical and clinical assessment methods.



### 3. STUDY DESIGN

#### 3.1. WORKING HYPOTHESIS

Given the great social importance of the problem, it is important to develop and test different methods related to the overall impact on the patient's body, including the muscle chains, which have a large role in maintaining the posture of the body. By including these exercises, we aim to fully tone the patient, by generally improving blood and lymph circulation, supplying the tissues and brain with more oxygen, and releasing hormones that reduce stress and tension.

Based on the importance of the problem, as well as on the basis of the studied literature and our own experience in this field, we formulated the following working hypothesis:

*The development and implementation of a science-based, specialized kinesitherapy program involving myofascial and soft tissue mobilization techniques combined with special muscle chain exercises in women with postural cervicothoracic pain syndrome suggest a reduction in symptoms that would significantly improve their quality of life.*

### 3.2 . OBJECTIVE OF THE DISSERTATION

The dissertation aims to investigate the effectiveness of 2 experimental kinesitherapy programs for the treatment of women with postural pain syndrome in the cervicothoracic region and to identify some objective factors that influence the pain symptoms and the quality of life of the subjects.

### 3.3. DISSERTATION TASKS

To achieve the thus formulated goal, the following tasks were set:

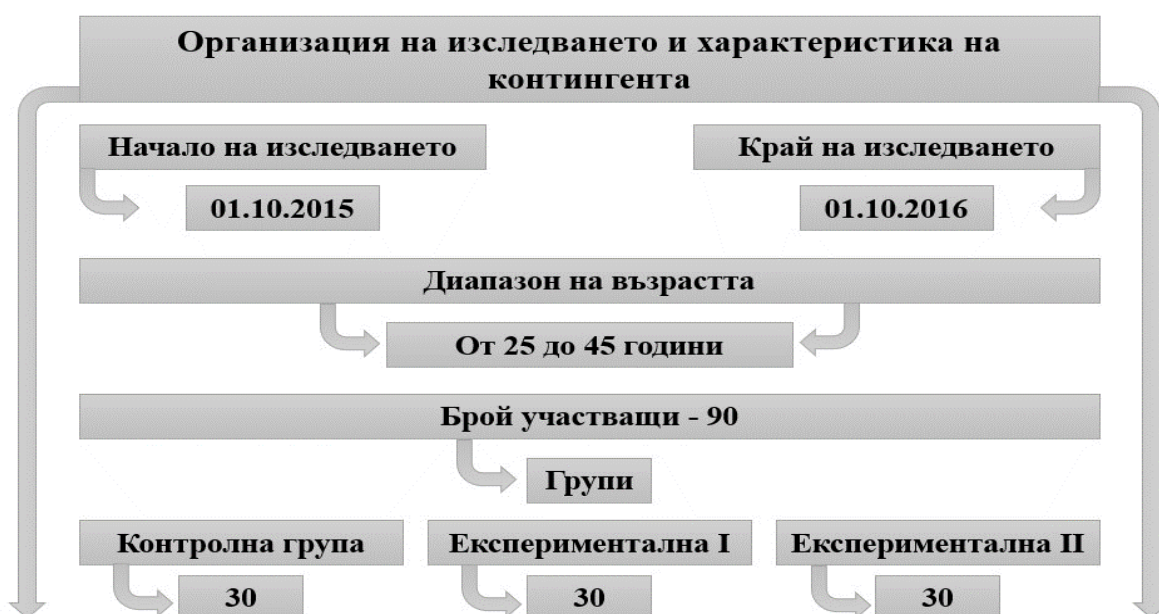
1. To develop two experimental methods, including modern kinesitherapeutic means to overcome postural pain syndrome in the cervicothoracic region.
2. To compare the effectiveness of the standard and experimental kinesitherapy programs in terms of some objectively measurable functional indicators - the active volume of movements, static muscle hypertonus, dynamic strength endurance, and static strength endurance.
3. To evaluate and compare the effectiveness of the two experimental methods with that of the conventional method in relation to some indicators of a subjective nature - pain intensity and quality of life.
4. To compare the two experimental methods in terms of the subjective and objective indicators studied.
5. To assess the impact of the studied objective indicators on pain symptoms and quality of life.

### 3.4 . ORGANIZATION OF THE RESEARCH AND CHARACTERISTICS OF THE CONTINGENT

The study was conducted in the period 01.10.2015 - 01.10.2016 in the First Medical School Sofia.

The study included a total of 90 women from 25 to 45 years of age. They were divided into three groups of 30 women, one control and two experimental. The author's methodology was applied for three weeks to E1 and E2, and for the individuals from the control group, a routine methodology was applied.

**Scheme 1**



All patients were assigned procedures with preformed physical factors (PFF): ultrasound, magnet, infrared, and interference current, and these procedures were assigned by a doctor of physical medicine.

In addition to the PFF procedures, we applied to the women of the control group, classical therapeutic gymnastics /standard general developing exercises, exercises to strengthen the paravertebral muscles, the muscles around the shoulder blades, and breathing exercises/.

To all women in the two experimental groups, in addition to the above-mentioned procedures with PFF, we applied the **author's methodology including: therapeutic massage, manual therapy, and specialized gymnastics for the cervicothoracic region.**

**In the second experimental group, we added specialized training for the muscle chains two to three times a week to the author's methodology.**

The average age of the subjects was 36 years. Their complaints and functional status are similar ( pain, impaired quality of life, muscle imbalance, limited range of motion). The results are reported at the beginning and the end of the therapeutic course.

#### **4. DIAGNOSTIC METHODS USED IN THE STUDY**

##### **Subjective Indicators**

1. Pain (intensity);
  - Visual Analogue Scale (VAS);
2. Health status
  - SF-36 Standardized Test ( John, E., Ware, Jr., 2000).

##### **Objective indicators**

1. Active volume of movement in the cervical region of the spine (measured with a tape measure in centimeters);
2. The muscle tone of neck, chest, and back muscles (digital scale according to Krajčiková, L., 2000);
3. Dynamic power endurance (6-point scale according to Krajčiková, L., 2000);
4. Static strength endurance (hold to failure in seconds).

## **5. AUTHOR METHODOLOGY OF KINESITHERAPY**

### **5.1. PURPOSE AND OBJECTIVES OF APPLIED KINESITHERAPY**

**The goal of kinesitherapy** is to restore the functional capabilities of the musculoskeletal apparatus in the cervicothoracic region.

**The tasks are:**

1. To reduce pain symptoms and overcome subjective discomfort.
2. To normalize muscle tone.
3. To improve the mobility of the spine.
4. To reduce the muscle imbalance in order to overcome the upper cross syndrome.
5. To train the patients in correct posture and performance of DEJ, as well as in performance of a complex of exercises to maintain normal muscle tone and optimal mobility in the cervico-thoracic region.
6. To give explanations to the sick about the risk factors and EDJ.

### **5.2. MEANS OF APPLIED KINESITHERAPY**

1. Healing massage
2. Myofascial release techniques
3. Soft tissue mobilization techniques
4. Positional Release Techniques (PRT)
5. Post-isometric relaxation (PIR)
6. Specialized gymnastics
7. Specialized training for the muscle chains for the female patients of the second experimental group.

## 6. RESULTS AND ANALYSIS

*We present the results of the conducted survey according to the indicators selected by us.*

### **Objective indicators:**

1. Active volume of movement in the cervical spine in cm.
2. Tone of the neck, back, and chest muscles / m. trapezius - pars descendens, m. levator scapulae, m. sternocleidomastoid, m. pectoralis major, mm scaleni/ /according to the scale of Krajčiková L., 2000/.
3. Dynamic power endurance/ according to Krajčiková L., 2000/.
4. Static strength endurance

### **Subjective indicators:**

1. Intensity on the pain \_ visual-analog scale /
2. Healthy status / Standardized test SF-36/

*The dynamics of the results regarding **the joint mobility** in the cervical spine in the sagittal plane show an influence in both experimental groups, more significantly in the patients of the second experimental group. We believe that this is due to the applied soft-tissue mobilizations in the cervical region and the active exercises for independent performance.*

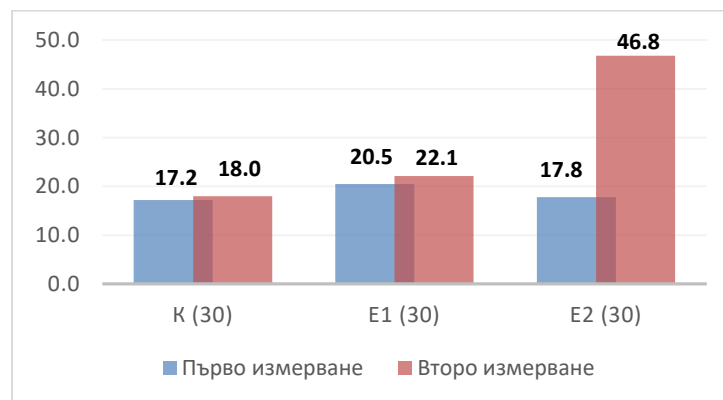
*Regarding **muscle tone**, except for m.pectoralis major (control group), all other measurements by group confirmed a significant difference in the results for the second versus the first measurement. In all three groups for m.sternocleidomastoideus, the strength of this dynamic is the same. In all other examined muscles, E2 was confirmed as the group where the dynamics were most pronounced, followed by E1 and the control group. We believe that **the techniques that influence the regulation of muscle tone are directly related to these results, namely myofascial release techniques, massage, as well as positional release techniques, and PIR.***

***Results regarding the impact of the author's methodology on muscle endurance.***

Data on ***dynamic strength endurance*** of various muscle groups are presented in Tables 14-19 and Figures 75-80. *In all the examined muscles and for all groups, a statistically significant increase in indicators was confirmed in the second measurement compared to the first. We attribute these results to the specialized exercises for the muscle chains. Except for the lateral trunk muscles, the increase in E2 was significantly stronger than the other two (for the control and E1). In the case of the lateral chain muscles of the trunk, three significantly different groups are formed according to the manifested increase - E2 in the first place, followed by E1 and the control in the last place.*

**Table 14.** Dynamic strength endurance of trunk extensor muscles

Measurement	Group (n)	Average arithmetic	Standard deviation	Statistical credibility (p)		
				p1	p2	p2 (comparison)
First	K (30)	17.2	6.9			
	E1 (30)	20.5	9.0			
	E2 (30)	17.8	6.5			
Second	K (30)	18.0	6.7	0.0497	0.6951	K versus E1
	E1 (30)	22.1	9.8	0.0010	0.0000	K versus E2
	E2 (30)	46.8	14.7	0.0000	0.0000	E1 versus E2

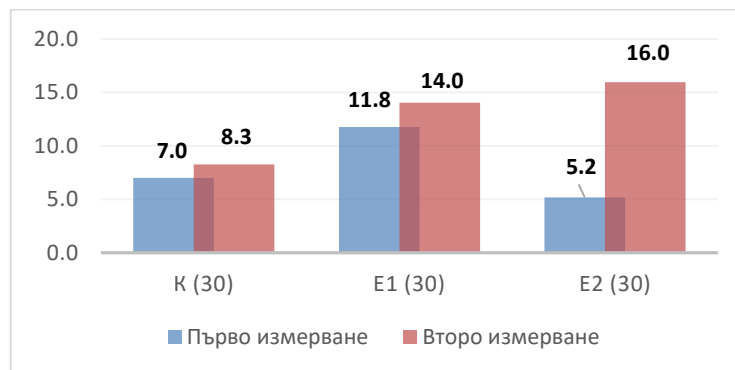


**Fig. 75.** Dynamic strength endurance of trunk extensor muscles

The results for the DSE of the **trunk flexor muscles are similar**, although at other levels and with slightly greater dynamics in the control group and E1 - table 15, figure 76. A significant increase is confirmed (second vs. first measurement for all three groups). It is strongest in E2, the difference in growth between E1 and the control group is not significant, i.e. they appear, secondly, weaker than the E2 level of magnification.

**Table 15.** Dynamic strength endurance of trunk flexor muscles

Measurement	Group (n)	Average arithmetic	Standard deviation	Statistical credibility (r)		
				p1	p2	p2 (comparison )
First	K (30)	7.0	4.8			
	E1 (30)	11.8	8.2			
	E2 (30)	5.2	3.6			
Second	K (30)	8.3	4.7	0.0000	0.2091	K versus E1
	E1 (30)	14.0	7.8	0.0005	0.0000	K versus E2
	E2 (30)	16.0	7.1	0.0000	0.0000	E1 versus E2



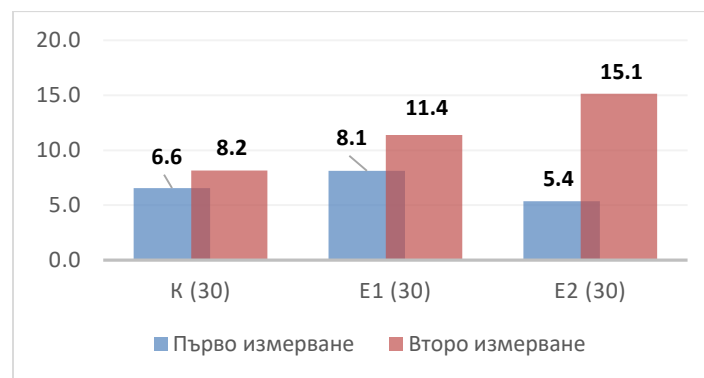
**Fig. 76 .** Dynamic strength endurance of trunk flexor muscles

The DSE results for **the lateral trunk muscles (left and right lateral muscle chain)** can be seen in Tables 16,17 and Figures 77 and 78 below. A significant increase in the reported values for the second measurement was observed in all three studied groups. This increase, in strength, was also significantly different for the three groups – it was strongest for E2, E1 followed in strength, and for the control group, it was the least pronounced (however significant).

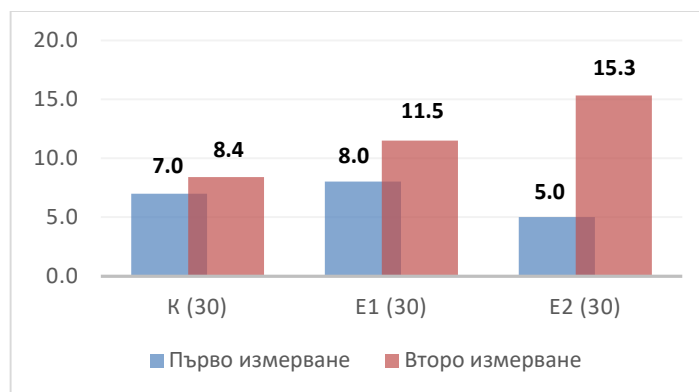


**Table 16.** Dynamic strength endurance of the left lateral muscle chain

Measurement	Group (n)	Average arithmetic	Standard deviation	Statistical credibility (p)		
				p1	p2	p2 (comparison)
First	K (30)	6.6	4.3			
	E1 (30)	8.1	5.7			
	E2 (30)	5.4	3.4			
Second	K (30)	8.2	4.5	0.0000	0.0194	K versus E1
	E1 (30)	11.4	6.4	0.0000	0.0000	K versus E2
	E2 (30)	15.1	6.4	0.0000	0.0000	E1 versus E2

**Fig. 77 .** Dynamic strength endurance of the left lateral muscle chain**Table 17.** Dynamic strength endurance of the right lateral muscle chain

Measurement	Group (n)	Average arithmetic	Standard deviation	Statistical credibility (p)		
				p1	p2	p2 (comparison)
First	K (30)	7.0	4.5			
	E1 (30)	8.0	5.8			
	E2 (30)	5.0	3.8			
Second	K (30)	8.4	4.6	0.0000	0.0021	K versus E1
	E1 (30)	11.5	6.4	0.0000	0.0000	K versus E2
	E2 (30)	15.3	6.5	0.0000	0.0000	E1 versus E2

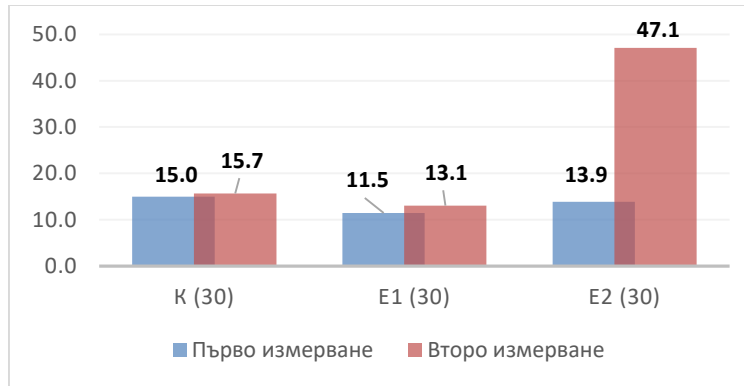


**Fig. 78.** Dynamic strength endurance of the right lateral muscle chain

DSI of left and **right m. gluteus** is presented in tables 18, 19 and figures 79, 80. The results (left, right) are analogous and with similar absolute values. Statistically significant increases at the second measurement were confirmed for all three groups. The difference in the strength of this change between the control group and E1 was insignificant. E2 is manifested, with the group where the strongest increase is observed showing significant differences from the other two.

**Table 18.** Dynamic strength endurance of left m. gluteus

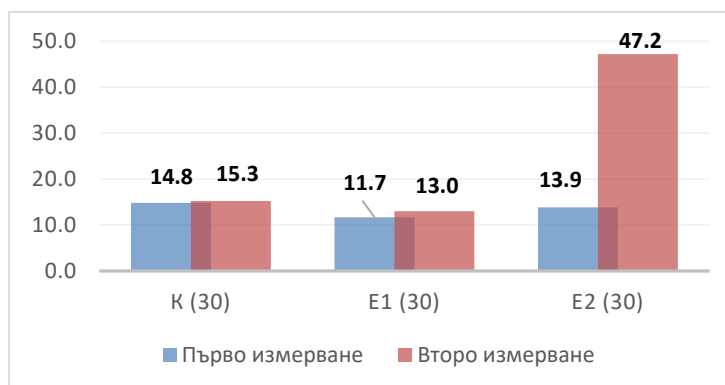
Measurement	Group (n)	Average arithmetic	Standard deviation	Statistical credibility (p)		
				p1	p2	p2 (comparison )
First	K (30)	15.0	6.8			
	E1 (30)	11.5	6.6			
	E2 (30)	13.9	7.1			
Second	K (30)	15.7	6.7	0.0000	0.6191	K versus E1
	E1 (30)	13.1	6.9	0.0000	0.0000	K versus E2
	E2 (30)	47.1	16.1	0.0000	0.0000	E1 versus E2



**Fig. 79.** Dynamic strength endurance of left m. Gluteus

**Table 19.** Dynamic strength endurance of right m. gluteus

Measurement	Group (n)	Average arithmetic	Standard deviation	Statistical credibility		
				p1	p2	p2 (comparison)
First	K (30)	14.8	7.1			
	E1 (30)	11.7	6.4			
	E2 (30)	13.9	7.1			
Second	K (30)	15.3	7.0	0.0046	0.6030	K versus E1
	E1 (30)	13.0	6.8	0.0000	0.0000	K versus E2
	E2 (30)	47.2	16.0	0.0000	0.0000	E1 versus E2



**Fig. 80.** Dynamic strength endurance of right m. Gluteus

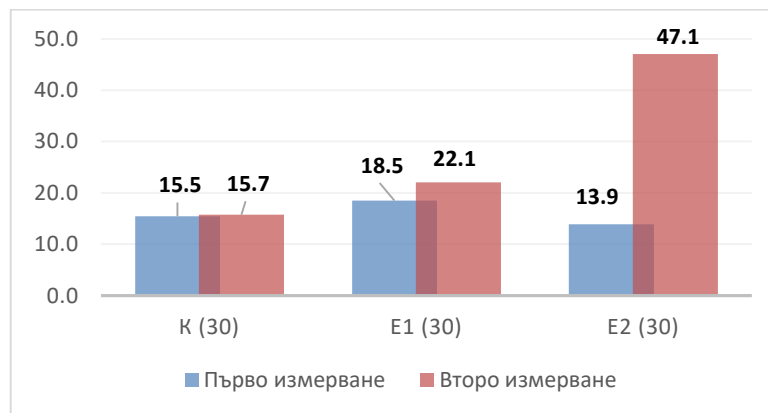
The data on *the static strength endurance of the different groups of muscles* are presented in Tables 20-25 and Figures 81. *In the control group, the results for the trunk flexor muscles did not confirm a significant change between the two measurements - in all other studies, for all groups, this change was statistically*

significant. We attribute these results to the specialized exercises for the muscle chains.

Table 20 Figure 81 summarizes the *data* on SSE of *trunk extensor muscles*. A significant increase in scores was confirmed for all groups at the second versus first measurement, although this increase was rather weak for the control group. The difference in increase between the control group and E1 was not significant. E2 was confirmed as the group with the strongest increase, which was significant from that observed in the other two groups

**Table 20.** Static strength endurance of trunk extensor muscles

Measurement	Group (n)	Average arithmetic	Standard deviation	Statistical credibility (p)		
				p1	p2	p2 (comparison)
First	K (30)	15.5	7.1			
	E1 (30)	18.5	9.8			
	E2 (30)	13.9	7.1			
Second	K (30)	15.7	7.0	0.0182	0.0860	K versus E1
	E1 (30)	22.1	12.3	0.0001	0.0000	K versus E2
	E2 (30)	47.1	16.1	0.0000	0.0000	E1 versus E2



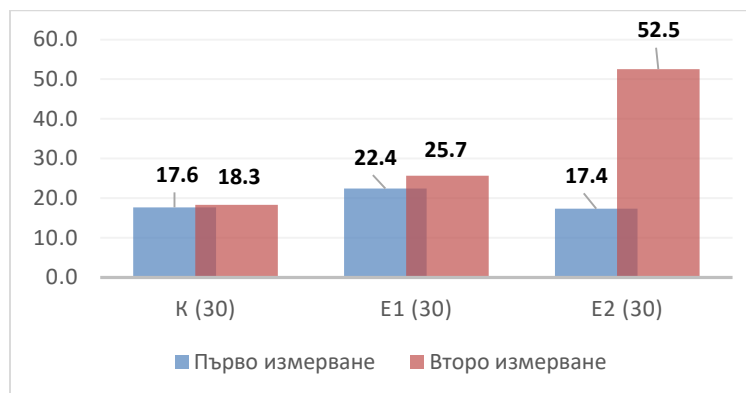
**Fig.81 .** Static strength endurance of trunk extensor muscles

The SSE of the *trunk flexor muscles* showed little change between the two measurements for the control group (from 17.6 to 18.3) and a significant increase for the other two experimental groups. This increase is strongest for E2, and the differences in changes compared to the other two groups are statistically significant. Of interest is the result of no significant difference in change between control

(insignificant change between the first and second measurements) and E1 (significant increase between the first and second measurements). Here we are talking about borderline results, confirming the tendency for a very weak change in the control group, a relatively stronger one, but still not always statistically different in E1, and a very strongly pronounced significant change in E2 (table 21 and figure 82).

**Table 21.** Static strength endurance of the trunk flexor muscles

Measurement	Group (n)	Average arithmetic	Standard deviation	Statistical credibility (p)		
				p1	p2	p2 ( comparison )
First	K (30)	17.6	6.6			
	E1 (30)	22.4	11.7			
	E2 (30)	17.4	6.7			
Second	K (30)	18.3	6.3	0.0897	0.1663	K versus E1
	E1 (30)	25.7	13.7	0.0001	0.0000	K versus E2
	E2 (30)	52.5	14.5	0.0000	0.0000	E1 versus E2

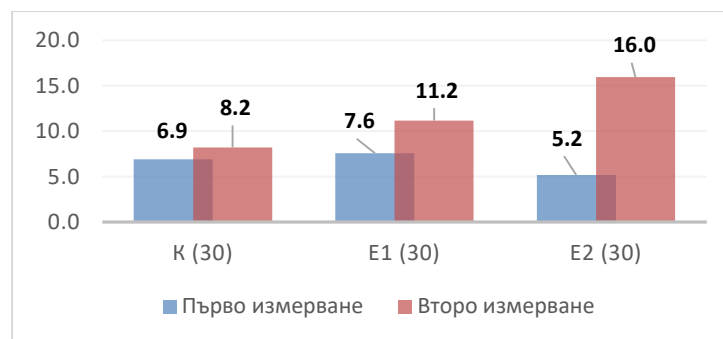


**Fig. 82 .** Static strength endurance of trunk flexor muscles

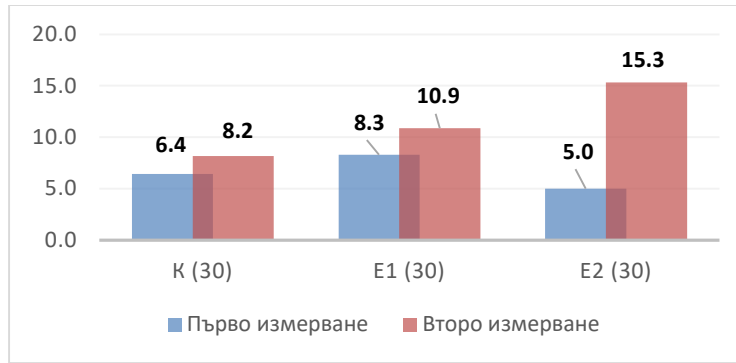
The SSE for the lateral **trunk muscles** (left and right lateral muscle chain) as results are summarized in Tables 22,23 and Figures 83, 84. A *significant increase was assessed in all groups for the second versus first measurement. For E2, this increase is significantly stronger than the corresponding increase in the other two groups. In the right lateral muscle chain, the difference in increase between E1 and control was insignificant - for the left, a significant difference in increase between E1 and control was confirmed.*

**Table 22.** Static strength endurance of the left lateral muscle chain

Measurement	Group (n)	Average arithmetic	Standard deviation	Statistical credibility (p)		
				p1	p2	p2 (comparison)
First	K (30)	6.9	4.9			
	E1 (30)	7.6	6.1			
	E2 (30)	5.2	3.6			
Second	K (30)	8.2	4.7	0.0001	0.0023	K versus E1
	E1 (30)	11.2	6.5	0.0001	0.0000	K versus E2
	E2 (30)	16.0	7.1	0.0000	0.0000	E1 versus E2

**Fig. 83 .** Static strength endurance of the left lateral muscle chain**Table 23.** Static strength endurance of the right lateral muscle chain

Measurement	Group (n)	Average arithmetic	Standard deviation	Statistical credibility (r)		
				p1	p2	p2 (comparison)
First	K (30)	6.4	4.0			
	E1 (30)	8.3	5.6			
	E2 (30)	5.0	3.8			
Second	K (30)	8.2	4.5	0.0000	0.2154	K versus E1
	E1 (30)	10.9	5.6	0.0000	0.0000	K versus E2
	E2 (30)	15.3	6.5	0.0000	0.0000	E1 versus E2

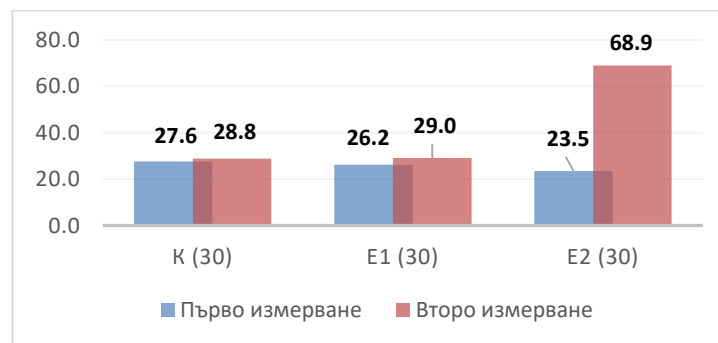


**Fig. 84.** Static strength endurance of the right lateral muscle chain

Tables 24-25, figure 85, 86, summarize the results for SSI for *left and right m.gluteus*. Here, significant changes were confirmed for all studied groups - second versus first measurement. Again, E2 is the group with the most pronounced and reliable improvement different from the other groups. E1 appeared as a significant next level in the right *m.gluteus*, and in the left, the change for E1 was not significant compared to the change in the control.

**Table 24.** Static strength endurance of the left m. gluteus

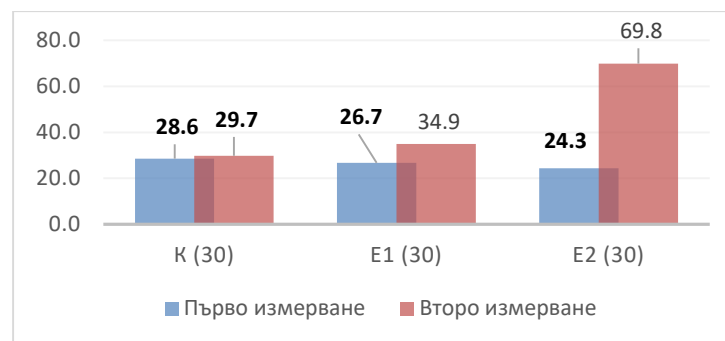
Measurement	Group (n)	Average arithmetic	Standard deviation	Statistical credibility (r)		
				p1	p2	p2 (comparison)
First	K (30)	27.6	12.2			
	E1 (30)	26.2	11.1			
	E2 (30)	23.5	8.3			
Second	K (30)	28.8	12.6	0.0000	0.4592	K versus E1
	E1 (30)	29.0	11.3	0.0000	0.0000	K versus E2
	E2 (30)	68.9	17.5	0.0000	0.0000	E1 versus E2



**Fig. 85.** Static strength endurance of left m. Gluteus

**Table 25.** Static strength endurance of right m. gluteus

Measurement	Group (n)	Average arithmetic	Standard deviation	Statistical credibility (r)		
				p1	p2	p2 (comparison)
First	K (30)	28.6	11.3			
	E1 (30)	26.7	10.6			
	E2 (30)	24.3	8.7			
Second	K (30)	29.7	11.8	0.0000	0.0293	K versus E1
	E1 (30)	34.9	20.8	0.0000	0.0000	K versus E2
	E2 (30)	69.8	16.9	0.0000	0.0000	E1 versus E2

**Fig. 86.** Static strength endurance of right m. gluteus

As a summary about the objective indicators the following conclusions can be formed:

- *There was a massive difference in the results of the second measurement compared to the first - this was confirmed for all groups. The exceptions are few and specifically the following:*

- In the control group - insignificant change for m. pectoralis major and SSI of the trunk flexor muscles;

- At E1 - insignificant change in extension;

- The trend is obvious for manifestation on significantly stronger and more significant, as change result for E2 vs the other two groups - here the only exception is one - at m. sternocleidomastoid .

- In 9 of 22 (41%) studies the evaluated change at E1 did not show significant differences from this one in the control room group. Everything again, in the bigger part of the research is significantly more pronounced.

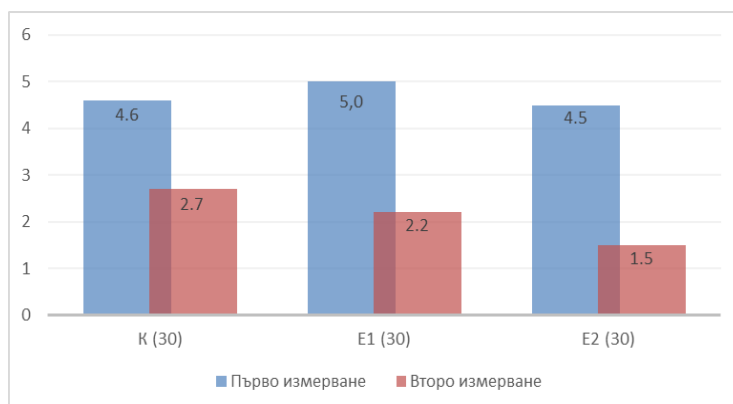


### ***Results regarding the impact of the author's methodology on pain.***

Data on ***pain intensity*** on a visual analog scale/ are presented in Table 26 and Figure 87. *In all three studied groups, a significant decrease in the estimated result for the second compared to the first measurement was confirmed.* The control group showed the smallest decrease (from 4.6 to 2.7 ), followed by E1 (from 5.0 to 2.2), and in the first place, with an estimated significant change greater than those in the control and E1 is E2 (from 4.5 to 1.5 ). *We believe that this result is due to the techniques related to overcoming the muscle spasm ( massage, myofascial release techniques, positional release techniques, and PIR).*

**Table 26.** VAS pain

Measurement	Group (n)	Average arithmetic	Standard deviation	Statistical credibility (p)		
				p1	p2	p2 (comparison)
First	K (30)	4.6				
	E1 (30)	5.0	1.6			
	E2 (30)	4.5	1.6			
Second	K (30)	2.7	1.0	0.0000	0.4439	K versus E1
	E1 (30)	2.2	1.1	0.0000	0.0046	K versus E2
	E2 (30)	1.5	1.0	0.0000	0.0530	E1 versus E2



**Fig. 87.** Pain measured on a visual analog scale

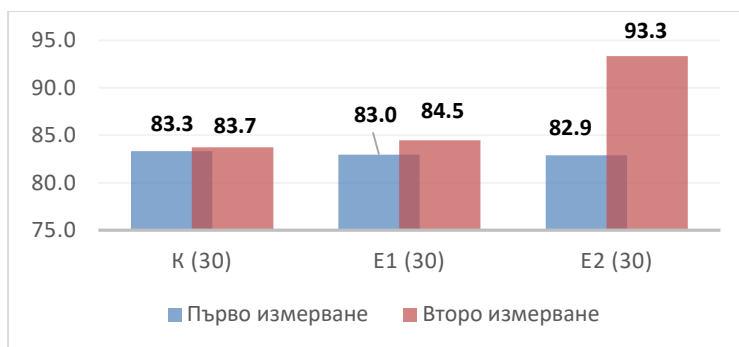
***Results regarding the influence of the author's methodology on the quality of life.***

The data on *the health status /conducted Standardized Test SF -36/* are summarized in Tables 24-30 and Graphs 24-30. It is striking that there was no significant change between the two measurements for the control group in all indicators. Results at E1 showed a statistically significant improvement. *The results in E2 also have a statistically significant improvement for all indicators, they are also manifested with greater strength and higher dynamics than those of the other two groups. We believe that the obtained results are a consequence of the methodology that we applied at EG since each of the included means is aimed at the indicators of the scale for evaluating the quality of life. Manual techniques are related both to influencing pain and to improving the emotional state in a nervous and humoral way. Physical exercises complement the positive effect and improve the general conditions of the patients.*

The assessment of *physical functions* in the control group showed minimal change between the two measurements. In the experimental groups, this change (increase) is significant, being much more pronounced and reliable than the other two at E2 - table 27, figure 88.

**Table 27.** Physical functions

Measurement	Group (n)	Average arithmetic	Standard deviation	Statistical credibility (p)		
				p1	p2	p2 ( comparison )
First	K (30)	83.3	9.1			
	E1 (30)	83.0	9.5			
	E2 (30)	82.9	7.3			
Second	K (30)	83.7	9.0	0.2313	0.2910	K versus E1
	E1 (30)	84.5	8.6	0.0208	0.0000	K versus E2
	E2 (30)	93.3	3.8	0.0000	0.0000	E1 versus E2

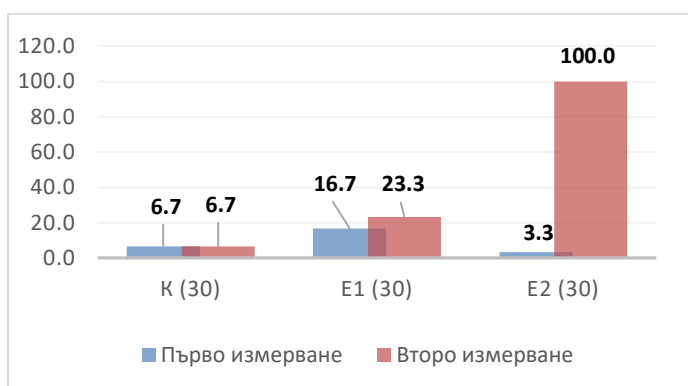


**Fig. 88 . Physical functions**

The assessment of limitations in **physical health** is given in table 28 and figure 89. It is practically the same and very low for the control group in both measurements - 6.7. At E1 it is observed **to** change from 16.7 to 23.3, but this change is statistically insignificant. In E2, the change was statistically significant - an increase from 3.3 to 100, and this increase was verified with the increases in the other two groups

**Table 28.** Limitations in physical health

Measurement	Group (n)	Average arithmetic	Standard deviation	Statistical credibility (p)		
				p1	p2	p2 (comparison)
First	K (30)	6.7	25.4			
	E1 (30)	16.7	37.9			
	E2 (30)	3.3	18.3			
Second	K (30)	6.7	25.4	1.0000	0.4090	K versus E1
	E1 (30)	23.3	43.0	0.5000	0.0000	K versus E2
	E2 (30)	100.0	0.0	0.0000	0.0000	E1 versus E2

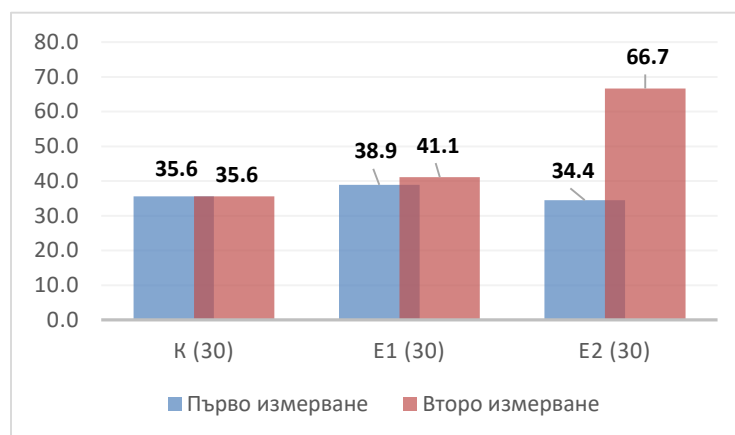


**Fig. 89 . Physical health limitations**

The assessment of *limitations in the emotional state* - table 29 and Figure 90 - practically confirm the conclusions made for the assessment of limitations in physical health. Here, the differences are the higher baseline levels in all three groups and the smaller increase in score in E2 (which is significant, as a change and as a dynamic compared to that of the other two groups).

**Table 29.** Limitations in the emotional state

Measurement	Group (n)	Average arithmetic	Standard deviation	Statistical credibility (r)		
				p1	p2	p2 (comparison)
First	K (30)	35.6	8.5			
	E1 (30)	38.9	12.6			
	E2 (30)	34.4	6.1			
Second	K (30)	35.6	8.5	1.0000	0.4090	K versus E1
	E1 (30)	41.1	14.3	0.5000	0.0000	K versus E2
	E2 (30)	66.7	0.0	0.0000	0.0000	E1 versus E2

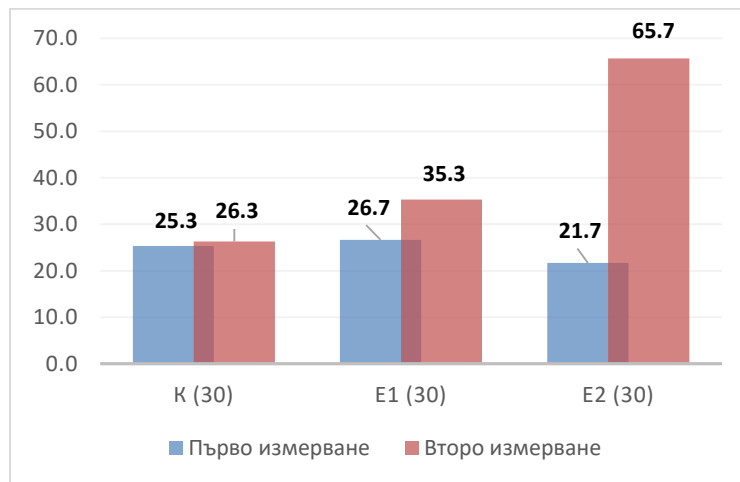


**Fig.90 .** Limitations in the emotional state

The results regarding *strength and fatigue assessment* are presented in Table 30 and Figure 91 - the control group showed no significant change between the two measurements. Both experimental groups showed a marked increase, being much stronger with E2. The strength of the dynamics was confirmed to be significantly different for the three groups.

**Table 30.** Strength and fatigue

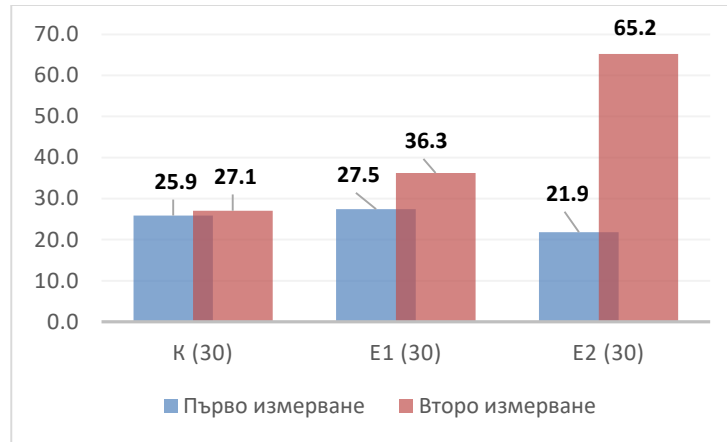
Measurement	Group (n)	Average arithmetic	Standard deviation	Statistical credibility (p)		
				p1	p2	p2 ( comparison )
First	K (30)	25.3	7.3			
	E1 (30)	26.7	7.1			
	E2 (30)	21.7	4.6			
Second	K (30)	26.3	7.6	0.2500	0.0007	K versus E1
	E1 (30)	35.3	9.4	0.0000	0.0000	K versus E2
	E2 (30)	65.7	7.7	0.0000	0.0000	E1 versus E2

**Fig. 91 .** Strength and fatigue

The results for *emotional health* are similar to those for strength and fatigue - table 31, figure 92.

**Table 31.** Emotional health

Measurement	Group (n)	Average arithmetic	Standard deviation	Statistical credibility (r)		
				p1	p2	p2 ( comparison )
First	K (30)	25.9	8.5			
	E1 (30)	27.5	7.8			
	E2 (30)	21.9	5.0			
Second	K (30)	27.1	8.8	0.0831	0.0015	K versus E1
	E1 (30)	36.3	9.7	0.0000	0.0000	K versus E2
	E2 (30)	65.2	7.7	0.0000	0.0000	E1 versus E2

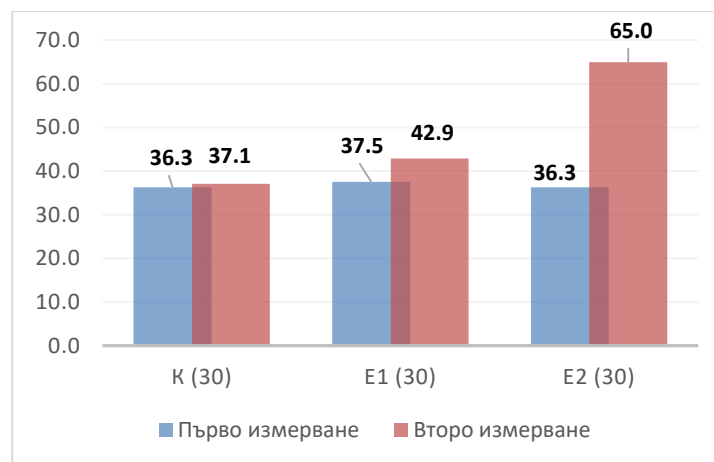


**Fig.92 . Emotional health**

Again analogous to the above two results - *for social functions* - table 32 and figure 93.

**Table 32. Social functions**

Measurement	Group (n)	Average arithmetic	Standard deviation	Statistical credibility (p)		
				p1	p2	p2(comparison)
First	K (30)	36.3	8.9			
	E1 (30)	37.5	9.3			
	E2 (30)	36.3	8.9			
Second	K (30)	37.1	9.0	0.5000	0.0075	K versus E1
	E1 (30)	42.9	9.7	0.0005	0.0000	K versus E2
	E2 (30)	65.0	8.3	0.0000	0.0000	E1 versus E2

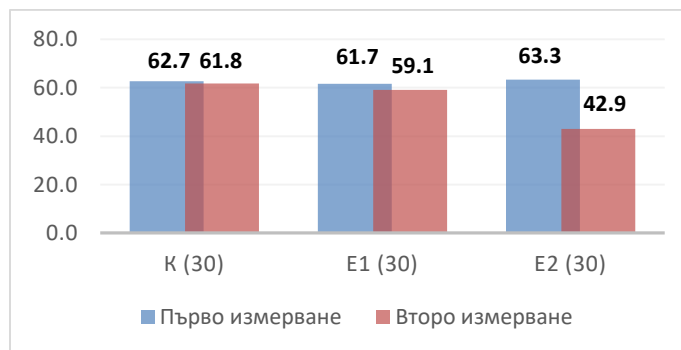


**Fig.93 . Social functions**

**Pain** score in the control group showed a slight change from 62.7 at the first measurement to 61.8 at the second - Table 33, Figure 94. E1 showed a statistically significant decrease, although it was quite weak, to the point of being assessed as not significantly different from that of the control group. The decrease in E2 is the strongest (from 63.3 to 42.9), has a substantial character, and is significantly different from the differences shown in the other two groups for both measurements.

**Table 33. Pain**

Measurement	Group (n)	Average arithmetic	Standard deviation	Statistical credibility (r)		
				p1	p2	p2 ( comparison )
First	K (30)	62.7	5.8			
	E1 (30)	61.7	5.3			
	E2 (30)	63.3	6.6			
Second	K (30)	61.8	6.1	0.1250	0.3011	K versus E1
	E1 (30)	59.1	6.2	0.0020	0.0000	K versus E2
	E2 (30)	42.9	6.8	0.0000	0.0000	E1 versus E2

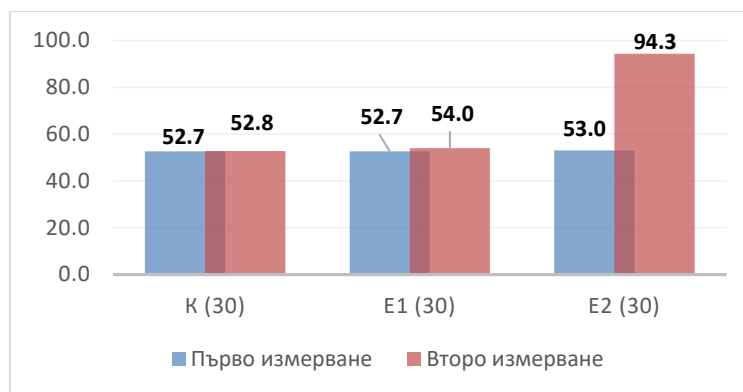


**Fig. 94 . Pain**

The control group showed no marked change in the **overall health score** for both measurements - Table 34, Figure 95. The change in E1 is significant, although it is a rather small increase (from 52.7 to 54.0). The increase in E2 is also statistically significant and is much stronger (from 53.0 to 94.3). Each group is significantly different from the other two in terms of dynamics - strongest increase for E2, weaker but significant for E1, and no significance of the change in the control group.

**Table 34.** General health

Measurement	Group (n)	Average arithmetic	Standard deviation	Statistical credibility (p)		
				p1	p2	p2 ( comparison )
First	K (30)	52.7	3.4			
	E1 (30)	52.7	2.9			
	E2 (30)	53.0	3.1			
Second	K (30)	52.8	3.1	1.0000	0.0360	K versus E1
	E1 (30)	54.0	4.0	0.0078	0.0000	K versus E2
	E2 (30)	94.3	2.2	0.0000	0.0000	E1 versus E2

**Fig. 95 .** General health

In general, no set of objective measures stand out that are factors in all subjective outcomes, i.e. the relevant factors are different (as studies and as their set) for each subjective measure.

It is striking, however, that the results for E2 were significantly different from those for E1 and the control group, i.e. and here the different (stronger) manifestation of results for E2 observed at each level of the study is confirmed, i.e. in E2 we have a more frequent manifestation of a difference between the two measurements, as well as significant and stronger dynamics between them - all this compared to the analogs for E1 and the control group.



## **7 . CONCLUSIONS**

The analysis of the results obtained from the conducted research gives us reason to draw the following conclusions:

1. The specialized kinesitherapeutic methods developed and approved by us have a positive therapeutic effect on influencing pain, joint mobility, muscle imbalance, and quality of life in women with postural cervicothoracic pain syndrome. The inclusion of specialized exercises for the myofascial chains is an essential factor in this result.

2. The studied parameters improved significantly and positively, the static and dynamic strength endurance of the body's muscle chains increased, which has a direct bearing on improving the postural control of the patients.

3. The author's methods prove a faster and more effective influence on the intensity of pain compared to the conventional method, which is related to the quality of life of the examined persons.

4. The analysis of the results gives us reason to claim that the application of the author's complex methods leads to a significant improvement of all the objective and subjective indicators of the examined persons with a distinct advantage of the experimental method, in which the priority is emphasized on exercises for the muscle chains of the body.

5. We found that as a result of the applied author's experimental methods of kinesitherapy, the improvement of the objective indicators positively affected the subjective condition of the patients, respectively their quality of life.

## 8. RECOMMENDATIONS

8.1. The important advice that the therapist should give to the daily activities of patients with similar symptoms is related to:

- Posture during work:
  - The position of the upper limbs while working with a computer should be flexed in the shoulder joints above 60 degrees / the torso should be relieved of their weight/, the gaze should be forward, there should be no flexion or extension of the neck / neutral position/.
  - It is recommended that when working with a computer, the patient independently performs neck retraction every hour 10 times, intending to change the prolonged protracted position that is taken during work.
- The position of the head during sleep should be close to neutral (the correct selection of a pillow is important).
- Avoid carrying weights (up to 5 kilograms) that burden the shoulder girdle.

8.2. Cervical orthoses should be used primarily for the treatment of muscle spasms, stabilization, and limitation of range of motion. In our country, the Schantz collar is mainly used. It can be used in periods of exacerbation, to relieve the burden on the vertebrae and reduce pain. The dosage for wearing it is determined individually.

8.2. Various forms of daily motor activity (walking, hiking, swimming, pilates, yoga, or another type of aerobic exercise close to the patients), strict following of the recommendations and guidelines of the kinesitherapy team, and regular execution of the exercises in free time, at home and workplace.

## **9 . DISSERTATION CONTRIBUTIONS**

Contributions of a scientific-theoretical nature:

- Based on the data from the scientific literature, we justified, developed, and approved two proprietary methods for the application of manual techniques and special exercises for postural pain syndrome in the cervicothoracic region.
- The study confirms the concept of influencing patients with cervicothoracic pain syndrome by systematizing daily targeted kinesitherapy: a combination of exercises involving the muscle chains of the whole body, combined with manual techniques and special exercises.

Contributions of a scientific applied nature:

- The study confirms the possibility of pain reduction and functional improvement of quality of life in patients with cervicothoracic pain syndrome.

Contributions of a practical nature:

- The implementation of this methodology in practice will ensure good results regarding the influence of the symptoms of postural pain syndrome. Combining manual techniques and muscle chain exercises is key to achieving lasting results and a better quality of life for women with this problem.

## **10. CONCLUSION**

In conclusion, we can summarize that the application of kinesitherapy, including the combination of manual techniques and exercises for the whole body, leads to a faster and permanent resolution of symptoms in women with postural cervicothoracic pain syndrome. The study proved the positive changes in the individual aspects of the quality of life of the patients, manifested as early as the second week after starting the kinesitherapy.

### **List of publications related to dissertation**

1. Zheleva, E. \_ Manual therapy and healing gymnastics at spondylogenic pathology on cervicothoracic transition. *Physiotherapy* " 3-4, 2015 (ISSN 1314-4642)
2. Zheleva, E. \_ " Effectiveness of own kinesitherapeutic methods in women with cervico -thoracic postural pain syndrome, Scientific and pedagogical schools in the field physical cultures and sports. materials International scientific and practical congress devoted to the 100th anniversary of GCOLIFC, May 30-31, 2018 / under the general row. A.A. Peredelskogo and others. - M.: RGUFKSMiT, 2018. - 779 pp., 214-218. ISBN 978-5-90-5760-93-8
3. Zheleva, E. \_ Myofascial \_ techniques. Reduction of the pain in the neck department on the spinal pillar. " *Physiotherapy* " 1-2, 2021 (ISSN 1314-4642)

### **Participation in scientific forums:**

1. Medical rehabilitation for cervical arthrosis, Rehabilitation Academy, Sofia 2012.
2. Myofascial techniques. Interspinal arthrosis in the cervical spine, 21st Scientific Congress of the Bulgarian Anatomical Society, Sofia, 2013.
3. Effect of the application of myofascial techniques, therapeutic massage, and therapeutic gymnastics in spondylogenic pathology of the cervicothoracic transition, Jubilee conference with international participation "20 years of Kinesitherapy specialty" Neofit Rilski Medical University, Blagoevgrad, 2014.
4. Manual therapy and therapeutic gymnastics for spondylogenic pathology of the cervicothoracic transition, 18th symposium on sports and physical education of young people, Ohrid, 2014.
5. Effect of the application of myofascial techniques and therapeutic massage in spondylogenic pathology of the cervicothoracic transition, Thirteenth National Scientific Session for Students and Teachers, Pleven, 2014.
6. Myofascial techniques. Reduction of pain in the cervical spine, Seventh National Congress of the Association of Physiotherapists in Bulgaria, Sofia, 2015.
7. The role of kinesitherapy in improving the quality of life of women with postural cervicothoracic pain syndrome, Jubilee Scientific Conference "Public Health Policy and Practice", Pleven, 2015.
8. Effect of the application of myofascial techniques, massage, and specialized training in pain syndrome in the cervicothoracic region, First Congress of Physiotherapists in the Republic of Macedonia, Skopje, 2015.
9. Improving static strength endurance in women with postural cervicothoracic pain syndrome, Therapeutic physical culture: achievements and development prospects, Moscow, 2017.
10. Effectiveness of own kinesitherapeutic methodology in women with postural cervicothoracic pain syndrome, Congress "Scientific and pedagogical schools in the field of physical culture and sports", Moscow, 2018.