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Evaluation of therapeutic management in women with lumbar spine pain complaints

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Original article

Abstract

Aim of the study: To evaluate the effects of two different modes of improvement on the level of perceived pain, spinal mobility, lumbar spinal motion control and limitations in activities of daily living in women aged 51–62 with lumbar spine pain.

Material and methods: The study included a group of 31 women between the ages of 51 and 62. The subjects were divided into 2 groups. Group I (FK) received physical therapy treatments and general gymnastics, while group II (FS) received physical therapy treatments and exercises using a PBU stabilizer. The project covered a period of 10 treatment days excluding Saturdays and Sundays. Before and immediately after the rehabilitation, tests of flexion and extension control in the L-spine, active knee joint flexion test, Schober test were performed, and the NRS scale was used scale and QBPDS scale.

Results: After the applied rehabilitation, a significant reduction in the level of perceived pain and improvement in spinal mobility in the direction of flexion were observed in both groups. In the FS group, there was also a significant improvement in lumbar flexion control and better lumbar spine control during the active knee flexion test. In addition, a reduction in disability as measured by the QBPDS scale was noted.

Conclusions: The use of comprehensive rehabilitation brings significant improvements in terms of pain reduction and improvement in lumbar spine mobility in the flexion direction. A two-week exercise program using a stabilizer appears to yield significantly better results in terms of lumbar flexion control as well as better lumbar control during the active flexion test of both knee joints. And this, in turn, may affect the results obtained using the QBPDS scale among FS subjects.

Keywords

- pain syndromes
- rehabilitation
- general mobility exercises
- stabilization exercises

Contribution

A – the preparation of the research project
B – the assembly of data for the research undertaken
C – the conducting of statistical analysis
D – interpretation of results
E – manuscript preparation
F – literature review
G – revising the manuscript

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Introduction

Lumbar spine pain syndromes are now one of the most common reasons for patients to visit their primary care physician. This is due to the progressive changes in the lifestyle of the modern world, including a reduction in physical activity, lack of time for rest, the prevalence of sedentary work, inadequate sleep or the occurrence of stress. Also, adopting improper posture leads to uneven loading of the spine, which can result in damage to the spine and the occurrence of pain.[1] In Poland, as many as every second Pole experiences back pain. In 72% of the population, lumbar pain complaints occur before the age of 40, while in 66% of men and 30% of women these complaints occur after the age of 40.[2] They typically result in decreased mobility of the spine and limited performance of activities of daily living. The most popular form of improvement is conservative therapy. There are many models of rehabilitation in the world today, but the best results in alleviating pain and restoring the desired level of function are achieved during comprehensive rehabilitation, which consists of kinesitherapy, physical therapy and prevention.[3,4] The main goals of comprehensive rehabilitation are: to reduce or eliminate pain by relieving pressure on structures within the damaged segments, to strengthen the muscles of the trunk, hip girdle, improve mobility and achieve the best possible stabilization both in individual segments and within the entire spine, to learn to maintain correct posture and appropriate movement patterns. The important role in patient education regarding lifestyle, work and rest is also emphasized.[3,5]

Exercise is one of the more effective as well as safer forms of rehabilitation. In chronic pain of the lumbar spine, they help improve flexibility, muscle strength, increase spinal mobility and overall exercise tolerance. They also have an impact on reducing or removing perceived pain and disability due to fear and anxiety about the onset of pain.[3] Stretching, muscle strengthening and breathing exercises are standardly used. Efforts are made to teach the patient how to properly perform the prepared set of exercises, so that he or she can safely continue doing them at home on his or her own after rehabilitation. In practice, the use of exercises as a rehabilitation program is often a challenge for the physiotherapist, as they require the patient's involvement and motivation, not just his passivity, which does not always meet with the patient's approval.

One of the exercise models used for back pain is the Kinetic Control Concept. It is a modern physiotherapeutic method that has existed in the world since 1995, pioneered by Mark Comerford. It is a comprehensive system of diagnosis and therapy focusing on the analysis of specific movement patterns and their functions. Its main premise is to find abnormal movement patterns (so-called uncontrolled movement – NR) causing pain, and then teaching the patient the correct way to perform specific movement patterns. The aim is to abolish pain and restrictions in the musculoskeletal system by finding the cause of the pain6. Through movement analysis, using a number of functional tests, restricted areas in the musculoskeletal organ (i.e. reduced mobility, muscle strength) are located. In the Kinetic Control concept, the analysis of movement and motor control is extensively developed. It takes into account the analysis of movement patterns performed in the sagittal, frontal and transverse planes of various parts of the body (spine, shoulder girdle with kg and hip girdle with kd). To evaluate a given pattern, the examiner verifies a given movement by assessing the quality and quantity of the movement. The tests performed by the patient are both a test and, once the disturbed pattern is corrected, are also therapy. Another way (in addition to visual assessment) that can estimate the functional stability of the trunk is the use of a PBU (Pressure Biofeedback Unit – PBU, Stabilizer) in physiotherapy practice. The PBU is a device that works by changing the pressure in an air-filled cuff due to changes in spinal pressure. It can be used for both therapy and diagnosis of spinal pain syndromes. The PBU enables biofeedback training. According to the authors of the concept, the presence of pain in the lumbar spine alters the quality of the movement pattern performed and the stability of the examined segment. In the case of assessing the stability of the lumbar spine, the test subject (depending on the movement performed) obtains different values than patients in whom no pain was recorded.

Physical therapy complements comprehensive rehabilitation for lumbar spine pain. It is aimed at: analgesic effect, reduction or elimination of inflammation, minimization of neurological symptoms, and reduction of clinical symptoms accompanying pain (e.g., spinal static disorders).[7] The classical model of rehabilitation uses, among others: electrotherapy treatments (e.g. Tens), ultrasound therapy, laser therapy.

The purpose of this study is to evaluate the effects of two different methods of improvement on the level of pain, spinal mobility, lumbar spine motion control and limitations in activities of daily living in women aged 51–62 years with complaints of lumbar spine pain.

Material and methods

The study included 31 women with complaints of lumbar spine pain. The study was conducted in one of the

Health Centers in Malopolska. The mean age in the study group was 56.77 ± 3.28 years. Each woman in the study was informed in detail about the course of the research and asked for written consent to participate. The study was conducted with high scientific and ethical standards. Inclusion criteria were: written consent to participate in the study, reporting complaints of lumbar spine pain, age between 51 and 62 years, no injuries in the last 3 months (sprains, dislocations, etc.), use of rehabilitation treatments previously but not in the last 6 months. Disqualifying criteria were: lack of consent to participate in the study, fresh injuries, spinal surgery, other concomitant musculoskeletal conditions (e.g. RA, AS, lupus erythematosus, etc.), attendance at treatments less than 100%.

Height, weight and BMI were measured once in each participant. Height and weight were measured using the HM202P built-in height gauge for the Charder MS6110 medical scale. Height was measured to the nearest 0.1 cm. Body weight was measured to the nearest 0.1 kg. Based on the aforementioned data, BMI was determined, assuming that BMI ≥ 25 kg/m² indicates overweight and BMI ≥ 30 kg/m² indicates obesity.

In all participants, the following tests were performed twice (before the rehabilitation program, after the rehabilitation program) the following tests:

1. Uncontrolled lumbar spine flexion test using PBU.
2. Uncontrolled lumbar spine extension test using PBU.
3. Test of active flexion of the knee joints using the goniometer.
4. Schober test: Lumbar flexion and extension mobility test.
5. The NRS scale.
6. The QBPDS scale.

1. Uncontrolled lumbar spine flexion test using PBUs

The test patient was asked to assume a supine position on a recliner with her legs flexed at the hip and knee joints. A PBU was slipped under the lumbar spine, in the middle of the lumbar lordosis at L3 height, and inflated to a baseline value of 40 mm Hg to place the lumbar spine in a neutral position. The subject then raised both lower limbs above the ground by flexing them at the hip joints to a 90° angle and held them in this position for 5 seconds. While the subject performed this action, the movement of the cue on the PBU was observed. An increase or decrease in the baseline value during the execution of the movement of more than 10 mm Hg indicated the occurrence of uncontrolled lumbar spine movement. On the other hand, even slight deviations from the baseline value of 40 mm Hg while keeping the hip joints flexed to 90° for at least 5 seconds also indicated the occurrence of uncontrolled movement.[6]

2. Uncontrolled lumbar spine extension test using PBU

The test patient in the starting position of forward lying with upper extremities hanging off the recliner and lower extremities straight. The PBU was slipped under the abdomen, at the level of the belly button, and inflated to 70 mm Hg to position the lumbar spine in a neutral position. The subject was then instructed to simultaneously perform flexion of both knee joints to an angle of 120°. While the subject carried out this command, the movement of the pointer on the PBU apparatus was observed. In a normal situation, the pressure should decrease by 8–10 mm Hg. The occurrence of an increase or decrease in the baseline value of more than 10 mm Hg during the movement or while maintaining the final position of the exercise indicated the occurrence of uncontrolled movement.[6]

3. Active knee joint flexion test using a goniometer (assessment of extension)

The test patient was asked to lie forward on a recliner, with her hands placed along her body and her lower extremities straight. The axis of rotation was placed on the knee joint crevice on the lateral side, the non-moving arm along the thigh facing the greater femoral vertebrae, while the moving arm along the shin facing the lateral ankle. The lower limb was asked to flex to the limit where lumbar spine pain begins to appear or loss of lumbar spine control is observed, and the measurement was recorded. Measurements were taken for the left and right lower limbs in turn.[8]

4. Schober's test: Examination of lumbar flexion and extension mobility

The test subject was instructed to stand upright with her feet placed hip-width apart and her upper extremities along her torso. Then 2 points were marked on the skin with a marker. The first point located at a height

between L5 and S1, while the second point was located 10 cm above the first. To assess lumbar spine mobility in the direction of flexion, the patient was instructed to perform a forward bend, while to assess uprightness, the patient was instructed to perform a backward bend in the same position. The correct value sequentially for flexion should increase to 14–16 cm while for extension it should decrease to 8–9 cm.[9]

5. NRS scale

Before the start of the series of treatments and after the completion of rehabilitation, each patient was asked to assess the intensity of her lumbar spine pain complaints using the NRS numerical scale.[10]

6. QBPDS scale

Each patient was asked to complete the QBPDS scale, which deals with limitations of in daily functioning due to complaints of back pain.

The subjective scale assessed the following activities: getting out of bed, sleeping through the night, rolling over in bed, driving a car, standing for 20–30 minutes, sitting in a chair for several hours, climbing one floor of stairs, walking about 300–400 meters, walking several kilometers, reaching higher shelves, throwing a ball, running about 100 meters, taking food out of the refrigerator, making the bed, putting on socks (tights), bending over to wash the bathtub, moving a chair, pulling or pushing a heavy door, carrying two shopping bags, lifting and carrying a heavy suitcase. The respondent subjectively rated the above activities on a scale of 0 to 5, where 0 meant a complete lack of difficulty in performing it, while 5 meant an impossible activity. The final score was the sum of the points obtained for each question. The higher the values the respondent obtained, the greater her limitations.[11]

Qualified patients were assigned to one of two groups:

- Group I – FK (classical physiotherapy) 15 people: women who, for a period of 2 weeks, daily (excluding Saturdays and Sundays) received physical treatments (UD, laser, TENS currents) and performed a set of general mobility exercises.
- Group II – FS (physiotherapy with stabilizer – PBU) 16 people: women who, for a period of 2 weeks, daily (excluding Saturdays and Sundays) benefited from physical treatments (UD, laser, TENS currents) and performed an exercise program according to the Kinetic Control concept using PBU.

Group assignment

Due to the nature of the facility's work, if there were several patients per clock hour, they were assigned to the FK group, while if there was one patient per clock hour, she was assigned to the FS group.

Improvement program

Patients in the FK group performed a set of general improvement exercises every day (except Saturdays and Sundays). The exercises included: stretching exercises, strengthening exercises, improving spinal mobility and breathing exercises. The classes were conducted in the form of group classes (2–4 people). All exercises were performed on a mattress under the supervision of a physiotherapist (the author of the project). The main purpose of the exercises was to improve mobility and reduce pain in the lumbar spine. Duration of the exercises: 25 minutes

Patients in the FS group performed a set of stabilization exercises from the Kinetic Control program each day (except Saturdays and Sundays) using the PBU. The device used consisted of a blood pressure cuff and an analog manometer along with a pumping pear. The exercises included activities that included control of lumbar flexion and extension according to the methodology presented by the author of the concept. The activities were conducted in individual form. All exercises were performed on a recliner under the supervision of a physiotherapist. The main purpose of the exercises was to increase awareness and control of the movement performed and to reduce pain in the lumbar spine. Duration of the exercises: 25 minutes.

The following physical treatments were applied to each of the project participants, regardless of their group membership:

Ultrasound treatment

Performed using Astar's Sonaris apparatus. Ultrasound was used, to have an analgesic and anti-inflammatory effect, as well as to reduce muscle tension. The treatment parameters used were: for the first 5 treatment days, treatments were performed at an intensity of 0.7 W/cm², from the 6th treatment day until the end of the series, an intensity of 0.8 W/cm² was used.

Laser therapy

The treatment was performed using a non-contact, superficial technique with the Polaris 2 scanning laser

apparatus from Astar ABR, in order to z reduce pain, have an anti-inflammatory effect on tissues and improve microcirculation. The scanning camera was directed perpendicularly to the exposed area and the parameters were set according to the instructions provided with the Polaris 2: R-radiation, dose 1.2 J/cm², IR radiation, dose 9.6 J/cm², time: 7 minutes.

TENS currents

Transcutaneous electrical nerve stimulation was performed using the Aries electrotherapy device from Astar ABR, with the main goal of reducing pain. Treatment parameters were set according to the instructions supplied with the Aries apparatus: pulse shape: asymmetrical, pulse duration: 100 μs, pulse frequency: 100 Hz, time: 20 minutes. The current intensity was set to the subjective sensation of a pronounced highest tolerable tingling/ vibration. During the treatment, after the body became accustomed, the intensity dose was increased at the patient's request.

Statistical analysis methods

In order to confirm the established research hypotheses and to evaluate and analyze the obtained results, the program Statistica ver. 13.0 was used. The following parameters of descriptive statistics were taken into account in the evaluation: mean, median, minimum and maximum value, standard deviation. Normality of the distribution of variables was estimated using the Shapiro-Wilk test. A Student's *t*-test was used to compare two groups of quantitative variables under the assumption of normality of distribution. If this assumption was not met, the non-parametric Mann-Whitney U test was used. To verify within-group variability (measuring the same parameters twice), the following were used in the case of conformity of the distributions of the variables to the normal distribution, the parametric test Student's *t*-test for dependent samples. On the other hand, when the distributions did not conform to the normal distribution verified by the Shapiro-Wilk test, the Wilcoxon test was used. The level of statistical significance was set at $p < 0.05$.

Results

Women did not differ significantly in age, height, weight or BMI (Table 1).

There was a significant difference in lumbar flexion control among FS subjects between the first and second tests. The subjects controlled flexion better. An intergroup comparison showed no significant differences in both the assessment of flexion and extension control in the first and second examinations (Table 2).

Table 1. Somatic data of the subjects

Variable	Group	$\bar{x}$	Me	Min	Max	SD	*P*
AGE [years]	FK	56.80	57	51	62	3.41	0.96
	FS	56.75	57	51	62	3.28	
BODY HEIGHT [cm]	FK	164.47	165.50	154.40	175.60	6.85	0.32
	FS	162.18	160.50	154.80	173.40	5.64	
BODY MASS [kg]	FK	70.21	69.60	58.00	88.20	9.86	0.85
	FS	69.61	69.55	58.30	84.40	7.62	
BMI [kg/m²]	FK	25.91	24.60	21.64	32.20	2.94	0.58
	FS	26.52	26.19	21.68	32.57	3.12	

$\bar{x}$ – arithmetic mean; Me – median; Min – minimum value; Max – maximum value; SD – standard deviation; I – study I; II – study II; * statistically significant difference; FK – classical physiotherapy; FS – physiotherapy with a stabilizer.

Table 2. Lumbar spine motion control tests [mm Hg]

Intergroup comparison			Variable	Group	Study no.	$\bar{x}$	Me	Min	Max	SD	*P*
Study no.	Group	*p*	FLEXION CONTROL TEST	FK	I	78.07	82.00	46.00	98.00	14.67	0.13
I	FK vs FS	0.75			II	76.73	82.00	45.00	94.00	14.49	
II		0.29		FS	I	79.69	85.00	46.00	98.00	13.88	<0.00*
Student's *t*-test					II	71.25	78.00	45.00	88.00	13.88	
Study no.	Group	*p*	EXTENSION CONTROL TEST	FK	I	70.87	72.00	62.00	82.00	5.15	0.35
I	FK vs FS	0.82			II	71.47	72.00	63.00	85.00	4.94	
II		0.37		FS	I	71.31	71.00	62.00	85.00	5.67	0.33
Student's *t*-test					II	70.25	70.00	66.00	74.00	2.05	

$\bar{x}$ – arithmetic mean; Me – median; Min – minimum value; Max – maximum value; SD – standard deviation; I – study I; II – study II; * statistically significant difference; FK – classical physiotherapy; FS – physiotherapy with a stabilizer.

A significant difference was observed in both the left and right knee joints when performing active joint flexion. The subjects from both groups (FK and FS) controlled the lumbar spine better after rehabilitation. The FS subjects controlled the lumbar more symmetrically. An intergroup comparison showed no significant differences when assessing control of active flexion in both the left and right knee joints in either study one or two. The intergroup comparison showed a significant change in the difference in range of motion between the left and right knee joints between the FK and FS groups but only in study two (Table 3).

There was a slight but significant change in lumbar spine mobility during both flexion and extension in both groups. Subjects in both groups achieved higher flexion and lower extension values. An intergroup comparison showed no significant differences during both lumbar flexion and lumbar extension in tests one and two (Table 4).

Table 2. Active knee flexion test [°]

Intergroup comparison			Variable	Group	Study no.	$\bar{x}$	Me	Min	Max	SD	*P*
Study no.	Group	*p*	LEFT KNEE JOINT	FK	I	97.20	96.00	84.00	115.00	8.44	0.00*
I	FK vs FS	0.76			II	100.93	102.00	86.00	112.00	7.38	
II		0.52		FS	I	96.38	97.00	83.00	108.00	6.80	0.00*
Student's *t*-test					II	102.63	104.00	84.00	113.00	7.37	
Study no.	Group	*p*	RIGHT KNEE JOINT	FK	I	96.87	96.00	86.00	106.00	5.51	0.00*
I	FK vs FS	0.53			II	101.73	104.00	88.00	108.00	5.75	
II		0.32		FS	I	98.38	98.00	88.00	112.00	7.48	0.00*
Student's *t*-test					II	104.06	103.00	88.00	114.00	7.06	

Intergroup comparison			Variable	Group	Study no.	$\bar{x}$	Me	Min	Max	SD	*P*
Study no.	Group	*p*	THE DIFFERENCE IN ACTIVE FLEXION BETWEEN THE LEFT AND RIGHT KNEE JOINT	FK	I	5.53	5.00	2.00	9.00	2.20	0.24
I	FK vs FS	0.82			II	5.13	5.00	2.00	9.00	2.17	
II		0.04*		FS	I	5.38	5.00	2.00	8.00	1.78	0.00*
Mann-Whithney U test					II	3.63	4.00	2.00	6.00	0.96	

$\bar{x}$ – arithmetic mean; Me – median; Min – minimum value; Max – maximum value; SD – standard deviation; I – study I; II – study II; * statistically significant difference; FK – classical physiotherapy; FS – physiotherapy with a stabilizer.

Table 4. Schober Test [cm]

Intergroup comparison			Variable	Group	Study no.	x	Me	Min	Max	SD	*P*
Study no.	Group	*p*	LUMBAR FLEXION	FK	I	12.19	12.20	11.50	12.80	0.36	0.00*
I	FK vs FS	0.26			II	12.53	12.60	11.80	13.10	0.38	
II		0.18		FS	I	12.33	12.40	11.70	12.80	0.31	0.00*
Student's *t*-test					II	12.71	12.80	12.10	13.20	0.34	
Study no.	Group	*p*	LUMBAR EXTENSION	FK	I	9.51	9.50	9.00	9.80	0.24	0.02*
I	FK vs FS	0.96			II	9.42	9.50	8.90	9.80	0.25	
II		0.66		FS	I	9.48	9.60	8.50	9.90	0.35	0.02*
Mann-Whitney U test					II	9.41	9.55	8.50	9.80	0.35	

$\bar{x}$ – arithmetic mean; Me – median; Min – minimum value; Max – maximum value; SD – standard deviation; I – study I; II – study II; * statistically significant difference; FK – classical physiotherapy; FS – physiotherapy with a stabilizer.

In both groups, a significant reduction in pain intensity was observed between the first and second examinations. There were no significant differences between the groups in the intensity of pain experienced in either the first or second study (Table 5).

In both groups, significant differences were observed in the total scores using the QBPDS scale between the first and second studies. An intergroup comparison showed no significant differences between the groups in either the first or second study (Table 6).

Table 5. NRS scale

Intergroup comparison			Variable	Group	Study no.	$\bar{x}$	Me	Min	Max	SD	*P*
Study no.	Group	*p*	NRS	FK	I	6.47	6.00	5.00	9.00	0.99	0.001*
I	FK vs FS	0.73			II	5.40	5.00	4.00	8.00	1.18	
II		0.39		FS	I	6.56	6.00	6.00	9.00	0.89	<0.00*
Mann-Whitney U test					II	5.06	5.00	3.00	7.00	1.00	

$\bar{x}$ – arithmetic mean; Me – median; Min – minimum value; Max – maximum value; SD – standard deviation; I – study I; II – study II; * statistically significant difference; FK – classical physiotherapy; FS – physiotherapy with a stabilizer.

Table 5. QBPDS scale – total points obtained

Intergroup comparison			Variable	Group	Study no.	$\bar{x}$	Me	Min	Max	SD	*P*
Study no.	Group	*p*	QBPDS	FK	I	42.60	38.00	19.00	72.00	16.38	0.01*
I	FK vs FS	0.73			II	39.40	34.00	23.00	65.00	13.15	
II		0.39		FS	I	41.19	40.00	14.00	64.00	14.60	0.00*
Student's *t*-test Mann-Whitney U test					II	34.50	32.00	11.00	58.00	14.39	

x – arithmetic mean; Me – median; Min – minimum value; Max – maximum value; SD – standard deviation; I – study I; II – study II; * statistically significant difference; FK – classical physiotherapy; FS – physiotherapy with a stabilizer.

Respondents in the FK group in study one reported the greatest difficulty when sitting in a chair for several hours (question 6), running about 100 m (question 12), and lifting and carrying a heavy suitcase (question 20). After rehabilitation, they reported a reduction in difficulty in such activities as sitting in a chair for several hours (question 6), walking about 300–400 m (question 8), making the bed (question 14), and pulling or pushing a heavy door (question 18) (Figure 1).

Before the start of the rehabilitation program, the FS group found it most difficult to roll over in bed (question 3), sit in a chair for several hours (question 6) and lifting and carrying a heavy suitcase (question 20). After rehabilitation, there was a reduction in the difficulty of performing activities such as getting out of bed (question 1), sleeping through the night (question 2), rolling over on the bed (question 3), sitting in a chair for several hours (question 6), walking several kilometers (question 9), making the bed (question 14), putting on socks (question 15), bending over to wash the bathtub (question 16) and pulling or pushing a heavy door (question 18) (Figure 2).

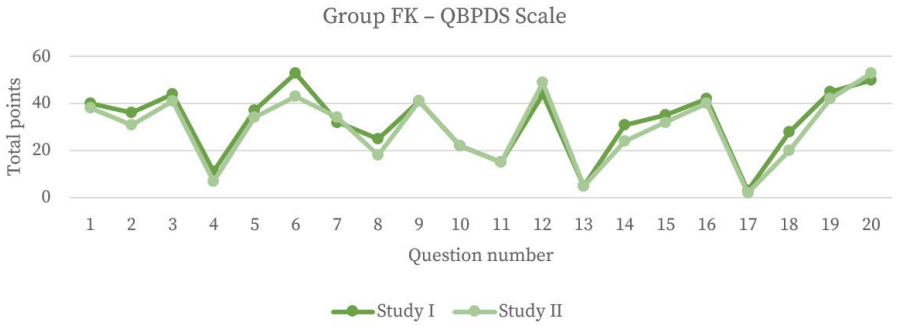

Figure 1. Total scores obtained for individual questions using the QBPDS scale among FK respondents

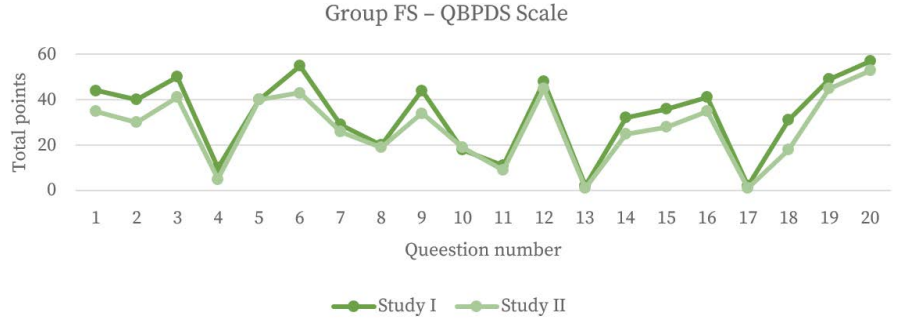

Figure 2. Total scores obtained for individual questions using the QBPDS scale among FS respondents

Discussion

Lumbar spine pain is one of the most common reasons for patients presenting to their primary care physician, as well as being a condition in which a clear cause for the pain often cannot be found. Currently, there are many methods that are used to deal with the occurrence of these ailments and new ones are constantly being developed, but so far it has not been possible to determine which method is the most effective. Numerous authors address the topic of comprehensive rehabilitation aimed at abolishing pain, increasing range of motion and restoring functional capacity, while in the results analyzed there is a lot of discrepancy in the evaluation of the effectiveness of the methods studied. The available literature indicates the effectiveness of the use of comprehensive physiotherapy in lumbar spine pain. In the study presented here, comprehensive rehabilitation was applied to both groups and the results obtained were evaluated using the NRS scale and the QBPDS scale. In both the FK and FS groups, there was a slight but significant improvement in lumbar mobility in the direction of flexion and a significant decrease in subjective feelings of pain intensity on the NRS scale, as well as a decrease in limitations during activities of daily living assessed using the QBPDS scale. The results obtained appear to be consistent with the observations of other researchers. Mikolajczyk et al.[12] compared the effects of traditional physiotherapy with Medical Taping. Forty patients with lumbar spine pain were subjected to traditional physiotherapy, which included classical massage, mechanical massage – aquavibron, sollux lamp, paraffin compresses, local cryotherapy, low-frequency magnetic field, ultrasound, laser, diadynamic currents, TENS currents, interference currents and kinesitherapy. Each patient assigned to this group benefited from 3 to 5 of these treatments. Another 40 patients (the control group) received Medical Taping. The therapy used fascial and muscle taping techniques without the use of other physiotherapeutic treatments. The rehabilitation program covered a period of 10 days. The results showed that the use of comprehensive rehabilitation (kinesitherapy and physical therapy) significantly reduces spinal pain and improves the quality of function, while no significant differences were found between the use of traditional physiotherapy and the Medical Taping method. It was also observed that the use of the Medical Taping method significantly reduced the intensity of pain and the degree of dysfunction among those treated with this method. In contrast, Depa et al.4 in their study evaluated the effect of comprehensive rehabilitation in 75 subjects (45 men, 30 women) aged 40 to 62 years on changes in quality of function and subjective experience of lumbar spine pain using the VAS scale and Oswestry Questionnaire. The program of physiotherapy treatments included: alternating magnetic field, diadynamic currents, cryotherapy, iontophoresis, dry massage and kinesitherapy. After a series of 15 treatments performed over a period of three weeks from Monday to Friday, a reduction in restrictions during activities of daily living, a decrease in pain and an increase in ranges of mobility in the lumbar spine were noted. This is also confirmed by the observations of Lisinski and Woloszyk.[13] The authors evaluated the effectiveness of physical therapy treatments in patients with lumbar spine pain syndrome accompanied by sciatica. They used a rehabilitation program based on the application of several selected physical therapy treatments on a group of 39 patients for a period of 10 days. The study showed little effectiveness of using only physical therapy in the subjects studied. Hence, it can be concluded that the desired therapeutic effects can be obtained by simultaneously using physical therapy combined with other methods as comprehensive rehabilitation.

The present study focused on comparing comprehensive classical rehabilitation (implemented by the center where the project was carried out) combining physical therapy treatments with general mobility exercises, and comprehensive rehabilitation combining physical therapy treatments with stabilization exercises using the PBU stabilizer. The company's own study showed that after completing a series of 10 treatments, the degree of limitations during the performance of activities of daily living improved in the group performing stabilization exercises compared to the group performing general mobility exercises. In addition, a significant improvement in lumbar flexion control and an improvement in the symmetry of the active flexion movement performed at the knee joints during the lumbar spine extension control test were also observed among patients in the FS group. However, due to the relatively short duration of the project, it is not possible to assess the long-term effectiveness of the exercises used. A similar study was conducted by Koumantakis et al.[14] in patients with recurrent chronic lumbosacral spine pain. The authors compared the effectiveness of general exercise with spinal stabilization exercises, but without the use of physical therapy. The study included 55 patients who were randomly assigned to one of two groups. Group one (29 subjects, mean age – 39.2 years) performed exercises directed at strengthening the muscles that stabilize the spine, including the abdominal and back muscles, and additionally performed aerobic and strength training exercises. The second group (26 people, average age – 35.2 years) performed only

a set of general fitness exercises. The project lasted for a period of 8 weeks, and the effectiveness of the therapy was evaluated immediately after the intervention, as well as 3 months after its completion. Immediately after the rehabilitation program, a reduction in pain intensity and a decrease in the disability of daily activities were observed in both groups. The results also showed that general mobility exercises significantly reduced the patients' disability in the short term and were more effective than stabilization exercises. In contrast, these differences were not noticeable in a repeat study after 3 months. In contrast, Goldby et al.[15] conducted a study evaluating the effectiveness of using three different interventions in patients with lower back complaints. 346 patients between the ages of 18 and 65 with chronic lumbar complaints were randomly assigned to one of three groups: rehabilitation using manual therapy, rehabilitation using stabilizing exercises, and a control group that received self-help education for pain relief. The effectiveness of the methods was evaluated sequentially after 3, 6, 12 and 24 months of intervention, taking into account: pain intensity (VAS scale), use of pain medication and quality of functioning (Oswestry Questionnaire). The results after 6 months showed a significant reduction in pain intensity and a significant improvement in the degree of functioning in daily life in the group performing stabilization exercises compared to the group that received manual therapy and compared to the control group. However, after 24 months, the stabilization exercise group additionally showed a reduction in pain medication.

An important goal of ongoing rehabilitation for lumbar spine pain syndromes is to reduce pain or eliminate it completely. However, a myriad of factors influence the desired results. These include the establishment of an accurate diagnosis, the selection of an appropriate rehabilitation program, the patient's psychophysical condition, and the intentions with which the patient decides to undergo rehabilitation (such as obtaining disability benefits). This is a difficult parameter to assess, since pain is a subjective sensation. Our own research showed that in both groups, after the completion of the 10-treatment series, the intensity of pain complaints changed significantly. The subjects experienced a reduction in lumbar discomfort, which they expressed using the NRS scale. A study by Goldby et al.[15] showed a statistically significant improvement in subjective pain intensity ratings on the VAS scale in the group performing stabilization exercises compared to the group that received manual therapy. Kujawa J. et al.[16] evaluated the analgesic efficacy using laser therapy combined with therapeutic gymnastics compared to the use of interferential currents combined with kinesitherapy. The study group consisted of 450 patients (319 women, 131 men) aged between 21 and 79 years. The results showed the effectiveness of both methods in reducing lumbar back pain using the Laitinen questionnaire, with laser therapy combined with therapeutic gymnastics being more effective. Depa et al.[4] conducting a comprehensive rehabilitation program noted a reduction in subjective pain intensity in 59% of the subjects, as measured by the VAS scale. They also noted that the resulting improvement in ranges of motion, as measured by the Schober and Otto tests, was accompanied by a greater reduction in subjective pain sensations occurring in the lumbosacral region.

Our study showed that the applied physiotherapeutic measures in both groups resulted in a statistically significant improvement of the analyzed parameters in the flexion of the lumbar spine. This proves that the use of comprehensive rehabilitation improves mobility in the painful spinal segment. The results of the study by Depy et al.[4] also showed an improvement in lumbar range of motion in 57% of the subjects. They also reported that increased ranges of motion significantly improved the quality of function in performing daily activities (as measured by the Oswestry questionnaire). Lukowicz et al.[17] conducted a study among 40 subjects (28 women, 12 men) aged between 23 and 70 years. Patients were divided into 2 groups (each consisting of 20 people), where one group received kinesitherapy and ultrasound, and the other group received only spinal strengthening exercises. A series of 10 treatments was performed for a period of 2 weeks excluding Saturdays and Sundays. After the rehabilitation, it was noted that lumbar range of motion (as measured by the Schober test and the toe-to-floor test) improved statistically significantly in both groups. However, it was also noted that a significant reduction in pain intensity (measured using the VAS scale and Laitinen questionnaire) was also observed in the group that received comprehensive rehabilitation, which was not observed in the group that received only strengthening exercises. It can be concluded that kinesiotherapy activities are an effective method in improving the range of motion of the lumbar spine, but when combined with other methods as comprehensive rehabilitation, they can bring much better results.

The occurrence of lumbar pain not infrequently results in a limitation of function, which manifests itself in difficulties in performing daily activities. An important part of rehabilitation in this case is, among other things, to focus on improving function and range of motion, as well as learning postural control and technique of movements. Numerous questionnaires and scales are used to assess disability due to back

pain, in the case of this project, the QBPDS scale. The company's own research showed that after the rehabilitation program, both groups improved in performing activities of daily living. However, a more significant reduction in functional disability was observed in the group in which stabilization exercises were used compared to the group in which general mobility exercises were used. The results obtained appear to be consistent with the observations of other researchers. Ajimisha et al.[18] evaluated the effectiveness of the muscle-fascial release method in nurses with complaints of lumbar pain. The study involved 80 nurses between the ages of 20 and 40 who were divided into two groups. The first group used standard back exercises and myofascial release techniques. The control group consisted of those in whom sham musculo-fascial release was applied in addition to exercises. The project lasted for a period of 8 weeks. The QBPDS scale was used to check the effects of treatment. Analysis of the results showed a significantly greater reduction in disability in the group undergoing myofascial release therapy compared to the placebo group. Dilekçi et al.[19] conducted a study evaluating the short-term effects of balneotherapy on pain, disability and fatigue in people with lumbar pain. 270 participants between the ages of 30 and 65 were divided into two groups. The control group received physical therapy treatments: warm compresses, TENS currents and ultrasound. In the second group, in addition to physiotherapy treatments, 20 minutes of balneotherapy (baths in thermal springs or warm water pool, water massages, thermal mud applications) were applied. Both groups simultaneously benefited from standard exercises used for back pain. The rehabilitation program lasted for a period of 3 weeks. The use of the QBPDS scale in the study showed a more significant improvement in the function of patients receiving balneotherapy compared to the control group. Based on the cited studies using the QBPDS scale, it can be concluded that the use of comprehensive rehabilitation can contribute to better therapeutic results in terms of a significant reduction in disability for lumbar pain.

Many researchers in their studies emphasize the need to conduct studies in homogeneous age groups and to conduct comparative studies where different therapeutic interactions are applied. In our study, we demonstrated the beneficial effect of a two-week comprehensive therapeutic interaction on the level of pain, spinal mobility, movement control of the lumbar spine and the reduction of limitations in activities of daily living in two modes of exercise (general exercise, stabilization exercises - combined with movement control). The observations show that both exercise techniques combined with physical therapy brought beneficial changes. However, only in the group of women who performed exercises using the stabilizer were significant changes in lumbar flexion control recorded, as well as the subjects had better lumbar control (to a greater extent) when performing active flexion at the knee joints.

Conclusions

1. The use of general-motor exercises and physical therapy treatments significantly reduced the level of perceived pain and improved mobility, while it did not significantly improve the control of lumbar spine motion in the women studied.
2. The use of PBU stabilizer exercises and physical therapy treatments had a significant effect on reducing the level of pain, improving mobility, and improving lumbar spine motion control in the women studied.
3. The use of both forms of comprehensive rehabilitation reduced limitations in the performance of activities of daily living assessed using the QBPDS scale. However, these changes are more pronounced in the group performing exercises using the PBU stabilizer (FS group).
4. Use of comprehensive rehabilitation (physical therapy treatments combined with general mobility exercises or with exercises with the use of a PBU stabilizer) yields significant results in reducing pain and improving lumbar spine mobility in the flexion direction. It seems, that a two-week exercise program with the stabilizer yields significantly better results in terms of lumbar flexion control and better control of lumbar extension when performing the NR spinal extension test. And this, in turn, may have an impact on the results obtained using the QBPDS scale among FS subjects.

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