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INVESTIGATION OF THE EFFECTS OF MANUEL TREATMENT IN PHYSIOTHERAPY- REHABILITATION OF PATIENTS WITH CHRONIC LOW BACK PAIN

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Abstract

Aim: The aim of this study was to investigate the effects of manual threatment in physiotherapy and rehabilitation of patients with chronic low back pain.

Material and methods: 30 patients, aged between 18-65, who accepted to be included in this study and diagnosed as chronic low back pain, were randomly divided into 2 groups: 1 control and 1 application. All patients (including the control group) underwent a standard physiotherapy program consisting of low back training and spine strengthening and stabilization exercises. The control group received no treatment other than this standard physiotherapy program. In addition to this program, manual treatment was applied to the application grup. The patients were treated for a total of 6 weeks, 2 sessions per week.

The level of pain severity of the participants was determined by Visual Pain Scale (VAS) and Algometry; The level of muscle strength was measured by muscle dynamometer. Oswestry Disability Index for functional evaluation; Beck Depression Inventory for anxiety level; Quality of Life Questionnaire (SF-36) was used for quality of life and Tampa Kinesophobia Scale was used for fear of movement. These assessments were performed at the beginning and end of the 6- week treatment program.

Results: We found statistically significant differences in both groups between the before-treatment and after-treatment results in terms of all evaluation parameters except Tampa kinesiophobia. Manual treatment method has reduced the severity of pain, increased muscle strenght, contributed positively to functional statues, decreased the level of anxiety and depression and improved the quality of life but no improvement in kinesiophobia in patients with chronic low back pain.

Conclusion: In line with our study results, we anticipate that the planned physiotherapy and rehabilitation program and manuel therapy will reduce the health expenditures by finding a solution option for chronic low back pain commonly seen in societies.

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Keywords:

Chronic low back pain, physical therapy, manual therapy, back training, back exercises

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Introduction

Low back pain (LBP) is defined as pain in the posterior region of the lower back. The limits of the low back are the lower edge of the last rib and the iliac crest, with or without leg pain (Vora *et al.,* 2010). Epidemiological studies have shown that 70-80% of people suffer from low back pain at some point in their lives and it takes the first place in chronic painful conditions (Krismer & Van Tulder, 2007). Chronic low back pain (CLBP) is a major health problem worldwide and is associated with high medical costs, lost productivity, and long-term disability (Dagenais et al.,2008; Freburger et al., 2009; Strine et al.,2007). It usually leads to aloss of functionality and of participation in society, loss of work and performance, psychological stress, affecting activities of Daily life and quality of life (Franke & Franke JD *et al*, 2014).

The ability to control pain is very limited in patients with chronic low back pain. It is very difficult for patients to live with chronic low back pain, to regulate family and work relationships and special occupation activities. These patients generally consulted a large number of doctors, underwent many medical evaluations and underwent surgical intervention. Not being able to determine the source of the pain and being told to learn to live with pain gives the patient the idea that a positive result cannot be reached in the treatment and that he will live with pain until the end of his life (VanTulder et al., 1997). Therefore, patients with LBP limit the use of their back and even all physical activities due to the re-injury and fear of pain. Restriction of activities results in functional losses and decreases physical fitness. Stiffness of the ligaments and joints of the vertebral column, loss of flexibility and limitation of the range of motion are seen. Muscle strain and spasm tendency occurs. Without solving these problems of the vertebral column and without improvement in physical fitness there is a risk of recurrence in low back pain. Restriction of physical activity and fear of movement (kinesophobia) cause anxiety, frustration, morale, and depression in individuals about active life and return to work. Especially depression is an important part of chronic low back pain. If one becomes dependent on someone else, they lose their self-confidence and cause deterioration in family and social relations. It even causes him to lose his job and cause economic problems. As a result, patients' whole lives are adversely affected by these problems. Apart from this, the decrease in continuity or decrease in job performance with frequent treatments or reports leads to loss of labor and cost increase for the employer; this causes economic harm in societies.

In the literature, the physiotherapy and rehabilitation methods used for chronic low back pain can be listed as follows:

Treatment of low back pain; conservative treatment and surgical approaches. The aim of conservative treatment is to maximize the patient's current condition. For this purpose, in order to accelerate the return to activity with functional restoration and to reduce the risk of recurrence of low back pain, it becomes important in terms of physiotherapy and rehabilitation of both primary damaged and secondary regions with dysfunction (Narin et al., 2008).

In conservative treatment, short-term bed rest is recommended for acute patients, while rest is not recommended for chronic patients. In these patients, active movement and functional rehabilitation are more important than resting. Especially active movement is a condition of functional rehabilitation (Porter, 2003; Bogduk, 2004; Norastek, 2012).

In low back pain, lumbar corsets are necessary to protect the waist from repetitive positions, to increase the standing balance and to support the waist in the sitting position. Drug treatment and injection treatments are also available (nonsteroidal anti-inflammatory drugs, analgesics, muscle relaxants, antidepressants, etc.). If these approaches are useless, invasive procedures can be applied (Munoz et al., 2010; Mathias, et al., 2010; Deyo, et al., 2009). The most commonly used methods for invasive applications are epidural lysis, epidural steroid injection, intra-disc injections, lumbar sympathetic block, radiofrequency thermoregulation applications (nerve, lumbar sympathetic ganglion, disc, dorsal root ganglion radiofrequency thermoregulation applications), spinal cord stimulation and spinal opid. Other surgical indications are sacral root paralysis due to disc herniation. Relative indications are progressive neurological loss, motor weakness, unbearable severe pain, frequent relapse and a negative response to appropriate conservative treatment (Dündar & Kavuncu, 2006).

In the treatment of patients with chronic low back pain, many physiotherapy and rehabilitation approaches such as hydrotherapy, electrotherapy, massage, thermotherapy, manual therapy, back school, traction and exercise are applied (Henchoz, 2008; Ferreira et al., 2010; Costa et al,. 2009; Unsgaard-Tondel et al., 2010; Saal, 1990). Superficial and deep heat agents are used as thermotherapy in the treatment of patients with low back pain (Özcan, 2000; Öztürk & Akşit, 2004).

Exercise is especially important in the treatment of patients with chronic low back pain. There have been many studies on this (Henchoz & Kai-Lik So, 2008; Ferreira et al., 2010; Costa et al,. 2009; Unsgaard-Tondel et al., 2010; Saal, 1990). Some of these are patient-specific exercises (Norastek, 2012; Henchoz & Kai-Lik So, 2008; Ferreira et al.,2010), PNF (proprioceptive neuromuscular facilitation) exercises (Aydoğan, 2009) dynamic stabilization exercises, Mc-Kenzie extension exercises (Henchoz & Kai-Lik So, 2008), aerobic exercises, flexion-extension exercises, strengthening and flexibility exercises (Henchoz & Kai-Lik So, 2008). Yoga, Tai-chi and pilates are among the exercises that have been used in the treatment of patients with low back pain because it provides core stabilization (Touche et al., 2008; Menacho et al., 2010; Basford et al., 2005). Many randomized trials and clinical practice guidelines have shown that exercise reduces pain and disability in patients, improves function and occupational status, and also reduces recurrence rates (Henchoz & Kai-Lik So, 2008; Ferreira et al., 2010; Costa et al,. 2009; Unsgaard-Tondel et al., 2010; Saal, 1990).

Manual therapy, which is one of the physiotherapy-rehabilitation methods, has been used more widely in clinical practice in recent years although it is a very old treatment method. Manual treatment methods include both diagnostic and treatment techniques. In physiotherapy, manual treatment programs are multimodal rehabilitation programs, which often include exercise, training and recommendations, in addition to manual treatment, and provide individual approach to patients. The general aim of manual treatment is to provide or increase mobility in joints and soft tissues, to accelerate the opening of the adhesions formed and thus gain painless function and to accelerate the person's return to daily life and / or sports by increasing tissue healing capacity (Franke & Franke *et al.,2014*).

The aim of this study was to investigate the effects of manuel treatment in physiotherapy and rehabilitation of patients with chronic low back pain.

Matherial and Methods

Individuals

The aim of this study was to investigate the effects of manual threatment in physiotherapy and rehabilitation of patients with chronic low back pain. The study was conducted between June 2018-February 2019 on 30 individuals who were admitted to Istanbul Esenyurt Necmi Kadıoğlu State Hospital and İstanbul Avcılar Murat Kölük State Hospital Physical Therapy and Rehabilitation Unit and diagnosed with chronic low back pain.

Our study was evaluated by Istanbul Medipol University Non-Interventional Clinical Research Ethics Committee with the Decision Number 10840098-604.01.01-E.5615 on 14/02/2018 and was found suitable for medical ethics.

30 patients, aged between 18-65, who accepted to be included in this study and diagnosed as chronic low back pain, were randomly divided into 2 groups: 1 control and 1 application. All patients (including the control group) underwent a standard physiotherapy program consisting of low back training and spine strengthening and stabilization exercises. The control group received no treatment other than this standard physiotherapy program. In addition to this program, manual treatment was applied to the application grup. The patients were treated for a total of 6 weeks, 2 sessions per week.

Before the study, all participants were informed about the aim of the study, the treatment methods used, the questionnaires to be applied, the duration of the treatment and the assessments to be made both verbally and in writing and the On “Informed Consent Form ” was signed.

The level of pain severity of the participants was determined by Visual Pain Scale (VAS) and Algometry; The level of muscle strength was measured by muscle dynamometer. Oswestry Disability Index for functional evaluation; Beck Depression Inventory for anxiety level; Quality of Life Questionnaire (SF-36) was used for quality of life, and Tampa Kinesophobia Scale was used for fear of movement. These

evaluations were administered to patients at the beginning and end of the 6-week treatment program and the data obtained were recorded.

Inclusion criteria:

- Low back pain for more than 3 months,
- Diagnosis of chronic low back pain by specialist physician,
- No drug use,
- Active in daily life,
- Literate,
- 18-65 years old,
- Volunteer to participate in the study,

Exclusion criteria:

- Spine fracture or dislocation,
- Patients with severe osteoporosis,
- Those with malignancy,
- Rheumatic diseases such as rheumatoid arthritis or ankylosing spondylitis,
- Patients with inflamatory low back pain,
- Patients who have had spine or disc surgery,
- Patients with neurological deficit,
- Patients with structural scoliosis or severe kyphosis,
- Those with advanced spinal stenosis or spondylolisthesis,

Methods

After explaining the purpose of the study and the methods used to the patients who met the inclusion criteria, the participants were signed the Informed Consent Form and the treatment was started. Before starting the treatment, In the first session, the questionnaires used in the treatment were filled in by the participants and necessary measurements were made. After the measurements, treatment program was applied. At the end of the 6-week treatment program, the following evaluation parameters were re-applied to the participants.

The following parameters were used in the evaluation:

1. Sociodemographic evaluation
2. Pain
3. Muscle strength
4. Functional evaluation
5. Quality of life

6. Anxiety
7. Kinesiophobia

Evaluation

Sociodemographic Evaluation

Before the treatment, the participants were asked and recorded their name, surname, age, weight, body mass index (BMI), educational status, marital status, income level and occupation.

Pain Assessment

The severity of pain was measured with Visual Analog Scale (VAS) and algometer.

VAS: The visual analogue scale (VAS) consistes of a line, usually 100mm long, whose ends are labeled as the extremes ('no pain' and 'pain as bad as it could be'); the rest of the line is blank. The patients is asked to put a mark on the line indicating their pain intensity (at the present time, over the past week, or over the past 2 weeks, etc.). The distance between that mark and the origin is measured to obtain the patient's score. Sometimes describtive terms, such as 'mild' and 'severe', or numbers are provided along the scale for guidance and the scale is then referred to as a graphic rating scale (Mannion et al., 2007).

The patients were told that the starting point showed no pain, and the ending point showed unbearable pain, and they were asked to mark the severity of the pain in the form. The point marked on the scale was measured with a ruler (in cm) and recorded.

Algometer: Algometer (Dolorimeter) was used to objectively measure pain threshold and pain tolerance. The algometer (Baseline FDK 10) consists of a metal piston with a 1cm diameter round rubber disc attached to a dial measuring pressure in kilograms (kg) and pounds (lb). Algometry was applied vertically to the most painful point by increasing the pressure 1kg / cm2 every three seconds until the patient felt pain. The pressure value causing pain sensation was determined as pain threshold. Three measurements were made within 20 second intervals and the lowest pressure value was recorded as pain threshold (Friction et al., 1985).

Muscle Strength Assessment

Muscle strength was measured by Takei brand back and leg dynamometer.

The Back and Leg Dynamometer consists of a foot chain, a lifting rod made of rigid aluminum covered with comfortable hand grips and a lifting platform. The 61X61cm lifting platform can be easily transported to any work area. The back and leg dynamometer includes springs of high strength and stiffness to guarantee a lifetime of high precision measurement. The dynamometer has a measuring range

of 0-300 kg (Tamer, 2000). Before the test, the patients were explained in detail about the procedure. After placing the legs on the dynamotre table with the knees bent, the patients pulled the dynamometer bar vertically with their hands upwards with the legs stretched, the back straight and the trunk slightly leaning forward, using their legs at the maximum rate. The patients were asked to perform the movement twice and their best grades were recorded.

Functional Evaluation

Back functions of the patients were evaluated using the Turkish version of the Oswestry Disability Index (ODI) questionnaire. Oswestry Disability Index; It consists of 10 items that question daily life activities. These; severity of pain, personal care, lifting, walking, sitting, standing, sleeping, social life, travel and degree of pain change. There are 6 options between 0-5 points for each item. The patient is asked to select the expression that best describes his condition. The maximum score is 50. Accordingly, 0-14 points are considered mild, 15-29 points are considered moderate, and 30 points are considered as severe functional restriction (Yakut et al., 2004). The Oswestry Disability Index was valid in Turkish (Yakut et al., 2004).

Life Quality

Quality of life was measured using the Quality of Life Questionnaire (SF-36), which was rated between 0-100.

Quality of Life Index: Short Form-36, which is frequently used to assess quality of life, provides a wide-angle measurement. The scale consists of eight subscales including physical function, physical role, emotional function, social function, general health, mental health, pain and vitality. Each subscale scores between 0-100 and the scale is directly proportional to the quality of life. 100 points reflect the best health status, while 0 pounds indicate the worst health status (Koçyiğit et al., 1999). The Turkish validity and reliability study of the Quality of Life Questionnaire (SF-36) was conducted (Koçyiğit et al., 1999).

Anxiety Assessment

Anxiety was measured by Beck Depression Questionnaire.

Beck Depression Questionnaire: This scale, which was developed by Beck in 1967 and consisted of 21 questions, consists of seven items using symptoms of sadness, pessimism, past failures, self-indulgence, self-blame in the face of any situation, loss of interest in life and those around it, and suicidal thoughts or desire. depression is tested in six. Each question consists of 4 sentences and 0 points: neutral status, 3: severe depression. The sentences in the content of the scale were prepared by taking the statements of the depression patients who were treated. The score is maximum 63. The validity and reliability of the Turkish language was made by Hisli et al. (Hisli, 1998). Interpretation of scores:

0-13 points: No depression

14-24 points: Moderate depression

25 points and above: Serious depression.

Evaluation of Kinesiophobia

Kinesiophobia was measured with the Tampa Kinesiophobia Scale (Tunca et al., 2011), a Turkish validity and reliability study.

Tampa Scale for Kinesiophobia: The scale, which was developed to measure the fear of movement and re-injury, consists of 17 questions. 4-point Likert score (1paun: Strongly Disagree, 2 points: Disagree, 3 points: Agree, 4 points: Totally Agree) is used for the questions in the scale. Patients receive a minimum score of 17 and a maximum score of 68. The higher the score, the higher the kinesiophobia. In studies, 37 points and above are defined as high kinesiophobia (Tunca et al., 2011).

Physical therapy and rehabilitation

Control Group

Patients in this group were given a standard physiotherapy training consisting of low back training and spine strengthening and stabilization exercises. The control group received no treatment other than this standard physiotherapy program.

Within the scope of the standard physiotherapy program;

• Williams flexion exercises,

• Stretching exercises for lumbar extensors, hip flexors and hamstrings,

• Strengthening exercises for abdominal muscles,

• Strengthening exercises for back extensors,

• Strengthening exercises were applied to the muscles around the hips.

Each of the above exercises was performed by the patients with 10 repetitions under the supervision of the physiotherapist.

Within the scope of back training;

- Anatomy and function of the spine,
- Posture training,
- Ensuring proper posture during daily activities,
- Back health protection techniques were given as presentations and demonstrations and these

individuals were trained on these issues.

Back training was given in 2 sessions for each group for a total of 30 minutes before treatment.

Manual Treatment Group

Patients in this group were given standard physiotherapy and manual therapy in addition to low back training.

The following procedures were applied to the patients as manual treatment.

- Classical soft tissue massage
- Lumbar region mobilization
- Lumbar region manipulation

Classical Soft Tissue Massage: The patient was laid on the treatment table. His clothes were stripped so that the lumbar area was naked. A thin pillow or folded towel was placed under the patient's waist. When the upper extremity of the patient was in the opposite T position, the head was turned freely to one side. The physiotherapist placed his fingertips on the lumbar paravertebras of the patient while standing on one side of the treatment bed. All palms and fingers were exited longitudinally with deep stroking from both sides of the vertebra. Slightly over the lumbo-thoracic border, the hands descended transversely laterally and the hands were brought closer to each other in a full waist-cup. This method was continued and 10 min classical massage was applied.

Lumbar region mobilization: The following mobilization techniques were applied to the participants:

- **Sustained Natural Apophyseal GlideS (SNAGs):** When the patient was in the sitting position, the mobilization belt was placed on the lower abdomen of the patient and the therapist's waist was placed in the appropriate position. The patient was asked to perform full trunk flexion. A constant force was applied throughout the movement, without interrupting hand contacts, with the therapist's hands on the facet joints and spinous protrusions. The applications were performed in one set and 10 repetitions while the patient was going to flexion and extension.
- **Central Postero-Anterior (PA) Technique:** The patient extends to the prone treatment table. The physiotherapist applies pressure by placing the palms of the palms on the processus spinosus in the lumbar region of the patient. Applications were performed in one set and 10 replicates.

Lumbar Region Manipulation: Patients underwent high velocity and low amplitude (HVLA) or grade 5 manipulation to the lumbar region.

The patient was placed on the side lying on the treatment bed, the lower leg was extended and the

upper leg was flexed from the hips and knees and the trunk was rotated contralaterally. The physiotherapist placed one of the forearms on the patient's hip with the fingers located on the patient's supralateral transverse process of lumbar vertebrae; and the other forearm placed on the chest and axillary region. With the help of the forearm placed on the hip of the patient, the physiotherapist passively rotated the patient's hip until the end of the range of motion and then physical therapist applied grade 5 manipulation.

Statistical analysis

SPSS 25 program was used for statistical analysis. The qualitative variables of the groups were summarized by number and percentage, and the quantitative data were summarized by the mean and standard deviation if they were normal distribution, and by the median, 25th and 75th percentiles if they were not suitable for normal distribution. Categorical variables were analyzed by chi-square test. The comparisons between the groups were examined by using ANOVA for the variables with normal distribution assumption, LSD post hoc tests with significant differences, and Kruskal Wallis with the Mann Whitney U test. In the first and after measurements, variables that fit the normal distribution were examined by t test in dependent groups and variables that did not fit the normal distribution were examined by Wilcoxon paired sample test. Statistical significance was set at $p < 0.05$.

Findings

30 patients, aged between 18-65, who accepted to be included in this study and diagnosed as chronic low back pain, were randomly divided into 2 groups: 1 control and 1 application.

In the control group, all variables except Tampa kinesiophobia were statistically significant.

Tablo 1 Comparison of before-after measurements in the control group.

	Before	After	t or Z	p
VAS Rest	5 (3-6)	2 (1-3)	-3.401	0.001
VAS Aktivity	6 (5-7)	3 (2-3)	-3.453	0.001
VAS Night	6 (5-7)	1 (0-2)	-3.431	0.001
Algometer	4.2±1.7	6.5±1.5	-11.571	<0.001
Dinamometer	39 (34-50)	59 (51-82)	-3.411	0.001
Tampa Kinesiofobia Total	41.3±5.3	41.9±5.6	-0.395	0.699
Oswestry Total	16.3±6.4	8.2±4.4	7.612	<0.001
BECK Total	19.9±10.6	11.8±9	4.837	<0.001
Physical Functioning	60 (45-80)	80 (75-85)	-2.626	0.009
Role physical	0 (0-50)	50 (50-75)	-2.708	0.007
Role emotional	0 (0-33.3)	66.7 (33.3-100)	-2.987	0.003
Vitality	40±16.1	61±13.9	-7.964	<0.001
Mental Health	60 (56-64)	72 (56-76)	-2.596	0.009

Social Functioning	50 (37.5-75)	75 (62.5-75)	-2.784	0.005
Bodily Pain	35 (22.5-45)	67.5 (65-77.5)	-3.220	0.001
General Health	45.3±17.7	56±12.8	-2.978	0.010

* T test or Wilcoxon rank test in dependent groups

In the manual therapy group, all variables except Tampa kinesiophobia were statistically significant.

Tablo 2 Comparison of before-after measurements in manual therapy group

	Before	After	t or Z	p
VAS Rest	5 (4-7)	2 (1-3)	-3.421	0.001
VAS Activity	8 (6-8)	3 (2-4)	-3.426	0.001
VAS Night	5 (3-8)	0 (0-1)	-3.424	0.001
Algometer	3.9±1.2	7.8±1.4	-15.020	<0.001
Dinamometer	58 (34-115)	94.5 (50.5-133)	-3.409	0.001
Tampa Kinesiofobia Total	41.9±9.3	37.8±8.8	1.828	0.089
Oswestry Total	17.3±6.9	8.1±4.7	6.108	<0.001
BECK Total	20.6±10	11.3±8.6	3.064	0.008
Physical Functioning	65 (40-80)	85 (75-90)	-2.949	0.003
Role Physical	0 (0-75)	50 (50-100)	-2.362	0.018
Role emotional	33.3 (0-66.7)	66.7 (33.3-100)	-2.136	0.033
Vitality	29.3±16.6	57±20.6	-4.228	0.001
Mental Health	44 (20-56)	64 (56-80)	-3.049	0.002
Social Functioning	50 (12.5-62.5)	75 (62.5-87.5)	-2.998	0.003
Bodily Pain	32.5 (10-45)	67.5 (45-80)	-3.244	0.001
General Health	35.3±24.5	55.3±26.6	-3.464	0.004

* T test or Wilcoxon rank test in dependent groups

Discussion

The main goals of CLBP treatment are to reduce pain, to improve soft tissue flexibility due to spasm and tension, to increase strength and endurance of the trunk stabilizers, and to improve mobility and posture, thereby, leading to improved functional capacity, better ability to perform activities of daily life, and prevention of work loss (McGill, 1998; Simmonds et al., 1998) Many methods such as resting, medical treatment, back school, hydrotherapy, massage, thermotherapy, manuel therapy, traction, exercise programs, physical therapy modalities, and manipulation are used in the treatment of CLBP (Chou et al., 2007; Negrini et al., 2006; Poitras et al., 2008) Among them, manual therapy has become a recommended treatment option to manage LBP, according to new clinical practical guidelines for American College of Physicians (R. Chou et al., 2017; D. Dowell et al., 2016) Manual therapy is a common and standard treatment for LBP which has been used by approximately 70% of clinicians such as physical therapists, osteopathic physicians and chiropractors in orthopedic seetings (J.E. Bialosky et al., 2009; C. E. Ladeira et al., 2015; A.H. Slattengren et al., 2017; R. Chou et al., 2007; R. Chou et al., 2007).

As recommended in the literature, we used manual therapy techniques in the treatment of patients with chronic low back pain. This study showed that both physical therapy (control) and manuel treatment programme improved pain, function, muscle strenght, quality of life and anxiety in patients with chronic low back pain.

Evidence-based studies have shown that spinal manual therapy is an effective method in the treatment of patients with chronic low back pain, and it provides significant improvements in pain and functional status. In a randomized controlled study in which Aure et al. Examined the effects of exercise therapy (stretching, strengthening, coordination and stabilization of the waist, leg, and hip circumference) and manual therapy (spinal manipulation, mobilization and stretching) in patients with chronic low back pain, pain (VAS) in both groups , functional evaluation (Oswestry disability index) and overall health related parameters. In the comparison between the groups, they obtained a better result in the parameters in the manual therapy group.

Spinal manipulation and exercise are important modalities that play a central role in the treatment of CLBP (Cuesta-Vargas et al., 2011) Some studies have found that the treatment of CLBP with spinal manipulative therapy may significantly decrease pain and improve function. Therapeutic exercise has also been shown to provide improvement on pain and functioning (Bronfort G et al., 2011; Cecchi F et al., 2010; Cecchi F et al., 2010;). In a meta-analysis, the patients with CLBP treated with exercise therapy showed a significant improvement in terms of pain and functional status, compared to the patients who received no treatment or other conservative treatments (Van Tulder et al., 2000).

(Goldby et al., 2006) found that spinal stabilization exercises were more effective than manual therapy in reducing pain intensity and disability and dysfunction. Interestingly, manual therapy was more effective in reducing pain in patients with the highest intensity. (Krekoukias et al., 2017) investigated the efficacy of manual therapy in patients with low back pain due to disc degeneration. They applied spinal mobilization to the first group, sham mobilization to the second group, and conventional physiotherapy to the third group. Passive physiological and accessory movements were applied to the level with disc degeneration as mobilization, while TENS, massage and stretching exercise were applied as conventional physiotherapy program. Mobilization has proven to be superior to conventional physiotherapy in improving pain severity and disability.

In our study, we applied a standard physiotherapy program to both control and manual treatment groups. In addition to the manual treatment group, we applied soft tissue massage, mobilization and manipulation techniques. The VAS and algometer were used to assess the pain severity and the ODI was used to evaluate the functional status. We found significantly higher improvements in the VAS and ODI scores in both physical therapy and manuel treatment grup.

In the study of (Dündar et al., 2009) stated that the quality of life of individuals with chronic low back pain was worse than those without pain and that psychiatric evaluations of patients with chronic low back

pain would improve their quality of life. In our study, we used the Beck Depression Scale to examine the psychological and depression status of the patients.

(Saracoglu et al.,2019) 69 participants were included in their study to investigate the effect of manual therapy and neuroplastic pain education in patients with chronic low back pain. They used the Numerical Pain Scale to assess the severity of pain, the algometer for pressure pain threshold measurement, the Oswestry Disability index to determine the functional level, and the Tampa Kinesiophobia Scale to determine the kinesiophobia levels. As a result, in all groups, pain level decreased, pressure pain threshold increased, functional level improvement and kinesophobia decreased.

We obtained similar results in our study. In both the control group and the manual therapy group, we achieved decreased pain levels, improved functional level, and increased pressure pain threshold. However, in our study, Tampa kinesiophobia values were not statistically significant in both groups.

In studies conducted, it has been proved that muscle strength decreased in patients with chronic low back pain compared with healthy control group (Gibbons et al. 1997, Lee et al. 1994, Ramos et al. 2016). We measured the leg and back muscle strength of the participants with a dynamometer before and after treatment. We found that muscle strength was statistically significant in both the control group and the manual treatment group.

Results

- Manual treatment method has reduced the severity of pain in patients with chronic low back pain.
- Manual treatment method increased muscle strength in patients with chronic low back pain.
- Manual treatment method has contributed positively to functional evaluation of patients with chronic low back pain.
- Manual treatment method decreased the level of anxiety and depression in patients with chronic low back pain.
- Manual treatment method has improved the quality of life of patients with chronic low back pain.

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