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Comparative analysis of two different physiotherapy intervention programs in individuals experiencing chronic lower back pain

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ABSTRACT

Background and objectives. *Physiotherapy programs in individuals experiencing chronic lower back pain (CLBP) aim to improve function, disabilities from worsening. As per clinical practice guidelines, many methods are applied, such as the McKenzie method, therapeutic exercises, transcutaneous electrical nerve stimulation (TENS), traction, thermotherapy etc. The effectiveness of these methods is supported by a wide range of evidence and studies, making them some of the most diverse and well-established approaches. These physiotherapeutic treatments are combined every day. Therefore, the aim of this research is to provide a comparative investigation on two different physiotherapy programs containing a combination of these treatment modalities in individuals with CLBP.*

Materials and methods. *This research involved 60 patients who were separated into two groups. Group I received the McKenzie treatment method, passive modalities, lumbar traction, and a walking program. Group II received therapeutic exercises, passive modalities, lumbar traction, and a walking program. Both groups underwent treatment for six weeks. Subjects were tested using research instruments at the beginning, at the end of three weeks, and at the end of six weeks of treatment. The evaluation instruments used were the visual analog scale, Finger-to-Floor test, the Oswestry Low Back Pain Disability Questionnaire, and the Rosenberg self-esteem scale.*

Results. *Pain intensity, functional disability, lumbar flexibility, and self-confidence showed greater improvement after six weeks of treatment in both programs ($p < 0.0001$), without any significant statistical difference among the groups ($p > 0.05$).*

Conclusions. *The data obtained from both groups support the effectiveness of both treatment programs and suggest that they can be considered as options for viable programs treatment for patients with CLBP.*

Keywords: McKenzie, therapeutic exercises, traction, TENS, walking

INTRODUCTION

Across the world, one of the most common causes of long-term impairment is the condition of chronic low back pain (CLBP). As the average life expectancy has increased, there has been a considerable increase in the prevalence of CLBP [1]. Low back pain's clinical course can be categorized as acute, subacute, recurring, or chronic. Clinicians should focus substantially on treatments that prevent these events because of the dis-

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ease's high prevalence, related discomfort, and associated expenses [2]. CLBP is associated with high levels of pain, limitations in physical function, a poorer prognosis, and reduced quality of life [3], substantial disability, and loss of work [4]. An updated review of clinical recommendations for the treatment of CLBP suggests that patients receive education, exercise, multidisciplinary care, and integrated psychological and physical therapies [5].

The primary objectives of rehabilitation are to boost function and prevent the disability from becoming worse. Clinical practice guidelines encompass various methods, such as the McKenzie method, therapeutic exercises, nerve stimulation with transcutaneous electrical current (TENS), traction, thermotherapy, etc. The efficacy of these techniques is supported by a wealth of varied and comprehensive research [6]. One effective way for reducing pain [7], improving disability [8], as well as the lumbar range of motion (LROM) in CLBP patients is the McKenzie method [9]. Therapeutic exercises have been demonstrated to reduce the intensity of pain, improve muscle strength [10], disability and attitudes about avoiding fear [11], physical function, and consequent quality of life [12]. Lumbar traction, despite its widespread use, has yielded contradictory clinical outcomes. According to a late randomized controlled trial, lumbar traction was found to help people with CLBP with their pain and functional status [13]. However, other studies have reported little or no value of traction regarding clinical results, such as pain intensity and functional state, among individuals with LBP [14]. In patients with CLBP, walking has been demonstrated to decrease pain, disability, living quality in relation to health, and fear-avoidance [15]. Passive modalities, such as TENS, have been documented to positively impact lowering pain intensity [16] and improving postural control [17]. However, some studies have reported otherwise, indicating a lack of clinical outcomes of TENS in CLBP patients [18,19]. Another commonly used passive modality is thermotherapy, which gives patients with CLBP pain relief, strengthened muscles, and increased flexibility [20,21].

These physiotherapeutic treatments are routinely combined in clinical practices as part of comprehensive treatment programs for patients with CLBP. Therefore, the aim of this research is to provide a comparative analysis of two different physiotherapy programs containing a combination of these treatment modalities in individuals with CLBP.

The particular goal of the study is to compare the effectiveness of the therapeutic program of the McKenzie approach in combination with other physiotherapeutic treatments against a program of therapeutic exercises in combination with other physiotherapeutic treatments in individuals with CLBP.

MATERIALS AND METHODS

There were sixty patients in the research and was carried out over a period of six weeks at the Special Hospital for Rehabilitation “Banja e Kllokot.” The hospital's ethics committee gave the research its approval. All study participants met the inclusion criteria, which included both sexes, age range of 18 to 65, presence of pain in the lower back without or with leg radiation, and symptoms continuing longer than twelve weeks. The exclusion criteria for the participants were specific comorbidities (osteomyelitis, spondyloarthritis, vertebral fractures, maligned illnesses, structural scoliosis, instability of the spine, spinal tuberculosis, spondylolisthesis, and retrolisthesis), specific conditions (compression of nerve roots, pregnancy, patients who have undergone a surgical operation on the spine, specific contraindications of applied modalities), and patients who were not willing to follow a protocol lasting for six weeks. The participants have written informed permission after being made aware of the study. A series of computer-generated random numbers were used to assign subjects before to the initiation of therapy, to one of the two treatment groups. We divided the subjects equally, assigning 50% of the participants to Group I and 50% to Group II. The responsible clinical assessor did not know in which treatment group the subjects were. Group I received the McKenzie treatment method, passive modalities (TENS, thermotherapy), lumbar traction, and a walking program. Group II received therapeutic exercises, passive modalities (TENS, thermotherapy), lumbar traction, and a walking program. Both groups received treatment for three weeks, with five sessions per week in the hospital. Afterward, the subjects were treated for three additional weeks in an ambulatory manner, with three treatment sessions per week.

The McKenzie therapy involved various techniques, such as manual overpressure, manual mobilization with physiotherapist assistance, and/or self-mobilizing repetitive moves, or recurring stances in certain directions of motion. The guiding premise of treatment for the majority of patients was to encourage motions and postures that induced centralization of pain and discouraged motions that peripheralized their symptoms. According to how intense the pain is and the stage of the condition, subjects performed the exercises five times daily with 10 to 15 repetitions. Over the course of six weeks, the subjects underwent a maximum of 24 treatments [22]. The therapeutic exercises were carried out, five times per week for the first three. For an additional three weeks, exercises were performed three times a week. The physical training regimen comprised dynamic as well as static back exercises, with a focus on the lower limbs, pelvic muscles, abdominal region, and

lumbar area. Over the course of six weeks, the subjects underwent a maximum of 24 treatments [23]. The passive modalities that were administered included thermotherapy and TENS. For the first three weeks, the lumbosacral region and the affected leg were treated using hot pieces for 15 to 20-minute sessions, five times a week. The application continued three times a week for another three weeks using the same steps. TENS was administered using four medium-sized (2.5 cm) cutaneous electrodes, which were used to provide the current, and it included a 0.1 millisecond pulse length and a frequency of 7Hz. The intensity of TENS was adjusted based on the patient's subjective tolerance and pleasantness. Three times a week, TENS was administered for twenty to thirty minutes at a time. Over the six-week period, the subjects received a maximum of 18 TENS treatment sessions. For a period of six weeks, lumbar auto-traction therapy was given three times a week for up to thirty minutes each time. Based on the patient's reported tolerance, weight-bearing was administered intermittently by gradually raising the weight, starting at a third of the patient's body weight [24]. Five days a week were dedicated to the walking program. Initially, the patients began their session with ten minutes of walking (1200 steps daily) before progressing to 30 minutes of moderate-to-intense physical activity, such as brisk walking. The patients had the option to walk up to their pain limit, walk with a minimum level of pain (rated 1-3/10) for 15 to 20 minutes, or divide the walk into four to five minutes of walking, repeated four times a day [25].

Baseline assessments, as well as assessments after three and six weeks of treatment, were performed using four research instruments to evaluate the subjects' progress. Four valited instruments were used to assess the participants: The visual analog scale (VAS) was utilized to examine and assess the intensity of the pain [26]. Lumbar flexibility was assessed with the Finger-to-Floor (FTF) distance test using a tape measure [27]. Functional disability was assessed using the Oswestry Low Back Pain Disability Questionnaire (ODI). The ODI includes 10 areas of performance restrictions, such as pain level, self-care, lifting, moving, sitting, standing, sleeping, sexual activity, social activities, and travel [28]. Furthermore, to assess self-confidence was used the Rosenberg Self-Esteem Scale (RSE). Ten statements about general feelings of self-acceptance or self-esteem make up the RSE [29]. To process the data was used the statistical program SPSS 22.0. Mean and standard deviation are used to present data. The data were evaluated using the Chi-square test, Mann-Whitney test, Friedman test, and Dunn's multiple comparison test. P-values less than 0.05 were regarded as significant.

RESULTS

Sixty participants total were split into two groups for the study. The gender distribution analysis of the patients shows that there was equal representation of male and female respondents in each specific group as well as in the overall sample. Based on statistical research, there is no significant gender difference between the groups (p=1.000). Analysis of the age average revealed that the patients in first group had a slightly higher average age of 43.1 years (SD ± 9.0 years) in contrast to the individuals in the second group with an average age of 41.7 years (SD ± 10.7 years). However in terms of age, there was no statistically significant variance between the groups under investigation (p >0.05). The values of body mass index (BMI) revealed small deviations between the studied groups. The participants in the second group of this research had an average BMI of 25.3 kg/m^2, wich was slightly unhealthier in contrast to the study's first group of respondents, whose average BMI was 25.1 kg/m^2. However, based on body weight, height, and BMI, the analyzed groups did not exhibit any statistically significant differences. (p >0.05), according to the comparison between groups (Table 1).

The examination of the mean ratings on the VAS scale reveals that in both observed groups, the least amount of pain was reported following six weeks of treatment. Group I had an average score of 1.8 ± 0.9 after receiving 6 weeks of treatment, while Group II had a slightly higher average score of 2.4 ± 1.1. Nevertheless, both sets of participants demonstrated statistical significance in terms of pain intensity (p < 0.0001), with no notable difference found in between the two groups (p >0.05) (Table 2).

TABLE 1. *Characteristics at the start of the study for both intervention groups*

	Group I n = 30	Group II n = 30	P-value
Men	15 (50.0%)	15 (50.0%)	1.000
Women	15 (50.0%)	15 (50.0%)	
Age (year)	43.2 ± 9.0	41.7 ± 10.7	0.576
Weight (kg)	70.2 ± 7.1	71.7 ± 7.3	0.420
Height (cm)	167.1 ± 5.9	168.3 ± 5.8	0.260

TABLE 2. *Analysis for pain intensity based on measures using VAS-scale*

VAS	Group I n = 30	Group II n = 30	P-value*
Baseline	6.9 ± 0.9	6.7 ± 0.8	0.714
3 Week	4.4 ± 0.9	4.4 ± 0.9	0.087
6 Week	1.8 ± 0.9	2.4 ± 1.1	0.029
P-value1	<0.0001	<0.0001	

Legend: Mann-Whitney test, 1 Friedman test, and Dunn Multiple Comparison test

The inquiry of the mean score on the OSW questionnaire indicated that after six weeks of treatment, Group I,

with an average score (14.7 ± 6.5), had the lowest findings, thereby indicating less disability when compared to Group II, where the average score was a little lower (7.7 ± 6.8). However, regarding disability statistical significance was obtained for both groups (p <0.0001) and there was no significant difference in statistical terms between the groups (p >0.05) (Table 3).

The investigation of the results on the FTF test demonstrates that in the studied groups, following six weeks of therapy, Group I had the lowest results indicating better lumbar flexibility with an average score of 20.3 ± 5.9 compared to Group II, where the average score was slightly lower at 24.0 ± 7.4. Nevertheless, in terms of flexibility both groups were statistically significant (p <0.0001), and there were no notable discrepancies in statistics between the two groups (p >0.05) (Table 4).

The examination of the mean ratings on the RSE scale suggests that after six weeks of physiotherapy in the observed groups, Group I had higher results, indicating greater self-confidence, with an average score of 5.4 ± 2.3. On the other hand, Group II had slightly lower scores, with an average score of 24.0 ± 3.0, indicating lower self-esteem. However, in terms of self-esteem improvement, there was no significant statistical variance observed among the treatment groups (p >0.05). Both groups achieved statistical significance (p <0.0001) (Table 5).

TABLE 3. *Analysis for functional disability based on measures using OSW-questionnaire*

OSW	Group I n = 30	Group II n = 30	P-value*
3 Week	30.0 ± 5.7	32.4 ± 6.0	0.172
6 Week	14.7 ± 6.5	17.7 ± 6.8	0.122
P-value1	<0.0001	<0.0001	

Legend: Mann-Whitney test, 1 Friedman test, and Dunn Multiple Comparison test

TABLE 4. *Analysis for lumbar flexibility based on measures using the FTF-test*

FTF	Group I n = 30	Group I n = 30	P-value*
Baseline	52.9 ± 5.7	53.0 ± 5.7	0.899
3 Week	37.3 ± 7.1	39.9 ± 7.1	0.300
6 Week	20.3 ± 5.9	24.0 ± 7.4	0.040
P-value1	<0.0001	<0.0001	

Legend: Mann-Whitney test, 1 Friedman test, and Dunn Multiple Comparison test

TABLE 5. *Evaluation of self-confidence based on measures using RSE-scale*

RSE	Group I n = 30	Group II n = 30	P-value*
Baseline	11.8 ± 2.6	11.6 ± 2.5	0.673
3 Week	18.6 ± 2.8	17.4 ± 3.0	0.118
6 Week	25.4 ± 2.3	24.0 ± 3.0	0.048
P-value1	<0.0001	<0.0001	

Legend: Mann-Whitney test, 1 Friedman test, and Dunn Multiple Comparison test

DISCUSSION

As far as we know, this is the initial published reaserch for comparison between these two specific treatment programs for patients with CLBP. Therefore, we divided the discussion into two parts. In the first part, we discussed studies in which some of the modalities of our treatment programs were combined, as no studies with the same programs were available. In the second part, we incorporated research that evaluated the effectiveness of specific modalities that were part of our treatment programs. According to a recently published study by our group of researchers, therapeutic exercises combined with TENS, thermotherapy, lumbar traction, and a walking program were better at controlling pain, reducing disability, and enhancing quality of life [30].

In a study by Sanjana and Yatish, it was revealed that in CLBP with radiculopathy, combining TENS with the McKenzie technique is important for reducing pain, enhancing functional ability, and increasing spinal ROM [31]. These findings agree with our findings, as the treatment program incorporating the McKenzie method, TENS, and other modalities resulted in decreased pain intensity and increased spinal flexibility. According to controlled trials conducted by Deyo et al., TENS therapy does not appear to provide additional benefits when combined with exercise alone in patients with CLBP [32]. As reported by Jalalvandi et al., TENS therapy is more efficient in alleviating pain and reducing disability in comparison to back exercises in patients with CLBP [33]. Additionally, according to the study conducted by Murtezani et al., McKenzie therapy is superior in reducing lowering pain and functional disability compared to electrophysical agents among subjects with CLBP [34]. We cannot confirm or deny these findings because we did not specifically measure the efficiency of TENS (electrophysical agents) alone. Additionally, we did not measure the combination of therapeutic exercises or the McKenzie method with TENS (electrophysical agents) as standalone treatments but rather in combination with other modalities.

In relation to the Petersen et al. research, which compared the treatment of patients with the McKenzie method vs intensive strength training for subacute or CLBP patients, there was no difference in the reduction of disability and pain reduction, and no differences were observed at any time during the 8-month follow-up between the groups [35]. Our findings align with this study, since we didn't observe any statistically significant variances among the group that underwent treatment with McKenzie therapy and other modalities and the group treated with therapeutic exercises and other modalities after the 3rd and 6th week of treatment. In the study by Kochański et al., it was found that

when compared to kinesiotherapy and physical therapy treatments, McKenzie therapy was found to considerably enhance patients' quality of life with lumbosacral spine illnesses, as measured by the ODI. [36]. Similarly, in the research documented by Szulc et al., the implementation of the McKenzie approach was linked to a notable decline in ODI and a notable reduction in pain level (VAS) compared to standard physiotherapy treatments, such as classical massage, laser therapy, and TENS in patients with CLBP [37]. These findings align with our own findings, where the group treated with McKenzie therapy and other treatment modalities showed significant improvement in both the ODI (from 43.6 ± 4.3 to 14.7 ± 6.5) and the VAS scale (from 6.9 ± 0.9 to 1.8 ± 0.9). But in our study statistically significant was not achieved comparing the McKenzie therapy and the other treatment modalities group vs exercise therapy and other therapeutic modalities group ($p > 0.05$).

As evidenced by Clare et al., among individuals with LBP, following a brief study, McKenzie therapy leads to a more significant reduction in pain and disability when compared to regular exercises [38]. In our short-term comparative results, we also observed a slightly greater efficacy of McKenzie methods in combination with other treatment methods compared to therapeutic exercises, although without significant differences. Lam et al. suggests that McKenzie's technique is more effective than other therapies for decreasing pain and disability in patients with chronic low back pain, while the effectiveness varies depending on the specific treatment being compared to McKenzie [39]. In contrast, the study by Sanchis-Sanchez et al., concluded that there is evidence of low to moderate quality suggesting that McKenzie's approach is not better than other conventional physical therapy treatments (active and/or passive physical therapy) in reducing patients' pain and impairment with CLBP [40]. According to our research results, the group treated with McKenzie therapy and other treatment modalities demonstrated significant improvements in pain and disability, however, there were no substantial variations compared to the other group treated with therapeutic exercises and other treatment modalities. The short treatment duration for our subjects can be considered the main limitation of our study.

As a future direction for research, we believe that studies comparing the different physiotherapy programs with new methods such as Pilates, Yoga, Mulligan, etc., would be highly valuable.

CONCLUSION

We can conclude that both treatment programs have a significant positive effect on improving pain, disability, lumbar flexibility, and health-related quality of life among individuals with CLBP. The data obtained from both study groups support the effectiveness of both programs as treatment options for CLBP patients. When comparing the two groups, although there was slightly greater progress in the treatment program that combined the McKenzie method, passive modalities, lumbar traction, and a walking program, but the statistical significance was not achieved. However, to draw a definitive conclusion about on the efficacy of these programs in treating CLBP patients, it is important to take into account the longer-term treatment results.

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