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Impact of Brief Manual Therapy on The Degree of Pain and Functional Limitations in Individuals with Low Back Pain

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ABSTRACT

Background: Every year, there is a rise in the prevalence of musculoskeletal problems, with chronic back and neck pain being among the most common complaints requiring manual therapy treatment. The dose-effect relationship that exists between the clinical and physiological outcomes of therapy and the unique characteristics of spinal manipulation therapy has been the subject of research in the past few years.

The Aim of the work: This work aimed to assess how short-term manual treatment affects the degree of pain and functional limitation in individuals suffering chronic lower back pain.

Patients and Methods: The study comprised fifty patients, aged 20 to 50, who had persistent, nonspecific low back pain that persisted for more than three months. For a period of two weeks, each patient received both conservative care and spinal manipulation [SM] of the lumbar spine, which is characterized by high velocity and low amplitude thrusts. Evaluations were conducted both at the beginning of the intervention and four weeks thereafter. The Oswestry disability scale and the Visual Analogue Scale [VAS] were used to measure the degree of pain and functional disability.

Results: At the 4-week follow-up post-intervention, there was a significant reduction in both pain intensity [6.93±1.09 vs 3.33 ± 1.31] and functional disability [32.55 ± 6.14 vs. 16.65 ± 5.74]. Moreover, there was a strong correlation found between disability scores and pain VAS scores among our patients.

Conclusion: We concluded that for individuals with persistent low back pain, chiropractic care is useful in short-term settings for reducing pain as well as improving disability.

Keywords: Manual Therapy; Spinal Manipulation; Low Back Pain; Disability.

INTRODUCTION

Musculoskeletal disorders can originate in the lumbar, thoracic, or cervical portions of the spine. Its length might vary from just a few days or even weeks for an acute situation up to years for a chronic condition [1]. Worldwide, the leading contributory factor to disability and functional limitation is mechanical low back pain [LBP], followed closely by cervical pain [1,2]. Over 10% of the times individuals lived with a disability globally were attributed to back and cervical pain altogether [2].

Disc lesions, facet arthropathy, myofascial triggers, spinal ligaments, and other less prevalent reasons can all be the source of discomfort in the spine [1, 3]. Still, it might be difficult to pinpoint the exact cause of discomfort in certain situations [3, 4].

More secure and efficient therapies are required since both acute and long-term primary spinal pain can have an enormous adverse effect on both individuals and the community [1-3]. Spinal manipulative treatment [SMT] is one of the conservative methods that may work well for treating certain disorders [4].

Spine manipulation [SM] is the process of applying a force to a spinal area with high-velocity, low-amplitude thrusting, which is preceded by a gradual preload stage [5, 6]. The effects of preload and thrust phases on paraspinal muscle outcomes as well as joint structures such as ligaments, articular capsules, and intervertebral discs have been studied [6-8].

Previous research has shown that the force used during SM modifies spinal biomechanics and triggers paraspinal nerve endings [5, 9, 10]. Thus, some of the therapeutic outcomes of SMT may be explained by these effects [5]. However, it's yet unknown exactly which neurophysiological pathways SM uses to reduce pain [10]. This is especially crucial for nonspecific back pain because the majority of the most recent clinical treatment guidelines [11, 12] suggest using SMT to treat neck pain and LBP.

THE AIM OF THE WORK

In this work, we set out to assess how short-term manual treatment affects the degree of pain and the functional limitations in individuals suffering chronic mechanical lower back pain.

PATIENTS AND METHODS

Participants

This study was carried out in our university hospitals' rheumatology and rehabilitation departments. After signing an informed consent form and indicating their willingness to participate, individuals were evaluated for eligibility. The study was approved by the Hospital Research Ethics Committee.

The criteria for inclusion were as follows: age range of 20 to 50 years; LBP present for at least a 12-week period; localized discomfort; and pain that radiates to one or both of the lower extremities without any neurological abnormality. The exclusion criteria were: subjects with radiating back pain accompanied by neurological issues; infectious diseases or inflammatory conditions in the spine; thoracic or abdominal surgical procedures in the previous six months; joint or muscle inflammatory conditions; spondylolysis; lumber spinal fracture or surgery; being pregnant; and performing manual therapy interventions within 12 weeks prior to enrollment in the study.

Treatment procedures

Modified spinal flexion exercises [MSFE].

William's Flexion Exercise has been utilized for decades and has been shown to be effective in relieving LBP, making it one of the most effective physical treatments available to treat this condition [13]. For a two-week period, each patient was required to follow a prescribed workout regimen that they were to execute every other day. Every exercise was performed twice per session. There was a one-minute pause in between each set of five repeats.

Behavioral Modification

In this field, the patient received instructions and details on posture correction, the bio-mechanical approach to stress reduction, and back care during everyday activities.

Manipulation Procedure

All procedures were performed on an examination table with the patient in a lateral decubitus posture [Fig. 1].

A ten-year-experienced physician [SG], who had received training in spinal manipulation and vertebral mobility identification, carried out all procedures. As shown in Fig. [2], the patient assumes a left lateral recumbent posture with the pelvis and shoulder perpendicular to the table, the right leg flexed at the hip and knee, and the right foot in the left popliteal area without straining the paravertebral tissue.

With his left forearm in touch with the patient's right buttock, the clinician rotates the pelvis superiorly and interiorly, contacting the barrier at L4-5 level. The clinician's right forearm induces right rotation down to L4. Then, in accordance with **Gibbons and Tehan** [14], a sudden, small thrust is made anteriorly and cephalocaudally [Fig. 3]. An audible 'pop' during the manipulation was not essential [15].

Figure [1]: Starting position for the intervention

Figure [2]: Patient position in the preload phase

Figure [3]: Application of the high-velocity, low-amplitude thrusting

Assessment of outcomes

The clinical and demographic information was gathered at baseline. The Visual Analogue Scale [VAS] [16] and the Oswestry disability index [17] were recorded at baseline and four weeks after the intervention. The subjective VAS uses a 10-cm horizontal scale to represent self-rated pain severity at the time of testing; 0 cm represents "no pain" and 10 cm represents "worst pain." The Oswestry Disability Questionnaire is a patient-completed tool used in LBP rehabilitation that provides a subjective score of function [disability] in daily living activities.

Statistical methodology

Using G*Power, Version 3.1.9.2, the sample size was determined. Based on a repeated-measures analysis of variance [ANOVA] model, a minimum sampling size of 43 individuals was needed for a power of 0.80 and an alpha error of 0.05. Epi-Info, version 6.04 software, was used to perform statistics. The central tendency of the data and the distribution of the data around their mean value were measured using the X mean and SD standard deviation tests. A statistically significant difference between the mean values of two samples may be tested using the Student's t test. When examining qualitative data [or percentages], the X2 test [Chi square test] is used to determine whether there is a statistically significant relationship between various variables or grades. To determine if there is a significant difference between two values for the same individual [either before and after the intervention or between his left and right sides], the paired T test Pt was used. To determine if two numerical variables have a linear relationship, the Pearson correlation coefficient test [r] was used. If $p < 0.05$, the result is deemed significant.

RESULTS

Thirteen of the initial sixty-three participants were deemed ineligible due to their failure to satisfy the eligibility criteria. Thus, 50 individuals—25 females and 25 males—participated in the current study.

The average age was between 20 and 50 years old [mean 29.28 ± 6.53], the mean duration of LBP was 9.03 ± 4.33 months, and the mean weight was 69.65 ± 11.79 [Table 1].

At the 4-week follow-up post-intervention, the current research showed a highly statistically

significant decrease in the VAS score in comparison to the baseline evaluation [P = 0.000] with 52% percentage of improvement in VAS [Table 2].

On correlating VAS scores with the other study variables, we found a highly substantial positive correlation between the improvement in VAS and the disability index [DI]. That is to say, the improvement in the disability index will be greater, the more the VAS pain scores improve.

Following intervention, there was a substantial statistical decline in the disability index for our patients [P = 0.000] in comparison to the initial baseline evaluation.

There was a significant positive correlation between DI and the LBP disease duration. Cases with a long history of low back pain showed better results in disability score at the follow-up evaluation.

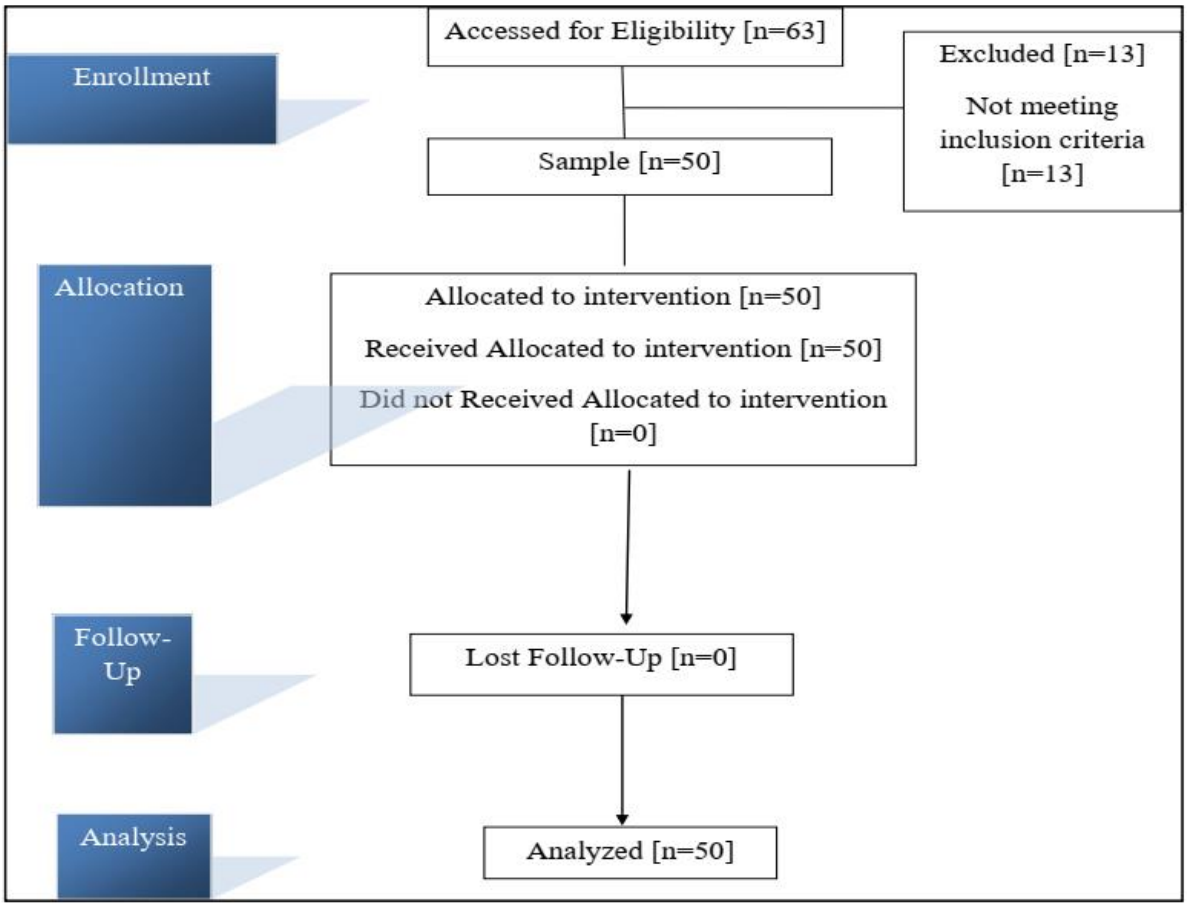

Figure [4]: Flow chart of the study participants

Table [1]: General characteristics of the studied groups

Variables		No.	%
Total cases		50	100
Sex	Males	25	50
	Females	25	50
Age [y]	Min - max	20 – 50	
	Mean ± SD	29.28 ± 6.53	
Weight [Kg]	Min - max	47 – 92	
	Mean ± SD	69.65 ± 11.79	
Duration [m]	Min - max	3 – 17	
	Mean ± SD	9.03 ± 4.33	
Occupation	Profession	7	14
	Student	6	12
	Worker	17	34
	Housewife	20	40

Table [2]: Visual analogue scale before and after intervention for the studied groups

	VAS Mean ± SD
Before intervention	6.93 ± 1.09
After intervention	3.33 ± 1.31
tp.	19.79
p.	0.000
Percentage of improvement	52 %

Table [3] Correlation between improvement in VAS after intervention and the other variables

Correlation	*r.*	*p.*
Improvement in VAS and age	0.18	> 0.05
Improvement in VAS and sex	0.13	> 0.05
Improvement in VAS and duration of disease	0.13	> 0.05
Improvement in VAS and weight	-0.06	> 0.05
Improvement in VAS and improvement in DI	**0.41**	**< 0.01**

Table [4]: Disability index before and after intervention for the studied groups

	DI % Mean ± SD
Before intervention	32.55 ± 6.14
After intervention	16.65 ± 5.74
tp.	27.34
P.	0.000
Percentage of improvement	49.48 %

Table [5]: Correlation between improvement in disability index after intervention and the other variables

Correlation	*r.*	*p.*
Improvement in DI and age	0.23	**> 0.05**
Improvement in DI and sex	0.22	**> 0.05**
Improvement in DI and duration of disease	0.39	**< 0.01***
Improvement in DI and weight	**0.22**	**> 0.05**

DISCUSSION

In this study, we provided evidence of a possible beneficial short-term impact of manual treatment on pain and function in patients with persistent mechanical LBP. In comparison to the baseline evaluation, our results showed a considerable percentage reduction in pain intensity, reaching 52% improvement at the 4-week follow-up after the SM intervention.

In accordance with several studies [9, 10, 18], our patients have high statistically significant pain relief after short-term spinal manipulation. **Stig *et al.*** [18] demonstrated that, following 12 sessions, 75% of the patients with persistent LBP undergoing chiropractic treatments experienced improvements in both pain and overall well-being.

Numerous neurophysiological pathways, including the spinal cord, peripheral nervous system, and supraspinal processes, may contribute to the pain-relieving effects of SM.

According to **Duarte *et al.*** [19] and **Kolberg *et al.*** [20], reactive oxygen species [ROS] in tissues experiencing oxidative stress as a result of acute damage may sensitize nociceptive fibers. In addition to enhancing allodynia and nerve function indicators, SM may have pain-relieving effects on patients with acute and chronic spine pain by preventing the rise of plasmatic ROS.

Prior study indicates that SM may attenuate pro-inflammatory cytokine responses [21, 22]. This might lead to modifications in peripheral inflammation and nociceptor sensitivity, ultimately resulting in pain alleviation. According to **Coronado *et al.*** [23] and **Honore *et al.*** [24], segmental inhibition of nociceptive pathways may be responsible for at least some of the pain-inhibiting effects of SM. However, **Mohammadian *et al.*** [25] **and Song *et al.*** [26] found that by inhibiting central sensitization, SM might lessen allodynia, secondary hyperalgesia, and spontaneous pain.

In this study, we observed a substantial improvement in functional disability after SM, with nearly 50% improvement in disability at the

4-week follow-up compared with the baseline findings. Our results are consistent with the findings of **Meade *et al.*** [27], who found that patients with chronic and severe LBP experienced a substantial drop in Oswestry scores following ten chiropractic manipulative therapy sessions.

The current study's findings revealed a strong positive relationship between disability and pain severity. **McGorry *et al.*** [28] demonstrated that acute pain attacks were significantly associated with both drug use and disability. They claimed that the level of discomfort could have an impact on disability. However, in their investigation, **Descarreaux *et al.*** [29] found a disparity between the assessment scores for pain and disability. Although persistent LBP can lead to disabilities, there is a complex link between pain and the degree of disability [30, 31]. Patients may exaggerate their degree of disability based on a variety of circumstances, such as their social and psychological status.

There are some drawbacks to this study, including a limited sample size, the absence of a control group, and the need for a valid method, such as lumber spine electrophysiological studies, to accurately assess the response to spinal manipulation. To ascertain the long-term effects of spinal manipulation methods, longitudinal studies are required.

Conclusions: This study concluded that in patients with persistent mechanical LBP, a brief manual therapy intervention combined with other treatment modalities [such as exercises] resulted in a short-term improvement in pain intensity and functional disability; however, additional research is needed to monitor the long-term effect of this treatment modality.

Availability of data and material: The information will be made available upon reasonable request.

Competing interests: The authors state that they do not have any competing interests.

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