Journal of Bodywork & Movement Therapies 41 (2025) 194–198

Contents lists available at ScienceDirect

Journal of Bodywork & Movement Therapies

journal homepage: www.elsevier.com/jbmt

Acute effects of myofascial release technique on flexibility and pain: Outcome for chronic low back pain

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ARTICLE INFO

Handling Editor: Dr Jerrilyn Cambron

Keywords:
Myofascial release
Chronic low back pain
Flexibility

ABSTRACT

Background: Myofascial release technique (MFR) is frequently used in the treatment of patients with chronic low back pain (CLBP), but there are limited studies on the acute effects of this technique. It was aimed to determine the acute effect of MFR technique on pain and flexibility in CLBP.
Methods: Forty CLBP patients (19 female; 21 male) with an average age of 40 years were randomized as MFR technique and classical massage groups. A single session of technique was applied to each group. Outcome measurements consisted of the Visual Analogue Scale (VAS), Sit and Reach Test (SRT), Straight Leg Raise Test (SLRT), and Modified Schober Test.
Results: In within-group comparisons, all outcome measures (except right-SLRT) improved statistically significantly in both groups after interventions ($p<0.05$). ANCOVA was conducted to determine whether there were significant differences in between groups after intervention while controlling for age. The analysis showed that VAS, SRT and left-SLRT results were significantly more improved after the MFR technique compared with classical massage ($p<0.05$).
Conclusion: In conclusion, the MFR technique is a safe and effective method for the immediate relief of pain and the enhancement of flexibility. Furthermore, it demonstrates superior efficacy in pain relief and flexibility improvement compared to classical massage, which is another manual therapy technique.

1. Introduction

Manual therapy is one of the physiotherapy applications for the management of chronic low back pain (CLBP), consisting of spinal manipulation, mobilization, classical massage, and myofascial release (Boff et al., 2020). Classical massage, one of the most well-known and widely used manual therapy techniques, is thought to provide symptomatic relief of pain through physical and mental relaxation and increases the pain threshold as a result of the release of endorphins (Ernst, 1999). The gate control theory states that massage stimulates large diameter nerve fibers and, as a result, suppresses T cell activity. In a review, it was reported that massage may be beneficial in patients with subacute and chronic nonspecific LBP, especially when combined with exercise and education (Furlan et al., 2008). The myofascial release (MFR) technique has effects such as reducing fibrous adhesion, increasing flexibility, optimizing fascial slip, enhancing recovery, and helping relieve symptoms (Ozsoy et al., 2019). In addition, the purpose of the MFR technique is to restore tissue extensibility of the connective tissue that has changed its mechanical features, such as loss of normal flexibility and viscosity (Barnes, 1997). It has been reported that with a single application of myofascial intervention, there was a change in the neuromechanical properties of the muscles (increase in contraction speed) (Lohr and Medina-Porqueres, 2021), and with ten sessions of application, electromyographic activity is not affected but flexibility is increased (Rodrigues et al., 2021).

There are many studies on the acute and/or immediate effect of MFR on different outcome measures, such as strength (Campos de Almeida et al., 2021), jump performance (Koźlenia and Domaradzki, 2022), sprint performance at 15 m (Klich et al., 2024), muscle flexibility (Sulowska-Daszyk and Skiba, 2022), lumbar spine flexibility (Grieve et al., 2015), heart rate variability, and mood state (Fernández-Lao et al., 2012). Different study samples were included in these studies, such as

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https://doi.org/10.1016/j.jbmt.2024.11.035
Received 5 February 2024; Received in revised form 26 October 2024; Accepted 16 November 2024
Available online 18 November 2024

swimmers (Martins et al., 2024), academic athletes (Klich et al., 2024), long-distance runners (Sulowska-Daszyk and Skiba, 2022), breast cancer survivors (Fernández-Lao et al., 2012), inactive women (Martínez-Lema et al., 2021), and individuals with hip adductor strain (Metgud, D'Silva and Kamat 2022). Although there are many studies on the acute and/or immediate effect of MFR on different outcome measures in different study samples, acute effect studies in LBP are limited. One of the studies examining the acute effects of MFR in LBP measured spine shape parameters (Brandl et al., 2021). Another study found a reduction in leg length difference (Brandl et al., 2022). It has also been reported that both the Mulligan and MFR techniques provide clinically and statistically significant changes in pain and functionality in patients with nonspecific LBP in the immediate and short term (Bhat et al., 2021a). So, there are a limited number of studies examining the acute effects of MFR in CLBP, and no study has been found comparing the acute effects of classical massage and the MFR technique. This study aimed to determine the acute effects of MFR intervention on pain and flexibility in patients with CLBP and to compare it with classical massage intervention, which is one of the most common manual techniques. It was hypothesized that the MFR technique improves pain and flexibility more than classical massage in patients with CLBP immediately after a single session.

2. Method

2.1. Study design

The prospective, randomized, and controlled clinical trial was conducted at Iğdır State Hospital and involved patients diagnosed with CLBP. The study was approved by Haliç University Ethics Committee (30/February 25, 2021) and was registered on the ClinicalTrials.gov website (number: NCT05302882). All patients included in the study were informed, and their consent was obtained.

2.2. Participants

The inclusion criteria were being between the ages of 20 and 55 years, having pain for 6 months or longer, having stable clinical status, and having no cognitive and mental problems. Participants were excluded if they had specific spinal pathologies, previous spine surgery history, nerve root pain, history of malignancy, skin alignments, use of corticosteroids during the past three months, systemic diseases, cardiovascular problems, and pregnancy.

Patients were initially evaluated for inclusion and exclusion criteria, and their sociodemographic characteristics were recorded. Those eligible for the study were randomly allocated into the MFR group (n = 20) and classical massage group (n = 20) using a computer-generated sequence (randomization.org).

2.3. Outcomes measures

Outcome measures were consisting of the Visual Analogue Scale (VAS), Sit and Reach Test (SRT), Straight Leg Raise Test (SLRT), and Modified Schober Test. All assessments were made just before and immediately after the interventions.

Pain severity was assessed with VAS. The participants were asked to rate pain by marking on a 100 mm scale, labeled from ''least possible pain (score = 0)'' to ''worst possible pain (score = 100)'' (Price et al., 1994). The minimal clinically important difference (MCID) for this variable has been determined in 20 mm (Ostelo and de Vet 2005).

The SLRT and SRT are commonly used to evaluate hamstring flexibility (Miyamoto et al., 2018). The SRT was performed according to the procedures outlined in the American College of Sports Medicine manual. The participants sat on the floor with fully extended knees and feet positioned flat against a standard test box (Baseline Sit-And-Reach Trunk Flexibility Box was made in China). It is 35 cm long, 45 cm, wide and 32 cm high. Top surface dimensions are 55 cm long and 45 cm wide. There is a 50 cm ruler on the top surface of the box. The surface where the feet are placed is 15 cm ahead of the starting point of the ruler. At the beginning of the test, the first point touched by the fingertips is the zero point on the ruler. Then the participants performed maximum trunk (hip) flexion without bending the knee and reached forward, sliding their hands along the measuring scale as far as possible. Three trials were performed, and the average was recorded as ± centimeters. The MCID for the SRT is 4 cm (López-Miñarro and Rodríguez-García, 2010).

The SLRT is one of the most widely used measurements in both clinical and research settings to assess hamstring flexibility and is considered the standard assessment (Mier and Shapiro, 2013). The leg of the participant in the supine position was lifted with hip flexion by the physiotherapist while keeping the knee extension. The test was stopped when the subject first reported symptoms or the onset of pain in the hamstring reported by the subject. The degree of flexion in the hip joint was measured and recorded with a goniometer. The pivot point of the goniometer was placed at the hip joint, and its fixed arm was placed parallel to the body (Mens et al., 2001).

Lumbar flexibility was assessed with the Modified Schober test. When published, the Modified Schober Test was compared to L1-S1 radiographic measurements, and a very high correlation was found. At the same time, high accuracy and reproducibility were reported in subsequent studies (Beattie et al., 1987). While the patient was standing, marked a skin point five cm caudal and 10 cm cephalad to the lumbosacral junction (a parallel line drawn from the posterosuperior corner of the S1 vertebra to the skin) (Hershkovich et al., 2022). The patient was asked to perform active lumbar flexion without increasing pain. The distance between the highest and lowest points was measured in this position. The difference between measurement in neutral position distance (15 cm) and measurement in flexed position distance is calculated and recorded (Tousignant et al., 2005).

2.4. Interventions

A single session of application was performed for each group. For the MFR group, the technique was applied in a prone position according to described by Dewar (Duncan, 2021; Dewar, 2001). The physiotherapist positioned both palms at the level of T12, corresponding to the right and left ribs, and continuously stretched superiorly for two minutes. Then the physiotherapist placed his hands on the T12-L1 levels and the sacrum. A cross-hand hold was applied along the fascia without slipping on the skin or straining the tissue. This technique was applied for two minutes. After waiting two seconds, MFR was terminated by applying deep compression to the paraspinal muscles with the palm for two minutes on each side.

For the classical massage intervention, the physiotherapist placed a pillow under the patients' abdomen and asked the patients to lie in the prone position. Classical massage was applied to the waist area by the physiotherapist for eight minutes. The fact that the application was eight minutes was important so that the application time remained the same as the MFR and there was no difference in intervention time between the groups. The solid vaseline was used to move the hands more easily. The technique included three strokings, three kneadings, and friction, three strokings (Vickers et al., 2001). The classical massage application was began with three superficial strokes (effleurage) covering the entire lumbar region. This was followed by three strokes, three kneading, and three frictions for each side of the lumbar region. The technique was concluded with three superficial stroking (effleurage) covering the entire lumbar region.

2.5. Statistical analysis

The sample size was calculated with the G - Power v3.1 program (Universitat Kiel, Germany). When the literature was examined, the difference in lumbar flexibility was −4.66 ± 2.66 in the myofascial

release group, while the difference was −1.47 ± 2.78 in the sham group, and the effect size (d) was calculated as 1.172 (Do and Yim, 2018). Based on this, the sample size was calculated as 18 cases for both groups and a total of 36 cases, with 80% power and 95% confidence level. Considering that there may be data loss, a total of 40 cases were included in the study.

The data were analyzed using the IBM® SPSS® Statistics for Windows software (Version 22.0). Mean ± standard deviation (mean ± SD) and percentage (%) were used for the descriptive variables. The Kolmogorov-Smirnov test was used to check the normality of the all numerical data. In between-group comparisons of variables, the Chi-Square test was used for gender and the independent samples *t*-test was used for numerical variables. Pair samples *t*-test was used for within-group comparisons. The difference variable delta (Δ, mean change between baseline and immediately after the intervention) was used in comparisons. The purpose of using delta is to clearly demonstrate the effect of an intervention or treatment. Cohen's d was used to determine the effect size. According to this, values for Cohen's d statistics were >0.2 (small), >0.6 (moderate), and >1.2 (large) (Hopkins et al., 2009). An analysis of covariance (ANCOVA) was run to examine whether a change in outcome results differed between groups when controlling 'age'. Partial eta squared value is given for effect size for ANCOVA. According to Pallant (2007), 01 ≤ Eta-squared <0.06 is interpreted as "low level of effect", 0.06 ≤ Eta-squared <0.14 is interpreted as "medium level of effect" and Eta-squared ≥0.14 is interpreted as "high level of effect" (Pallant, 2007). Statistical significance was accepted for p values < 0.05.

3. Results

Table 1 shows the comparison of the demographical characteristics of the participants. There were no statistically significant difference in all baseline parameters except age (p = 0.037).

Table 2 presents the within-group and between-group comparisons, along with effect sizes. In within-group comparisons, all outcome measures, except right-SLRT in the classical massage group, showed statistically significant improvements in both groups following the interventions (p<0.05). ANCOVA was conducted to assess whether there were significant differences between groups after intervention while controlling for age. The analysis indicated that the VAS, SRT, and left-SLRT results were significantly more improved after the MFR technique compared with the classical massage group (p = 0.035, p = 0.010, p = 0.049; Table 2). Additionally, the partial eta square for the VAS variable indicated "medium level effect" ($\eta_p^2 = 0.114$), the partial eta square of the SRT variable indicated "high level effect" ($\eta_p^2 = 0.167$), and the partial eta square of the left-SLRT variable indicated "medium level effect" ($\eta_p^2 = 0.101$).

Table 1
Comparison of demographic data between the groups.

		MFR Group	Classical massage Group	p-value
		Mean ± SD	Mean ± SD	
Age (years)		44.15 ± 9.85	35.85 ± 11.00	**0.037**[a]
BMI (kg/m^2)		27.42 ± 3.48	25.85 ± 3.93	0.156[a]
		n (%)	**n (%)**	
Gender	Female	9 (45%)	10 (50%)	0.755[b]
	Male	11 (55%)	10 (50%)	

MFR: Myofasial release; BMI: Body mass index; kg: kilogram; m^2: meter square; SD: Standard deviation.
[a] Independent Samples *t*-test.
[b] Chi-square test.

4. Discussion

In the study examining the acute effects of MFR technique versus classical massage on pain and flexibility in patients with CLBP, it was seen that both interventions effectively relieved pain and increased flexibility. According to the analysis result that was performed to eliminate the effect of the difference between the groups the MFR technique was found to be more effective in relieving pain and improving flexibility compared to classical massage.

By acting directly on the fascia, the MFR technique tempts soft tissue release and elongation, increases local blood circulation, and regulates deep muscle and connective tissue (Beardsley and Škarabot, 2015). According to some studies, MFR has been reported to be more effective than multimodal physical therapy programs in increasing the pressure pain threshold (Rodríguez-Huguet et al., 2018). However, a recent systematic review and meta-analysis showed that MFR has no significant effect in relieving pain (Chen et al., 2021). Therefore, there is no consensus in the literature regarding the effectiveness of MFR in pain management. Some studies suggest that MFR and Mulligan techniques yield similar effects (Bhat et al., 2021b). In the current study, the MFR technique was effective in reducing pain both statistically and clinically, immediately. In contrast, classical massage did not demonstrate clinical effectiveness. The minimal clinically significant value for the VAS is stated as 20 mm (2 cm). The MFR group showed an average pain reduction of 3.00, meeting clinical significance, while the classical massage group did not reach this threshold, with a reduction of 1.85. In summary, pain decreased both clinically and statistically more in the MFR group than in the classical massage group. Although both interventions target the same structures, the superiority of MFR regarding the specified parameters has been established. This superiority may be attributed to the proven mechanism of MFR, which enhance fluid dynamics, improve tissue viscoelastic behavior, and increase the sensitivity of mechanoreceptors, such as muscle spindles, in that region, as noted in a study by Lohr and Medina-Porqueres (2021). While our study did not make such an inference based on the data, we believe this result is reasonable and should be further emphasized in future studies.

Decreased flexibility is one of the most important factors that damage soft tissue and structures that form the musculoskeletal system. While the impact of trunk extensor and hamstring muscle shortness in LBP is known, studies have shown that release techniques applied to the back region can positively affect the flexibility of these muscles (Dhiman et al., 2021). Self-MFR techniques applied to the backline have been shown to improve SRT (Williams and Selkow, 2019) and SLRT (Zhang et al., 2020) results. However, Ozsoy et al. (2019) found that MFR did not have an additional effect on flexibility assessed by the SRT. The literature includes a limited number of studies examining the acute effects of the MFR technique on the back region flexibility, indicating a need for more research on its effectiveness. A recent systematic review determined that while the MFR technique is effective in improving flexibility, it is less successful compared to other soft tissue release techniques (Dhiman et al., 2021). The flexibility was evaluated with four parameters: SRT, Modified Schober Test, right-SLRT, and left-SLRT. Among these, only SRT and left-SLRT showed significant differeneces in the between-group analysis. However, significant improvements were observed in all flexibility parameters within the MFR group. This findings aligns with other studies in the literature that highlight the positive effect of MFR technique on flexibility (Lohr and Medina-Porqueres, 2021; Sığlan and Çolak, 2023; Rodrigues et al., 2021).

In our study, the difference between the groups in some demographic and physical evaluations despite randomization can be counted as a limitation. On the other hand, the fact that the extremity affected by LBP is not noted during SLRT evaluation makes it difficult to interpret the superiority obtained in left-SLRT alone. This is thought to be probably due to the more affected one being the left extremity. Also, a follow-up to the study of 6 weeks or 3-months would have been useful to determine if the changes were maintained in the medium/long term. Additionally,

Table 2
Effects of the interventions on outcome measures.

	MFR group					Classical massage group					Analysis of covariance	
	Before	After	Δ	p[a]	Cohen's d	Before	After	Δ	p[a]	Cohen's d	p[b]	η_p^2
Visual Analog Scale (cm)	5.85 ± 2.11	2.85 ± 2.03	−3.00 ± 1.91	**<0.001**	1.563	6.15 ± 1.46	4.30 ± 1.34	−1.85 ± 1.13	**<0.001**	1.628	**0.035**	0.114
Sit and Reach Test (cm)	12.22 ± 7.51	17.16 ± 7.92	4.94 ± 3.89	**<0.001**	−1.268	14.05 ± 5.95	16.29 ± 5.76	2.23 ± 1.63	**<0.001**	−1.365	**0.010**	0.167
Modified Schober Test (cm)	7.93 ± 6.39	8.86 ± 6.12	0.93 ± 1.37	**0.007**	−0.675	4.92 ± 3.36	5.74 ± 3.60	0.82 ± 0.56	**<0.001**	−1.449	0.702	0.004
Right Straight Leg Raise Test (°)	56.50 ± 18.22	63.25 ± 17.64	6.75 ± 6.82	**<0.001**	−0.989	67.75 ± 11.03	68.70 ± 17.88	0.95 ± 14.42	0.772	0.066	0.147	0.056
Left Straight Leg Raise Test (°)	63.35 ± 16.60	72.40 ± 16.32	9.05 ± 9.05	**<0.001**	−0.999	70.60 ± 10.53	74.75 ± 10.01	4.15 ± 5.47	**0.003**	−0.757	**0.049**	0.101

MFR: Myofasial release; Δ: difference between after and before the interventions; η_p^2: partial eta-square.
[a] Comparison between before and after the sessions using Paired Samples T-test.
[b] Comparison between MFR and classical massage groups using the ANCOVA test.

including sham treatment groups in the study design in future studies may be important to examine the effectiveness of the MFR technique.

5. Conclusion

In conclusion, the MFR technique is a safe and effective method for the immediate improvement of pain and flexibility. Additionally, MFR is superior to classical massage, another common manual therapy technique, in reducing pain and increasing flexibility. Therefore, incorporating the MFR technique into treatment programs for managing pain and decreased flexibility - key symptoms of CLBP - may enhance the effectiveness of rehabilitation programs.

CRediT authorship contribution statement

Ozan Çetinyol: Writing – original draft, Resources, Methodology, Investigation, Formal analysis. **Seda Saka:** Writing – review & editing, Writing – original draft, Resources, Methodology, Formal analysis, Conceptualization. **Ayşenur Çetinkaya:** Writing – original draft, Resources, Formal analysis.

Ethical approval

The study was approved by the Haliç University Non-Interventional Clinical Research Ethics Committee (30/February 25, 2021). All authors acknowledge ethical responsibility for the content of the manuscript and will accept the consequences of any ethical violation.

Clinical trials number

NCT05302882 (retrospectively).

Funding

No funding received.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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