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Effectiveness of myofascial release technique versus dry cupping therapy in management of patients with non-specific low back pain

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ABSTRACT

This study aimed to compare the effects of myofascial release and cupping techniques on pain levels, spinal mobility, and functional impairments in individuals with non-specific low back pain (NSLBP). This study was a randomized controlled trial employing a pre-test and post-test design. Sixty male and female patients diagnosed with NSLBP, aged 45 to 55, participated. They were randomly assigned to three groups: Group A, in which 20 patients received myofascial release (MFR) along with conventional physical therapy; Group B, in which 20 patients received cupping therapy in addition to conventional physical therapy; and Group C, in which 20 patients received only conventional physical therapy. All groups underwent treatment three times per week for four consecutive weeks. Visual analog scale (VAS) results indicated significant improvements within each group; however, group A demonstrated superior pain reduction compared to groups B and C ($p<0.05$). Additionally, all three groups exhibited improvements in functional disability levels and range of motion, with group A showing statistically significant superiority over the other two groups ($p<0.05$). In conclusion, myofascial release therapy was more effective than cupping therapy in reducing pain, improving functional impairment, and enhancing lumbar range of motion in NSLBP patients.

KEYWORDS

Myofascial Release; Cupping; Non-Specific Low Back Pain

1. INTRODUCTION

The term "non-specific low back pain" (NSLBP) refers to low back pain that cannot be attributed to a specific, identifiable, or known pathology. Examples of such pathologies include a fractured spine, radicular nerve compression, a slipped intervertebral disc, lumbar spine stenosis, an inflammatory spine disorder (e.g., ankylosing spondylitis), cauda equina syndrome, congenital back disorders, or spinal infections. Other potential underlying conditions include HIV, autoimmune diseases (e.g., RA), meningitis, cancer, osteoporosis, and tumors in the lumbar region (El-Sayed et al., 2010).

Non-specific low back pain is more common among workers in strenuous physical labor, such as heavy lifting, repetitive movements, and prolonged static postures (Lizier et al., 2012). Chronic lumbar dysfunction, a poorly understood condition, significantly contributes to global healthcare costs and disability (Van Nieuwenhyse et al., 2004). It restricts movement in the lumbar region and surrounding joints, leading to functional impairment (Demoulin et al., 2007).

Some patients continue to experience persistent symptoms despite seeking treatment from doctors, physical therapists, chiropractors, and acupuncturists. For years, research has examined the efficacy of conservative, surgical, and pharmaceutical approaches in treating LBP patients. Many common treatment methods can be expensive, ineffective, and associated with serious side effects (Balagué & Dudler, 2011). Specific manipulation techniques have become a focus of physiotherapy for patients with chronic back pain. It is suggested that these techniques be integrated into a physical therapy program to enhance dynamic stability and fine control of the lumbar spine for the patient's benefit (Furlan et al., 2010).

Researchers and practitioners have recently advocated for a multidisciplinary approach to LBP treatment. Cupping is one such method that may enhance low back rehabilitation programs by providing immediate pain relief. Cupping therapy, a long-standing and widely used treatment in traditional Chinese medicine (TCM), may help alleviate localized chronic pain symptoms. An increasing number of patients are now interested in using cupping therapy for LBP, believing it to be a safer and more effective alternative to current treatments (Kim et al., 2012).

This traditional Chinese medical practice involves applying suction cups to soft tissue. According to Chinese medical philosophy, cupping promotes the free circulation of blood and qi (qi is considered the vital life force, with blood being a component of qi that flows together in the body), thereby reducing swelling and chronic pain. Furthermore, cupping may help manage gastrointestinal issues, lung diseases such as cough and asthma, and lower back, shoulders, and leg pain (Choi et al., 2021).

Patients with lumbar discomfort have been treated with cupping therapy. Due to its immediate symptom relief and ease of use, cupping is becoming increasingly popular in conventional medical practice (Tham et al., 2006). A recent comprehensive study demonstrated significant advantages of cupping when combined with other East Asian medicine therapies or medications compared to single interventions (Cao et al., 2010).

Another study suggests that when integrated into a multidisciplinary approach, cupping may be beneficial for individuals with LBP (Chenot et al., 2007). LBP can be managed through various therapeutic approaches, each effective in its own way. Myofascial release therapy (MFR) is a highly interactive stretching technique that adapts to the body's response to determine the stretch's direction, force, and duration, helping tight or restricted tissues relax as much as possible (Van Middelkoop et al., 2011). MFR methods consist of precise movements targeting the body's soft tissues, particularly the muscles and fascia. While all fibroelastic connective tissues, including skin, tendons, ligaments, blood, and lymph, may be affected, these techniques primarily focus on treating muscle and fascia (Digiovanna et al., 2005).

In addition, MFR is a group of techniques designed to alleviate mobility restrictions caused by fascial tension in the body's soft tissues. The controlled, focused application of force stretches and elongates the muscular and fascial (myofascial) structures, aiming to restore tissue mobility, proper joint function, and fascial tissue's fluid/lubricating properties (Manheim, 2008). The literature has ongoing debate regarding the relative effectiveness of cupping therapy and MFR in treating LBP.

Therefore, this study aimed to compare the effects of cupping therapy and MFR techniques on pain intensity, spinal mobility, and functional impairment levels in patients with NSLBP.4

2. METHODS

2.1. Design and Participants

This study was a randomized controlled trial employing a pre-test and post-test design. Sixty patients diagnosed with NSLBP were selected from those attending the outpatient clinic at Helwan Hospital. The study's inclusion criteria required participants to be between 45 and 55 years old, have a body mass index of 18.5-24.9 kg/m^2, and have experienced NSLBP for at least three months. Each patient's visual analog scale (VAS) score ranged from 4 to 6, indicating moderate pain. Participants were required to have restricted lumbar spine range of motion due to muscle tightness, hypersensitive tender points on palpation, and para-spinal pain. Exclusion criteria included osteoporosis, lumbar canal stenosis, spinal pathology (e.g., fractures or tumors), lumbar radiculopathy, a history of spinal surgery, back pain associated with pregnancy, or spinal deformities such as kyphosis or scoliosis.

Participants were randomly assigned to three groups. Group A consisted of 20 patients who received MFR along with traditional physical therapy, which included 30 minutes of therapeutic exercises targeting back, iliopsoas, and hamstring stretching and abdominal muscle strengthening. Group B consisted of 20 patients who received cupping therapy and the same traditional physical therapy regimen. Group C consisted of 20 patients who received only standard physical therapy, including 30 minutes of therapeutic exercises focused on abdominal muscle strengthening and back, iliopsoas, and hamstring stretching. All groups underwent their respective treatment protocols three times per week for four weeks.

2.2. Randomization

The flowchart illustrates the study selection procedure (Figure 1). The eligibility of 80 individuals with NSLBP was assessed. Six subjects dropped out, while 14 did not meet the inclusion criteria, eliminating 20 participants. Using a random generator, the remaining 60 participants were assigned to three equal groups: Groups A, B, and C.

The independent individual responsible for the allocation process did not handle participant recruitment and treatment. A therapist administered the intervention to each group, with patients remaining blind to their assigned group but aware of the treatment they received. One examiner evaluated and collected patient data both before and after treatment. The random allocation sequence was generated using a computer list and sealed in opaque envelopes to ensure allocation concealment. Before their first session, an envelope was opened for each eligible participant.

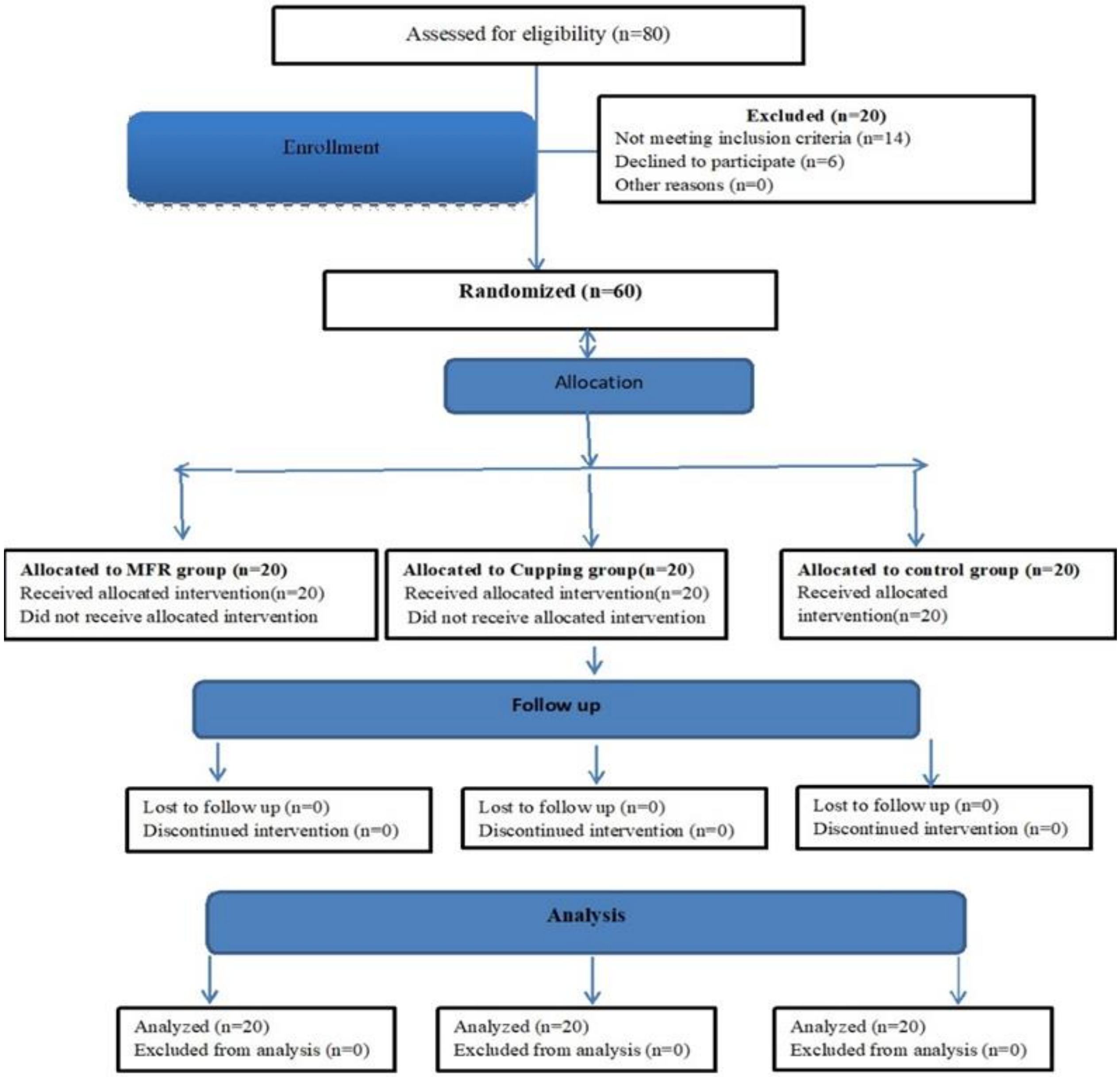

Figure 1. Flowchart of study participants

2.3. Ethical Considerations

Before the study commenced, ethical approval was obtained from the Cairo University Faculty of Physical Therapy's Research Ethical Committee (P.T. REC/012/005495). The investigation adhered to the guidelines of the Helsinki Declaration for research involving human subjects. The study protocol was registered online at ClinicalTrials.gov under the identification number NCT06773247.

2.4. Instruments for Assessment

2.4.1. Visual analog scale

Patients with NSLBP were assessed for subjective pain using VAS before and after treatment. The VAS is a self-reported 10 cm straight line indicating pain intensity, with the two extremes representing the least and most severe pain, respectively. The VAS is a valid and reliable instrument for measuring perceived pain (Hawker et al., 2011).

2.4.2. Functional disability

The Oswestry disability index (Ar-ODI) was used to assess limitations in daily living activities. The questionnaire covers 10 spects of daily function: pain intensity, personal care, lifting, walking, sitting, standing, sleeping, social life, traveling, and employment. Each section has six possible responses, rated on a scale from 0 to 5, where 0 indicates no disability, and 5 represents total disability. The overall score is calculated using the formula: (patient's score/50) * 100, providing a percentage representation of disability (Algarni et al., 2014).

2.4.3. Assessment procedure of lumbar flexion and extension ROM

The double inclinometer flexion technique

Lumbar flexion and extension were measured using two inclinometers. The examiner stood behind the standing subject while the therapist instructed the patient to bend forward into full lumbar flexion while holding the inclinometers. The therapist marked the skin along the spine, halfway between the two posterior superior iliac spines (PSIS), with an additional mark placed on the spinous processes 15 cm above the PSIS line. The inclinometers were positioned as close to 0 degrees as possible above the skin marks, and all inclinometer angles were recorded to the nearest degree. The upper inclinometer measured the gross flexion of the hips and lumbar spine, while the lower inclinometer captured hip flexion alone. The lumbar flexion range of motion was determined by subtracting the lower inclinometer reading from the upper inclinometer measurement. Rubbing alcohol was used to remove the skin marks (Trudelle-Jackson et al., 2010).

The double inclinometer extension technique

Lumbar extension measurements were conducted using the same landmarks and methods as the lumbar flexion technique. Both inclinometers were positioned over the skin marks, and the patient was instructed to bend backward while the therapist held the inclinometers and recorded the angles. The upper inclinometer measured the gross extension motion of the hips and lumbar spine, while the lower inclinometer captured hip extension alone. The lumbar extension range of motion was determined by subtracting the lower inclinometer measurement from the upper inclinometer reading. Skin markings were removed using rubbing alcohol (Trudelle-Jackson et al., 2010).

2.5. Intervention

2.5.1. Myofascial release technique

The lumbar region was treated using a vertical stroking technique targeting the quadratus lumborum. Prolonged repetitive motions, twisting, bending, prolonged sedentary posture, and muscle imbalances can contribute to the formation of trigger points, making the quadratus lumborum a common source of LBP. The technique was performed with the patient in a side-lying position, supported by a pillow under the waist to enhance muscle stretch. The therapist stood at the level of the patient's posterior hip, applying counterpressure on the ribs in a cephalic direction while using the other to perform vertical knuckle stroking caudally along the barrier's path. Upon reaching a barrier, the therapist applied mild pressure to stretch it and maintained the position for three to five minutes. A therapeutic pulse, such as heat, was observed before release. As the barrier was released, the therapist detected movement and softening of the tissue. Sessions were conducted three times per week, every other day, for four weeks (Bhosale & Burungale, 2022).

2.5.2. Cupping technique

Six double-walled glass cups, each measuring 75 to 100 mm in diameter, were placed upside down on the affected low back muscle area (acupoint BL23), which is located 1.5 cm lateral to the posterior midline at the level of the lower border of the spinous process of the second lumbar vertebra and is traditionally used to treat LBP. The cupping procedure was performed as follows: Massage oil was first applied to the area to enhance contact and facilitate movement of the cups. A vacuum was created as the air inside the cups cooled, pulling the skin upward. The cups were spaced 1-2 cm apart. Depending on the intensity of the cupping marks, which ranged from faint pink to dark red, the cups were removed after 10-20 minutes. Patients were instructed to remain still during the procedure. If suction became intolerable, the cups were removed before the entire duration elapsed. Cupping therapy was administered for 15–20 minutes, three times per week, every other day, for four weeks (Akbarzadeh et al., 2014).

2.5.3. Conventional physical therapy treatment

The program consisted of 30 minutes of abdominal muscle-strengthening exercises and stretches for the hamstrings, iliopsoas, and back. Stretching exercises were performed three times per week over four weeks. Each set comprised three repetitions, each involving a 30-second hold followed by a 30-second rest. Sessions were conducted every other day for four weeks, three days per week, and included a single set of strengthening exercises consisting of ten repetitions with a five-second hold (Ajimsha et al., 2015).

2.6. Sample Size Calculation

The sample size was calculated using G*Power software (version 3.0.10), as illustrated in Figure 2. The F-test MANOVA was selected for both within- and between-group interaction effects. With three groups and two measures, a power of 0.80, a 0.05 (two-tailed) alpha level, and an effect size of 0.393, a minimum sample size of 60 subjects (20 participants per group) was required.

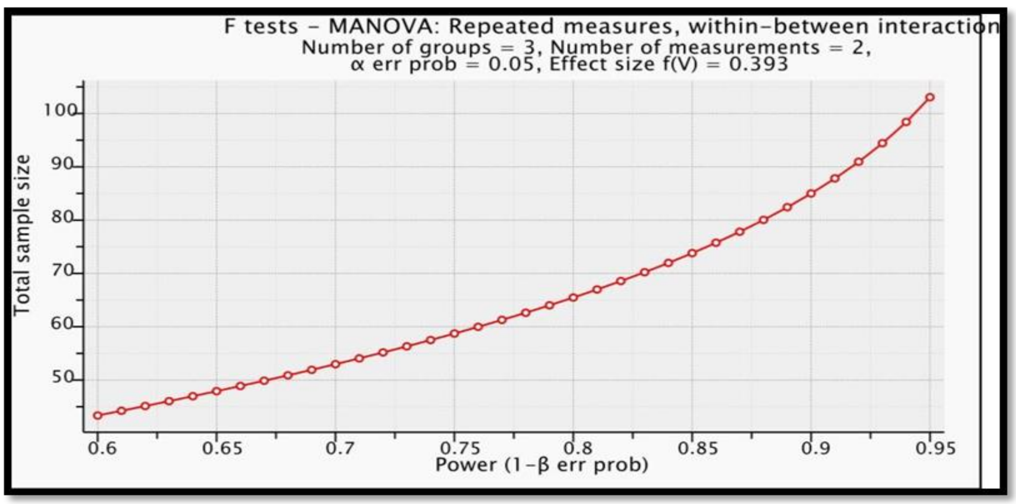

Figure 2. A plot of sample size

2.7. Statistical Analyses

The mean ± SD was used to express the data. The characteristics of the subjects in the three groups were compared using ANOVA. The efficacy of the myofascial release technique vs. cupping therapy on pain severity, spinal mobility, and functional impairments in patients with NSLBP was compared within and between groups using MANOVA. The chi-square test was used to analyze sex distribution. Data were analyzed using the Statistical Package for the Social Sciences (SPSS Inc., Chicago, Illinois, USA; version 20 for Windows). A p-value of 0.05 or less was considered statistically significant.

3. RESULTS

3.1. Normality test

After screening the data for extreme scores, homogeneity of variance, and normality assumptions, the Shapiro-Wilk and Kolmogorov-Smirnov tests confirmed that pain, disability scale, and back flexion and extension were normally distributed. Sex distribution analysis showed that group A had 6 (40%) females and 9 (60%) males, group B had 7 (46.7%) females and 8 (53.3%) males, and group C had 5 (33.3%) females and 10 (66.7%) males. The distribution of sexes across the three groups did not differ significantly (χ^2 = 0.556, p = 0.758).

As presented in Table 1, groups A, B, and C had mean ages of 47.1±7.1, 48.1±2.7, and 49.9±3.3 years, respectively; mean weights of 73.9±7.8, 70.5±7.5, and 73.3±8.5 kg; and mean heights of 167.5±9, 164.1±7.2, and 165.9±6.5 cm. Their mean BMIs were 26.2±1.9, 25.9±2.5, and 24.1±7 kg/m^2. No significant differences were found among the groups regarding age, weight, height, or BMI (p > 0.05).

Table 1. Characteristics of subjects in the three groups

Subject characteristics	**Group A** Mean ± SD	**Group B** Mean ± SD	**Group C** Mean ± SD	f-value	p-value
Age (years)	47.1 ± 7.1	48.1 ± 2.7	49.9 ±3.3	1.29	0.286
Weight (kg)	73.9 ± 7.8	70.5 ± 7.5	73.3 ± 8.5	0.783	0.464
Height (cm)	167.5 ± 9	164.1 ± 7.2	165.9 ± 6.5	0.744	0.481
BMI (kg/m^2)	26.2 ± 1.9	25.9 ± 2.5	24.1 ± 7	1.02	0.369

3.2. Effect of treatment on pain

Before the trial, the mean ± SD pain scores for groups A, B, and C were 6.3 ± 1.4, 5.9 ± 1.3, and 6.6 ± 1.2, respectively. After the study, the scores were 3.4 ± 1.7, 4.5 ± 1.1, and 6 ± 1.5, respectively. The pre-trial comparison revealed no statistically significant differences between the groups (p = 0.425). However, post-trial analysis indicated a statistically significant difference among the groups (p = 0.001). A significant reduction in pain levels was observed in groups A and B (p = 0.001 and 0.005, respectively), while no statistically significant change was noted in group C (p = 0.296), as shown in Table 2.

3.3. Effect of treatment on functional disability score

Before the trial, the mean ± SD disability scores for groups A, B, and C were 70.1 ± 7.8, 70 ± 8.4, and 68.4 ± 7.4, respectively. After the study, the scores were 45.9 ± 9.2, 61.2 ± 8.2, and 64 ± 8.3, respectively. The pre-trial comparison showed no statistically significant differences between the groups (p = 0.801). However, post-trial analysis revealed a statistically significant difference among the groups (p = 0.006). A significant reduction in disability scores was observed in groups A and B (p = 0.001 and 0.003, respectively), while no statistically significant change was noted in group C (p = 0.124), as shown in Table 2.

Table 2. Comparison of pre- and post-study mean values of pain, disability score, and back flexion and extension

Measured variables	Pre-study Mean ± SD	Post-study Mean ± SD	% of change	p-value
Pain				
Group A	6.3 ± 1.4	3.4 ± 1.7	46%	0.001*
Group B	5.9 ± 1.3	4.5 ± 1.1	24%	0.005*
Group C	6.6 ± 1.2	6 ± 1.5	4%	0.296
P-value	0.425	0.001*		
Disability scale				
Group A	70.1 ± 7.8	45.9 ± 9.2	34.5%	0.001*
Group B	70 ± 8.4	61.2 ± 8.2	12.6%	0.003*
Group C	68.4 ± 7.4	64 ± 8.3	6.4%	0.124
P-value	0.801	0.006*		
Back flexion (degrees)				
Group A	35.4 ± 8.2	85.3 ± 3.5	140%	0.001*
Group B	29.8 ± 9.26	65.1 ± 10.4	118%	0.001*
Group C	29.6 ± 6.8	44.3 ± 9.9	49.7%	0.001*
P-value	0.104	0.001*		
Back extension (degrees)				
Group A	9.9 ± 3.7	27.3 ± 1.9	176%	0.001*
Group B	10.4 ± 3.7	22 ± 2.1	111%	0.001*
Group C	10.8 ± 3.9	17.9 ± 2.4	65.7%	0.001*
P-value	0.707	0.001*		

Note. *SD: Standard deviation; p-value: Probability value; *: Significant.*

3.4. Effect of treatment on back flexion

Before the trial, the mean ± SD back flexion values for groups A, B, and C were 35.4 ± 8.2, 29.8 ± 9.26, and 29.6 ± 6.8, respectively. After the study, these values increased to 95.3 ± 3.5, 65.1 ± 10.4, and 44.3 ± 9.9, respectively. The pre-trial comparison showed no statistically significant differences between the groups (p = 0.104). However, post-trial analysis revealed a statistically significant difference among the groups (p = 0.001). Additionally, within-group comparisons showed a statistically significant improvement in back flexion for groups A, B, and C (p = 0.001 for all), as shown in Table 2 above.

3.5. Effect of treatment on back extension

Before the study, the mean ± SD back extension values for groups A, B, and C were 9.9 ± 3.7, 10.4 ± 3.7, and 10.8 ± 3.9, respectively. After the study, these values increased to 27.3 ± 1.9, 22 ± 2.1, and 17.9 ± 2.4, respectively. The pre-study comparison showed no statistically significant differences between the groups (p = 0.707). However, post-study analysis revealed a statistically significant difference among the groups (p = 0.001). Additionally, within-group comparisons demonstrated a statistically significant improvement in back extension for groups A, B, and C (p = 0.001 for each group), as shown in Table 2 above.

3.6. Post hoc test for pain, disability, and back flexion and extension after treatment

As observed in Table 3, the post hoc test conducted to determine the statistical differences in the mean values of pain post-treatment revealed significant differences between groups A and B and between groups A and C (p = 0.038 and 0.001, respectively), favoring group A.

Table 3. Post hoc test for the mean values of measured variables post-treatment

	Pain		**Disability score**		**Back flexion**		**back extension**	
	Mean difference	**p-value**	**Mean difference**	**p-value**	**Mean difference**	**p-value**	**Mean difference**	**p-value**
Group A vs. Group B	-1.07	0.038*	-6.33	0.028*	20.13	0.001*	5.26	0.001*
Group A vs. Group C	-2.66	0.001*	-9.13	0.002*	40.9	0.001*	9.4	0.001*
Group B vs. Group C	-1.6	0.002*	-2.8	0.325	20.8	0.001*	4.1	0.001*

***Note.** p-value: Probability value; *: Significant.*

A significant difference was observed between groups B and C (p = 0.001), favoring group B. Regarding the mean disability score after treatment, significant differences were found between groups A and B and between groups A and C (p = 0.028 and 0.002, respectively), favoring group A. However, no significant difference was observed between groups B and C (p = 0.325).

For the mean values of back flexion after treatment, significant differences were found between groups A and B and between groups A and C (p = 0.001). A significant difference (p = 0.001) was observed between groups B and C, favoring group B. Similarly, for back extension after treatment, significant differences (p = 0.001) were found between groups A and B and between groups A and C, favoring group A. A significant difference (p = 0.001) was observed between groups B and C, favoring group B.

4. DISCUSSION

This study examined the effect of the cupping technique compared to the MFR technique in treating NSLBP using VAS, the double inclinometer flexion and extension technique, and the Oswestry Low Back Pain Scale (OLBPS).

According to the gate control theory, sensory stimuli, such as the pressure applied in myofascial release, travel through the nervous system more rapidly than pain stimuli, which may explain the significant VAS outcome observed in group A. This faster transmission of pressure stimuli inhibits pain perception by blocking the transmission of nociceptive signals to the brain.The results of this study demonstrated that myofascial release significantly improved patient outcomes (p = 0.001) (Mayor, 2004). Additionally, myofascial release can enhance the length and condition of restricted connective tissues, thereby reducing the strain on pain-sensitive structures, including blood vessels and neurons (Ajimsha et al., 2014).

Furthermore, this study demonstrated that, compared to the control group, the cupping therapy group showed a significant improvement in pain intensity, suggesting that cupping therapy is more effective in reducing pain than standard management. This finding aligns with a related study that reported a notable decrease in pain following cupping therapy, attributing this effect to the suction-induced negative pressure. This mechanism enhances the removal of toxins at the application site, subsequently activating anti-inflammatory enzymes that alleviate pain and promote muscle relaxation (Wang et al., 2017).

Additional studies have examined the efficacy and safety of cupping therapy for individuals with varying levels of back pain. Significant findings indicate that cupping therapy is highly effective, safe, and affordable, with an average pain reduction ranging from 50% to 70% (Teut et al., 2018). The cupping glass is heated by the partial vacuum created through suction pressure, which enhances tissue blood flow and lymphatic circulation. This method relaxes tense muscles, a crucial factor in pain relief (Siddiqui et al., 2022).

After the intervention period, the MFR group's lumbar spine range of motion was statistically significantly greater than that in the cupping and conventional therapy groups. Both groups significantly improved the range of motion within their respective group comparisons. Myofascial release facilitates the breakdown of adhesions, increases blood flow and lymphatic drainage, and enhances soft tissue elasticity, ultimately improving range of motion and muscle strength (Paoloni et al., 2009).

Body function and pain levels are directly interconnected; alleviating pain may promote functional recovery. Myofascial release can improve overall physical function by enhancing trunk mobility and physical activity. Additionally, it reduces discomfort, increases trunk mobility, and enhances flexibility. Myofascial release helps restore the body's balance and stability by relaxing tense tissues responsible for pain (Yu et al., 2016).

A theory proposed by Hong (1999) suggests that reducing discomfort may account for improving the range of motion. There is broad agreement that the observable changes associated with fascial release can be explained by viscoelasticity. This concept posits that fascia responds to mechanical therapy techniques in three interconnected ways. Increased tissue extensibility results from the following factors: (1) the breaking of cross-links between fibers, (2) an increase in inter-fiber distance, which reduces fiber affinity, and (3) changes in the volume and consistency of the ground substance (Hong, 1996).

Other studies indicate that dry cupping is as effective as passive stretching and self-myofascial release in improving hamstring range of motion. Additionally, Markowski et al. (2014) investigated the effects of cupping therapy on individuals with low back pain. Their findings revealed that four sessions of cupping therapy significantly reduced pain while enhancing straight-leg raise motion, lumbar flexion range of motion, and pain-pressure threshold.

Following the intervention period, patients with NSLBP in the MFR and cupping groups experienced statistically significant reductions in functional disability, whereas the control group showed no significant differences. This improvement can be attributed to the combined effects of pain reduction and increased lumbar spine mobility. The hardening of fascial tissue, increased tension, and reduced sliding ability in other body areas may contribute to additional discomfort and functional limitations (Schroeder & Best, 2015).

5. CONCLUSIONS

According to the findings, patients with non-specific LBP can benefit from both treatment approaches (MFR plus conventional treatment and cupping plus conventional treatment) regarding pain reduction, functional impairment, and lumbar range of motion. However, statistical analysis revealed that MFR plus conventional physiotherapy was more effective than cupping plus conventional treatment or conventional treatment alone in reducing pain, improving range of motion, and decreasing functional impairment.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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