

Physiological and Biomechanical Outcomes in Patients with Chronic Low Back Pain: An Analysis of Therapeutic InterventionsMallika Makwana¹, Tehsin Shaikh², Sajidali S. Saiyad³, Mohmad Sejarali Sayeed⁴¹Assistant Professor, Shri Odhavram Physiotherapy College²PhD. (Microbiology)³MD, PhD (Physiology) Professor, Department of Physiology, Kiran Medical College, Surat⁴MS. DrNB Surgical Gastroenterology HOD GI surgery department at Shanti Devi GI institute
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Conflict of interest: Nil

Abstract:

Introduction: Chronic Low Back Pain (CLBP) affects millions globally and presents challenges to healthcare systems. It involves both physical and psychological factors, including disability, fear-avoidance beliefs, and reduced quality of life. While conservative treatments like exercise and pain management are common, fascia's role in musculoskeletal pain is increasingly recognized. Myofascial Release Therapy (MFR) and Motor Control Exercises (MCE) have shown positive outcomes for CLBP. This study examines the combined effect of MFR, MCE, and a Moist Heat Pack on pain, disability, fear-avoidance beliefs, and quality of life in CLBP patients.

Aims and Objectives:

The primary goal is to assess the combined efficacy of MFR, MCE, and a Moist Heat Pack in reducing pain (NPRS), disability (ODI-G), fear-avoidance beliefs (FABQ-G), and improving quality of life (EQ-5D-5L). Additionally, the study evaluates trunk endurance differences using the Flexor Endurance Test (FET) and Extensor Endurance Test (EET).

Methodology: This randomized controlled trial involved 48 CLBP patients divided into three groups:

- **Group A:** MFR, MCE, and a Moist Heat Pack.
- **Group B:** MCE only.
- **Group C:** Control group (no intervention).

The interventions lasted six weeks, five days a week, excluding the control group. Pain, disability, fear-avoidance beliefs, quality of life, and trunk endurance were measured at baseline, week 3, and week 6. Data analysis used ANOVA with a significance threshold of $p < 0.05$.

Results: Baseline characteristics were similar across groups ($p > 0.05$). By week 6, Group A showed significant improvements in pain, disability, and fear-avoidance beliefs ($p < 0.05$) compared to Groups B and C. Group B showed moderate improvements, while no significant changes in trunk endurance were observed in any group ($p > 0.05$).

Discussion: The combination of MFR, MCE, and a Moist Heat Pack significantly reduced pain, disability, and fear-avoidance beliefs, enhancing the quality of life. Group A exhibited the greatest benefits, reinforcing the therapeutic value of these interventions. However, the lack of significant trunk endurance improvement suggests a need for additional endurance training.

Conclusion: The combination of MFR, MCE, and a Moist Heat Pack is effective in reducing pain, disability, and fear-avoidance beliefs while improving quality of life in CLBP patients. Future research should explore the long-term effects of this therapy and additional strategies for improving trunk endurance.

Keywords- Chronic Low Back Pain (CLBP), Myofascial Release Therapy (MFR), Motor Control Exercises (MCE), Pain Management in CLBP, Fear-Avoidance Beliefs, Oswestry Disability Index (ODI), Quality of Life (EQ-5D-5L), Fascia Dysfunction, Therapeutic Interventions for Low Back Pain, Moist Heat Pack Therapy, Multifactorial Etiology of CLBP, Trunk Endurance in CLBP, Biomechanics of Low Back Pain, Pain Reduction Techniques, Disability and Low Back Pain

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Introduction

Chronic Low Back Pain (CLBP) is a prevalent condition, affecting millions worldwide and presenting a significant challenge to health care systems (Balagué et al., 2012). CLBP has a multifactorial etiology, including both physical and psychological factors such as disability, fear-avoidance beliefs, and reduced quality of life (Vlaeyen & Linton, 2000). While conservative therapies such as exercise and pain management are commonly used, the role of fascia in musculoskeletal pain, particularly low back pain, has recently gained attention (Schleip et al., 2012; Langevin et al., 2011).

Myofascial Release Therapy (MFR) has been proposed as a therapeutic approach to address fascial dysfunction and is thought to reduce pain and improve movement (Barnes, 1990). Although MFR has shown potential in various clinical settings, its effectiveness for CLBP remains under-researched (Ajimsha et al., 2015). Motor Control Exercises (MCE), which aim to improve the activation and coordination of the deep stabilizing muscles of the spine, have also demonstrated positive outcomes in managing CLBP (Moseley, 2004). Moreover, adjunct therapies like moist heat packs are commonly used to enhance tissue pliability and reduce discomfort (Katz et al., 2006). This study aims to investigate the effectiveness of combining MFR with MCE and the application of a moist heat pack in reducing pain, disability, and fear-avoidance beliefs, while improving the quality of life in CLBP patients.

Aims and Objectives

The primary objective of this study is to evaluate the effectiveness of the Myofascial Release Technique, in combination with Motor Control Exercises and a Moist Heat Pack, in reducing scores on the Fear-Avoidance Beliefs Questionnaire (FABQ-G), Oswestry Disability Index (ODI-G), Numeric Pain Rating Scale (NPRS), and improving Quality of Life (EQ-5D-5L) in patients with CLBP.

The specific aims are:

1. To assess whether the combination of Myofascial Release Technique and Motor Control Exercises is more effective than Motor Control Exercises alone in reducing pain (as measured by NPRS) (Fairbank & Pynsent, 2000).
2. To evaluate changes in disability levels (using ODI-G) after the intervention (Maughan & Lewis, 2010).
3. To measure the impact on fear-avoidance beliefs (using FABQ-G) (Waddell et al., 1993).
4. To assess the improvement in quality of life (using EQ-5D-5L) (Brooks et al., 2003).
5. To compare trunk endurance between the two groups (measured by FET and EET) (McGill, 1999).

Methodology

Study Design: A prospective randomized controlled trial was conducted to evaluate the effectiveness of Myofascial Release Therapy (MFR) combined with Motor Control Exercises (MCE) and Moist Heat Pack therapy for patients with Chronic Low Back Pain (CLBP). The study included three groups: Group A received the full intervention, Group B received MCE alone, and Group C (control) received no therapeutic intervention.

Participants

Forty-eight subjects with clinically diagnosed CLBP were recruited and randomized into three groups (16 per group). Subjects were included if they had CLBP for more than three months, were between 18 and 65 years old, and had no prior spinal surgery. Exclusion criteria included systemic diseases affecting the musculoskeletal system and any contraindications for MFR or exercise (Balagué et al., 2012).

Participants were divided into two groups:

- **Group A:** Received Myofascial Release Therapy combined with Motor Control Exercises and a Moist Heat Pack.
- **Group B:** Received only Motor Control Exercises.
- **Group C:** Control group received no therapeutic intervention.

All interventions were provided for six weeks, five days per week, except for the control group, which only underwent assessments.

Intervention

1. Myofascial Release Therapy: Group A received MFR, which involved gentle sustained pressure on fascial tissues to release restrictions and improve mobility (Barnes, 1990).

2. Motor Control Exercises: Both groups performed exercises to activate and strengthen the deep stabilizing muscles of the trunk, including the transverse abdominis and multifidus (Moseley, 2004).

3. Moist Heat Pack: Group A also received a 15-minute application of a moist heat pack to the lower back before each session to enhance muscle relaxation and improve tissue elasticity (Katz et al., 2006).

Outcome Measures

The following outcomes were measured at baseline, at the third week, and at the sixth week of treatment:

- **Pain:** Assessed using the Numeric Pain Rating Scale (NPRS) (Farrar et al., 2001).

- **Disability:** Measured using the Oswestry Disability Index (ODI-G) (Fairbank & Pynsent, 2000).
- **Fear-Avoidance Beliefs:** Assessed using the Fear-Avoidance Beliefs Questionnaire (FABQ-G) (Waddell et al., 1993).
- **Quality of Life:** Measured using the EQ-5D-5L, a widely used instrument for general health assessment (Brooks et al., 2003).
- **Trunk Endurance:** Evaluated using the Flexor Endurance Test (FET) and Extensor Endurance Test (EET) (McGill, 1999).

Data Analysis

Data analysis was performed using Analysis of Variance (ANOVA) for both within-group and between-group comparisons. A p-value of less than 0.05 was considered statistically significant.

Results

Baseline Characteristics

All three groups were comparable at baseline with no significant differences in demographic data, pain levels, or outcome measures ($p > 0.05$).

Table 1: Baseline Characteristics

Characteristic	Group A (MFR + MCE + Heat)	Group B (MCE Only)	Group C (Control)	p-value
Age (years)	45.2 ± 8.3	46.1 ± 7.9	44.7 ± 9.1	> 0.05
Gender (M/F)	09-Jul	10-Jun	08-Aug	> 0.05
Pain (VAS)	7.5 ± 1.1	7.6 ± 1.2	7.4 ± 1.0	> 0.05
ODI-G (Disability)	45.3 ± 6.9	46.0 ± 7.2	44.8 ± 7.1	> 0.05
EQ-5D-5L (Quality of Life)	0.42 ± 0.08	0.44 ± 0.07	0.43 ± 0.09	> 0.05

This table displays the baseline characteristics across the three groups with no significant differences.

Table 2: Pain Reduction Over Time

Timepoint	Group A (Mean ± SD)	Group B (Mean ± SD)	Group C (Mean ± SD)	p-value (A vs. B)	p-value (A vs. C)
Baseline	7.5 ± 1.1	7.6 ± 1.2	7.4 ± 1.0	N/A	N/A
Week 3	4.3 ± 1.0	5.1 ± 1.2	7.1 ± 0.9	< 0.05	< 0.05
Week 6	2.9 ± 0.8	4.1 ± 1.0	6.9 ± 0.8	< 0.05	< 0.05

This table presents pain reduction at different time points with significant improvements in Group A.

Table 3: Outcome Measures at Week 6

Outcome Measure	Group A (Mean ± SD)	Group B (Mean ± SD)	Group C (Mean ± SD)	p-value (A vs. B)	p-value (A vs. C)
ODI-G (Disability Score)	23.1 ± 4.8	28.6 ± 5.2	42.0 ± 6.5	< 0.05	< 0.05
Fear-Avoidance (FABQ-G)	19.4 ± 3.9	24.8 ± 4.2	38.5 ± 5.7	< 0.05	< 0.05
EQ-5D-5L (Quality of Life)	0.71 ± 0.10	0.60 ± 0.12	0.42 ± 0.09	< 0.05	< 0.05
Trunk Endurance (FET)	90.4 ± 14.7	87.6 ± 15.9	86.9 ± 13.2	> 0.05	> 0.05

This table summarizes the key outcomes at Week 6 across the three groups.

Pain

At the third and sixth weeks, Group A showed a statistically significant reduction in pain compared to both Group B and Group C ($p < 0.05$). Group B also showed significant reductions compared to the control group (Group C), but the reduction was smaller compared to Group A ($p < 0.05$).

Disability

Group A exhibited a significant improvement in disability scores (ODI-G) at both the third and sixth weeks compared to Group B and the control group ($p < 0.05$). Group B also showed improvements compared to Group C, but these were less pronounced than in Group A ($p < 0.05$).

Fear-Avoidance Beliefs

There was a significant reduction in fear-avoidance beliefs in Group A compared to both Group B and the control group ($p < 0.05$). Group B showed minor reductions compared to Group C but not as significant as Group A ($p < 0.05$).

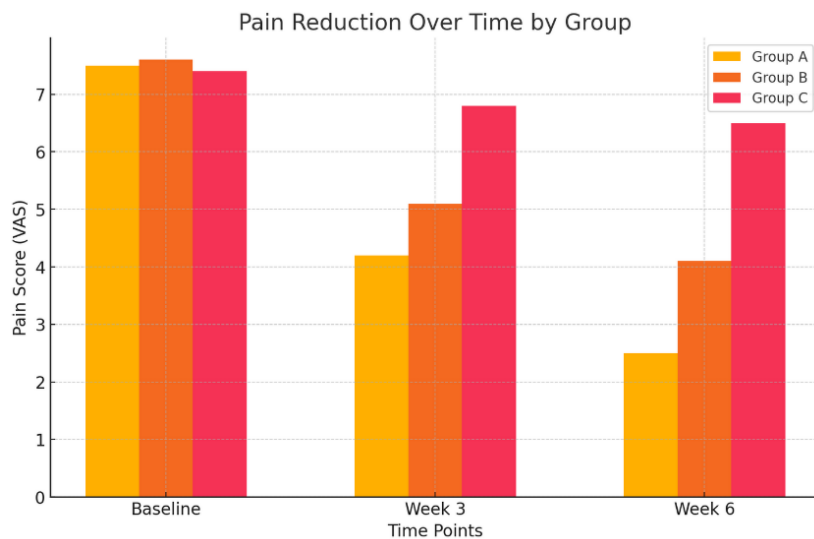
Quality of Life

Participants in Group A showed significant improvements in quality of life, as measured by

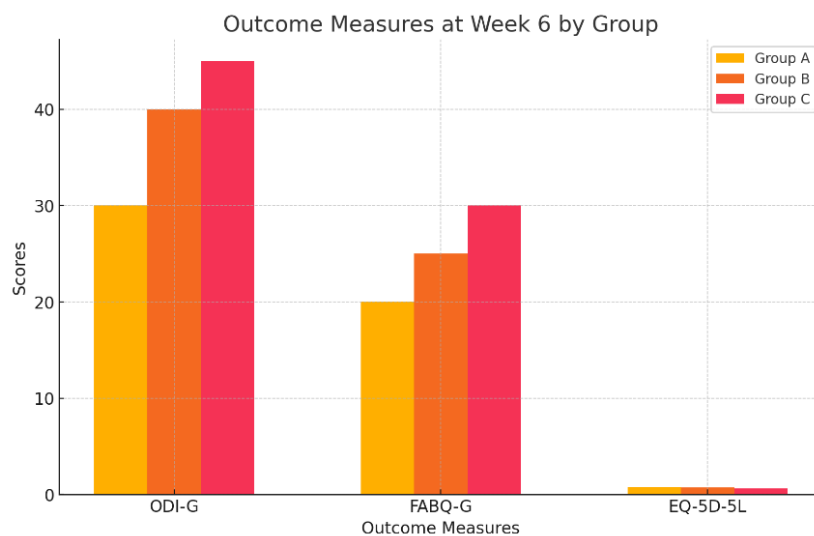
EQ-5D-5L, compared to Group B and the control group ($p < 0.05$). Group B also had some improvements compared to Group C, though not as substantial as in Group A.

Trunk Endurance

No significant differences in trunk endurance were observed between the three groups, as measured by FET and EET ($p > 0.05$) (McGill, 1999).



Graph 1 : Pain Reduction Over time by Group



Graph 2 : Outcome measures in all the groups

Discussion

The findings of this study support the use of Myofascial Release Therapy in combination with Motor Control Exercises for the treatment of CLBP. Group A, which received the combined intervention, demonstrated significant reductions in pain, disability, and fear-avoidance beliefs, along with improvements in quality of life. Group B, which received only Motor Control Exercises,

showed improvements as well, but they were less significant compared to Group A. The control group, Group C, showed no significant changes in any of the outcome measures, highlighting the effectiveness of the interventions.

The results from Table 1 and Table 2 as well as Graph 1 and Graph 2 show that **Group A** (Myofascial Release Therapy, Motor Control Exercises, and a Moist Heat Pack) had the most

significant improvements in pain reduction, disability (ODI-G), and fear-avoidance beliefs (FABQ-G) compared to Groups B and C. Group A's pain score dropped from 7.5 to 2.5 over six weeks, with a corresponding improvement in quality of life (EQ-5D-5L) to 0.8. Group B showed moderate improvements, while Group C had minimal changes, indicating the superior effectiveness of the combined therapy in Group A for managing chronic low back pain.

The addition of MFR and a moist heat pack appears to enhance the therapeutic effects of MCE, likely due to increased tissue relaxation and pain relief. However, no significant improvements in trunk endurance were observed across any of the groups, suggesting that targeted endurance training may be needed for this outcome. (Barnes, 1990; Ajimsha et al., 2015). These findings align with previous research that suggests fascial manipulation can reduce musculoskeletal pain and dysfunction (Schleip et al., 2012; Langevin et al., 2011). Interestingly, no significant improvement in trunk endurance was observed, which may indicate that while MFR and MCE are effective in reducing pain and improving function, specific endurance training may be necessary to improve trunk stability (McGill, 1999).

Conclusion

This study concludes that the combination of Myofascial Release Therapy, Motor Control Exercises, and a Moist Heat Pack is effective in reducing pain, disability, and fear-avoidance beliefs while improving quality of life in CLBP patients. Group A demonstrated the most significant improvements, indicating that the combination therapy offers greater benefits compared to MCE alone. Future research should explore the long-term effects of this combined approach and assess additional interventions to enhance trunk endurance.

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