The Effectiveness of Myofascial Release Versus Traditional Physiotherapy Techniques for Plantar Fasciitis Among Adults: A Randomized Controlled Trial

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Background: Plantar fasciitis is characterized by degenerative changes and irritation at the origin of the plantar fascia, primarily involving the medial calcaneal tuberosity and the surrounding perifascial soft tissues. Common causes include overuse from activities such as running, prolonged standing, or walking on hard surfaces, which can lead to small tears in the fascia. Other contributing factors include wearing unsupportive footwear, obesity, and foot conditions such as pes planus or cavus.

Methods: Fifty-eight subjects with plantar fasciitis were selected and randomly assigned to two groups. Both groups underwent an intervention. The intervention group received myofascial release, while those in the traditional group received calf stretching. Both interventions were administered three sessions per week for 8 weeks. The Functional Foot Index (FFI) and Numeric Pain Rating Scale (NPRS) were used to assess outcomes before and after the intervention. The significance of the changes observed before and after the intervention was evaluated using the Wilcoxon signed-rank test and the Mann–Whitney *U* test.

Result: The Wilcoxon signed-rank test demonstrated a significant reduction in NPRS following both the interventional therapy ($Z = -4.898$, $p < 0.001$) and traditional therapy ($Z = -4.522$, $p < 0.001$). The Mann–Whitney *U* test revealed no significant difference between groups at baseline ($p = 0.77$); however, a significant difference was observed post-intervention ($p = 0.002$), favoring interventional therapy. Effect sizes for the NPRS were $r = 0.32$ (small) at baseline and $r = 0.58$ (large) post-intervention. Similarly, FFI scores demonstrated a significant post-intervention difference between groups ($p = 0.005$), with effect sizes of $r = 0.39$ (small) at baseline and $r = 0.52$ (large) post-intervention.

Conclusion: According to the study, myofascial release helps individuals with plantar fasciitis by improving function and reducing pain and disability, with no reported adverse effects. This technique appears to be a more effective treatment than traditional physiotherapy, thereby strengthening the evidence base for physical therapy protocols.

KEYWORDS: Health; myofascial release; pain; randomized controlled trial; World Health Organization

INTRODUCTION

Heel pain is a common problem that is often not adequately addressed; it may begin slowly and gradually worsen, persist throughout the day, or flare up and go away.[(1)] The plantar fascia is a thick, multilayered fibrous sheet of connective tissue that originates from the plantar aspect of the posteromedial calcaneal tuberosity. In addition to supporting the longitudinal arch of the foot, it functions as a dynamic shock absorber during ground contact.[(2)] When aggravating circumstances are present, excessive strain results in tension along the fascia, which in turn causes inflammation and microtears at the fascia's insertion. It is more common among women aged 40–60.[(3)] If it is properly assessed and treated, 80% of patients with plantar fasciitis (PF) recover within a year. One of the primary clinical signs is severe, non-radiating pain localized to the proximal medial-plantar region of the foot. This pain can be reliably reproduced by forceful dorsiflexion of the toes at the metatarsophalangeal joints while maintaining ankle stability, a maneuver that isolates stress to the plantar fascia and aids in the clinical diagnosis.[4] Plantar heel discomfort can arise from overuse injury and degeneration as it is crucial for preserving the longitudinal foot arch and absorbing stresses across the midtarsal joint.[5] Tight calf muscles restrict ankle dorsiflexion, increasing plantar fascia strain, while weakness of intrinsic foot muscles reduces arch support. Together, these factors act as functional risk factors.[6] Although plantar heel pain has a high incidence of approximately 4–7% and significantly affects affected individuals, the most effective management strategy remains uncertain due to the lack of clear understanding of its etiology.[7] According to the concept underlying myofascial release (MFR) therapies, fascia—a connective tissue that spans the entire body—realigns along lines of tension when subjected to physical stress. However, in the presence of chronic inflammation, collagen fibers tend to bind together and progressively lose their intrinsic flexibility, further contributing to fascial stiffness and restriction of movement.[8] Patients typically report pain at the calcaneum's anteromedial prominence. The toes' passive dorsiflexion makes the pain worse. Patients often report symptom onset occurring several weeks to months prior to presentation. When standing for the first time after resting, usually in the early morning, the pain is more intense. Pain typically diminishes with continued walking or activity after initial weight-bearing. The discomfort subsides during the day but never completely resolves, and it worsens with prolonged walking or exercise, especially on hard surfaces.[9] A "windlass" is a rope or cable that has been tightened. The plantar fascia functions similarly to a cable anchored between the calcaneus and the metatarsophalangeal joints. During dorsiflexion of the hallux—particularly in the propulsive phase of gait—the plantar fascia wraps around the metatarsal heads. This winding action increases the height of the medial longitudinal arch by effectively reducing the distance between the calcaneus and the metatarsals. The fundamental principle of the windlass mechanism is that dorsiflexion of the hallux results in tensioning of the plantar fascia.[10]

Usually applied to the fingers, thumb, forearms, or elbows, the direct MFR technique seeks to improve soft-tissue mobility by introducing a controlled, progressive mechanical stress directly into a restriction. The pressure is gradually increased or reapplied until the tissue's mobility is thought to have improved. The application of indirect techniques is similar to that of direct techniques, but the force applied is less intense and lasts for a considerably longer period of time, allowing the tissue to "melt" or loosen.[11] Conservative therapies are actually employed in 85–90% of cases and have historically been the primary line of treatment for PF. For at least 6–12 months, non-steroidal anti-inflammatory medications, prefabricated orthotics, and stretching are the primary conservative therapies advised. Shock wave therapy has been suggested by many to produce better long-term outcomes than steroid injections.[12] Historically, the concept of myofascial dysfunction was first described by Dr. Janet Travell and Dr. David Simons, who emphasized the role of trigger points and fascial tension in musculoskeletal pain. Later, John F. Barnes advanced the concept of MFR, introducing gentle, sustained pressure techniques aimed at releasing fascial restrictions and improving tissue mobility. MFR has since gained recognition as an effective conservative approach to managing soft-tissue disorders, including PF.[13,14] Therefore, the goal of this study was to evaluate the effectiveness of MFR versus traditional physiotherapy stretching techniques in adults with PF.

METHODS

Study Design and Ethics

The randomized controlled trial study received approval from the Institutional Scientific Review Board of Saveetha College of Physiotherapy, Saveetha Institute of Medical and Technical Sciences, Chennai, India, at ISRB Number 416/07/2024/ISRB/UGSR/SCPT. Written informed consent was obtained from all participants after providing verbal and written explanations of the study, its procedures, risks, benefits, confidentiality, and the voluntary nature of participation. Participants had the opportunity to ask questions and could withdraw at any time. Consent forms were signed by both the participant and the investigator, in accordance with institutional ethical guidelines.The study followed the CONSORT Guidelines throughout the study duration (Figure 1).

Sample Size Calculation

An *a priori* power analysis was performed in G*Power (0.83). The total sample size required for a two-sample *t*-test with the specified parameters is 58 participants (29 per group). This sample size ensures a balanced allocation (1:1 ratio) and sufficient power (0.83) to detect a meaningful difference between the two groups with an effect size of 0.8 at the $\alpha = 0.05$ significance level.

Research Question

The research question was confirmed with FINER criteria (Feasible: practical with available resources where recruitment is manageable, Interesting: relevant to physiotherapists and patients, Novel: comparing the MFR and calf stretching, Ethical: non-invasive, requiring ISRB approval and informed consent, Relevant: addresses a common cause of PF, impacting treatment strategies) and Framed using PICO criteria (Population, Intervention, Comparison, Outcome)—P: patients with PF, I: MFR, C: comparing MFR versus traditional stretching physiotherapy technique, O: Numeric Pain Rating Scale (NPRS) and Functional Foot Index (FFI).

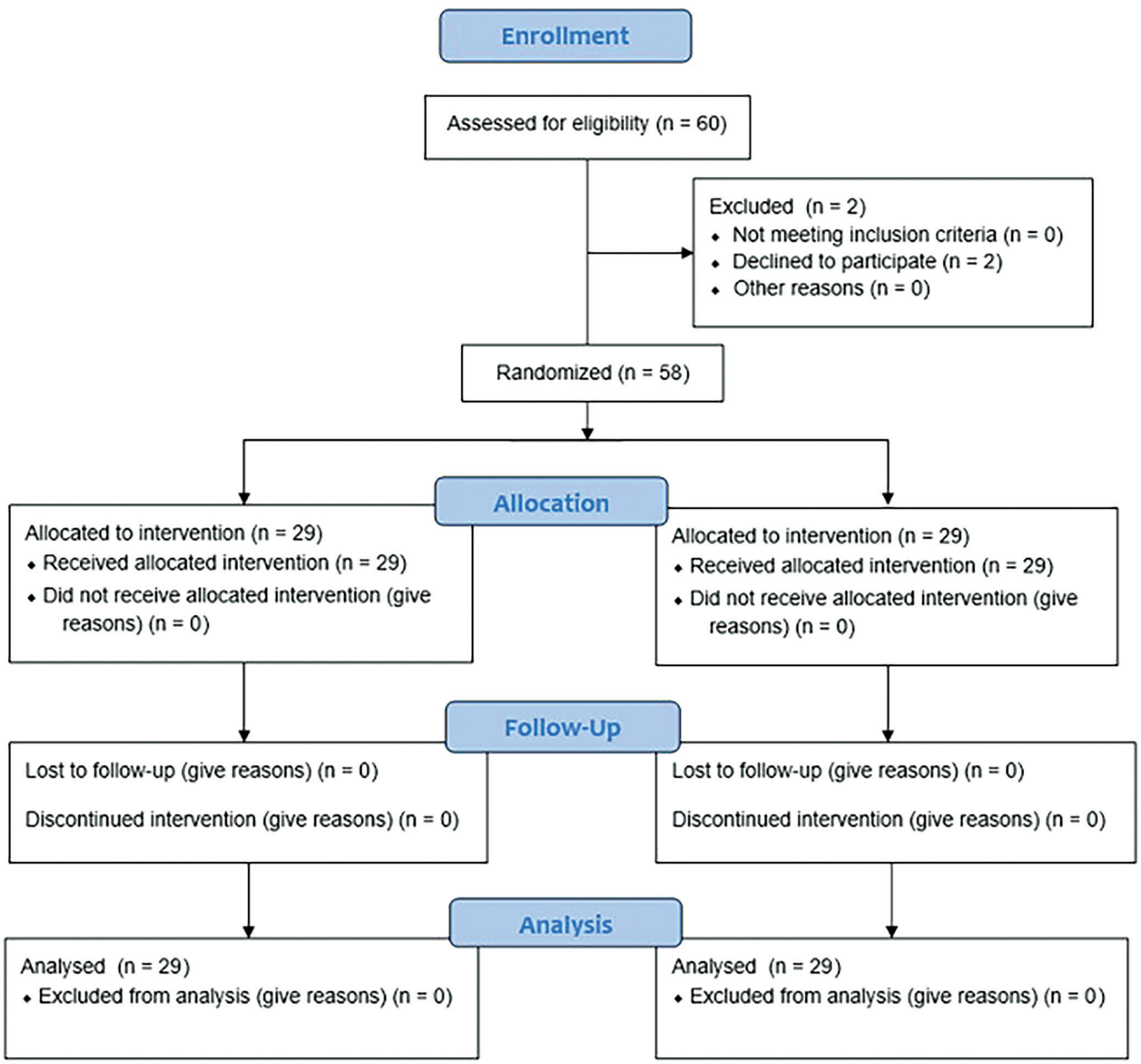

FIGURE 1. CONSORT Flow chart diagram.

How effective is the MFR protocol in treating PF? How effective is the traditional physiotherapy calf stretching protocol in managing PF?

Primary Objectives

To determine the efficacy of MFR in reducing pain and improving functional activity in patients with PF. To evaluate the effectiveness of traditional physiotherapy calf stretching in enhancing functional activity and decreasing pain in patients with PF.

Secondary Objectives

To compare the effectiveness of two treatment approaches, MFR and calf stretching therapy, in the management of PF.

Inclusion Criteria

Participants in this study were men and women between 25 and 45 years of age who experienced heel pain with an NPRS score >5, indicating moderate to severe discomfort. Eligibility required a positive windlass test, defined as the reproduction of heel pain during passive dorsiflexion of the great toe in either a standing or seated position. To maintain consistency in treatment assessment, only individuals with unilateral PF were included.

Exclusion Criteria

Individuals with a recent injury or trauma to the lower limb were not included in the study. Those with coagulation disorders were excluded to prevent any risk of excessive bruising or bleeding during the MFR therapy. Participants who had undergone surgery for PF within the previous 6 months were also excluded, as postoperative recovery could have influenced the study outcomes. In addition, individuals who had received corticosteroid injections for PF within the last 3 months were ineligible to participate, as such interventions might have altered tissue responsiveness and pain perception.

Study Settings, Sampling Technique, and Group Allocation

This study was conducted at the Physiotherapy Department of Saveetha Hospital, Chennai, India, from the first week of August 2024 to the first week of October 2024. A random sampling method was used to select 58 patients from the Integrated Clinic 1–6 based on specific inclusion and exclusion criteria. After obtaining informed consent, participants were randomly assigned to two groups of 29 using a lottery method, in which each participant's name was written on a slip of paper, placed in a container, and drawn one by one to assign them to either group A (interventional group, receiving MFR) or group B (traditional group, receiving calf stretching therapy).

Participant confidentiality was maintained by using coded identifiers only, and access to the code key was restricted to the principal investigator. Demographic details were collected prior to randomization (Table 1).

Intervention

The 29 patients in the interventional group received MFR. A total of 29 patients were treated with a traditional physiotherapy protocol consisting of calf stretching. Both interventions were administered for three sessions per week for 8 weeks.

The myofascial group underwent manual MFR applied to the plantar fascia using thumb pressure techniques. Each participant was positioned comfortably in a supine lying posture with the feet relaxed and adequately supported. The therapist applied firm yet controlled pressure with the heel of the hand and fingers, gliding along the plantar fascia while maintaining continuous contact. The technique was performed rhythmically for approximately 2 min and repeated for 10 repetitions within a single treatment session (Figure 2).

As tolerated, pressure intensity was progressively increased to promote fascial release, improve tissue extensibility, and enhance overall plantar flexibility while ensuring participant comfort.[15]

The traditional physiotherapy group performed calf stretching exercises while standing and facing a wall. Each participant stood with both palms on the wall at chest height, elbows fully extended. One leg was positioned forward with the knee flexed, while the opposite leg was placed behind with the knee extended, ensuring that both feet remained in full contact with the floor (Figure 3). To apply the stretch, the participant flexed the front

TABLE 1. Demographic Data

Variable	*Category*	*Frequency (n)*
Gender	Male	22
	Female	36
Age (years)	25–34	25
	35–42	22
	43–45	11
Comorbidities	Diabetes mellitus	8
	Hypertension	7
	Thyroid disorder	8
Body mass index (BMI)	16.5–18.5 (underweight)	15
	19.5–24.9 (normal weight)	27
	25–29.9 (overweight)	16
Mechanism of injury	Overuse/repetitive strain	28
	Sudden trauma/fall	14
	Unknown/gradual onset	16
Duration of symptoms	<4 weeks	16
	4–8 weeks	25
	>8 weeks	17
Episode type	Initial episode	38
	Recurrent	20
Foot structure	Normal arch	20
	Flat foot (pes planus)	21
	High arch (pes cavus)	17

FIGURE 2. Myofascial release for plantar fascia.

knee, allowing the trunk to move forward while maintaining an upright posture and keeping the heels pressed firmly against the floor. The stretch was held for 30 s and then performed three times on each leg during the intervention session.[16]

Outcome Measures

The NPRS is a widely used tool for assessing pain intensity. It is used to assess pain intensity on a 0–10 scale, with specific levels indicating different pain severities (0—No pain, 1–3—Mild pain, 4–6—Moderate pain, 7–9—Severe pain, 10—Worst possible pain).[17]

The FFI is a self-reported questionnaire used to assess the impact of foot disorders, assessing pain, disability, and activity limitation. It contains three subscales (Pain, Disability, and Activity Limitation), each item rated on a 0–10 scale; higher scores indicate worse impairment. The overall result is expressed as a percentage (0–100%), with 0–30% denoting minimal foot dysfunction, 31–60% moderate dysfunction, and 61–100% severe dysfunction. The FFI is known for good reliability and responsiveness. In a validation study of the Brazilian-Portuguese version, the Minimal Detectable Change was determined to be 2.42 points (at 90% confidence), implying that changes smaller than this threshold may fall within measurement error rather than reflecting true clinical change.[18]

Data Analysis

All data were analyzed using SPSS version 27. Within-group comparisons for groups A and B were conducted using the Wilcoxon signed-rank test, while between-group differences were assessed using the Mann–Whitney *U* test.

RESULTS

A Wilcoxon signed-rank test revealed that after an 8-week interventional treatment course, administered three times a week, participants in group A experienced a statistically significant reduction in NPRS for PF (mean difference = 2.74; 95% confidence interval (CI): 2.35–3.13; $Z = -4.675$, $p < 0.001$; Figure 4). Similarly, group B, which received traditional therapy, showed a significant reduction in NPRS (mean difference = 3.07; 95% CI: 2.67–3.47; $Z = -4.648$, $p < 0.001$; Table 2).

FIGURE 3. Calf stretch in standing.

Regarding functional improvement, the interventional therapy led to a significant reduction in FFI scores (mean difference = 4.62; 95% CI: 3.99–5.25; $Z = -4.898$, $p < 0.001$; Figure 5). Traditional therapy also produced a statistically significant improvement in FFI scores (mean difference = 2.04; 95% CI: 1.32–2.76; $Z = -4.522$, $p < 0.001$; Table 3).

A Mann–Whitney *U* test revealed no significant difference in baseline NPRS scores between group A and group B ($p = 0.77$), indicating comparability at baseline. However, a larger and statistically significant difference was observed in the post-intervention scores ($p = 0.002$; Table 4), suggesting that the treatment method had a significant impact on PF. The calculated effect size (*r*) for the baseline was approximately 0.32, indicating a very small effect, whereas the post-intervention *r* value was approximately 0.58, representing a large effect.

Similarly, the Mann–Whitney *U* test showed a significant difference in post-intervention FFI scores between the

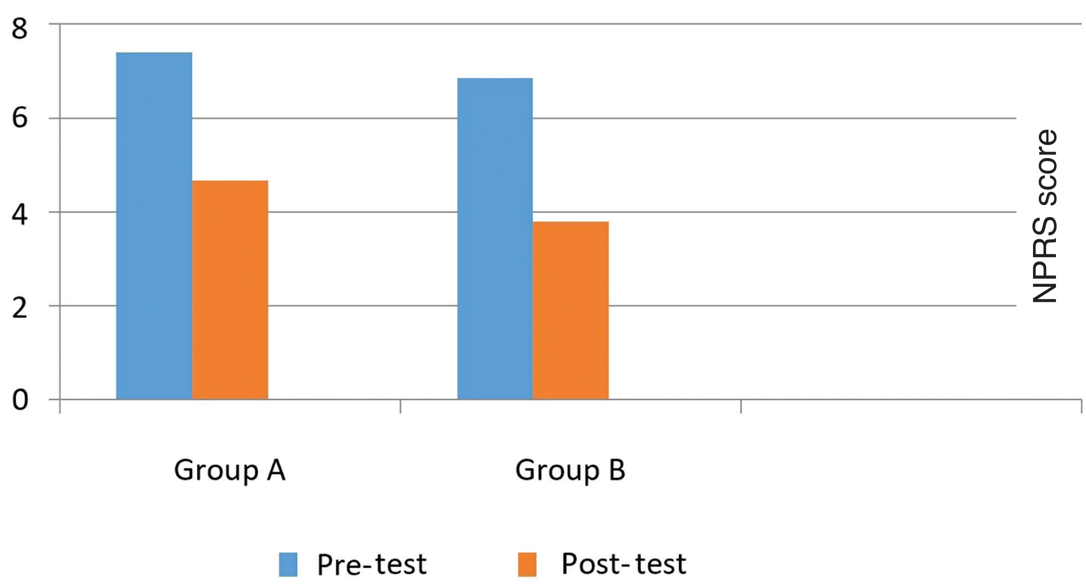

FIGURE 4. Comparison of NPRS within group A and group B.

TABLE 2. Comparison of NPRS Within Group A and Group B

Groups	*Pre-Test Mean ± SD*	*Post-Test Mean ± SD*	*Z Value*	*p-Value*
Group A (N = 29)	7.4 ± 1.018	4.66 ± 1.045	−4.675	<0.001
Group B (N = 29)	6.86 ± 1.187	3.79 ± 0.819	−4.648	<0.001

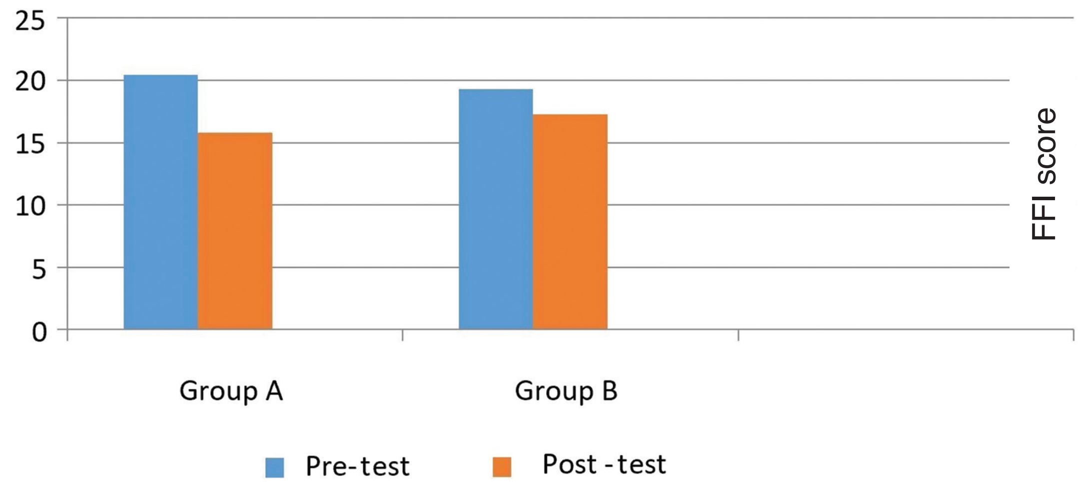

FIGURE 5. Comparison of FFI within group A and group B.

interventional and the traditional groups (p = 0.005; Table 5), while the baseline difference was not significant. This result supports rejection of the null hypothesis, indicating that the treatment strategy had a significant effect on PF. The calculated baseline *r* value was approximately 0.39, reflecting a small effect size, whereas the post-intervention *r* value was approximately 0.52, reflecting a large effect size.

DISCUSSION

This randomized controlled trial suggests that MFR appears more effective in the short term for reducing pain and improving function in adults with PF than traditional physiotherapy techniques, such as calf stretching. During weight-bearing activities, the heel fat pad plays a critical role in cushioning the foot and absorbing shock. In our study, participants receiving MFR showed greater improvements in pain and FFI scores, which may be related to enhanced flexibility and reduced mechanical stress on the heel pad. These findings highlight practical implications for physiotherapists, suggesting that incorporating MFR into treatment plans could help improve functional outcomes in patients with PF. Previous studies have emphasized the importance of preserving heel pad integrity, particularly in older adults or those exposed to repetitive stress, as diminished shock absorption can increase mechanical strain on the plantar fascia.[1] Our results align with these findings, supporting interventions that reduce tension and promote healing. Non-invasive approaches such as physical therapy, stretching, orthotic support, and footwear adjustments have been reported to address the underlying causes of PF and improve outcomes.[4] Whittaker et al. reviewed the literature to evaluate whether foot orthoses improve function and reduce pain in individuals with plantar heel discomfort, a condition commonly associated with PF. Their findings indicated that foot orthoses, particularly prefabricated types, were effective in reducing pain in the short term compared with no treatment or sham interventions.[5] Bolgla and Malone described the windlass mechanism, which explains how the plantar fascia tightens during toe dorsiflexion, elevating the arch and stabilizing the foot during gait. Dysfunction in this mechanism, caused by excessive strain or mechanical overload, leads to repeti-

TABLE 3. Comparison of FFI Within Group A and Group B

Groups	*Pre-Test Mean ± SD*	*Post-Test Mean ± SD*	*Z Value*	*p-Value*
Group A (N = 29)	20.41 ± 1.680	15.79 ± 1.634	−4.898	<0.001
Group B (N = 29)	19.28 ± 1.925	17.24 ± 1.883	−4.522	<0.001

TABLE 4. Comparison of NPRS Between Group A and Group B

Tests	*Mean ± SD*	*Z value*	*W*	*U*	*p-Value*	*r-Value*
Pre-test	7.14 ± 1.131	−1.770	745.5	310.5	0.77	0.32
Post-test	4.22 ± 1.027	−3.150	229	664	0.002	0.58

TABLE 5. Comparison of FFI Between Group A and Group B

Tests	*Mean ± SD*	*Z value*	*W*	*U*	*p-Value*	*r-Value*
Pre-test	19.84 ± 1.881	−2.136	285	720	0.033	0.39
Post-test	16.52 ± 1.894	−2.826	676.5	241.5	0.005	0.52

tive stress, inflammation, and microtears in the plantar fascia. The present findings align with this biomechanical concept, suggesting that interventions such as MFR may reduce fascial tension and improve load distribution across the foot.[6] Similarly, Singh et al. reported that PF is one of the most common causes of heel pain, typically resulting from repetitive strain and microtears due to excessive loading. The authors emphasized that risk factors such as obesity, prolonged standing, high-impact activities, and biomechanical abnormalities—such as a tight Achilles tendon or excessive pronation—predispose individuals to this condition.[7,19–22] These risk factors were also observed among participants in the current study, highlighting the importance of targeted physiotherapy interventions to address underlying biomechanical contributors. It is important to acknowledge that placebo effects and therapist–patient interaction may have influenced treatment outcomes and thus served as potential confounding factors in the present study.

Limitations

This study had several limitations that should be acknowledged. It was limited by its relatively short duration and small sample size, which may have restricted the generalizability of the findings. The participants were within a narrow age range (25–45 years), which limited the applicability of the results to older or younger populations who might have responded differently to the intervention. In addition, the study was conducted at a single center, which may not have represented broader clinical populations or diverse treatment settings.

Blinding of participants and assessors was not implemented, which may have introduced bias in outcome reporting and assessment. Furthermore, only the NPRS and the FFI were employed as outcome measures. Objective assessments such as ROM, gait analysis, and musculoskeletal ultrasound were not included; these could have provided deeper insight into structural and functional changes.

Finally, the outcomes were evaluated only in the short term, so the long-term sustainability of the observed improvements remained unclear. Future multicenter studies with larger sample sizes, wider age ranges, blinded assessments, and long-term follow-up were recommended to strengthen the evidence base and validate these findings.

CONCLUSION

According to the study's findings, MFR significantly reduced pain and improved functional activity in individuals with PF.

No adverse effects were observed in either interventional or conventional groups during the study. These results suggest that myofascial release is a more effective therapeutic approach compared to traditional physiotherapy, thereby strengthening the evidence base for its integration into physical therapy protocols.

CONFLICT OF INTEREST NOTIFICATION

The authors declare there are no conflicts of interest.

FUNDING

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AUTHOR CONTRIBUTIONS

Sathya Siva: Conceptualization, methodology, supervision, project administration, statistical analysis, data interpretation, manuscript writing, critical revision, and final approval of the manuscript., Sukumar Ramaswami: Clinical supervision, patient evaluation, medical management, validation, interpretation of clinical findings, and critical review of the manuscript. A. Harishraj: Supervision, patient evaluation, medical management, validation, interpretation of clinical findings. D. Boopathy: Data collection, intervention assistance, data curation, and manuscript editing. V. Madhubala: Literature review, data collection, documentation, and manuscript editing. Prathap Suganthirababu: Study design, methodology, interpretation of results, manuscript review, and overall scientific supervision.

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