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Original Research Article

# Effect of MFR Technique Versus Static Stretching on Pain Among Adults with Plantar Fasciitis

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## ABSTRACT

**Background:** Disorder of plantar fascia caused from overuse, excessive overload or prolonged standing time is called plantar fasciitis. Conservative treatment is a primary choice of treatment for plantar fasciitis and physiotherapist play a vital role. Interventions such as ultrasound, soft tissue massage, orthotics, taping, hot pack, cold pack, stretching and strengthening exercises are used by physiotherapists for treatment of this condition.

**Objectives:** This study is aimed to evaluate and compare the effectiveness of myofascial release technique and static stretching of plantar fascia, on pain among adults with plantar fasciitis.

**Methods:** All the subjects were screened as per the inclusion & exclusion criteria. After getting their written consent, a total of 42 plantar fasciitis patients with mean age of 28 years were included in the study. They were randomly allocated into two groups with n= 21 in each group. Group A was given Myofascial Release Technique whereas Group B was given Static Stretching on the affected plantar fascia. The interventions were carried out for twice a week for two weeks. Visual Analogue Scale was used as the outcome measure and it was measured pre- and post-intervention at baseline during week one and at the end of treatment at week two.

**Results:** The study demonstrated statistically significant difference between pre-treatment and post-treatment visual analogue scale scores, in both groups: MFR ($p < .0001$) and Static Stretching ($p < .0011$).

**Conclusion:** Both MFR as well as static stretching are effective in reducing pain in plantar fasciitis patients.

**KEY WORDS:** Plantar Fasciitis, Static Stretching, Myofascial Release, Pain, Visual Analogue Scale.

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## INTRODUCTION

Plantar fascia is a thick fibrous aponeurosis, it has its origin at the calcaneus and runs to attach at the heads of all five metatarsals. It is accountable for lifting up and stabilizing the foot arch during weight-bearing activities using the windlass mechanism. The disorder of this plantar fascia at its origin is known as plantar fasciitis [1]. It is characterized by collagen breakdowns, micro-tears, calcification and scarring. New researchers deem that inflammation plays little to no role in plantar fasciitis [2]. Although the cause is unknown, in around 85% of patients, plantar fasciitis can arise in conjunction with a variety of arthritis. It happens from a degenerative rather than an inflammatory process and the key feature of its pathogenesis is the tensile strain [3]. Plantar fasciitis can affect athletes due to overuse,or people having an obese sedentary lifestyle (body mass index < 30) due to excessive loading on the plantar fascia or

individuals with prolonged standing time [4]. Foot deformities also predisposes individuals to develop plantar fasciitis by instilling biomechanical stresses.

For example, people with high arch foot have restricted mobility through the transverse tarsal joints which leads to an inability of dissipating shock from ground strike, thus increasing the load in the plantar fascia, and leading to plantar fascia overload. It is almost similar to a stretch on a bow string. The clinical signs include dull aching or throbbing pain localized around the plantar fascia origin which is particularly worst with first step in the morning. It usually affects one foot, although around 30 per cent of patients suffer from bilateral symptoms [5]. Around 1 million people get treated for this condition annually. It is also a common condition being treated at physiotherapy clinics.

According to Yelverton, Rama & Zipfel [6], conservative treatment is a primary choice in plantar fasciitis treatment and around 90% of patients respond to conservative therapy. Therefore, the role of physiotherapist becomes vital. In physiotherapy, interventions such as ultrasound, soft tissue massage, orthotics, taping, hot pack, cold pack, stretching and strengthening exercises are used to treat plantar fasciitis. Steinmetz [7], states that for better results these treatment methods should be used in combination rather than applying separately. The patient outcome varies from individual to individual but usually focuses on reducing pain, improving function or managing symptoms. There are varieties of treatment available for plantar fasciitis, however, the effectiveness of these treatment is under-researched and there is poor evidence to support the most effective approach. Therefore, this study will contribute in the better understanding of the effective treatment methods.

Researchers agree that mechanical or manual techniques are cornerstone of any treatment plan. Manual therapy for plantar fasciitis focuses primarily on releasing tightness of plantar fascia and associated intrinsic musculature, or/and correcting other underlying cause. The manual therapy used in this study is myofascial release technique and static stretching. Myofascial release, or MFR, is a treatment method that incorporates methods and techniques from soft tissue therapy, MET, and intrinsic force craniosacral therapy. This technique is used for conditions which cause stiffness and restrictions in soft tissues. The surface tension of the ground substance is changed to a more fluid state by MFR, which relieves the fascia's excessive stress on the pain-sensitive structures and helps to restore proper alignment. As a result, it is proposed that MFR acts as a catalyst in the treatment of plantar fasciitis [8]. Static Stretching is a type of stretching that allows one to maintain a controlled stretch by fully elongating a muscle and holding it there for an extended period of time. It is a therapeutic maneuver that aims to enhance the extensibility of soft tissues and improve flexibility by lengthening the structures which have become hypomobile over time from shortening due to adaptation [9]. When we stretch a soft tissue structure, there's changes in its elastic, viscoelastic or plastic properties.

The purpose of this study is to determine whether myofascial release technique and static stretching are beneficial in reducing pain among plantar fasciitis adults. This study is also aimed to determine whether myofascial release or static stretching is more effective in reducing pain levels in plantar fasciitis patients.

## MATERIALS AND METHODS

This is a quasi-experimental study wherein there was no involvement of control group. Judgmental sampling was used in order to collect samples from the population. Judgemental sampling occurs when "elements selected for the sample are chosen by the judgment of the researcher [25]. It is considered to be a cost-effective and time-effective sampling method. The only con of judgmental sampling is that it's highly susceptible to researcher bias [26]. And in order to avoid or minimize the impact of the bias on this study, verification of various data sources was carried out during the proposal submission phase of the study.

**Inclusion Criteria**

a) Patients of both genders.

b) Patients with age group of 21 years and above

c) Patients who have positive Windlass Test in weight bearing position

**Exclusion Criteria**

a) Patients with congenital foot abnormalities, tumor, etc

b) Patients who have had a lower limb fracture or surgery.

c) Patients who have a history of any soft tissue injury around ankles e.g ligament sprains, etc.

d) Patients who have history of systemic disease.

e) Patients who have received corticosteroid injections in heel.

f) Patients who have refused to take part in the study.

To select the sample out of the received population, similar research studies were referred to understand the appropriate sample size. Then an online sample size calculator was utilized to find the exact number. It was done by inputting 70% confidence level, five % margin of error and 10% population proportion based on the plantar fasciitis prevalence study. The resulting sample size was 39. Also, according to Carter et al. [27], for an experimental or a quasi-experimental study, a sample size of 30 is considered to be appropriate for the study to be reliable. Thus, the 42 samples collected in this study were deemed sufficient.

After screening, a total of 16 samples, they were then randomly allocated into two groups until each group had 21 members each. Random allocation is essential in order to reduce the risk of bias. For the random allocation in this study, the participants were numbered 1-42 and every odd number patient was placed in group B. Before the implementation of interventions, written consents were obtained from the participantsand pre-treatment VAS scores were measured for both the groups and recorded for the statistical analysis.

For group A (myofascial release technique), the patients were made to lie prone on the bed and a pillow was placed under their feet area for comfort and support. The physiotherapist stood at the caudal end of bed and used the thumbpads to give sustained pressure along the plantar fascia fibres from the calcaneus towards the phalanges [28]. This technique was given for 10 second and repeated twice in a session. The treatment sessions were carried out twice a week for two weeks.For group B (static stretching of plantar fascia), the patients were made to sit on the bed in long-sitting position. The therapist stood at the caudal end of the bed and fixed the patient's calcaneus with one hand and pushed the patient's toes into dorsiflexion with the other hand, until he/she felt the pull at the sole of the feet. This plantar fascia stretch was held for a minimum of 30 seconds and repeated for 2 times per session with 10 seconds resting period in between each repetition. The treatment sessions were carried out twice a week for two weeks in total.

Following the completion of treatment at 2nd week, the pain scores of all the subjects were collected post-treatment for the purpose of data analysis. Data analysis was done using the online mean, standard deviation and T-Test calculator.Individual effectiveness of myofascial release technique as well as plantar fascia-specific stretching performed on the samples were tested using the pre- test and post- test design.

Parametric testing was used for data analysis of the collected data. Paired T-Test was used for intragroup comparison. This was done by inputting the pre-treatment scores recorded at week 1 and post-treatment scores recoded at last session of week 2 into the raw data-sheet of online T-test calculator. Unpaired t-test was used for intergroup comparison. This was done by inputting the mean and standard deviation of the final week VAS scores, recorded post-treatment at last session, into the tabs of the online unpaired t-test calculator. To calculate results obtained from the t-test, the p value has to be < .0001

Windlass Test: The windlass test induces a direct stretch on the plantar aponeurosis,

which can be helpful in evaluating plantar fascia dysfunction. The windlass test is positive if there is pain at the heel area when the toes are passively dorsiflexed [20]. This test has 100% specificity and 32% sensitivity in detection of plantar fasciitis [21].

Visual Analogue Scale (VAS):It's a 10 cm scale marked with numbers 0-10 where zero symbolizes no pain and 10 symbolizes maximum and intolerable pain and is used to measure pain severity. According to Hawker et al. [22], the test–retest reliability of VAS has been shown to be good, but higher among literate patients (r = 0.94, P < .001) than in illiterate patients (r = 0.71, P < .001). It has also shown to be sensitive in patients with chronic inflammatory or degenerative joint pain [23].As compared to the Foot Function Index and Foot Health Status Questionnaire, VAS is more appropriate for this study as it solely focuses on pain measurement which was the main objective of this research. And in a critical review done by Begum [24], VAS was found to be more valid and reliable scale as compared to faces pain scale (FPS), color analogue scale (CAS) and numeric rating scale (NRS). And since it's an interval level scale, VAS can be easily used in clinical practice for pain measurement.

## RESULTS

**Table 1**: Age distribution of group A & group B.

| Groups | Group A | Group B |
|---|---|---|
| **Mean Age (Years)** | 28.95 | 28.76 |
| **Standard Deviation** | 6.96 | 7.23 |

In table 1, the mean age of the study samples is stated. Group A has a mean age group of 28.95 years with a standard deviation of 6.96. Group B has a mean age of 28.76 years with a standard deviation of 7.23.

**Table 2:** Comparison of pre and post VAS scores of group A and B.

| Groups | Pre-treatment VAS score | Post-treatment VAS score |
|---|---|---|
| **Group A** | Mean = 7.24 S.D = 1.09 | Mean = 5.67 S.D = .85 |
| **Group B** | Mean = 7.10 S.D = 1.37 | Mean = 5.90 S.D = 1.04 |

In table 2, the pain intensity scores of group A and group B are given. The VAS score was taken at first session pre-treatment and last session post-treatment. The table gives the mean and SD of these recorded VAS scores. For group A, the mean ± SD scores during post-treatment was 5.67 ± 0.85 as compared to 7.24 ± 1.09 during pre-treatment. Whereas for group B, the mean + SD scores during post-treatment was 5.90 ± 1.04 as compared to 7.10 ± 1.37 during pre-treatment.

**Table 3:** Comparison of T value and P value of group A and group B.

| Groups | P Value | T Value |
|---|---|---|
| **Group A** | 0.0001 | 0.0011 |
| **Group B** | 5.28 | 3.799 |

In table 3, the comparison of the P Value and T Value of group A and group B is given. The P Value of group A is 0.0001 while the P Value of group B .0011. And the T Value of group A is 5.28 while that of group B is 3.799.

**Table 4:** Result of the unpaired T- Test of group A and B.

| | |
|---|---|
| **P Value:** | 0.43 |
| **T Value:** | 0.78 |

In table 4, the P value and T Value obtained from the unpaired t-test of group A and B is given. The P value of the unpaired t-test is 0.43 while the T value of it is 0.78.

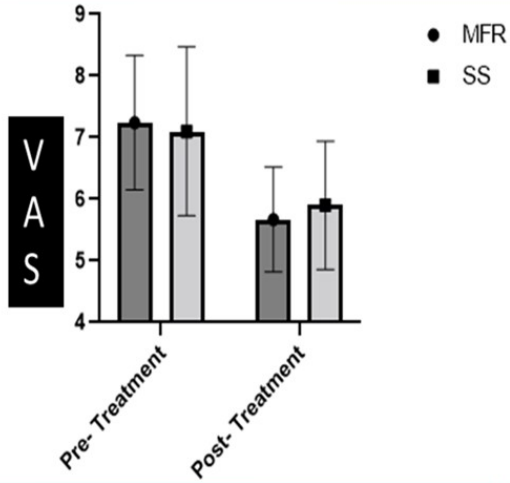


**Figure 1:** Inter and Intra Group Comparison of VAS Scores.

The samples included in the study ranged from 21 to 50 years old. The mean age of samples in group A was 28.95 years old and that of group B was 28.76 years old. Hence the samples in both of groups didn't have much variance in term of age.

The analytical test showed significance for both the groups stating that myofascial release technique and static stretching were both beneficial to reduce pain intensity within the

groups. The group A showed decrease in pain from a mean pain score of 7.24 pre-intervention to a mean VAS score of 5.67 post intervention. The p value of group A was .0001, which by conventional criteria is considered to be extremely statistically significant. Therefore, it can be stated that Myofascial release technique is beneficial in reducing pain among plantar fasciitis patients. The group B also showed decrease in pain from a mean VAS score of pre-intervention to a mean VAS score of post intervention. The p value of group B was .0011, which by conventional criteria is considered to be extremely statistically significant. Therefore, it can be stated that static stretching of plantar fascia is beneficial in reducing pain among plantar fasciitis patients.

The intergroup unpaired t-testing of group A and group B resulted in two-tailed p value of 0.43 and t value of 0.78, which by conventional criteria is not statistically significant. Therefore, it can be stated that there is no significant difference between myofascial release and static stretching in pain reduction for plantar fasciitis patients. The mean of MFR minus Static Stretching equals -0.2300. The confidence interval of this difference: From -0.8224 to 0.3624 is 95%. The standard error of difference is .29.

## DISCUSSION

Group A who received MFR showed significant reduction in pain scores (t = 5.28 p = .0001). This aligns with the research done by Kuhar et al. [28], which states that the group of patients who received MFR showed statistically significant reduction in pain scores. The goal of myofascial release technique is to break up adhesions as well as smoothen and elongate the fascia. Myofascial release technique has been shown to amplify the body's innate restorative properties by improving circulation and nervous system by releasing the fascia that may be obstructing blood vessels or nerves.

The projected mechanism of myofascial release technique's pain reduction is that when consistent pressure is applied at depth to the painful lesion, it helps in relieving the pain associated with the lesion. The pressure and movement applied through MFR is considered to be enough in causing minor damage to normal tissues. This minor damage in turn leads to the release of inflammatory chemicals like bradykinin and histamine. The local blood circulation and nociceptors will be affected by the release of these chemicals. These inflammatory chemicals also cause traumatic hyperemia i.e. local vasodilation. This lasts for a long time and may have favorable effects in terms of healing. Myofascial release also stimulates the mechanoreceptors which may help in closing the pain gate via pre- and post-synaptic synapses. Furthermore, it has shown to cause the release of endogenous opiates. It has also been shown to boost fibroblast proliferation that leads to collagen synthesis, which in turn may help to heal plantar fasciitis by removing the degenerated tissues and replacing it with stronger, better and more functional tissues.

Group B who received static stretching also showed significant reduction in pain scores (t = 3.799 p = 0.0011). The main goal of stretching is to ease the tension/ stress on the plantar fascia by changing the physical properties of connective tissues. This is accordance with the research done by Digiovanni et al. [29], which showed that 8 weeks of specific plantar fascia stretches reduced pain and improved functions in the long run and also had a greater per cent of patient satisfaction. Although, the present study only evaluated the effects of static stretching on pain after 2 weeks intervention period.

However, when the treatments were compared by using unpaired t-test, the statistical analysis showed no significance for group A when compared to group B. Based on this data, we reject the alternate hypothesis and accept the null hypothesis. The implication of this study is that both myofascial release technique as well as static stretching of plantar fascia can be used in the treatment of plantar fasciitis as both are significant in reducing pain.

## CONCLUSION

The analysis of the recorded data revealed that the pain intensity reduces significantly for both

the groups after the completion of two weeks treatment. And there is no significant difference between both the treatment methods. Thus, the alternate hypothesis is rejected and the null hypothesis is accepted for this study. To conclude this study, it can be stated that both myofascial release technique as well as static stretching of plantar fascia helps in reducing pain among adults with plantar fasciitis.

## Conflicts of interest: None

**Ethical approval:** The procedures for this study were reviewed and has passed the ethical committee board from Masha University (Ref no:MAHSA/ FOHS-FRRC/ 21(31) to ensure subjects' and researchers' safety. Subjects are required to read and sign the informed consent form prior to this study. Next, information about the study will be given to the subjects in simple words and language. None of the subjects shall be forced to engage in this study. The treatment process and risk of the study will be clearly explained to the subjects before they sign the consent form. During the study, subjects shall not feel uncomfortable and shall be told as to the right to withdrawal at any time. All the subjects' personal information about the health condition will be kept confidential in accordance with Personal Data Protection Act 2010 at all times and will not be published without prior consent. Also, as this study was carried out during COVID-19 pandemic, all the safety and precautionary measures will follow the standard protocols by the Malaysian Ministry of Health (MoH).

## Authors' contributions

**Corresponding author:** Research process, review of literature, research design and discussion,

**Sahu Deepali Nilanchal:** Data collection, manuscript drafting, research analysis and review of literature.

Rahul**Krishnan:** Research analysis, discussion, and review of literature.

**Priya Kesar:** Summary, editing, manuscript drafting and review of literature.

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