https://doi.org/10.35845/kmuj.2025.23447

ORIGINAL ARTICLE

Comparative effectiveness of static stretching and deep kneading massage in the management of plantar fasciitis: a randomized controlled trial

Syed Muhammad Ghalman Jaffri [1], Sarah Ahmad [1]✉, Gulnaz Yamin [1], Mishal Kamran [1], Wajeeha Afzal [1], Muhammad Naveed Babur [1]

1: Department of Physiotherapy, Faculty of Rehabilitation and Allied Health Sciences, Superior University, Lahore, Pakistan

Email ✉: sarah.ahmad@superior.edu.pk
Contact #: +92-331-4907585

Date Submitted: August 15, 2023
Date Revised: December 29, 2024
Date Accepted: January 11, 2025

ABSTRACT

Objective: To compare the efficacy of static stretching and deep kneading massage in patients with plantar fasciitis in enhancing pain relief and functional outcomes.

Methods: This open-label, randomized controlled trial was conducted involving 69 patients diagnosed with plantar fasciitis, aged 20–60 years. Participants were randomized into two groups: Control group received conservative treatment with static stretching, and experimental Group received conservative treatment with deep kneading massage. Stretching was administered in 3–5 repetitions of 45 seconds, while massage lasted 5–15 minutes, adjusted for tolerance and severity. Both groups received two sessions per week for two weeks. Outcome measures included the Visual Analog Scale (VAS) for pain and the Foot and Ankle Ability Measure (FAAM). Statistical analysis was performed using SPSS v21.

Results: Both interventions showed significant within-group improvements in pain and functional ability ($p = .000$). The static stretching group showed a mean VAS reduction of 5.80 (SD = 0.96) and FAAM improvement of 39.00 (SD=8.88). The deep kneading massage group showed a VAS reduction of 4.91 (SD=1.05) and FAAM improvement of 36.61 (SD=6.67). Between-group comparisons indicated that deep kneading massage resulted in greater overall improvements.

Conclusion: Both static stretching and deep kneading massage are effective adjuncts in managing plantar fasciitis, with deep kneading massage showing superior pain relief and functional recovery. Further research with larger, more diverse populations is needed to confirm these findings and optimize treatment strategies.

Clinical trial registration number: NCT05388253

Keywords: Physical Therapy Modalities (MeSH); Fasciitis, Plantar (MeSH); Exercises (MeSH); Deep kneading massage (Non-MeSH); Static Stretching Exercises (MeSH); Pain (MeSH); Rehabilitation (MeSH); Foot and Ankle Ability Measure (MeSH); Visual Analog Scale (MeSH).

THIS ARTICLE MAY BE CITED AS: Jaffri SMG, Ahmad S, Yamin G, Kamran M, Afzal W, Babur MN. Comparative effectiveness of static stretching and deep kneading massage in the management of plantar fasciitis: a randomized controlled trial. Khyber Med Univ J 2025;17(1):47-51. https://doi.org/10.35845/kmuj.2025.23447

INTRODUCTION

Plantar fasciitis is a common soft-tissue condition characterized by sharp, often severe heel pain, particularly intense with the first steps in the morning.[1] This condition, arising from inflammation of the plantar fascia a thick band of tissue supporting the foot arch[2]-is frequently seen in runners and individuals whose work involves prolonged standing.[3] The pain and stiffness associated with plantar fasciitis significantly impact quality of life, limiting mobility, functional status, and daily activities for affected individuals.[4] The underlying cause of plantar fasciitis is often linked to repetitive microtrauma from prolonged stress on the plantar fascia.[2] However, the biomechanical factors contributing to this condition include foot structure (such as flat feet or high arches), gait abnormalities,[5] and overuse injuries.[6] These factors, combined with inadequate footwear or excessive physical activity, can exacerbate tissue strain, leading to chronic inflammation and injury.[7] This biomechanical understanding is crucial for developing effective therapeutic interventions.

Various treatments aim to alleviate plantar fasciitis symptoms, focusing on reducing inflammation, improving mobility, and relieving pain.[8] Conventional therapies include stretching exercises, strengthening programs, and deep kneading massage,[9] alongside more advanced modalities such as ultrasound and transcutaneous electrical nerve stimulation (TENS).[10] Stretching exercises targeting the plantar fascia and Achilles tendon, especially static stretching (where muscle tissue is elongated over a period, generally 30 seconds),[11] are commonly employed due to their effectiveness in increasing flexibility, reducing stiffness, and lowering the risk of muscle strain.[12] Deep kneading massage also shows promise by reducing muscle tension, improving blood circulation, and breaking down adhesions and knots, thus relieving pain.[13] While each of these treatment approaches offers benefits, there is limited evidence comparing the effectiveness of static stretching[14] versus deep kneading massage when combined with conventional therapy.[15] This gap leaves clinicians without clear guidance on the optimal therapy combination, potentially limiting patient outcomes and prolonging recovery.

This study aims to address critical gaps in the treatment of plantar fasciitis by comparing the effects of static stretching and deep kneading massage, particularly when combined with conventional therapies. Understanding the nuances of these therapeutic

approaches is essential, as plantar fasciitis not only causes persistent pain but also significantly affects patients' quality of life, limiting their ability to engage in work, recreational activities, and even basic daily tasks. This study seeks to clarify their respective roles in comprehensive care. Moreover, integrating these findings with conventional therapies may offer more personalized and effective treatment plans, allowing for faster recovery and sustained relief. Ultimately, the findings are intended to provide clinicians with evidence-based guidance for optimizing therapeutic outcomes and minimizing the burden of plantar fasciitis on patients.

METHODS

This open-label, randomized controlled trial was conducted on 69 patients who fulfilled the inclusion criteria. This randomized controlled trial was conducted following ethical approval from Faculty of Allied Health Sciences, Superior University Lahore and registered as a randomized clinical trial on clinicaltrials.gov (NCT05388253). Informed consent was obtained from all participants, affirming their voluntary participation and their right to withdraw at any stage of the study. Data collection tools, including structured questionnaires, were administered with patient approval.

Allocation concealment was ensured using sequentially numbered, opaque, sealed envelopes to prevent selection bias. Randomization was performed through a lottery method, assigning participants to either the experimental or control group. The recruitment, data collection, and follow-up were conducted over a two-month period, from June 10, 2024, to August 10, 2024 (Figure 1).

Participants were recruited from the Outpatient Department (OPD) of the Physiotherapy Department. Eligible patients were aged 20–60 years, of either gender, and diagnosed with plantar fasciitis by an orthopedic surgeon. Patients were excluded if they had fractures, metabolic disorders, inflammatory arthritis, neurological abnormalities, hypersensitivity to treatment modalities, significant muscular dysfunction, or red-flag conditions such as rheumatoid arthritis, osteoporosis, Paget's disease, or hemiplegia.

Participants were randomly allocated into two groups. Control group received conservative treatment supplemented with deep kneading massage applied to the toes. The duration of massage ranged from 5 to 15 minutes, adjusted based on individual tolerance and clinical presentation. Both groups attended two treatment sessions per week, completing a total of three sessions over a two-week period.

Experimental group received conservative physiotherapy in combination with static stretching exercises targeting the foot. Each stretching session involved 3to5 repetitions, with each repetition held for 45 seconds, tailored to the patient's tolerance level and symptom severity.

Data were analyzed using SPSS version 21.Descriptive statistics were computed and presented through charts and tables. Within-group comparisons were performed using paired-sample t-tests, while between-group differences were evaluated using independent-sample t-tests. A 95% confidence interval was applied, and a p-value ≤ 0.05 was considered statistically significant.

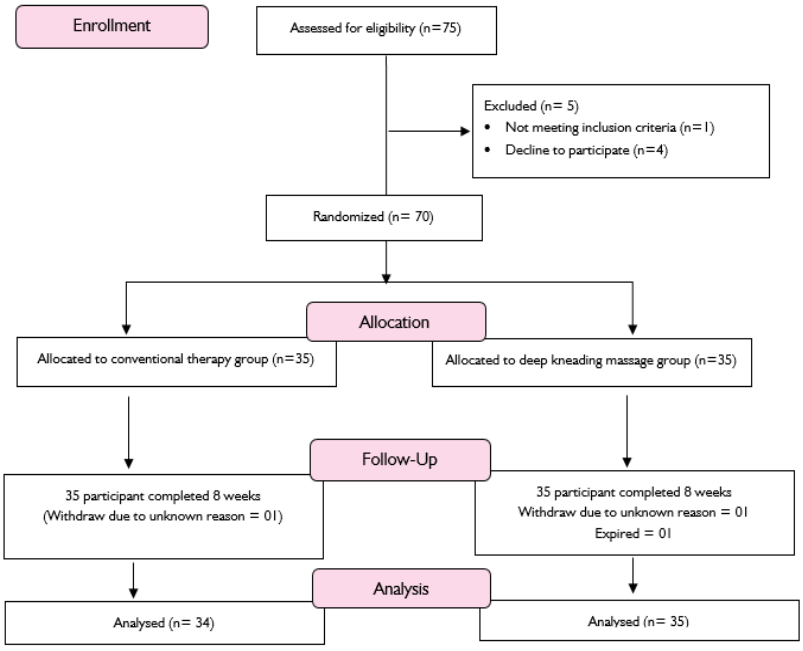

Figure 1: Consort flow chart showing enrollment intervention allocation and follow up of patients

RESULTS

In this study, baseline characteristics such as age and gender were found to be normally distributed and comparable between the experimental and control groups, as shown in Table I. The mean age of participants in the experimental group was 47.02±5.16 years, while that of the control group was 48.08±4.07 years, with no statistically significant difference ($p = 0.91$).

The study findings demonstrated significant improvements in pain intensity and functional ability across both intervention groups. As shown in Table II, the median Visual Analog Scale (VAS) score for pain reduced from 6 at baseline to 1 after eight weeks of treatment, with a notable decline across percentiles, indicating overall improvement in reported pain levels.

Within-group comparisons revealed statistically significant changes in both VAS and Foot and Ankle Ability Measure (FAAM) scores for each group ($p < 0.001$), confirming the effectiveness of both interventions. Detailed values for

Table I: Demographic and baseline characteristics of participants by intervention group

Variables		Static Stretching (Control) (n=34)	Deep Kneading (Experimental) (n=35)	p-value
Age (years)		48.08±4.07	47.02±5.16	.91
Gender	Male	33 (97.06%)	33 (94.29%)	0.99
	Female	1 (2.94%)	2 (5.71%)	

Table II: Changes in visual analog scale scores for pain before and after 8 weeks of treatment

Statistics		Pre-Treatment 1st Week Check Value (Visual Analog Scale)	Post Treatment 8th Week Value (Visual Analog Scale)
N		69	69
Median		6.00	100
Percentiles	25	6.00	.000
	50	6.00	1.00
	75	7.00	2.00

Table III: Pre and post intervention outcomes for static stretching and deep kneading massage

Assessment	Outcome	Mean	Std. Deviation	p-value*
Static stretching	Pre and Post value (VAS)	5.80	0.96	.000
	Value of Pre and Post (FAAM)	39.00	8.88	.000
Deep Kneading massage	Pre and Post value (VAS)	4.91	1.5	.000
	Value of Pre and Post (FAAM)	36.61	6.67	.000

*Independent T-Test; VAS: Visual Analog Scale; FAAM: Foot and Ankle Ability Measure

pre- and post-intervention means, standard deviations, and p-values are summarized in Table III. Notably, although both groups improved, the deep kneading massage group showed a greater reduction in pain and better functional recovery than the static stretching group.

DISCUSSION

In our study, the comparison of static stretching and deep kneading massage for the treatment of plantar fasciitis revealed that patients receiving deep kneading maneuvers experienced greater symptom improvement than those undergoing static stretching. Paired t-tests conducted for pre- and post-treatment evaluations demonstrated a significant reduction in pain in Experimental Group B(p= 0.000). Additionally, a comparison of pre- and post-treatment questionnaire scores indicated a significant reduction in activity limitation due to heel pain in the study group (p=0.000). An independent t-test was performed to compare the two study groups. While pre-treatment pain levels showed no significant difference between the groups (p>0.05), post-treatment analysis revealed a significant reduction in pain, with a p-value <0.05, confirming the effectiveness of the intervention.

In 2020, Moshrif A, et al. conducted a study concluding that deep friction massage is ineffective as a stand-alone treatment for plantar fasciitis. However, it may serve as a beneficial physical adjuvant therapy. The authors emphasized the need for large-scale research to further validate this finding.[17] Similarly, in 2021, a study by Gala M, et al. examined the effects of self-myofascial release therapy and transverse friction massage therapy on hamstring flexibility in office workers. The study found that both techniques, when applied to the plantar fascia using the anatomy trains approach, resulted in improved flexibility. However, self-myofascial release therapy demonstrated superior effectiveness both statistically and clinically compared to transverse friction massage therapy.[18]

In 2021, Juchli L, et al. conducted a study indicating that massage therapy, including proximal trigger point release, may help reduce discomfort and functional limitations in patients with plantar fasciitis. However, further research is needed to establish its effectiveness and validate trigger point release as a treatment option.[19]

Similarly, in 2015, Rathleff MS, et al. compared two treatment approaches for plantar fasciitis: shoe inserts combined with plantar-specific stretching versus shoe inserts combined with high-load strength training. The study included 48 patients, divided into three groups. At three months, the foot function index (FFI) was significantly lower in the strength training group (29 points lower, P = 0.016). However, no significant differences were observed at 1, 6, or 12 months. At one year, FFI scores were 22 for the strength training group and 16 for the stretching group, with secondary outcomes showing no significant differences. The findings suggest that high-load strength training may provide faster pain relief and functional improvement compared to plantar-specific stretching. These results contrast with the findings of the

present study.[20]

In 2023, Sugino Y, et al. conducted a study utilizing shear wave elastography to assess the effects of various stretching exercises on the mechanical properties of the plantar fascia. Fourteen participants performed different stretching techniques, and results showed a significant increase in plantar fascia elasticity after all stretching sessions, with values rising from 133.8–144.7 kPa to 158.9–215.8 kPa ($P<0.01$). Continuous Achilles tendon stretching was found to enhance flexibility more than intermittent stretching ($P = 0.03$). However, no significant differences were observed between various plantar fascia-specific or Achilles tendon stretching techniques. Overall, the study concluded that stretching exercises, regardless of method or frequency, improve plantar fascia suppleness. These findings contrast with those of the present study.[21]

Limitations of the study

• The study had a higher proportion of male participants, limiting its generalizability across genders.

• With only 69 participants, the sample size was relatively small, restricting the broader applicability of the findings.

• Patients with red-flag conditions or severe plantar fasciitis were excluded, which may limit the relevance of the results for more complex cases.

• Recruitment was limited to a single outpatient department, potentially reducing the external validity of the study.

CONCLUSION

This study revealed a significant difference in the effectiveness of static stretching and deep kneading massage, both used as adjuncts to conventional therapy, in managing plantar fasciitis symptoms. The findings support the alternative hypothesis, indicating that the experimental group receiving deep kneading massage experienced greater pain relief and better inflammation management compared to the static stretching group. However, given the study's limitations, further research with larger, more diverse populations is recommended to validate these findings and optimize treatment strategies for plantar fasciitis.

REFERENCES

1. McPoil TG, Martin RL, Cornwall MW, Wukich DK, Irrgang JJ, Godges JJ. Heel pain-plantar fasciitis. J Orthop Sports Physical Ther 2008;38(4):A1-A18. https://www.jospt.org/doi/10.2519/jospt.2008.0302
2. Wearing SC, Smeathers JE, Urry SR, Hennig EM, Hills AP. The pathomechanics of plantar fasciitis. Sports Med 2006;36:585-611. https://doi.org/10.2165/00007256-200636070-00004
3. Latt LD, Jaffe DE, Tang Y, Taljanovic MS. Evaluation and treatment of chronic plantar fasciitis. Foot Ankle Orthop2020;5(1):2473011419896763.https://doi.org/10.1177/2473011419896763
4. Riddle DL, Pulisic M, Sparrow K. Impact of demographic and impairment-related variables on disability associated with plantar fasciitis. Foot Ankle Int 2004;25(5):311-7. https://doi.org/10.1177/107110070402500506
5. Galli M, Cimolin V, Rigoldi C, Pau M, Costici P, Albertini G. The effects of low arched feet on foot rotation during gait in children with D own syndrome. J Intellect Disabil Res 2014;58(8):758-64. https://doi.org/10.1111/jir.12087
6. Arachchige SNK, Chander H, Knight A. Flatfeet: Biomechanical implications, assessment and management. Foot 2019;38:81-5. https://doi.org/10.1016/j.foot.2019.02.004
7. Renström P, Johnson RJ. Overuse injuries in sports: a review. Sports Med 1985;2:316-33. https://doi.org/10.2165/00007256-198502050-00002
8. Schuitema D, Greve C, Postema K, Dekker R, Hijmans JM. Effectiveness of mechanical treatment for plantar fasciitis: a systematic review. J Sport Rehab 2019;29(5):657-74. https://doi.org/10.1123/jsr.2019-0036
9. Atchison JW, Tolchin RB, Ross BS, Eubanks JE. Manipulation, traction, and massage. Braddom's Physical Medicine and Rehabilitation: Elsevier; 2021. pp. 316-37. e7. https://doi.org/10.1016/B978-0-323-62539-5.00016-3
10. Skillgate E, Pico-Espinosa OJ, Côté P, Jensen I, Viklund P, Bottai M, et al. Effectiveness of deep tissue massage therapy, and supervised strengthening and stretching exercises for subacute or persistent disabling neck pain. The Stockholm Neck (STONE) randomized controlled trial. Musculoskelet Sci Pract 2020;45:102070. https://doi.org/10.1016/j.msksp.2019.102070
11. Kim Y, Bhatia D, Lee Y, Ryu Y, Park H-S. Development and clinical evaluation of a novel foot stretching robot that simultaneously stretches plantar fascia and Achilles tendon for treatment of plantar fasciitis. IEEE Trans Biomed Eng 2022;69(8):2628-37. https://doi.org/10.1109/TBME.2022.3151871
12. Kay AD, Blazevich AJ. Moderate-duration static stretch reduces active and passive plantar flexor moment but not Achilles tendon stiffness or active muscle length. J Appl Physiol 2009;106(4):1249-56. https://doi.org/10.1152/japplphysiol.91476.2008
13. Chanif C, Petpichetchian W, Chongchareon W. Does foot massage relieve acute postoperative pain? A literature review. Nurse Media J Nurs 2013;3(1):483-97. https://doi.org/10.14710/nmjn.v3i1.4452
14. Behm DG, Chaouachi A. A review of the acute effects of static and

dynamic stretching on performance. Eur J Appl Physiol 2011;111:2633-51. https://doi.org/10.14710/nmjn.v3i1.4452

15. Forman J, Geertsen L, Rogers ME. Effect of deep stripping massage alone or with eccentric resistance on hamstring length and strength. J Bodyw Mov Ther 2014;18(1):139-44.https://doi.org/10.1016/j.jbmt.2013.04.005

16. Allen RH, Gross MT. Toe flexors strength and passive extension range of motion of the first metatarsophalangeal joint in individuals with plantar fasciitis. J Orthop Sport Physical Ther 2003;33(8):468-78. https://www.jospt.org/doi/10.2519/jospt.2003.33.8.468

17. Moshrif A, Elwan M, Daifullah OS. Deep friction massage versus local steroid injection for treatment of plantar fasciitis: a randomized controlled trial. Egypt Rheumatol Rehab 2020;47:1-5. https://doi.org/10.1186/s43166-020-00013-6

18. Gala M, Kulkarni P, Kumar A. Comparison of Immediate Effect of Plantar Fascia Release by Roller Massager and Transverse Friction Massage on Hamstring Flexibility in Desk Job Workers. Int J Physiother Res 2021;9(4):3954-9. : https://dx.doi.org/10.16965/ijpr.2021.157

19. Juchli L. Effectiveness of massage including proximal trigger point release for plantar fasciitis: a case report. Int J Ther Massage Bodyw 2021;14(2):22. https://doi.org/10.1186/1757-1146-3-18

20. Rathleff MS, Mølgaard CM, Fredberg U, Kaalund S, Andersen K, Jensen T, et al. High-load strength training improves outcome in patients with plantar fasciitis: A randomized controlled trial with 12-month follow-up. Scand J Med Sci Sports 2015;25(3):e292-e300. https://doi.org/10.1111/sms.12313

21. Sugino Y, Yoshimura I, Hagio T, Ishimatsu T, Nagatomo M, Yamamoto T. Effect of plantar fascia-specific stretching and Achilles tendon stretching on shear wave elasticity of the plantar fascia in healthy subjects. Foot Ankle Surg 2023;29(3):208-12. https://doi.org/10.1016/j.fas.2023.01.003

AUTHORS' CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

SMGJ, GY & WA: Conception & Study design, acquisition of data, drafting the manuscript, approval of the final version to be published

SA, MK & MNB: Analysis and interpretation of data, critical review, approval of the final version to be published

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

CONFLICT OF INTEREST

Authors declared no conflict of interest, whether financial or otherwise, that could influence the integrity, objectivity, or validity of their research work.

GRANT SUPPORT AND FINANCIAL DISCLOSURE

Authors declared no specific grant for this research from any funding agency in the public, commercial or non-profit sectors

KMUJ web address: www.kmuj.kmu.edu.pk
Email address: kmuj@kmu.edu.pk