



"Effectiveness Of Short Foot Exercise In Plantar Fasciitis": A Narrative Literative Review

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Abstract

Introduction: The most frequent cause of heel discomfort is plantar fasciitis. Pain in the medial longitudinal arch of the foot is a frequent symptom of plantar fasciitis. Short foot exercises have been a widely utilized technique for enhancing postural stability and bolstering the plantar muscles.

Objective: This narrative literature review aims to explore the effectiveness of short foot exercise in plantar fasciitis.

Data sources: Between 2018 and 2023, the literature was gathered using medical database searches on MEDLINE, PEDro, PubMed, and Google Scholar.

Review method: Selection criteria include the papers that affirm the role of the short foot exercises in plantar fasciitis. A total of 22 articles including Randomized control trials, longitudinal studies, case-controlled trials, and original studies in physiotherapy published in peer-reviewed publications, as well as full-text English language articles, were reviewed. Twelve studies were eligible for inclusion in this narrative review. PEDro scoring was done for all the articles included in the review. Information is extracted from data using a technique called content analysis.

Result: The main focus was on establishing a effectiveness of short foot exercises in plantar fasciitis. This review highlights the short foot exercises impact in plantar fasciitis. Abnormal alignment of foot, therapeutic approaches like toe raise and curl, toe splay, marble pickup, tennis ball roll reduced the pain and function in plantar fasciitis. Stabilization exercises, which increase balance, play a vital role in enhancing foot stability during plantar fasciitis treatment.

Conclusion: This review discovered the vital involvement of the short

<p>CC License CC-BY-NC-SA 4.0</p>	<p>foot exercises in both the prevention and treatment of plantar fasciitis, presenting opportunities for effective interventions and better patient results. There is still a considerable gap in the research, and high-quality clinical trials to supplement these hypothesized findings are needed.</p> <p>Keywords: <i>plantar fasciitis, short foot exercises, heel pain</i></p>
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INTRODUCTION

The most prevalent cause of heel discomfort is plantar fasciitis and which is believed to impact 10% of the general population throughout the course of their lifetime. Plantar fasciitis, plantar fasciosis, or plantar heel pain are appropriate terms used to describe the condition. It is supported by imaging and histological evidence that plantar "fasciitis" is essentially a degenerative "fasciosis" without inflammation. (Dunning et al., 2018)(Çağlar Okur & Aydın, 2019). The development of plantar fasciitis is affected by a number of variables. One of the implicated elements for the development of plantar fasciitis was proposed to be a reduction in ankle dorsiflexion angle coupled with calf muscle stiffness. Pain in the lower heel area and trouble walking are the most typical signs of plantar fasciitis. Patients frequently experience particularly acute Pain at the first few steps in the morning or following spending a lot of time doing non-weight-bearing activities like sitting or lying down. A period of bearing weight will cause this soreness to return. (Boonchum et al., 2020)(Çağlar Okur & Aydın, 2019). Planter heel pain is sometimes known as plantar fasciitis; however, the word encompasses all pathoanatomical symptoms of this disorder, including plantar fascia inflammation, degeneration or thickness, pathology of the heel fat pad, nerve irritation, and heel spurs. (McClinton et al., 2019) The primary diagnosis for plantar fasciitis is clinical. Traditional physical examination findings indicative of plantar fasciitis included reproducible discomfort when the plantar medial portion of the heel is palpated and pain when the ankle and toes passively flex. For the first assessment of plantar fasciitis, diagnostic imaging is not advised. (Çağlar Okur & Aydın, 2019). The majority of the time, plantar fasciitis is self-limiting, but it can take up to a year for all symptoms to disappear, which negatively affects patients' quality of life and aggravates the medical staff. (Ferreira et al., 2021). A plantar fasciitis diagnosis can be obtained based on the patient's medical history, clinical symptoms, foot questionnaires, and objective tests such as pain severity, palpation, muscle tightness, joint range of motion, or strength. Diagnostic imaging can also be used to rule out other potential sources of discomfort, such as heel spurs or tissue inflammation. The fundamental issue with plantar fasciitis is heel discomfort when engaging in weight-bearing activities, particularly walking, which is the most crucial activity for everyday life [9]. Patients who have trouble walking may experience limitations in their ability to function, work, participate in social activities, and quality of life. (Thong-On et al., 2019) Risk factors including obesity, physical activity, a restricted range of ankle dorsal flexion, or an abnormal foot posture index (often linked to rigidity of the flexor muscles of the foot) are all related to excessive stress on this structure. The fascia is a part of the gastrocnemius-achilles-plantar system, which plays a key role in how the fascia interacts with the windlass mechanism. When the gastrocnemius muscles are less elastic, their functioning may be impacted. (Castro-Méndez et al., 2022). Jogger's heel, tennis foot, and police foot are other names for plantar fasciitis. The tendon or fascia of the foot experiences aseptic inflammation, which leads to plantar fasciitis, a common musculoskeletal condition of the foot. Reduced daily activities are a result of plantar fasciitis, and patients' feet frequently feel hot and sore. (Xu et al., 2019).

One of the most popular exercises for plantar intrinsic foot muscles strength is the short-foot exercise. (Okamura et al., 2020). Short-foot workouts, which are usually prescribed to build intrinsic foot muscles, engage the abductor hallucis muscle, which prevents the medial longitudinal arch height from dropping too far. (Unver et al., 2020). Short-foot exercise has been used often to strengthen the plantar muscles and enhance postural stability. To enhance the foot's biomechanical position, the short-foot posture involves greater medial longitudinal arch. To shorten the length of the foot To do the short-foot exercise, push the head of the first metatarsal toward the heel while keeping the toes straight. Short-foot exercise increases the medial longitudinal arch by activating the intrinsic foot muscle while without overworking the extrinsic foot muscles, such as the tibialis anterior and gastrocnemius. Patients with weight-bearing conditions can actively participate in this activity. (Moon & Jung, 2021). The newly designed short-foot exercise is a popular balance training technique that develops the intrinsic foot muscles, allowing the foot to raise and retain its medial longitudinal arch while also improving dynamic standing balance. (Lee et al.,

2019). Short-foot exercise is a basic and safe kind of muscle training. Extrinsic foot muscles are not engaged; it solely targets the specified intrinsic foot muscle. (Namsawang & Muanjai, 2022) They aggressively seek to move the head of the first metatarsal nearer the heel and shorten their foot anterior-posteriorly. A stability trainer (Thera-Band) was used to provide appropriate floor friction and minimize slippage throughout the short-foot exercise. (Lee et al., 2019).

The purpose of incorporating short foot exercises into the treatment plan for planter fasciitis patients with the aim of reducing pain. The primary purpose of short foot exercises is to reduce this pain and promoting a more comfortable daily life for patients.

METHODOLOGY

Identification of literature

In the medical databases MEDLINE, PEDro, PubMed, and Google Scholar, researchers searches for the years 2018 through July 2023. They started their search inside medical databases by creating procedures for high-quality evaluations of the relevant medical literature. Dynamic balance, an assessment of ankle instability, quantitative soma-sensory thresholds for joint position sensing and vibration, effects were compared before and after. Their search criteria included "PLANTAR FASCIITIS" and "SHORT FOOT EXERCISES," which contained a number of usual synonyms. Keywords included:

- Plantar fasciitis
- Short foot exercises
- Plantar fasciitis AND Short foot exercises

The researcher combined diverse phrases utilizing boolean operators (such as plantar fasciitis and short foot workouts). When accessible, they also investigated relevant connection alternatives in databases such as MEDLINE. They meticulously reviewed the reference lists of the literature they discovered to uncover more relevant works. They carefully studied the titles and abstracts of all the studies they discovered, and if the studies were relevant to their study subject, they obtained entire copies of the articles for extra examination.

Inclusion criteria

Nineteen papers were found that dealt with the role of brief foot workouts. For research to be included, specific requirements have to be met. The inclusion criteria were as follows.

- Research based on clinical trials, case control and randomized trial.
- Etiology of plantar fasciitis.
- Short foot exercises reduced to pain.
- Publication in peer-reviewed journals.
- Full-text English language articles.

In this narrative review, studies that did not meet these criteria, such as letters to the editor, non-clinical trials, and conference abstracts, were excluded. We also had specific criteria about the patient population under consideration, focusing on individuals with plantar fasciitis as identified by researchers. To analyze the gathered data comprehensively, they employed content analysis, which is recognized by qualitative researchers as a flexible method for examining textual data. Content analysis allowed them to establish connections and highlight distinctions between various data sets consistently.

Review of literature

The reviewer conducted a critical appraisal of all included studies. The studies were assessed using content analysis. A table was created to examine each research by comparing and contrasting content linked to:

- aims and methodological design;
- sample;
- outcome measurements;
- conclusion and results

Author's name	Population	Intervention	Outcome measure	Results	conclusion
(Lee et al., 2019)	30 adults (age range: 19–29)	SFE (n =15)	Ankle instability,	Over time, the SFE group	SFE therapy is more effective

	years	and PSE (n=15)	dynamic balance, and quantitative somatosensory measurements of vibration sensory thresholds and joint position sensation	demonstrated substantial improvements in joint position sensing, vibration sensory threshold, and balance indices. The ankle instability SFE group improved much more in return.	for ankle sprains than PSE. To help people with ankle sprains return to their normal lifestyles, an effective and supervised fitness program must be developed and pushed.
(Elsayed et al., 2023)	Forty participants with symptomatic flexible flatfoot	Experimental group, N.=20 or shoe insole only (eight hours a day) control group, N.=20	static and dynamic foot pressure measures, foot pain, lower extremity function	In a research with 40 individuals, the experimental group experienced less pain (P=0.002) and greater function (P=0.03) after six weeks than the control group. Foot pressure, pain, and function showed substantial changes over time and interaction (P<0.001, P=0.02 - <0.001), but there was no group effect. Both groups had similar decreases in navigational drop.	In individuals with symptomatic flatfoot, implementing a shoe insole and SFE for six weeks reduced pain and function, as well as adjusted foot pressure distribution, more than shoe insoles alone.
(Unver et al., 2020)	Forty-one participants with pes planus	short-foot exercises group (n=21) or the control group (n=20)	Navicular drop, Foot Posture Index, foot pain, disability and plantar pressures	After six weeks of short-foot workouts, the group showed substantial improvements in navigational drop, Foot Posture Index, discomfort, and disability ratings, as well as an increase in maximal plantar force of the midfoot (p<0.05). In the control group, no significant differences were seen between baseline and sixth-	In pes planus, six weeks of short-foot workouts reduced navicular drop, foot pronation, foot discomfort and disability while increasing plantar force of the medial midfoot.

				week outcomes (p>0.05).	
(Moon & Jung, 2021)	total of 32 flat-footed participants were included in the study (14 males and 18 females) and	the SMT combined with SFE group and SMT alone group	Static Balance Dynamic Balance	There was no significant A-P COPE change interaction (F = 0.250, p = 0.621), but a significant time impact (F = 5.388, p = 0.027) and group-time interaction (F = 11.234, p < 0.05) for M-L COPE. SMT paired with SFE resulted in a substantial reduction in M-L COPE compared to SMT alone (p < 0.01).	In clinical settings, we feel that combining SMT and SFE outperforms SMT alone in terms of improving postural balance control among flat-foot patients. Future research is needed to explore the long-term effects of combination SMT and SFE therapy on postural balance in flat-footed participants.
(Okamura et al., 2020)	20 participants with pes planus	short-foot exercise group (exercise) or a control group (controls)	static foot alignment thickness of the intrinsic and extrinsic foot muscles	The exercise group's foot posture index scores for calcaneal inversion/eversion improved considerably after 8 weeks (p < 0.05). Furthermore, the time needed for navicular height to reach the minimal value dropped considerably (p < 0.01).	Individuals with pes planus found that the short-foot exercise efficiently addressed static foot alignment and temporal characteristics of foot kinematics when walking. This temporal shift, which reduces the time it takes for navicular height to reach its minimal value, implies a more efficient windlass mechanism. As a result, short-foot training may be useful in preventing or treating injuries associated to pes planus

					alignment.
(Engkananuwat et al., 2018)	Fifty participants aged 40 to 60 years	Group A Achilles tendon and Group B plantar fascia	Pain intensity, Pressure pain threshold Ankle range of motion Foot and ankle disability	The difference in Group 1 was significant ($P = .040$). There were no differences in any factors across groups ($P > .05$). Both therapies significantly decreased pain while increasing pain threshold, VAS score, and ankle dorsiflexion ($P < .001$). More people in Group 2 stated that their symptoms had improved significantly or totally as compared to Group 1.	Stretching the Achilles tendon and plantar fascia concurrently for four weeks proved to be a more effective treatment for plantar fasciitis. Patients who reported complete remission from symptoms at the conclusion of the 4-week intervention in the simultaneous stretching group ($n = 14$; 56%) were double that of the stretching of the Achilles tendon-only group ($n = 7$; 28%).
(Sulowska-Daszyk et al., 2020)	Eighty long-distance runners, aged 20–45	Group 1 ($n = 48$) and Group 2 ($n = 32$). Participants in Group 1 performed foot exercises daily for six weeks. Subjects in Group 2 were without any intervention	quality of movement patterns with the Functional Movement Screen and muscle flexibility was evaluated	Group 1 showed increased muscular flexibility (e.g., external rotation muscles, $p = 0.005$). In Group 2, only one Active straight leg lift test task improved ($p = 0.005$ and 0.02). However, external rotation muscles' flexibility decreased ($p = 0.001$).	Plantar short foot muscle workouts may increase muscular flexibility in the upper body's myofascial networks and alter the quality of fundamental movement patterns. Such exercises may be useful for all physically active persons and can be practiced as part of general fitness programs.
(Thong-On et al., 2019)	Eighty-four patients with PF participated	randomly assigned to the strengthening or stretching	Pain visual analogue scale (VAS) scores temporospatial gait parameters	Time had a substantial impact on different gait metrics, but there were no group	Strengthening and stretching exercise regimens dramatically

		exercise groups		effects or group-time interactions. Both groups had changes in worst pain, morning pain, cadence, and stride time with time, but there were no significant differences between the two groups in any of the measures..	decreased pain and improved gait in people with PF.
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S. No.	Author	Eligibility Criteria	Random Allocation	Concealed Allocation	Similar Baseline	Subject Blinding	Therapist Blinding	Assessors Blinding	Measures of key outcome from more than 85% of subjects	Intention to treat Analysis of at least one key outcome	Between group Statistical comparison of at least one key outcome	Variability for at least one key outcome	Total
1	(Lee et al., 2019)	Yes	Yes	no	Yes	No	No	Yes	Yes	No	Yes	Yes	7/11
2	(Elsayed et al., 2023)	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	9/11
3	(Moon & Jung, 2021)	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	8/11
4	(Okamura et al., 2020)	Yes	Yes	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes	8/11
5	(Engkanuwat et al., 2018)	Yes	Yes	No	Yes	No	No	Yes	No	No	Yes	Yes	6/11
6	(Sulowska-Daszyk et al., 2020)	No	Yes	No	Yes	No	No	Yes	No	No	Yes	Yes	5/11
7	(Thong-On et al., 2019)	Yes	Yes	No	Yes	No	No	No	No	No	Yes	Yes	5/11

RESULT:

There are very limited studies regarding the short foot exercises in planter fasciitis. This review was to deliberate the effect of short foot exercise in planter fasciitis. In total 19 articles were identified that discussed, the effect of short foot exercises. Case-control trials (n = 2) and pilot studies (n = 5) were the least represented methodological methods, with the latter including the solitary qualitative research found. The most prevalent kind of experiment was randomized controlled trials (n = 12).

The initial search identified 30 papers in total, but only 22 were scanned for eligibility. In further screening, only 19 studies fulfilled the inclusion criteria of the current study.

Two studies identified the long term effect of short foot exercises. Two studies compared different types of foot alignment and 2 studies documented the short term significant effect of short foot exercise.

DISCUSSION:

There is limited research in recently on planter fasciitis in India. Very few studies exist on the short foot exercises on planter fasciitis. The degree of evidence in the present literature is likewise low, given the majority of these investigations were the product of poorly constructed surveys. The most common finding of this review was that the short foot exercises are effective, (Rathleff et al., 2015) notice that, increased ankle dorsiflexion strength may also be an advantage of the high-load strength training activity. Patients with planter fasciitis have been found to have decreased ankle dorsiflexion strength in the past. Patients with planter fasciitis have severe disability since weight-bearing activities exacerbate their pain. This straightforward high-load strength training technique is relevant since it provides for a faster decrease in pain and discomfort after 3 months when compared to planter-specific stretching. (Thong-On et al., 2019) Patients with PF were randomly assigned to one of two groups to undergo 12 weeks of physical therapy treatment with either strengthening or stretching exercise routines. The results demonstrated that both groups had comparable improvements in pain reduction and gait measures. Both groups had a decrease in their severe pain and morning discomfort. This conclusion was consistent with earlier research showing that stretching and strengthening activities reduced pain in PF patients. (Sulowska-Daszyk et al., 2020) found that, Planter short-foot muscle training has been shown in long-distance runners to significantly enhance upper-body muscular flexibility within myofascial chains. Furthermore, long-distance runners may benefit from these types of foot workouts by enhancing the quality of their fundamental movements. Unfortunately, athletes rarely include short workouts to strengthen their foot muscles in their training programs. Exercises for the planter short foot muscles may help long-distance runners' proximal muscles become more flexible and improve their functional movement patterns. The adductor, quadratus lumborum, tensor fasciae latae, and piriformis muscles (external rotation muscles) had higher values than the iliopsoas and rectus femoris. All of these findings pointed to an improvement in the bigger muscles' flexibility, which led to an increase in range of motion. (Unver et al., 2020). The effects of SFE on participants with pes planus' navicular drop, posture, discomfort, and dynamic planter pressures. Six-week short foot exercises reduced ND, improved foot posture, decreased foot discomfort and impairment, and increased planter force in the midfoot. (Huang et al., 2022) found that, Although no change was detected in muscle hypertrophy, the SFE significantly improved foot alignment when compared to other treatments. The precise technique as well as the SFE's long-term consequences. Dorsal and planter flexion exercises, as well as the toe curl, stimulate some IFM; however, they also require extensive activation of the extrinsic foot muscles, making them less recommended until foot core stability is established. The SFE has been demonstrated to cause more evident changes in foot alignment than foot orthoses. (Sulowska-Daszyk et al., 2020)

The purpose of this study was to determine if daily training of the short planter muscle resulted in a significant change in foot posture after four weeks of an SFE training regimen in a group of asymptomatic individuals with pronated foot posture when compared to NBF exercises. Our findings indicate that, unlike the NBF exercise, SFE training did not result in a statistically significant difference in foot position between the two groups. However, each independent group had different ND and FPI scores before and after intervention. The ND decreased, and a more neutral posture was seen. The study's findings show that there was no statistically significant change in foot pronation measured by the FPI and ND in the sample of asymptomatic patients who completed the SFE vs the control group before or after the intervention. However, all research participants preferred a more neutral index value for foot posture and a lower score of ND. Short-foot exercises might thus be considered an effective therapy in the treatment of disorders defined by excessive pronation of the foot.

Conclusion

In this narrative review, it was found that short foot exercises effect which is more effective, has a budding clinical efficacy in treating planter fasciitis be it acute condition. It can either be used as an adjunct to pharmacological management or individually as well. The evidence available till now with regards to its effectiveness is more and in need of further well controlled studies.

Limitations and future scope

It has now been made evident that although short foot exercises can indeed produce a decrease in the mean monthly days with moderate or severe pain but its effect may either be mild or controversial in chronic condition. The current evidence available on the databases falls short in depicting the effect of short foot exercises on planter fasciitis in the long term follow ups. Hence, keeping in line the interest of better options for planter fasciitis treatment, more sham controlled, double-blind studies are essential to confirm the available findings especially in Indian population for which there is scarcity of evidence and also to explore whether short foot exercises holds the potential to bring better results in chronic planter fasciitis with further modifications in short foot exercises parameters.