Physical Education, Health and Social Sciences

https://journal-of-social-education.org

E-ISSN: 2958-5996

P-ISSN: 2958-5988

The Role of Foot Intrinsic Muscle Strength and Ankle–Foot Dorsiflexion in Maintaining Plantar Fascia Health: A Review with Focus on Salespersons

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DOI: https://doi.org/10.63163/jpehss.v3i4.952

Abstract

Background: Plantar fasciitis leading cause of heel pain, frequently affects individuals engaged in prolonged standing, such as salespersons. The interplay between intrinsic foot muscle (IFM) strength and ankle foot dorsiflexion is critical in maintaining plantar fascia integrity and reducing mechanical overload.

Objective: A review on the role of IFM strength and ankle dorsiflexion in plantar fascia health, emphasizing occupational implications for salespersons.

Methods: A narrative review after studying databases including PubMed, Scopus and Google Scholar (2020–2025). Studies examining the relationship between IFM function, ankle dorsiflexion, and plantar fasciopathy were analyzed.

Results: Limited dorsiflexion and weak intrinsic musculature increase plantar fascia strain via altered arch mechanics and early heel-off during gait. IFM-strengthening exercises and dorsiflexion mobility programs significantly improve symptoms, posture, and foot function. Salespersons exhibit elevated plantar fasciitis prevalence due to prolonged standing and cumulative load.

Conclusion: Optimal plantar fascia health relies on adequate IFM strength and ankle mobility. Integrating strengthening, stretching, and ergonomic interventions offers preventive and therapeutic benefits for salespersons.

Keywords: Plantar Fasciitis, Intrinsic Foot Muscles, Dorsiflexion, Occupational Health, Salespersons.

Introduction

Plantar fasciitis is a common and uncomfortable foot condition characterized by inflammation of the plantar fascia, which is a thick band of tissue that stretches across the bottom of the foot,

connecting the heel bone to the toes. It usually causes a piercing heel ache, most noticeable upon rising in the morning and taking that first stride, or after having remained inactive for an extended interval .(1) The plantar fascia is a thick band of connective The plantar fascia constitutes a resilient, fibrous layer of connective tissue located just beneath the skin, stretching from the medial tubercle of the heel bone to the heads of the metatarsals. It helps maintain the foot's medial longitudinal arch. Functionally, it serves as a supportive beam for the metatarsus during flexural stresses when the foot pushes off during walking, and acts like a truss to absorb impact forces in the initial load-bearing portion of gait.(2)

Plantar fascia often worsens with high-impact or weight-bearing activities. Early recognition of the signs and symptoms of plantar fasciitis is essential for timely diagnosis and effective management. The condition usually presents as localized heel pain that may extend along the arch of the foot. The purpose of this review is to enhance understanding of how foot muscle function influences the utilization of ankle plantar flexor activity. Specifically, it aims to explore the relationship between foot muscle and ankle plantar flexor function and how these factors impact performance and overall foot health in individuals with plantar fasciitis.(3)

The exact cause of the a forementioned predicament remains uncertain, although several deep-down and external risk factors have existed identified. Intrinsic factors include undue body mass index, limited upward movement of the foot, flat feet (pes planus), high arches (pes cavus), tendo calcaneus abnormalities, hyperpronation leading to increased hassle, plus feebleness of the central and plantar bottom sways. Extrinsic factors involve unwarranted bodily movement, poor-value footgear, unsuitable walking planes, in addition to walk shoeless. Persons having plantar fasciitis often practice extreme pain in heel during their leading stepladders in the dawn or after prolonged epochs of rest, for instance after snoozing or deskbound. If left untreated, these signs can become chronic, significantly reducing quality of life, restricting daily activities, and having a negative social impact.(4)

Plantar fasciitis often shows resistance to conventional treatments, as many traditional methods primarily emphasize improving foot flexibility or strength. However, stretching and strengthening alone may have limited effectiveness because they fail to address the underlying scar tissue and microlesions that cause tightening and weakening of the plantar fascia.(5) A prior study indicated that focal metatarsal loading decreased PF stiffness in individuals with pes cavus. Additionally, a recent scoping review utilizing finite element analysis highlighted that the plantar fascia serves as the main stabilizing element of the foot arch, and understanding its functional biomechanics has been deemed essential for creating effective rehabilitation and surgical interventions aimed at addressing abnormal foot arch deformities.(6)

Abnormal foot biomechanics can increase the risk of developing patellofemoral syndrome (PFS). For instance, individuals with pes planus typically have a low medial arch and tend to experience excessive pronation. On the other hand, those with pes cavus have a high medial arch and generally remain in a supinated position, which decreases their ability to absorb shock. While previous biomechanical studies with healthy individuals have consistently demonstrated that the pes planus and pes cavus groups show significantly different patterns of plantar pressure and gait mechanics, it is still uncertain if these differences are also present in populations with PFS. Notably, patients suffering from PFS often display a mix of overpronation and restricted ankle dorsiflexion, which may seem contradictory given their foot structure.(7) Although previous studies have measured plantar fascia stiffness in standing, none have compared it directly with intrinsic foot muscle stiffness as per the present study. Previous findings indicate that muscle activity serves a secondary supportive role with the plantar fascia acting as the principal passive postural stabilizer and intrinsic muscles playing a more significant aid once strain placed on the plantar fascia is greater, as during added loading.

Methodology

This review employed a narrative review approach to collate and analyze recent evidence on the role of foot intrinsic muscle strength and ankle-foot dorsiflexion in maintaining plantar fascia health, with a specific focus on occupational implications among salespersons who spend extended hours standing or walking. A structured literature search was conducted across major electronic databases such as PubMed, Scopus and Google Scholar to ensure comprehensive coverage of clinical, biomechanical, and occupational studies. The key search terms used were foot intrinsic muscles," "intrinsic muscle strength," "ankle dorsiflexion," "ankle foot mobility," "plantar fascia," "plantar fasciitis," "plantar fasciopathy," "occupational health," and "salespersons.

Available Medical Subject Headings that relate to "intrinsic muscles of foot" or "plantar fascia" were searched and put in the search string whenever relevant. The search string was created with the assistance of a library information professional. The search was limited to full-text papers written in English, languages that the researchers are fluent in reading and interpreting, and studies involving human participants, if permitted by the search engine.

The purpose of this narrative review is to summarize the body of knowledge about the function of ankle-foot dorsal flexion and foot intrinsic muscle strength in preserving plantar health in salespeople. Studies were included if they assessed foot intrinsic muscle strength, ankle foot dorsal flexion, or plantar health outcomes in salespersons, with no constraints on study design or publication date. Included studies were reviewed for quality, and data were gathered on research characteristics, treatments, and results. The data were evaluated thematically, and findings were presented narratively to uncover patterns and implications for practice. Inclusion criteria were salespersons of both genders with age ranging from 17 to 35 years and salespersons with or without foot or ankle issues. Exclusion criteria consisted of those not undergoing any pharmacological or surgical procedures and persons above 35 years.

Foot pronation and arch function were assessed using the Navicular Drop Test. Foot Function Index Questionnaire was also used to assess plantar health outcomes and functional limitations. Data integrity was ensured through detailed documentation of the search strategy, selection process, and data extraction protocols, facilitating replication by other researchers.

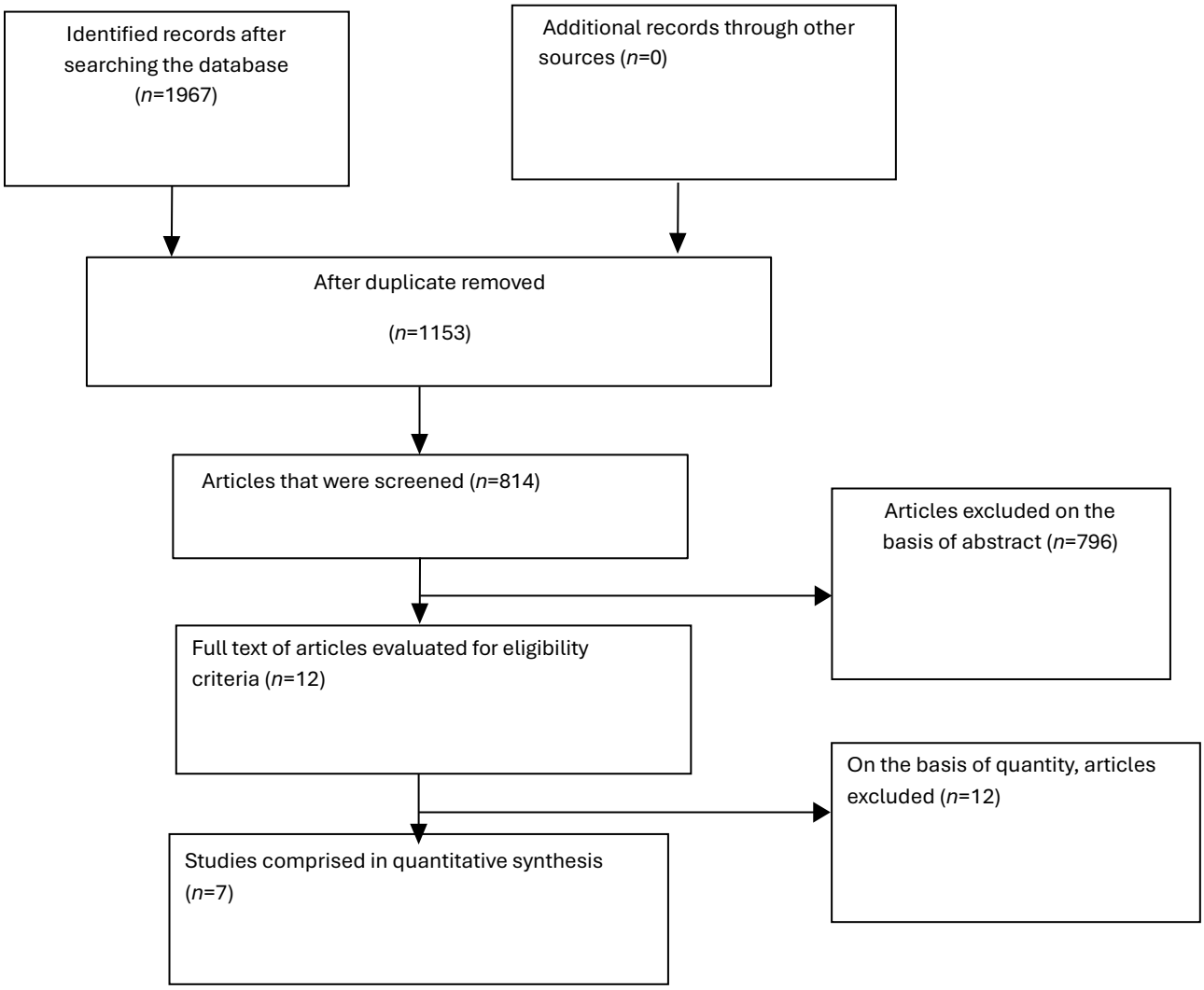
Results

The key findings regarding the relationship between intrinsic foot muscle (IFM) strength, ankle-foot mechanics, and plantar fascia health, particularly in individuals exposed to prolonged standing or high-load occupations such as salespersons. Effects of Intrinsic Foot Muscle Strengthening across multiple recent systematic reviews, meta-analyses, and imaging-based studies have been studied and showed that IFM strengthening produced consistent improvements in Medial longitudinal arch (MLA) parameters, including reduced navicular drop and improved foot posture index.

Foot strength and dynamic stability have been improved with enhanced postural control and balance in various functional tasks. Outcomes indicate that stronger IFMs contribute to more efficient load distribution across the foot and reduce excessive tension on the plantar fascia. Interaction Between IFM Strength and Plantar Fascia Load evidence indicates that well-trained IFMs support the MLA during both static and dynamic activities. They contribute to load sharing within the foot, thereby reducing overstrain on the plantar fascia and provide resilience against plantar fasciitis in high-load populations. However, studies also show that isolated non-weight bearing IFM exercises alone may be insufficient to alter foot kinetics or pronation control, emphasizing the need for function-based strengthening. Recent studies demonstrate that ankle dorsiflexion mobility influences the activation and mechanical contribution of IFMs during gait.

Functional weight-bearing tasks (e.g., standing, walking, balance tasks) result in greater IFM activation compared with isolated exercises. Limited dorsiflexion or poor foot mechanics can

Figure 1: PRISMA CHART



increase compensatory stresses on the plantar fascia, especially when IFM strength is inadequate. Although evidence directly linking dorsiflexion restrictions to plantar fasciitis in occupational groups is limited, the functional interaction between ankle mobility and foot-core activity is increasingly recognized. Relevance for salespersons and long-standing workers indicate that individuals who stand or walk for prolonged periods (e.g., salespersons) experience repetitive and cumulative plantar loads and are at greater risk of plantar fascia irritation or overload. These individuals can benefit substantially from IFM strengthening, dorsiflexion mobility training, and ergonomic strategies (e.g., supportive footwear). The evidence supports implementing preventive programs in occupational settings to minimize long-term plantar fascia stress. Evidence gaps and limitations despite promising findings, several limitations remain most studies involve healthy or athletic populations; fewer focus on symptomatic plantar fasciitis patients or occupational groups. Optimal exercise dosage (intensity, frequency, duration) for IFM training remains unclear. Long-

term outcomes and recurrence rates of plantar fasciitis after IFM-focused rehabilitation are underreported. Some studies show minimal kinetic changes following IFM training alone, supporting the need for integrated multimodal approaches.

Discussion

Plantar fasciitis (PF) is one of the most common causes of heel pain and affects a wide variety of people, including athletes, healthcare workers, and individuals whose jobs require long hours of standing—such as salespersons. Because PF can become chronic and significantly disrupt daily activities, researchers and clinicians continue to explore effective conservative treatments. Among these, strengthening the intrinsic muscles of the foot, improving ankle–foot dorsiflexion, and using orthotic devices have gained strong clinical attention...(8) For salespersons who spend most of their working hours on their feet, inadequate foot muscle strength and restricted dorsiflexion can place extra stress on the plantar fascia. Normally, the foot's intrinsic muscles provide natural support to the medial arch, helping distribute pressure during standing and walking. When these muscles weaken, the plantar fascia is forced to absorb more load, increasing the risk of micro-trauma. Similarly, limited ankle dorsiflexion can alter gait mechanics, often causing excessive pronation—another key contributor to PF. Strengthening these muscles and restoring ankle mobility therefore becomes a central strategy in maintaining plantar fascia health..(9)

Additionally, a 2025 imaging-based study reported that increased IFM cross-sectional areas and improved navicular height (an indicator of arch support) occur after foot-strengthening interventions. (10) These findings support the hypothesis that strong, responsive IFMs help distribute plantar loads more evenly, reduce excessive strain on the plantar fascia, and potentially reduce the risk or severity of plantar fasciitis (PF).Deep ankle and foot mechanics including ankle dorsiflexion range and foot loading during gait are also relevant for plantar fascia stress. Although fewer studies focus strictly on dorsiflexion, recent research points to functional interactions between ankle-foot joint mobility, foot core activation, and dynamic foot stability.

A 2024 study comparing intrinsic foot muscle activation during functional (weight-bearing) versus isolated (non-weight bearing) exercises found that PIFMs (plantar intrinsic foot muscles) are more effectively engaged during functional tasks. This implies that foot mechanics during gait (which involve ankle dorsiflexion and ground contact) are crucial for IFM contribution to arch support. The concept of “foot core stability” extends beyond local muscle strength, global foot-ankle neuromuscular control, interaction between intrinsic and extrinsic muscles, and joint/range-of-motion factors (including ankle dorsiflexion) collectively contributing to proper force transmission through the plantar fascia.(11) Thus, limited ankle dorsiflexion, poor foot mechanics, or suboptimal neuromuscular coordination may overload the plantar fascia especially if IFMs are weak or inactive, increasing risk of injury or degeneration.

Our focus on salespersons is particularly relevant. These individuals often spend prolonged periods standing or walking across hard surfaces which places repetitive load on the plantar fascia. The reviewed evidence suggests that building IFM strength, improving foot-ankle control, and ensuring proper mechanics (including ankle-foot mobility) may act as protective or rehabilitative strategies. Incorporating IFM exercises may improve foot posture, dynamic stability and shock absorption reduces chronic strain on the plantar fascia during long hours of standing or walking.(12)There is limited data explicitly linking ankle dorsiflexion range of motion (or impairment) with plantar fascia injury risk, especially in occupational (non-athlete) populations. More research is needed focusing on foot-ankle joint mobility, foot-core activation during functional tasks (e.g., prolonged standing, repetitive walking) and long-term plantar fascia outcomes.

Based on current evidence, the following clinical recommendations can be incorporated by Integrating IFM strengthening into foot/ankle rehab and preventive programs, especially for

individuals at risk (e.g., salespersons, workers standing long periods, athletes). Use exercises like "short-foot," toe-yoga, foot doming, and weight-bearing dynamic foot exercises that promote natural muscle engagement. Combining foot-core strengthening with ankle-foot mobility and neuromuscular control training. Given the interaction between foot muscles and ankle/foot mechanics, therapeutic programs should address both local foot strength and global lower-limb/foot-ankle control.

Using progressive, functionally relevant training protocols rather than isolated, non-weight-bearing exercises only, include functional, weight-bearing tasks (standing balance, walking drills, dynamic foot loading) to mimic real-life demands. Monitoring foot posture, arch behavior, and plantar load, not just pain is very crucial for maintaining plantar fascia and foot health. Objective measures such as arch height, navicular drop, foot posture index, functional tests, and possibly gait/pressure analyses can be done to track changes and adjust interventions. There is need for further research in clinical, high risk and occupational populations. Longitudinal studies are needed to clarify how IFM strength and ankle-foot mobility impact plantar fascia health over time, including prevention and recurrence of plantar fasciitis. For high risk or symptomatic individuals (e.g., early PF, heel pain), foot-core strengthening combined with ankle-foot mobility training may help prevent disease progression or recurrence. Recent consensus-derived progressive strengthening protocols support this integrated approach.(13)

Overall, the growing evidence supports that maintaining strong intrinsic foot muscles, ensuring adequate ankle–foot dorsiflexion, and using foot orthoses when needed form an effective, safe, and practical strategy for preventing and managing plantar fasciitis. For salespersons who stand and walk throughout the day, these approaches are especially valuable, not only for managing pain but also for protecting long-term foot health and sustaining occupational performance.

Conclusion

This review shows that both intrinsic foot muscle (IFM) strength and adequate ankle-foot dorsiflexion are essential for protecting and supporting the plantar fascia. Recent research highlights that stronger IFMs contribute to better arch stability, improved foot mechanics, and more efficient load distribution during daily activities. Functional, weight-bearing exercises that activate the foot core and promote ankle mobility appear to offer greater benefits than isolated, non-weight-bearing routines, emphasizing the need for an integrated approach to lower limb neuromuscular training.

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