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RESEARCH

Effects of manual therapy on pain and function in patients with plantar fasciitis: A systematic review of the literature

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ABSTRACT

OBJECTIVE Plantar fasciitis is common and impairs people's ability to move. Manual therapy is frequently used to treat plantar fasciitis. However, its effects are inconclusive. For this reason, the purpose of this systematic review is to determine the effect of manual therapy on plantar fasciitis.

METHODS A systematic review of the literature was conducted, following the PRISMA checklist. Five databases (CINAHL, Scopus, PubMed, Web of Science, and OVID) were searched, along with a review of the gray literature and a manual search. Randomized clinical trials from 2014 to 2024 were selected that examined the efficacy of manual therapy in reducing pain intensity and improving function in patients aged 18 to 60 years with a clinical diagnosis of plantar fasciitis. Methodological quality (PEDro scale) and risk of bias (risk of bias scale) were assessed.

RESULTS Four randomized clinical trials (n = 224) were included, reporting controversial statistical differences in pain and function. In addition, two studies reported clinically relevant changes favoring manual therapy. PEDro scale scores ranged from 4 to 6, and three studies presented a high risk of bias.

CONCLUSIONS The effects of manual therapy on pain and function in patients with plantar fasciitis are uncertain. The evidence is limited, heterogeneous, and lacking in methodological rigor. A larger number of randomized clinical trials with more consistent, replicable protocols are needed to determine the contributions of manual therapy to improving pain and function in patients with plantar fasciitis. Similarly, the inconsistency and limited evidence on indicators of clinical significance in the selected studies preclude an assessment of the clinical impact of this intervention.

PROSPERO REGISTRATION CRD42024501550.

KEYWORDS Plantar fasciitis, manual therapy, pain, functionality

INTRODUCTION

The plantar fascia is a broad, thick band of connective tissue that originates at the calcaneus and attaches to the forefoot at three distinct sites [1]. The central band supports the longitudinal arch of the foot, acting as a windlass mechanism during the stance phase of gait [2]. In turn, this structure may cause pain due to perifascial edema from microtears at the calcaneal insertion site, leading to plantar fasciitis or plantar fasciosis [3–6]. Plantar fasciitis has a prevalence of 9.6% in the general population, preferentially affecting adults between 40 and 60 years of age [7,8]. It is associated with several major risk factors, including increased plantar flexion range of motion, high body mass index, and increased tension in the posterior calf muscles [9–11].

One of the non-invasive interventions used for plantar fasciitis is manual therapy, defined as the application of force to body tissues using the hands or other body parts, tools, or modalities, with therapeutic intent [12]. It includes thrust manipulation, joint mobilization, soft tissue mobilization, and neurodynamic movements [13]. These interventions provide

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MAIN MESSAGES

- Plantar fasciitis is a common condition in the general population that has been treated with non-invasive methods, particularly manual therapy, the effectiveness of which is uncertain.
- This study evaluates the isolated effect of manual therapy, unlike previous reviews in this field, where manual therapy was included as part of a multimodal treatment regimen.
- The limitation of this study lies in the inability to complement the qualitative analysis with a quantitative analysis, due to the variety of measurement instruments, application techniques, and different time points at which the outcomes of interest were assessed.

physiological mechanical effects, such as blood shear stress or tissue stretching, which induce the release of nitric oxide from endothelial tissue and blood cells, in addition to neurological effects related to the descending pain modulation pathway [14,15].

Systematic reviews and overviews of systematic reviews evaluating the effect of manual therapy in plantar fasciitis have been published from 2011 to 2018, with overviews extending to 2021. However, none of them have presented conclusive findings on the effects of manual therapy on variables such as pain and function in patients with plantar fasciitis [16–19]. Furthermore, previously published reviews have evaluated the effect of manual therapy in combination with different co-interventions [16–18], without further exploring their clinical significance; therefore, the isolated effect of manual therapy and its clinical impact remain unknown.

The aim of the present review is to determine the effect of manual therapy in patients with plantar fasciitis on pain reduction and improvement in functionality, based on a systematic search and updated analysis of randomized clinical trials in the field. It is expected that manual therapy, applied as a standalone intervention in patients with plantar fasciitis, will produce a significant reduction in pain and an improvement in functionality compared with other interventions or no intervention.

METHODS

A systematic review of the literature was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocols (PRISMA) checklist [20]. The study was registered in the International Prospective Register of Systematic Reviews (PROSPERO) under registration code CRD42024501550.

Literature search strategy

The search strategy was developed using the "population, intervention, comparison, and outcome measures" framework to conduct a precise search [21]. The following is an example of the search strategy used for the CINAHL database: Heel-Pain (S1) OR Heel-Spur (S2) OR Plantar-Fasciitis (S3) OR Policeman's-Heels (S4) OR Heel-Spur-Syndrome (S5) OR Chronic-Plantar-Fasciitis (S6) OR Calcaneal-Spurs (S7) OR Musculoskeletal-Pain (S8) AND Manipulations-Musculoskeletal (S9) OR Manipulation-Therapy (S10) OR Manipulative-Therapy (S11) OR Manual-Therapies (S12) OR Manual-Therapy (S13) AND Pain (S14) OR Function (S15). The complete search strategy is described in Supplementary Material 1.

The population consisted of patients diagnosed with plantar fasciitis; the intervention studied was isolated manual therapy techniques; and the comparison groups included control, placebo, and sham interventions. The primary outcomes were pain intensity and functionality. To develop the search strategy, four articles related to the topic were selected, and the search terms were obtained from the titles, abstracts, and keywords of each article [16–19].

Two investigators, with a third reviewer serving as a tiebreaker in cases of disagreement, conducted an exhaustive search of the available literature. The databases used were CINAHL, Scopus, PubMed, Web of Science, and Cochrane. The applied filters were related to the time frame and restricted to randomized clinical trials only. Duplicate articles identified through the search strategy were removed using a tool called Rayyan [22]. A gray literature search was also conducted using the Google search engine, reviewing the first 10 pages of results. In addition, a manual search was performed.

Selection process

Two investigators (MIA, JGM) independently conducted the search and article selection process. Disagreements were resolved by consensus with the participation of a third reviewer (JYV). Potential publications were selected by screening titles and abstracts for the inclusion of the intervention under study and the assessment of the variables of interest. Potentially eligible studies were retrieved, and the full-text articles were reviewed before applying the inclusion and exclusion criteria.

Eligibility criteria

Studies were considered eligible if they met the following criteria:

1. Conducted in adults between 18 and 60 years of age [23,24].
2. Plantar fasciitis had to be diagnosed.
3. Randomized clinical trials had to be published in journals between January 1st, 2014, and April 1st, 2024.

4. Studies had to report the isolated efficacy of manual therapy, along with changes in pain intensity and functionality.

Studies were excluded if they met any of the following criteria:

1. Editorial letters, books, pilot studies, or qualitative studies.
2. Studies including healthy subjects under an induced experimental pain paradigm.
3. Studies involving heel pain lesions of arthritic, infectious, neuropathic, traumatic, tumoral, or vascular origin.

Data collection process

Data extraction was performed using a standardized Excel spreadsheet that included multiple categories: article information (authors, year, design, country); population information (eligibility criteria); study groups; intervention characteristics (type of treatment, duration, number of sessions); and outcome measures, results, and clinical significance. Two investigators (MIA, JGM) independently participated in this phase. In the event of disagreement, a third reviewer (JYV) was involved and made the final decision. The most relevant information from the selected studies is presented in Table 1.

The main variables analyzed in this review were pain intensity [27], pressure pain threshold [28], and functionality [29]. Secondary variables included flexibility (range of motion and popliteal angle grading), quality of life, and body mass index.

Methodological quality and risk of bias

Methodological quality was assessed using the Physiotherapy Evidence Database (PEDro) scale, which comprises 11 items assessing a study's external and internal validity. Each item is evaluated as either fulfilled (yes) or not fulfilled (no) [30]. Risk of bias was analyzed using the updated version of the Cochrane Collaboration tool (RoB 2), which considers five domains evaluated as follows:

- Y: yes.
- PY: probably yes.
- PN: probably no.
- N: no.
- NI: no information.

An algorithm determined the overall risk of bias as low-risk, some concerns, or high-risk [31]. Both scales were independently applied by two reviewers (MIA, JGM). A third reviewer (JYV) intervened in cases of disagreement.

Clinical effect and effect size

The clinical change and effect size of manual therapy were determined in patients with plantar foot pain and the associated disability. Effect size refers to the magnitude of an outcome [32]. The term effect size may refer to the magnitude of an unstandardized effect (for example, the difference between group means, relative risk, or odds ratio) or standardized effect sizes (such as "correlation" or "Cohen's d") [33]. Effect size provides information about the magnitude of the association between variables and the size of the difference between groups [33,34]. Likewise, effect magnitude has been interpreted as an index of clinical relevance. The greater the effect size, the greater the difference between groups and the greater the clinical relevance of the findings [33]. According to Cohen's guidelines, values of 0.2, 0.5, and 0.8 are considered small, moderate, and large mean-difference effect sizes, respectively [35]. Complementing this categorization, a criterion for effect size definition proposed for rehabilitation research was also included, with values of 0.14 (small), 0.31 (moderate), and 0.61 (large) [36].

Certainty of evidence and strength of recommendation

The Grading of Recommendations Assessment, Development, and Evaluation (GRADE) approach was used to perform an overall assessment of the quality of evidence across five domains: risk of bias, inconsistency of results, indirect evidence, imprecision, and publication bias [37,38]. This system allows assigning a summary rating to the body of evidence regarding the effect of an intervention on a specific outcome measure, thereby facilitating the formulation of recommendations that guide clinical decision-making. After applying the GRADE approach, the results were classified according to their level of evidence [37,38]. This assessment was conducted considering a review in the absence of the estimated effect [39].

RESULTS

The search strategy identified a total of 4793 potentially eligible studies for this review, of which four were ultimately included. Figure 1 shows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram illustrating the study selection process.

The four selected articles were randomized clinical trials, including a total of 224 patients. Analysis of the intervention protocols revealed marked heterogeneity in the techniques used to address the same clinical condition. The interventions applied included manual therapy, particularly myofascial release [23,26]; joint mobilization [40]; custom foot orthoses [40]; the Gua Sha method [25]; structural diagnostic and management approach [26]; and cryostretching [25]. The detailed characteristics of each study are presented in Table 1.

Pain and symptomatology were evaluated in the four selected articles using different assessment tools: pressure pain threshold [23,25], the American Orthopedic Foot & Ankle Society ankle-hindfoot scale [40], the Foot Function and Pain Scale [40], the Numeric Pain Rating Scale [25], and the Foot Function Index, which includes five pain-related items [25].

Ajimsha et al. reported that the myofascial release group demonstrated a greater increase in pressure pain threshold compared with the control group ($p < 0.01$) [23]. Grim et al. reported that, at both the 1-month and 2 to 3-month follow-ups, the manual therapy group demonstrated greater improvements

Table 1. Characteristics of the included studies.

#	Authors, year, design, country	Participants / eligibility criteria	Study groups	Intervention	Outcome measures	Results	Clinical significance (effect size / minimal clinically important difference)
1	Ajimsha et al., 2014 / RCT / India [23]	65 patients aged 20 to 60 years. (17 men and 48 women). The main complaint is unilateral plantar heel pain.	MFRG n = 33. CG n = 32.	**MFRG:** 5 myofascial release techniques. **CG:** Sham ultrasound therapy applied to the gastrocnemius, soleus, and plantar fascia in the same areas. Intervention: 30 minutes, 3 times per week for 4 weeks (weeks 1 to 4).	**Pain:** PPT measured with a mechanical pressure algometer (Baseline, FPK 20). **Functionality:** FFI, a self-administered questionnaire consisting of 23 items assessing pain, disability, and activity limitation. Measurements were performed at week 1 (pre-intervention score), week 4 (post-intervention score), and follow-up at week 12 after randomization.	**Pain:** Significant group-by-time interactions were observed for changes in PPT measured in kg/cm^2 ($F = 23.406$; $p < 0.001$) and sole ($F = 22.232$; $p < 0.001$), and over the calcaneus ($F = 16.641$; $p < 0.001$). The MFRG showed greater increases in PPT than the control group ($p < 0.01$). **Functionality:** The MFRG showed significantly greater improvement than the CG at weeks 4 and 12 ($p < 0.001$), but there were no between-group differences at baseline ($p < 0.533$). For the 95% CI, the differences were: on day 12, 0.621 to 1.321; at 4 weeks, 5.160 to 8.465; and at 12 weeks, 2.529 to 5.971.	**Pain:** PPT measured at three points showed a substantial effect in favor of the MFRG at both 4 and 12 weeks from baseline, with Cohen's d values ranging from $d = 0.874$ to $d = 1.32$. **Functionality:** The mean difference in FFI between the CG and MFRG was 6.813 at week 4 (baseline score) and 4.250 at week 12 (post-intervention score).
2	Grim et al., 2019 / RCT / Germany [25]	63 patients (44 women, 19 men). Clinical diagnosis of PF with symptoms < 6 months. Older than 18 years.	MT group. CFO group. CT group.	**MT:** Joint mobilizations at the talocrural joint for dorsiflexion, subtalar joint for eversion and inversion, and the transverse tarsal joint for pronation and supination. **CFO:** custom foot orthosis made of vinyl acetate foam using a computer-assisted process. Intervention: MT was administered twice during the first week and once per week for the remaining 3 months.	**Pain:** AOFAS-AHS scored from 0 to 100, including subjective pain (40%) and function (60%) components. Higher scores indicate better outcomes. **Functionality:** FPDFS with an 11-point NRS from 0 to 10. Physical examination was performed at baseline (T0) and at follow-up sessions at 1, 2, and 3 months (T1 to T3).	**Pain:** The AOFAS-AHS showed greater improvement in the MT group ($p < 0.01$). **Functionality:** The FPDFS showed significantly greater improvement in the MT group ($p < 0.01$) than in the other groups.	**Pain:** Differences in AOFAS-AHS from T0 to T3 for the MT group, CFO group, and CT group were 35% ("considerable improvement"), 15% ("minimal improvement"), and 21% ("improvement"), respectively. **Functionality:** Changes corresponding to the FPDFS were 37% ("considerable improvement"), 18% ("minimal improvement"), and 24% ("improvement"), respectively.

(Continued)

(Continued)

#	Authors, year, design, country	Participants / eligibility criteria	Study groups	Intervention	Outcome measures	Results	Clinical significance (effect size / minimal clinically important difference)
3	Jadhav et al., 2023 / RCT / India [25]	36 subjects (12 men and 24 women). Subjects diagnosed clinically with plantar fasciitis. Aged 20 to 60 years.	GS group n = 12. CS group n = 12. PRT group n = 12.	**GS:** Using a jade stone and lubricant, unidirectional pressure movements were applied sequentially. **CS:** a frozen tennis ball was rolled over the plantar arch (20 repetitions every 2 minutes). **PRT:** pressure release technique over the sensitive point at the fingertip. Intervention: 7 consecutive sessions over a 7-day period, together with exercises.	**Pain:** NPRS using an 11-point numeric scale (format similar to a visual analog scale). PPT was measured with a pressure algometer. **Functionality:** FFI, measured through three subscales: pain, disability, and activity limitation. Measurements were performed before and after the intervention.	**Pain:** All three groups showed significant improvements in pain, disability, and function/PPT ($p < 0.001$). The GS group performed significantly better than the CS group ($p < 0.001$) and the PRT group ($p < 0.001$) for pain intensity. The PRT group was significantly superior to the GS group ($p < 0.001$) and the CS group ($p < 0.001$) regarding PPT outcomes. **Functionality:** The CS group was significantly better than the GS group ($p < 0.001$) and the PRT group ($p < 0.001$) for FFI disability assessment.	**Pain:** NPRS showed an ES favoring the GS group over the PRT group (d = 1.16). For PPT, the ES was d = 0.67 between the GS and PRT groups, favoring the PRT group. **Functionality:** For FFI, the ES was d = 0.14 in favor of the CS group compared with the GS group.
4	Akter et al., 2024 / RCT / Bangladesh [26]	64 patients (most were women). Diagnosis of heel pain, plantar fasciitis, or calcaneal spur. Pain lasting more than 4 weeks. Ages between 30 and 60 years.	MFR group n = 32. SDMA group n = 32.	**MFR:** myofascial release of the plantar fascia and perifascial structures in the supine position using 3 maneuvers of 5 to 7 repetitions, held for 30 seconds, progressively. **SDMA:** combined myofascial release with stretching of the gastrocnemius muscles; additionally, tensioning of the plantar arch with passive stretching of the posterior femoral, semitendinosus, semimembranosus, superficial peroneal, and tibial nerves was added.	**Pain:** FFI, a 17-item index with 5 pain items. **Functionality:** FFI, a 12-item index for painful activities. FADI is a 26-item questionnaire with 22 items related to functional difficulty and 4 related to pain. Baseline data were collected before treatment and reassessed after 12 treatment sessions in the hospital.	**Pain:** The SDMA group was superior to the MFR group, with statistically significant differences in FFI pain scores ($p < 0.01$). **Functionality:** The SDMA group was significantly better than the MFR group for FFI activity limitation ($p < 0.01$), FFI disability ($p < 0.01$), and FADI ($p < 0.01$).	**Pain:** Not reported. **Functionality:** Not reported.

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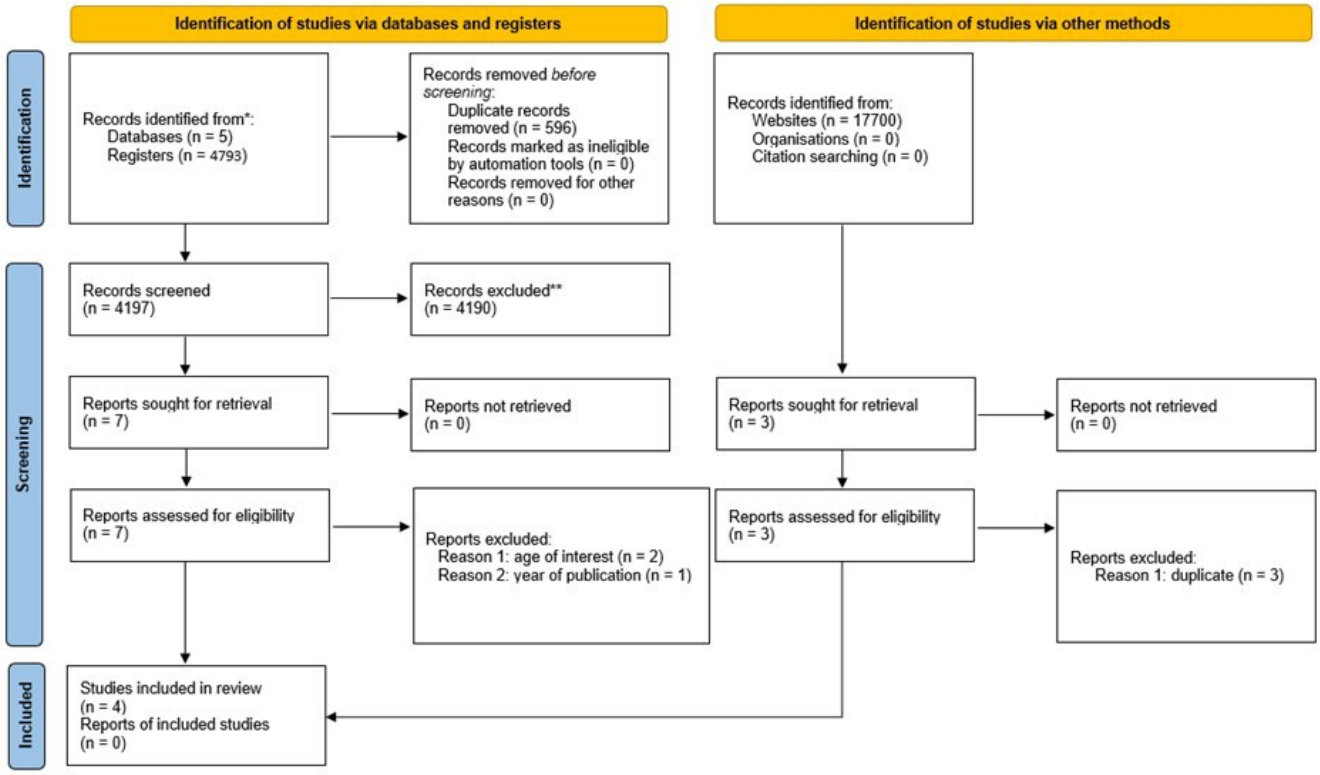
#	Authors, year, design, country	Participants / eligibility criteria	Study groups	Intervention	Outcome measures	Results	Clinical significance (effect size / minimal clinically important difference)
				Intervention: 30-minute sessions, 3 times per week.			

MFRG, myofascial release group. CG, control group. SUT, sham ultrasound therapy. PPT, pressure pain threshold. FFI, Foot Function Index. 95% CI, 95% confidence intervals. RCTs, randomized clinical trials. PF, plantar fasciitis. MT, manual therapy. CFO, custom foot orthosis. CT, combined therapy. AOFAS, American Orthopedic Foot & Ankle Society ankle-hindfoot scale. FPDFS, Foot Pain and Disability Scale. NRS, Numeric Rating Scale. GS, Gua Sha method. CS, cryostretching. PRT, positional release technique. NPRS, Numeric Pain Rating Scale. MFR, myofascial release. SDMA, structural diagnostic and management approach. FADI, Foot and Ankle Disability Index. ES, effect size.
Source: Prepared by the authors based on the study results.

Figure 1. PRISMA flow diagram for study selection.
The flow diagram indicates that, of 4793 records identified across five databases, four studies were ultimately included after screening (titles/abstracts) and eligibility (full-text review) processes.



PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses.
Source: Prepared by the authors based on the PRISMA proposal template.

than the foot orthosis group and the combined therapy group ($p < 0.01$), both in the ankle-hindfoot scale and in the Foot Function and Pain Scale [40]. Jadhav et al. reported a statistically significant reduction in pain on day seven after the intervention in all three groups, as assessed by pressure pain threshold and the Numeric Pain Rating Scale ($p < 0.001$). Akter et al. reported that the structural diagnostic and management group showed significant improvements in pain, as measured by the Foot Function Index, compared with the myofascial release group ($p < 0.01$).

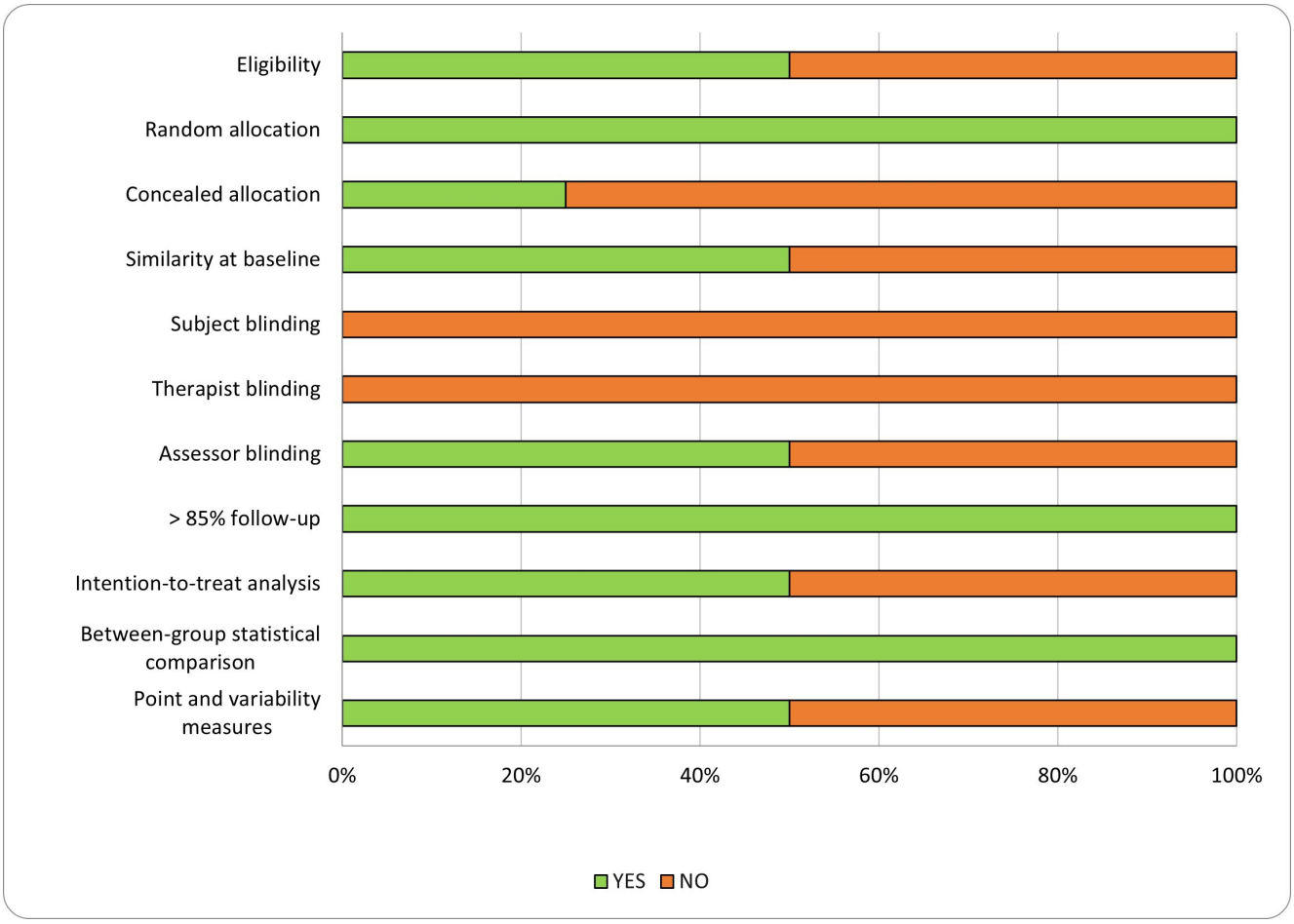
Functionality was evaluated in the four selected articles using two assessment tools: the Foot Function Index [23,25,26] and the Foot Function and Pain Scale [40].

The Foot Function Index results reported by Ajimsha et al. were controversial, showing statistically significant differences for the groups treated with myofascial release compared with the control group at 4 and 12 weeks ($p < 0.001$) [23]. In turn, the study by Jadhav et al. showed that the cryostretching group was significantly better than both the Gua Sha group ($p < 0.001$) and the positional release group ($p < 0.001$) [25]. Furthermore, in the study reported by Akter et al., the structural diagnostic and management approach group outperformed the myofascial release group ($p < 0.01$) [26]. Regarding the Foot Function and Pain Scale, significant improvements were observed, although the manual therapy group improved more ($p < 0.01$) than the other groups [40].

Clinical relevance reported by the authors

Table 1 details the reports on clinical relevance, which were explicitly reported only in the study by Grim et al. [40] and were retrospectively calculated for the studies by Ajimsha et al. [23] and Jadhav et al. [25]. Grim et al. [40] indicated that the manual therapy group showed a 35% change compared with the custom foot orthosis group, as measured by the American Orthopedic Foot & Ankle Society ankle-hindfoot scale. In the study by Ajimsha et al. [23], the effect size for the pressure pain threshold variable across the three measured time points ranged from $d = 0.87$ to $d = 1.32$ (large effect sizes) in favor of the manual therapy group compared with the control group. For Jadhav et al. [25], pain intensity, measured using the Numeric Pain Rating Scale, showed a large effect size ($d = 1.16$) in favor of the Gua Sha group compared with the positional release technique group. Meanwhile, for the pressure pain threshold variable, the effect size was $d = 0.14$ (small) in favor of the cryostretching group compared with the Gua Sha group.

Figure 2. Percentage compliance with PEDro scale criteria for selected articles.



The green color indicates the percentage of articles fulfilling the evaluated criterion, whereas the red color corresponds to the percentage of articles not fulfilling the criterion.
PEDro: Physiotherapy Evidence Database.
Source: Prepared by the authors based on the study results.

Table 2. Methodological quality assessment using the PEDro scale.

PEDro[1] table	EC[2]	RA	CA	BC	BS	BT	BA	AF	ITA	BGC	PEV	TS
Ajimsha et al. 2014 [23]	+	+	-	+	-	-	+	+	-	+	+	6
Grim et al. 2019 [40]	-	+	-	-	-	-	-	+	+	+	-	4
Jadhav et al. 2023 [25]	-	+	-	+	-	-	-	+	+	+	+	6
Akter et al. 2024 [26]	+	+	+	-	-	-	+	+	-	+	-	5

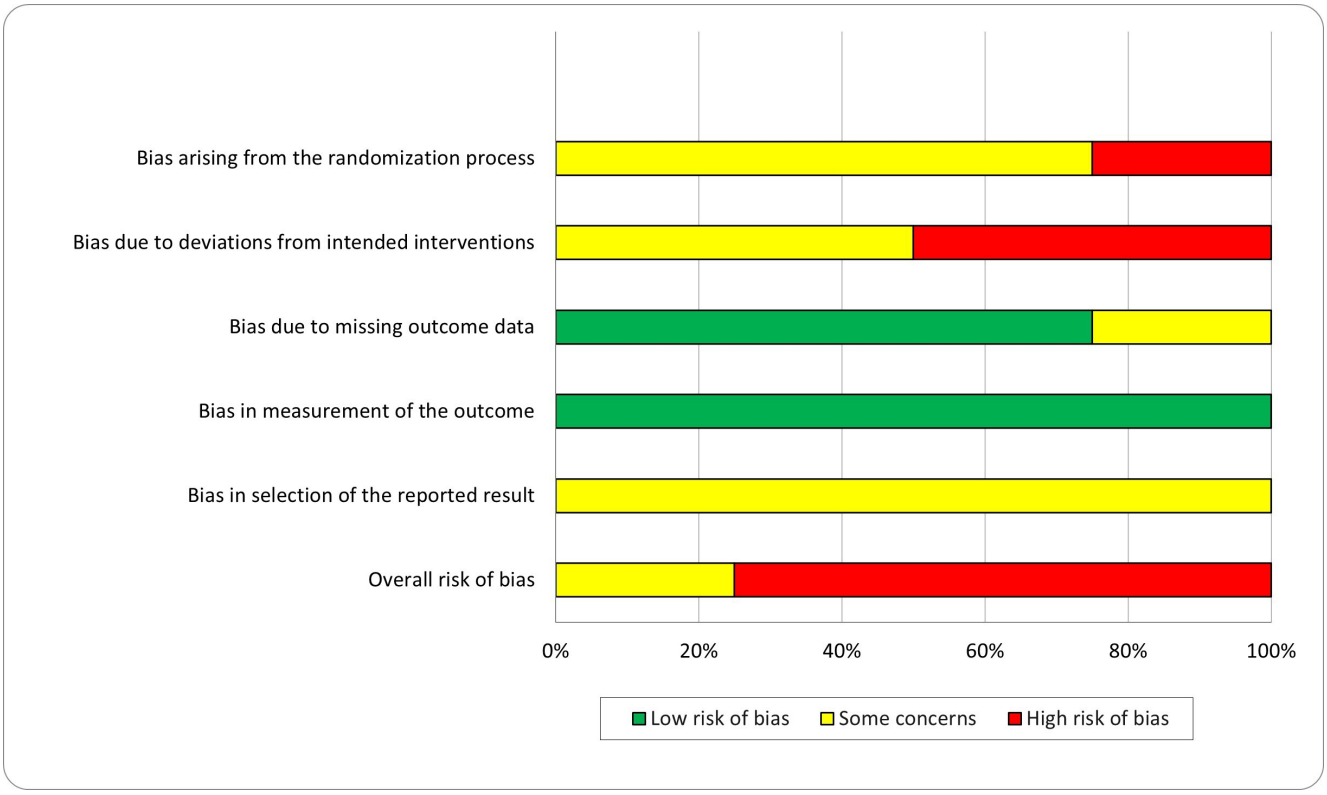
PEDro, Physiotherapy Evidence Database. EC, eligibility criteria. RA, random allocation. CA, concealed allocation. BC, baseline comparability. BS, blinded subjects. BT, blinded therapists. BA, blinded assessors. AF, adequate follow-up. ITA, intention-to-treat analysis. BGC, between-group comparison. PEV, point estimates and variability. TS, total score.
[1]The symbols used have the following interpretation: (+) criterion fulfilled, (-) criterion not fulfilled. [2]Not included in the total score.
Source: Prepared by the authors based on the study results.

Assessment of methodological quality and risk of bias

Table 2 describes the scores assigned by the evaluators to assess methodological quality, highlighting the studies conducted by Ajimsha et al. [23] and Jadhav et al. [25], which obtained a score of 6. Figure 2 shows the percentage of compliance with the PEDro scale criteria for the selected articles. According to these criteria, none of the studies fulfilled the blinded subjects or blinded therapists criteria. In contrast, random allocation and adequate follow-up were fulfilled in all articles.

The risk of bias for each study and the overall risk are shown in Table 3 and Figure 3. Three of the four studies had a high risk of bias, and only one study obtained a risk-of-bias classification of "some concerns" [25]. The domain with the lowest level

Figure 3. Percentage compliance with risk-of-bias scale criteria for selected articles.



The green color represents the percentage of articles fulfilling the evaluated criterion (low risk of bias); the red color indicates the percentage of articles not fulfilling the criterion (high risk of bias); and the yellow color corresponds to the percentage of articles with partial fulfillment (some concerns).
Source: Prepared by the authors based on the study results.

Table 3. Risk-of-bias scale domains.

Study	D1	D2	D3	D4	D5	General bias
Ajimsha et al. 2014 [23]	-	x	+	+	-	x
Grim et al. 2019 [40]	x	-	+	+	-	x
Jadhav et al. 2023 [25]	-	-	+	+	-	-
Akter et al. 2024 [26]	-	x	-	+	-	x
Bias due to randomisation.		D1		+	Low risk-of-bias	
Bias due to deviations from intended intervention.		D2		-	Some concerns	
Bias due to missing data.		D3		x	High risk-of-bias	
Bias due to outcome measurement.		D4				
Bias due to selection of reported result.		D5				

D, domain.
Source: Prepared by the authors based on the study results.

of compliance was "deviations from intended interventions" (50% of the studies) [23,26], which were categorized as "high risk of bias", in contrast to the "measurement of the outcome" domain, in which all studies were classified as "low risk of bias". For the domain "selection of reported results", all articles were categorized as "some concerns".

Certainty of evidence and strength of recommendation

Tables 4 and 5 describe the rating and judgment of the quality of evidence based on the GRADE analysis. Based on the analysis of pain intensity, the certainty of evidence was categorized as very low due to a high risk of bias (resulting from issues related to the randomization process, deviations from the intervention, and unclear or inadequate outcome data). In addition, there was serious imprecision and inconsistency because the total sample size was small, generating controversial and imprecise results (wide confidence intervals).

DISCUSSION

The interventions used for plantar fasciitis, as described in this review, were manual therapy (myofascial release) [23,26], joint mobilization [40], custom foot orthotics [40], the Gua

Table 4. GRADE rating and narrative summary of the evidence.

GRADE framework	Findings	Concerns about certainty domains
Methodological limitations of the studies	Based on the results of the risk-of-bias assessment for the included studies, we concluded that the clinical trials had serious methodological limitations.	Serious
Indirect evidence	The patients, interventions, and comparison groups in the studies provide direct evidence regarding the clinical question posed. All interventions included a component of manual therapy administered as a standalone treatment. The type and severity of symptoms (outcome) were assessed using different scales across the various trials. We considered the evidence was not indirectly significant, but we observed some variability in the intervention protocols used and certain differences in how the outcome was measured.	Not serious
Uncertainty	The total number of patients included in all trials was approximately 224. The studies reported controversial statistical differences regarding pain and function. In addition, two studies reported clinically relevant changes in favor of manual therapy, likely due to the small number of participants. This likely resulted in wide confidence intervals that encompassed both significant benefits and no effect. We considered the evidence to be of marginal precision.	Serious
Inconsistency	The direction and magnitude of the effect varied across the different trials. Grim et al. [40] reported that the group treated with manual therapy showed a 35% improvement compared to the group that received a custom foot orthosis, as measured by the Foot and Ankle Orthopedic Society's Ankle and Hindfoot Scale. In the study by Ajimsha et al. [23], a large effect size was observed for the pressure pain threshold variable, with values ranging from d = 0.87 to d = 1.32 across the three assessed points, favoring the manual therapy group over the control group. Meanwhile, Jadhav et al. [25] found that pain intensity, measured using the numerical pain rating scale, showed a large effect size (d = 1.16) in favor of the Gua Sha group compared with the group treated with the positional release technique. Regarding the pressure pain threshold, a small effect size (d = 0.14) was observed in favor of the cryostretching group compared to the Gua Sha group. We consider the evidence to present a serious inconsistency.	Serious
Publication bias	We do not strongly suspect publication bias, because both negative and positive trials were published, and the search for studies was exhaustive.	Not suspected

GRADE, Grading of Recommendations, Assessment, Development, and Evaluation.
Source: Prepared by the authors based on the study results.

Sha method [25], a structural diagnostic and management approach [26], and cryostretching [25]. In all of them, manual therapy was the most common intervention. For both the pain and functionality variables, results were controversial, as some studies found statistically significant differences for groups receiving manual therapy [23] while others did not [26], regarding both pain and functionality.

The analysis of the results raises important points for discussion. First, it is important to note the small sample size analyzed (n = 224). Although the few selected studies reported positive effects of manual therapy, it is well known

Table 5. Summary of the GRADE assessment for the different domains.

Results	Effect	Number of participants (studies)	Certainty of evidence
Pain intensity was assessed using various scales	They reported controversial statistical differences in pain	224 (4 randomized trials)	⊕OOO[23] Very low certainty.

GRADE, Grading of Recommendations Assessment, Development and Evaluation.
Notes: [1]Symbols commonly used to describe the certainty of evidence in evidence profiles: high certainty ⊕⊕⊕⊕, moderate certainty ⊕⊕⊕O, low certainty ⊕⊕OO, and very low certainty ⊕OOO. [2]Serious risk of bias in the studies due to unclear or inadequate randomization, intervention deviation, and outcome data. [3]Serious imprecision and inconsistency were considered together, as the total sample size is small, resulting in controversial and imprecise results (with wide confidence intervals).
Notes: The outcome of interest is pain (for which no single effect estimate is available, and only a narrative synthesis of the evidence was provided).
Source: Prepared by the authors based on the study results.

that in systematic reviews, small sample sizes can be associated with lower statistical power and, consequently, with differences between groups [41] or an increased risk of Type II error [42]. Another consequence of small sample sizes in systematic reviews is the limited generalizability of the review's results and conclusions [43]. Second, the review of the selected studies demonstrates heterogeneity in the intervention protocols used for this condition. For example, it is interesting to note that there is a wide variety of protocols regarding the number of sessions per week, the time allocated, and the choice of techniques. This suggests that the effects of treatment may depend on the dosage (time and number of techniques used) and the number of sessions, among other factors.

Among the most notable studies in this review is the work by Ajimsha et al. [23], who used myofascial release techniques over 12 sessions, with a 12-week follow-up after randomization, employing the Foot Function Index to assess function and the pressure pain threshold to assess pain. This study explored the clinical significance of the results for each variable evaluated in the studies. A growing trend in intervention studies is to accompany hypothesis testing with a measure of effect magnitude, or effect size; doing so provides an estimate of the effect size observed in subjects receiving the intervention. Despite growing interest in this topic and efforts to raise awareness, reporting of clinical significance in rehabilitation remains insufficient [44,45]. These findings are confirmed in our review, where most of the included articles do not report clinical significance values or indicators. Of the four selected articles, only one study reported this. Using the data provided in two of the studies, this indicator was calculated. The study by Grim et al. reported a 35% improvement in favor of the manual therapy group on the Foot and Ankle Orthopedic Society Ankle and Hindfoot Scale, classifying this as a "much better" change [46]. Ajimsha et al. [23] reported effect sizes for pressure pain threshold ranging from d = 0.87 to d = 1.32 in favor of the manual therapy group compared with the control group. These results were considered to represent a large or clinically relevant effect size, according to Cohen [35] and Kinney [36]. Finally, Jadhav et al. [25] reported an effect size of d = 1.16 for the Gua Sha group compared to the positional release technique group regarding pain intensity, as measured by a numerical pain rating scale. These results were considered to represent a high (clinically relevant) effect size. Furthermore, for the pressure pain threshold variable, the effect size was d = 0.14 in favor of the cryostretching group compared to the Gua Sha group, which is a clinically modest change according to the criteria of Cohen [35] and Kinney [36].

The results of this review show effect sizes ranging from low to high, reflecting considerable heterogeneity in the clinical response to manual therapy in patients with plantar fasciitis. This variability suggests that the efficacy of manual therapy may depend on individual patient factors, the therapist's experience, and its combination with other therapeutic strategies. Consequently, although manual therapy can be considered a valid therapeutic option within a multimodal approach, its recommendation should be made with caution and based on the specific characteristics of each case.

Given the limitations of statistical significance (p value) when interpreting the results of a study, reporting clinical significance and providing a clinical interpretation of these results should be a priority in physical therapy intervention studies. In intervention studies, it is important to assess the risk of bias. This risk is particularly associated with the study's internal validity, which affects the reliability of its conclusions.

The included studies have methodological limitations and biases that reduce confidence in their conclusions. This finding is consistent with systematic reviews that report similar results [16,17].

In line with previous reviews, the effects of manual therapy on plantar fasciitis remain uncertain. This necessitates new trials to better understand the effect of manual therapy on plantar fasciitis. However, the results reported by Ajimasha et al. [23] are noteworthy, as they demonstrated that myofascial release reduces pain in subjects with plantar fasciitis. This study has a PEDro score of 6.

When applying the risk-of-bias tool, three of the four articles were categorized as having a "high risk of bias." The items with the lowest compliance were "deviations from planned interventions" (none met the criteria) and "selection of reported outcomes" (all categorized as "some concerns"). This is mainly due to the nature of rehabilitation studies, in which participants are aware of the assigned intervention and outcomes are self-reported or depend on the evaluator's judgment.

These criteria have been recognized as a significant source of various biases (selection, assessment, etc.). Several epidemiological studies, particularly in medicine, have found a significant association between randomization, inadequate allocation concealment, and overestimation of the reported effect [47–51]. These results are consistent with another meta-epidemiological study that investigated the impact of selection bias on effect size estimates in clinical studies across different areas of physical therapy. It found that inadequate blinding led to an overestimation of treatment effects when compared to studies with adequate blinding [52].

The certainty of the evidence for this review is very low. This is primarily due to risks of methodological bias, imprecision in sample sizes, and clinical heterogeneity among the included studies. Consequently, the strength of the recommendation should be considered weak or conditional. This implies that its clinical use may be justified in specific contexts, especially when patient preference is prioritized or other therapeutic options have been exhausted. However, additional research with more rigorous designs is needed to strengthen the evidence base and thus enable more robust recommendations.

The limitation of this study lies in the inability to complement the qualitative analysis (systematic review) with a quantitative analysis (meta-analysis), given the variety of measurement instruments, application techniques, and different time points at which the outcomes of interest were assessed. This level of heterogeneity affects, to some extent, the synthesis of the evidence and the clinical applicability of this review's results.

The strengths of the study include: an analysis and discussion of the clinical relevance of the outcome measures of interest. Additionally, it evaluates the isolated effect of manual therapy, unlike previous reviews in the field, where manual therapy was included as part of a multimodal treatment.

CONCLUSIONS

Based on the limited, heterogeneous evidence, which is at high risk of bias, it is not possible to confirm the therapeutic effect of manual therapy for plantar fasciitis. Although some trials suggest a moderate benefit of manual therapy in reducing pain, the available evidence is insufficient to draw definitive conclusions.

Given this, there is a need for more randomized controlled trials with greater methodological rigor, including more consistent, replicable protocols. This will allow for definitive conclusions regarding the contribution of this modality in the field of musculoskeletal rehabilitation.

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Ethics Since the study analyzes secondary sources, it is exempt from ethical considerations.

Supplementary files Appendix 1 is available at DOI: 10.6084/m9.figshare.28774196(https://figshare.com/articles/dataset/dx_doi_org_10_6084_m9_figshare_6025748/6025748)

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Efectos de terapia manual sobre dolor y funcionalidad en pacientes con fascitis plantar: revisión sistemática de literatura

RESUMEN

OBJETIVO La fascitis plantar es común y genera alteraciones en la capacidad de moverse de las personas. La terapia manual se aplica frecuentemente en la fascitis plantar. Sin embargo, sus efectos no son concluyentes. Por esta razón, el propósito de esta revisión sistemática es determinar del efecto de la terapia manual sobre la fascitis plantar.
MÉTODOS Se realizó una revisión sistemática de la literatura, considerando la lista de verificación de PRISMA. Se consultaron cinco bases de datos (CINAHL, Scopus, PubMed, *Web Of Science* y OVID) junto con consulta de la literatura gris y búsqueda manual. Se seleccionaron ensayos clínicos aleatorios de 2014 a 2024 que consideraron la eficacia de la terapia manual en el cambio de la intensidad del dolor y funcionalidad en pacientes con diagnóstico clínico de fascitis plantar entre 18 y 60 años. Se determinó la calidad metodológica (escala PEDro) y riesgo de sesgo (escala riesgo de sesgo).
RESULTADOS Se incluyeron cuatro ensayos clínicos aleatorizados (n = 224), que reportaron diferencias estadísticas controversiales para dolor y la funcionalidad. Además, dos estudios reportaron cambios clínicamente relevantes a favor de la terapia manual. Los puntajes de la escala PEDro variaron de 4 a 6, y tres estudios presentaron alto riesgo de sesgo.
CONCLUSIONES Los efectos de la terapia manual sobre el dolor y la funcionalidad en pacientes con fascitis plantar son inciertos. La evidencia es limitada, heterogénea y con bajo rigor metodológico. Es necesario un mayor número de ensayos clínicos aleatorizados, con protocolos más consistentes y replicables para concluir definitivamente sobre los aportes de la terapia manual en los efectos clínicos en el dolor y funcionalidad de pacientes con fascitis plantar. De igual forma, la inconsistencia y limitada evidencia de indicadores de significancia clínica en los estudios seleccionados, no permite evaluar el impacto clínico de esta intervención.
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