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Effects of Massage Therapy for Achilles Tendinopathy - A Meta-Analysis on Determining the Effects on Pain and Functional Outcome

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Abstract

Introduction

Achilles tendinopathy has become more common during the last thirty years, and this rise has been linked to increased participation in leisure and competitive sports. The condition is commonly seen among those who participate in activities such as running and jumping.

Methodology

The study thoroughly assessed pertinent literature as part of its search approach. Reputable academic databases, such as Google Scholar, Web of Science, Scopus, Medline, and Pedro, were searched from 2015 to 2023 by an impartial reviewer. Studies examining massage therapy's impact on Achilles tendinopathy were included, emphasizing pain relief and functional enhancements.

Results

The meta-analysis examined three trials to evaluate the impact of a particular intervention (Kousar et al., 2022; Bussin et al., 2021; McCormack et al., 2016). An SMD of -0.788 (95% CI: -1.139 to -0.438, p<0.001) indicated a statistically significant overall impact in the fixed-effects and random-effects model, with an SMD of -0.950 (95% CI: -2.745 to 0.844, p = 0.297). With a CI ranging from -3.064 to -1.837, Kousar et al. analysis of individual studies revealed a sizeable negative impact (SMD=-2.450), indicating a significant outcome in favor of the intervention. A less favorable result was indicated by Bussin et al.'s small positive impact (SMD=0.192), which had a CI of -0.292 to 0.676. Although the CI was broader, from -1.636 to 0.456, McCormack et al. observed a negative impact (SMD=-0.590), indicating a significant result favoring the intervention. The test for heterogeneity (I2 = 95.62%, p<0.0001) found a high degree of inconsistency, indicating significant diversity between the investigations.

Conclusion

These results imply that even if proof of a sizable overall impact exists, more investigation is necessary to identify and address variability-related causes in improving the precision and generalizability of the intervention's benefits.

Keywords

Achilles tendon, Massage, Pain.

Introduction

Achilles Tendinopathy (AT) has been defined as a debilitating condition causing pain, decreased performance, and swelling in and around the tendon[1]. The relevance of AT stems from its ability to impact an individual's functioning and general well-being significantly[2]. Although AT is common among elite runners, with a 52% lifetime risk, it is worth noting that one-third of the patients with AT lead an inactive lifestyle[3-4]. This fact highlights the broad range of possible risk factors for AT, with the precise etiology yet to be known. Gender distribution in AT research has indicated a tendency towards increased inclusion of males, while a more considerable prevalence in males has not been definitively proved[5]. The contentious association between ageing and tendinopathy is still being debated.

Nonetheless, research shows that ageing causes abnormal changes in gene expression and matrix protein synthesis in the tendon, which may contribute to tendon degradation and delayed repair in ageing tendons[6-7]. Achilles tendinopathy has become more common during the last thirty years. This rise has been linked to increased participation in leisure and competitive sports. The condition is commonly seen among those who participate in running and jumping[8]. The frequency of running-related injuries ranges from 11% to 85%, or 2.5 to 59 injuries per 1000 running hours. Achilles tendinopathy is most common among runners, and it can affect recreational athletes and individuals not engaged in any sports activities[9-10]. People with Achilles tendinopathy frequently experience pain, edema, and stiffness in the Achilles tendon region, which impairs lower limb function[11]. Usually, pain starts during exercise and goes away while resting. If the problem is not treated, though, it might continue to exist even during rest, leading to further deterioration in performance. Achilles tendinopathy's complex nature emphasizes how it affects people at different activity levels and underlines the need for efficient management techniques[12]. Achilles tendinopathy is treated with various physiotherapeutic approaches, including low-energy Extracorporeal Shockwave Treatment (ESWT) and Low-Level Laser Therapy (LLLT)[13]. A vital component of the therapeutic strategy is exercise therapy, which includes stretching exercises and both concentric and eccentric activities.

Furthermore, the manual therapy methods used by physiotherapists, such as massage therapy and soft tissue method, greatly aid in the all-encompassing care of Achilles tendon inflammation. Massage therapy has therapeutic advantages, which has been proposed as a modality with several benefits. Numerous systematic reviews and more than 300 clinical studies have examined massage therapy's effectiveness for various conditions[14]. For example, systematic studies have indicated that myofascial release massage helps treat plantar fasciitis and that massage therapy using soft tissues may effectively treat shoulder discomfort. In light of this heterogeneity, it is imperative to include a thorough, rigorous analysis to ascertain the impactful massage treatment on Achilles tendinopathy. A meta-analysis can systematically synthesize the data, allowing for a more nuanced view of massage therapy's possible advantages. Hence, the current study aims to evaluate the effects of massage therapy on improving pain and functional outcomes by combining the results of various RCTs in which the effects were determined among AT patients.

Methodology

Search Strategies and Inclusion and Exclusion Criteria

The meta-analysis "Effects of Massage Therapy for Achilles Tendinopathy" thoroughly assessed pertinent literature as part of its search approach. Reputable academic databases, such as Google Scholar, Web of Science, Scopus, Medline, and Pedro, were searched by an impartial reviewer. To find relevant papers, search phrases including "Massage," "Achilles Tendinopathy," "Sprain," "Pain," and "Range of Motion" were used. Notably, the search was limited to research projects published between 2015 and 2023. Studies examining massage therapy's impact on Achilles tendinopathy were included in the inclusion criteria, emphasizing pain relief and functional enhancements. Research that fulfilled these requirements was carefully assessed; studies that did not explicitly address the effects of massage treatment on Achilles tendinopathy or that did not take place within the time limit given were not included. The rigorous inclusion/exclusion criteria and methodical search approach were intended to guarantee that the meta-analysis offers a thorough and targeted synthesis of the literature published on the designated topic within the designated timeframe (Table-1).

Quality Assessment through Risk of Bias Evaluation

The tool parameters of Cochrane were used to judge the risk of bias in the included studies. A risk assessment of allocation-related bias had been included in the review, taking randomization and concealment into account. The analysis also considered blinding factors, including participant and outcome blinding. The examination also included data assessment, which included both completeness and selectivity. The assessment was based on the author's judgment of the risk of bias (Figure-1)

Quantitative Analysis

In this quantitative analysis, MedCalc Statistical Software version 20.112 was used. Continuous Measure Analysis used a confidence interval (CI) of 95% for the SMD to ascertain the pooled effect. Using Cohen's rule of thumb, the effect size was assessed and classified into three parameters: a minor impact if the SMD values were 0.2 to 0.5, a moderate effect if the values were between 0.5 and 0.8, and a more significant effect if the values were>0.8. The I^2 value was used to measure the degree of heterogeneity, determining if a fixed effect model or a random effect model should be used (I^2<50 for fixed effect and I^2 >50 for random effect).

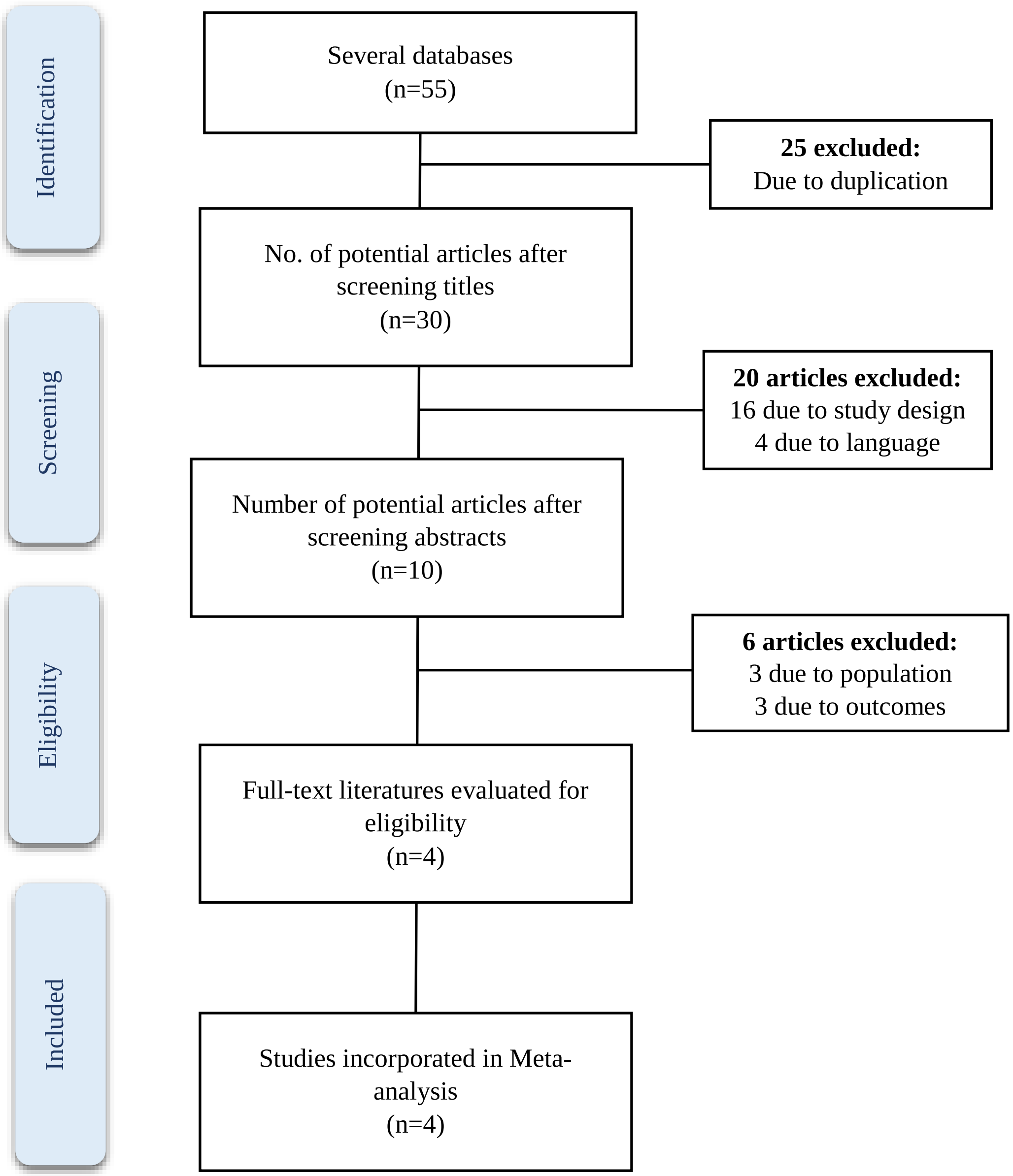

Figure-1 Flow chart on PRISMA guidelines

Table-1 Characteristics of the included studies						
Author' Year	**Design**	**Age**	**Target Population**	**Groups**	**Intervention**	**Outcome Measures**
Kousar et al., 2022[15]	RCT	18-65 years	Patients with Achilles tendinopathy	EG (n=36) CG (n=37)	**EG:** A 3-minute transverse friction massage using the thumb was applied to a 3-to 5-centimeter area. Three sessions each week were held over the course of the six-week course of treatment. **CG:** The ultrasonic settings were set up as follows: a 20% duty cycle pulse, an 8 ms emission interval, and a 2 ms burst 1.0 MHz sine waves that repeated at 100 Hz, producing an intensity of 0.5 w/cm². Both groups received eccentric exercises of plantar flexors	Pain, VISA-A
Bussin et al., 2021[16]	RCT	>19 years	Patients with Achilles tendinopathy	EG (n=32) CG (n=35)	**EG:** For period of four weeks, the participants had been instructed to apply 1 g of the gel, focusing on the Achilles tendons most painful location, three times a day for 30 to 45 seconds at intervals of eight hours. **CG:** No gel treatment	Pain, VISA-A
Stefansson et al., 2019[17]	RCT	>18 years	Patients with Achilles tendinopathy	EG (n=20) CG (n=15)	**EG:** During the first six weeks, patients received pressure massage treatments twice a week, with a gap of two or three days between treatments. After that, they had one session per week for the next six weeks. **CG:** Control group received eccentric exercises for 12 weeks	VISA-A
McCormack et al., 2016[18]	RCT	>18 years	Patients with Achilles tendinopathy	EG (n=7) CG (n=9)	**EG:** Participants in the experimental group went to clinic twice a week for a total of 12 visits. Massage therapy was performed on foot, ankle, and knee using a series of instrument. The duration of each therapy session ranged from 20 to 30 minutes. **CG:** Performed eccentric exercises as in the EG group.	Pain, VISA-A

CG= Control Group,
EG= Experimental Group,
VISA-A= Victorian Institute of Sports Assessment–Achilles
RCT= Randomized Controlled Trial

Results

The meta-analysis examined three trials to evaluate the impact of a particular intervention (Kousar et al., 2022; Bussin et al., 2021; McCormack et al., 2016). A standardized mean difference (SMD) of -0.788 (95% CI: -1.139 to -0.438, $p < 0.001$) indicated a statistically significant overall impact in the fixed-effects model. The random-effects model also demonstrated A significant overall impact, with an SMD of -0.950 (95% CI: -2.745 to 0.844, $p = 0.297$). With a confidence interval (CI) ranging from -3.064 to -1.837, Kousar et al.'s 2022 analysis of individual studies revealed a large negative impact (SMD = -2.450), indicating a significant outcome in favor of the intervention. Bussin et al.'s 2021 smaller positive impact (SMD = 0.192) indicated a less favorable result, with a confidence interval (CI) of -0.292 to 0.676. Although the confidence interval (CI) was broader, spanning from -1.636 to 0.456, McCormack et al. (2016) observed a negative impact (SMD = -0.590), indicating a significant result favoring the intervention. A high degree of inconsistency was found by the test for heterogeneity ($I2 = 95.62\%$, $p < 0.0001$), indicating significant diversity between the investigations. Compared to the fixed-effects model, the random-effects model had a somewhat greater total effect since it considers this heterogeneity. The results show a statistically significant benefit overall, but there are concerns about the data's generalizability due to their substantial heterogeneity (Table-2).

Table-2 Pooled effect model determining the effect of massage on pain										
Study	N1	N2	Total	SMD	SE	95% CI	t	P	Weight (%)	
									Fixed	Random
Kousar et al., 2022	36	37	73	-2.450	0.308	-3.064 to -1.837			33.19	33.79
Bussin et al., 2021	32	35	67	0.192	0.242	-0.292 to 0.676			53.58	34.29
McCormack et al., 2016	7	9	16	-0.590	0.488	-1.636 to 0.456			13.23	31.92
Total (fixed effects)	75	81	156	-0.788	0.177	-1.139 to -0.438	-4.445	<0.001	100.00	100.00
Total (random effects)	75	81	156	-0.950	0.909	-2.745 to 0.844	-1.046	0.297	100.00	100.00
Test for Heterogeneity										
Q	45.6844									
DF	2									
p-value	P < 0.0001									
I^2 (inconsistency)	95.62%									
95% CI for I^2	90.42 to 98.00									

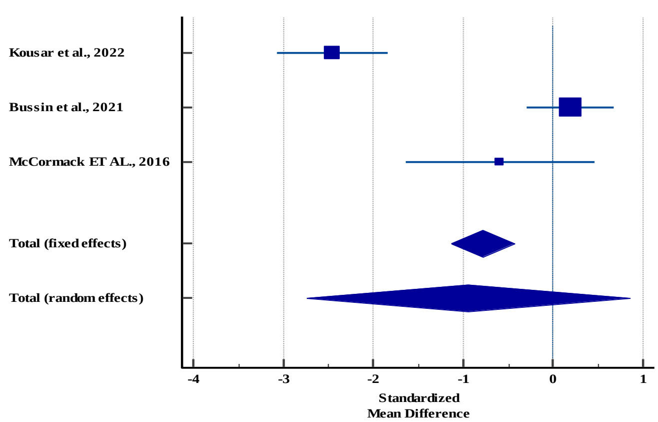

Figure-2 Forest plot showing fixed and random effects of studies Pain

The meta-analysis comprised four trials to examine the effects of a specific intervention (Kousar et al., 2022; Bussin et al., 2021; Stefansson et al., 2019; McCormack et al., 2016). With a standardized mean difference (SMD) of 0.784 (95% CI: 0.416 to 1.152, p=0.001), the fixed-effects model indicated a statistically significant overall impact. With an SMD of 2.135 (95% CI: -0.597 to 4.867, p=0.125), the random-effects model also revealed a significant overall impact. After analyzing individual trials, Kousar et al., 2022, found a largely favorable impact (SMD = 3.115), indicating a significant result in favor of the intervention with a confidence interval (CI) spanning from 2.424 to 3.806. With a CI of 3.132 to 7.729, Bussin et al.'s 2021 study revealed an even greater beneficial impact (SMD = 5.430), suggesting a favorable outcome. With a confidence interval (CI) of 1.074 to 2.715, Stefansson et al.'s 2019 study revealed a favorable impact (SMD = 1.894), indicating a significant result in favor of the intervention. A negative impact (SMD = -1.480) with a confidence interval (CI) of -2.026 to -0.934 was observed by McCormack et al. (2016), showing a significant result favoring the control group. Heterogeneity testing revealed high inconsistency (I^2 =97.86%, p<0.0001), indicating significant variation between the investigations. Compared to the fixed-effects model, the random-effects model had a greater overall effect since it takes this variability into account. Given the significant degree of variability, care should be used when interpreting the data, and more research into the possible origins of variance is necessary. Furthermore, the large confidence ranges for a few specific studies highlight the importance of carefully evaluating the precision of the overall impact estimate (Table-3).

Table-3 Pooled effect of massage therapy on VISA-A										
Study	**N1**	**N2**	**Total**	**SMD**	**SE**	**95% CI**	**t**	**P**	**Weight (%)**	
									Fixed	**Random**
Kousar et al., 2022	36	37	73	3.115	0.347	2.424 to 3.806			28.99	25.78
Bussin et al., 2021	7	9	16	5.430	1.072	3.132 to 7.729			3.03	22.65
Stefansson et al., 2019	20	15	35	1.894	0.403	1.074 to 2.715			21.41	25.63
McCormack et al., 2016	32	35	67	-1.480	0.273	-2.026 to -0.934			46.56	25.94
Total (fixed effects)	95	96	191	0.784	0.187	0.416 to 1.152	4.203	<0.001	100.00	100.00
Total (random effects)	95	96	191	2.135	1.385	-0.597 to 4.867	1.541	0.125	100.00	100.00
Test for Heterogeneity										
Q	140.1403									
DF	3									
p-value	P < 0.0001									
I^2 (inconsistency)	97.86%									
95% CI for I^2	96.40 to 98.73									

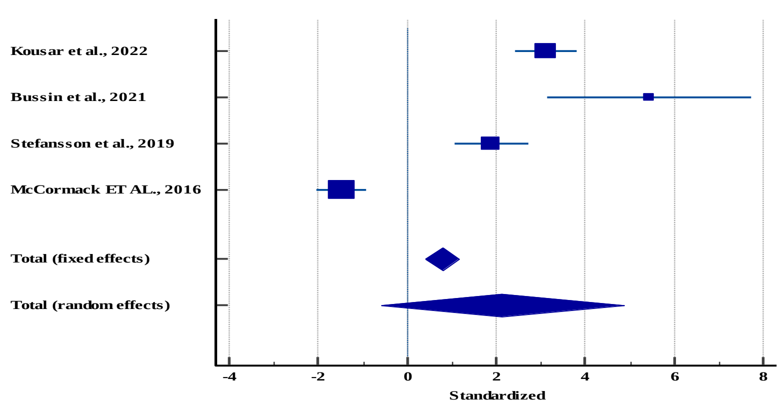

Figure-3 Forest plot showing fixed and random effects of studies on VISA-A

Quality Appraisal and Risk of Bias

The risk of bias assessment was conducted using Cochrane tool, which is employed to evaluate bias risk across various domain, as shown in Table-2.

Random Sequence Generation

All four studies demonstrated a minimal probability of bias as they adhered to a randomization order[15,16,17, 18].

Allocation Concealment

Two studies [16, 17] had concealed allocation of participants, whereas two studies[15, 18] had unknown risk.

Blinding of Participants and Personnel

Two studies [16, 17] considered participant and personnel blinding; whereas rest of the two studies[15, 18] showed an unknown risk of bias.

Blinding of Outcome Assessment

One study [16] showed low risk of bias, one study[17] showed high risk, whereas two[15,18] demonstrated an unknown risk of bias.

Incomplete Outcome Data

All the studies[15,16,17,18] showed a minimal risk of bias inrelation to this aspect.

Selective Reporting

All four studies demonstrated a minimal possibility of reporting bias. [15,16,17,18].

Author' Year	Random Sequence Generation	Allocation Concealment	Blinding of Participants and Personnel	Blinding of Outcome Assessment	Incomplete Outcome Data	Reporting Bias
Kousar et al., 2022[15]	+	?	?	?	+	+
Bussin et al., 2021[16]	+	+	+	+	+	+
Stefansson et al., 2019[17]	+	+	+	-	+	+
McCormack et al., 2016[18]	+	?	?	?	+	+

Table-4 Cochrane Collaboration's Tool: Assessing Risk of Bias of Included Studies

+ Low Risk of Bias
- indicates High Risk of Bias
? Unknown Risk of Bias

Discussion

The meta-analysis found a statistically significant overall impact of a particular intervention, which included three trials for pain. The results were demonstrated by the fixed-effects (SMD = -0.788, 95% CI: -1.139 to -0.438, $p<0.001$) and random-effects (SMD = -0.950, 95% CI: -2.745 to 0.844, $p = 0.297$) models. Despite the substantial overall advantages, the results could only be generalized slowly due to solid heterogeneity ($I^2 = 95.62\%$). Both fixed-effects (SMD = 0.784, 95% CI: 0.416 to 1.152, $p<0.001$) and random-effects (SMD = 2.135, 95% CI: -0.597 to 4.867, $p = 0.125$) models showed a statistically significant overall impact on VISA-A. The generalizability of findings was again called into question due to the high degree of heterogeneity ($I^2 = 97.86\%$), highlighting the necessity of more research into plausible causes of variability. A randomized controlled experiment comparing ultrasonic treatment with transverse friction massage in chronic Achilles tendinopathy comprised 76 randomly assigned to group A transverse friction massage and B ultrasound therapy. Both groups were subjected to eccentric exercises and evaluations using the numeric pain rating scale (NPRS), the Victorian Institute of Sports Assessment-Achilles questionnaire (VISA-A), and other tools.

Repeated measures ANOVA results showed significant improvement (p=0.05) in both groups throughout the therapy, with the TFM group demonstrating more noticeable improvement in pain intensity and ROM than the UST group after the third and sixth weeks of intervention. The researchers concluded that when paired with eccentric exercises, transverse friction massage is more beneficial than ultrasound treatment in diminishing pain intensity and increasing ankle range of motion in Achilles tendinopathy[15]. Another study examined the effectiveness of topical diclofenac plus massage against placebo therapy for Achilles tendinopathy. The primary outcome measure was the change in the severity of Achilles tendinopathy as measured by the VISA-A score at 4 and 12 weeks, with supplementary measures including a numeric pain assessment. VISA-A scores improved marginally in both groups, with changes falling short of the clinically significant difference.

In conclusion, consistent topical diclofenac administration did not improve clinical results compared to a placebo in treating Achilles tendinopathy during a 4-week period[16]. Another randomized controlled study, including 60 individuals with Achilles tendinopathy, was conducted to test the efficacy of pressure massage to eccentric exercises or their combination. The study discovered that all groups improved on the Victorian Institute of Sports Assessment-Achilles questionnaire (VISA-A-IS), with the pressure massage group improving considerably more than the eccentric activity group by week 4. All groups' ankle range of motion grew considerably over time, and there were no significant differences in pressure pain threshold or ultrasound scan measures. The study concluded that pressure massage is an effective treatment for Achilles tendinopathy, with results equivalent to eccentric exercises, and that combining the two therapies did not improve outcomes[17]. Another study assessed the effectiveness of soft tissue therapy (ASTYM) paired with eccentric exercise to eccentric exercise alone in a prospective randomized controlled trial concentrating on insertional Achilles tendinopathy (AT). While both groups showed statistically significant reductions in pain over the short and medium term, the soft tissue therapy (ASTYM) group had a significantly higher success rate at the 12-week point. The researchers concluded that combining soft tissue therapy (ASTYM) with eccentric exercise was more successful than eccentric exercise alone, demonstrating increased function in both short- and long-term follow-up periods.

The dependability of results would be improved by standardizing methods and outcome measures across study designs to address the substantial heterogeneity shown in meta-analyses and individual investigations. Refinement of therapy protocols may be aided by more investigation into the underlying processes and possible synergies between various therapies, such as the combination of soft tissue treatments and exercise regimens. Finally, broadening the research's focus to encompass more varied and sizable patient groups would aid in developing evidence-based protocols for Achilles tendinopathy treatment.

Conclusion

A meta-analysis can systematically synthesize the data, allowing for a more nuanced view of massage therapy's possible advantages. The fixed-effects models demonstrated significant advantages. The different experiments' effect sizes varied; some showed promising results, and others showed less favorability. The high levels of variability and inconsistency seen in the heterogeneity tests highlight the complexity of the impacts of the intervention. The wide range of confidence intervals for individual research emphasizes the importance of considering accuracy when estimating the aggregate effect. These results imply that even if proof of a sizable overall impact exists, more investigation is necessary to identify and address the causes of variability and improve the accuracy and generalizability of the intervention's benefits.

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Authors Contribution

Ghani SA: Conception, design and data acquisition.

Saleem Z: Data acquisition and analysis, writing the article.

Masood F: Critical revision of the article and final approval of article.

Declaration of Interest

None.

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None.

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