A critical appraisal of "Effects of Strengthening and Stretching Exercises on the Temporospatial Gait Parameters in Patients with Plantar Fasciitis: A Randomized Controlled Trial"

By

Aurora Emmons, SPT

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Department of Physical Therapy

Angelo State University

Member, Texas Tech University System

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Abstract

Plantar fasciitis is a prevalent source of foot and heel pain and has detrimental effects on walking, one of the most basic and necessary activities of daily living. Various exercise interventions and modalities have been researched as treatments for plantar fasciitis. In the vast majority of the relevant studies exploring a strengthening treatment, this intervention is combined with stretching exercises as well. Few studies have compared strengthening to stretching as separate interventions. In the study titled "Effects of Strengthening and Stretching Exercises on the Temporospatial Gait Parameters in Patients with Plantar Fasciitis: A Randomized Controlled Trial," the researchers sought to compare the effects of a strengthening versus a stretching program on the pain scores and gait parameters of 84 subjects with plantar fasciitis. In this critical appraisal, the quality of this research study is explored with the intent to learn to what extent the findings of this study can be utilized. Overall, this study had interesting results but is not a solid foundation on which to base treatment plans. The article seems to show a well-organized study that found legitimate scientific results. However, the presentation was compromised by an inadequate consultation of the relevant literature in both the introduction and discussion and by missing key details in the conduction of the study. Their results indicated that both the strengthening and stretching interventions resulted in statistically significant differences in the pain and gait outcome measures over time, and there were no statistically significant differences between the two intervention groups in any of the outcome measures. While these results can spark further investigation into strengthening and stretching as treatments for plantar fasciitis, this study should not serve as the basis on which to base the creation of treatment plans due to flaws in the conduction of this study and the lack of clinical significance in their results.

Key words: plantar fasciitis, stretch, strengthen, appraisal

Introduction

Plantar fasciitis is reportedly experienced by 2 million people in the United States every year and is a diagnosis commonly seen in physical therapy clinics (Agyekum et al., 2015). While it has a higher incidence in runners, it is frequently experienced in the non-running population as well. To treat plantar fasciitis, two of the major types of intervention are stretching and strengthening exercises. Most intervention plans include components of both stretching and strengthening, but it is important to know if either one of these interventions can accomplish full recovery from plantar fasciitis independent of the other. Thus, the following clinical question was researched: is strengthening without accompanying calf/plantar fascia stretching an effective treatment for plantar fasciitis? The article "Effects of Strengthening and Stretching Exercises on the Temporospatial Gait Parameters in Patients with Plantar Fasciitis: A Randomized Controlled Trial" was one of the few articles the author found which attempted to compare strengthening exercises to stretching as a treatment method. This critical appraisal was written to explore the strengths and weaknesses of this study so that this study's findings can be appropriately utilized.

Methods

PubMed was the primary database used to search for relevant articles to answer the clinical question, "Is strengthening without accompanying calf/plantar fascia stretching an effective treatment for plantar fasciitis?" CINAHL and PEDro were checked secondarily, but no additional applicable articles were found in these databases. The search terms used were "plantar fasciitis strengthen." No limits were placed on the search. Articles were excluded if there were systematic reviews and if they did not have intervention groups for both strengthening and stretching. The total number of hits from the search was 38 articles.

The article chosen for critical appraisal was published in the journal Annals of Rehabilitation Medicine in 2019. The six authors included three researchers with PhDs and three with Master's in Science degrees. Five were faculty members in the Physical Therapy Department at Mahidol University in Thailand, and the sixth was a faculty member at the University of Sydney in Australia in the Discipline of Exercise and Sport Science department. The study was conducted in the Mahidol University Physical Therapy Center from July 2017 to February 2019. This article was chosen for this critical appraisal because it most directly attempted to answer the clinical question by having two separate intervention groups, a strengthening group and a stretching group.

Results

Summary of the study

The study was conducted to address the effectiveness of strengthening exercise programs versus stretching exercise programs for patients with plantar fasciitis. In this study, the researchers gathered 84 plantar fasciitis patients without comorbidities and conducted an intervention study with 2 separate intervention groups and no control group. Both groups received physical therapy for 4 weeks from a licensed physical therapist which included ultrasound, passive plantar fascia stretching, and tissue mobilization. One group was also assigned a home exercise program that consisted of strengthening exercises, while the other group was assigned home exercises which consisted of gastrocnemius and soleus stretches. The outcome measures in this study included the pain visual analog scale (VAS) as well as 6 gait parameters (cadence, step width, stride length, stride time, total double support, and gait speed), which were all measured at baseline, 4 weeks, 8 weeks, 12 weeks, and 16 weeks. The results of this study indicated that both the strengthening and stretching groups improved in their VAS scores and all measured gait parameters except step width. Statistical analysis showed that there were no significant differences between the two groups regarding the measured outcomes. They concluded that both strengthening and stretching are effective methods to treat plantar fasciitis.

Appraisal of the study introduction

The introduction of the research article overall was clear and well-written. The literature review covered most of the key points in addressing the incidence, risk factors, and the clinical implications of the condition of plantar fasciitis. The articles cited were all from credible journals and were published relatively recently. They explained that the independent variables were the two intervention protocols, namely the strengthening and stretching exercise programs. The dependent variables were the two VAS pain measures and six gait parameters. Overall, the article showed a strong rationale for the study and indicated clearly the aim of the study: to explore the effects of a strengthening exercise protocol as compared to a stretching exercise protocol.

The greatest weakness in the article's introduction was in the portion of the literature review addressing treatment methods for plantar fasciitis. While physical therapy modalities and stretching were adequately addressed, there was a conspicuous lack of information regarding the effects of strengthening interventions on plantar fasciitis as revealed in past studies. In addition, while the aim of the study was clear, the hypothesis in the introduction stated that the two different interventions "may have different effects" (Thong-on et al., 2019). This hypothesis was contradicted later in the article when they stated that they expected the strengthening exercise protocol to yield greater results.

Appraisal of the study methods

There were many strong points in the methods of the study. This research study was a randomized controlled trial that was prospective, longitudinal, and double-blinded. Out of the 84 subjects participating, there were 0 withdrawals or drop-outs. They used a between-subjects design to compare the effects of the stretching group and the strengthening group. The groups were managed in the same way aside from the independent variable. No significant differences were found between the two groups on any of the sociodemographic, clinical, or prognostic characteristics. The instructions and training for the strengthening and stretching protocols were described in enough detail to be replicable as well as the procedures of data collection. The appropriate statistical analyses were used. The Kolmogorov-Smirnov goodness of fit test was used to check if the distribution was normal. A two-way repeated measure ANOVA was used to explore the main effects of time, the main effects of the two groups, and the interaction effects of time by group. The Bonferroni post-hoc analysis was also used to find the pair of differences and the independent sample t-test was used to find the differences between the groups.

However, there were a few flaws in this article's methods section. While the instruments and outcome measures were described in sufficient detail, the reliability and validity of these tools were not addressed. Also, no details were provided on duration or technique for any of the physical therapy intervention, thus reducing the study's replicability. Additionally, while the subjects and physical therapists were blinded to the second group's intervention, they did not address whether or not the outcome assessor was blinded to the subjects' group assignments.

Appraisal of the study results

The authors presented a logically organized results section following the same flow as in the methods section. The results addressed the original aim of the study and reported all previously stated outcome measures. The threshold value used for p was 0.05. The statistically significant results were that both the strengthening and stretching programs decreased "morning pain" and "worst pain" measurements, and they also both improved 5 of the 6 measured gait parameters. Step width had no statistically significant difference. There was no statistically significant difference between the strengthening versus stretching programs in any of the outcome measures.

However, there were a number of weaknesses in the results section as well. While overall the tables and figures are clear and well-laid out, they did not report the confidence intervals, and the clarity of the tables would benefit from the addition of units where applicable. Their choice to verbalize every pairwise comparison they made came across as wordy and redundant, and it added little to the clarity of the results section.

Appraisal of the study discussion

The discussion section had some strong points. All articles referenced were from credible journals and were relatively current. The oldest articles, from 1991 and 1993, were reviewed and their conclusions were found to be in agreement with more current studies. Limitations to the study were mentioned, and they included: the lack of a control group, the inclusion of both bilateral and unilateral plantar fasciitis patients, the lack of long-term follow-up with the patients, and the uncontrolled confounding factors such as changes in shoes, changes in activity level, and changes in weight. The authors did mention the MCID (minimal clinically important difference) for the VAS pain scores, which was 3cm. In their study they found changes of 2.96cm for the strengthening group and 2.29cm for the stretching group.

However, numerous flaws were apparent in the discussion. The section dedicated to discussing possible directions for future studies was vague and poorly written. The authors were lacking in their discussion of the importance of reducing pain and improving the gait parameters. While the importance of reducing pain is relatively self-explanatory, the lack of expansion on the importance of improvement in each of these gait parameters is a severe deficiency. They also did not interpret the normal values for gait parameter with reference to gender or age, which the information in their cited article on gait parameter norms clearly requires (Oberg et al., 1993). They also did not address the MCID for any gait parameters, and they did not discuss the implications of the MCID for the VAS pain measures. The NNT (number needed to treat) was not described for either the pain outcome measures or for the gait parameters. They also failed to adequately discuss the applications of their findings.

Discussion

This study sought to provide evidence for two different treatment methods for plantar fasciitis. Whereas most studies combine strengthening and stretching in their plantar fasciitis treatment protocols, this study investigated them separately, potentially providing support for the importance of utilizing both strategies to treat plantar fasciitis. For a patient who may not be fully “bought in” for one or the other, this study could serve as evidence that both stretching and strengthening independently work to treat plantar fasciitis.

However, I would argue against using the interventions exactly as recommended in this study. The potential benefits to using their interventions to treat plantar fasciitis are that patients may experience reduced pain scores and improved gait patterns. However, this research study does not give enough evidence in favor of their interventions. None of the statistically significant differences were shown to be clinically significant. In implementing a treatment plan that has not been shown to yield clinically significant results, clinicians run the risk of wasting the time and resources of their patients as well as the healthcare system. Perhaps if the researchers had

followed up with the patients for a longer period of time, they would have found that their results between the baseline and final measurement were clinically significant, but as it stands the study does not serve as solid evidence that these are effective interventions.

Personally, I could not implement the interventions as presented in this study both because too little detail was provided on their physical therapy interventions (mobilizations, and plantar fascia stretching) to allow for accurate replication and because the results of the study do not solidly show that the prescribed protocols yield clinically significant results. Based on my clinical knowledge and other research studies, there is good reason to believe that interventions rooted in strengthening and stretching exercises are effective treatments for plantar fasciitis, but it cannot be said that this is one of the studies providing solid evidence for it.

Overall, this research study made a good case for the possibility of using stretching and strengthening protocols independently to treat plantar fasciitis. They found statistically significant differences in their outcome measures in both groups over time, and they found no statistically significant difference between the groups on any of the outcome measures. These findings make this study a worthwhile launching point from which to explore other related studies and conduct future studies. However, on its own this article does not provide the evidence to show that their interventions provide clinically significant differences in pain scores or gait parameters.

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