A critical appraisal of "Effects of Hip Strengthening on Neuromuscular Control, Hip Strength, and Self-Reported Functional Deficits in Individuals With Chronic Ankle Instability"

By

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Abstract

Chronic ankle Instability (CAI) is classified as the general 'giving way' of the lateral side of the ankle after numerous ankle sprains. A 'gold standard' of rehabilitation has yet to be established for CAI, but there are many articles showing that hip strengthening and balance/proprioception training can improve the joint stability and limit injuries. This background bridges into my clinical question, in which I asked, "In patients with CAI, will balance/proprioception or strength training more beneficial at improving joint stability?" Personal research has led me to an article by Smith et al., in which the authors emphasize the effects of hip strengthening on CAI in a college-aged population. This article succinctly covers strengthening with CAI, while implementing an intervention that included credible and reliable outcome measures such as the Balance Error Scoring System (BESS), Star Excursion Balance Test (SEBT), hip strength both in abduction and external rotation, and self-reported Foot and Ankle Ability Measure (FAAM). The authors describe their scientific method concisely, while providing an easily replicable study that could be implemented within a clinical setting. The study had minimal bias, as it was a single-blind randomized controlled trial with all of the assessments being performed by the same clinician. Furthermore, a 'limitations' and 'future research' section was provided in order to educate readers on what interventions could be implemented in future research. While checking a lot of my boxes, some changes could have been made in order to make this paper better. No MCID or NNT values were present, the introduction did not include a conclusion over their literature review, and the dependent variables were not described much in the introduction. Ultimately, while no 'gold standard' for rehabilitation is available for CAI, this well-written article provides a credible intervention that could aid in future rehabilitation efforts.

Key words: CAI, balance, proprioception, strength, stability

Introduction

As someone who has played sports throughout their lifetime, I have dealt with numerous ankle sprains that have led me to believe that I suffer from Chronic Ankle Instability (CIA). CIA is generally characterized by a 'giving way' of the lateral region of the ankle joint, generally after repetitive ankle sprains impact the laxity of the joint. CAI is primarily prevalent in active populations, and a 'gold standard' for rehabilitation has yet to be determined. My history is what piqued my interest in CIA, but the lack of evidence on proper rehabilitation methods has made me want to delve into the topic. Therefore, my clinical question aims at comparing strengthening vs. balance/proprioception in regard to ankle joint stability in CAI patients. The article in which I am appraising looks at the strengthening aspect, and it does an excellent job of explaining what muscles we can work on proximally to improve stability in CAI. Ankles are commonly injured, and recurrent injuries are more prevalent when a history of ankle instability is present. As a Physical Therapist, we can use this information to rehabilitate individuals who may have existing ankle injuries, or we can prevent ankle injuries in those who may be at an increased risk due to their lack of strength or neuromuscular control.

Methods

PubMed is my preferred research engine, and I found 3 articles that would encompass my topic pretty effortlessly. However, all 3 articles were not free through PubMed, and I had to copy/paste the article titles into the Angelo State University library database to find free versions. The article being appraised is one of the two articles I found through the database, making it readily available for my critiques. When searching PubMed, I used phrases such as 'Chronic Ankle Instability', 'Balance', 'Proprioception', 'strength training', 'stability' in order to minimize my research efforts. After using the phrases mentioned above and the limits mentioned below, I

ended up with around 100 research articles to delve into. Thus, allowing me to browse the articles easier and more efficiently.

The limits placed on my search were as follows:

- Full text – I wanted to be exposed to a full article, not just an abstract.
- RCT and systematic reviews – I only used these two study types because they have the most bias control (least bias) and would give me data that I could work with and deem 'scientifically significant'.
- Last 10 years – I wanted current articles, and I only missed about 5-8 articles from the 2000-2009 years after narrowing my research.
- 19-24 years – I chose this age range because this range is readily available in college and can be replicated for a potential capstone/research project.
- Inclusion
    - Populations
        - 19-24 years of age
        - Male or Female
        - Must have rolled an ankle before
    - Interventions
        - Strength training
        - Balance/Proprioception
        - RCT/Systematic Reviews
- Exclusion
    - Populations
        - No underlying health conditions in subjects

Of the three articles I found regarding CAI, the article by Smith et al. fit my criterion and was succinctly described in a way that made it easy to understand. The article was published in 2018 by the 'Journal of Sports Rehabilitation', in which it tested physically active college participants from Midwestern University, a private NCAA Division II University. I chose this study because it checked all of the boxes I was looking for and it used reliable methods of measurement/identification. The study showed statistically significant findings, and potential alterations for future research interventions were provided as well.

Results

Summary of the study

This study looks at CAI and how hip strengthening can affect neuromuscular control, hip strength, and self-reported functional deficits in a physically active population. Hip strength has often times been lost in individuals with CAI and it is believed to be attributed to the fact that neuromuscular facilitation is hindered as well as the overuse of the proximal tissue (the hip muscles) when compensating for ankle pain/injury. The test subjects (n=27) were from the same university, and they took a reliable questionnaire which deemed them valid subjects whom have had CAI. After subject randomization, the training group (n=13) completed a 4-week training protocol implementing heavy-super heavy tubing while emphasizing hip abduction and external rotation (Glut Med, external rotators, TFL, etc). Pre- and Post-test measures were taken for hip strength, neuromuscular control, and self-reports. Overall, the training group saw statistically significant improvements in the pre- and post-test measures and hip strengthening was deemed a reliable and useful tool for CAI.

Appraisal of the study introduction

The introduction provides a thorough history, the etiology of CAI, and rehabilitation of CAI, so I think it is sufficient. They also briefly explain why they are looking for the dependent variables. The purpose was clearly listed at the end of the introduction, with a hypothesis provided a few sentences prior. Overall, the introduction was succinct and explained CAI holistically, which is most helpful for future researchers and students who may read the article.

I want to see more on the dependent variables though, in which they could have extended upon their introduction a little bit to talk about each pf the variables independently. They also provided keywords but did not utilize them as much as they should have. Finally, a conclusion over the results was provided, but a conclusion from a literature review should have been present so that we could see what past researchers have said.

Appraisal of the study methods

The methods section was wonderful and provided reasoning/credibility for all of their outcome measures and tests that were performed. The study was single-blinded and group allocation was randomized, thus minimizing bias. There were two groups involved, and a 'within-subject' and 'between-subject' design was implemented, allowing the readers to see various data tables with the respective data. The subjects all had similar demographics and age ranges, with a relatively even allocation of males/females in each group. The alpha level was set at $P < .05$ for all tests and an 95% confidence interval was calculated. Overall, the methods were clearly described and could be repeated with relative ease.

Not many negatives were present, but one of them was the software utilized. As a student who is ignorant in terms of research software, it would be hard to replicate this study to the same extent without that software or a program like it. One other thing I would mention is that I would try to

implement a double-blind approach to minimize bias. Outcome assessors were not blinded to the allocation of the participants and I would have liked to see that change.

Appraisal of the study results

Again, the results section was succinct and provided readers with all of the pertinent measures. All of the outcome measures (hip strength, self-reported functional deficits, and neuromuscular control) were deemed reliable and all were mentioned in the results. The tables provided were done neatly, while highlighting all of the statistical significances found within- and between-groups.

For the results section I would have liked to see an MCID or NNT value. This would have allowed the reader(s) a better understanding on just how 'trustworthy' hip strengthening would be within the clinic. The length of the results section was a bit worrisome, but it seemed to have all of the results listed succinctly.

Appraisal of the study discussion

The discussion section further explained the results and each outcome measure had their own section within the discussion, making it very user-friendly. Literature was cited throughout each part of the discussion, and none of the evidence provided seemed 'weak' as it all seemed to be gathered from PubMed and various research journals. The authors provided a 'limitations' and 'future research' section, which gave some good insight on things to potentially change in future studies. Finally, the conclusion was eloquently written and allowed the reader to get a very brief synopses on the entirety of the study within a small paragraph.

Not many negatives were found for the discussion section, and the authors covered all of their bases while keeping it short enough to not lose the readers' attention. The methods and discussion sections were the best parts of the paper, in which each outcome measure had an

independent section and allowed the reader to follow along easily. I would have liked to see a reason for the exclusion of the MCID or NNT values, as these values will illustrate clinical significance if present.

Discussion

The clinical question that I was interested in was as follows: In patients with CAI, will balance/proprioception or strength training be better at improving stability in the joint? This article highlighted the strength aspect of my article, and holistically explained the effects that strength training can have in a CAI population. As prior research shows, CAI is a very prevalent injury and the rehabilitation/preventative methods are still 'up in the air'. Researchers and clinicians are at opposite ends of the spectrum on if we should treat CAI as a neuromuscular or strength issue. Additionally, would a protocol consisting of both methods prove more useful? As an observer and future clinician, I have seen many rehabilitation methods utilized for ankle injuries. While each individual will have varying etiology behind their injury, it would be nice to know which methods are the "best" when treating CAI. In my opinion, a mixture of both strengthening and balance/proprioception will further improve quality of life in a CAI population. Improved strengthening will allow individuals an opportunity for improved posture, improvements in proximal muscular recruitment, and improvements in holistic stability of the ankle joint. Further, balance/proprioception training will hopefully allow for an improvement in the feedforward mechanism, greater compensation/recruitment, and overall faster responses in the CNS to spur PNS changes. Ultimately, either form of rehabilitation shows positive results and I would hope to see future studies delve into what rehabilitation method would be deemed the 'gold standard'.

Cross-referencing the validity of this paper with my DPT coursework, I can see hip strengthening providing a positive outcome for future patients due to the aforementioned reasonings. This study implemented tests that are already used in a clinical setting and could be easily replicated in a clinical setting.

Overall, the article is worth a read if you are looking for a rehabilitative method that could prove useful in a patient lacking hip strength or having chronic CAI issues. Treatment is individualized, and there are many rehabilitative methods available, but there is not a 'gold standard' for CAI rehabilitative/prevention. However, articles like this one are available in order to provide scientific evidence to a population looking for potential interventions that could ultimately change a person's quality of life.