

A critical appraisal of “Effects of barefoot vs. shod walking during indoor and outdoor conditions in younger and older adults ”

By

Nicolas Gonzalez, SPT

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Department of Physical Therapy

Angelo State University

Member, Texas Tech University System

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Abstract

This paper is an appraisal of “Effects of barefoot vs. shod walking during indoor and outdoor conditions in younger and older adults”. The foundation of the appraisal is stated as a clinical question followed by the criteria for article selection to be appraised. A breakdown of strengths and weaknesses of the introduction, method, results, and discussion sections of the article are analyzed and stated. Lastly, a discussion about the clinical significance and relevance of this study to Physical Therapy is explored and how it might pertain to patient care.

Key words: Gait, Stability, Barefoot, Footwear, walking patterns

Introduction

The main theme that all of this was related to was the importance of footwear and the effects it has on an individual's Lower extremity mechanics (ie. gait, stability). Preventing falls and increasing stability for individuals of all ages, especially to the older age population, is integral to our jobs as a Physical Therapist. As a result, I wanted to research easy and clear interventions that could be utilized by patients when away from the clinic. Thus this led to the formation of the clinical Question: “Does walking barefoot benefit gait and lower extremity mechanics more than shoes?”

Methods

The search process started with reformulating the original question to be more applicable to “real world” measurable variables. The search began on Pubmed with additional searches being used on google scholar. The keywords that were used are as follows: Barefoot vs shoes,

walking, gait, shod, stability, Age. To limit the total number of articles that would appear these limits were placed on the search; Full text, Reputable journals, Systematics reviews excluded, it had to contain a barefoot vs a type of footwear. Further inclusion and exclusion criteria were studies without conflicts of interest and studies that compared young vs old age test subjects. When the search hits went below 1000 and more than single digit search results is when I start selecting articles.

Following the conclusion of my search. I was left with 3 articles and further focused on 1 article, Effects of barefoot vs. shod walking during indoor and outdoor conditions in younger and older adults. The article was published in 2021 in the Gait & Posture by Karsten Hollander, Evi Petersen, Astrid Zech, Daniel Hamacher. It was conducted in Europe as a joint study between members in Germany and Norway. I chose this study due a better relation to my clinical question and due to its significance in the respect of factors that could lend themselves to fall risks for older adults. If at home modifications like barefoot walking can be made that show to reduce fall risk then it would be a great tool to bring into a patient's treatment.

Results

Summary of study

The study dove into the effects that walking with and without shoes can have on gait stability/measurements in outdoor and indoor walking. The study looked into a young vs older adult comparison. In the intro it speculates that barefoot walking may offer improvements through peripheral feedback from the feet. The study included 32 young adults and 42 older adults from a fitness club that were able to meet the study criteria. The experimental intervention was to walk 25m outside on a sidewalk and indoors on a gym floor for 25 m for 3 minutes

respectively. Participants wore high cushion shoes vs no shoes. The participants were block randomized into groups. The following gait measurements were taken following repeated bouts; stride length, stride time, and minimum toe clearance. After the data was collected it was run through data processing. The study has primary and secondary outcomes. To no surprise, young adults typically had better gait measurement than the older adults. Results and data showed that older adults are more cautious in barefoot walking that could relate to the variability seen within the results.

Appraisal of the study introduction

The introduction is comprehensive and relevant. It explains the basic mechanics of walking barefoot and its effects. It offers a look into the train of thought of the aim of the study. How different means of locomotion in older adults is affected by different types of footwear. It offers insight to other studies that have examined barefoot running vs shod running, but is sure to highlight that few have looked at the age effects in the context of walking with different footwear in lab and non lab settings, specifically non lab settings.

The article clearly articulates the background, aim, and explains the ways gait can be affected; as a result, I did not distinguish any problems or concernable weaknesses. Literature referenced in the introduction are current; only a few were older than 2005, and all were relevant.

Appraisal of the study methods

The methods section of the study brokedown the participant inclusion/exclusion criteria and study design. Criteria for inclusion and exclusion was clearly stated. The study did well to gain a large sample size of young and adult participants and to have no subject attrition. Furthermore, tests and statistical values from analysis of the data were explained and referenced.

Variables were clearly stated and equipment used to measure variables was explained so that one might be able to replicate the test and measurements.

A weakness that I found within the methods was that though the statistical tools used are referenced they are not well explained. It would not be easily replicable by an outside party. More subject information could have been included such as injury history, fitness level, fall risks. Sociodemographic information can only be assumed to be similar as it is not listed but all the participants are part of the same local sports club or a citizen of the town. Outside of those similarities we do not know other socio demographic info.

Appraisal of the study results

The results are presented in an organized and similar manner as the introduction. The participants/population was addressed first. With the primary and secondary outcomes with their data stated next. Statistically significant results are posted and bracketed in the results section making them clearly identifiable. As well, the graph that they pertain to is listed with it.

A major critique that I have with the results have to do with the graphs/tables used. There is a lot of information and values in them that make them feel bloated and bulky. They are cumbersome with lots of p values that don't appear significant and make the result harder to understand when just looking at the tables/graphs alone. No mention of MCID or NNT.

Appraisal of the study discussion

The aim of the study was completed and found “ high degree of adaptability”. The study did well to further indicate and elaborate the findings and data collected. The study did well to explain background support for the different results and comments for future studies or variables to take into account. The authors called for longer term study looking into; habitual wearers of

both barefoot and shod, adding obstacles and medium perturbations to simulate real world conditions. And Cushioned footwear vs minimal footwear.

Clinical significance is briefly mentioned pertaining to gait speed and MTC variability. In the conclusion, they speculate that diverse walking situations could improve general walking skills. Limitations they list are looking at just one type of footwear. When there are many different types and kinds of shoes that people wear. As well, this study only looks at a very short time table of measurement and is not representative of individuals who are accustomed to long term barefoot walking.

Discussion

The clinical significance of this study in relation to physical therapy practice is relevant because of the greater fall risks that we see in older individuals and the negative impacts that it can have on their overall health and quality of life. As physical therapists it is important to not only treat injuries but to also provide education and interventions that help prevent injuries. This study is relevant to my clinical question because it looks directly at the gait, stability, and local dynamic factors that are affected when one walks barefoot versus one walks with shoes. Using this study to look into the effects that barefoot versus shoe walking has on gait and stability can be used further to better prescribe at-home interventions when treating patients that can reduce their chances of falls and increase their quality of life.

I believe that having patients walk more around their house barefoot would lead to a more adaptable walking pattern with cautious step rates and gait that can decrease the risk of falling. As well, although not addressed in this study environmental enrichment such as; walking inside and outside barefoot versus with shoes on can better prepare patients pre and post injury as

well as with helping walking mechanics and walking patterns leading to more stability. A risk to consider would be patients falling at home when implicating this type of treatment in a home setting with no supervision. So it is important that proper education is given while at the clinic when supervision is available so that patients do not engage in potentially dangerous uncontrolled perturbations and obstacles that they could run to and at home without contacting their Physical therapist about. Establishing a proper progression for the patient of do's and don'ts would help decrease the risk of any injuries when implementing this at home. If this study was to have long-term effects of shod walking versus barefoot walking with different levels of shoe cushioning (for example: flip-flops versus vans versus tennis shoes versus boots) on gait and LE mechanics effects. That would lead to better and more specific interventions that could be implemented in relation to which type of shoe the patient habitually does or doesn't wear.

I believe the paper was written with a high degree of validity and scientific background. The study had ample references that were relevant and current that directly pertained to what the study was about. It is published in a reputable journal and the authors are members of universities. The study could use some more clarification and further breakdown of the statistical analysis tools used to get the values they had and the tables and graphs could be cleaned up to show what exactly is being tested against what. As of now the tables feel cumbersome and may just leave them more confusion than clarification. Finally, as stated in the study, a long-term effect of shoe walking versus barefoot walking needs to be looked into to make this more clinically specific and relevant to patient care for physical therapy.

In conclusion, this study is an exploratory look into barefoot versus walking with shoes effects on gait, stability, and walking patterns. The study did find significant differences among walking with shoes versus walking barefoot. Relevant and up-to-date references were used to

backup data and test conducted. The study was conducted with good validity and reliability.

However, one needs to be aware of the limitation that this was looked at in an acute time frame and not a long-term scope. As well as, only one type of shoe cushion was observed in the study.

Furthermore the results section can become a little convoluted and hard to follow is cumbersome graphs/tables.