Author’s response to reviews

Title: Passive Hallux Adduction Decreases Lateral Plantar Artery Blood Flow: a Preliminary Study of the Potential Influence of Narrow Toe Box Shoes

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Response to reviewers

Reviewer #1:

Abstract

Well written and succinct. Could you please review your concluding statement - may I suggest your data shows an initial decrease in BF - also mention AI? and perhaps remove the reference to tissue health as your data doesn't support this just yet.

Response: Thank you for the review of the manuscript. We greatly appreciate your comments and suggestions.
We eliminated the phase, “and tissue health”.

We appreciate your suggestion and we added the sentence: Individuals with lower AHI appear to have a greater risk of decreased BF with PHA.

Introduction

Line 86: hyperpronation is not a common term used in podiatry in Australia and the UK. Could you please reconsider the use of this term - can I suggest - excessive pronation?

Thank you for your recommendation. Response: Line 86: We changed hyperpronation to excessive pronation.

The final paragraph before the aims - line 111 - this entire paragraph needs referencing.

We added the appropriate references. We missed referencing this paragraph while formatting the paper. Thank you for helping us catch this error.

The aims are clear.

Methods

You excluded participants who had injury etc - how did you measure this? i.e. did you use a standardised questionnaire to measure injury?

We used a questionnaire/intake form created specifically for this study. If a potential subject reported an injury we asked follow up questions. Our recruiting materials made it clear that if there were a previous injury that the person would not be allowed to participate.

Added: “as determined by self-report on an IRB approved intake form”

Can you insert your institutional ethics approval number please? either here or within the acknowledgements.

Thank you for catching this, we are seeing more articles report this information. Yes, here is the number we inserted #X17492
In terms of your test conditions, you don't mention room temperature, caffeine intake prior to measurement and exercise - all of these can influence vascular measures.

We appreciate the guidance on these points. We added in methods the following: Ultrasound imaging was performed in a temperature-controlled room. Upon arrival, subjects removed their shoes and socks to allow acclimatization to the testing room. Subjects then sat quietly and completed the consent form and other paper work and had their AHI measured (~20 minutes).

Added to limitation: Study participants were asked not to exercise immediately prior to data collection and they were questioned about their exercise for the day of data collection. Thirty-five of the subjects did not exercise the day of the study, while 10 did exercise with at least 5 hours rest before participating in the study. Unfortunately, we did not think to ask about caffeine intake. We did not limit or monitor study participants’ use of caffeine.

I commend you on the use of a single tester, however I note it was likely not possible to blind the tester in any way - this should be added to the limitations.

Thank you for suggesting this. We agree it should be included in the limitations section. We added the following statement to the limitations paragraph: Also, due to the study design, the sonographer could not be blinded to the hallux position during data collection, but was blinded to AHI.

Also in relation to your sonographer, there are issues around reliability given the operator dependency nature of the testing method. Was intra-tester reliability of the sonographer established? If not, this is a significant limitation and this should be considered for future, larger studies which you may be planning, and will need to be mentioned in the limitations section.

Thank you for catching our mistake in not including this information. We did establish the sonographer’s reliability. We added: The reliability of this sonographer was found to be excellent with an Intraclass Correlation Coefficient (Two-Way mixed with random subjects and fixed scanner for absolute agreement) score of 0.99 between repeated measurements of blood flow volume.

Results

Presented clearly

Table 1 would also benefit from descriptive on cavus and planus foot types - I can see the mean but it would also be interesting to know the foot types if you classified them?
You suggestion is good and we have included this information in table 1. We did classify them (# cavus, # planus, etc), in our blocked design, but for the purposes of the statistical analysis, we treated AHI as a continuous variable rather than categorical.

We added the requested information to the table. Thank you for that suggestion.

Low Arch n=15 0.341 (0.006)
Mid-range Arch n=15 0.368 (0.005)
High Arch n=15 0.407 (0.004)

The first figure (graph) - I can't interpret this clearly? can you amend the title?

Thank you for catching the awkward description. We changed the title of figure 1 to the following:

Figure 1. A) The position of the L8-18i transducer recording a longitudinal image of the lateral plantar artery. Images were taken deep to abductor hallucis. B) The lateral plantar artery diameter was measured at the widest part of the artery from one tunica intima to the other as indicated on this image by the dotted vertical line.

Discussion

line 275-277: This is a reasonable statement however I think you should think about/discuss this further. Your results don't show the impact of blood flow changes and healing capacity. Your results show an initial decrease, which is then almost fully compensated for, which is probably likely due to a reactive hyperaemia response and the use of collateral arteries. People can have substantial occlusions in their arteries and still facilitate healing through collaterals and other coping mechanisms such as vasodilation (hyperaemia). Note it generally takes a proximal occlusion of 75% to impact on blood pressure in the foot.

Thank you for this suggestion. We agree that is a possibility to have hyperaemia and collateral blood flow. We found it interesting that 1/3 of individuals rapidly recovered from the PHA to maintain or slightly increased blood flow, while 2/3 had the initial decrease with a less robust recovery. There were several individuals who had a minimal recovery or no recovery in their blood flow. We also think it is important to consider that narrow tight shoes like soccer cleats not only passively adduct the hallux, but also add a general compression to the foot. Along with the compression from these shoe, the potential foot “swelling” or exercise induced enlargement of
the foot from extended activity in those shoes could further impact blood flow in some individuals.

We added to the discussion, based on your helpful suggestion.

line 308 - this is an interesting finding. Given that your population are healthy controls (?), I think it is unlikely that the health of the artery is impacting on the variation in your findings. Were any of your sample smokers, have hypertension, hyperlipidemia etc, anything that would jeopardise the health of the artery? Otherwise I think you should be looking at neurological status as a potential source of the variation that you are seeing?

We appreciate this insight, we added neurological status to this description. Specifically we added: This is likely due to neurological status or variations in arterial stiffness.

328 - (this is a comment only) agree wholeheartedly that this is likely the case. We have seen this as the case in some of the work completed in laser Doppler fluxometry. Might be worthwhile having a look at including this in future studies.

Thank you for this suggestion! I will look into this.

Reviewer #2

Reviewer #2: As a practising Vascular Podiatrist, I find the article of interest and worthy of publication. Well written, method described clearly. Discussion thought-provoking.

I can not comment on the methodology of how the blood flow measurements were obtained, as I am not familiar with the equipment used, but the use of a sonographer with experience appears reasonable.

I would have liked to have seen a more varied discussion about the potential for wound / tissue healing implications, with this initial work. The focus on plantar fasciitis is of course of interest, but the potential for discussion on the possible impact around forefoot healing with the other commonly presenting issues in podiatry (eg nail surgery, ulcer healing) has not been mentioned or explored. Discussing how the findings may link to high risk foot conditions such as the insensate or ischaemic foot, particularly in relation to footwear choices may also be important.

Could at least a paragraph on these themes be included in the final version?
Overall, thought-provoking and of interest to the podiatry & foot health community, in view of footwear influences & choices and the range of common foot conditions that these findings may have implications with - from delayed healing & associated pain & QOL issues, through to amputation risk.

Thank you for your helpful review of our article. We appreciate your suggestion to include more information about clinical application of our study findings. We added information about the other potential affects to pathologies and healing. We then suggested that these should be directly researched in the future.