Reviewer's report

Title: Angle-torque relationship of the subtalar pronators and supinators in younger and elderly males and females

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Reviewer: Kade Paterson

Reviewer's report:

Summary
The authors have done a great job responding to the previous review – well done! Overall, the manuscript is much clearer now and it reads much better. I still have a few minor suggestions as indicated below, most of which are grammatical. However there are two points that I would like to see amended, namely, comment 11 regarding justifying the purpose of the study and comment 17 regarding how the angles were derived.

Abstract
1. Line 11: consider changing “Beside active subtalar range of motion, peak pronator and peak supinator torques were measured in five anatomical joint angles across the active subtalar range of motion by using a custom-built apparatus with two force transducers. Furthermore, relative torques (normalised to the individual peak torque) and pronator-to-supinator strength-ratios were analysed.” To: “Total active subtalar range of motion and peak pronator and supinator torques were measured in five anatomical subtalar joint angles using a custom-built apparatus with two force transducers. Furthermore, relative torques (normalised to the individual peak torque) and pronator-to-supinator strength-ratios were also calculated.”
2. Line 12: delete “by”.
3. Line 17: Insert “and”: “Pronator-to-supinator strength ratio, AND peak pronator and supinator torques are affected by…”
4. Line 19: “has” should be “had”
5. Line 27: flexibility is not range of motion, so I would suggest changing “flexibility” to “range of motion” throughout the manuscript.
6. Line 30: Change “Younger females have higher pronator strength capacity in the most pronated joint angle due to their higher subtalar flexibility when compared to all other groups.” To: “Younger females have higher pronator strength capacity in the most pronated joint angle, which may be due in part to their greater subtalar joint range of motion compared to the other groups.”

Introduction
7. Line 42: “plantar flexors” should be one word.
8. Line 55: delete “however” and change “discussion about” to “research in to”
9. Line 57: “medio-lateral distortions” should probably be something like inversion and eversion forces/moments/stresses. This should be altered throughout the manuscript.

10. Lines 60-2: I think you could probably delete these lines as most readers would be familiar with what pronation and supination is.

11. Line 66-72: I feel you need to strengthen the link to the purpose of your study. You mention your previous study in line 66 but not why it is relevant here. Eg what did it show? And more importantly, what hasn’t been done? Perhaps bring in lines 70-2 about the influence of age and sex, and then mention this hasn’t been investigated. Hence the purpose of the present study was to ….

12. Line 72: delete “therefore” (if you do the changes from my previous point and move line 70-2)

Methods

13. Line 80: insert “and” between “local university” and “the elderly”.

14. Line 88: “arch flexibility” should be “midfoot mobility”.

15. Line 98: delete “by”

16. Line 110: change “…were each positioned in approximately right angles” to “…were each positioned at approximately 90 degrees”

17. Lines 119-22: I see the authors have tried to address my previous point regarding what these angles are but I’m still unclear as to what these angles are: “The angles are related to a neutral position with the shank perpendicular to horizontal and the foot (2nd ray) oriented in parallel to the thigh.” But what are the angles between? Is it the angle of the rearfoot/calc, and is “neutral” a frontal plane angle of 0 degrees between the calc and tibia for eg?

18. Line 132: “subjects underwent a 10-minute on a bicycle ergometer…” should be “subjects underwent a 10-minute warm up on a bicycle ergometer…”

19. Line 134-5: change “all subjects performed three valid of maximum voluntary isometric pronations and supinations in each subtalar joint angle.” To “all subjects performed three valid maximum voluntary isometric pronation and supination contractions in each subtalar joint angle.”

20. Line 147: delete “build up”

21. Line 162 –sentence on p=0.05, precede with “Unless otherwise stated,” as line 166 reports the bonferroni corrected p value for the relative strength analysis.

Results

22. Line 174-5: replace “younger females are more flexible in the pronation direction” with “younger females have greater pronation ROM”. Line 177 replace “flexibility” with “ROM”.

23. Line 185: replace “whose ascending part is missing between…” to “who do not show increase torque between….”
24. Line 204: “males” is spelt “ales”

25. Line 206-8: Replace “In contrast, the ascending part is missing in younger females who show a nearly equal pronator strength capacity in -24° and -8° with 89% and 92%, respectively” with “In contrast, relative peak pronator torque of young females is nearly equal in -24° and -8° with 89% and 92%, respectively”

26. Line 212: Change “There are found significant main effects of joint angle (P<0.0001; F(4,56)=79.9; #2 p=0.59) and sex (P<0.01; F(1,56)=10.6; #2 p=0.16) on relative pronator strength.” To “Significant main effects of joint angle (P<0.0001; F(4,56)=79.9; #2 p=0.59) and sex (P<0.01; F(1,56)=10.6; #2 p=0.16) on relative pronator strength were found.”

27. Line 226: delete “merely”

Discussion

28. Line 244: “we find descending…” specify that this is from a pronated to supinated position and vice versa relative to each curve.

29. Line 250: “explain” should be “explained”

30. Line 264: change “young females are able to exert an even higher PPT of 41%” to “young females are able to exert a 41% higher PPT”

31. Line 270-1: this is a good theory but you should relate it back to your sample (and needs a slight grammar correction), eg you could finish with “One possible explanation for the age x sex interaction in ROM is that estrogen level decreases in postmenopausal women, and given the average age of our older female sample was 66.7 years, this would likely have influenced their results”…or something to that effect.

32. Line 274: I think “lateral distortions” should be rapid inversion movements/moments/forces or something similar. Delete “it is assumed that”. The rest of this paragraph is a great discussion of your results – nice work.

33. Line 308-10: Change “Despite significant main effect of age and significant age x angle interaction, all groups showed increasing PSR the more the foot is in supinated position.” to “Despite a significant main effect of age and significant age x angle interaction, all groups showed increasing PSR as the foot moved in to greater supinated angles.”

34. Line 310-2: Change “In general, this angle-dependent PSR characteristic is advantageous according to the aforementioned injury patterns of medial and lateral ankle distortions: In end-ranged supination, there is a higher relative pronator strength capacity, and vice versa.” To “As mentioned, this angle-dependent PSR characteristic, whereby relative pronator strength capacity was higher in end-ranged supination and vice versa, is likely to be advantageous in preventing lateral ankle injuries.”

35. Line 314: what was the “respectively” referring to? May need to clarify this slightly

36. Line 315: Change “Therefore, PSR is rather a supplementary than a single parameter for functional subtalar strength diagnostics” to “Therefore, PSR is a
supplementary rather than a single parameter for functional subtalar strength diagnostics."

Conclusion
37. Line 332: Change “flexibility” to “active range of motion”
38. Line 333-5: Given the findings of this study didn’t show the strength differences were due to difference in ROM (and ROM is not flexibility), I would suggest softening this sentence somewhat. Perhaps consider changing: “It has to be highlighted that younger females have higher pronator strength capacity in the most pronated joint angle due to their higher subtalar flexibility when compared to younger males and elderly subjects.” To: “Younger females were found to have higher pronator strength capacity in the most pronated joint angle, which may be partly due to their greater subtalar joint range of motion when compared to younger males and elderly subjects.”
39. Line 335-9: Consider changing: “As pronator and supinator muscle strength is important for dynamic joint stabilisation, in terms of feed-forward control [52] and to counteract medio-lateral distortions [14], the subtalar strength capacity and the PSR should be assessed isometrically across a wider range of subtalar motion for clinical purposes.” To: “As pronator and supinator muscle strength is important for dynamic joint stabilisation, for both feed-forward control [52] and to counteract excessive inversion and eversion moments [14], the subtalar strength capacity and the PSR should be assessed isometrically across a wider range of subtalar motion for clinical purposes.”

Table
40. Indicate in the headings (or elsewhere in the table) that values are mean + SD. Also, indicate the units (i.e. °) in Table 2.

Level of interest: An article whose findings are important to those with closely related research interests

Quality of written English: Needs some language corrections before being published

Statistical review: No, the manuscript does not need to be seen by a statistician.

Declaration of competing interests:
I declare that I have no competing interests