Reviewer's report

Title: Comparison of vertical ground reaction forces during overground and treadmill running. A validation study

Version: 1 Date: 17 August 2012

Reviewer: Alan A.H. Hreljac

Reviewer's report:

Discretionary Revisions

1) Background: In the opening paragraph, and periodically throughout the manuscript, the authors have focused on issues related to running injuries. As the authors noted, the relationship between running injuries and vertical GRFs "remains unclear." There are, however, many reasons for researchers to study vertical GRFs during running. Of course, among these reasons is to study the injurious effects of vertical GRFs during running. Similarly, many of the running related issues that are mentioned by the authors are not necessarily related to vertical GRFs. It would be better to focus this first paragraph on the major point of the research, which is to validate the use of an instrumented treadmill for studying vertical GRFs during running. This background related to running injury research is only peripherally related to your study. I would suggest trying to refocus the introductory paragraphs.

2) Methods: Since this study appears to be primarily conducted to look at impact peaks and loading rates (Background, 2nd last paragraph), it may have been more appropriate to include only heelstrike runners as subjects.

3) Methods: As noted in the Background, one major advantage of an instrumented treadmill is the ability to monitor multiple consecutive steps of data. Although single sided data are often collected in overground running studies, it would have been preferable for the researchers to collect data on both feet to determine whether variations occurred on either side of the body.

4) Discussion, Paragraph 1: Some type of "curve comparison" analysis would have been helpful to determine the extent of the agreement more objectively.

5) Discussion, Paragraph 2: A more flattened landing style may indicate differences in AP GRF curves. This may be important in the resultant GRF and in the joint kinetics that would be determined using an inverse dynamics approach.

Major Compulsory Revisions

1) Methods: It is not clear how many steps of data were collected and used for the analysis of the treadmill running trials. Five steps should have been used to match overground trials. If only five steps were used for analysis, which five were chosen?
2) Results: Was the landing pattern within speed conditions consistent between the treadmill and overground (i.e., did subjects who used a HS pattern at a certain speed exhibit this pattern overground and on the treadmill?). The level of consistency of landing strategy between treadmill and overground running at a given speed would be an important comparison to make when determining the validity of using a treadmill to predict overground patterns of vertical GRFs. For example, if runners are not generally consistent in the landing pattern, the use of a treadmill may be contraindicated.

3) Discussion, Paragraph 2: Actual statistical comparisons of the various "inconsistencies" in landing patterns would be instructive, as these differences may be important in determining whether treadmill and overground kinetics are similar.

4) Discussion: At some point in your Discussion, two very important limitations of using an instrumented treadmill should be mentioned. Even if an instrumented treadmill were able to measure vertical GRFs in perfect agreement with overground running, it would not be possible to conduct a study in which joint kinetics could be assessed using a standard inverse dynamics methodology since AP and ML force data are not measured. The other important limitation is obviously that an instrumented treadmill would have very limited usefulness for walking studies.

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

**Quality of written English:** Acceptable

**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