Reviewer’s report

Title: Six weeks of balance or power training induce no generalizable improvements in balance performance in healthy young adults

Version: 0 Date: 05 Jun 2019

Reviewer: Lucy Parrington

Reviewer's report:

SSMR-D-19-00034: Six weeks of balance or power training induce no generalizable improvements in balance performance

The authors describe a study aimed at evaluating two different 6 week training interventions (balance v. plyometric) to improve balance and reduce fall risk on an untrained balance task. They found that neither intervention improved performance or acquisition on the untrained task, and conclude that the findings relate to task-specificity (or lack thereof), and indicate the need for more effective fall prevention programs.

The manuscript is generally well written. I feel the study in itself is interesting with regards to the intervention, assessing learning/ acquisition and task specificity. But, I have a few concerns with this being framed around fall risk and balance assessment, and discussion on interventions for at risk populations.

1. The population tested is not an at risk population (young adults). How does testing this population relate to testing at risk for falls populations? Results are not generalizable outside of the population tested.
2. Given any balance deficit in this population is likely subtle in comparison to at risk populations, could the lack of findings here be confounded / ceiling effect of running an intervention on a more fit population?
3. The trials were performed for 10 seconds. How do the authors know this test is capturing balance? Has this test been validated against other measures of balance or postural control? What are the sensitivity/ specificity of the 2 systems used for testing balance? How well do they distinguish between people with and without balance deficit?
4. Trip and falls risk are often related to tripping, turning and episodes of freezing of gait in at risk populations (i.e. Parkinson's). Gait and balance are controlled differently. How does the testing of balance here, relate to fall risk?
5. Please explicitly outline what fixed and random effects, and what interactions were tested in the model, and if any covariates were tested within the model.
6. Looking at the plot of the points of sensoboard time data, data seem to be centralized around 0-2.5s, with less people achieving 5s or higher. Did the authors assess normality of the data? Please present information relating to this.

Minor issues:
1) Please remove colloquialisms (i.e. 'double edged sword')
2) Can the authors please rationalize their approach of counterbalancing between subjects and not fully randomizing the order?
3) Though the explanation in the methods is good, a diagram showing the progression of testing an intervention (flow chart) would be helpful for readers to get a visual on what was run.
4) The final group composition demographics and the ANOVAs, could this be in a table? Help to de-clutter the paragraph.
5) Rather than F score throughout within the results section, a table with effect size coefficients (beta) for each effect and interaction within the model and confidence intervals would be preferable.

**Are the methods appropriate and well described?**
If not, please specify what is required in your comments to the authors.

Yes

**Does the work include the necessary controls?**
If not, please specify which controls are required in your comments to the authors.

Yes

**Are the conclusions drawn adequately supported by the data shown?**
If not, please explain in your comments to the authors.

Yes

**Are you able to assess any statistics in the manuscript or would you recommend an additional statistical review?**
If an additional statistical review is recommended, please specify what aspects require further assessment in your comments to the editors.

I am able to assess the statistics

**Quality of written English**
Please indicate the quality of language in the manuscript:

Acceptable

**Declaration of competing interests**
Please complete a declaration of competing interests, considering the following questions:

1. Have you in the past five years received reimbursements, fees, funding, or salary from an organisation that may in any way gain or lose financially from the publication of this manuscript, either now or in the future?
2. Do you hold any stocks or shares in an organisation that may in any way gain or lose financially from the publication of this manuscript, either now or in the future?

3. Do you hold or are you currently applying for any patents relating to the content of the manuscript?

4. Have you received reimbursements, fees, funding, or salary from an organization that holds or has applied for patents relating to the content of the manuscript?

5. Do you have any other financial competing interests?

6. Do you have any non-financial competing interests in relation to this paper?

If you can answer no to all of the above, write 'I declare that I have no competing interests' below. If your reply is yes to any, please give details below.

I declare that I have no competing interests

I agree to the open peer review policy of the journal. I understand that my name will be included on my report to the authors and, if the manuscript is accepted for publication, my named report including any attachments I upload will be posted on the website along with the authors' responses. I agree for my report to be made available under an Open Access Creative Commons CC-BY license (http://creativecommons.org/licenses/by/4.0/). I understand that any comments which I do not wish to be included in my named report can be included as confidential comments to the editors, which will not be published.

I agree to the open peer review policy of the journal