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: 29 Jun 2019

Reviewer: Thomas Muehlbauer

Reviewer's report:

Comments to the manuscript "Six weeks of balance or power training induce no generalizable improvements in balance performance" (Manuscript No.: SSMR-D-19-00034)

Title
Please include information on the investigated population (i.e., healthy young adults).

Abstract
Please include information on the investigated population (i.e., age, sex, training status) and training frequency and training duration per session.

Please indicate whether the trained/practiced tasks were also tested or did you performed transfer tests only?

Did you detect a group by time interaction?

Please add information on practical relevance (i.e., an effect size measure) of your findings.

Introduction
Page 4, line 32: Explain the "task-specificity principle of balance training" a bit more in detail.

Page 5, line 15: I was wondering whether the transfer depends on "incorporating many balance tasks" instead of "incorporating different types of balance (i.e., static, dynamic, proactive, reactive)".

Page 6, lines 24-39: Besides correlation analyses, there are several studies [2-4] available that showed transfer of balance training to muscle strength performances and vice versa, that is indicative of an cause and effect relationship. Please elaborate a bit more on that issue and describe corresponding literature.

Concerning your hypothesis: Why do you think that six weeks of training are enough to get transfer effects? Is there any hint for this training duration in the literature?

Please state which of the two training regimen will show better transfer and indicate why?
Methods
Page 6, lines 56: Please state what the "benefit and risks of the present investigation" are?

Please provide a figure that shows a subject performing the two tested balance tasks.

Please indicate which type of balance (static, dynamic, proactive, reactive) is represented by the two tested tasks.

How did you increase training intensity for the plyometrics.

Please add a table that shows the 6-weeks power training program per session (sets, reps, weight, duration, exercises, no. of jumps or ground contacts, rests etc.).

Please describe why the demands to perform the tasks during balance training differed from those when performing the two tested (untrained) tasks? There should be unique differences between the trained and tested (untrained) balance task if the goal is to show performance transfer.

How did you ensure balance training progression and/or increased balance training intensity?

Consider providing an effect size measure to see whether your outcomes are of practical relevance.

Results
Did you observe any baseline balance performance differences between the three groups?

Discussion
Please consider the following alternative explanation for the observed balance training effects: Shea and colleagues [1,6,7] showed that in accordance to the Hikosaka model [5] the transfer of learning (to different effectors, loads, and spatial requirements) is large for early in practice (after a single training session) but small for late in practice (after several sessions/days). Thus, you can argue that after six weeks of training (12 sessions in total) the participants achieved an increased level of movement automation (i.e., late in practice or high levels of movement experience) and the control of the trained motor task becomes more specific leaving less room for transfer.

On the other hand (and this could be investigated in a separate study), during stages of less movement automation (i.e., early in practice or low levels of movement experience), the control of a practiced motor task is relatively unspecific. That is muscle selection, computation, and the muscle activation is not effectively developed and therefore coded on a rather abstract level. As a consequence, the execution of movements with different task characteristics (e.g., untrained balance tasks) can easily be performed.

In the discussion section there is a lack in describing potential physiological and mechanical mechanisms that might be responsible for the assumed transfer effects of balance and power training to the two untrained balance tasks. Please add.

References used for review
3. Granacher U, Gruber M, Gollhofer A. Resistance training and neuromuscular performance in

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

No

**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

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