Reviewer's report

Title: How are falls and fear of falling associated with objectively measured physical activity in a cohort of community-dwelling older men?

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Reviewer: Geeske Peeters

Reviewer's report:

General comments

This paper describes the associations between the exposures fall history and fear of falling and the outcome physical activity. Physical activity was measured with accelerometers and four different definitions of physical activity were used. Although the association between falls and fear of falling with physical activity has been studied before, to my knowledge, this is the first study to examine these associations with an objective measure of physical activity in a relatively large sample of community-dwelling older men.

The paper is generally well written, however, the statistical analyses require further clarification. Some decisions in the analytical process are unusual, but there is currently insufficient information to judge whether it is a correct and novel way of approaching these data or incorrect and requiring revision.

Major compulsory revisions

1. Abstract: I read the abstract first and without having read the rest of the paper, the conclusion seemed to disagree with the results. The last sentence of the results (lines 73-76) seems to suggest that after adjustment for these other variables, the association between falls and FOF and PA are not statistically significant. But it is then concluded (lines 77-78) that falls and FOF are important barriers to gaining health benefits of walking and MVPA. If there are no significant associations, that falls and FOF can't be barriers. Later, from the text, I understood that these variables are believed to be mediators, but this is not clear from the abstract. If these variables really are mediators (see later comment), it would be helpful to clarify this in the abstract to avoid confusion.

2. Measures (line 138): The definition of sedentary behaviour was based on a cut-point of 100 counts/minute. Results presented in a recent publication showed, however, that a cut-point of 200 is more accurate in identifying sedentary time in older adults (Aguilar et al. ActiGraph GT3X+ cut-points for identifying sedentary behaviour in older adults in free-living environments. J Sci Med Sport 17(3): 293-299).

3. Measures (line 147/8) and Discussion (lines 257-259): A single item question was used to assess FOF. The text suggests that this question has been validated against FES and SAFE, however, the paper that is referred to here (nr 25) validates the SAFE against the FES and the FOF items developed by Howland.
The question used in this paper differs from all three. Has the question been validated? If so, please provide evidence of its validity. If not, please discuss this as a study limitation in the discussion.

4. Measures (line 152)/Statistical methods (line 180): Habitual PA was based on self-reports of participants 10 years earlier. What does this say about “habitual PA” from 10 years ago to now? This measure was used for the sensitivity analyses, but it is unclear what this sensitivity analyses actually tests. Please clarify or remove as it doesn’t seem to add anything to the paper.

5. Statistical methods (line 166-168): As log-transformation of MVPA did not alter the results, the non-transformed data were presented. It appears that log-transformation was done to deal with the zero counts in the PA data. However, a log-transformation deals with right-skewed data, not with excess of zeroes. More importantly, rather than examining the distribution of the outcome, it should be examined whether assumptions for linear regression are met (and normal distribution of the outcome is not one of the assumptions!). Please check the assumptions and report whether these were met. If not, adjust your modelling accordingly.

6. Statistical methods (lines 169-175): Although I am unsure whether I interpreted the text correctly, it appears that each day of PA measurement was used as a separate measurement and thus as repeated measurements. In the random effects models, the day of PA measurement was then included as a separate variable to account for the repeated measures. This is an unusual way of analysing these data and I am unsure if this is the correct way to do it. Usually the multiple day measurement of PA is done to account for the day-to-day variation in the data, which is then averaged out by using the mean value as a single outcome for each participant. Could you please explain why this approach was chosen and how it may have influenced the results? Also, did you really do random effects modelling? Was a random slope or random intercept included? If so, please explain. If not, than the model was in fact a fixed effects model, which is similar to a GEE model (except that it can deal with missing values). What correlation structure was used and did choice of correlation structure affect the results at all?

7. Statistical methods (lines 175-180): Please provide a rationale for why each of these variables might be mediators? Simply adding them in and checking whether they attenuate the association is not sufficient to say that a particular variable mediates the association of interest. For a variable to be a mediator, it should be associated with both the exposure and the outcome and a change in the exposure should cause a change in the mediator. This explorative modelling does not seem to answer your research question and could be a secondary research question if examined thoroughly. Also, quality of life was described in the results and tables as a mediator but not listed here.

8. Statistical methods (line 181): complete case analyses were done, but random (or fixed) effects modelling should be able to deal with missing values. There do not seem to be many missing values on falls history and FOF, but were there any missing values on any of the confounders or mediators?
9. General: I initially thought that, having the four definitions of PA was a strength of this paper. However, looking at the results in Table 2, it seems that the effects of falls and FOF on SB, light PA and MVPA add up to 0, which makes me wonder whether they are actually one measure rather than 3 different measures. It would be good to reflect on this in the discussion.

10. Conclusion (lines 326-328): The wording of the first sentence in the conclusion here and in the abstract seems a bit strange to me: the paper looks at the association between falls and FOF and PA, not at health benefits of PA. Also, I struggle with conceptualizing falls as a barrier to PA as it I would have thought that it is not the fall itself, but the consequences of the fall that could form a barrier.

Minor essential revisions:

11. Abstract (line 68): should “which” be “whom” in this sentence?

12. Statistical methods (line 161): Although often applied in research, including a categorical variable as a continuous variable in a linear regression model doesn’t actually say anything about “trends” as the p-value can suggest statistical significant if only one category differs from the lowest. Moreover, a “trend” cannot be shown over 2 categories (FOF). I’d suggest rephrasing as “Linear regression models were used to examine differences in continuous variables .....”

13. Results (line 192): It says 3-7 days here and 3-8 days in the statistical methods.

Level of interest: An article of importance in its field

Quality of written English: Acceptable

Statistical review: Yes, and I have assessed the statistics in my report.

Declaration of competing interests:

I declare that I have no competing interests