Reviewer’s report

Title: High-impact exercise in adulthood and vertebral dimensions in midlife - the Northern Finland Birth Cohort 1966 Study

Version: 0 Date: 22 Jun 2017

Reviewer: Ellen Aartun

Reviewer's report:

The authors have conducted a study on sports activities and vertebral size. It was a pleasure to read the manuscript; all sections are well-written and clear. However, there are some concerns especially in the statistical analysis that the authors need to address before publication.

1. The objective is not clearly formulated. I would recommend something like "the general objective of this study was to determine the association between…" and then provide the two specific objectives.

2. The study design is a cohort study. Please edit the title so it reflects the objective of the study, e.g., "association between…"instead of "Effects…" that indicates a RCT. Please be consistent in the wording throughout the manuscript, e.g., p13, line 24: Instead of using "connection" between the exposure and outcome, you should use "association".

3. My biggest concern in this study is the statistical analysis. First, you have not performed a crude analysis so we do not know the impact of the included covariates such as smoking and socioeconomic status on the association between sports activities and vertebral size. Please describe and report the results of the crude analysis. Second, I think it might be a concern that you include sports participation at age 31 and 46 in the same model. The sports participation variables might be strongly correlated and thus, it might be a multicollinearity problem in the model. Have you checked if the variables are correlated and/or checked the model for multicollinearity? Please report whether you have checked the model assumptions for linear regression models. Third, I think it is difficult to interpret the model when you have included sports participation at baseline and follow-up in the same model. I would prefer to perform two separate analyses, i.e., to perform cross-sectional and longitudinal analysis separately OR include a variable that show a change in sports participation from baseline to follow-up. Again, I'm afraid the variables might be correlated. The statistical analysis might be a problem to understand because the objective is not clearly formulated.

4. Please provide a flow-chart of the participants. Any missing data?
5. p4, line 10. A word before "mineral density (BMD)" is lacking. Should it be "bone mineral density"?

6. p6, line 12. Physical activity is much more than participation in sports, e.g., active commuting etc. Please consider to substitute "physical activity" with "Sports participation" or "exercise activity" as you have used in the subheading.

7. In the description of the variables, please clarify what variables that were used as exposure, outcome and covariates. It is common to describe the outcome before the covariates, so please change the order of these two.

8. P.8, 2nd line, method section. Please provide the justification of your choice of L4 with references.

**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.

No

**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 recommend additional statistical review

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

Acceptable
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