Reviewer’s report

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

Version: 0 Date: 31 Jul 2017

Reviewer: Lauren Barnett

Reviewer's report:

1. You can't use linear regression when there are repeated measurements involved. One of the assumptions in linear regression is that all observations are independent, which they aren't since you have an impact score for patients when they are aged 31 and again at 46 years. Linear models don't take into account that these are repeated measures and hence have some correlation between them, you can't assume them to be independent, even when they're combined. More appropriate analysis is a multilevel model, which takes into account the repeated measures. In this case patients would be level 1, and the impact scores/activity measures would be level 2.

2. Forest plots are not the accepted representation for linear regression results, and I'm having trouble understanding it. Regression results are put in a table. You don't usually need both the confidence interval and a p-value because they both say the same thing. I understand why you think putting the results in a forest plot makes them easier to understand, but it makes it more confusing and harder to read. People reading this paper will or should have a basic knowledge of linear models and know that if the CI includes 0 then the result is not statistically significant. No need to include a p-value, which has limited interpretation and doesn't add any more information to the estimate. Also I'm a little confused as to why you've given separate estimates for all the sports included when you put the individual sports into categories (high and low impact) in the first place, and have made your conclusions based on this categorisation.

3. The authors haven't tested any of the assumptions of the linear model, e.g. constant variance, errors being normally distributed, etc. As stated in point 1 your observations aren't independent since there are repeated measurements within patients, hence your model assumptions are violated and no statistically significant conclusions can be drawn. As also stated in point 1, multilevel modelling is more appropriate for the data.

4. There was no sensitivity analysis conducted on the data, which is essential in showing that the presented results are robust. I recommend doing this with your next analysis.
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

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I am able to assess the statistics

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