Reviewer's report

Title: Validity and bias on the online Active Australia Survey: Activity level and participant factors associated with self-report bias

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Reviewer: Volkert Siersma

Reviewer's report:

This paper reports on the validity of the online version of the Active Australia Survey (AAS) activity assessment and which factors are implicated in bias in this assessment. The data is a large sample of "wealthy, overweight women".

My first comment is on the generic use of validity. What is investigated is the association between AAS and a direct accelerometer measure of activity. Hence, the primary aim of the analysis (aim 1) is the investigation of criterion validity: for AAS to be any good, there has to be an association with the accelerometer measure, else we will not believe the AAS. Thereafter, the authors proceed by imagining that the accelerometer is some gold standard, while the authors themselves remark that also the accelerometer measure is not without errors. But fine enough, we will investigate how accurate AAS measures the values obtained by the accelerometer; that has possibly some merit in itself. However, this I will call accuracy, not validity.

In the introduction, and, later on, commenting on the results of the paper, a large number of Spearman's rho measures of association (mostly the authors are correct in writing "association", but at points "correlation" is used, Spearman's rho is strictly not a correlation coefficient). These are freely compared between populations, e.g. in the first line of the discussion: "lower than reported in most previous studies". But Spearman's rho (and quite some other measures of association) is dependent on the marginal distributions of the sample! They are not to be compared between populations! It is even hard to gauge what a rho that is not (close to) 0 or 1 really means: rho=0.5, is this a strong association?

The AAS has eight items, but in this paper only four of them are used (I read on page 6, line 12). Hence, only the "minutes" subscale of AAS is "validated" in this paper; the reason for this (page 6, line 13) is "recommendation for calculating sufficient MVPA" which phrase I do not understand. The "number of times" subscale/items is ignored.

Accelerometer measures are only included in the study when the device is used more than a given amount of time in the week; often not the full 7 days, 24 hours. Hence, the accelerometer measure is always biased downward! Maybe an idea to add an indicator variable to the bias predictor list whether the accelerometer was used (almost) the full week, or less. The accelerometer is not used in water-based activities, which is slightly funny given the popular image of Australians as surfers, etc.
What is a relative association (page 7 line 12)? The description of the Bland-Altman plot is a little confusing (page 7 line 14). The absolute difference is the same as the bias scores I figure. There is higher variance for higher values of activity: nobody thought about using a logarithm transform, i.e. using a measure of bias that reports on the percentage of the bias relative to the mean of the AAS and accelerometer measure? And instead of just the accelerometer measure, the mean of AAS and the accelerometer measure may be used as bias predictor.

Page 8 line 2: how adjusts this estimator for missing data? How are all these information criteria used?

Only in the end of the discussion it is clearly written that the AAS assessment and the accelerometer measure are not over the same period, but different periods rather some time apart! This could have been written more clearly in the methods section.

**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?**
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Unable to assess

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