Reviewer's report

Title: A framework for power analysis using a structural equation modelling procedure

Authors:

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Reviewer: Fruhling Vesta V Rijsdijk

Level of interest: A paper whose findings are important to those with closely related research interests

Advice on publication: Accept after discretionary revisions

Title: A framework for power analysis using a structural equation modeling procedure.

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Overview

The manuscript describes how SEM can be used to perform power analyses for more complex multivariate problems. This is a nice paper, in particular the gentle introduction to the logic of model fitting methods and the comparison of (power) results across different (more common) methods. However, I do have some questions and minor issues which I address in the following sections.

General points

Pages are not numbered, which makes it difficult to write a review report.

Compulsory revisions

Specific points

a) Introduction could be more concise, there is a lot of repetition, for example the explanation of 'over-identification' is given three times.
b) Page 9 (at least, what I count as page 9): multiple group approach (model of Figure 7). This example could be described more clearly by introducing the variables (x1, x2) in the beginning rather than at the end of the section (last line page 9). Also, in addition to describing the specific tests of the models, the results (in the table) should be discussed in the text: i.e. Model 2 > no effects of sex; Model 3 > significant effect of type; Model 0 > no interaction effect.

c) Power Analysis, in general: I think a short description of the RAM Covariance and Mean models (i.e. meaning of S, A and F) should be given in the text in addition to the comments in the scripts. Especially because the explanation of matrix A only appears in the second script, not in the first.
d) Power Analysis (Page 12): Multivariate ANOVA. Figure 8 is missing. The number of dependent variables alternates between 2 and 3. This has implications for the description of the number of univariate tests, which is indicated as two, and should be three. The author should make number of dependent variables and description of the model in the text consistent. Lets assume that there are 3 independent variables. Given the
standardized effect of x on y1, y2 and y3 (.5) and the correlation of .8 between all dependent variables, it's puzzling how the implied population covariance matrix in the table is derived. Could the author explain this? The correlation between y1 and y2 (due to x) would be .25, so the specified population correlation of .20 implies that the correlation coefficient between y1 and y2 will be negative (-.05), not .80?

If we assume that the correlation matrix on page 13 (Table 5) is indeed the population correlation matrix on which the power analyses are performed: the required sample size for 80% power in Mx for the first test (x1>y1=0), should be 27 not 28. It should be stated in the table that this number will be the same for all 3 univariate tests i.e. x1>y1=0 or x1>y2=0 or x1>y3=0, for 1df, since the effect of x on y1, y2 and y3 is the same. It's also not clear for the reader that the multivariate test is a 3 df test. This should also made clear in the Mx script as a note (i.e. that in option power the df specification has to be changed to 3).

e) Concluding Remarks: How is last paragraph 'In addition' different from the second?

Minor points
a) Sometimes it's not clear to what the notes are referring (e.g. Page 11).
b) Typo's:
   Page 3, last paragraph, isn't df usually p-r?
   Page 4, second paragraph, 'overi-identifed', shouldn't p>r ?; tpe = type.
   Page 6, r>p should be r<p?
   Page 11 in note, meaqn = mean.
   Page 13, on = one.
   Page 14, know = known.

Competing interests:
None declared.