Specifications for SEM project: Part I – Measurement Model

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Abstract

- (optional for this project)

Introduction

- Describe and summarize the background of your project in a few pages (2-3) rather than including a full literature review.
- Include a paragraph describing the objectives of the study.
    - Something about establishing a sound measurement model before proceeding to test hypotheses in a full model
    - You can mention the hypotheses/objectives for the full model or you can leave this part for the second part of the project when you describe the full model

Method

- **Describe the sample**. (sample size, gender, age group, any other defining characteristic e.g., prisoner inmate population)
    - Describe how you are dealing with missing data (ask me if you have any questions about this). Remember that if you are using Mplus (and I think AMOS) you can estimate missing data. Some of the new research suggests that it's better to estimate missing data than to throw out subjects (i.e., listwise deletion) when they are missing some observations
- **Describe the measures/variables**. If you are analyzing items describe the scale (i.e., yes/no, five-point scale). If you are using subscales, describe any information available on range of scores and reliability
- **Include a section/paragraph on Analytic Methods**. Here you can mention that you will be testing a measurement model using confirmatory factor analytic procedures using Mplus, Amos, etc. You should also mention any other detail such as the estimator (usually Maximum likelihood which is the default in Mplus, or you can use Maximum Likelihood Robust to correct the standard errors for some non-normality in your data). If you are analyzing items using the Mplus categorical-ordinal approach, you would mention this also.
    - Example. "*Confirmatory factor analysis of the items was conducted in Mplus Version 6.12 (Muthén & Muthén, 1998-2012) with a weighted least squares estimator with mean and variance adjusted chi-square test statistics (WLSMV). The "categorical" outcome variable option was specified to indicate that items were measured on an ordered*

discrete category "scale" rather than on a continuous scale. In Mplus, this specification refers to Samejima's graded response models (Baker and Kim, 2004; Samejima, 1969)."

Results

- **Include a section on descriptive statistics of your observed variables (i.e., indicator variables)**. This typically includes the means and standard deviations (you could also include skewness and kurtosis values). If you have several variables it might be useful to have a table in this section.
- **Include a summary of the models you ran.** This would include at least your first model and then additional models that you ran after doing modifications. As discussed in the course, it is best to do modifications one-at-a-time because all the parameters in the model can change with just one modification. In the paper we reviewed on pain and in the lecture slides there are examples of tables reporting series of model tests. e.g. below (although I didn't include it, it may be useful to include the confidence interval of RMSEA)

Table 1. CFA WHO-DAS II item analyses.

Model	χ^2	df	$\Delta\chi^2$	CFI	TLI	RMSEA
one-factor	525.14	54		.94	.92	.14
one-factor, cov e_1-e_7	310.79	53	93.97*	.97	.96	.10
one-factor, cov e_1-e_7, e_8-e_9	214.34	52	39.91*	.98	.97	.08
one-factor, cov e_1-e_7, e_8-e_9, e_{10}-e_{11}	188.91	51	23.68*	.98	.98	.08

Note *$p < .001$; $\Delta\chi^2$ are based on Mplus Difference Tests for WLSMV estimation

- **Include a description of the final model parameter estimates (i.e., loadings, correlations among latent variables and correlations among residuals if applicable).** This can be done in either a table or a figure. If you use a table, you could perhaps add a column of loadings in your table of descriptive statistics for the indicators if that works. Usually researchers report the standardized loadings and correlations among the latent variables and indicate whether any parameters are statistically significant or not. Some of your model modifications may have included the removal of non-significant loadings etc. One question that often arises is whether non-significant correlations between exogenous latent variables should be removed. It is generally recommended to leave these correlations in the model unless there is a clear rationale as to why the correlations would be zero.

- **Include the data correlation matrix in the paper itself or in an appendix**. This would be a correlation of the observed variables in your models. I know this can be a tedious task if you have a lot of variables but it can be very useful as you have seen in the course to understand your model in more depth. For publications purposes, researchers either include such a table in an appendix or mention that it is available on a website or upon request.
- **Any other important detail about the analyses you conducted**. If you make major changes to a hypothesized model such as dropping latent variables or re-conceptualizing other ones, you should probably include this in the result section also.

Discussion/conclusions

- The main point to discuss would be to restate your hypothesized model and to discuss whether you found support for that model. Usually you will have made some minor or perhaps major modifications. In this case you would summarize these changes and discuss the implications (i.e., does this mean that the constructs have changed drastically in meaning). One thing to realize is that if you make major modifications to your model, it is best to mention in your discussion that this new model would need to be confirmed in future research. You can include statements about the reliability and validity of your model . Do the latent variables have a good set of indicators (moderate to high loadings and representative of the construct)?

- Because this is the first part of the project, you can simply stop here and mention that hypotheses/objectives about the full SEM model will be addressed in the second part.