

# Structural Equation Modeling

## P.03 - Model Parameters

October 31, 2022

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### Exercise 1

Umstattd Meyer et al. (2014) measured poor psychosocial health as a single factor model using three item facets from a depression questionnaire and a measure of social activity. The covariance matrix is given in Figure 1.

- Enter the covariance matrix into R.
- Fit the model using (1) the marker variable approach, (2) the standardized latent variable approach, and (3) the effect coding approach for achieving identification of the latent variable. For the marker variable method, use **Depression 1** as the marker variable. The resulting  $\chi^2$  and degrees of freedom (DF) should be identical for the three models.
- Re-estimate the the first model (i.e., using the marker variable method), but now with the additional equality constraints between the loadings of **Depression 1**, **Depression 2**, and **Social Activity**.
- Test the constrained against the unconstrained marker model using the likelihood ratio test. What do you conclude?

	D1	D2	D3	SA
Depression 1	0.77	0.38	0.39	-0.25
Depression 2	0.38	0.65	0.39	-0.32
Depression 3	0.39	0.39	0.62	-0.27
Social Activity	-0.25	-0.32	-0.27	6.09

Data taken from Umstattd-Meyer et al. (2013, pp. 4-5)

Figure 1: Covariances for exercise 2 ( $N = 6053$ ).

## Exercise 2

Consider the following hypothesized four-factor CFA model of self-concept depicted in Figure 2.

- Using the data that are stored in the dataset `ASC7INDM.csv` with  $N = 265$ , estimate this model and evaluate its fit using the MFTS statistic reported by `lavaan`. Use the marker variable approach to identify the scale of the latent variables.
- According to the `lavaan` results, this model has 98 degrees of freedom. Show calculations that clarify why this model has 98 degrees of freedom.
- Which possibilities do you have to possibly improve the fit of the model?

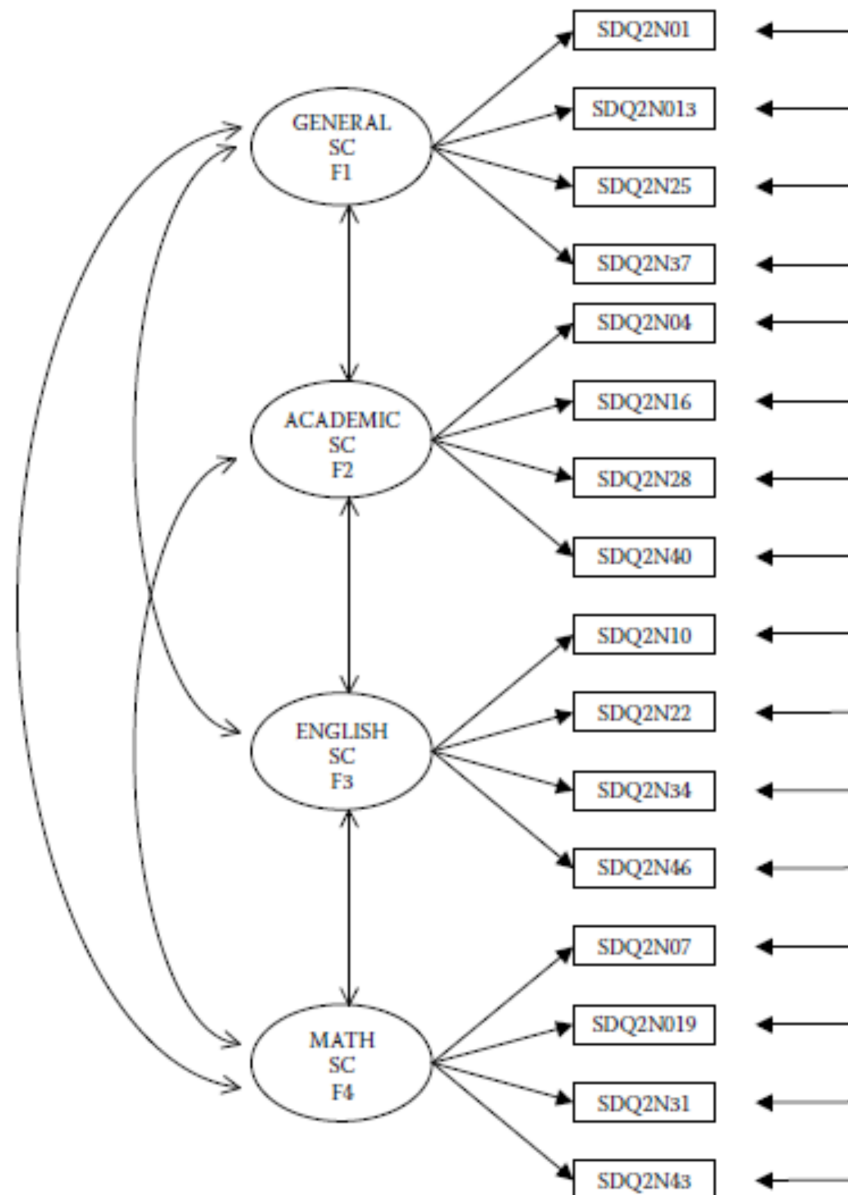


Figure 2: CFA model of self-concept.

## References

- Umstattd Meyer, M. R., Janke, M. C., & Beaujean, A. A. (2014). Predictors of Older Adults' Personal and Community Mobility: Using a Comprehensive Theoretical Mobility Framework. *The Gerontologist*, *54*(3), 398–408. <https://doi.org/10.1093/geront/gnt054>