SEM 1: Confirmatory Factor Analysis

Week 4 - General factor models

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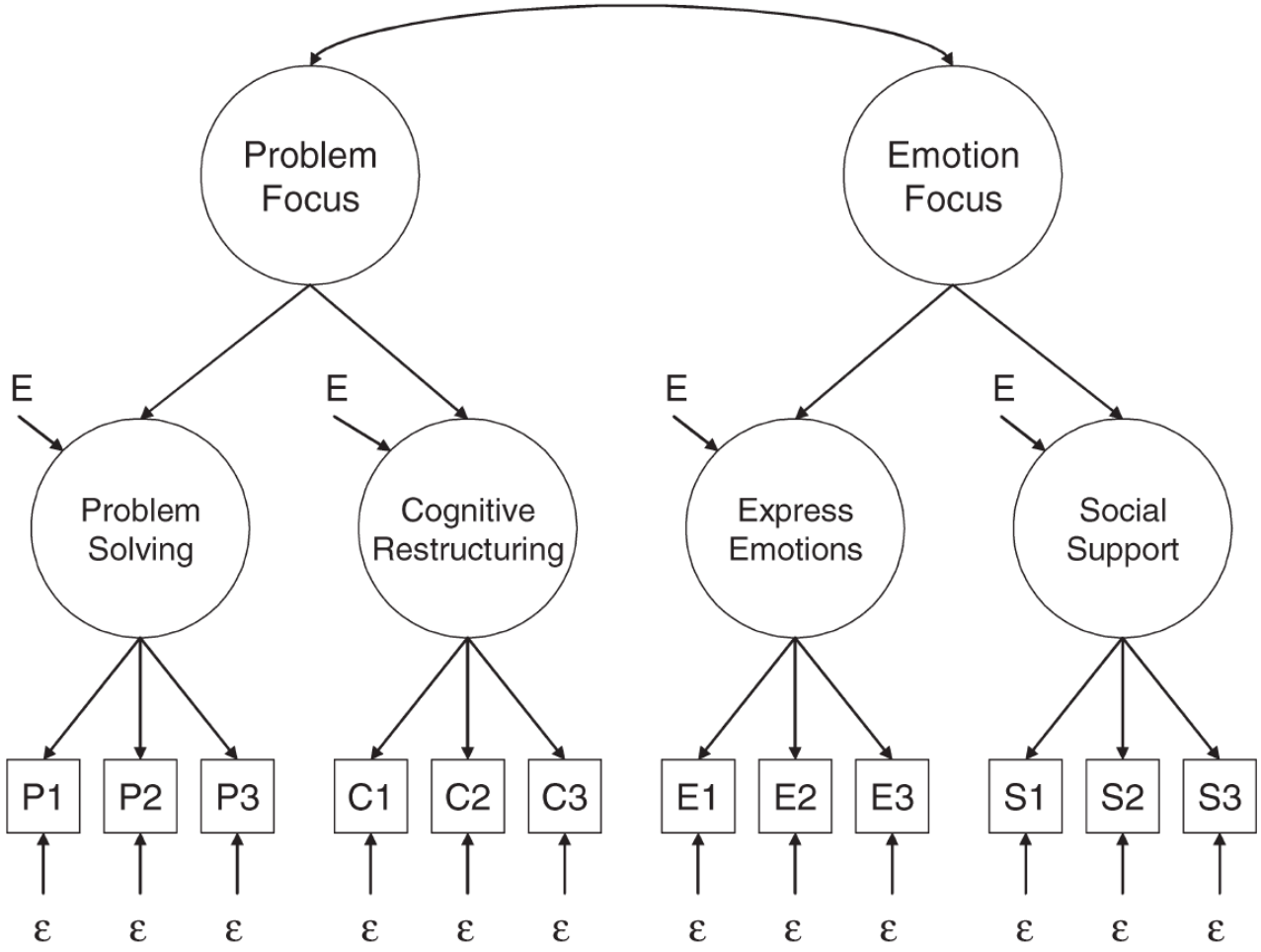
2020

Higher order models



Higher order models

Mathematically, simply a second factor model on the latent variable variance–covariance matrix:

$$\boldsymbol{\Psi} = \boldsymbol{\Lambda}^{*}\boldsymbol{\Psi}^{*}\boldsymbol{\Lambda}^{*\top} + \boldsymbol{\Theta}^{*}$$

Same rules of identification apply:

- The higher order factor must be scaled (one factor loading or the variance fixed to 1)
- The number of variances and covariances in $\boldsymbol{\Psi}$ must be at least as much as the number of parameters used to model $\boldsymbol{\Psi}$

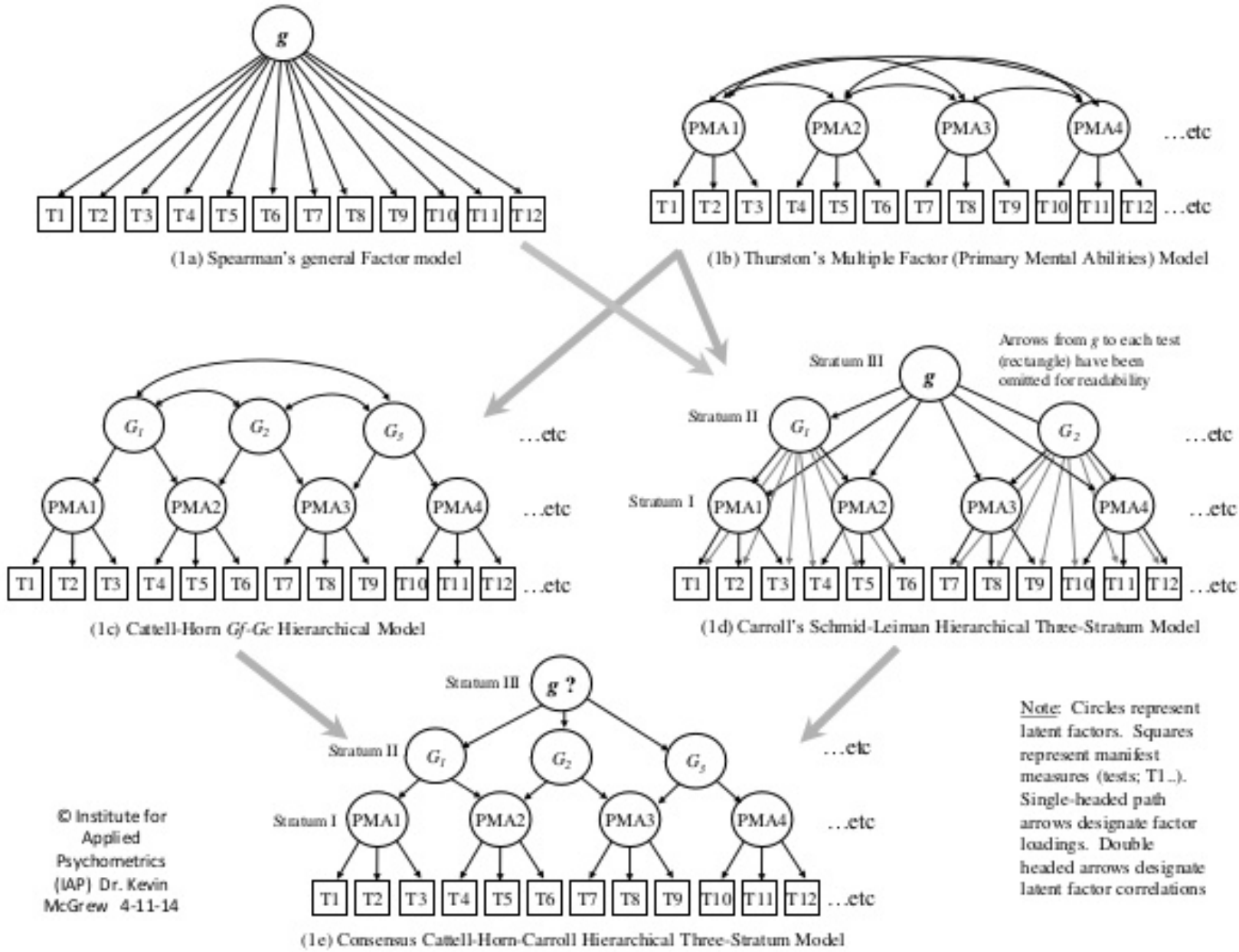
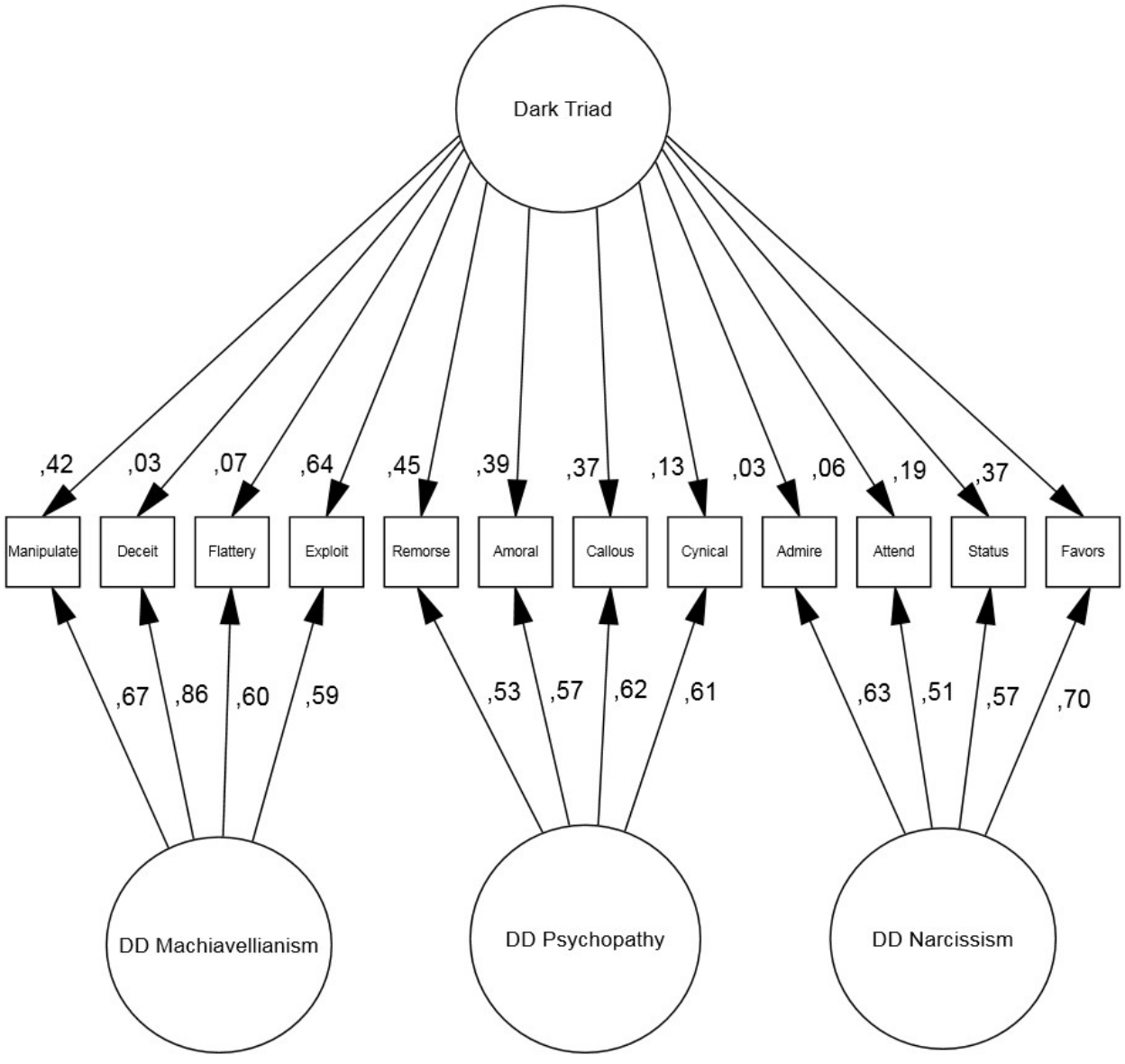


Figure 1: Major stages in the evolution of psychometric theories from Spearman's *g* to Cattell-Horn-Carroll (CHC) theory

Bi-factor models



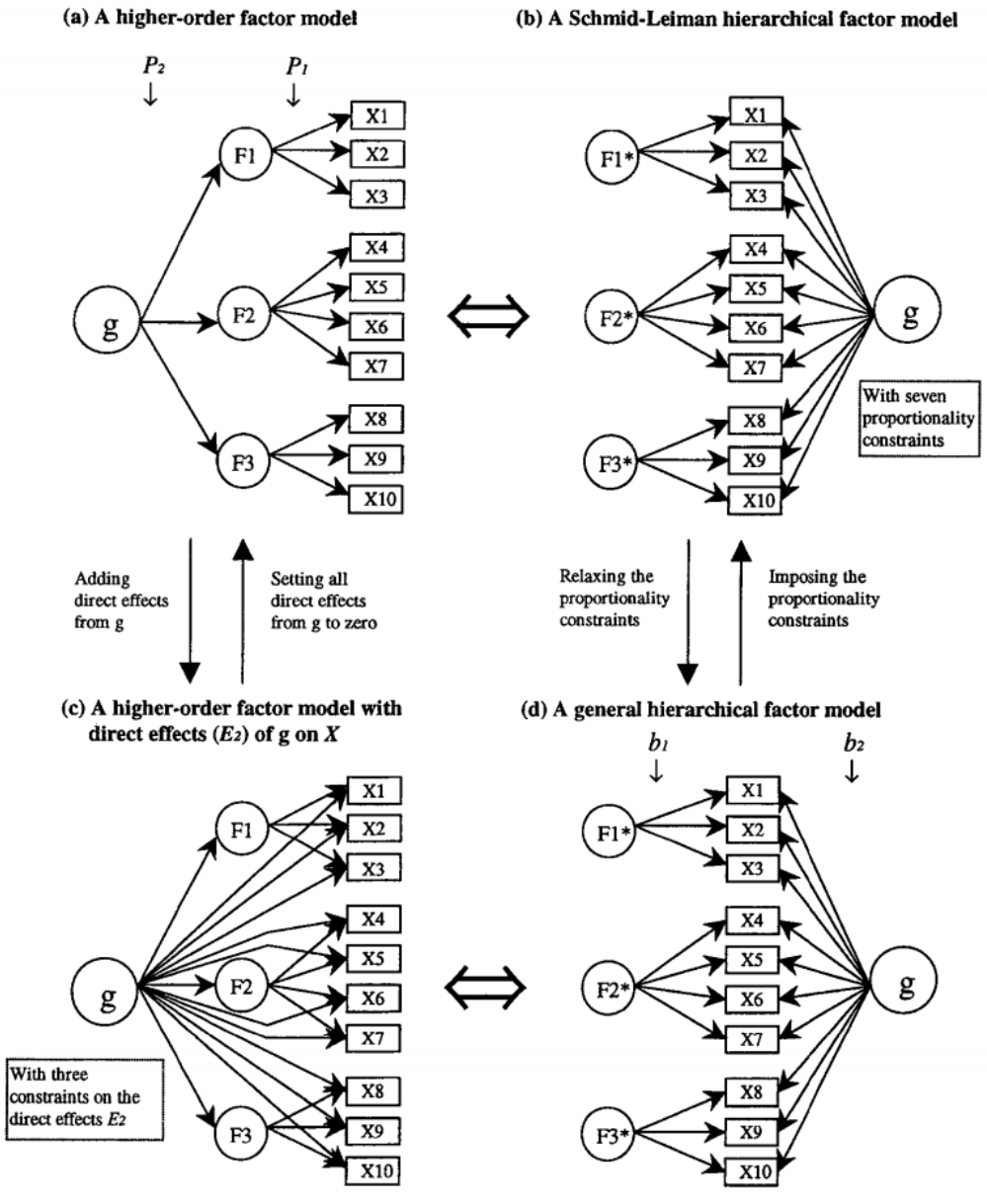
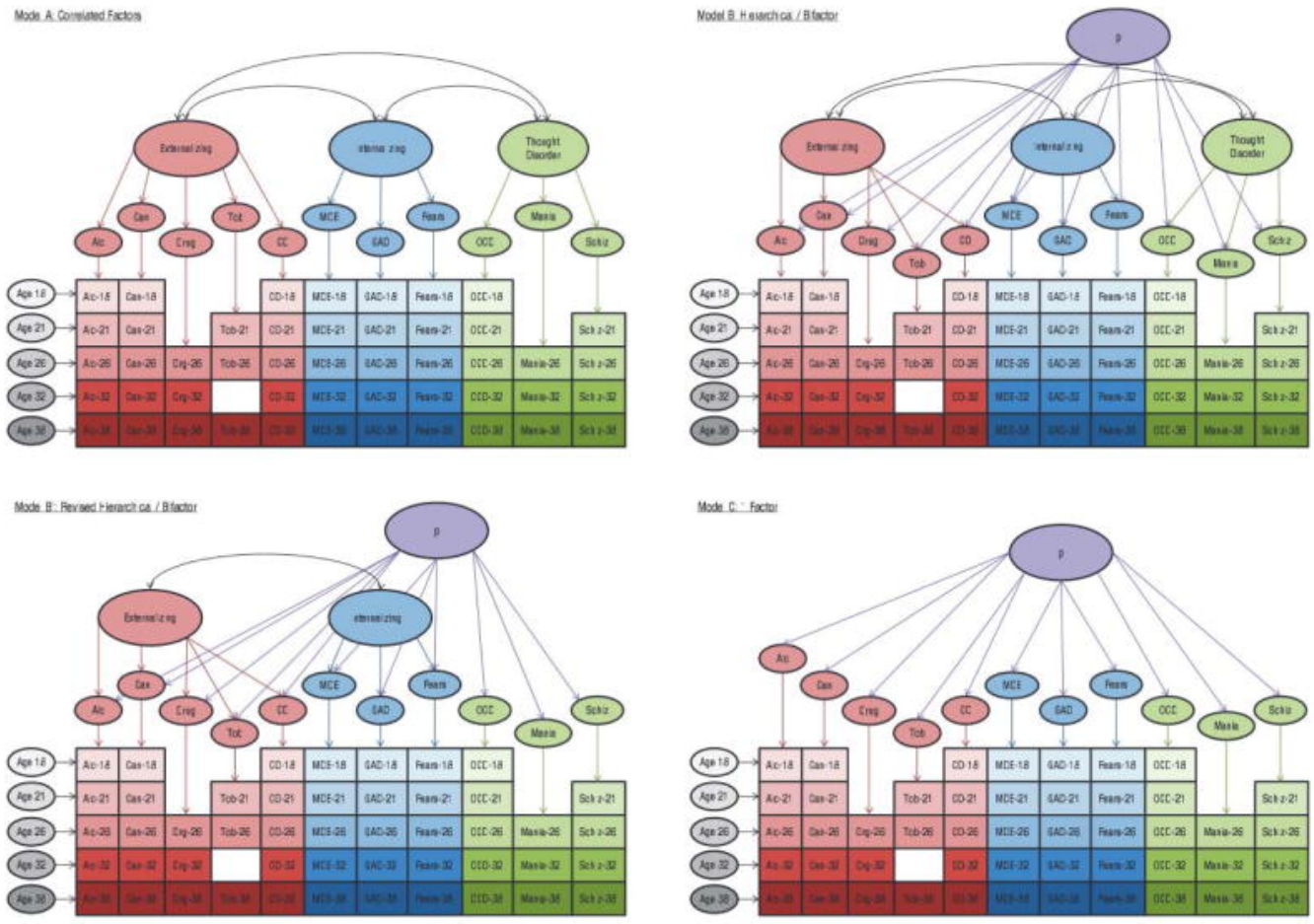


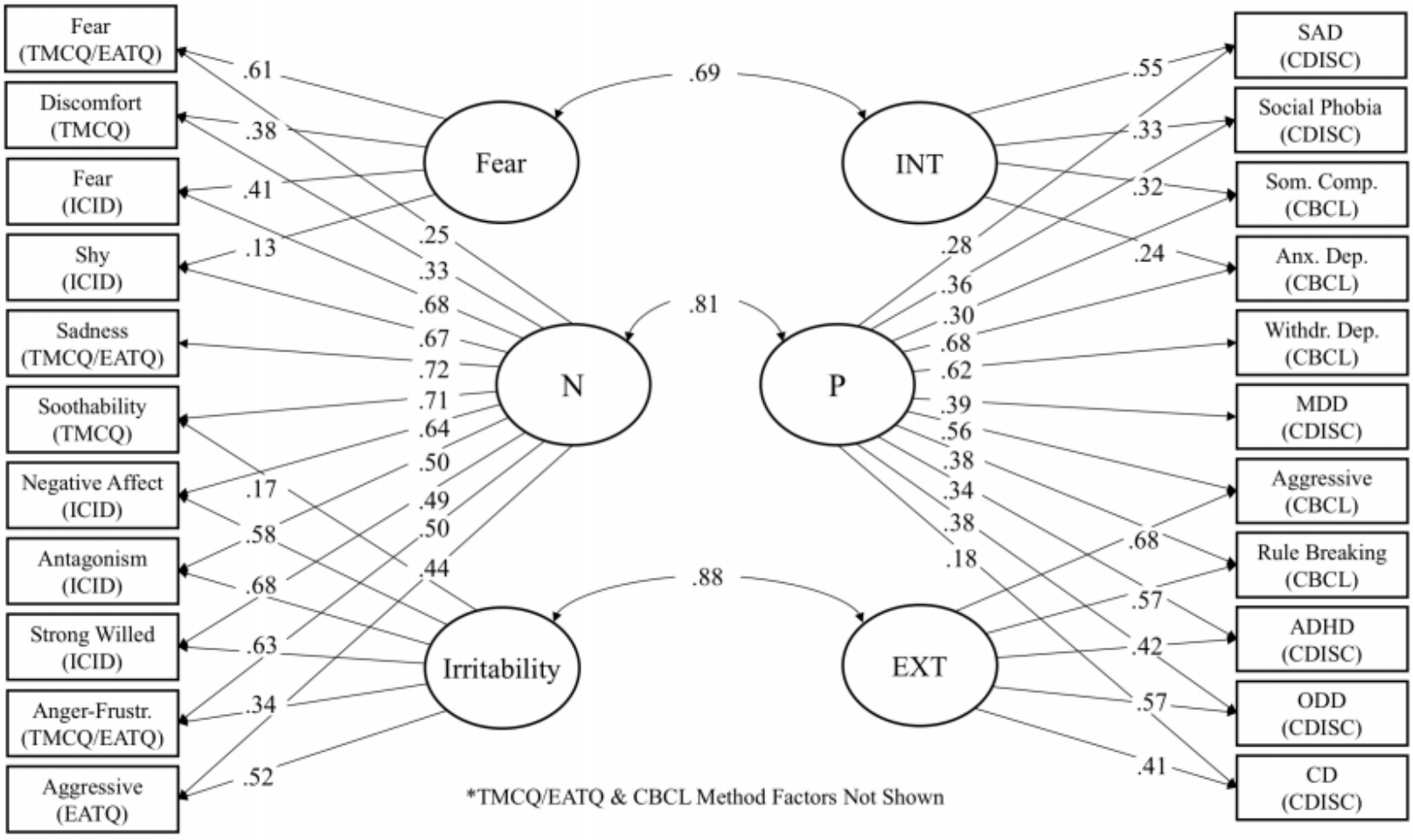
FIGURE 1.
Higher-order factor models and hierarchical factor models.

- Schmid-Leiman transformed higher order models are useful for assessing explained variance of the general factor.
- Many complicated nesting and equivalence relations, even though causal interpretations are vastly different!

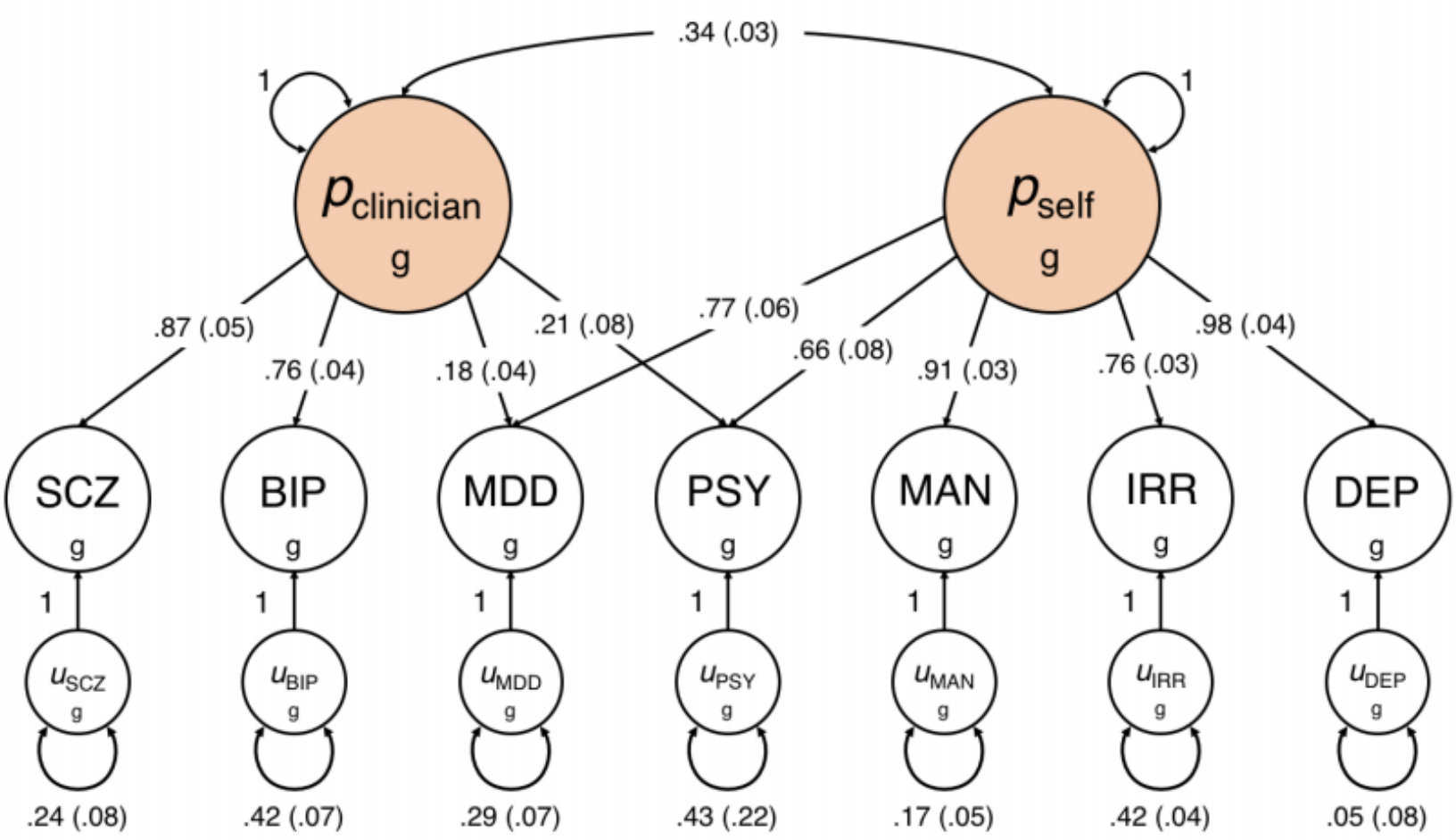
Yung, Y. F., Thissen, D., & McLeod, L. D. (1999). On the relationship between the higher-order factor model and the hierarchical factor model. *Psychometrika, 64*, 113–128.



Caspi, A., Houts, R. M., Belsky, D. W., Goldman-Mellor, S. J., Harrington, H., Israel, S., ... & Moffitt, T. E. (2014). The p factor: one general psychopathology factor in the structure of psychiatric disorders?. *Clinical Psychological Science, 2*(2), 119-137.



Brandes, C.M., Herzhoff, K., Smack, A. J., & Tackett, J. L. (in press). The pfactor and the nfactor: Associations between the general factors of psychopathology and neuroticism in children. *Clinical Psychological Science*.



Mallard, T. T., Linnér, R. K., Okbay, A., Grotzinger, A. D., de Vlaming, R., Meddens, S. F. W., ... & Harden, K. P. (2019). **Not just one p**: Multivariate GWAS of psychiatric disorders and their cardinal symptoms reveal two dimensions of cross-cutting genetic liabilities. bioRxiv, 603134.

What is the *p*-factor of psychopathology? Some risks of general factor modeling

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Abstract

Recent research has suggested that a range of psychological disorders may stem from a single underlying common factor, which has been dubbed the *p*-factor. This finding may spur a line of research in psychopathology very similar to the history of factor modeling in intelligence and, more recently, personality research, in which similar general factors have been proposed. We point out some of the risks of modeling and interpreting general factors, derived from the fields of intelligence and personality research. We argue that: (a) factor-analytic resolution, i.e., convergence of the literature on a particular factor structure, should not be expected in the presence of multiple highly similar models; and (b) the true underlying model may not be a factor model at all, because alternative explanations can account for the correlational structure of psychopathology.