Appendix. Calculating Standardized Factor Loadings for Generating Data

Let variable *U* represent a latent variable measured by *p* multiple indicators. A single indicator X_{pij} for item *p* for person *i* in group *j* may be decomposed as (Lüdtke et al., 2011):

$$X_{\mathrm{pij}} = \lambda_{\mathrm{pW}} x_{\mathrm{Wij}} + \epsilon_{\mathrm{ij}} + \lambda_{\mathrm{pB}} x_{\mathrm{Bj}} + \epsilon_{\mathrm{j}}; p = 1, \ldots, P$$

where λ_{pW} and λ_{pB} are the within- and between-factor loadings, respectively; x_{Wij} and x_{Bj} are the unobserved true scores at L1 and L2, respectively, and ϵ_{ij} and ϵ_{j} are the residuals at L1 and L2, respectively. Both x_{Wij} and x_{Bj} are assumed to be normally distributed with means of zero and Var(x_{Wij}) = σ^2 and Var(x_{Bj}) = τ^2, respectively. For generating data, unstandardized factor loadings for each indicator at both levels were set equal to 1. Similarly, measurement error variances for each item were set to σ_{e}^2 and τ_{e}^2 at L1 and L2, respectively. As a result of parallel measures at both levels, the observed variance of a single indicator may be decomposed as:

$$Var\left(X_{\mathrm{ij}}\right) = \sigma^2 + \sigma_{\mathrm{e}}^2 + \tau^2 + \tau_{\mathrm{e}}^2$$

Now, the standardized factor loading for a single indicator at L1 is:

$$\lambda_{\mathrm{W},std} = \frac{\sigma^2}{\sigma^2 + \sigma_{\mathrm{e}}^2}$$

while the standardized factor loading for a single indicator at L2 is:

$$\lambda_{\mathrm{B},std} = \frac{\tau^2}{\tau^2 + \tau_{\mathrm{e}}^2}$$

The standardized factor loadings were set to be equal at L1 and L2. Moreover, the total variance of a single predictor variable *X* was assumed to equal 1, where Var(x_{Bj}) = τ^2 and Var(x_{Wij}) = 1 - τ^2. Then, the item residual variance for a single item at L1 is specified as:

$$\sigma_{\mathrm{e}}^2 = \frac{(1 - \tau^2)\left(1 - \lambda_{\mathrm{W},std}\right)}{\lambda_{\mathrm{W},std}}$$

while the item residual variance for a single item at L2 is:

$$\tau_e^2 = \frac{\tau^2\left(1 - \lambda_{B,std}\right)}{\lambda_{B,std}}$$

For example, for simulation conditions with an intraclass coefficient (ICC_O) = .25 and standardized factor loadings = 0.8, the residual variances at L1 and L2, respectively, are:

$$\sigma_e^2 = \frac{.75 * (1 - 0.8^2)}{0.8^2} = 0.42$$

and

$$\tau_e^2 = \frac{.25 * (1 - 0.8^2)}{0.8^2} = 0.14$$