Basic rules for defining models in *lavaan*

Conventionally, parameters can be set free or constrained in *lavaan* by manually assigning labels for each group simultaneously within the model specification string using `c()`. For instance, `c(lambda1, lambda1) * item2` sets the loading of item 2 in two groups equal by labeling them both `lambda1`, and `c(lambda1, lambda2) * item2` frees the loading of item 2 by using different labels. It is also possible to specify a different model for each group by using group declarations (e.g., `"group: ELS"`) and explicitly defining a model for each possible group. Constraints can still be manually placed by using the same parameter label across the models (e.g., `lambda1 * item2` under each group declaration). Conversely, using different labels or not setting any labels allows the parameters to vary across groups (e.g., `lambda1 * item2` in one model and `lambda2 * item2` in the next).

- Loadings: `factor =~ lambda1 * item1 + (...)`
- Intercepts: `item1 ~ nu * 1`
- Uniqueness (unique variances): `item1 ~~ theta * item1`
- Covariances: `item1 ~~ item2`
- Thresholds: `item1 | threshold1 * t1`
- Latent variances: `factor ~~ psi * factor`
- Latent means: `factor ~~ alpha * factor`

Freeing parameters: `NA * item1` or unique labels across groups, e.g., `c(lambda1, lambda2) * item1` if simultaneously defining the model for all groups, and `lambda1 * item1` for the first group and `lambda2 * item1` for the second group if defining the model syntax separately for each group.

Constraining parameters: set the same label across groups, e.g., `c(lambda1, lambda1) * item2` if simultaneously defining the model for all groups, and `lambda1 * item2` under the first group declaration and `lambda1 * item2` under the second group declaration if defining the model syntax separately for each group.

Additional details can be found in:

Rosseel, Y. (2012). lavaan: An R Package for Structural Equation Modeling. *Journal of Statistical Software*, *48*(2), 1–36. https://doi.org/10.18637/jss.v048.i02