

A few other LMM things...

- You can add participant and item covariates as fixed effects, and you can have a variety of continuous and categorical variables in your LMM. LMMs are *very* flexible.
- You'll find that sometimes several models fit your data - always run likelihood comparison tests to determine which is the best fit. If you have a selection where not one is statistically better than the others, choose the model that makes most *theoretical* sense.

The danger of over-fitting

- Sometimes you'll find yourself trying to fit an over-parameterised model - this is one whether you are trying to estimate more components of the model than your data/design supports.
- In the latest version of lme4, you'll receive a "singular fit" error if your model appears over-parameterised - one solution is simplify the random effects structure (usually by removing random slopes) in a way that makes theoretical sense until you arrive at a model that fits (but doesn't overfit) your data.
- Having said that, if the random effects structure makes complete theoretical sense then you might not want to simplify it. Often it's a judgement call...
- Read more in "Parsimonious mixed models" by Bates et al. here: <https://arxiv.org/abs/1506.04967>