**Longitudinal Computational Modeling**

1. Introduction
   1. Characteristics of longitudinal data and longitudinal models
      1. Describe what qualifies as longitudinal
         1. 3+ waves of data on the same measures for the same people (Ployhart & MacKenzie)
      2. Benefits of longitudinal designs
         1. Examine change at both group and individual level
         2. Establish sequence of events (i.e., what predicts what)
      3. Drawbacks to longitudinal designs
         1. Expensive & difficult
         2. Frequently observational; thus, cannot establish causation
         3. Sequence effects may bias results
   2. A brief overview of longitudinal modeling methods
      1. RM ANOVAs
      2. Multilevel modeling
      3. Latent growth curve modeling
   3. Current study
      1. Prior longitudinal methods rely only on general linear model (i.e., cannot structure theoretical model to capture growth within the model)
         1. Good place to put in McElreath quote about GLM – something like “definitely wrong but hard to beat”
         2. To incorporate theoretical model, typically have to use two-stage approach
      2. Here, we show how to incorporate growth-related parameters in computational models so that our theoretical model can capture growth in a similar way as typical growth modeling
         1. Benefits
            1. Propagate uncertainty across multiple levels of analysis which improves inferences (?) – **it would be good if we could show this.**
            2. Allows us to use theoretical models to examine growth instead of summary statistics

AUC for delay discounting might be a good example here

1. Method/Results (a & b might be presented like separate experiments, each with their own method and results)
   1. Build simple 1-parameter reinforcement learning model of some simple yes/no decision-making task?
      1. Model-building process
         1. How it would be fit to a single person
         2. How it would be fit to multiple people (single timepoint model)
         3. How it would be fit to multiple people across time (growth model)
      2. Simulations:
         1. Simulate data based on growth model across multiple conditions

|  |  |  |
| --- | --- | --- |
|  | No cor | Moderate cor |
| No effect | *rtime* = 0, *d* = 0 | *rtime* = .3, *d* = 0 |
| Moderate effect | *rtime* = 0, *d* = .5 | *rtime* = .3, *d* = .5 |

* + - 1. Fit single timepoint and growth RL model to each timepoint
    1. Results
  1. Present PP-ORL model
     1. Show single timepoint model
     2. Show growth model
     3. Introduce TADS data
     4. Fit both models to data
     5. Results

1. Discussion
   1. Benefits of this approach
      1. Propagate uncertainty across levels of data
      2. (Hopefully) note how data were better characterized with growth model
      3. Could include other covariates
   2. Drawbacks of this approach
      1. Note any issues we found
      2. Computationally intensive