Structural Equation Modeling

P.11 - Multilevel Model for Change (Part 2)

November 15, 2022 (15:04:49)

Lab Description

In this assignment you are going to estimate several multilevel models that reproduce the findings discussed in *lecture 11*. Compare your results with the findings reported in the lecture slides. Try to use the lecture slides as a guide through the `R` output.

For this practical you will need the following packages: `lme4`, `ggplot2`, and `psych`. You can install and load these packages using the following code:

```r
# Install packages.
install.packages(c("lme4", "ggplot2", "psych"))

# Load the packages.
library(lme4)
library(ggplot2)
library(psych)
```

Questions

Start by loading the `alcohol.csv` data in `R`, then compute basic descriptive statistics. The data is available on Canvas in the module corresponding to the current lab session.

1. Estimate the the *unconditional means model* (i.e., as `model_a`). In this model, the variable `alcuse` (i.e., alcohol use) is the dependent variable, which is only predicted by the intercept.
   - *Tip.* Recall how interecepts are modeled in simple linear regression, and how to allow for the intercepts to vary across individuals.
2. Calculate the *interclass correlation coefficient* (ICC) from `model_a`.
3. Estimate the *unconditional growth model* (i.e., as `model_b`). In this model, allow for random variation in the `age_14` variable, which captures the effect of time.
   - *Note.* The variable `age_14` by subtracting 14 from the variable `age`. Therefore, variable `age_14` holds 0 for age 14, 1 for age 15, and 2 for age 16.

4. Estimate another model (i.e., `model_c`), where the variable `coa` predicts both the initial status and the rate of change in variable `alcuse`.
    - *Note.* The variable `coa` refers to whether the children belongs to a family with an alcoholic parent, i.e., coded as 1, and 0 otherwise.
5. Calculate the proportional reduction in variance in the initial status and the rate of change due to including the `coa` predictor in the model.
6. Estimate another (i.e., `model_d`) in which the variable `peer` is added to `model_c` to explain the initial status and the rate of change in `alcuse`.
    - *Note.* The variable `peer` is a measure of peer alcohol use.
7. Calculate the proportional reduction in variance in the initial status and the rate of change due to including the `peer` predictor in the model.
8. Estimate another model (i.e., `model_e`), in which the non-significant effect of varaible `coa` on the rate of change is removed.
9. Estimate another model (i.e., `model_f`) based on `model_e`, but with intercepts that describe a child of non-alcoholic parents with an average value of `peer` (i.e., use the centered variable `cpeer`).
10. Perform a *Likelihood-Ratio Test* (LRT) in which you simultaneously compare `model_c`, `model_d`, and `model_e`. What do you conclude?