Class 6 In-Class Assignment  
HBEH 762  
October 5, 2018

We use the same data as last week’s class to focus on the variance accounted for, model comparisons, and cross-level interactions.

Our datafile is "motivation.sas7bdat." Our subjects are students in grades 7 through 9, nested within 47 classrooms.

Our variables are:

* **classid** (unique classroom identifier)
* **studentid** (unique student identifier)
* **goalstrct** (classroom-level variable indicating the extent to which the classroom emphasizes performance and demonstrating ability)
* **sex** (0=female; 1=male)
* **relperf** (student-level variable indicating the extent to which a student is focused on his or her relative performance)
* **intrinsic** (a measure of the student's intrinsic motivation)

At **Level 1**, we have group-mean centered **relperf** (to create **relperf\_grpmc**) around class means. At **Level 2**, we have grand-mean centered the class-specific means of **relperf** (to create **relperf\_class\_grdmc**), and grand-mean centered **goalstrct** (to create **goalstrct\_grdmc**).

Answer the following questions, using the attached abridged outputs when necessary.

**Questions**

1. We fit the null model predicting intrinsic motivation and find the residual variance is 2.12 and the intercept variance is .70. In **Model 1** below, how much variance is accounted for by the random intercept? How much is accounted for by the random slope? That is, make two separate proportion-of-variance calculations, one for intercept and one for slope.
2. What is the -2\*LL of **Model 1**? What is the -2\*LL of **Model 2**? Calculate the chi-square statistic comparing the fit of these two models. Assume that there is one degree of freedom for this test, and that the critical p.value for a chi-square with 1 degree of freedom is 3.84. Does Model 2 fit significantly better than Model 1?
3. Look at the output of **Model 2**. Write a sentence or two about what the significant interaction term between goal structure and relative performance means. (You don’t need to include coefficients.)

# Model 1. Random slopes model with effects of relative performance and sex

We first fit a random intercepts model, testing the Level-1 effects of **sex** and **relperf**, as well as the Level-2 effect of **relperf\_class\_mean** and **goalstrct,** on **intrinsic.**

**Here are the Level 1 and Level 2 equations:**

Level 1:

Level 2:

**Here is the abridged output:**

## Covariance Parameter Estimates  
##   
## Standard Z  
## Cov Parm Subject Estimate Error Value Pr Z  
##   
## UN(1,1) classid 0.1587 0.06357 2.50 0.0063  
## UN(2,1) classid 0.03438 0.05358 0.64 0.5211  
## UN(2,2) classid 0.1086 0.05832 1.86 0.0313  
## Residual 1.9459 0.1132 17.19 <.0001  
##

## Fit Statistics  
##   
## -2 Log Likelihood 2467.6  
## AIC (smaller is better) 2485.6  
## AICC (smaller is better) 2485.8  
## BIC (smaller is better) 2502.2  
##   
## Solution for Fixed Effects  
##   
## Standard  
## Effect Estimate Error DF t Value Pr > |t|  
##   
## Intercept 6.2539 0.09774 44 63.99 <.0001  
## sex 0.002304 0.1105 592 0.02 0.9834  
## relperf\_grpmn 0.3089 0.07590 46 4.07 0.0002  
## relperf\_class\_grdmc -0.2210 0.2268 592 -0.97 0.3303  
## goalstrct\_grdmc -0.8436 0.08610 592 -9.80 <.0001  
##   
##   
## Type 3 Tests of Fixed Effects  
##   
## Num Den  
## Effect DF DF F Value Pr > F  
##   
## sex 1 592 0.00 0.9834  
## relperf\_grpmn 1 46 16.56 0.0002  
## relperf\_class\_grdmc 1 592 0.95 0.3303  
## goalstrct\_grdmc 1 592 96.01 <.0001

# Model 2. Adding in an interaction between goal structures and relative performance

We now fit a random slopes model, testing the Level-1 effects of **sex** and **relperf** on **intrinsic.**

**Here is the abridged output:**

## Covariance Parameter Estimates  
##   
## Standard Z  
## Cov Parm Subject Estimate Error Value Pr Z  
##   
## UN(1,1) classid 0.1586 0.06299 2.52 0.0059  
## UN(2,1) classid 0.03436 0.03660 0.94 0.3478  
## UN(2,2) classid 0.04151 0.03732 1.11 0.1331  
## Residual 1.9352 0.1116 17.34 <.0001  
##   
##   
## Fit Statistics  
##   
## -2 Log Likelihood 2450.0  
## AIC (smaller is better) 2470.0  
## AICC (smaller is better) 2470.3  
## BIC (smaller is better) 2488.5  
##   
##   
## Solution for Fixed Effects  
##   
## Standard  
## Effect Estimate Error DF t Value Pr > |t|  
##   
## Intercept 6.2781 0.09747 45 64.41 <.0001  
## sex -0.04449 0.1099 591 -0.40 0.6857  
## relperf\_grpmn -0.6191 0.2162 45 -2.86 0.0063  
## relperf\_class\_grdmc -0.2112 0.2258 591 -0.94 0.3500  
## goalstrct\_grdmc -0.8018 0.08663 591 -9.26 <.0001  
## relperf\_gr\*GoalStrct 0.3152 0.07054 591 4.47 <.0001  
##   
##   
## Type 3 Tests of Fixed Effects  
##   
## Num Den  
## Effect DF DF F Value Pr > F  
##   
## sex 1 591 0.16 0.6857  
## relperf\_grpmn 1 45 8.20 0.0063  
## relperf\_class\_grdmc 1 591 0.87 0.3500  
## goalstrct\_grdmc 1 591 85.66 <.0001  
## relperf\_gr\*GoalStrct 1 591 19.96 <.0001