# Lab #4

Multilevel Linear Models (MLM)

Copy and paste any results and write out your answers in the space provided.

## SPSS

### Using “popular.sav”

1. Fixed-Intercept Only Model (Model 0)

MIXED popular

/FIXED=| SSTYPE(3)

/METHOD=ML

/PRINT=SOLUTION DESCRIPTIVES.

HIGHLIGHT HERE AND PASTE THE OUTPUT.

1. Random-Intercept Only Model (Model 1)

MIXED popular

/FIXED=| SSTYPE(3)

/METHOD=ML

/PRINT=SOLUTION

/RANDOM=INTERCEPT | SUBJECT(class) COVTYPE(UN).

HIGHLIGHT HERE AND PASTE THE OUTPUT.

2.a. Compute a likelihood ratio chi-square comparing this model to the previous model and test for significance. Does adding random intercepts improve the model?

HIGHLIGHT HERE AND ANSWER #2.a.

2.b. Look at the AIC, what does that tell you about model improvement?

HIGHLIGHT HERE AND ANSWER #2.b.

2.c. Compute the ICC.

HIGHLIGHT HERE AND ANSWER #2.c.

1. Random-Intercept and Fixed Level 1 Predictors (Extraversion (Model 2) and Female (Model 3) sequentially)

Model 2 syntax:

MIXED popular WITH cextrav

/FIXED=cextrav | SSTYPE(3)

/METHOD=ML

/PRINT=SOLUTION DESCRIPTIVES

/RANDOM=INTERCEPT | SUBJECT(class) COVTYPE(UN)

HIGHLIGHT HERE AND PASTE THE OUTPUT.

3.a. Compute a likelihood ratio chi-square comparing this model to the previous model and test for significance. Does adding extraversion as a fixed predictor improve the model?

HIGHLIGHT HERE AND ANSWER #3.a.

3.b. Look at the AIC, what does that tell you about model improvement?

HIGHLIGHT HERE AND ANSWER #3.b.

Model 3 syntax:

MIXED popular WITH cextrav female

/FIXED=cextrav female | SSTYPE(3)

/METHOD=ML

/PRINT=SOLUTION DESCRIPTIVES

/RANDOM=INTERCEPT | SUBJECT(class) COVTYPE(UN).

HIGHLIGHT HERE AND PASTE THE OUTPUT.

3.c. Compute a likelihood ratio chi-square comparing this model to the previous model and test for significance. Does adding female as a fixed predictor improve the model?

HIGHLIGHT HERE AND ANSWER #3.c.

3.d. Look at the AIC, what does that tell you about model improvement?

HIGHLIGHT HERE AND ANSWER #3.d.

1. Random-Intercept and Random Level 1 Predictors (Extraversion (Model 4) and Female (Model 5))

Model 4 syntax:

MIXED popular WITH cextrav female

/FIXED=cextrav | SSTYPE(3)

/METHOD=ML

/PRINT=SOLUTION

/RANDOM=INTERCEPT cextrav | SUBJECT(class) COVTYPE(UN).

HIGHLIGHT HERE AND PASTE THE OUTPUT.

4.a. Compute a likelihood ratio chi-square comparing this model to the previous model and test for significance. Does adding extraversion as a random effect improve the model?

HIGHLIGHT HERE AND ANSWER #4.a.

4.b. Look at the AIC, what does that tell you about model improvement?

HIGHLIGHT HERE AND ANSWER #4.b.

Model 5 syntax:

MIXED popular WITH cextrav female

/FIXED=cextrav female | SSTYPE(3)

/METHOD=ML

/PRINT=SOLUTION

/RANDOM=INTERCEPT cextrav female | SUBJECT(class) COVTYPE(UN).

HIGHLIGHT HERE AND PASTE THE OUTPUT.

4.c. Compute a likelihood ratio chi-square comparing this model to the previous model and test for significance. Does adding female as a random effect improve the model?

HIGHLIGHT HERE AND ANSWER #4.c.

4.d. Look at the AIC, what does that tell you about model improvement?

HIGHLIGHT HERE AND ANSWER #4.d.

1. Adding Level 2 Predictors (Model 6)

Model 6 syntax:

MIXED popular WITH cextrav female ctexp

/FIXED=cextrav female ctexp | SSTYPE(3)

/METHOD=ML

/PRINT= SOLUTION DESCRIPTIVES

/RANDOM=INTERCEPT cextrav female | SUBJECT(class) COVTYPE(UN).

HIGHLIGHT HERE AND PASTE THE OUTPUT.

5.a. Compute a likelihood ratio chi-square comparing this model to the previous model and test for significance. Does adding teacher experience as a fixed effect improve the model?

HIGHLIGHT HERE AND ANSWER #5.a.

5.b. Look at the AIC, what does that tell you about model improvement?

HIGHLIGHT HERE AND ANSWER #5.b.

5.c. Can we test teacher experience as a random effect? Why or why not?

HIGHLIGHT HERE AND ANSWER #5.c.

1. Adding Cross-Level Interactions (Model 7)

Model 7 syntax:

MIXED popular BY cextrav female ctexp

/FIXED=cextrav female ctexp cextrav\*ctexp | SSTYPE(3)

/METHOD=ML

/PRINT=SOLUTION

/RANDOM=INTERCEPT cextrav female | SUBJECT(class) COVTYPE(UN).

HIGHLIGHT HERE AND PASTE THE OUTPUT.

6.a. Compute a likelihood ratio chi-square comparing this model to the previous model and test for significance. Does adding the cross-level interaction as a fixed effect improve the model?

HIGHLIGHT HERE AND ANSWER #6.a.

6.b. Look at the AIC, what does that tell you about model improvement?

HIGHLIGHT HERE AND ANSWER #6.b.

## R

1. Open a new R notebook

7.a. **File** 🡪 **New File** 🡪 **R Notebook**

7.b. Clear everything from the new notebook.

7.c. Add to the file the following and run the chunks:

---

title: "Psy524 Lab #4 R code"

author: "Your Name"

output:

word\_document: default

html\_notebook: default

---

# Psy524 Lab #4 R Syntax

```{r Load Libraries}

#install.packages("foreign")

library(foreign)

#install.packages("lme4")

library(lme4)

```

# Load Data

```{r Loading Data}

popular <-read.spss("https://github.com/AndrewAinsworth/psy524/raw/master/LabAssignments/Lab04/popular.sav",

use.value.label=TRUE,

to.data.frame=TRUE)

names(popular) <- tolower(names(popular))

```

1. Running fixed intercept and random intercepts only models and comparing them.

# Testing fixed intercept and random intercepts only models

```{r Models 0 and 1}

#Fixed Intercept Only Model

model0 <- lm(popular ~ 1, data = popular)

summary(model0)

print(model0)

#Random Intercepts only model

model1 <- lmer(popular ~ 1 + (1 | class), data = popular, REML = FALSE)

summary(model1)

print(model1)

#Is it better to have random intercepts?

anova(model1,model0)

```

1. Let’s add in a predictor as both a fixed and random effect.

# Adding in extraversion as a fixed and then random predictor

```{r Model2}

#Does adding in extraversion as a fixed effect improve the model?

model2 <- lmer(popular ~ cextrav + (1 | class), data = popular, REML = FALSE)

summary(model2)

print(model2)

anova(model2,model1)

#Does allowing extraversion be a random effect improve the model?

model3 <- lmer(popular ~ cextrav + (cextrav | class), data = popular, REML = FALSE)

summary(model3)

print(model3)

anova(model3,model2)

```