Name:

**Hierarchical Linear Modeling**

Psyc 741, Spring 2025

**Due Date**: February 24th (by 11:00 AM)

**Session 5 – In-Class Assignment**

For this in-class assignment, you will be carrying out null, random intercept, and random slopes models.

You will be completing the following questions, some of which involve conducting analyses in R. You will hand in the answers to the questions; enter them into this word document. Some of the answers involve you copying and pasting your R code. However, you also need to submit your *complete* R code too (saved as a .R script file). Submit both this completed document and your R script file to the submission portal for the Session 5 In-Class Assignment on Canvas.

1. Import the **Nurses.sav** data files into RStudio. This data file contains information about a sample of nurses nested within hospitals.

**Null Model**

1. Execute a null multilevel model with the cluster ID as the random intercept variable and nurse stress as the dependent variable. Make sure that maximum likelihood (ML) is used as the estimator. Paste your R syntax below.

null\_model <- lmer(stress ~ (1|hospital), REML = F, data = df)

1. Report the following variance components from the model output:
   1. Between-group variance: 0.2730
   2. Within-group variance: 0.6863
2. Calculate and report the intraclass correlation coefficient (ICC) below and decide if multilevel modeling seems necessary for this data.

ICC = 0.2845825, yes multilevel modeling is indeed necessary.

**Random Intercept Model**

1. There is a variable in the dataset that reports the experience of the nurses in years (experien). The models below also include the hospital average (mean) experience of the nurses. Create an aggregate version of the experien variable such that the mean experience of the nurses for each hospital is included in the data frame. Copy/paste your R syntax below.

df <- df %>%

group\_by(hospital) %>%

mutate(mean\_exp = mean(experien, na.rm = T)) %>%

ungroup()

1. Execute a random intercept model with the same random intercept from the null model as above and the following fixed effects predictors: the age of the nurse, the experience of the nurse, the hospital average experience for nurses you created in Q5, and the hospital size (treated as a factor). Make sure that maximum likelihood (ML) is used as the estimator. Paste your R syntax below.

ri\_model <- lmer(stress ~ experien + age + mean\_exp + as\_factor(hospsize) + (1|hospital), REML = F, data = df)

1. Report the following fit statistics from the random intercept model:
   1. AIC: 2478.2
   2. BIC: 2517.5
2. Report the following variance components from the random intercept model output:
   1. Between-group variance: 0.1695
   2. Within-group variance: 0.6462
3. Report which fixed effects predictors were statistically significant or not and the directionality of the effects.

The experience of the nurse is negatively associated with stress, while age and hospital size are positively associated with stress, and all these effects are significant.

**Random Slope Model**

1. Execute a random slope model that is the same as the random intercept model as in Q6 above but also has a random effect for the experien slope included. Paste your R syntax below.

rs\_model <- lmer(stress ~ experien + age + mean\_exp + as\_factor(hospsize) + (1|hospital) + (1|hospital:experien), REML = F, data = df)

1. Make a determination if this random slope should be retained in the model or not. Provide the supporting evidence for your determination.

The random slope should not be retained as the random effect is not significant ( p = 0.92)