# Lab 08: Models with Multiple Categorical Predictors (Multi-Way).

As always, indicate your answers using a different color font or shading to clearly separate your answers from the questions. When you are finished, save the file as "lab08\_FIRST\_LAST" using **your** first name and **your** last name, and then upload the file as a Word Document or .pdf on Canvas.

Start by opening the data\_THERAPY.csv datafile in Jamovi. These data show the results of a hypothetical study in which psychotherapy was combined with different types of medication in the treatment of depression. The different drugs (Drug A, Drug B, and an inert Placebo) were tested in combination with psychotherapy (either active Treatment or a no treatment Control) and participants’ depressive and anxious symptoms were measured with validated surveys. For our purposes, these different symptom counts have been combined into a single outcome called “Mood” where greater values indicate fewer symptoms (i.e., higher numbers indicate treatment was more effective).

## Question 1.

1A. Create a **boxplot** showing Mood scores as a function of both Psychotherapy and Drug:

1B. Insert a **table of descriptive statistics** showing the mean and standard deviation for each of the six different groups in this study:

1C. To conduct the multiway ANOVA, select “ANOVA” under the ANOVA tab. Note that this is not a One-Way ANOVA because we have multiple factors, nor is it a Repeated Measures ANOVA because these were different people randomly assigned to different groups (i.e., one observation per person). Turn on the “Overall Model Test” and the “partial η2” measure of effect size. **Insert the ANOVA table** below:

1D. **Provide a written interpretation** of Main Effects and Interactions. Conduct any post-hoc tests that are required and include those post-hoc tests in your written interpretation.

1E. Finally, turn on the assumptions checks for Homogeneity, Normality, and the QQ Plot. Insert those assumption checks below. **Do these data satisfy the assumptions for a Multi-Way ANOVA**?

Question 2

Next, we will be using the data\_TEACHING.csv datafile to explore the effects of two different science curricula delivered by two different teachers. Our outcome will be students’ scores at the end of the class (ignoring pre-test scores for now) and we will have two categorical factors of Curriculum (+1 = the new experimental curriculum; -1 = the traditional “control” curriculum) and Teacher (+1 = Teacher A and -1 = Teacher B). Ideally, we would like to see an effect of curriculum (in either direction), but not an effect of teacher (as hopefully our teachers have similar efficacy, baseline student abilities, etc.). However, it is important to see if there are any teacher effects, so we want to include it as a factor in our model.

2A. Create a **boxplot** showing students’ scores as a function of both Teacher and Curriculum:

2B. Insert a **table of descriptive statistics** showing the mean and standard deviation for each of the four different groups in this study:

2C. To conduct the multiway ANOVA, select “ANOVA” under the ANOVA tab. Turn on the “Overall Model Test” and the “partial η2” measure of effect size. **Insert the ANOVA table** below:

2D. **Provide a written interpretation** of Main Effects and Interactions. Conduct any post-hoc tests that are required and include those post-hoc tests in your written interpretation.

2E. Finally, turn on the assumptions checks for Homogeneity, Normality, and the QQ Plot. Insert those assumption checks below. **Do these data satisfy the assumptions for a Multi-Way ANOVA**?

Question 3

Finally, using the data\_TEACHING dataset again, we want to conduct the comparable ANOVA but using the Regression tab to make it clear that Factorial ANOVA is a special case on the general linear model. Use the “Linear Regression” function under the Regression tab. Set up your regression with Scores as the outcome and Curriculum, Teacher, and the Teacher x Curriculum interaction as predictors.

3A. Insert the **regression table** showing the Estimates, Standard Errors, t-observed, and p-values for all of the parameters in your model.

3B. Write out the **full regression equation** using the Estimates from your table above:

3C. Insert the appropriate values to solve the regression equation to get the predicted values in each group:

* New Curriculum, Teacher A:
* New Curriculum, Teacher B:
* Old Curriculum, Teacher A:
* Old Curriculum, Teacher B:

3D. Do these predicted values match the means that you calculated in the descriptive statistics table back in 2B?