# Lab 03: Z-scores and probabilities under the normal curve.

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 "lab0\_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\_GAME.csv datafile in Jamovi. These data resemble real data taken from a study of two groups of participants who learned to a motion-controlled video game using the upper extremity (e.g., like the Microsoft Kinect). Participants completed a pre-test and were then either randomly assigned to practice where they chose the difficulty of the game from block to block, or to a matched group who were assigned the same difficulty schedule as a matched participant (i.e., received the same difficulty schedule but did not have choice). Twenty-four hours later the participants completed a post-test to asses their retention. Participants also completed several psychological questionnaires to assess engagement with the task: focused attention (FA), usability (US), aesthetics (AES), endurability (END), novelty (NOV), and level of involvement (INV which you can also think of as “immersion”). All of these variables combine to form a composite score for total engagement (EngTotal).

## Question 1.

Create a **scatterplot** showing the relationship between post-test scores (on the y-axis) and pre-test scores (on the x-axis) as a function of group. Next create a **scatterplot** showing the relationship between post-test scores (on the y-axis) and total engagement (on the x-axis) as a function of group.

Notice that all of these variables are on arbitrary and different scales. As such, it might be useful to **normalize** (i.e., z-transform) all of these variables. Create new normalized variables called Post.z, Pre.z, and Eng.z, respectively.

1A. Create a **density** plot showing the distribution of Post.z as a function of group.

1B. Insert a **scatterplot** showing the relationship between Post.z (on the y-axis) and Pre.z (on the x-axis) as a function of group. Turn on the **marginal distributions** for this plot.

1C. Calculate a 95% confidence interval around the **mean** of Post-Test scores:

Lower Limit:

Upper Limit:

Question 2

2A. For a standard normal distribution, what should be the values of the mean and the standard deviation?

2B. Create a table of descriptive statistics for the three normalized scores you created above, obtain the sample size, mean, and standard deviation for each group. Insert the table below:

2C. Given your answer in 2A, do the values you see in 2B make sense? Why or why not?

Question 3

Use data either from your own discipline or from one of the datasets from the course (see the zipped “data” folder and the “Data Dictionary” under Module 02) to answer the following questions below:

Note that for these questions you will need a data-set that includes a continuous dependent variable at least one categorical independent variable.

3A. Insert a table of **descriptive statistics** for a dependent variable in those data. Include the sample size, mean, and standard deviation as a function of the independent variable/s. (That is, provide descriptive statistics for each group.)

3B. Given the data you have in 3A, calculate **95% confidence intervals** for the mean of each group, assuming a perfectly normal distribution of sample means. Relabel the groups and dependent variables in the table below as needed:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Group 1** | | **Group 2** | |
|  | ***Lower Limit*** | ***Upper Limit*** | ***Lower Limit*** | ***Upper Limit*** |
| **DV1** |  |  |  |  |
| **DV2 (if present)** |  |  |  |  |