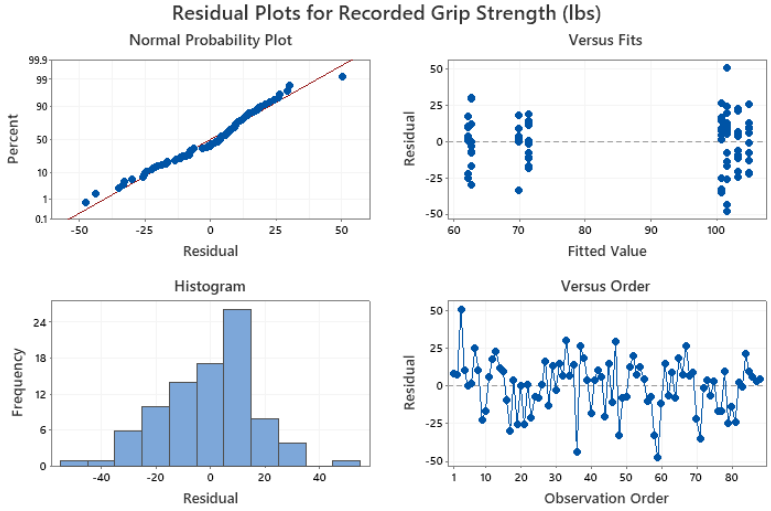
Statistical Methods Technical Summary

Research Question 1:

I decided to move forward with an ANOVA Generalized Linear Model for the statistical analysis method for research question one. Below are the plots that display the assumptions for the ANOVA Generalized Linear Model. Normality is good with the exception of observation 3. All of the observations were independent of each other. We should proceed with caution with equal variance due to the unusual observations causing a fanning pattern, but it is not too concerning. You should proceed with caution with these results because there is an uneven amount of participants across treatments. I found that observation 3 and 59 were true outliers in the data. Observation 36 was also an unusual observation, but it was not a true outlier because it did not show up in the box plot.



After variables are in click Graphs>Select Four in one to produce residual plots>click OK

Reproduce Analysis: Stat>ANOVA>General Linear Model>Fit General Linear Model>Select Recorded Grip Strength (lbs) as the Response Variable>Select Auditory Stimulus, Gender, and Grip Direction as the Factors>to include interactions click Mode>change Interactions through order pull-down menu to 3 and click Add and then OK>click OK and the analysis is produced

Reproduce Boxplot: Graph>Boxplot>With Groups>Select Recorded Grip Strength (lbs) as the Graphing Variable>Select Gender as the Categorical Variable>Click Data View and check the Outliers symbol box and Click OK>Click OK and the box plot is produced

Research Question 2:

For the second research question I used a sample size estimation based on a 95% Confidence Interval to determine the minimum number of participants needed for this experiment. I assumed the same standard deviation as the sample data (25.13, the sample SD is an efficient estimator of the population SD) and a Normal distribution of the data (distribution shown in bottom left plot of the Residual Plots above). I used errors of 4,5,6 since they all produced reasonable sample sizes. Because the grip strengths differed significantly across Gender, it would be beneficial to do a RCBD to make sure results are not biased by Gender. An even number of both participants in treatment groups and replicates ensures accurate results and allows us to measure the effects of the factors accurately.

Reproduce Analysis: Stat>Power and Sample Size>Sample Size for Estimation>change Parameter pull-down menu to Mean (Normal)>input 25.13 (sample standard deviation) into Standard Deviation>input 4 into Margins of Error>click OK>repeat for Margins of 5 and 6