Project 1: Test a Perceptual Phenomenon

Question 1: What is our independent variable? What is our dependent variable?

The independent variable is the word (Congruent or Incongruent) and the dependent variable is the reaction of the test taker.

Question 2: What is an appropriate set of hypotheses for this task? What kind of statistical test do you expect to perform? Justify your choices.

My Null Hypothesis would be that the Congruent mean should be greater than or equal to that of the Incongruent mean. My Alternate Hypothesis would be that Incongruent mean will be equal to or greater than that of the Congruent mean. With this Hypothesis I expect to perform a One Tailed Test. This will show if there is statistically a difference whether Congruent times are Greater than Incongruent.

H_0: $\mu_q \geq \mu_w$

H_1: $\mu_q < \mu_w$

*q= Congruent, w=Incongruent

The sample size is less than 30 making a t-test the right statistical test.

The following are assumptions for a t-test for dependent means:

- Interval or ratio scale of measurement (approximately interval)
- Random sampling from a defined population
- Samples or sets of data used to produce the difference scores are linked in the population through repeated measurement, natural association, or matching
- Scores are normally distributed in the population; difference scores are normally distributed

Given the data I would use a dependent t-test. I would use it because the scores are linked in the population. One person has a Congruent and a Incongruent score.

My Times

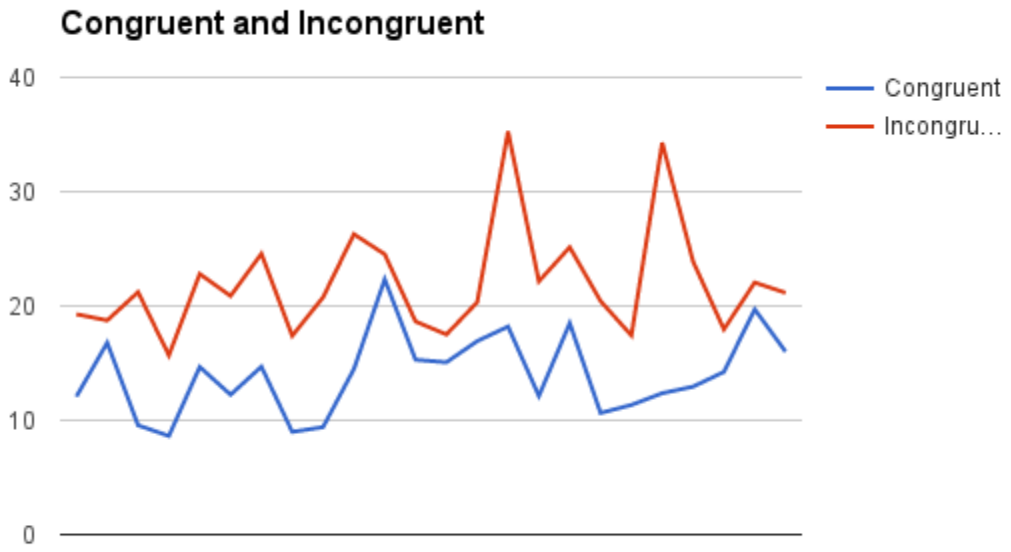
16.766, 26.453

Question 3: Report some descriptive statistics regarding this dataset. Include at least one measure of central tendency and at least one measure of variability.

Congruent: Average- 14.05, Median- 14.36, Standard Deviation- 3.56

Incongruent: Average- 22.02, Median- 21.02, Standard Deviation- 4.80

Question 4: Provide one or two visualizations that show the distribution of the sample data. Write one or two sentences noting what you observe about the plot or plots.



Between the two plots it is apparent that the incongruent sample took longer. In every case Congruent times are smaller than Incongruent. Both graphs show the comparison between Congruent and Incongruent between a single test taker.

Question 5: Now, perform the statistical test and report your results. What is your confidence level and your critical statistic value? Do you reject the null hypothesis or fail to reject it? Come to a conclusion in terms of the experiment task. Did the results match up with your expectations?

Degrees of freedom = 23, A = 0.05, T- Critical = - 1.714, T- Statistic = -8.03, P- Value = <0.0001

The mean difference is 7.97. With 23 degrees of freedom and a = 0.05, the Negative T- Critical Statistic would be -1.714 via the T-table. The Standard Deviation of the difference being 4.86. Then to get the T-Statistic I Calculated the following formula, $T=\frac{22.02-14.05}{4.86/\sqrt{24}}$. This gives you the T- Statistic of -8.13. Which gives you a p- value of <0.0001.

This difference is considered to be extremely statistically significant. The null hypothesis is rejected because with the Congruent mean being 14.05 and the Incongruent mean being 22.02 and the difference being 7.97 it is unlikely the mean of Congruent would be equal or greater than Incongruent. With this information it shows it takes more time to recognize Incongruent rather than Congruent. In Conclusion it takes significantly longer to complete the incongruent-condition task than the congruent-condition task.

Sources

http://www.graphpad.com/

https://s3.amazonaws.com/udacity-hosted-downloads/t-table.jpg

https://en.wikipedia.org/wiki/Stroop_effect

http://www.psychology.emory.edu/clinical/bliwise/Tutorials/TOM/meanstests/assump.htm