P1 - Stroop Effect

1. **What is your your independent variable? What is your dependent variable?**
   My independent variable is the color of the words in relation to the color the words stand for (Congruent vs. Incongruent). My dependent variable is the time it takes to say the color of the words.

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

H_0 **(Null)**	$\mu_C = \mu_I$
H_a **(Alternative)**	$\mu_C < \mu_I$

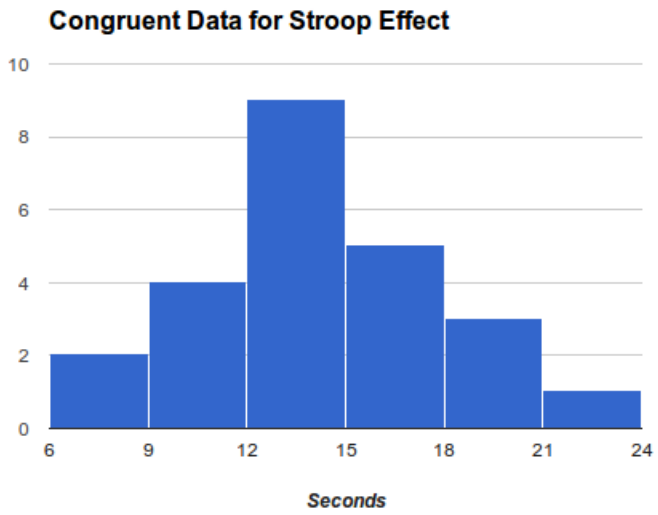
In plain English, the Null hypothesis (H_0) is that the Congruent population mean (μ_C) and the Incongruent population mean (μ_I) will be equal (=) to each other, and the Alternative hypothesis (H_a) is that the Congruent population mean (μ_C) will be less than (<) the Incongruent population mean (μ_I).

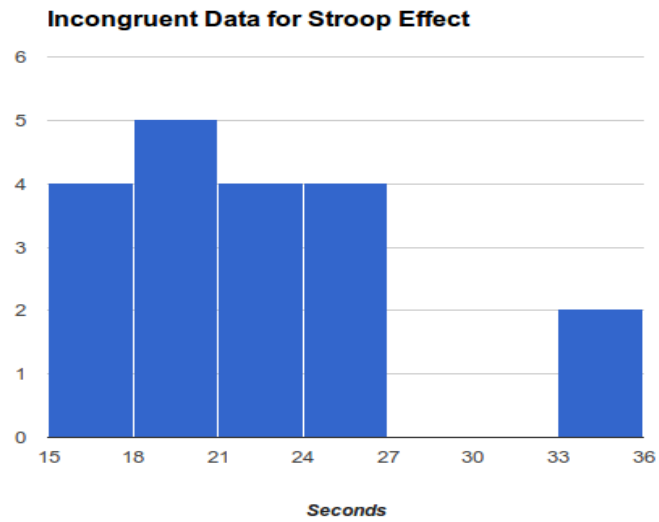
I expect to perform a one-tailed dependent sample T-test. One-tailed because my alternative hypothesis is only testing for a change in one direction; dependent sample because the subjects in each sample group are the same before and after a change occurred; and a T-test, as opposed to a Z-test, because of the small sample size (<30 in each sample group[1]) and the lack of information about population standard deviation.

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

	Congruent	**Incongruent**
Mean	14.051125	22.01591667
Median	14.3565	21.0175
Mode	N/A	N/A
Variance	12.66902907	23.01175704
Standard Deviation	3.559357958	4.797057122

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.**





Observational Note: The distribution for the Congruent Data is normal while the distribution for the Incongruent Data is positively skewed.

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?**

Confidence Level	95%
Critical Statistic Value	$\alpha = 0.05$ / T-critical = -1.714
Mean of D	-7.964791667
Standard Deviation	4.86482691
SEM	0.9930286348
T-statistic	-8.020706944
Margin of Error	-1.70205108
Critical Interval	(-9.666842747, -6.262740587)
Cohen's D	-1.637219949
r^2	0.7366364161
P-value	0.00005^2

After performing the one-tailed dependent variable T-test, the results above show that the calculated T-statistic of -8.020706944 is not only less than the T-critical score of -1.714, but has a P-value of 0.00005. This is an extremely small p-value showing that the difference between the means of the Congruent and Incongruent samples is extremely statistically significant. Also, because the results are in the negative direction, the test shows that the Congruent sample mean is indeed less than the Incongruent sample mean. As a result, the null hypothesis should be rejected and the alternative hypothesis should be accepted.

1. This particular criteria was taken from a discussion forum found here: https://discussions.udacity.com/t/p1-q2b-project-correction/176980/2
2. The P-value was calculated using the “P Value Calculator” here: http://www.graphpad.com/quickcalcs/pValue1/