Stroop Effect Test Data Analysis

As a general note, be sure to keep a record of any resources that you use or refer to in the creation of your project. You will need to report your sources as part of the project submission.

1. What is our independent variable? What is our dependent variable?

- The independent variable is the two conditions: a congruent words condition, and an incongruent words condition. In other words, whether the words in the list, that participant is asked to state the color of the text, match their prospective color or not.
- The dependent variable is the amount of time it takes a participant to name the ink colors of all words in the lists correctly.

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

- I would create a dependent-samples t test with a one tail p-value of .001.
- I chose a dependent-samples t test since I am estimating population characteristics using samples and both samples are tested on both variations of the independent variable.
- I chose a t test since I do not know any population descriptive statistics.
- I chose a one-tailed test since I want to know if the congruent test is short than the incongruent test response times in the population on average.
- Since I have such a small sample size I chose a very small p-value of .001 to test for a strong correlation.
- As you can see in figure 4 the difference of response times seems to not to be perfectly normally distributed but with such a small sample size of 24, it is difficult to create a normal distribution so I believe a t test is still a viable option.
- The null hypothesis postulates the average population response time for the incongruent Stroop list is equal to the average population response time for the congruent Stroop list. ($H_0: \mu_I = \mu_C$)
- The alternative hypothesis postulates the average population response time for the incongruent Stroop list is larger than the average population response time for the congruent Stroop list. ($H_0: \mu_I > \mu_C$)
- I believe that the alternative hypothesis in correct for this test based upon research I have completed online about Stroop affect.

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

- As you can see in the table below the congruent test took on average 7.96 seconds less to complete with a tighter standard deviation of about 1.24 less.

Figure 1	Congruent	Incongruent	Difference
Mean Time (s)	14.05	22.02	7.96
Standard Deviation Time (s)	3.56	4.80	4.86

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.
Both the congruent and incongruent and difference data is positively skewed as you can see figure 2, 3 and 4. In figure 5, one can see that the average is a lot larger for the incongruent test than the congruent test but the incongruent test has two large outliers which could have cause the mean to be skewed to a higher value.
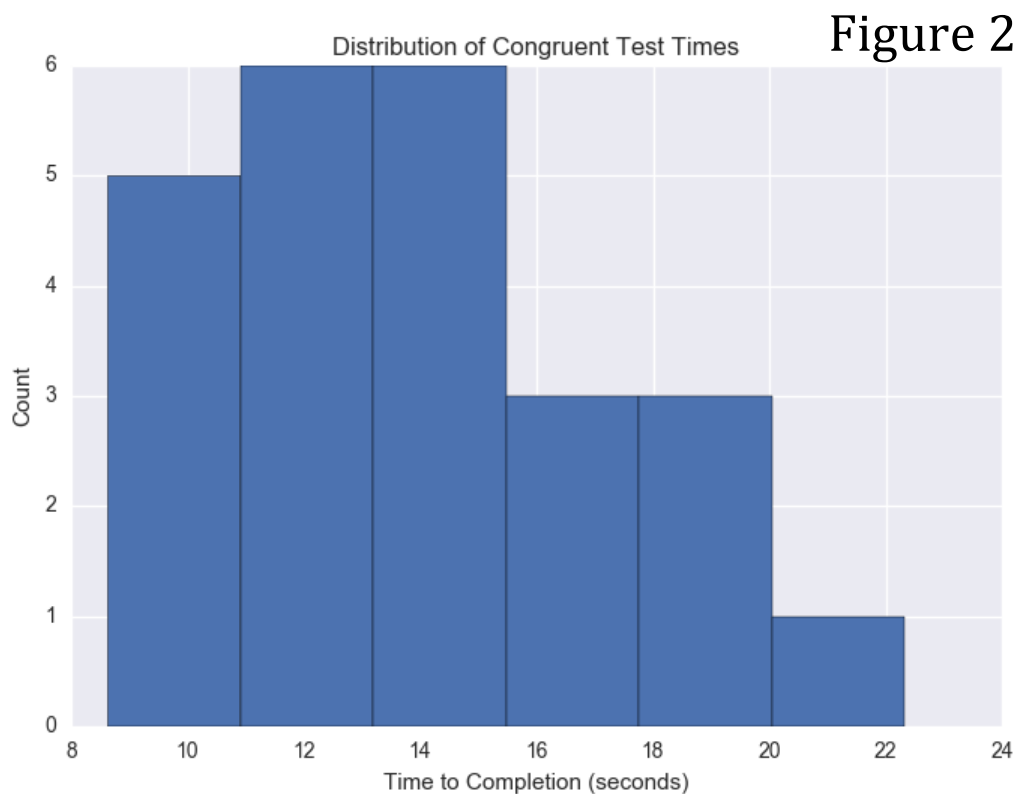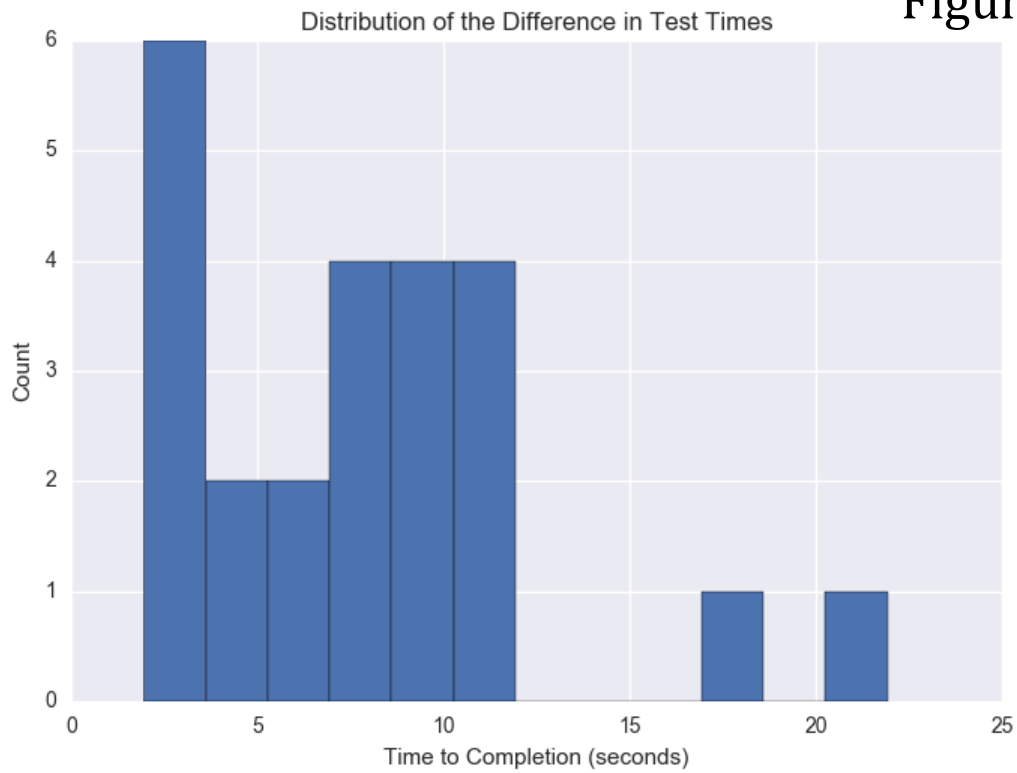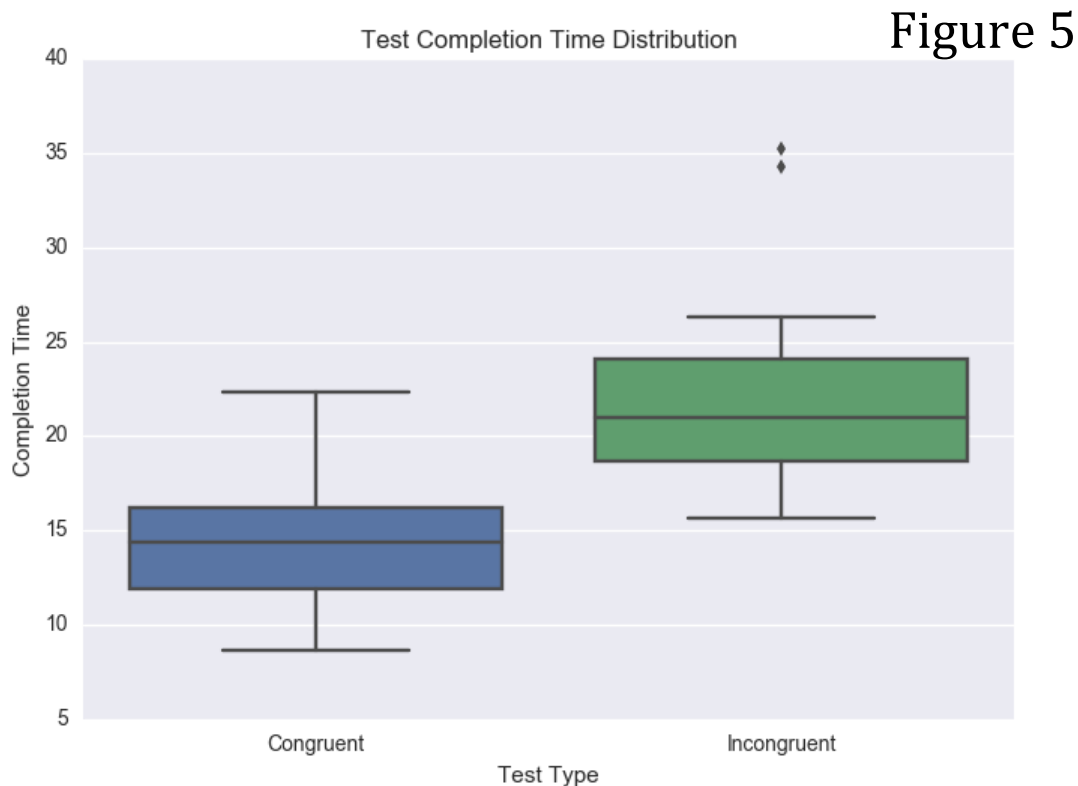

Distribution of Congruent Test Times

Figure 2

Figure 3

Distribution of Incongruent Test Times

Figure 4

Distribution of the Difference in Test Times

Test Completion Time Distribution

Figure 5

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?

I choose 3.485 as my t-critical value based upon my degrees of freedom = 23 and a p value of .001. In other words .100% of a t distribution has a greater than 3.485 t value. I calculated a t value for our data of 8.02 for a df=23 and a standard error of .99. Since my t value is much greater than the t critical value of 3.485, I reject the null hypothesis and conclude the average population response time for the incongruent Stroop list is significant larger than the average population response time for the congruent Stroop list. Based upon my t^2 value, I conclude about 74% of the change between the congruent and incongruent Stroop list completions times is caused by the changes in the Stroop lists. These results match up perfectly with my original hypothesis.

Figure 6	T Test
Standard Error	0.99
Df	23
T-statistic	8.02
T Squared	0.74

6. Optional: What do you think is responsible for the effects observed? Can you think of an alternative or similar task that would result in a similar effect? Some research about the problem will be helpful for thinking about these two questions!

After reviewing the site (https://faculty.washington.edu/chudler/words.html) I found an explanation for this phenomenon that seemed very reasonable. Following speed processing theory, the interference occurs because words are read faster than colors are named. The mind tackles the easiest problem first based on habit. Reading the word is quicker in the mind than identifying colors and it short-circuits when you are asked the color of an incorrectly named word. I would love to know if you placed name of the fruit on a bunch of fruits and ask people to ignore the word and tell me the fruit they view. Then perform the test with incongruent wording and see of the time changes significantly between tests.