Udacity P1 Submission
Test a Perceptual Phenomenon

Brian Preisler
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1. The independent variable in a Stroop task is the condition of the task as to whether it is congruent or incongruent. The congruent condition occurs when the color words' names match the colors in which they are printed, and the incongruent condition is when the color words' names do not match the colors in which they are printed. The dependent variable in the Stroop task is the amount of time it takes the participants to name the ink colors for equal size lists in each condition.

2. A)The null hypothesis (H_n) could be stated as when the average population time to name congruent conditions (μ_c) would be equal to the average population time to name incongruent conditions (μ_i). The alternative hypothesis (H_a) could be stated as when the average population time to name congruent conditions (μ_c) would not equal the average population time to name incongruent conditions (μ_i). Stated below is the mathematical formula:

   H_n: $\mu_c = \mu_i$

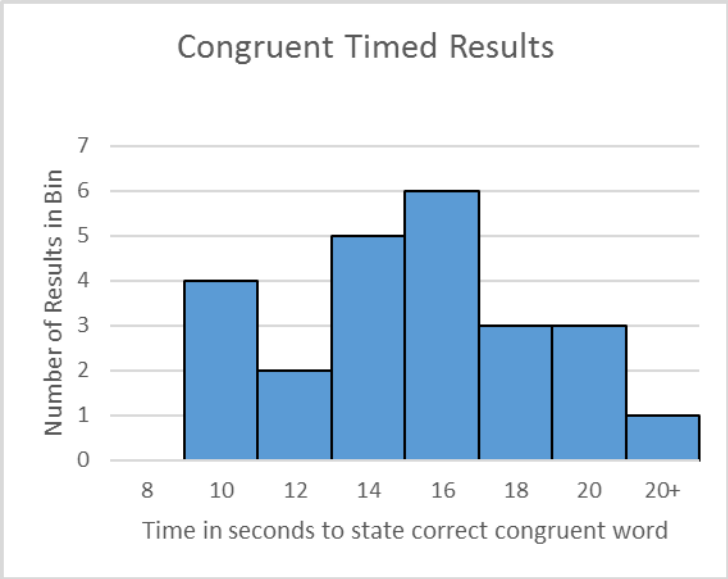
   H_a: $\mu_c \neq \mu_i$

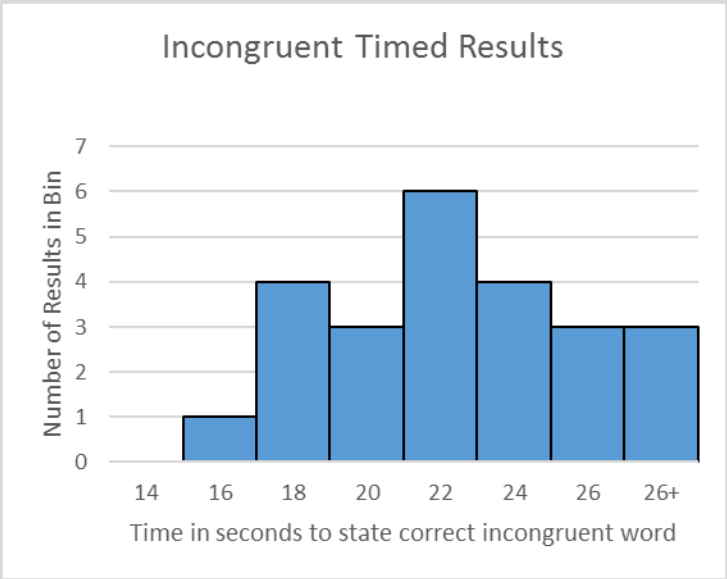
   B)The two tailed t test for dependent (or paired) variables could be used on this dataset because we desire to see if printing words in different colors has any effect on their ability to be read quickly by participants. Whether the congruency of the words make the participant faster or slower is less important overall as we care more about whether the difference is significant. Also, the two tailed test actually forces the test to be more conservative in nature because the α value is split in half for each tail. We can run this paired two tailed t test assuming that our data is continuous, our independent variable consists of matched pairs, there are no statistical outliers, and the distribution of the differences is normal.

3. The mean of the congruent data set is $\mu_c = 14.05$
   The mean of the incongruent data set is $\mu_i = 22.02$
   The mean of the differences between the two sets is $\mu_d = -7.96$
   These would be the measures of central tendency.

   The standard deviation of the congruent data set is $SD_c = 3.56$
   The standard deviation of the incongruent data set is $SD_i = 4.80$
   The standard deviation of the difference of data sets is $SD_d = 4.86$
   These would be the measures of variability.

4.





You can see in the above plots that the standard deviation is much higher for the plot of the incongruent data which reflects a more varied data set as seen in the 2 higher values. The difference in the means (μ) of the data also point to why a statistical test is necessary to tell if that difference is significant or not. Both distributions are roughly normal which is why we can perform the t test.

a. Confidence Level = 95%
-Critical statistic level = +- 2.069 (t critical value)

n (number of sample data points) = 24
df (degrees of freedom) = 23
α (alpha level for determining confidence) = .05
t statistic = -8.02
p = .0001

test result: The test rejects the null hypothesis as the t statistic (-8.02) is below the t

critical values with an alpha level of 0.05. The p value of .0001 also points to the fact that the probability of obtaining these results randomly is very rare and less than 1%.

I expected the difference in the two data sets to be statistically significant so I am not surprised by the results of the t test, except maybe in the small size of the p value. When taking the test it seemed clear that the incongruent words definitely had an effect on the time it took me to correctly state the color.

Sources:

Udacity Statistics Class
-Lessons 9 and 10
https://statistics.laerd.com/stata-tutorials/paired-t-test-using-stata.php
-To find assumptions about a paired two tail t test