Science of Decisions: The Stroop Effect

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Purpose: To investigate the Stroop Effect, namely the difference in time taken to complete the two tasks of the Stroop Effect: The Congruent Task and the Incongruent Task. I believe that the type of task determines the time taken to complete the task, thus the independent variable is the Type of task (Congruent or Incongruent) and the dependent variable will be the in time taken to complete the task (in seconds).

Hypothesis:

The following hypothesis test is based on the expectation that the average time taken to complete Incongruent task of the Stroop Effect is longer than the average time taken to complete the Congruent task:

H0: μ Incongruent = μ Congruent

H1: μ Incongruent > μ Congruent

The test chosen was a 1-sided *dependent sample t-test* for the following reasons:

- Small sample size (n=24)
- Unknown Population Standard Deviation
- Both samples (Congruent and Incongruent) are matched pairs coming from the same group of participants hence the data is *dependent*
- It is expected that the Incongruent task takes longer so we are exclusively interested in the right-tail of the test

Descriptive Statistics: The following statistics are based on the difference (Incongruent time-Congruent time) in seconds, for each observation in the dataset.

Median=7.67

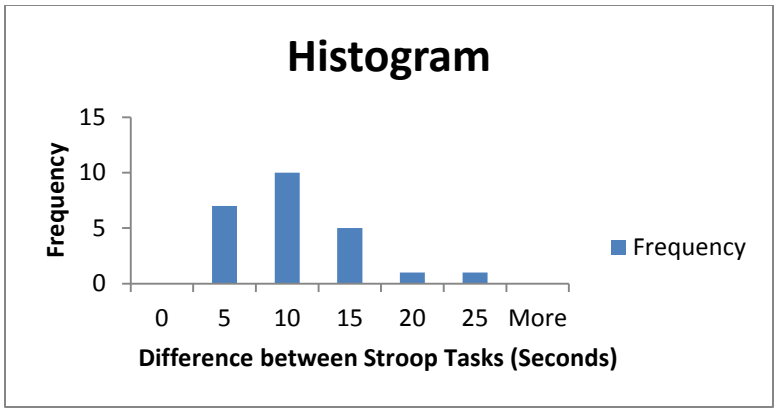
Mean=7.96

Standard Deviation: 4.86

75^{th} percentile: 10.26

25^{th} percentile: 3.65

Visualization:



As noted by the preceding Histogram, the distribution of the data is unimodal and left-skewed with the majority of observations falling between 5 to 15 seconds for the difference in time between the time taken to complete the Incongruent task vs the Congruent Task of the Stroop effect.

Statistical Test:

The following chart summarizes the output of a paired-sample t-test in 2010 Excel (confidence level=0.05) performed on the dataset:

	Incongruent	*Congruent*
Mean	22.01591667	14.051125
Variance	23.01175704	12.66902907
Observations	24	24
Pearson Correlation	0.351819527	
Hypothesized Mean Difference	0	
df	23	
t Stat	8.020706944	
P(T<=t) one-tail	2.0515E-08	
t Critical one-tail	1.713871528	
P(T<=t) two-tail	4.103E-08	
t Critical two-tail	2.06865761	

The T- statistic (8.021) exceeds the critical value of 1.714 for a one-sided test. The p-value of 2.05E-08 means that is highly unlikely to obtain 7.96 s difference due to chance, hence we reject the null hypothesis that μ Incongruent= μ Congruent. This result corresponds to the expectation that the Incongruent task of the Stroop effect takes longer to complete than the Congruent Task.

References and Sources

Information about the Stroop effect: https://faculty.washington.edu/chudler/words.html#seffect

Data Analysis done in Excel 2010.