Stroop Effect Hypothesis Testing

By Amandeep Mander

1. Our independent variable is the congruency of the test, i.e. whether the words presented are congruent or incongruent.
   Our dependent variable is the time that it takes to name the ink colors.

2. My null hypothesis is that the time it takes to name the ink colors under the incongruent words condition is less than or equal to the time it takes to name the ink colors under the congruent words condition. My alternative hypothesis is that the time it takes to name the ink colors under incongruent colors is greater than the time it takes to name the ink colors under congruent colors.
   I am treating this as a positive one-tailed test since I believe that the time it takes to name the ink colors under the incongruent words condition will increase when compare to the time it takes to name ink colors under congruent words condition.
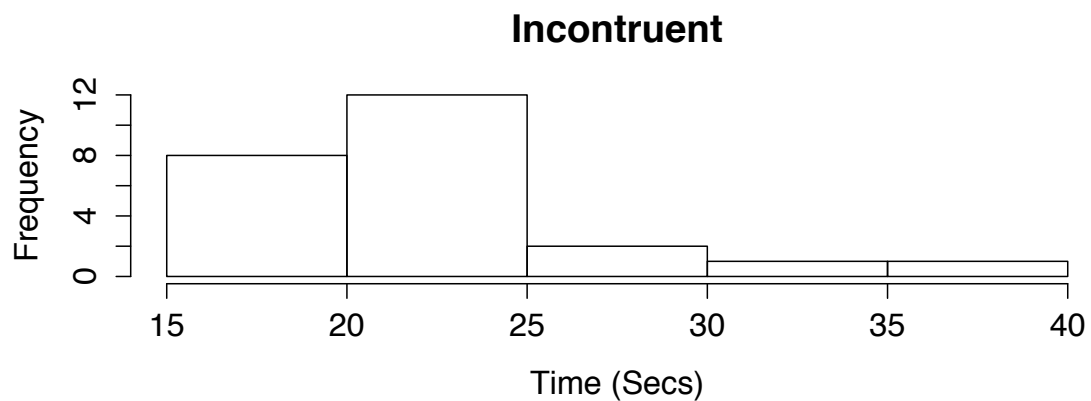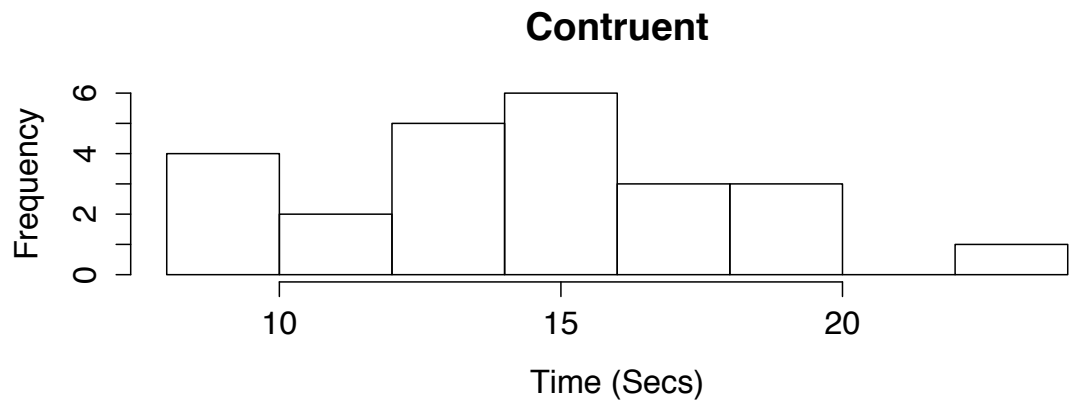 H_0: $\mu_{congruent} \geq \mu_{incongruent}$
   H_1: $\mu_{congruent} < \mu_{incongruent}$
   Where H_0 is the null hypothesis, H_1 is the alternative hypothesis, $\mu_{congruent}$ is the population mean of the time under the congruent words condition and $\mu_{incongruent}$ is the population mean of the time under the incongruent words condition. I expect to perform a positive one-tailed dependent samples t-test since we do not know the population parameters (mean and standard deviation). This is a dependent test because the same people who performed the test under the congruent words condition perform the test again under incongruent words condition.

3. Descriptive Statistics:

Dataset	Mean	Median	Standard Deviation
Congruent	14.05	14.35	3.56
Incongruent	22.02	21.02	4.80

4. The histogram provides insight into the distribution of the two samples. The congruent dataset is approximately normal whereas the incongruent distribution is positive skewed.

Contruent

Incontruent

5. Results of the one-tailed (right-tailed) two (independent) samples test are outlined below:

H_0: $\mu_{congruent} \geq \mu_{incongruent}$

H_1: $\mu_{congruent} < \mu_{incongruent}$

$\alpha = 0.05$

Difference of the means: 7.96

Standard deviation of the differences: 4.86

Standard Error: 0.99

Degrees of Freedom: 23

t-statistic: 8.02

t-critical: 1.714

$p < 0.00001$

Since the t-statistic is greater than the t-critical value and $p < 0.05$, we can reject the null hypothesis. Therefore, the time it takes to name the ink colors under the incongruent words condition is greater than the time it takes to name the ink colors under the congruent words condition. The difference in the means is 7.96s with the following confidence interval for an α level of 0.05:

[6.26, 9.67]

The results were in line with what I had initially expected.

6. The difference in the time is caused by the fact that two separate parts of the brain are at work in interpreting what you are seeing. The output from your brain however has to come only from the part that interprets the color. The delayed reaction is thus caused by the process of filtering out the correct output. Other variations of this test include using non-color words, rotating the words at an angle and coloring the word only partially.[1]

[1] https://faculty.washington.edu/chudler/words.html#seffect