**Test a Perceptual Phenomena**

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Date: December 2, 2017

**Background Information**

In a Stroop task, participants are presented with a list of words, with each word displayed in a color of ink. The participant’s task is to say out loud the *color of the ink* in which the word is printed. The task has two conditions: a congruent words condition, and an incongruent words condition. In the *congruent words* condition, the words being displayed are color words whose names match the colors in which they are printed: for example, RED, BLUE. In the *incongruent words* condition, the words displayed are color words whose names do not match the colors in which they are printed: for example, PURPLE, ORANGE. In each case, we measure the time it takes to name the ink colors in equally-sized lists. Each participant will go through and record a time from each condition.

**Questions for Investigation**

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

**Independent Variables:** Congruent words condition and Incongruent words condition

**Dependent Variable:** Time it takes to name the ink colors in equally-sized lists.

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

**Hypotheses 1:**

The population mean of reaction time for congruent words condition equals the population mean of reaction time for congruent words condition.

**Hypotheses 2:**

The population mean of reaction time for congruent words condition is greater than the population mean of reaction time for congruent words condition.

**Hypotheses 3:**

The population mean of reaction time for congruent words condition is smaller than the population mean of reaction time for congruent words condition.

I will choose the One-tailed dependent t-test on the difference between reaction time in the congruent words condition and the incongruent words condition.

It is one- tailed because I need to test only one direction. It is dependent because the same participant is taking the test twice one time with congruent list, and second with incongruent list. Moreover, it is a t-test because the standard deviation of reaction time difference is unknown.

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

|  |  |
| --- | --- |
| *Congruent* | |
| Mean | 14.05113 |
| Standard Error | 0.726551 |
| Median | 14.3565 |
| Standard Deviation | 3.559358 |
| Sample Variance | 12.66903 |
| Kurtosis | -0.20522 |
| Skewness | 0.4169 |
| Range | 13.698 |
| Minimum | 8.63 |
| Maximum | 22.328 |
| Sum | 337.227 |
| Count | 24 |

|  |  |
| --- | --- |
| *Incongruent* | |
| Mean | 22.01592 |
| Standard Error | 0.979195 |
| Median | 21.0175 |
| Standard Deviation | 4.797057 |
| Sample Variance | 23.01176 |
| Kurtosis | 2.6889 |
| Skewness | 1.54759 |
| Range | 19.568 |
| Minimum | 15.687 |
| Maximum | 35.255 |
| Sum | 528.382 |
| Count | 24 |

1. 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.

This plot clearly shows that the average time needed for participants to read a congruent list is less than the average time needed for participants to read an incongruent list. Furthermore, the line chart represents that the range of time for incongruent list is wider the range of time for the congruent list.

1. 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?

Significance level: 5%

Degree of Freedom: 24 – 1 = 23

t – statistic = = - 8.0209

p – value = pt (-8.0209) = 2.0507e-08

Critical value (one-tailed): qt (0.05,23) = -1.7139

Critical value (two-tailed): qt(0.025,23) = 2.0687

0.95 confidence interval: (5.9105, 10.0191)

Reject hypotheses 1 and 2 since the p-value is less the significance level. At the significance level 0.05, it takes more time to read the ink color in the incongruent list than in the congruent list.

The result match my expectations. I expected the incongruent condition to take more time than the congruent condition since I feel that it is easier to read the word rather than to recognize it.