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# Stroop Effect P1

1) **What is our independent variable? What is our dependent variable?**

   Our independent variable in the Stroop Effect is whether or not the color of the ink matches the meaning of the word being read, and the dependent variable is the time taken to read the color of the ink of all the words.

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

   The null hypothesis in this study would be that the color of the words does not impact the time taken to read all of them. The alternative hypothesis would be that the color of the word would impact the score negatively due to how our brains perceive colors and words.

   $\mu_1$: The average time taken for the population where the words and colors are congruent

   $\mu_2$: The average time taken for the population where the words and colors are not congruent

   $H_o$: $\mu_1 = \mu_2$: The average time taken for the population where the words and colors are congruent will be equal to the average time for the population where the words and colors are not congruent

   $H_a$: $\mu_1 < \mu_2$: The average time taken for the population where the words and colors are congruent will be less than the average time for the population where the words and colors are not congruent

   To test these hypotheses, I expect to perform a paired t-test because the dataset includes before and after scores of the Stroop test. We also don't know the population's standard deviation, and have a sample size of under 30, which fits the need to use a t-test.

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

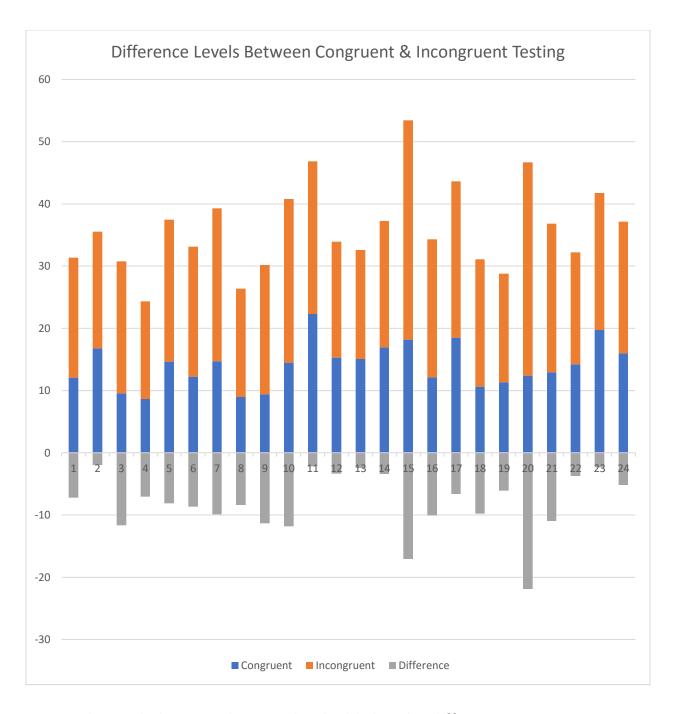| Congruent Mean | Incongruent Mean |
|---|---|
| $\overline{x}1$ | $\overline{x}2$ |
| 14.051125 | 22.01591667 |

| Standard Deviation | Standard Error |
|---|---|
| $S1 = \sqrt{(\overline{x}i - \overline{x})^2} / n - 1$ | $SE = S/\sqrt{N}$ |
| 4.86482691 | 0.993028635 |

| Point Estimate | Degrees of Freedom |
|---|---|
| $PE = \overline{x}1 - \overline{x}2$ | $df = n - 1$ |
| -7.964791667 | 23 |

| Alpha | Size |
|---|---|
| α | n |
| 0.05 | 24 |

| t-critical | t-statistic |
|---|---|
| Use t-table with df and α | $t = (\overline{x}1 - \overline{x}2)/ (SE)$ |
| -1.714 | -8.020706945 |

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.**

Difference Levels Between Congruent & Incongruent Testing

I wanted to include a visualization that highlights the differences in times for each trial between tests. From this you can also see clearly that nobody could best their original times, nor were they able to land at exactly the same time. For example, you can see that difference in number 20's times is quite large in comparison to many of the other times, whereas number 2's times are quite close to the original.

**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?**

My confidence level is 0.95 and my critical statistic value is -1.714. The t-statistic of -8.02 falls well into the range of the t-critical, therefore I reject the null hypothesis. My P value was less than 0.0001, which means that these statistics are significant. The results match to my expectations because in my own experience doing the test I found it quite hard to do the incongruent portion, and I imagine that is the case for most people, if not almost all.

**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?**

Based on the web page "Using the Stroop Effect to test our capacity to Direct Attention" by Raymond De Young, Associate Professor of Environmental Psychology and Planning, I think that the brain is simply not used to directly focusing on this sort of task regularly, and it fatigues us mentally to the point where we are prone to making mistakes. When we read a book or website, generally we aren't looking at every word because we understand the shape and general form of words. When we're forced to concentrate in this way, it feels like we're forcing the ourselves to do something unnatural, almost like a form of exercise. Maybe it's possible to use this as a way to increase our mental capacity, but it's more likely that we are simply hardwired this way to recognize written language.

As for what similar task might have a similar effect, I think it's hard to find something that would be as universally useable as this one. Even in different languages I think the Stroop Effect would be very useful because of the base nature of the test and just using colors and written words. Things like shapes might be too difficult to incorporate, or might have different meaning in different languages or cultures. I could see numbers and basic arithmetic being interesting, where one set could include

problems with infix notation, and one set could be prefix notation, all using the same numbers. An example of this would be "1+1" and "+ 1 1".

## Bibliography

Kent State University. (2017, 2 9). *SPSS Tutorials: Paired Samples t Test*. Retrieved from Kent State University: http://libguides.library.kent.edu/SPSS

Young, R. D. (2016, March 1). *USING THE STROOP EFFECT TO TEST OUR CAPACITY TO DIRECT ATTENTION* . Retrieved from Stroop Effect: http://www.snre.umich.edu/eplab/demos/st0/stroopdesc.html