1. Variables

Independent Variable - The text/color congruency of the words displayed on the screen. Congruent words were displayed in a color that matched the text. Incongruent words were displayed in a color that did not match what the text said.

Dependent Variable - Time taken for participants to identify the color of ink for the words on the screen. This was specifically measured as the time for participants to say the color of 25 words of a given type aloud and then press a virtual button.

2a. Hypotheses

H_0: $\mu_c = \mu_i$
H_A: $\mu_c \neq \mu_i$

where:
μ_c = population mean for time to complete the congruent task
μ_i = population mean for time to complete the incongruent task

It is intuitive to suggest that the average congruent reading speed would be faster than the average incongruent reading speed, since the text can act as a clue in the former and perhaps an obstacle in the latter. However, as this topic concerns the complexities of the human nervous system, it is also imaginable for the inverse to be true. Thus, our Alternative Hypothesis is that congruency can have either a positive or a negative effect on the populations' speed. The Null Hypothesis is the converse of this, which is that it has no effect at all.

2b. Testing

I propose employing a Dependent t-test for Paired Samples for the following reasons:

- Our study has fewer than 30 samples.
- We do not know the population mean or standard deviation, so a z-test is difficult to evaluate.
- Our sample data is coming from one group of participants who has been tested on two tasks, so a Dependent t-test will allow us to measure paired samples.

3. Descriptive Statistics

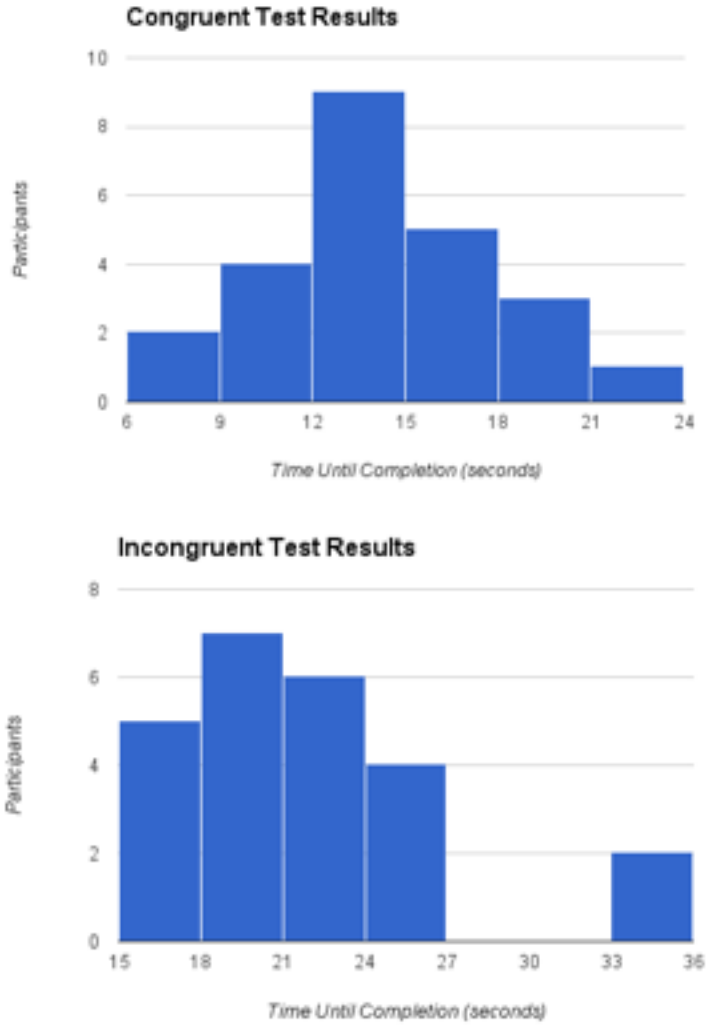
$\bar{x}_c$ = 14.05 seconds
$\bar{x}_i$ = 22.016 seconds

S_c = 3.56 seconds
S_i = 4.80 seconds

The mean and standard deviation of participants' difference in scores between the two tests were also calculated:

$\bar{x}_d$ = 7.96 seconds
S_d = 4.86 seconds

4. Visualizations



The first graph depicts participants' performance on the Congruent test. The second depicts performance on the Incongruent test. For the Congruent task, the distribution appears to be roughly normal with a slightly positive skew. For the Incongruent task, the distribution appears to be more positively skewed, with a noticeable spike near the end of the right tail. The charts show that the average time was generally higher for the Incongruent Test. This is reflected in a

higher median (between 18 and 21 seconds), when compared to the Congruent Test (between 12 and 15 seconds).

5. Statistical Test

As this experiment involved participants undergoing two separate tasks, I used the data in a dependent t-test for paired samples. This was a two-tailed test with a confidence level of 95%. As there were 23 degrees of freedom, and an α-level of 5% the critical t-statistic was ± 2.069.

The results of the test were as follows:

$t(23) = -8.03$, $p < .05$, two-tailed

As the t-statistic was far outside the critical value of -2.069, we can confidently say that the data presented showed that congruence and incongruence had a statistically significant on participants' reading speed for the words on screen during the task. Thus, we reject the Null Hypothesis.

In attempting to find a 95% confidence interval for the difference between the two means, I found the following:

Confidence Interval on the mean difference; 95% CI = (-10.02, -5.94)

6. Additional Observations

Two possible explanations for the observed results are as follows:

1 - For many people, the human brain can correctly identify colors visually more quickly than it can read them in text form.
2 - The human brain can respond more quickly when given visual and textual clues than it can when given a correct visual and incorrect textual clue.

It must also be mentioned that the order of tasks may have influenced the results of this test. As all participants took the Congruent Task first and Incongruent Task second, it may be that delayed adjustment negatively affected their performance on the latter. Conversely, it is also possible that comfort with the testing format after the first round made them improved their results on the second. This could be corrected by randomizing the order of the two tasks in a future experiment.

If researchers wanted to test a similar idea with different specifics, they could test for participants' speed at identify shapes when the name of a shape is written inside of it. In one case the name of a shape could match the shape itself (e.g. the word "triangle" inside of a triangle), and in another case the word could be the name of a different shape (e.g. the word

“square” inside of a circle). One benefit of this test would be that colorblindness would not be a factor as it may be in the Stroop Test.