**Stroop Test Data Analysis**

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| --- | --- | --- | --- |
| **Congruent** |  | **Incongruent** |  |
| Standard Deviation | 3.559357958 | Standard Deviation | 4.7970571 |
| Variance | 12.66902907 | Variance | 23.011757 |
| Mean | 14.051125 | Mean | 22.015917 |
| Median | 14.3565 | Median | 21.0175 |
| Mode | NA | Mode | NA |

The Dependent variable will be the time it takes in seconds to say the color of the words. The independent variable will be whether the words are congruent or not.

As you can see there is clearly a trend between the Congruent and Incongruent versions of the test. Every person took longer on the Incongruent test than they did on the congruent test.

H0: Ucongruent = UIncongruent

HA: Ucongruent < UIncongruent

Null Hypothesis: Based on our incongruent and congruent sample means, our hypothetical population means for congruent and incongruent times would be equal to the congruent and incongruent sample means.

Alternate Hypothesis: Based on our incongruent and congruent sample means, our hypothetical population mean for congruent times would be lower than our hypothetical population mean for incongruent times.

We will do a dependent one tailed t-test in the positive direction, because we want to know if the Incongruent times are larger than the Congruent times and because the Incongruent and congruent times are not independent. We are using a t-test because we have a small sample size and are trying to make inferences about the population means. Our degrees of freedom for this sample is 23 since df = n -1. We will use an alpha of 0.05 which will give us a t-critical value of 1.714. Based on the graphs we can say our data is fairly normal.

Here we have the table of values with the differences

|  |  |  |  |
| --- | --- | --- | --- |
| Congruent | Incongruent | Differences | Squared Deviations |
| 12.079 | 19.278 | -7.199 | 0.586436877 |
| 16.791 | 18.741 | -1.95 | 36.17771879 |
| 9.564 | 21.214 | -11.65 | 13.58076046 |
| 8.63 | 15.687 | -7.057 | 0.82408571 |
| 14.669 | 22.803 | -8.134 | 0.02863146 |
| 12.238 | 20.878 | -8.64 | 0.455906293 |
| 14.692 | 24.572 | -9.88 | 3.66802296 |
| 8.987 | 17.394 | -8.407 | 0.19554821 |
| 9.401 | 20.762 | -11.361 | 11.53423104 |
| 14.48 | 26.282 | -11.802 | 14.72416779 |
| 22.328 | 24.524 | -2.196 | 33.27895729 |
| 15.298 | 18.644 | -3.346 | 21.33323646 |
| 15.073 | 17.51 | -2.437 | 30.55648071 |
| 16.929 | 20.33 | -3.401 | 20.82819438 |
| 18.2 | 35.255 | -17.055 | 82.63188754 |
| 12.13 | 22.158 | -10.028 | 4.256828627 |
| 18.495 | 25.139 | -6.644 | 1.744490627 |
| 10.639 | 20.429 | -9.79 | 3.33138546 |
| 11.344 | 17.425 | -6.081 | 3.548671043 |
| 12.369 | 34.288 | -21.919 | 194.7199302 |
| 12.944 | 23.894 | -10.95 | 8.911468793 |
| 14.233 | 17.96 | -3.727 | 17.95887821 |
| 19.71 | 22.058 | -2.348 | 31.54834863 |
| 16.004 | 21.157 | -5.153 | 7.906172377 |

|  |  |
| --- | --- |
| Mean Difference | -7.964791667 |
| Sum Squared Dev | 544.33044 |
| Variance | 23.66654087 |
| SD | 4.86482691 |
| SQRT N | 4.898979486 |
| Standard Error | 0.993028635 |
| T-statistic | -8.020706944 |
| Cohens D | -1.637219949 |
| CI upper | -6.262740587 |
| CI lower | -9.666842747 |

This t-statistic gives us a p-value of 0.0001 which means it is extremely statistically significant and not due to chance, so we can safely reject the null hypothesis. Meaning that Incongruent test caused slower response times.

For a 95 confidence interval we have a lower bound of -9.6668 and an upper bound of -6.2627. Which means that there is a 95% chance that a user will take between 9.7 seconds and 6.26 seconds longer on the Incongruent test than on the Congruent test.

Conclusion

The results were exactly as I expected, it was not due to luck or chance that the Incongruent test took more time than the Congruent test. I took the stroop test myself and got 11 seconds on the first Congruent test and 22 seconds on the Incongruent test. The Incongruent test is definitely harder. Maybe it will be easier without the first congruent test. I took the Incongruent test after a rest period after taking the Congruent test and got 15 seconds. This leads me to believe the first Congruent test might negatively prepare someone for the Incongruent test. I think this is because the brain is used to and primed to look at colors and words as the same, but then it has to “delete” that pattern and start again with a new pattern by dissociating words and colors. I believe that resting a significant amount after the first test might lead to different results as well. Unfortunately, I could not find anything about this online.

**Resources**

https://graphpad.com/quickcalcs/pValue1/

http://psychclassics.yorku.ca/Stroop/

https://discussions.udacity.com/t/what-exactly-are-we-testing-for-project-5/306468

https://discussions.udacity.com/t/mann-whitney-u-test-question-p3-3-spoilers/31550/4