

Stroop Test Data Analysis

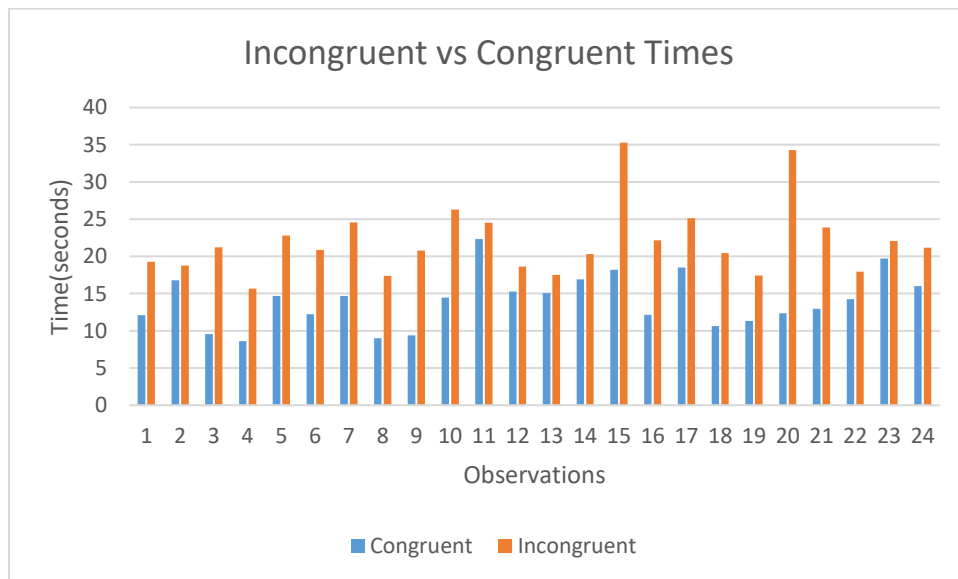
Congruent

Standard Deviation	3.559357958
Variance	12.66902907
Mean	14.051125
Median	14.3565
Mode	NA

Incongruent

Standard Deviation	4.7970571
Variance	23.011757
Mean	22.015917
Median	21.0175
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.

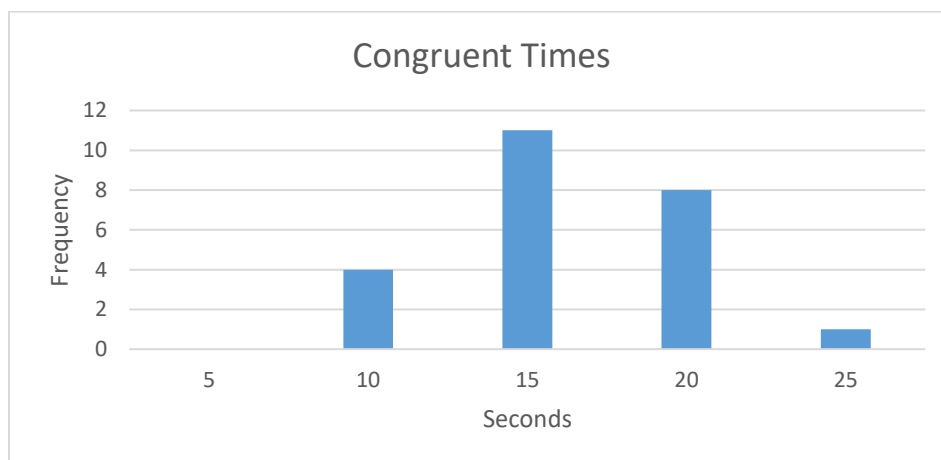
$$H_0: U_{\text{congruent}} = U_{\text{incongruent}}$$

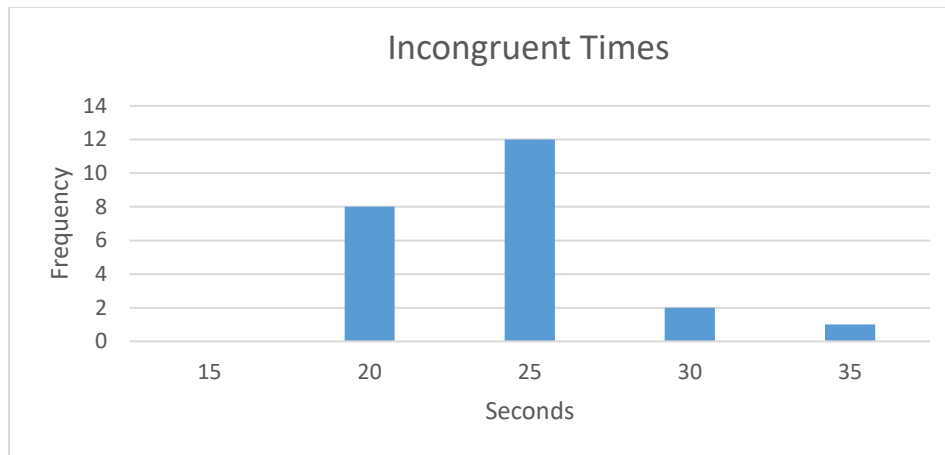
$$H_A: U_{\text{congruent}} < U_{\text{incongruent}}$$

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>