Stroop Test

What are our independent and dependent variables?

The **independent** variable is the Stroop Test itself, which tests the reaction time to: first, a set of words that are the same as the color in which they are typed (congruent), and secondly, a set of words that are different than the colors in which they are typed (incongruent). The **dependent** variable is the difference in reaction times to the first and second parts of the Stroop Test.

Statistical Test

In this test, we don't know the mean (μ) or standard deviation (σ) of the population. Thus, we want analyze this with a positive direction, one-tailed t-test.

Hypothesis

The null hypothesis (H_0) is that there is no difference between the time it takes to complete the congruent and incongruent parts of the Stroop Test in the population.

The alternative hypothesis (H_A) is that this sample will show that, for the population, it takes longer to complete the incongruent part than the congruent part. If this is the case, then the difference between the mean of the incongruent data (μ_I) and the mean of the congruent data (μ_C) will be positive.

The null hypothesis states that the difference in the means (μ_I - μ_C) is less than or equal to zero. The alternative hypothesis states that the difference (μ_I - μ_C)) is strictly greater than zero.

H_0: $\mu_C \geq \mu_I$ (*or* $\mu_I - \mu_C \leq 0$)
H_A: $\mu_C < \mu_I$ (*or* $\mu_I - \mu_C > 0$)

Stroop Test

Congruent (C)	Incongruent (I)	I - C
12.079	19.278	7.199
16.791	18.741	1.95
9.564	21.214	11.65
8.63	15.687	7.057
14.669	22.803	8.134
12.238	20.878	8.64
14.692	24.572	9.88
8.987	17.394	8.407
9.401	20.762	11.361
14.48	26.282	11.802
22.328	24.524	2.196
15.298	18.644	3.346
15.073	17.51	2.437
16.929	20.33	3.401
18.2	35.255	17.055
12.13	22.158	10.028
18.495	25.139	6.644
10.639	20.429	9.79
11.344	17.425	6.081
12.369	34.288	21.919
12.944	23.894	10.95
14.233	17.96	3.727
19.71	22.058	2.348
16.004	21.157	5.153

Interesting Values

μ_C	μ_I	$\mu_{I\text{-}C}$	$\sigma_{I\text{-}C}$	Standard Error
14.05	22.02	7.96	4.86	0.99

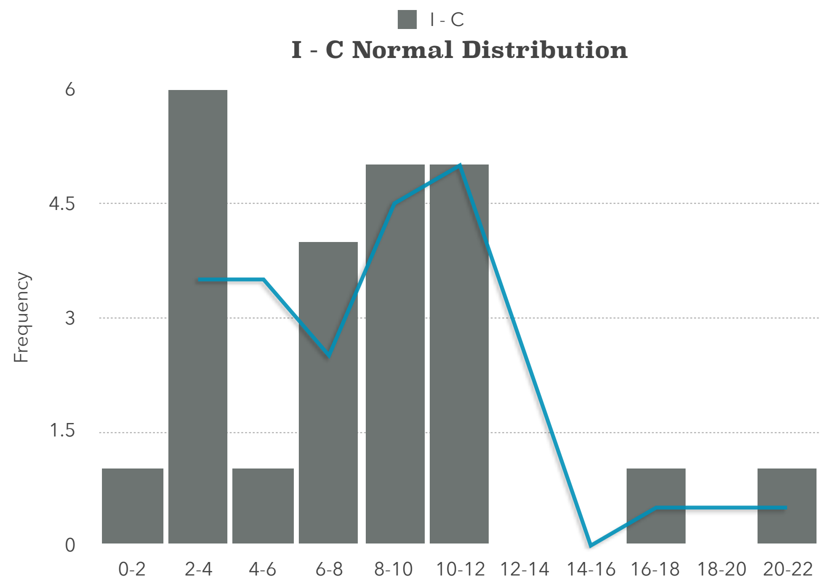
α	df	t_{crit}	p*
0.05	23	1.714	less than 0.0001

t_{stat}	Cohen's d	r^2
8.02	8.02	0.74

Margin of Error	95% Confidence Interval
+/- (1.70)	(6.26, 9.66)

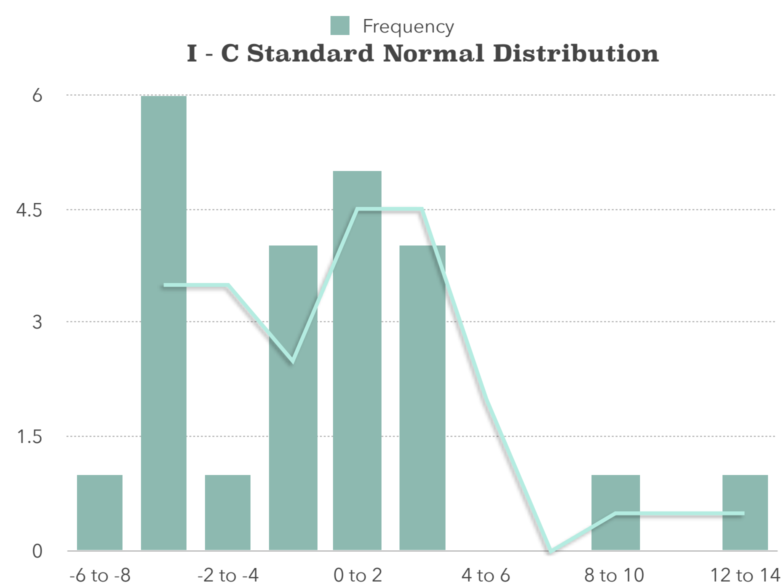
Frequency Table

	I - C Frequencies
0-2	1
2-4	6
4-6	1
6-8	4
8-10	5
10-12	5
12-14	0
14-16	0
16-18	1
18-20	0
20-22	1



I - C Normal Distribution

	Frequency
-6 to -8	1
-4 to -6	6
-2 to -4	1
0 to -2	4
0 to 2	5
2 to 4	4
4 to 6	0
6 to 8	0
8 to 10	1
10 to 12	0
12 to 14	1



Normal Frequency Table Analysis

The plot of the data is relatively normal if you consider the values between 8 and 9 and between 12 and 14 to be outliers. The chart shows that the t-statistic is significantly far from the t-critical, less than $p = 0.05$, rather an outlier itself.

Results

We conclude that there is a significant difference between the t-statistic and t-critical results because p is extremely small. For this test, we reject the null hypothesis (H_0), which does match with my hypothesis. However, I did not expect there to be the spike in data between 2-4 s.

Optional

I think that the second part of the Stroop Test (the incongruent words/colors) is more difficult to decipher, thus it takes longer than the first part to finish.

I think observing the difference in a batter's swing between Tee-Ball and Baseball would be similar. In Tee-Ball, you are learning to bat, but there are handicaps. Once you reach Baseball, the handicaps are taken away, though you are familiar with the process, and it would be harder to hit the ball. If we were to measure the difficulty of hitting the ball in Tee-Ball versus Baseball, I think we would see similar effects.

Resources:

*http://www.graphpad.com/quickcalcs/pValue2/