

Project 2 – Investigation of the Stroop Effect

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Question 1: What is our independent Variable? What is the dependent variable?

The variable being altered in the two conditions is the congruency between word and color presentation. (The independent variable)

The dependent variable, the one possibly being influenced by the two conditions of the independent variable, is the time needed to read out all the words aloud.

Question 2: What is an appropriate set of hypotheses for this task? What kind of statistical test do you expect to perform?

$$H_0: \mu_C = \mu_I$$

The population mean in both the congruent and the incongruent treatment are similar

$$H_1: \mu_I > \mu_C$$

The population in the incongruence situation shows a significant higher mean size.

Based on the given sample Data with $n=24$, the dependent structure of the experimental setup and as the experiment is aimed to explore if the mean difference between both treatment situations can be generalized to the population as a whole, I expect to conduct a one directional dependent t-test. Hereby I chose a t-test to a z-test, as with the small sample size $n < 30$, as a normal distribution of the sample can not be expected.

The aim is to answer the question, if the difference in the population mean from the two treatment situations are significant and can therefore be generalized to the general population.

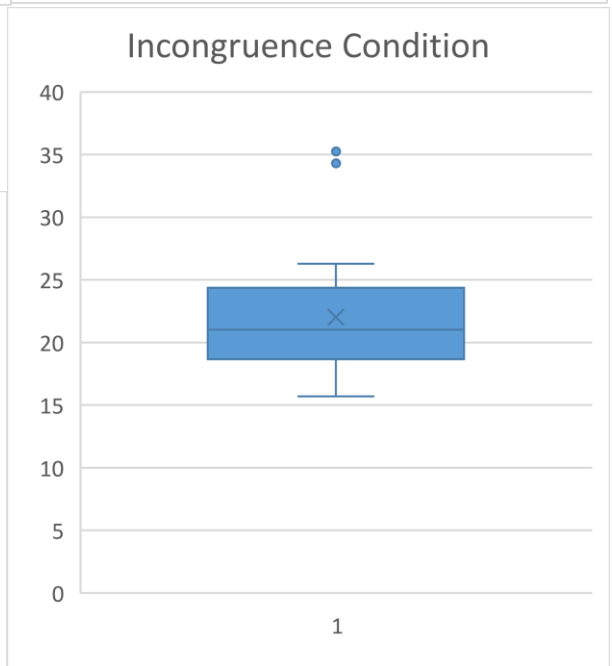
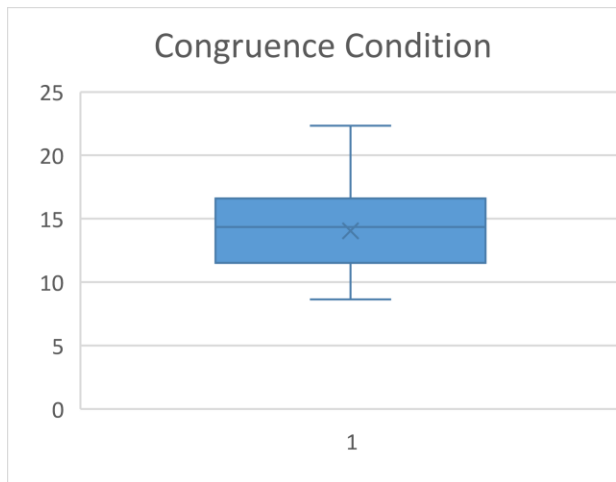
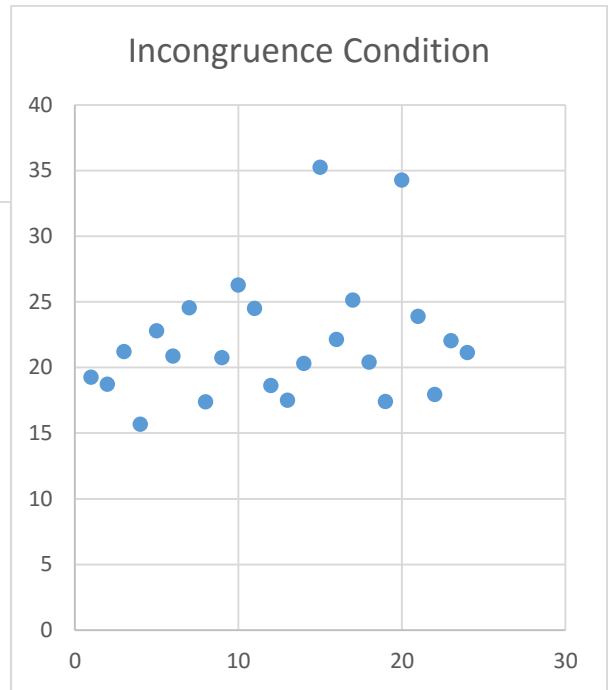
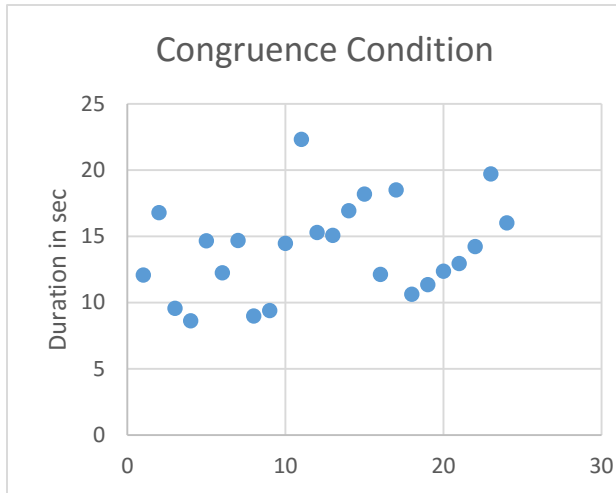
I expect to be following a directional hypotheses, along the theoretical expectation that a dissonance in visual and literal representation of the words to be read results in a disturbance in recognition, and therefore slows down the oral replication of the stimulus materials. This must result in a higher sample mean for the second treatment condition.

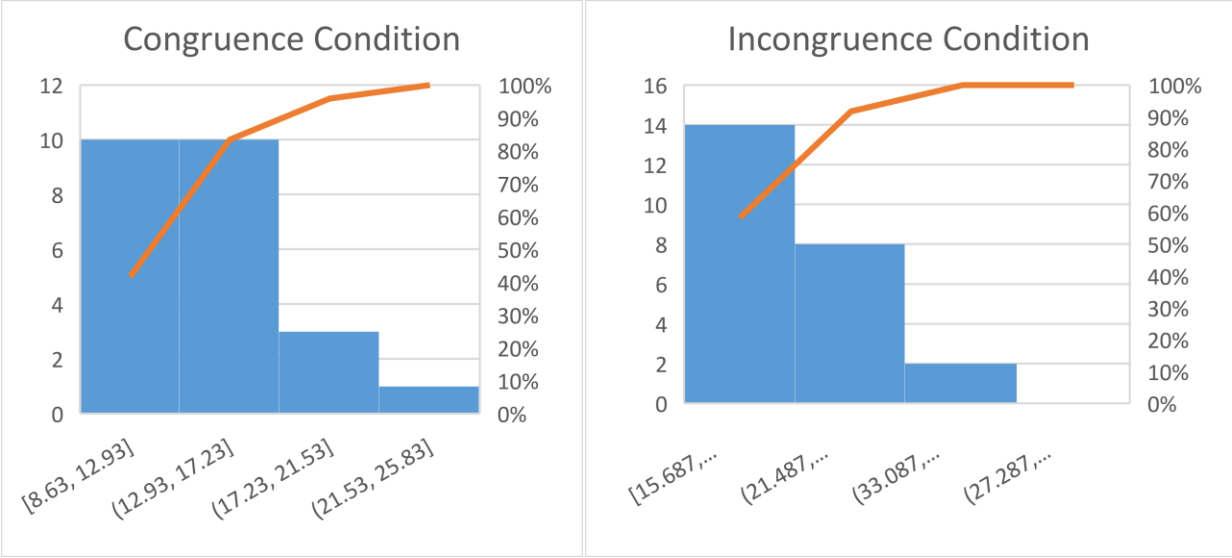
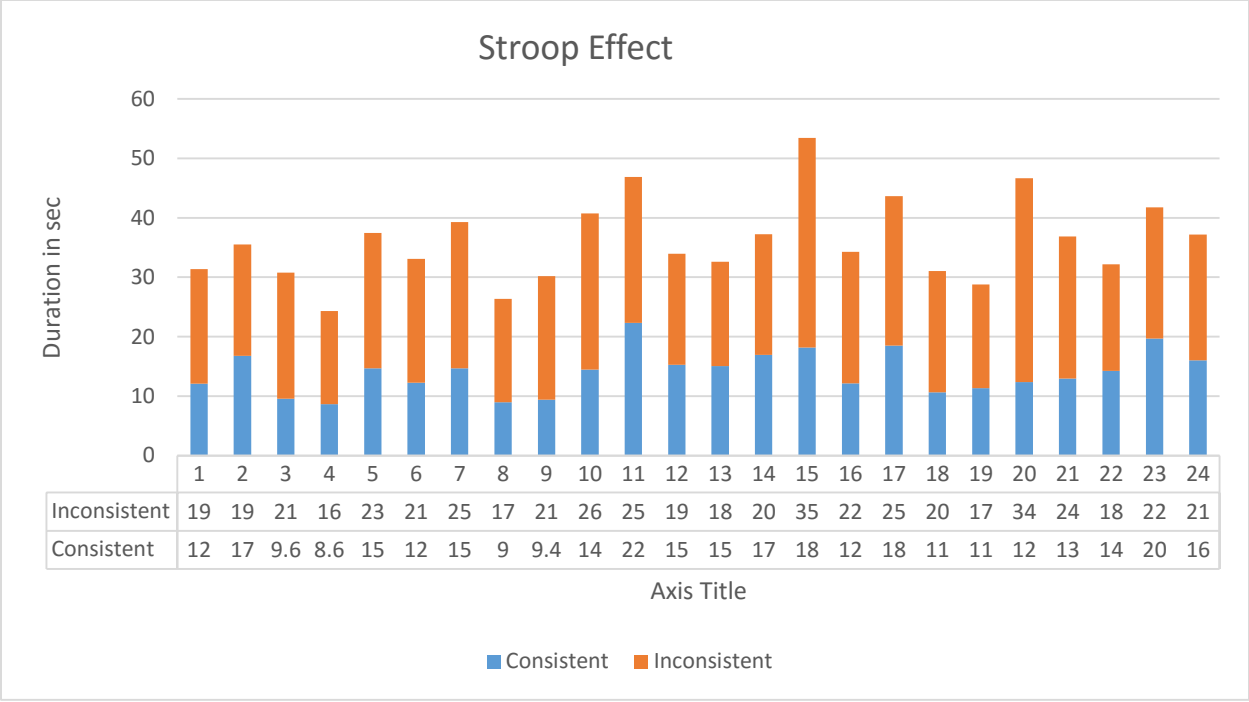
Along this expectation the alternative Hypotheses formalizes this hypotheses as the significant difference of the sample mean.

Question 3: Report the descriptive statistics

n	24	24
mean	14.4491	22.10
sd	3.6	4.80
Calculating a one-tailed t-test on sample means		

Question 4: Visualizations:





It can be clearly seen, that there is an overall increase in the Duration in sec within subjects over the two treatment. Looking at the relative frequency of Duration scores recorded between the two groups, the data is strongly positively skewed. Yet this effect seems to be stronger in the Congruent Condition.

There are two outlying datapoints in the second treatment condition, yet they are in range and do not pose any threat to the analysis.

The spread of the data seems to be stable across both treatment situations, with a little stronger spread in the Incongruence Condition.

Question 5: Performing the one-tailed-t-test on the data

Congruent	Incongruent	Difference	squared error		
12.079	19.278	7.199	51.825601		mean(d) 7.96479167
16.791	18.741	1.95	3.8025		sd(d) 9.4795895
9.564	21.214	11.65	135.7225		SE(d) 1.9350131
					t-
8.63	15.687	7.057	49.801249		statistic 4.11614353
14.669	22.803	8.134	66.161956		critical t 1.319
12.238	20.878	8.64	74.6496		df 23
					Cohens
14.692	24.572	9.88	97.6144		d 0.424
8.987	17.394	8.407	70.677649		
9.401	20.762	11.361	129.072321		
14.48	26.282	11.802	139.287204		
22.328	24.524	2.196	4.822416		
15.298	18.644	3.346	11.195716		
15.073	17.51	2.437	5.938969		
16.929	20.33	3.401	11.566801		
18.2	35.255	17.055	290.873025		
12.13	22.158	10.028	100.560784		
18.495	25.139	6.644	44.142736		
10.639	20.429	9.79	95.8441		
11.344	17.425	6.081	36.978561		
12.369	34.288	21.919	480.442561		
12.944	23.894	10.95	119.9025		
14.233	17.96	3.727	13.890529		
19.71	22.058	2.348	5.513104		
16.004	21.157	5.153	26.553409		

With with a t-score of 4.116 the result is significant at $p < 0.05$, with 0.42 sd difference (cohens d).

This means that there is a clear significant mean difference between the two treatment groups.

This matches the expectations both from the underlying theorie, as from the descriptive analytic of the dataset.