

Project 3: Test a Perceptual Phenomenon

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Interactive Stroop Effect Experiment

In a Stroop task, participants are presented with a list of words, with each word displayed in a color of ink. The participant's task is to say out loud the *color of the ink* in which the word is printed. The task has two conditions: a congruent words condition, and an incongruent words condition. In the *congruent words* condition, the words being displayed are color words whose names match the colors in which they are printed: for example, **RED**, **BLUE**. In the *incongruent words* condition, the words displayed are color words whose names do not match the colors in which they are printed: for example, **PURPLE**, **ORANGE**. In each case, we measure the time it takes to name the ink colors in equally sized lists. Each participant will go through and record a time from each condition.

1.)

Independent Variable: The two conditions; congruent or incongruent

Dependent Variable: response times

2.)

What is an appropriate set of hypotheses for this task? What kind of statistical test do you expect to perform? Justify your choices.

We want to observe the response time from each condition resulting from the task type and the effect they have on the response times. We will then assess whether the difference in our sample is because congruent and incongruent populations are significantly different. For this reason, we purpose a two-tailed dependent t-Test.

μ_C : Congruent population's mean response time

μ_I : Incongruent population's mean response time

The Null Hypothesis (H_0):

There won't be much difference between mean response times for Congruent and Incongruent conditions

$$H_0: \mu_C - \mu_I = 0$$

The Alternative Hypothesis (H_A):

The mean time of participants' response time in performing incongruent task compared to congruent task is faster

$$H_A: \mu_C - \mu_I \neq 0$$

We justify our hypothesis choice due to the small sample size (smaller than 30), the sample distribution is normal and the data in both congruent and incongruent conditions are similarly structured without outliers.

3.) Report some descriptive statistics regarding this dataset. Include at least one measure of central tendency and at least one measure of variability.

Summary Descriptive Statistics

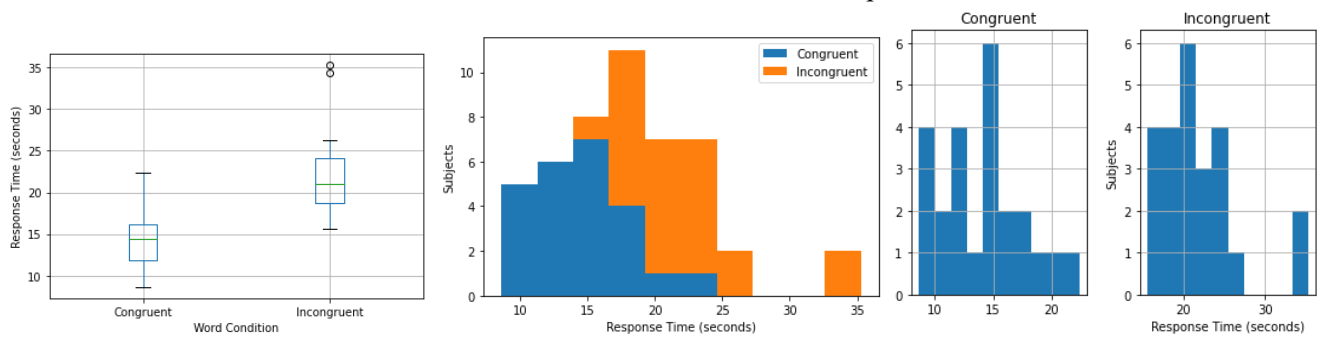
	count	mean	std	min	25%	50%	75%	max
Congruent	24.0	14.051125	3.559358	8.630	11.89525	14.3565	16.20075	22.328
Incongruent	24.0	22.015917	4.797057	15.687	18.71675	21.0175	24.05150	35.255

Congruent task sample mean $\bar{x}_C = 14.051$ seconds $\sigma_C = 3.558$ seconds

Incongruent task sample mean $\bar{x}_I = 22.016$ seconds $\sigma_I = 4.797$ seconds

4.)

Provide one or two visualizations that show the distribution of the sample data.



Both samples look normally distributed with similar variance from the mean. Furthermore, the boxplot and histogram it is obvious the mean, the median and the interquartile range for the incongruent task appears higher than those for the congruent task.

5.)

Now, perform the statistical test and report your results. What is your confidence level and your critical statistic value? Do you reject the null hypothesis or fail to reject it? Come to a conclusion in terms of the experiment task. Did the results match up with your expectations?

Two-tailed Dependent t-Test for Paired Samples with a 99% Confidence level

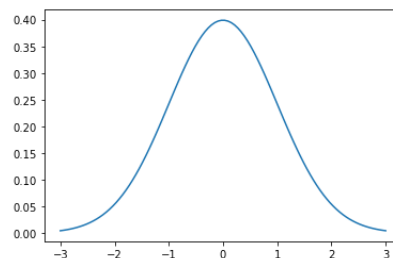
Degrees of freedom: $df = 23$

Alpha- level: $\alpha = .01$

t^* critical values: $= (-2.81, +2.81)$

t-statistic(df): $t(23) = -8.02$

p-value : $p > 0.0001$



The t-statistic falls below the negative t^* critical value within the critical region with a p-value < 0.0001 . For this reason, we reject the Null Hypothesis with a 99% Confidence level and conclude that there is a significant difference in the scores between participants performing congruent and incongruent tasks.

The results confirm our observations and the increase change in response time to perform an incongruent task compared to a congruent task are statistically significant.

6.

What do you think is responsible for the effects observed? Can you think of an alternative or similar task that would result in a similar effect? Some research about the problem will be helpful for thinking about these two questions!

I think the responsible effect observed is caused by our conditioning by color. It would be curious to perform this task with the range color blind participants. Some other examples would be the following:

Instead of color/ word you could use, picture/word in testing which word comes to the participants mind first. Another possible test is to test bilingual words which may even cross with culture and after researching the topic there is indeed a Stroop like test which to predict the control one may have on a second language compared to their native language.