Statistics: The Science of Decisions Project Instructions

Background Information

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.

Questions for Investigation

1. What is our independent variable? Congruent / Incongruent word condition
What is our dependent variable? The time it takes to complete the test (in seconds).

2. What is an appropriate set of hypotheses for this task?

Null Hypothesis Ho: μi = μc: There is NO significant difference in response time between stating the color of words in (μi) incongruent state vs. (μc) congruent state.

Alternative Hypothesis Ha: μi ≠ μc: There IS a significant difference in response time between stating the color of words in (μi) incongruent state vs. (μc) congruent state.

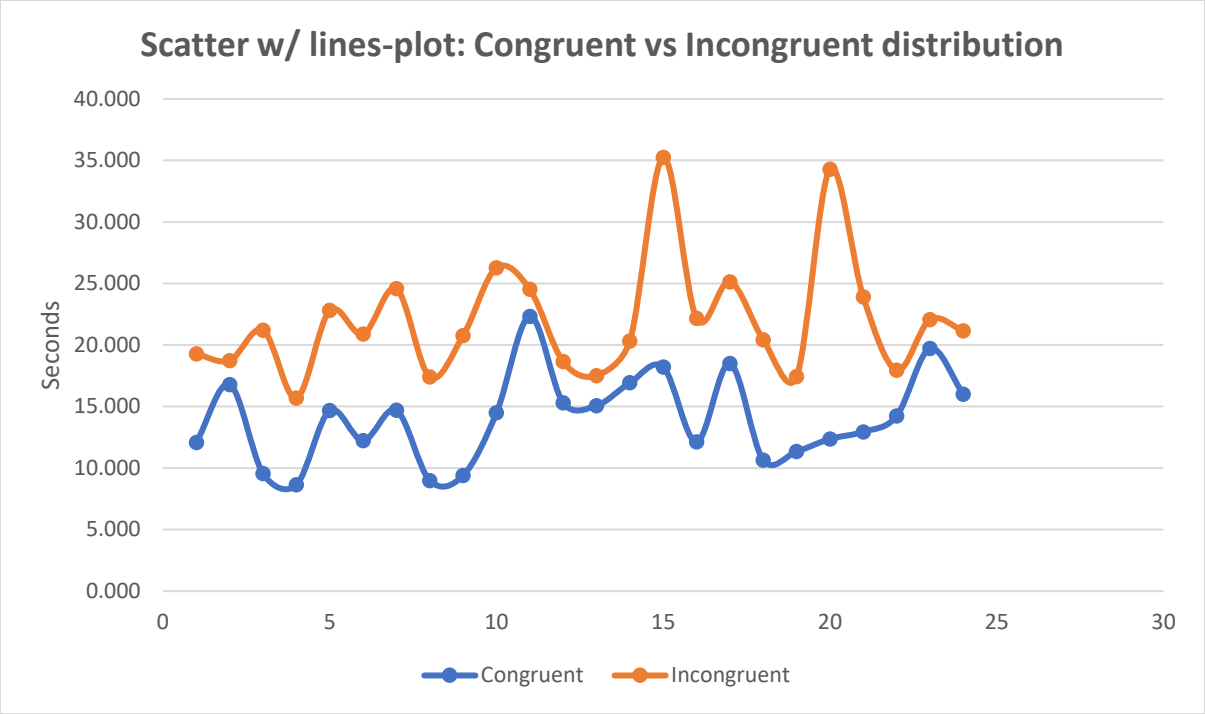
What kind of statistical test do you expect to perform?

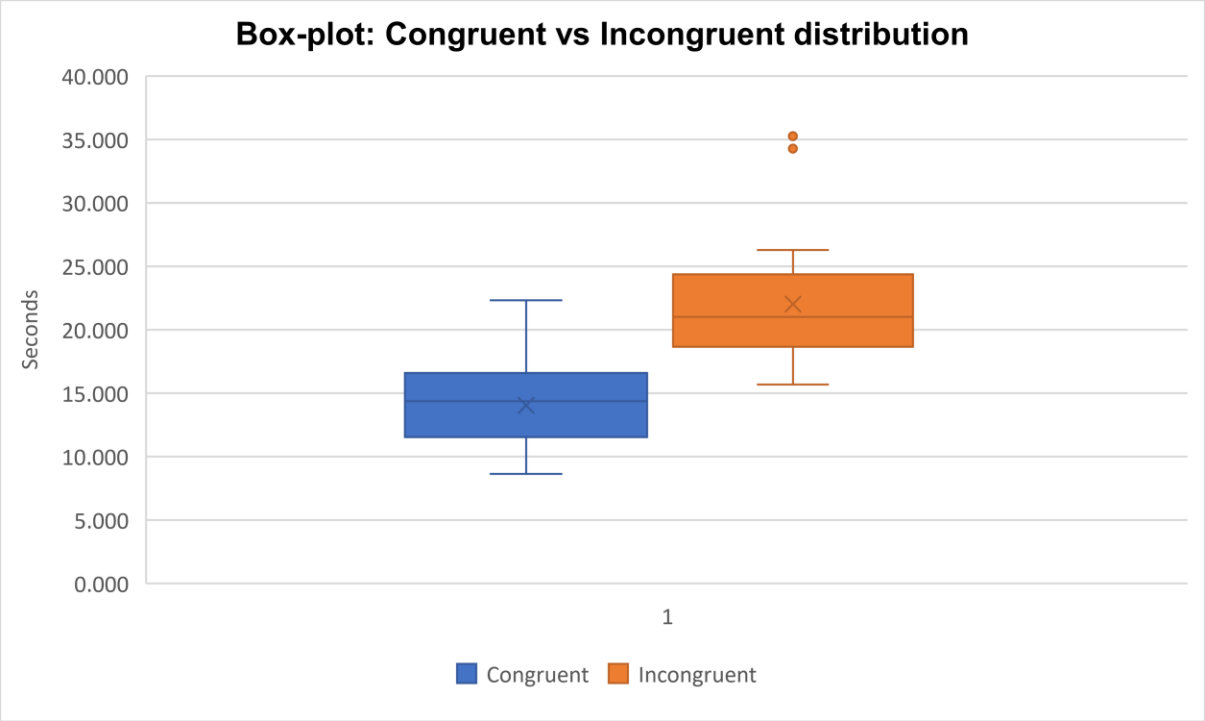
Statistical test: For this analysis, we will use a dependent paired t-test (two-tailed). The reason for selecting this test is because a t-test is the best choice for sample sizes under 30, and when the population parameters are not known. The t-test will allow us to see if there is a significant difference between the means of our two groups (same subject/person which completed two similar tests). We will find the two populations means through statistical examination.

3. Report some descriptive statistics regarding this dataset.

	Congruent μc	Incongruent μi	Difference μd
Mean	14.051125	22.015917	7.964792
Standard Deviation	3.559358	4.797057	1.237699

4. Provide one or two visualizations that show the distribution of the sample data. Write one or two sentences noting what you observe about the plot or plots.





There is a 7.97 seconds difference between the mean on the congruent (mean 14.05 seconds) and the incongruent (22.02 seconds). Looking at our plots, we can observe that the incongruent samples consistently took longer than the congruent samples.

5. Now, perform the statistical test and report your results. (done in excel)

	Congruent	Incongruent	Difference
MEAN	14.051125	22.015917	7.964792
SD	3.5593580	4.7970571	4.8648269
Sample Size	24	24	24
CI (confidence interval)			0.95
dF (degrees of freedom)			23
a (alpha level)			0.05
tc (t-critical value)			2.069
SE (standard error)			0.993028635
T (t-statistic)			8.020706944
Cohen's D			1.637219949
P (probability) **GraphPad**			< 0.0001

Confidence Interval	
5.910215	10.019368

What is your confidence level and your critical statistic value?
Ci = 95% tc = +2.069, -2.069

Do you reject the null hypothesis or fail to reject it?
Reject the null hypothesis since our t-statistic is 8.0207 is a lot higher than our t-critical value of 2.069 (with the probability < 0.0001, the difference is considered extremely statistically significant, GraphPad).

Come to a conclusion in terms of the experiment task. Did the results match up with your expectations?
We found that our probability is less than alpha ($p < 0.05$), allowing us to reject the null hypothesis. The results match my expectations of the incongruent samples taking longer than the congruent samples.

References

https://www.investopedia.com/ask/answers/073115/what-assumptions-are-made-when-conducting-ttest.asp

https://www.bing.com/videos/search?q=paired+t-test&docid=608010886300763976&mid=FA5E17B83F388A6EF7EFFA5E17B83F388A6EF7EF&view=detail&FORM=VIRE

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