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? What is our dependent variable?

The independent variable of the Stroop task is the congruency of the pair of words presented to the subject. The dependent variable is the time it takes for the subject to name the colours with which the words are written.

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

H0: The population means for response times for the two conditions, congruent and incongruent, are the same (or effectively the same).

μ_congruent = μ_incongruent

HA: The population means for response times for the two conditions, congruent and incongruent, are not the same.

μ_congruent ≠ μ_incongruent

In this task, we can use hypothese as follow:

The null hypothesis is H_0:H0: there is no difference between the mean reaction time under congruent words condition and incongruent words condition. That is μcongruent=μincongruent

The alternative hypothesis is H_a:Ha: there is difference between the mean reaction time under congruent words condition and incongruent words condition. That is μcongruent≠μincongruent

To test the hypothesis, I use two-tailed paired t-test. Because one the test is non-direction, so the p-value is the two-tailed probability; two we need compare the means of two groups; three each participant is invovled under both conditions.

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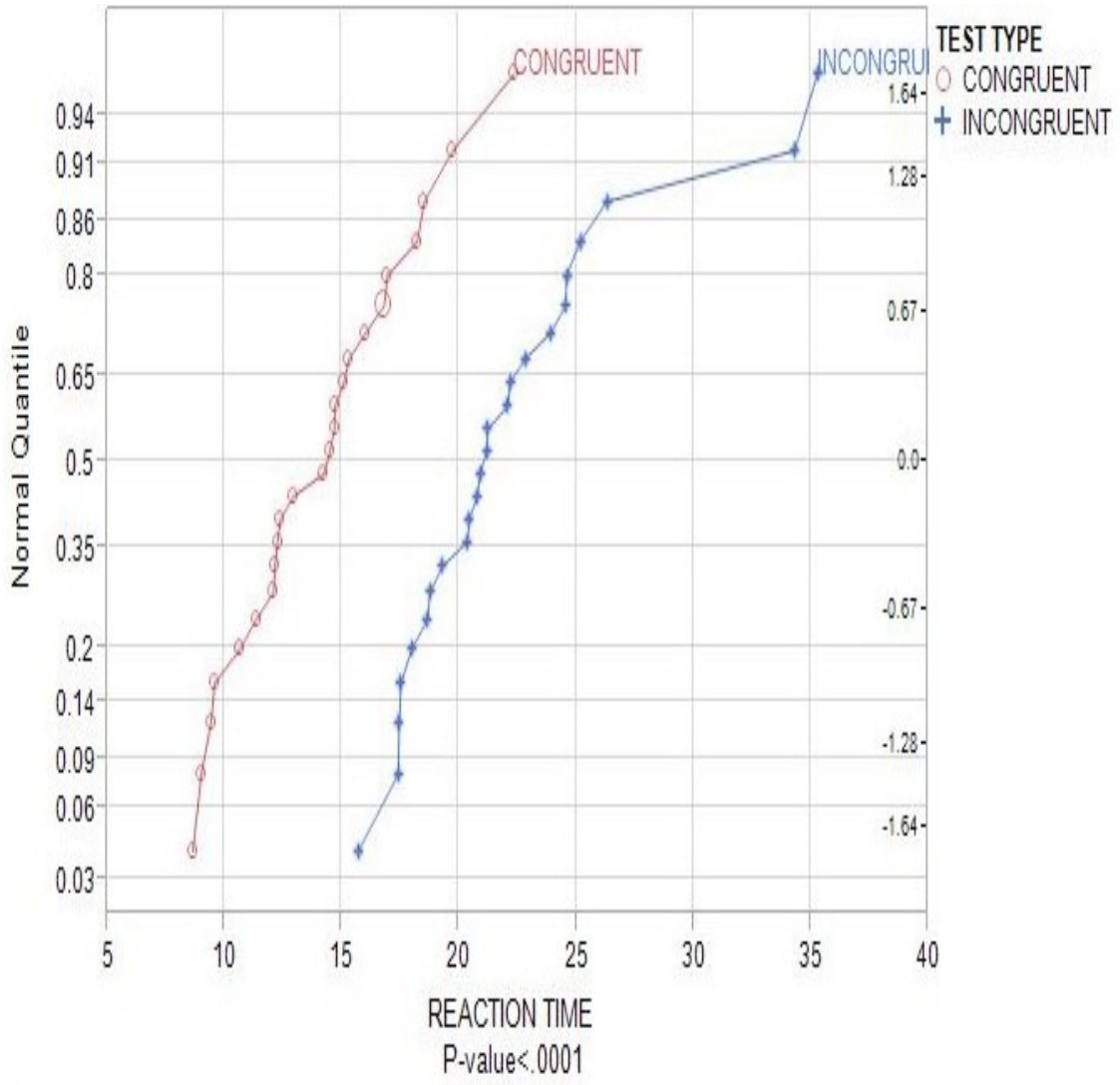
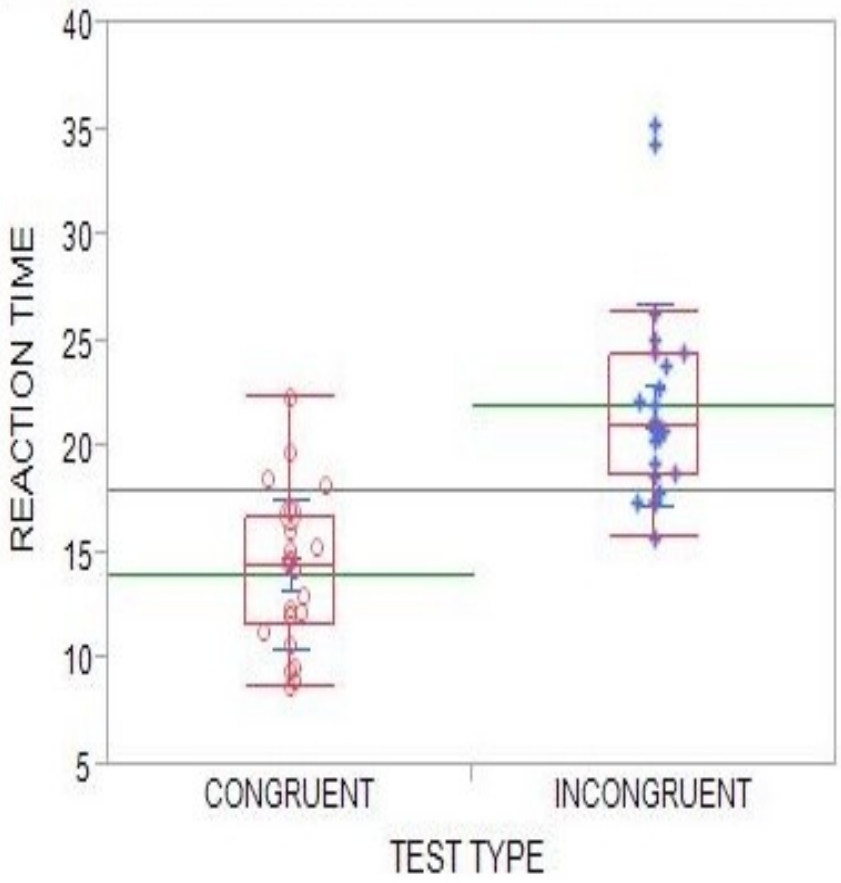
3. Report some descriptive statistics regarding this dataset. Include at least one measure of central tendency and at least one measure of variability.



TEST_TYPE	Number	Mean	Std Dev
CONGRUENT	24	14.0508	3.55986
INCONGRUENT	24	22.0158	4.79749

Reaction Time *vs* Test Time For Congruent Words/ Colors *Vs Incongruent*



Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
CONGRUENT	24	14.0508	3.55986	0.72665	12.548	15.554
INCONGRUENT	24	22.0158	4.79749	0.97928	19.990	24.042

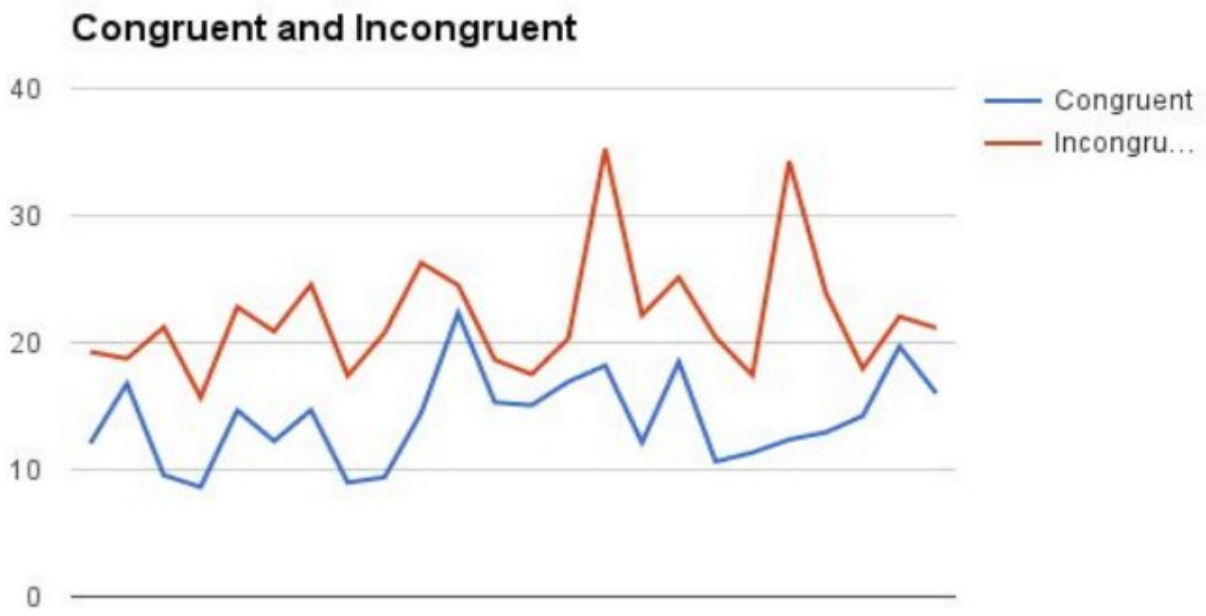
P-value<.0001

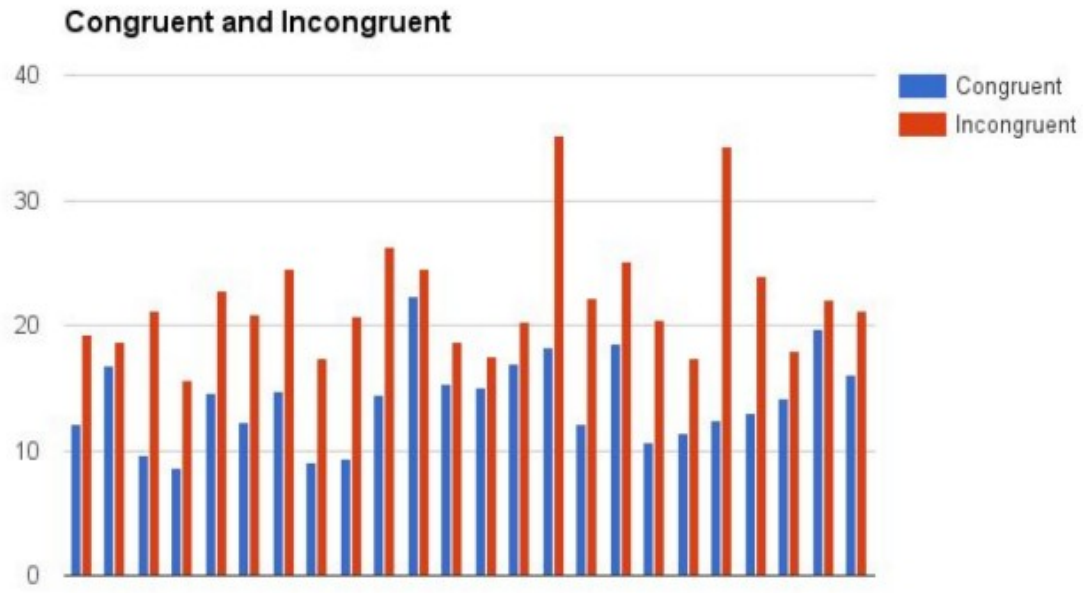
Reaction Time *vs* Test Time For Congruent Words/ Colors *Vs Incongruent*

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.

1> As mentioned above – the datasets are statistically mismatched. The P Value is less than 0.0001.

2> All statistical measures of central tendancy are different, Mean, Median





From both the graphs above I infer that congruent data value is always lesser than the corresponding incongruent data value.

As mentioned above :

Mean (congruent data) = 14.05

Mean (incongruent data) = 22.10

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?

Observations :

t(statistics value) = - (8.02)

t(critical value) = 2.06

As the t(statistics) value is way past the t(critical) value the null hypothesis is rejected. I **reject** the null hypothesis which states that there is no significant differences between the population average completion time for the two different conditions (Congruent & Incongruent) we expect there would be a significantly slower or significantly faster time in either the the incongruent or congruent condition.

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