

# 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?

Ans). The independent variable in our experiment is the list of words displayed to the participant and dependent variable is the time taken by him or her to correctly identify the color in which the words are printed.

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

Ans). Let's consider

$\mu_L$  is the mean time taken under incongruent condition and

$\mu_C$  is the mean time taken under congruent condition.

Then Null Hypotheses( $H_0$ ) is that there won't be much difference between the mean time taken by the participants in performing both the tasks.

$$\text{I.e, } H_0 : \mu_L - \mu_C = 0$$

Alternative Hypotheses( $H_1$ ) is that participants take more mean time in performing incongruent task when compared to congruent task.

$$\text{I.e, } H_0 : \mu_L - \mu_C > 0$$

By observing the data in excel sheet i would like to perform dependent sample one tail t-test in positive direction because of the following reasons:

a).Because we are provided with data which are just the samples of population

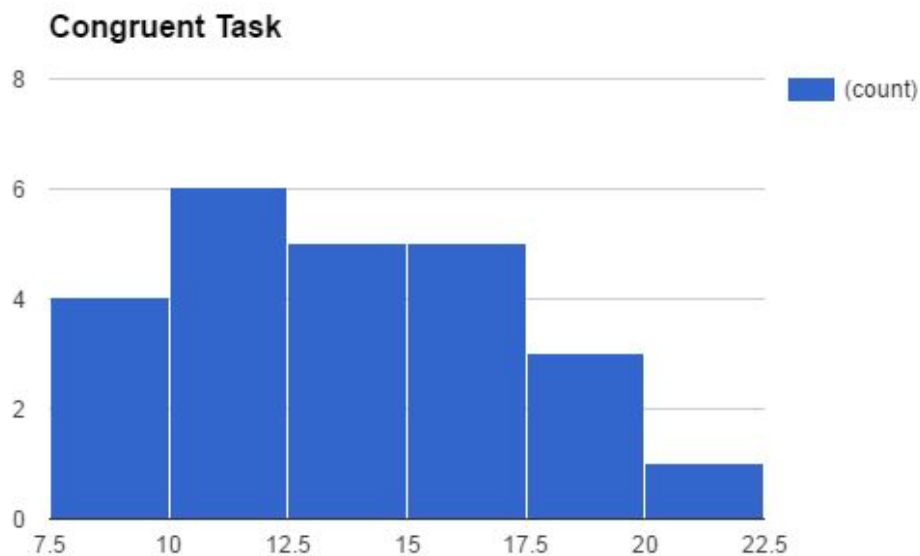
b).It is within in the same subject design and the same participants are being measured twice under two different conditions.

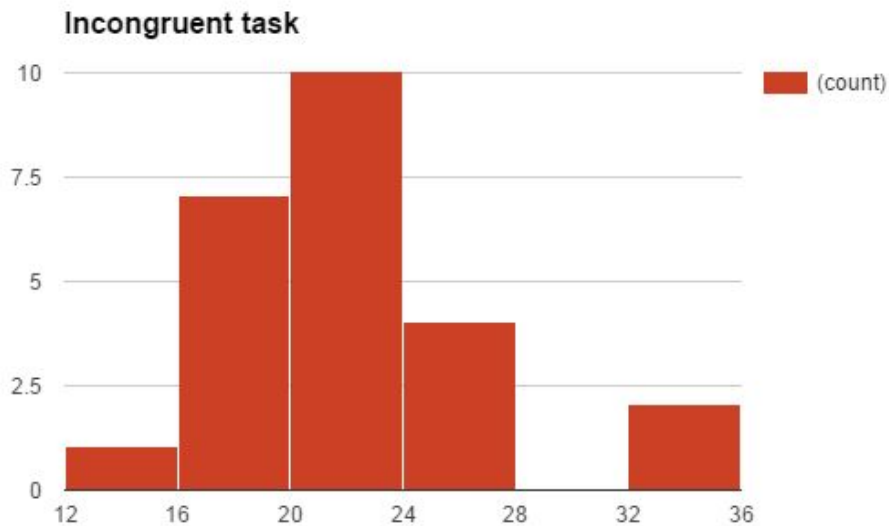
3. Report some descriptive statistics regarding this dataset. Include at least one measure of central tendency and at least one measure of variability.

Ans). The mean difference of time taken in performing incongruent and congruent task is : 7.96 and standard deviation for the same is 4.86

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.

Ans). The first histogram shows the distribution of congruent task data where we can see that most people took 10 to 12.5 secs to complete the task and second histogram shows the distribution of incongruent task data where we can observe that most people took 20 to 24 secs to complete the 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?

Ans). The t-critical value at alpha level of 0.05 and  $df=23$  ( $n=24$ ) is 1.714 and the t-statistic is 8.02. As we can see that t-statistic lies far ahead the t critical value in positive direction so we reject the null hypotheses by accepting the alternative hypotheses which states that participants take more time in performing the incongruent task. Yes the results did match up with my expectations.