Stroop Effect Analysis

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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- Independent variable= the condition of the task i.e. whether it is congruent words condition or incongruent words condition.

Dependent variable=the time taken by the participants to identify ink color.

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

Ans- μ_c=Congruent words population mean.

μ_I=Incongruent words population mean.

Null Hypothesis (H_o -> $\mu_c = \mu_I$) =Mean time taken for each word condition(congruent and incongruent) remain the same.

Alternate Hypothesis (H_A -> μ_c != μ_I) =Mean time taken for each condition are not equal.

I expect to perform a two tailed dependent sample t-test because t-tests are performed when we are given sample instead of population. If a population was given, I would have performed the z-test.

The t-test performed will be two tailed because we want to know in which direction does the t-test statistic falls i.e. in –ve direction or +ve direction. This is a repeated measures design dependent sample.

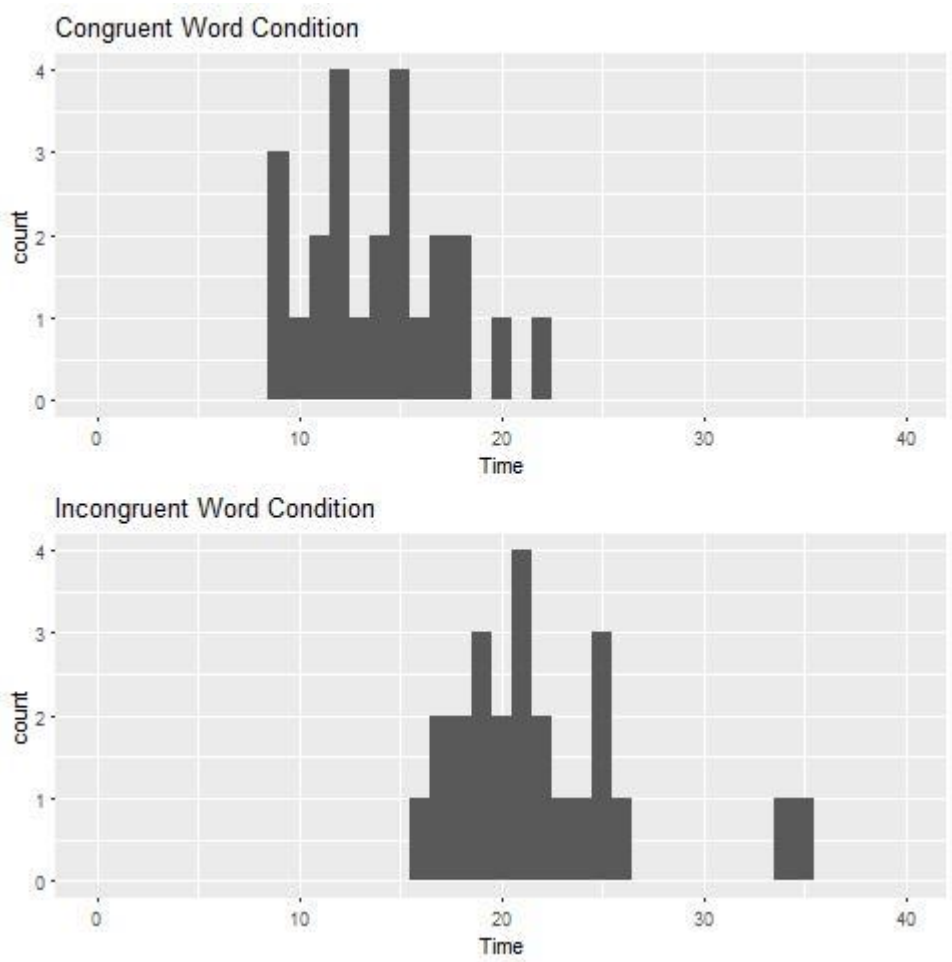
3. Report some descriptive statistics regarding this dataset. Include at least one measure of central tendency and at least one measure of variability.

Ans- **Mean ($\bar{x}_c$) =**14.05 **Median**=14.35 **Standard Deviation (σ_c)** = 3.56

Mean ($\bar{x}_I$) =22.02 **Median**=21.01 **Standard Deviation (σ_I)** = 4.80

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-



It is quite clear from the above histograms that in case of incongruent words condition, people took more time to respond. Even the minimum response time for incongruent words condition was way more than congruent words condition. From the graph we can easily estimate the time range for congruent word condition (around 9 to 23 seconds) and incongruent word condition (around 15 to 35 seconds).

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- Confidence level=95%

α=0.05

df =n-1 =24-1 =23 So, $\mathbf{t_{crit}}$=+-2.069

s=4.87

t= $\overline{x}_D$ / (s/ √ n) = (22.02-14.05) / (4.87/√24)=8.017

t=8.017

Since t> t_{crit} and p<0.05, hence we reject the null. This means the time taken to identify ink color in case of incongruent words is not equal to time taken to identify ink color in case of congruent words.Yes, I was expecting this to happen because even I tried Stroop task and the results were quite similar.

CONCLUSION- The time taken by participants in case of incongruent words was significantly higher than the case when congruent words were given.

References-

https://en.wikipedia.org/wiki/Stroop_effect

http://www.statisticshowto.com/probability-and-statistics/t-test/