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?

- ✧ Independent variable – congruent/incongruent words condition, i.e, whether the color words displayed match the colors in which they are printed or not.
- ✧ Dependent variable – the time it takes to name the ink colors in equally-sized lists.

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

- ✧ Null Hypotheses – It takes the same time to name the ink colors between congruent and incongruent words conditions.
- ✧ Alternative Hypotheses– On average, it takes more time for the participants in incongruent words conditions to name the ink colors than those in congruent words conditions.

Below is the mathematical expression of the hypotheses set.

$H_{n:}\ \mu_1 = \mu_2$

$H_{a:}\ \mu_1 < \mu_2$

Where

H_n = the null hypotheses

H_a = the alternative hypotheses

μ_1 = the population mean response time of the participants in the congruent words conditions

μ_2= the population mean response time of the participants in the incongruent words conditions

Independent Samples T-test would be the right choice here given the following reasons. First, the sample size is 24, which is less than 30. Second, the standard deviation of the population is unknown in this task. Third, the 2 samples are independent of each other as information from one sample does not reveal that of the other.

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

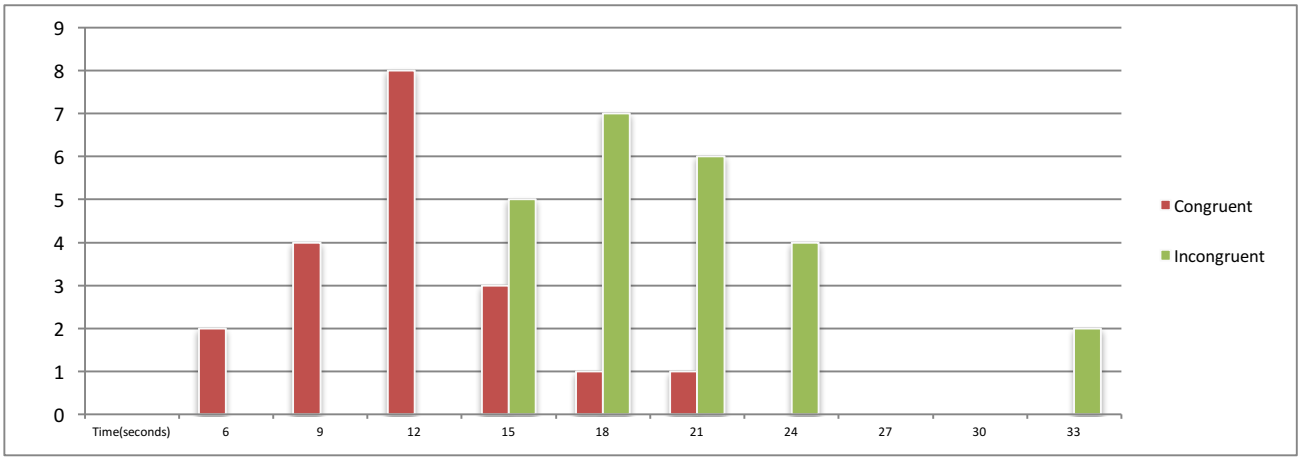
	Congruent	Incongruent
Mean	14.0511	22.0159
Median	14.3565	21.0175
Standard Deviation	3.5594	4.7971
Sample Size	24	24

On average, it takes 22.0159 seconds for the incongruent group to read out the ink colors, 7.9648 seconds longer than the congruent group. Median comparison tells us the same story. Also, the standard deviation of the

incongruent group shows us that the time spent by this group's participants has larger variability than that by the congruent group.

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.**

Below histogram measures the distribution of the sample data where x-axis is the time and y-axis indicates the number of the participants who fall within that time range. As we can see, the congruent group mostly fall in the left side of the histogram while the incongruent the right side, indicating that on average, the latter take more time to name the ink colors than the former.



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?**

The confidence level is set at 95% and the corresponding t-critical value is approximately -1.714. The t-value of this experiment test is around -8.02, therefore the null hypothesis is rejected. That is, on average, the participants in the incongruent condition group spend more time than congruent group in naming the ink colors. Therefore, the Stroop effect stands. The results match my expectations.