Questions For Investigation

As a general note, be sure to keep a record of any resources that you use or refer to in the creation of your project. You will need to report your sources as part of the project submission.

Q1. What is our independent variable? What is our dependent variable?

A1. As per the given scenario, the variables can be identified as follows:

- the condition or type of the test (i.e. whether it is congruent or incongruent) is the **Independent Variable**.
- the response time recorded for those people to read the words is the **Dependent Variable**.

Q2. What is an appropriate set of hypotheses for this task? What kind of statistical test do you expect to perform? Justify your choices.

A2. We can define the set of hypotheses as follows:

- Null Hypothesis (H_o): Our null hypothesis is that there will be no significant difference in the time for the population to state the colors of the words in a congruent or incongruent condition.
  i.e.: $H_o: \mu_1 = \mu_2$

- Alternate Hypothesis (H_a): Our null hypothesis is that there will be a significant difference in the time for the population to state the colors of the words in a congruent or incongruent condition.
  i.e.: $H_a: \mu_1 \neq \mu_2$

(Where μ_1: mean of the response times during congruent test, μ_2: mean of the response times during incongruent test)

Since the data we have is of a sample, and not the population, we will use **Dependent Sample t-test** to evaluate the hypothesis.

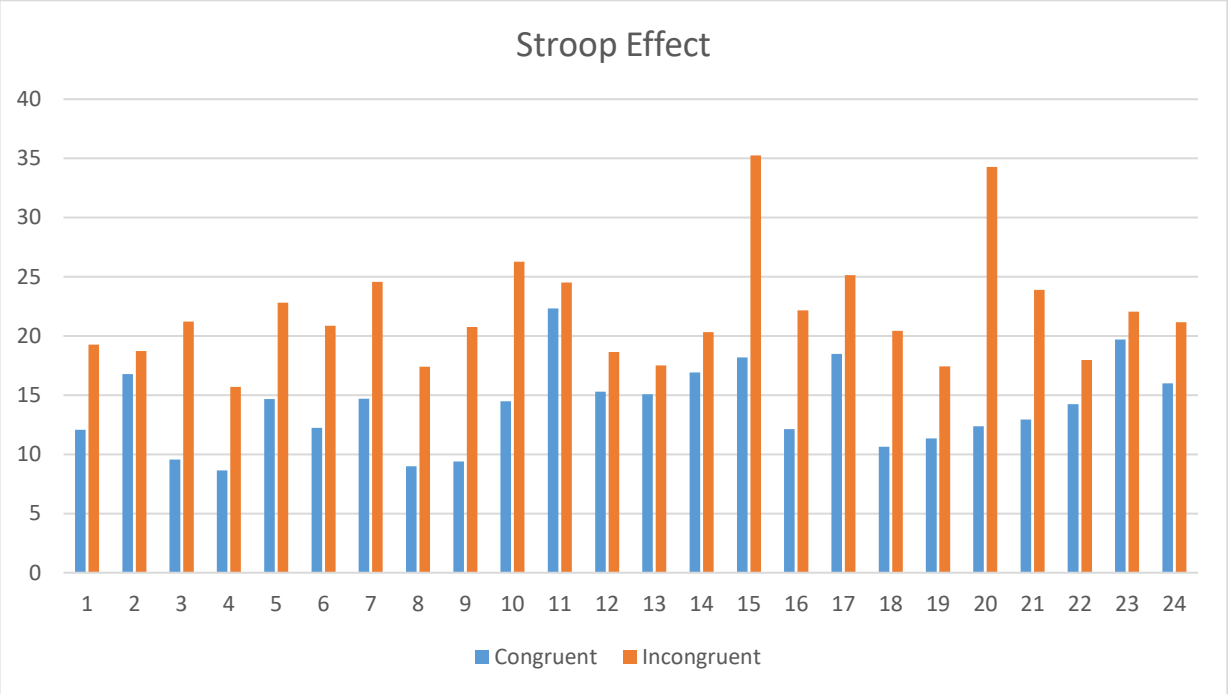
Q3. Report some descriptive statistics regarding this dataset. Include at least one measure of central tendency and at least one measure of variability.

A3. For to the given dataset, the statistics are as follows:

- The average response time of people in congruent test is 14.05 secs and in incongruent test is 22.01 secs.
- The sample variance is 23.62. As a result, the sample standard deviation comes as 4.86 and our t-statistic comes out as -8.03.
- We are comparing the statistics on a significance level of 0.05 in a two tail test (degrees of freedom being 23), which gives us t-critical value as ±2.069.

Q4. 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.

A4. As per the following graph, the response times of the incongruent test have consistently been more than those of the congruent test. The Y-axis represents time in seconds and the X-axis represents the individuals who took the tests.



Q5. 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?

A5. As we see that our t-statistic (-8.02) lies below the t-critical value (-2.069), we reject the null hypothesis (H_o). The time responses are statistically different at a significance level of 0.05.

This result was as per expectations as similar observation was made from the results of the java applet linked in the description of the project when I took the test myself.