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

Independent Variable : The text and its colour are the independent variable i.e we can decide if the text and the colour are similar(congruent) or they both are different (incongruent)

Dependent Variable : The time difference of when the stimuli is introduced i.e texts are shown and the response of the respondent i.e. when he/she says the colour of the text.

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

The null hypothesis always assumes no difference in the two population means i.e the sample mean of congruent results and that of the incongruent results . The alternative hypothesis will be that there is a statistically significant difference in the population means of above stated data sets.

$$H_0: \mu_{congruent} - \mu_{incongruent} = 0 \text{ at } \alpha = 0.5$$

$$Ha: \mu_{congruent} - \mu_{incongruent} \neq 0 \text{ at } \alpha = 0.5$$

Where **μcongruent** is the population mean of the congruent results data and **μincongruent** is the population mean of the incongruent data result.

There will be a paired two sample t-test as the same participants were measured twice for two different conditions (Repeated measures design) i.e the congruent and incongruent. Also, since we are not concerned with the direction of the difference, the test will be two-tailed.

The reason for choosing this specific test is that t-test is the best statistical test for comaparision of two sample means and since we are not concerned with the direction of difference hence we conduct a two-tailed test. These two population were measured for the different condition.

The paired two sample t-test is appropriate for the differences between two paired samples differs from 0 (or a target value).And since the two means are independent of each hence the t-test is the only robust hypothesis test.

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

Here are some descriptive statistics for the dataset:

$$\bar{x}_{congruen} = 14.05 \text{ sec}$$

$$S_{congruent} = 3.56 \text{ sec}$$

$$\bar{x}_{incongruent} = 22.02 \text{ sec}$$

$$S_{incongruent} = 4.80 \text{ sec}$$

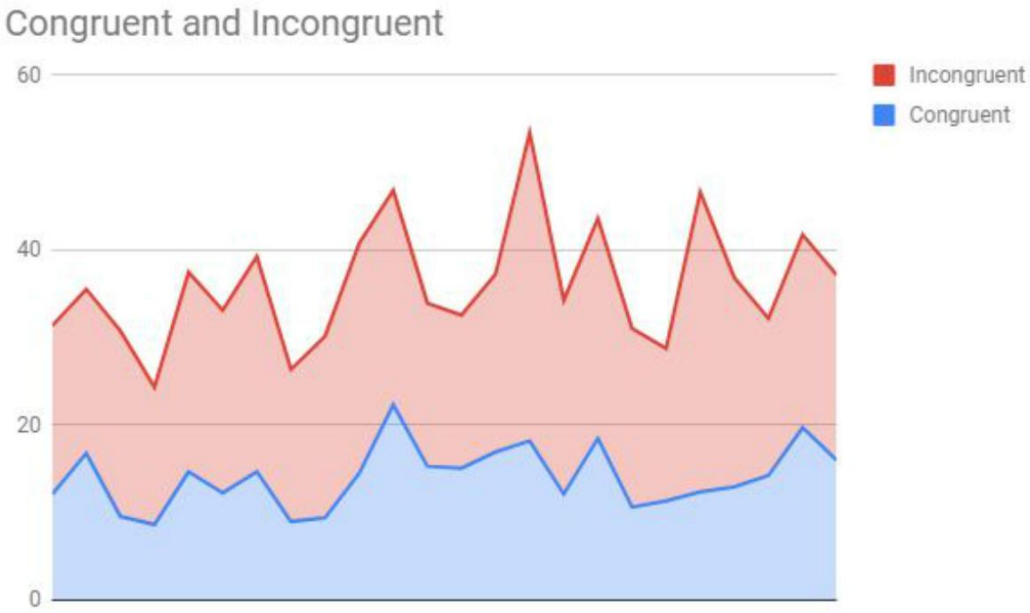
Where x and S are the sample mean and sample standard deviation respectively.

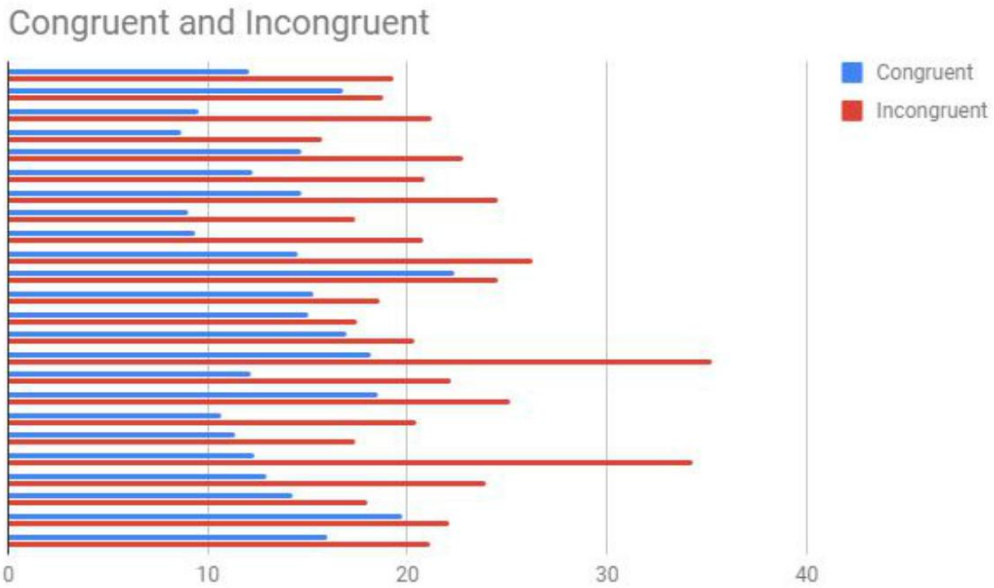
These are the values rounded up to two decimal places.

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.

The stacked area graph is the first depiction.

The bar graph show positively skewed distributions for both samples.





It can be clearly seen the comparision graphs that the time taken in incongruent data always peaks in comparision with that of congurent and the stacked area graph the incongurent data covers more area than than that of the congruent one

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?

We have,

$$\mu_D = -7.97 \text{ (Mean of differences)}$$
$$SE_D = 0.99 \text{ (Standard Error) } n = 24, df = 23$$

Performing a two tailed t-test, we get:

$$\alpha = 0.5 \text{ (95\% confidence level)}$$
$$t = \pm 2.069 \text{ (two tail)}_{critical}$$
$$t = -8.021_{statistic}$$
$$p < 0.0001$$

The null hypothesis will be rejected as the p-value is extremely small and it is highly unlikely that the difference in times occurs due to random chance.

The alternative hypothesis is accepted and we come to the conclusion that there is a statistically significant difference in average times for congruent/incongruent tasks.

This result that we just devised highly likely to occur as it takes more time for the response in incongruent test.

6. What do you think is responsible for the effects observed? Can you think of an alternative or similar task that would result in a similar effect? Some research about the problem will be helpful for thinking about these two questions!

The incongruent test takes more time as when we read a word the text goes to our mind first and then the colour hence we have re assess the word to give the colour of the word.

Another task that can give similar result are different shapes as we can write the correct shape and in the incongruent part we can write different shape. For eg. we write rectangle inside a square or circle inside a triangle.