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

Independent variable : the ink color of the word (the color name) in the list. In other words, the congruency between the color name and its ink color in the list.

Dependent variable : Time is taken by a participant to name the ink color of each word (the color name) in the list.

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

Hypotheses :

μC **:** The population mean of the time spent naming congruent words list.

μI **:** The population mean of the time spent naming incongruent words list.

Null hypothesis ⇒ H_0**:** $\mu C = \mu I$

The mean of the time that is needed to recognize the list of words are the same under both conditions, congruent words and incongruent words .

Alternative hypothesis ⇒ H_A**:** $\mu C \neq \mu I$

The mean of the time that is needed to recognize the list of congruent words is different from the mean of the time that is needed to recognize the list of Incongruent words

Statistical Test:

I'll perform Dependent T-Test for paired samples, for the following reasons :

1. SD of the population is unknown .
2. The same subject takes the test twice.
3. I'm comparing means of two dependent samples.

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

measure of central tendency :

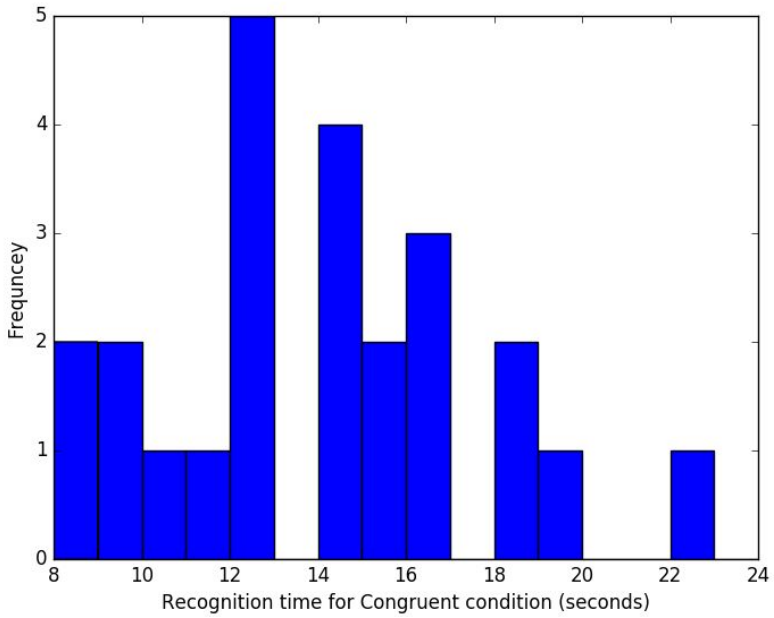
	Congruent	Incongruent
Medain	14.3565	21.0175
Mean	14.051125	22.01591667

measure of variability :

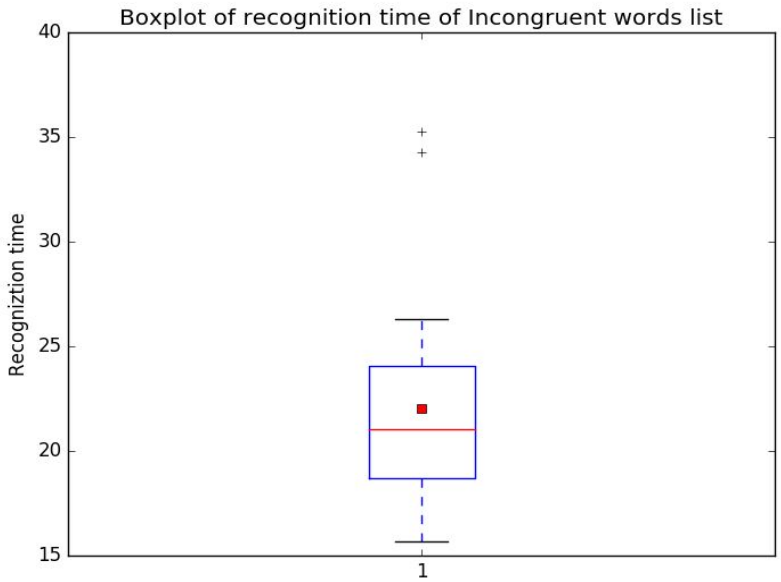
	Congruent	Incongruent
Range	13.698	19.568
Interquartile Range (IQR)	4.686	5.5165
Variance	12.66902907	23.01175704

Standard Deviation	**3.559357958**	**4.797057122**

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 above histogram depicts the time taken by participants to recognize congruent words list, and we can see most of the participants needed between 12 and 13 seconds to recognize the entire words list.



The box plot visualizes quartiles and the median of the time participants needed to recognize the incongruent words list. It also shows the max and the min times in our sample. Moreover, we can see that we have 2 outliers in our sample.

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?

I will refer to congruent sample with 1 (for example m means the mean of sample 1), and refer to Incongruent sample with 2 (ex : m2 means the mean of sample 2)

Sample size (n) = 24
Point of estimate ⇒ m1-m2 = -7.96479167
DF = 23
Sample SD of differences ⇒ S = 4.86482691
SE ⇒ 0.382251013
T-statistics ⇒ (m1-m2)/(S/SQRT(n)) = **-8.021**
P-Value ⇒ P < 0.0001
T-critical value ⇒ For our test, with an alpha level of 0.05; the T-critical value is **+/- 2.0686**
CI ⇒ ((m1-m2) - T-critical * (S/SQRT(n)) , (m1-m2) + T-critical * (S/SQRT(n))) = (-10.0189707, -5.910612633)

Since our T-statistics value falls in one the critical regions (**-8.021 < - 2.0686**) , we reject the null hypothesis. Participants significantly take longer time to recognize incongruent words list comparing to the time they need to recognize congruent words list.

We're 95% confident that true population mean will be within this interval (-10.0189707, -5.910612633)