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

Independent Variable: Condition of words (Congruent or Incongruent)
Dependent Variable: Response time for reading words

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 Hypothesis: $\mu c \geq \mu i$
Mean response time needed to read congruent words are more than or equal to mean response time needed to read incongruent words.

Alternative Hypothesis: $\mu c < \mu i$
Mean response time needed to read the congruent words is less than the mean response time needed to read incongruent words.

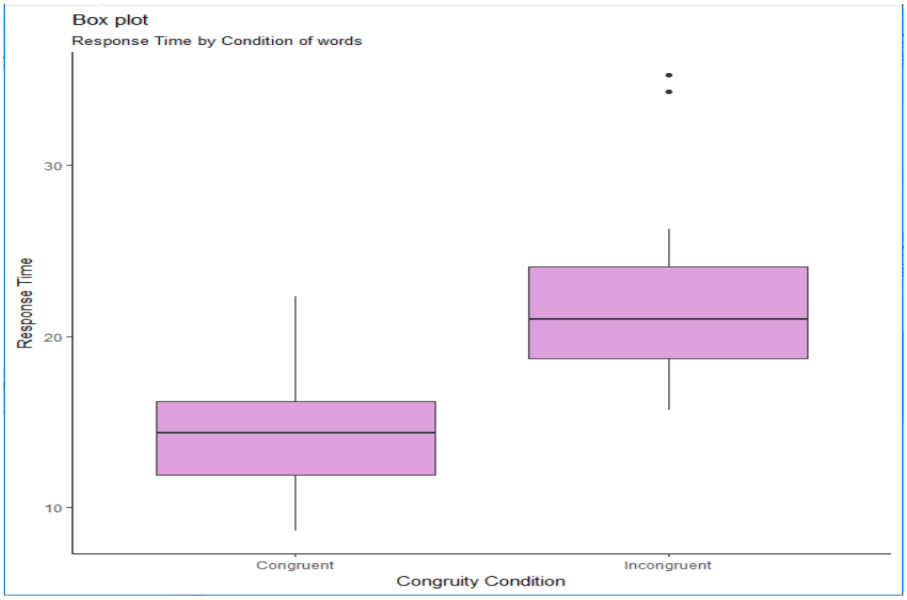
Note: c refers to Congruent words, and i refers to Incongruent Words, where μ refers to the corresponding population mean.

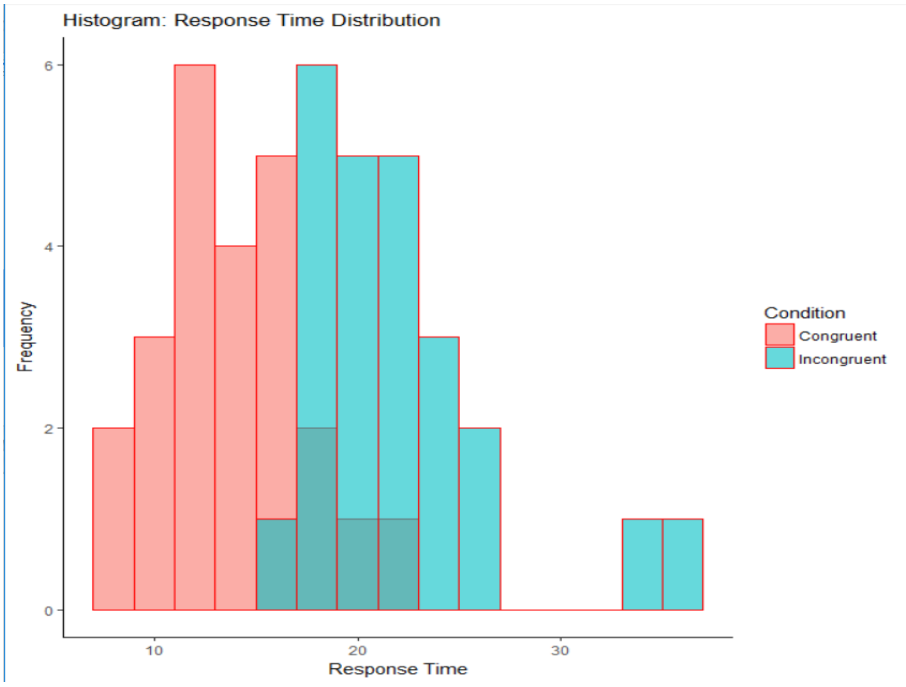
Since population parameters are not available, so Z test is not appropriate in this scenario. The dependent sample t test is apt for this scenario as two groups are related, same group is assigned two different conditions and there are less than 30 samples.

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

Congruent: Mean - 14.05, Median - 14.36, Standard Deviation - 3.559
Incongruent: Mean - 22.02, Median - 21.02, Standard Deviation - 4.797

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.





By looking at the plots:
For Congruent words - 75% or more response time are less than 20. Mean is less than 15.

For Incongruent words - maximum distribution of response time are above 20. Mean is more than 20. Two very large values.

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?

one tailed t test, Confidence level: 0.05, t - critical value = 1.714, degree of freedom = 23

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        Paired t-test

data:  stroopdata$Congruent and stroopdata$Incongruent
t = -8.0207, df = 23, p-value = 2.052e-08
alternative hypothesis: true difference in means is less than 0
95 percent confidence interval:
      -Inf -6.262868
sample estimates:
mean of the differences
              -7.964792
```

|t-stat| > |t-crit| with p value less than 0.001, we reject the null hypothesis in favor for the alternative hypothesis, i.e. difference between two means is negative. The response time to read congruent words are significantly less than the incongruent ones.

The statistics results match with the prediction, as mean response time for reading congruent words are significantly less than the response time for incongruent words. Also, distribution of response time for incongruent words is more spread.