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

Soln :
Our independent variable is the word condition(either congruent or incongruent).
Our dependent variable is the time it takes to name the ink colours.

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

Soln:
Null hypothesis - difference between population mean of the congruent and incongruent is zero i.e there will not be any significant difference in the time taken to name the ink colours.
Alternative hypothesis - difference between population mean of the congruent and incongruent is not zero i.e there will be significant difference in the time taken to name the ink colours.

Mathematically,

H_0: $\mu_{incongruent} - \mu_{congruent} = 0$

H_A: $\mu_{incongruent} - \mu_{congruent} \neq 0$

Where H_0 = null hypothesis

H_A = alternative hypothesis

$\mu_{incongruent}$ = population mean of incongruent

$\mu_{congruent}$ = population mean of congruent

We will use t-tests instead of z-test because:

- we have small sample size (n<30)
- Unknown population variance.

Since the same samples of students perform both the tests and the population mean and variances are unknown, we will do dependent samples t-test . It will be two tailed test since the direction of the differences is unknown.

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

Soln:

For incongruent data:

Mean : 22.02

Standard deviation : 4.80

For congruent data:

Mean: 14.051125

Standard deviation : 3.56

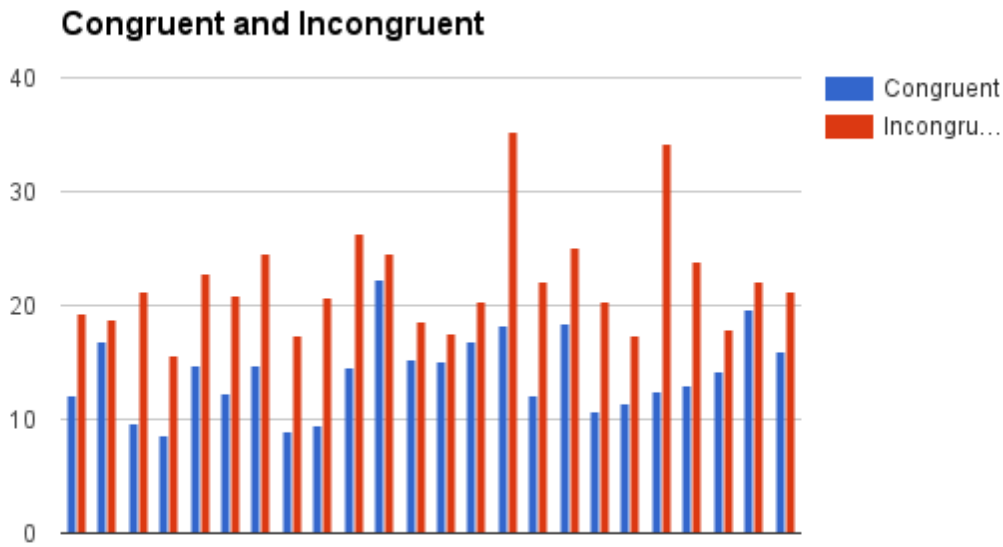
For difference between two:

Mean: 7.96

Standard deviation : 4.86

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.

Soln:



This graph clearly shows that each participant takes more time to respond in the case of incongruent word condition.While difference for some students is less but is very large for some students.

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?

Soln:
t-critical value: 2.06 (data taken from t-table)

$t(24) = 8.02$, $P<0.0001$,two tailed
(probability calculated from http://www.graphpad.com/quickcalcs)

We have to reject the null hypothesis.

Confidence interval on the mean difference ; 95% CI = (5.92,10).

We can conclude that each participant takes more time to respond in the case of incongruent word condition. Yes, the results did matched up with my expectation.