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

The independent variable is the the congruent and incongruent conditions.

The dependent variable is the “time it takes to name the ink colors in equally-sized lists” for each condition.

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

$H_0 : \mu_c = \mu_i$

H knot is the population mean of congruent tasks equal to the population mean of incongruent tasks. This means that the difference between μ_c and μ_i will be pretty much close to 0.

$H_a : \mu_c \neq \mu_i$

H alternative is the population mean of congruent tasks will not be equal to the population mean of incongruent tasks. This means that the difference between μ_c and μ_i will not equal 0.

Null hypothesis: There will be no significant change in the population mean time it takes to name the ink colors in equally-sized lists between the conditions.

Alternative hypothesis: There will be a significant change in the population mean time it takes to name the ink colors in equally-sized lists between the conditions.

I expect to perform a t-test because we don’t know the mean and the standard deviation of the population who took this stroop effect test. We only have a sample data set. We will be dealing with a dependent sample. In other words we are dealing with a within-subject design.

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

Congruent data set:

Mean → 14.05
Median → 14.3565
Mode → 9-17

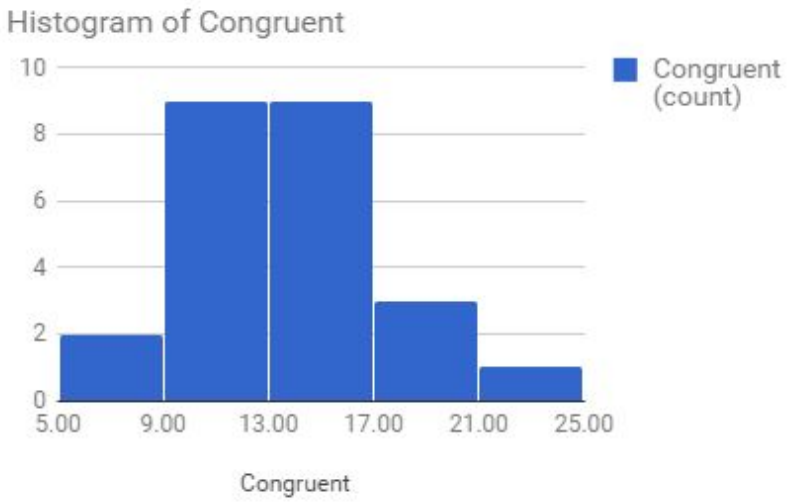
Range → 13.698
Standard Deviation → 3.56

Incongruent data set:

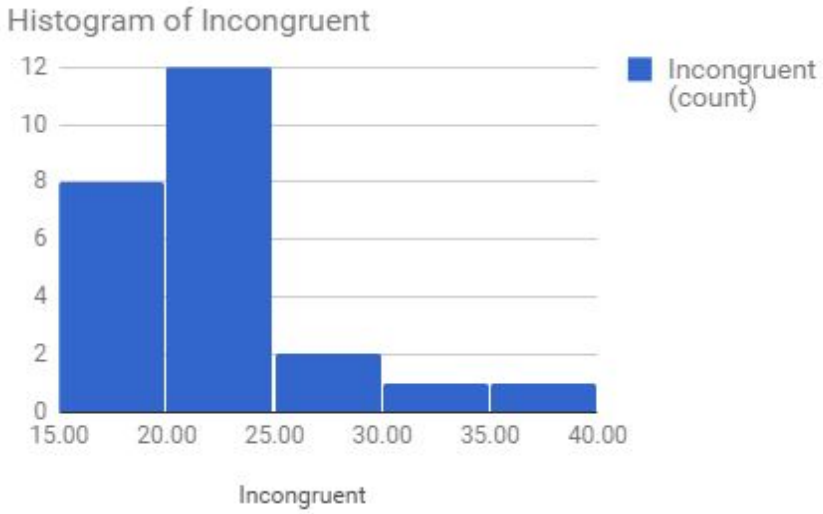
Mean → 22.02
Median → 21.0175
Mode → 20-25

Range → 19.568
Standard Deviation → 4.80

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.



I notice that the histogram for the congruent data points follows a general normal distribution. There seems to be a lot of scores between the range of 9-17 seconds.



I notice that the histogram for the incongruent data points follows a positively skewed distribution. This means that most data points are clustered around the lower tail of the distribution. When a distribution is skewed like this, the best measure of central tendency would be the median instead of the mean. This is because you might come across some positively skewed data sets that have large outliers that can influence the mean, thus resulting in a central tendency that may not be representative of the sample. Medians aren't as affected by outliers.

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?

Two tailed
Alpha level = 0.05
Degrees of Freedom → 23

T-critical → -2.069 & 2.069
SE - difference → 0.38
Mean difference → 7.96
T-statistic → -8.02
95% CI for the mean difference → (-10.02, -5.91)

Conclusion → Reject null hypothesis, because $p < 0.05$ → not likely due to chance
The results of this experiment matched up with my expectations. I expected that there would be a significant change in the time it takes to speak out loud congruent words than incongruent

words. There seems to be an significant increase in time taken in seconds from congruent to incongruent words.

6. Optional: 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!

Our minds are trained to associate words with specific meanings. When the word “pink” is ink colored in “blue”, our brain has to consciously exert more effort into seeing if the word and the ink color is congruent, and if not, then our brain has to ignore the word meaning and focus on the ink color instead. Therefore, there’s two stages involved. Whereas, in the congruent task our minds can just go on autopilot mode knowing that the word meaning is congruent with the ink color.

The stroop effect can be observed when we go grocery shopping. With all the mass of items in the store we become easily distracted with whether to purchase this item or that item. To counteract this effect we must use selective attention. Coming to a grocery store with a ready list of specific items will persuade your mind to focus on specific items rather than deciding which item and their similarities to buy.

Links:

http://www.thesimpledollar.com/the-stroop-effect-and-your-wallet/