Simon Zhang
Stroop Test Hypothesis Test Project

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

The independent variable is the congruent or incongruent condition the participant is given. The dependent variable is the reaction time it takes the participant to say the ink color 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.

I would perform a one-tailed dependent samples t-test because it is a small sample size and the population standard deviation is unknown. We want to estimate the real population by using the sample data that we have.

Null hypothesis is that there is no difference in reaction time between the congruent and incongruent.

Alternative hypothesis is that the reaction time is longer for the incongruent condition than the congruent condition.

μ(con) is the mean reaction time of the congruent population and μ(incon) is the mean reaction time for the incongruent population.

Ho: μ(con) >= μ(incon)
Ha: μ(con) < μ(incon)

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

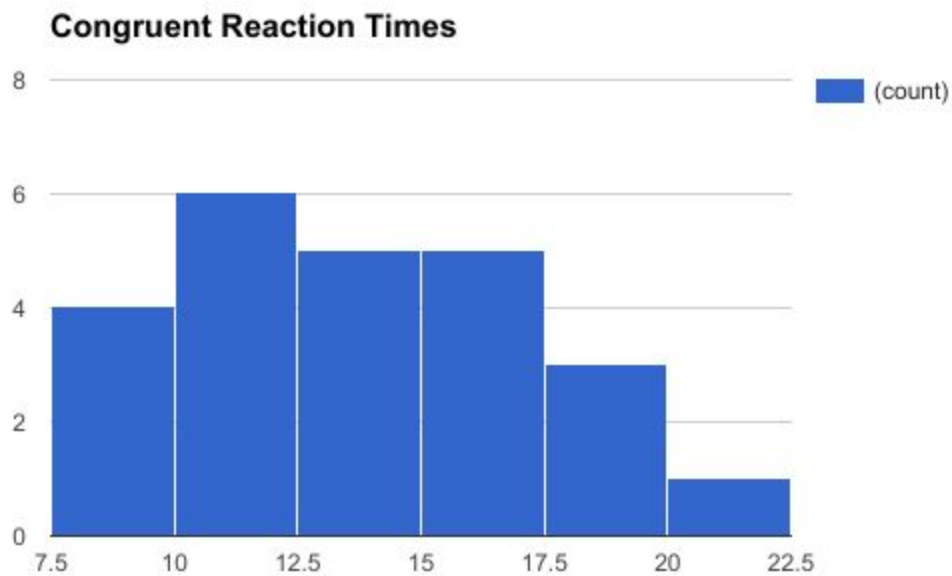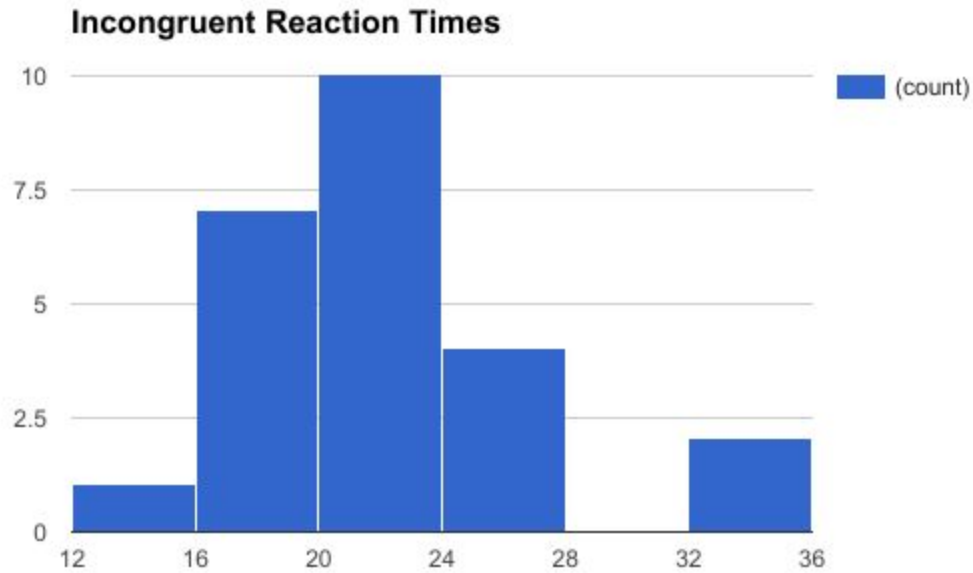$\bar{x}$ (con) = 14.051125
Standard deviation = 3.559357958

$\bar{x}$ (incon) = 22.01591667
Standard deviation = 4.797057122

$\bar{x}$ (diff) = $\bar{x}$ (con) - $\bar{x}$ (incon) = -7.964791667
Standard deviation(con-incon) = 4.86482691

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.

Incongruent Reaction Times

Congruent Reaction Times

I think that it's pretty clear that the average reaction time is high for the incongruent condition. It seems that the congruent condition also has more uniformity in terms of the range of times as well as having a smaller range. The incongruent times are more centralize around 16-24 seconds however the range is bigger.

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?

n=24

df = 23

a = .05

SE = s/ $\sqrt{n}$ = 4.86482691/ $\sqrt{24}$ = .9930286347

t = (x¯(con) - x¯(incon))/ SE = -7.964791667 / .9930286347 = -8.0207

Critical value = -1.714

95% CI = (x¯(diff)-t*SE, x¯(diff)+t*SE) = (-9.666, -6.2627)

Reject null hypothesis. It is very clear that the reaction times for the incongruent condition is significantly longer than the congruent condition time with t = -8.0207. It is very unlikely that the difference in mean times is random. These results are as I expected would be the case early on just by looking at the histograms and the mean difference and standard deviation.

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!

I think that we are trained our whole lives to read and at this point it pretty much becomes second nature. When we see words, we hardly spell them out and almost can read them as one block of symbols at a time because we've practiced for so many years that it's almost automatic to process the words (green, orange, blue, etc…) since these are words we see so much. Colors, our eyes can also automatically identify without much cognitive effort. Therefore, the two things, instant word processing and instant color recognition, cause a problem in our brain when the color and the word is incongruent. We are confused as to which one we are supposed to react to first since both are almost instantaneous reactions. The longer reaction times is caused by the fact that we have to actively think in our heads to identify the color rather than identify the word. I hypothesize that the result if tested on really young kids may be different. Kids who are still learning to read and can't process simple words like (red, blue, green, etc…) as instantaneously as adults can but can process colors much faster. Kids around the age of 4 maybe. I think that the young kids may be able to process the congruent and incongruent conditions at similar reaction times.

Another task such as Simon says can have similar results. The congruent condition is when Simon says something and acts that same thing out. "Simon says touch your nose" and he/she

touches their nose. The participant must then copy what he or she says to do. Record reaction time. The incongruent condition is when Simon says something and acts out something different. "Simon says touch your nose" and he/she touches their chin instead. The participant must follow what is said but not what is acted out even when watching "Simon". I've actually done this before and it's quite hard when you start doing it really fast. Also maybe reaction time wouldn't be the best dependent variable here; maybe number of mistakes could be something easier to use as a dependent variable.