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Project 1

Statistics: The Science of Decisions

Stroop Effect

1. What is our independent variable? What is our dependent variable?
   Independent variable: Congruency – Whether the word matches the color of ink.
   Dependent variable: Time – The time it takes to process & read the word.

2. What is an appropriate set of hypotheses for this task?
   Non-Directional Hypotheses
   μ_Δ: Population Mean
   μ_C: Congruent Population Mean
   μ_I: Incongruent Population Mean
   $\mu_\Delta = \mu_C - \mu_I$

   Null Hypothesis – H_0: The incongruent words *will not* affect a reader's speed of performance.
   [H_0: $\mu_\Delta = 0$]

   Alternative Hypothesis – H_1: The incongruent words *will* affect a reader's speed of performance.
   [H_1: $\mu_\Delta \neq 0$]

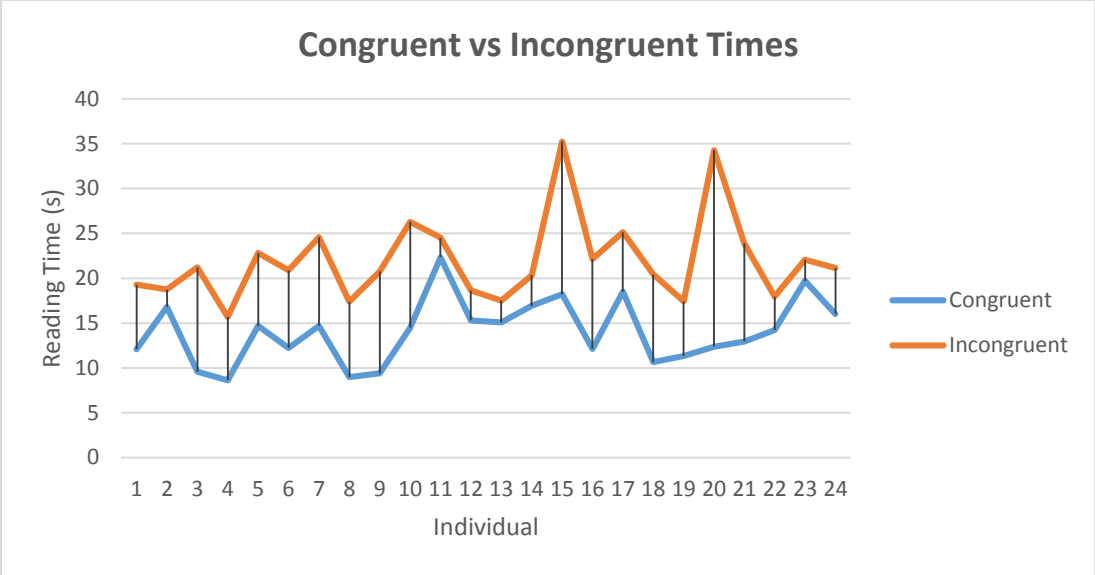
   What kind of statistical test do you expect to perform? Justify your choices.
   I expect to perform a Dependent T-Test for Paired Samples. I chose to use the t-score due to the lack of a value for the population standard deviation and also because there is a sample size less than 30. The test will check for equal sample means. A Dependent T-Test for Paired Samples implies that each individual observed has a unique value for each of the tests. A two-tailed t-test.

   Personal Stroop Test Times
   Congruent: 12.062 s
   Incongruent: 15.218 s

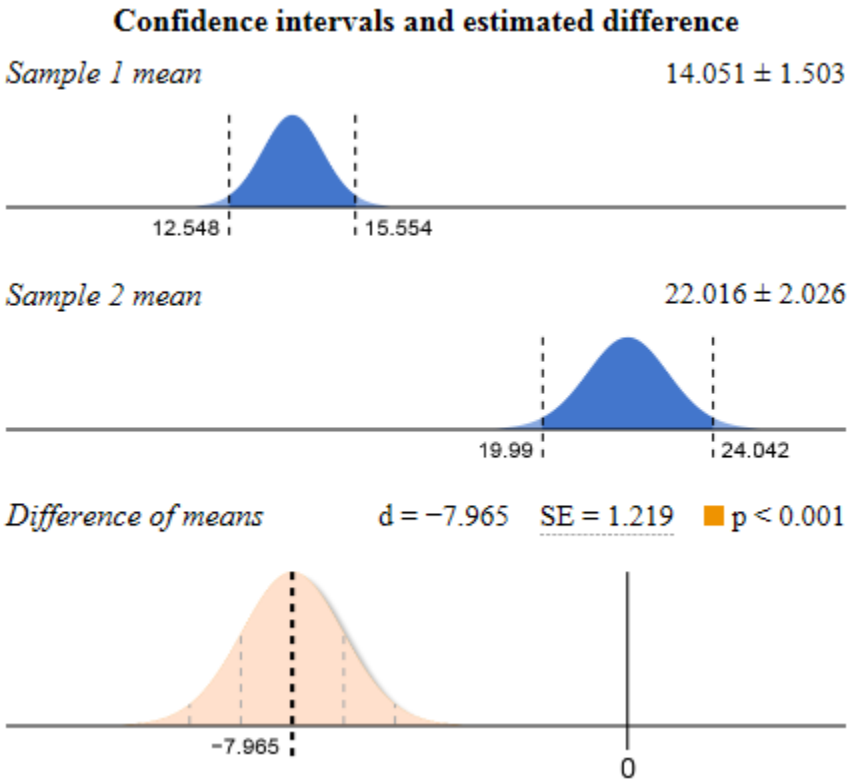
3. Report some descriptive statistics regarding this dataset. Include at least one measure of central tendency and at least one measure of variability.

	Full Population	**Congruent Sample**	**Incongruent Sample**
Median	17.735	14.357	21.018
Mean	18.034	14.051	22.016
Standard Deviation	5.740	3.559	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.



This graph shows the Reading Times for all 24 individuals tested. By observing this graph, you can visually conclude that all times for the Incongruent times are higher.



Sample 1: Congruent & Sample 2: Incongruent
Used to test my results: This shows Sample 2's mean is greater.

5. Now, perform the statistical test and report your results.
Degrees of freedom: n – 1 = 24 – 1 = 23

T Statistic: $\frac{7.97}{\frac{5.1519}{\sqrt{24}}} = 7.5738$

T-Critical value: [(alpha/2 = 0.25),df = 23] = 2.069

P-Critical Value: 0.05

T-stat is greater than T-critical.

What is your confidence level and your critical statistic value?

- I am 95% confident. T-Critical value: 2.069

Do you reject the null hypothesis or fail to reject it?

- Yes, I reject the null hypothesis, because the T-stat value is greater than the T-critical value.

Come to a conclusion in terms of the experiment task.

- I conclude that the incongruent words take longer to process; likely due to the interference caused by the non-matching word/color correlation.

Did the results match up with your expectations?

- Yes, the Stroop Effect is present within this observation just as it was in my personal test.

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!

Resources:

https://explorable.com/dependent-t-test-for-paired-samples

http://www.evanmiller.org/ab-testing/t-test.html#!14.051125/3.559358/24;22.015917/4.797057/24@95

http://support.minitab.com/en-us/minitab/17/topic-library/basic-statistics-and-graphs/hypothesis-tests/basics/null-and-alternative-hypotheses/

http://support.minitab.com/en-us/minitab/17/topic-library/basic-statistics-and-graphs/hypothesis-tests/basics/what-is-a-hypothesis-test/

http://www.statisticshowto.com/when-to-use-a-t-score-vs-z-score/

http://www.anselm.edu/homepage/jpitocch/ttest/ttesttwodepsample.html