Statistics: The Science of Decisions Project Instructions

Background Information

In a Stroop task, participants are presented with a list of words, with each word displayed in a color of ink. The participant's task is to say out loud the *color of the ink* in which the word is printed. The task has two conditions: a congruent words condition, and an incongruent words condition. In the *congruent words* condition, the words being displayed are color words whose names match the colors in which they are printed: for example RED, BLUE. In the *incongruent words* condition, the words displayed are color words whose names do not match the colors in which they are printed: for example PURPLE, ORANGE. In each case, we measure the time it takes to name the ink colors in equally-sized lists. Each participant will go through and record a time from each condition.

Questions For Investigation

As a general note, be sure to keep a record of any resources that you use or refer to in the creation of your project. You will need to report your sources as part of the project submission.

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

   The independent variable in this experiment was whether the word name and font colorwere the same or different. The levels of the independent measured are font colour same ascolour names (word-colour match) and font colour and word names are different (word-colour mismatch) .The dependent variable was the reaction time (RT) take to name the fontcolour. The dependent variable was measured by taking average of reaction time for naming same or different word names and font colors.

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

   H0 = The two samples t-statistic do not statistically differ at an alpha of .05
   HA = The two samples t-statistic do statistically differ at an alpha of .05

Because the mean difference might be due to expected variability, we need to do a T-Test to find out if the difference is significant. I will perform a dependent paired, two-sample for mean T-Test.

- Dependent: I chose dependent because there is only one sample that has been tested twice
- Paired: I chose paired because our participants were measured at two time points (so each individual has two measurements).

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

   Congruent variance = 12.1411
   Incongruent variance = 22.0529

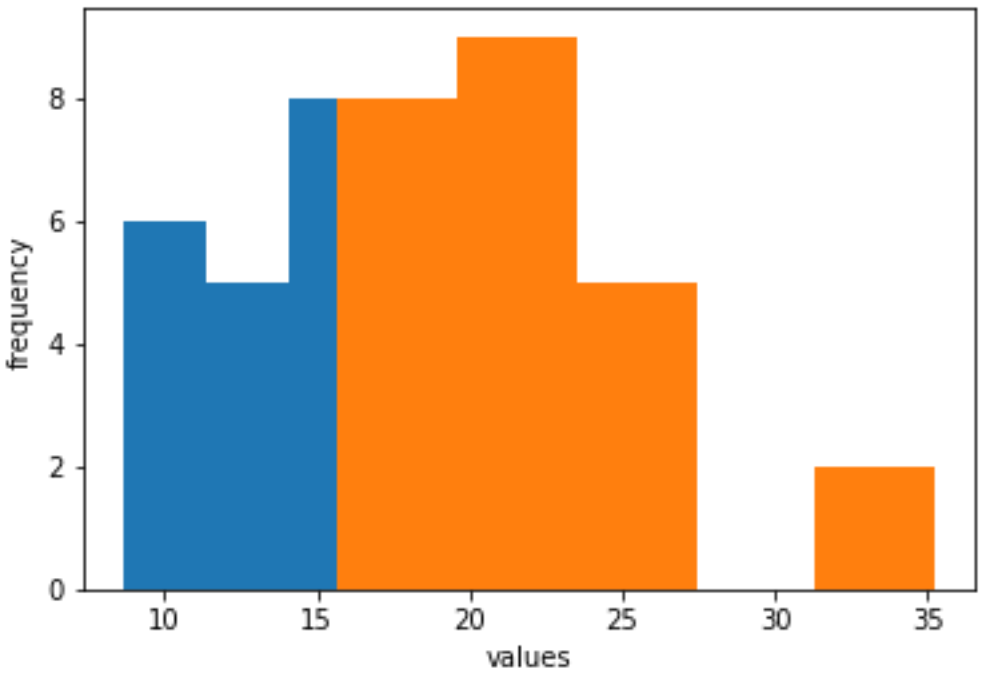
   Congruent standard deviation = 3.4844
   Incongruent standard deviation= 4.696

   t-statistics for congruent = 19.6851
   t-statistics for incongruent = 22.9151

   The two-tailed P value is less than 0.0001. By conventional criteria, this difference is considered to be extremely statistically significant.

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.

```
import matplotlib.pyplot as plt
import xlrd
import pandas as pd
stdata = pd.read_csv('C:\\Users\\phyadavi\\Downloads\\stroopdata.csv')
plt.hist(stdata[stdata.columns[0]], bins=5)
plt.hist(stdata[stdata.columns[1]], bins=5)
plt.xlabel('values')
plt.ylabel('frequency')
```



From the plot it is observed that more people have taken more time to identify the words when the words are incongruent.

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?

Getting a p-value of 0.0001 makes sense. Therefore I reject the null hypothesis.

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!

the incongruent data set is harder to interpret because the brain uses separate modules for processing color and for processing writing. I also wonder if the incongruent results would be similar to any other two signal mixes, for example, if someone was to verbally say “blue” at the same time you read the word “red”.

Resources:

https://olegleyz.github.io/stroop_effect.html
https://www.graphpad.com/quickcalcs/pValue2/
https://faculty.washington.edu/chudler/words.html