Stroop task
Inferential Statistics Assignment

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Link to Dataset :
https://docs.google.com/spreadsheets/d/1X1feHTqf8P9zxv__M8c122SiSy6L6DpaTAAEc-Vr_0s/edit?usp=sharing

1. What is our independant variable? What is our dependant variable?

By definition, Independent variables are variables that are manipulated or are changed by researchers and whose effects are measured and compared. The dependent variables refer to that type of variable that measures the affect of the independent variable(s) on the test units.

So in this case:
~~**Independant variable :** Number of congruent or incongruent words~~
Independant variable possibilities:

- Turn the words upside down or rotate them 90 degrees
- Turn the words "inside out."
- Use non-color words such as "dog" or "house."
- Use nonsense words such as "kiw" or "thoz."
- Compare long words to short words.
- Use emotional words such as "sad" or "happy" or "depressed" or "angry."
- Color only half of the word or color only the first and last letter of each word

In this experiment the Independant variable is condition of words congruence, one being a congruent words condition, the other being an incongruent words condition.

Dependant variable : Time taken to name the ink 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.

The **Null hypothesis** would be the mean time taken to name the ink colors for congruent and incongruent words are same or equal.

$H_0 : \mu_{x1} - \mu_{x2} = 0$

The **Alternate hypothesis** being the the mean time taken to name the ink colors for congruent and incongruent words are not same or equal

$H_A : \mu_{x1} - \mu_{x2} <> 0$

Here I choose **Dependant sample two tailed T-test**

The assumptions of the tests are the following

- The dependent variable are continuous
- The dependent variable are assumed to be approximately normally distributed.
- The dependent variable does not contain any outliers.

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

Following are the measures of Central tendency

For Congruent dataset

Mean = 14.051125

Median =14.3565

For Incongruent dataset

Mean = 22.01591667

Median = 21.0175

Followig are the measures of variability

For Congruent dataset

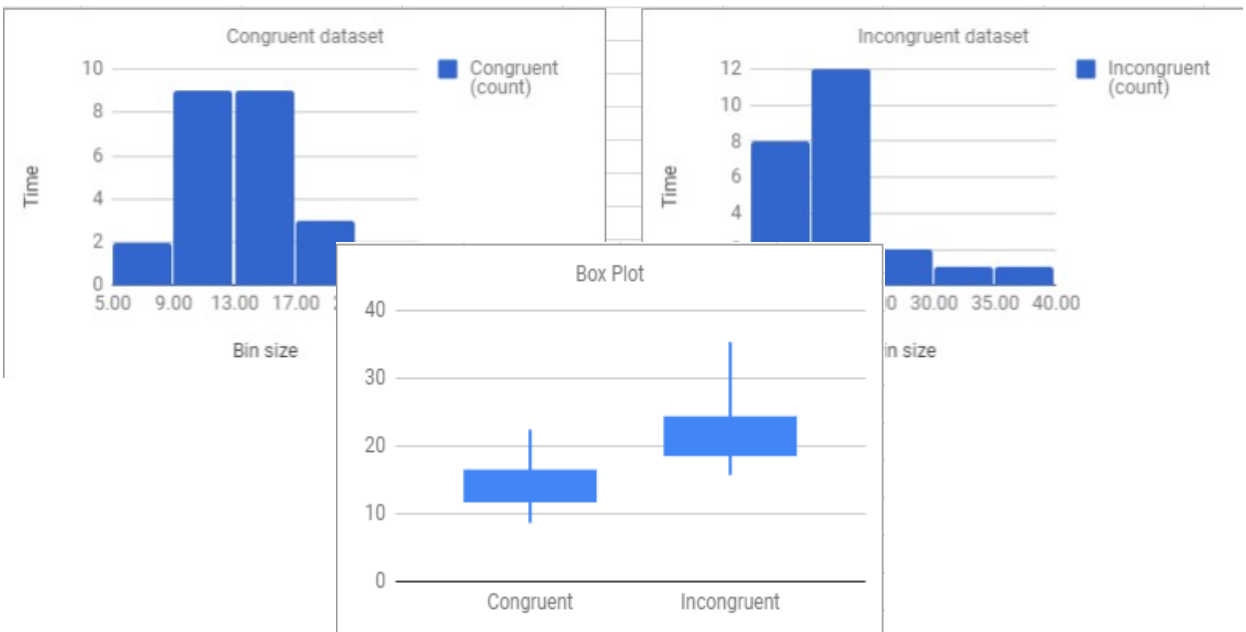
Standard Deviation = 3.559357958

For Incongruent dataset

Standard Deviation = 4.797057122

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.

Following are the visualizations of the sample data:



Looking at the plots above we can conclude that the time taken for incongruent group is higher. The histogram shows that the distribution is nearly normal for both groups

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?

Since we have chosen the dependant sample t test we will need to calculate the t-statistic and t-critical values.

So first t-statistic is given by Sample mean of x1 – Sample mean of x2 / Std .Error

= (14.0511 – 22.0159)/ 0.99302 = **-8.0207**

Let us assume a confidene interval with alpha = 0.01, so t-critical = **±2.5** with df = 23

~~P-value < 0.0001~~

P-Value for t-statistic = 0.0001 and P-value for t-critical = 0.02

So as the t-statistic does not lie between the t-critical and p < ~~0.0001~~ 0.02 , we would **reject the Null Hypothesis**

6. 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 stroop effect was an interesting exercise to know how our brains work. I did the excercise myelf and with my son who does not know to read english but can identify colors. This is the result:

	Time taken for reading Congruent dataset (seconds)	Time taken for reading Incongruent dataset (seconds)
My Self	14	34
My Son	19	22

This numbers above show how our brain processes process visual information based on the prior knowledge or understanding we have got. My brain has the knowledge to read whereas my son's

brain has not yet learned how to read. So naturally, it takes more time to process the information for my brain compared to my sons'. (I know there might be better brains to outpace my processing time though :))

References :

1) **http://www.statisticssolutions.com/independent-and-dependent-variables/**

2) **https://docs.google.com/spreadsheets/d/1X1feHTqf8P9zxv__M8c122SiSy6L6DpaTAAEc-Vr_0s/edit?usp=sharing**

3) **https://www.graphpad.com/quickcalcs/**

4) My Blog - https://vijayemmanuel.wordpress.com/2018/02/13/inferential-stastistics/