

# STROOP EFFECT-STATISTICAL ANALYSIS

- Here the **Independent Variable** is the Fact that whether the Participant was shown a Congruent Word or a incongruent word and the **Dependent Variable** is the Time taken by the Participant to correctly Decipher the Color of the Background which depends on which category of word the participant is Shown
- NULL HYPOTHEIS: There is not a significant time difference taken by a participants in population when expanded to go through a list of Congruent and incongruent words

ALTERNATIVE HYPOTHESIS: There is significant time difference taken by the participant to go through a list of Congruent and incongruent words

$$U_a = U_b \text{ NULL HYPOTHEIS}$$

$$U_a \neq U_b \text{ Alternative Hypothesis}$$

Where  $U_a$  and  $U_b$  are Proposed Population means Statistically predicted

- ✓  $U_a$ —> The estimated population mean of time taken to go through congruent list by the population if everybody starts taking it
- ✓  $U_b$ —> The estimated population mean of time taken to go through incongruent list by the population if everybody starts taking it

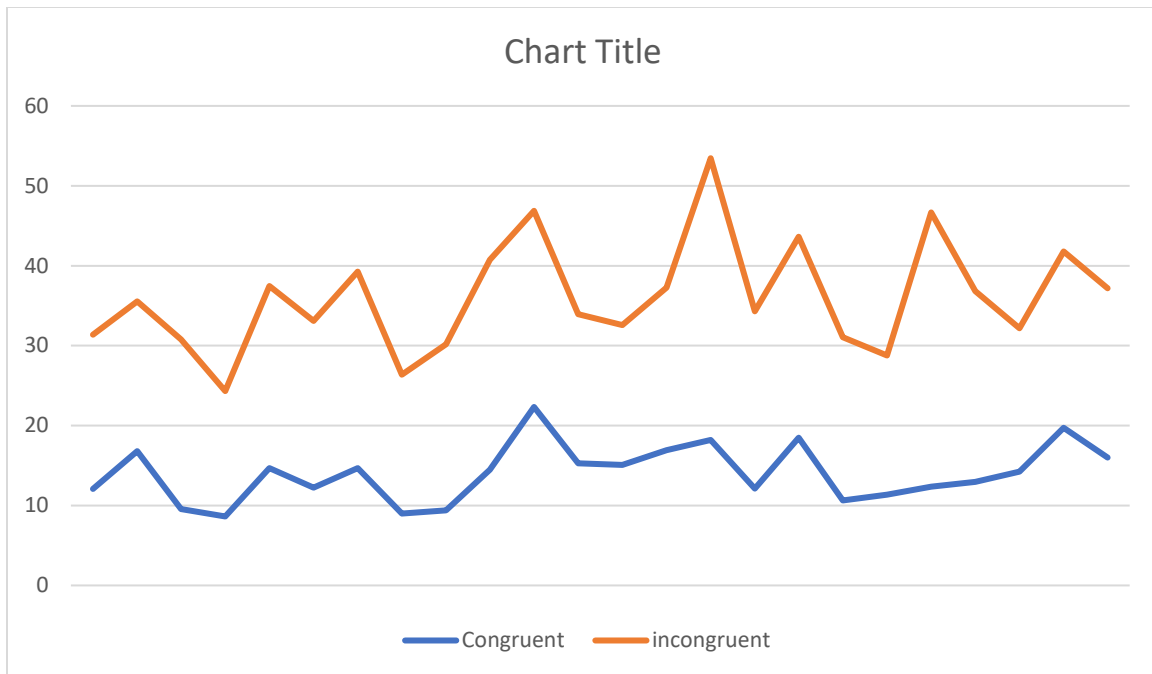
# STATISTICAL TEST DETERMINATION

- ✓ We will be using Repeated Measure design (dependent samples) since these experiments are evaluated Under different condition
- ✓ We are only finding if there is **Similarity between the Test Conditions** and thus a **Two tailed Table** will be used to perform Stastical Analysis

## WHY T TEST

1. Absense of the population standard deviation as the given Dataset is representative of one of many Sample
2. Here the Corresponding Data set of the Sample is quite small which is all the more reason to use T test
3. The T test assumes to approach normal Distribution in the large amount of samples
4. Here the dependent means t test is used as the same subject participate in both conditions of experiment

Simply put a t test is for testing and comparing the means of population when population standard deviation is unknown and relative sample size is quite low



- ❖ Evident from The chart The time Taken to go through the Incongruent List by the Participants is **generally Higher than time taken** to go through the Congruent List
- ❖ The Slowest Time taken by a participant to go through the Congruent list is lower than the Fastest time taken to go through the Incongruent List

## Descriptive statistics and Statistical Test

## ■ Descriptive Stastics

- ✓ The Average Time Taken by the Participant to go through the Congruent list is 14.05
- ✓ The Average Time Taken by the Participant to go through the Incongruent List is 22.015

TAKING ACCOUNT OF BESSEL CORRECTION

- ✓ The Standard Deviation of Time taken in case of Congruent List is 3.559
- ✓ The Standard Deviation of Time Taken in case of Incongruent list is 4.797

## ■ Stastical Test

- ✓ To begin Stastical test between two dependent Samples , lets calculate T STAT of the Difference of the Time taken by the participant to go through each of the category

$$T = (Ua - Ub)/std$$

$$std = s/sqrt(n)$$

*Ua and Ub are proposed Population means*

- $(Ua - Ub) = -7.964791667$  (The Mean Differnce)
  - $std = Standard\ error$
  - $S = standard\ deviation\ of\ differnces\ of\ sample = 4.86$  (Solved in Spreadsheat Attached)
  - $std = \frac{4.86}{sqrt(24)} = 0.9930$
  - $T = \frac{Ua - Ub}{std} = -8.020706944$
  - S is calculated by taking the difference of time taken by each of the participant in experiment and calculating the deviation
- ✓ For  $alpha = 0.05$  and  $df = n - 1 = 23$  the ***T Critical Value = TC = 2.07***
  - ✓ From above calculation ***T > T Critical*** and hence there is a strong evidence of Rejecting **the Null Hypothesis**

- ✓ By Rejecting **Null Hypothesis** it can be prove there **exists a significant time difference to go through the list of congruent and incongruent list by the Participants**
- ✓ Further Calculating we now find the *CI = Confidence Interval*

- $CI = (Ua - Ub) \pm TC * (\frac{s}{\sqrt{n}})$
- $CI = -7.964 \pm (-8.020706944) * 0.9930$
- *Lower Bound CI* = -15.92958333
- *Higher Bound CI* = 0

## Reason of Deviation

Most popular theory for this known phenomenon is that Most parts of brain works in unison in deciphering, recognizing the everyday objects, but the Stroop effect causes the multiple parts of brain to get in conflict and thus causes the extra delay in deciphering the Background as the linguistic word does not agree with the word of the background

## References

- <http://faculty.washington.edu/heagerty/Books/Biostatistics/TABLES/t-Tables/> [ T table]
- <https://imotions.com/blog/the-stroop-effect/> [Excellent Article on Stroop effect]
- <https://cyfar.org/types-statistical-tests> [Information about stastical Tests]

## References

- Two Google Sheets in pdf Showing the Roughwork for Calculating Stastical Measures (T Value std, etc)

## Conclusion

**By performing Stastical Test we find that There exist a Significant Evidence that Population will take more time to go through a incongruent list than the congruent list**