Program: Data Analyst Nanodegree

Project: P1-Perceptual Phenomenon

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Stroop Test

Introduction

Stroop effect is a neuropsychological experiment which was named after John Ridley Stroop. In this project we are given a dataset(click here for the dataset) with sample size of 24 where the individuals are given two sets of different color words. The first congruent set is a list of color names printed by their respective color. In this first case the color red is printed in red color (Red). The second incongruent set is a list of color names printed in different color. Example, the color red is print in blue (Red). The individual has to say the printed color name in both cases. The time taken for each individual to say the words in both cases is recorded. The experiment is to see if there is any significant difference in the time taken to read the words between the congruent and incongruent cases.

I believe that it is easier and faster to identify colors, images and objects than to read names of the colors, images and objects. In addition to that when the words are printed with different colors (other than printed in black color), are confusing and needs more time to say them. Hence, my expectation is the time taken to say the words in the congruent case will be less than the time taken to say the incongruent words.

1. **Dependent and Independent variable**

   Independent variables: the printed names of colors (congruent and incongruent)

   Dependent variable: the time taken to say the printed names of the colors in seconds

2. **Hypothesis**

   My expectation is the population mean of the time taken to say the words for the congruent is less than the population mean of the time taken to say the words for the incongruent. I am adding one

more variable which is the time difference between the congruent and incongruent. I will name it difference.

Population mean for the congruent = μ_C

Population mean for the incongruent = μ_I

Population mean for the difference ($\mu_D = \mu_C - \mu_I$)

H_0: The population mean of the time taken (in seconds) to say the words for the congruent situation is the same as the incongruent

H_a: The population mean of the time taken (in seconds) to say the words for the congruent is less than the time taken for the incongruent words.
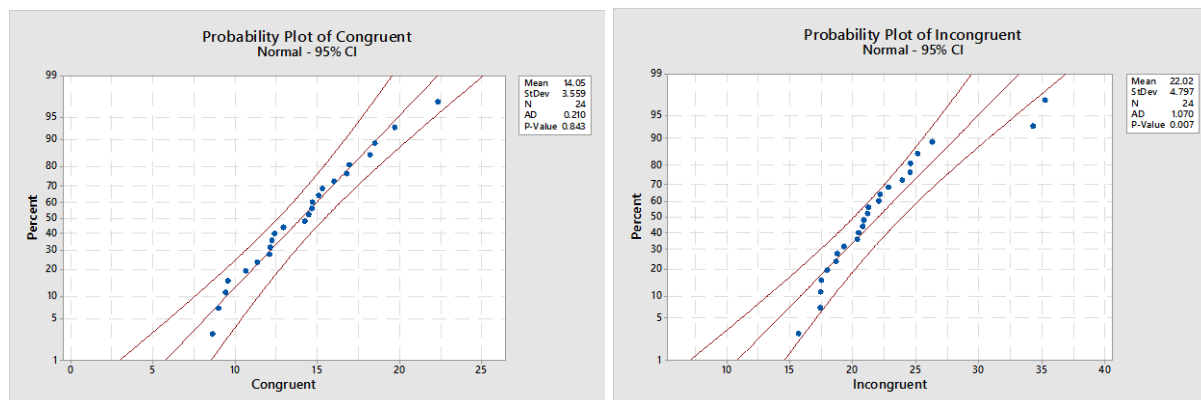
That is:

H_0: $\mu_D = 0$

H_a: $\mu_{c <} 0$

Statistical Test Preference

As the below graphs indicates, the data is approximately normally distributed. The sample size is also less than 30 which 24. The population standard deviation is not known. Moreover, the variables are dependent and I have assumed the sample is a random sample from specific population. Considering all the above mentioned assumptions, I have decided to t test to check the significance.
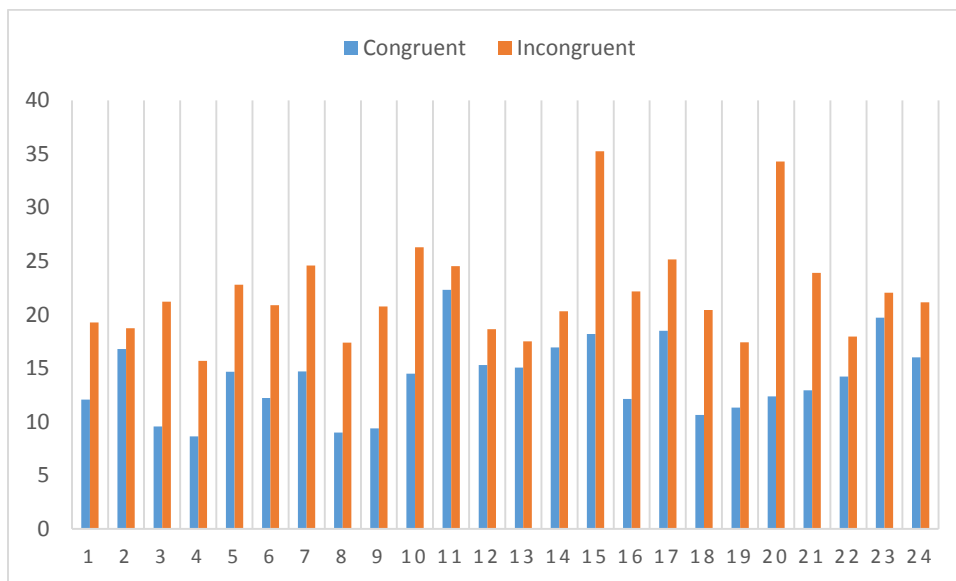
3. Descriptive Statistics for the dataset

	Mean	Std. Deviation
Congruent	14.05	3.56
Incongruent	22.02	4.80
Difference	7.96	4.86

4. Data Visualization

The graph shows that the individuals took more time to say the color's names in the incongruent case.

5. Paired/ Dependent T- Test

For $\alpha = 0.05$ the paired t-test result shows that the t-critical one- tail is 1.71 and the t calculated is 8.02. As the t calculated is greater than the t-critical, the null hypothesis is reject. Additionally, the p-value (approximately 0.00000002) is less than α (0.05). Hence, the null hypothesis is rejected with 95% confidence level. It can be concluded that the population mean of the time taken to say the congruent list of color names is less than the population mean of the time taken to say the incongruent list. The result is the same as my expectation.

6. Conclusions

In my opinion the reason for the time difference for the congruent and incongruent is our mindset. When the printed color and the name of the color differs, it conflicts with our perception. In addition to that, since the individuals were already familiar with the congruent colors (provided that the congruent case was tasted before the incongruent), their mind expects the same for the next test. So they were slow to say the printed color names.

A similar experiment can be done to say the name of an object printed on respective image (congruent case) and the name of an object printing on image of different object (incongruent case). Example, the congruent case can be an image of a door with a door printed on it and the incongruent case can be an image of a window with a door printed on it.

Reference

1. Chudler, E.(2016). Neuroscience for Children: Stroop effect: Retrieved from
   https://faculty.washington.edu/chudler/words.html
2. Shier, R.(2004).Statistics: 1.1 Paired t test: Retrieved from
   http://www.statstutor.ac.uk/resources/uploaded/paired-t-test.pdf