

# Test a Perceptual Phenomenon

April 25, 2018

## 0.0.1 Analyzing the Stroop Effect

Perform the analysis in the space below. Remember to follow [the instructions](#) and review the [project rubric](#) before submitting. Once you've completed the analysis and write-up, download this file as a PDF or HTML file, upload that PDF/HTML into the workspace here (click on the orange Jupyter icon in the upper left then Upload), then use the Submit Project button at the bottom of this page. This will create a zip file containing both this .ipynb doc and the PDF/HTML doc that will be submitted for your project.

- (1) What is the independent variable? What is the dependent variable?

There is two type of variables independent and dependent variable. Independent variable is the words of colors in same or different colored. We already know what's going to be in an independent variable. The dependent variable is the time taken by the reader to recognize the words in Incongruent or Congruent. It's what we want to find from different readers or by analyzing the data. It's like our dependent variable(outcomes) is depends on the independent variables.

- (2) What is an appropriate set of hypotheses for this task? Specify your null and alternative hypotheses, and clearly define any notation used. Justify your choices.

In this case, the Null Hypothesis( $H_0$ ) will be ( $\mu_x = \mu_y$ ) the mean of Congruent( $x$ ) and Incongruent( $y$ ) will be the same. Alternative Hypothesis( $H_a$ ) ( $\mu_x \neq \mu_y$ ) the mean of Congruent( $x$ ) and Incongruent( $y$ ) will not be the same. By looking at Stroopdata t-Test is the appropriate statistical test. We can not use z-Test here because ( $n < 30$ ) so, it's not applicable here. With the help of t-test, we can find out the Calculated value of 't'. We have to choose the appropriate level(alpha). Then we will find the degree of freedom ( $n-1$ ) where  $n=24$ . After finding the Tabulated value we have to compare our Computed value( $Z$ ) with Tabulated value( $Z$ ) to reject or accept our Null Hypothesis.

Statistical Test Choice : A paired one-tail t-test will be appropriate because of both congruent and incongruent data is of one and the same group of reader/person which takes part in a test twice under different situation 1>Colors name with the same color(Congruent) 2>Colors name with a different color. There should be a difference in a mean of both the situation by which we can reject or accept the null hypothesis. We cannot use the z-test because here  $N$ (Number of participants) $< 30$ . By the help of one-tailed t-test, we can do our statistical test because we have a dependent sample and both two case takes different time to test. We can predict the dependent samples with the help of one-tailed t-test.

- (3) Report some descriptive statistics regarding this dataset. Include at least one measure of central tendency and at least one measure of variability. The name of the data file is 'stroop-data.csv'.

```
In [ ]: > st <- read.csv('stroopdata.csv')
```

```
In [ ]: > mean(st$Congruent)
[1] 14.05113
> mean(st$Incongruent)
[1] 22.01592
> median(st$Congruent)
[1] 14.3565
> median(st$Incongruent)
[1] 21.0175
> sd(st$Congruent)
[1] 3.559358
> sd(st$Incongruent)
[1] 4.797057
```

Congruent: Min.8.63, 1st Qu. 11.90, Median 14.36, Mean 14.05, 3rd Qu. 16.20, Max. 22.33  
 Incongruent: Min. 15.69, 1st Qu. 18.72, Median Mean 3rd Qu. Max. 22.02 24.05 35.26

- (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.

```
In [ ]: p1 <- ggplot(data = st, aes(x = Index, Congruent))
p1 + geom_point(color = "#F79420")+
  scale_y_continuous(breaks = seq(1,23,1), limits = c(1,23))+
  scale_x_continuous(breaks = seq(1,24,1), limits = c(1,24))+
  ggtitle('Congruent')+
  xlab('Number of Reader')+
  ylab('Time taken to read (In sec.)')
```

```
In [ ]: p2 <- ggplot(data = st, aes(x = Index, Incongruent))
p2 + geom_point(color = "#5760AB")+
  scale_y_continuous(breaks = seq(1,36,1), limits = c(1,36))+
  scale_x_continuous(breaks = seq(1,24,1), limits = c(1,24))+
  ggtitle('Incongruent')+
  xlab('Number of Reader')+
  ylab('Time taken to read (In sec.)')
```

In Congruent the interval of time is between 8.63 to 22.33 and Incongruent the time is 15.69 to 35.26. It means the Congruent task is faster or takes less time as compared with the Incongruent task.

- (5) Now, perform the statistical test and report your results. What is your confidence level or Type I error associated with your test? What is your conclusion regarding the hypotheses you set up? Did the results match up with your expectations? **Hint:** Think about what is being measured on each individual, and what statistic best captures how an individual reacts in each environment.

```
In [1]: (x - y): 7.9648
SD: 4.86482691
```

```
df: 23
t_test_value: 8.020706944
level_of_Confidence = 90%
t_crit = 1.711
t_stat > t_crit
8.0207 > 1.711
```

Null hypothesis rejected because the time taken to read the colors name is different between congruent and incongruent tasks. We take less time to read the colors name when they are in the same color. It's always going to take more time to name the colors when they are in a different color. It means ( $x < y$ ) mean of Congruent is always less than the mean of Incongruent. This result confirms my prediction.

- (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!

It happens because of our brain. Brain always follows the shortcut paths that's why when we see the word with a color, we first go with color then we try to read the word. When (Color of the word = Name of the color) brain takes very less time to read it. But when we have (Color of the word  $\neq$  Name of the color) our brain think about the color first and then look for a word but here when we have a different name, it takes time to re-think that "Am I reading it CORRECTLY !?" so, this task takes some more time.