

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

Independent Variable – Color Words

Dependent Variable – Reaction time/Response time to the words

2)

a) **Null and alternative hypotheses are clearly stated in words and mathematically. Symbols in the mathematical statement are defined.**

H_0 (Null Hypothesis): This assumes that there is no significant difference between the current population parameters and the new population parameters after the intervention/interference.

$H_0: \mu = \mu_1$ (This does not mean that they are exactly similar)

μ - Current population mean

μ_1 – Population mean after intervention/interference

H_0 : In the Stroop effect experiment the null hypothesis is there will be no significant difference in the reaction time of the participant when the ink color matches the name and when the ink color is different from the name.

H_a (Alternative Hypothesis): This assumes that there will be significant difference between the current population parameters and the new population parameters after the intervention/interference.

$H_a: \mu < \mu_1$ (Current population mean is less than the Population mean after intervention/interference)

$H_a: \mu > \mu_1$ (Current population mean is greater than the Population mean after intervention/interference)

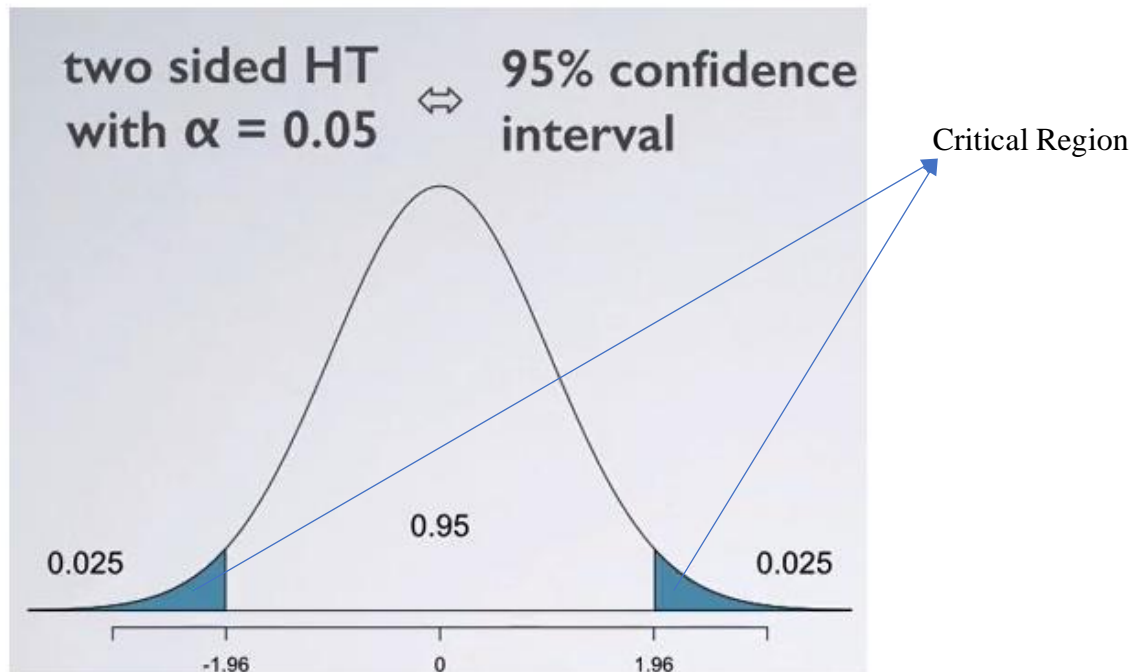
$H_a: \mu \neq \mu_1$ (Current population mean is not same as the Population mean after intervention/interference but we don't know which direction it is in.)

H_a : In the Stroop effect experiment the alternative hypothesis is there will be a significant difference in the reaction time of the participant when the ink color matches the name and when the ink color is different from the name.

b) **A statistical test is proposed which will distinguish the proposed hypotheses. Any assumptions made by the statistical test are addressed.**

The statistical test is to find the significance level which means based on a level of likelihood that the null hypothesis can be rejected or accepted.

In this experiment, we assume that null hypothesis is true i.e. $H_0: \mu = \mu_1$ and we don't know how will the Stroop effect change the behavior the participant, so we use a two tailed test with an alpha level of 0.05 which is $\alpha = 0.05$.



In the above figure is shown a two-tailed test with $\alpha = 0.05$. If the Z-value of the μ (Population mean after intervention/interference) is not in the critical region then we say the value is not significant and accept the null hypothesis but if the Z-value is in the critical region we reject the null hypothesis.

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

There are 24 observations in the dataset each having a value for congruent and incongruent task which show how each participant performed on the Stroop task.

Measure of centrality:

1) Mean for congruent data:

$$\mu = \frac{\sum x}{N}$$

$$= \frac{\text{Sum of all congruent values}}{N}$$

$$= \frac{337.227}{24}$$

$$\mu = 14.05$$

Mean for incongruent data:

$$\mu = 22$$

Measure of Variability:

Standard Deviation for Congruent Data:

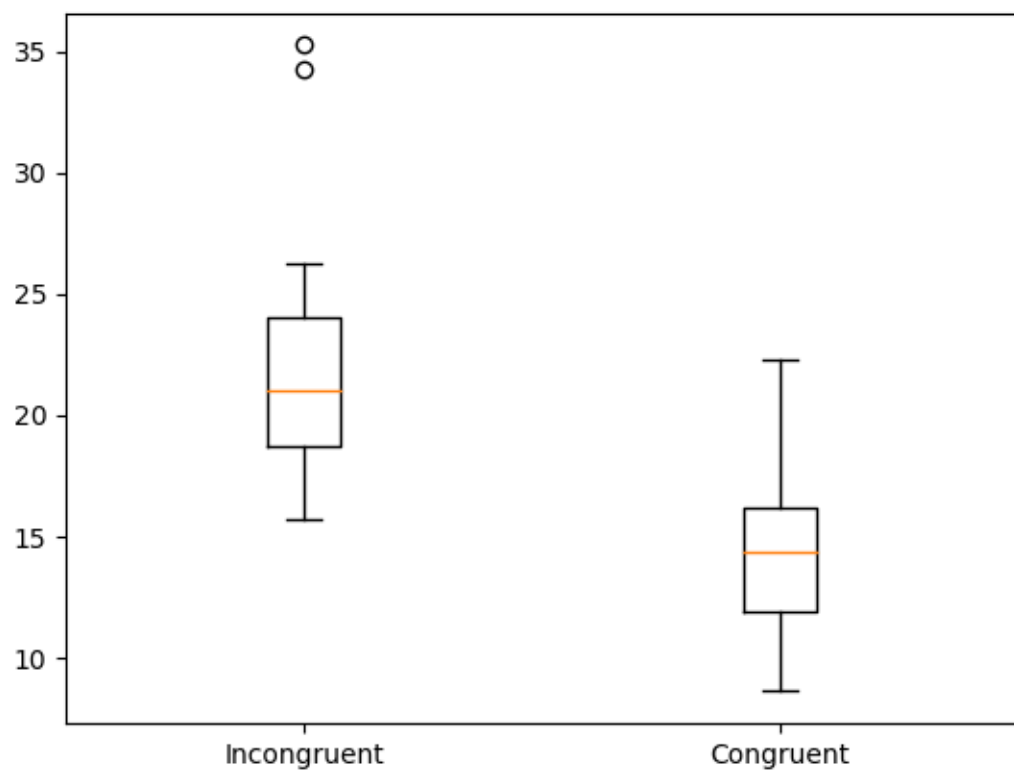
$$\sigma = \sqrt{\frac{1}{N} \sum_{i=1}^N (x_i - \mu)^2}$$

$$\sigma = 3.484$$

Standard Deviation for Incongruent Data:

$$\sigma = 4.7$$

- 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.



From the above box plots we can clearly see that the incongruent times are more than the congruent times. The range of values for incongruent readings is more than the congruent readings which clearly shows us that the interference does indeed increase the reaction time.

- 5) **A statistical test has been correctly performed and reported, including test statistic, p-value, and test result. The test results are interpreted in terms of the experimental task performed.**

First we have to calculate the Z score:-

$$\begin{aligned} Z &= (X - \mu) / \sigma \\ &= (22 - 14.05) / 3.484 \\ &= 2.28 \end{aligned}$$

Here the **Z-value is 2.28** which is more than z value for $\alpha = 0.05$ which is **1.96**. Hence we reject the null hypothesis coming to the conclusion that there is a significant difference in the reaction time of the participants.

Two tailed p-value is $(1 - 0.9887) * 2 = 0.0226$

Bibliography:-

- 1 <http://www.statisticshowto.com/probability-and-statistics/z-score/>