

Test a Perceptual Phenomenon

“Stroop Effect”

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

Ans: Our Independent variables are congruent words condition and incongruent words condition. Our Dependent variables are the time it takes to name the ink colors in equally-sized lists for the both conditions

2. What is an appropriate set of hypotheses for this task? What kind of statistical test do you expect to perform? Justify your choices.

Ans: Null Hypothesis ($H_0: \mu_1 = \mu_2$)

⇒ The population means of time it takes to name the ink colors for congruent words condition and incongruent words condition are equal/same

Alternative Hypothesis ($H_A: \mu_1 \neq \mu_2$)

⇒ The population means of time it takes to name the ink colors for congruent words condition and incongruent words condition are not equal/same (i.e different)

I would like to use T-test for the paired samples because the same group of people or subjects are participating for both the conditions

Assumptions :

1)The sampling distribution is normal

2)There is no bias in the experiment

3)The participants or subjects are randomly selected from the population

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

Ans: Code:

```
import pandas as pd
data=pd.read_csv('stroopdata.csv')
print(data.describe()) #to generate descriptive statistics for dataset
```

Descriptive Statistics regarding this dataset

	Congruent	Incongruent
count	24.000000	24.000000
mean	14.051125	22.015917
std	3.559358	4.797057
min	8.630000	15.687000
25%	11.895250	18.716750
50%	14.356500	21.017500
75%	16.200750	24.051500
max	22.328000	35.255000

central tendency

=> Mean for congruent words condition(of time) = 14.05

=> Mean for incongruent words condition(of time) =22.02

measure of variability

=> Standard deviation for congruent words condition(of time) = 3.56

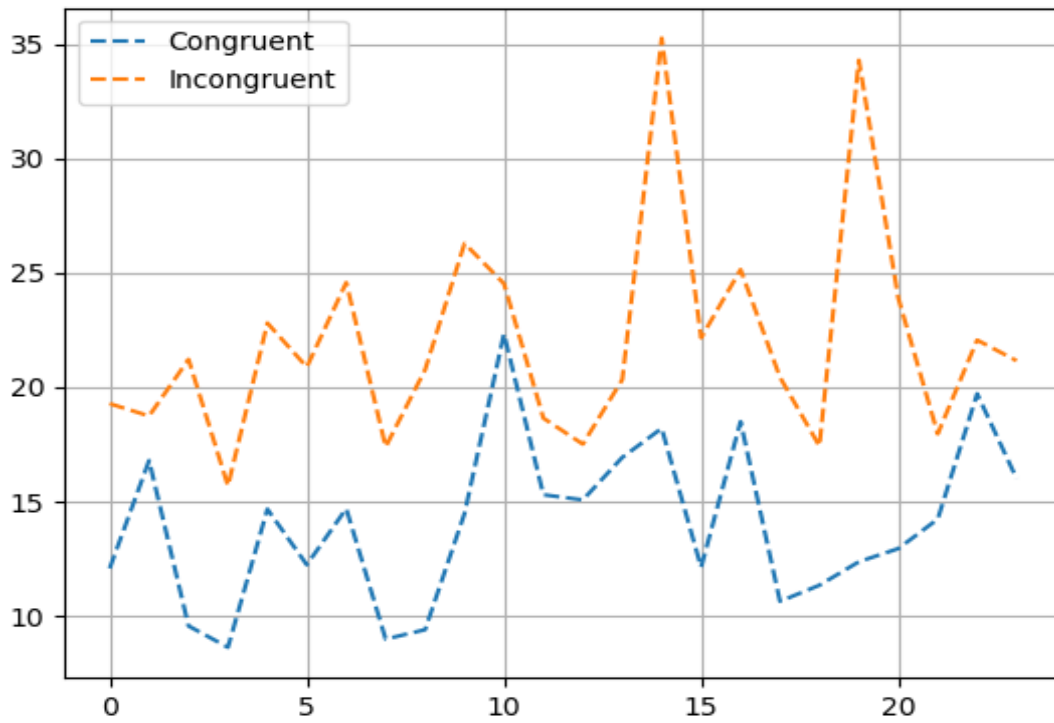
=> Standard deviation for incongruent words condition(of time) = 4.80

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.

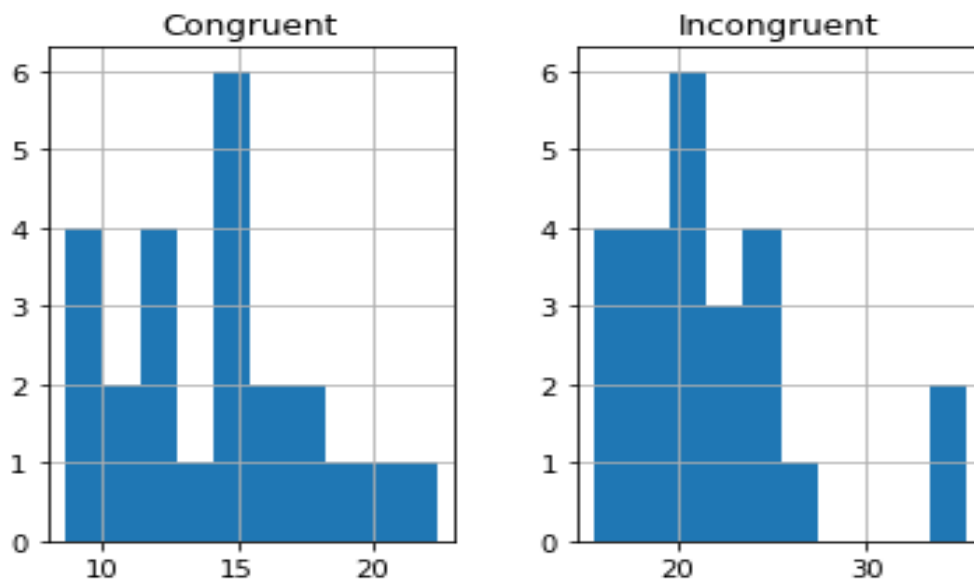
Ans:

Some of the visualizations:

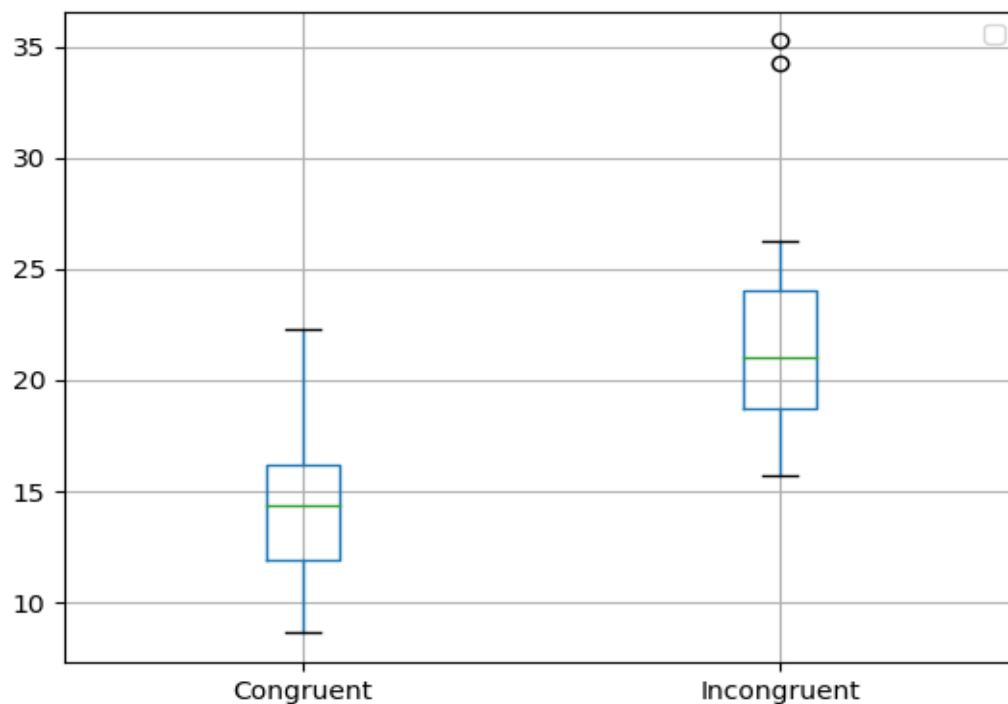
A) Line Plot



B) Histogram



C) Box Plot



Observations about the plots:

- 1) The average completion time of incongruent words condition is comparatively higher than congruent words condition.
- 2) The box plot shows that incongruent words condition has two extreme values (outliers).

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?

Ans: let the statistical test be T-test with Confidence level of 95% So, alpha level ($\alpha=0.05$)

Hypothesis here:

Null Hypothesis ($H_0: \mu_1 = \mu_2$)

⇒ The population means of time it takes to name the ink colors for congruent words condition and incongruent words condition are equal/same

Alternative Hypothesis ($H_A: \mu_1 \neq \mu_2$)

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Degree of freedom = $24 - 1 = 23$

As it is a two tailed test as Alternative hypothesis suggests

So, critical region for $\alpha = 0.05$ in the distribution is divided as $\alpha = 0.025$ on the either side

So, T-critical value = ± 2.069

[at $\alpha = 0.025$ & Degree of freedom = 23]

T-value = -8.021

For the calculated T-value , P-value = .0005 (approx.)

Since, T-value > T-critical value (i.e. P-value < α) therefore, we reject the Null hypothesis. Hence, we can say that congruent words condition and incongruent words condition has different average population time to complete tasks