

TEST A PHENOMENON PROJECT

Stroop Effect

Q1. What is the Independent Variable? What is the Dependent Variable?

A1. Independent Variable: The 2 conditions – Congruent and Incongruent.

Dependent Variable: The time taken in Congruent and Incongruent Task.

Q2. What is an Appropriate Set of Hypotheses for this task? What kind of Statistical test do you expect to perform? Justify your choices.

A2. Hypotheses

H₀: There is no significant difference in time for the population to state the colors in a congruent or incongruent condition i.e. $\mu_c - \mu_i = 0$

H_a: There is difference in time for the population to state the colors in a congruent or incongruent condition i.e. $\mu_c - \mu_i \neq 0$

Where μ_c – population mean for Congruent condition

μ_i - population mean for Incongruent condition

Statistical Test

t-Test

Since no population parameters are provided for the task, therefore a t-Test is the most apt statistical test in this situation since it does not need population parameters.

We will use *Dependent t-Test* since a person in sample is testing both the conditions.

The Given Dataset is: n=24

Congruent words time	Incongruent words time
8.63	15.687
8.987	17.394
9.401	20.762
9.564	21.214
10.639	20.429
11.344	17.425

12.079	19.278
12.13	22.158
12.238	20.878
12.369	34.288
12.944	23.894
14.233	17.96
14.48	26.282
14.669	22.803
14.692	24.572
15.073	17.51
15.298	18.644
16.004	21.157
16.791	18.741
16.929	20.33
18.2	35.255
18.495	25.139
19.71	22.058
22.328	24.524

Q3 Report some descriptive statistics regarding this dataset. Include at least one measure of central tendency and at least one measure of variability.

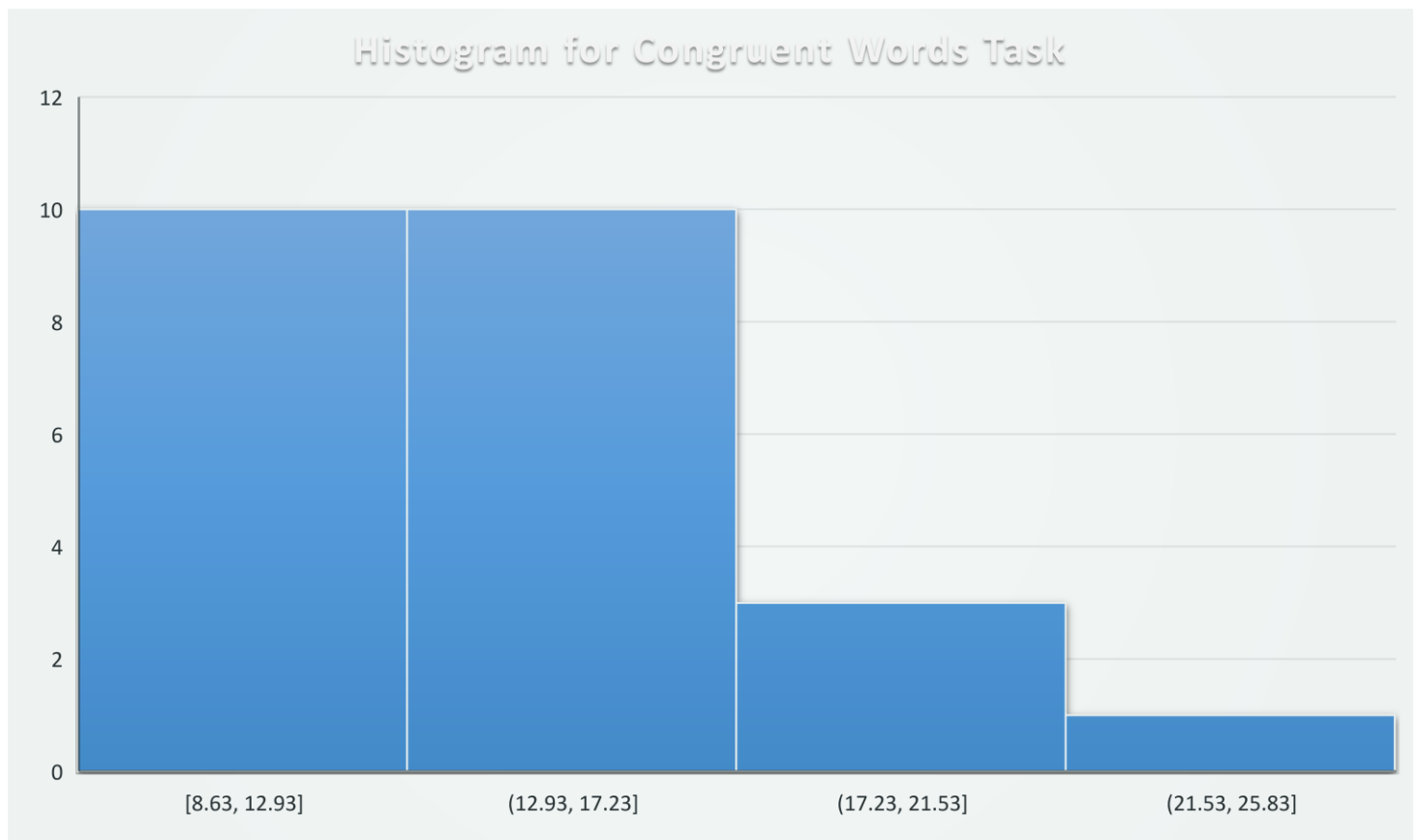
A3. Measures of Central Tendency:

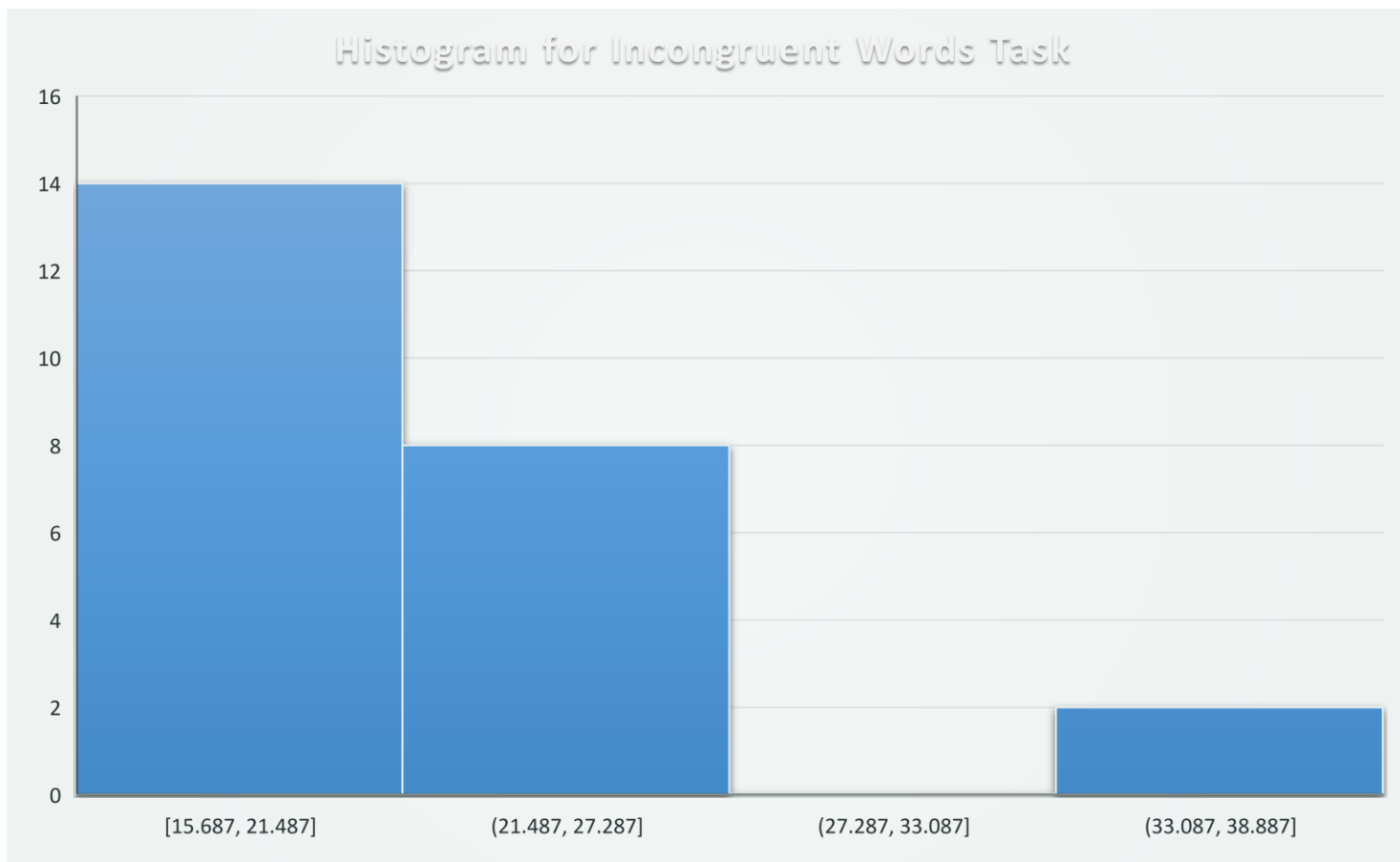
Congruent(in seconds) Incongruent(in seconds)		
Mean	14.05	22.02
Median	14.36	21.02

Measures of Variability:

Dependent Samples(difference)	
Variance(Bessel's Correction)	23.67
Standard Deviation	4.86

Q4. 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.





The Congruent Histogram is *Bimodal* and *Positively Skewed*. The most common time taken for such task is between 8.63s to 17.23s.

The Incongruent Histogram can be seen as *Bimodal* due to absence of a peak in between. It is also *Positively Skewed*.

Q5. 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?

A5. t-Test:

$$n=24, df = n - 1 = 23, \text{mean}_c=14.05, \text{mean}_i=22.02, \text{mean}_{\text{diff}}=-7.97$$

$$S = 4.86$$

$$SE = S/\sqrt{n} = 0.99$$

$$t_{\text{statistic}} = \text{mean}_{\text{diff}}/SE = -8.051$$

$$t_{\text{critical}} = \pm 2.069 \text{ (at } \alpha=0.05 \text{ for two-tailed test)}$$

Based on the above values, we ***fail to retain the null hypotheses***.

Cohen's $d = \text{mean}_{\text{diff}} / S = -1.64$

CI = $\text{mean}_{\text{diff}} \pm t_{\text{critical}} * SE = (-10.02, -5.92)$ for 95% CI

Therefore, the conclusion I draw from the test is that people generally take more time when Incongruent test is given as compared to Congruent portion of the test.

This matches with the my expectations since the brain is given 2 conflicting information – name of color & different color. Therefore, response time is degraded.

Sources used:

Udacity's Descriptive Statistics course