

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

Independent variable: match or nor match (color and the name)

Dependent variable: the time used to name the ink color

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

Null hypothesis: the average time used to name the ink color of congruent words is not different from that of incongruent words

$$H_0: \mu_{\text{incongruent}} - \mu_{\text{congruent}} = 0$$

Alternative hypothesis: the average time used to name the ink color of congruent words is larger that of incongruent words

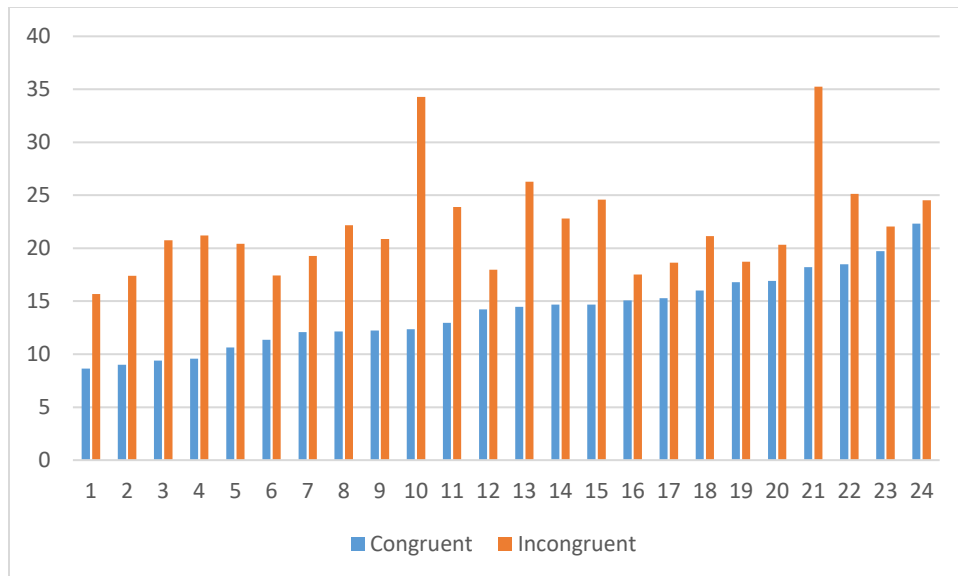
$$H_A: \mu_{\text{incongruent}} - \mu_{\text{congruent}} > 0$$

Statistical test: I want to see if the difference between the average time of two datasets are significant enough to conclude the condition of incongruent has impact on the time. Since population parameter is not available and sample size is smaller than 30, a dependent one-tailed t-test will be used in this case, with the assumption of population to follow a normal distribution.

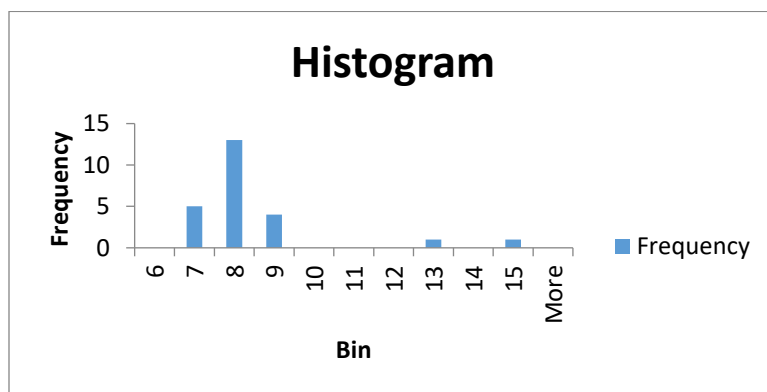
3. Report some descriptive statistics regarding this dataset. Include at least one measure of central tendency and at least one measure of variability.

	Incongruent - Congruent
Mean	7.965
Standard deviation	4.865
Max	21.919
Min	1.95
Median	7.667
Sample size	24

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 this graph, we can see that for each participant, the time used on incongruent condition is larger than that on congruent condition.



If we take the two outliers away (13, 15), we can see it's close to a normal distribution. Most people experienced an increase in time of around 8 under incongruent condition and some people experienced an increase of more than 10.

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?

$t(23)=8.021$, $p=.00$, one-tail

confidence interval on the mean difference; 95% CI= (7.310,8.620)

Conclusion: The result matches up with my expectation. Since the p-value is smaller than α level of 0.05, I conclude the result is statistically significant enough to reject the null and in favor of the alternative hypothesis, whereas the incongruent condition will increase time used to completed the task.

t-Test: Paired Two Sample for Means

	<i>Incongruent</i>	<i>Congruent</i>
Mean	22.01592	14.05113
Variance	23.01176	12.66903
Observations	24	24
Pearson Correlation	0.35182	
Hypothesized Mean Difference	0	
df	23	
t Stat	8.020707	
P(T<=t) one-tail	2.05E-08	
t Critical one-tail	1.713872	
P(T<=t) two-tail	4.1E-08	
t Critical two-tail	2.068658	