

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

Independent variable: two conditions in different words with congruent or incongruent colors.

Dependent variable: the time it takes to name the ink colors in equally-sized lists.

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: different words conditions do not affect the population means response time.

Alternative hypothesis: different words conditions will affect the population means response time.

We will use t-test to see if there is any significant reaction time difference between two words conditions. It's a pre- and post-test, also a dependent-sample t-test.

Because it compares the same people with different conditions.

$$H_0 : \mu_1 = \mu_2$$

$$H_1 : \mu_1 \neq \mu_2$$

μ_1 : means of population response time in congruent color words

μ_2 : means of population response time in incongruent color words

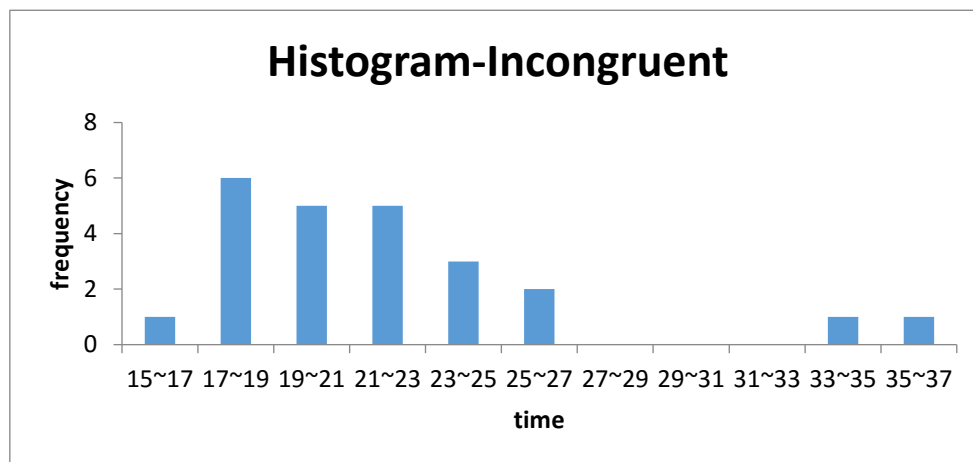
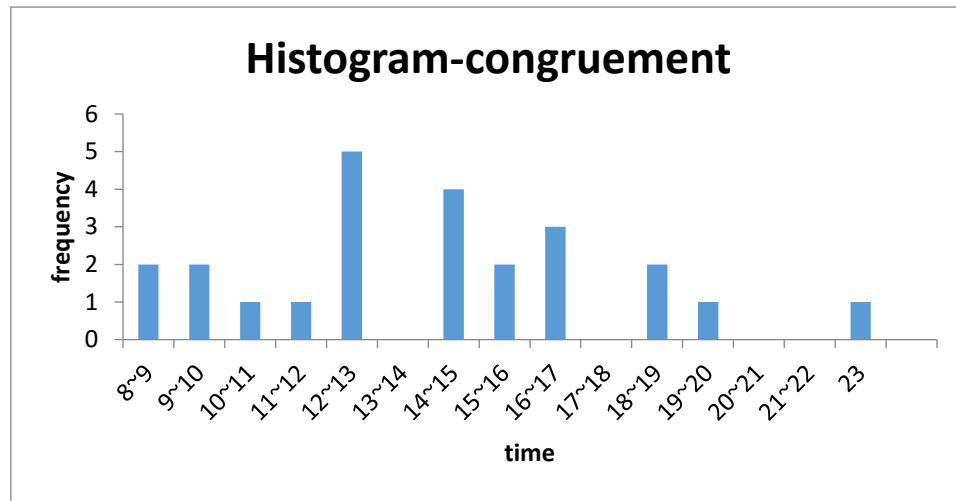
We assume that the population is approximately normal distribution. And the sampling is independent and random.

Since we only have 24 samples (small sample) to do our statistical hypothesis, we need to use t-test to make inferences about our population.

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

	Congruent	Incongruent
Mean	14.05	22.02
Mode	NA	NA
Median	<u>14.36</u>	<u>21.02</u>
Standard deviation	<u>3.56</u>	<u>4.80</u>

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.



We can see that there is some difference between two graphs. The congruent one is approximately normal distribution and the Incongruent one is likely a positive skewed distribution.

- 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?**

Since this is dependent sample question and two-tail test, we use t-test to test our hypothesis. Our significant level is 0.05

mean of sample difference	Standard Deviation of sample difference	t-critical value	95% confidence interval	Degree of freedom	t-value	p-value
<u>-7.96</u>	4.86	2.069	<u>(-10.02, -5.91)</u>	23	<u>-8.02</u>	0.000

The results show that the ($p\text{-value} = 0.000$) $<$ ($\alpha = 0.05$). So we reject the null hypothesis and accept the alternative hypothesis, which means that there is a significant response time difference between people see the congruent or

incongruent words.

- 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!**

I think the answer is quite truth. Because after I really try this program, I found that I have to spend more time reading the incongruent color word correctly.

In addition to words, graph can also have a similar effect to response time. The task can be design to show the graph with incongruent word. For example, we can show a square graph and a word "circle" and collect the react time from our testers.