Statistics: The Science of Decisions
Project Instructions

Questions For Investigation

As a general note, be sure to keep a record of any resources that you use or refer to in the creation of your project. You will need to report your sources as part of the project submission.

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

independent variable: the word condition (congruent or incongruent)

dependent variable: the time it takes to name the ink colors

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

The null hypothesis H_0 is that there is no significant difference between the times taken to complete the task of naming the ink colors between the two conditions, congruent and incongruent. Where $\mu_{congruent}$ is the population mean response time of the congruent condition and $\mu_{incongruent}$ is the population mean response time of the incongruent condition.

H_0: $\mu_{congruent} = \mu_{incongruent}$

The alternative hypothesis H_A is that there is a significant difference between the times taken to complete the task of naming the ink colors between the two conditions, congruent and incongruent. Where $\mu_{congruent}$ is the population mean response time of the congruent condition and $\mu_{incongruent}$ is the population mean response time of the incongruent condition.

H_A: $\mu_{congruent} \neq \mu_{incongruent}$

This is a within-subject design experiment. I expect to perform a two-tailed dependent t-test for paired samples. A two-tailed test because we are interested if there is a significant difference in the population means, but not specifically one being greater or less than the other. A dependent t-test for paired samples because we do not have data on the population but we do have paired data from each subject and the differences in time from each condition will be compared.

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

$\overline{x}_{congruent} = 14.051$

$s_{congruent} = 3.559$

$\overline{x}_{incongruent} = 22.016$

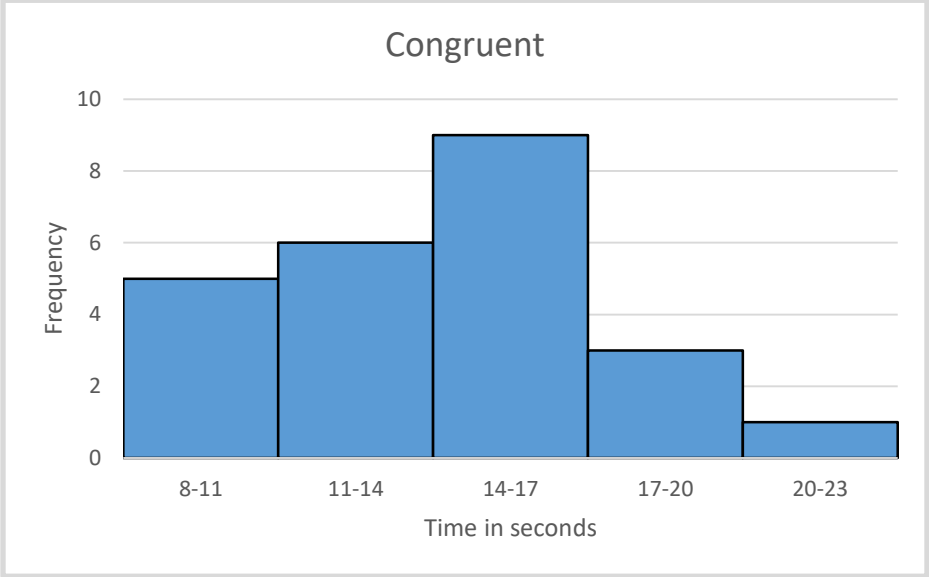
$s_{incongruent} = 4.797$

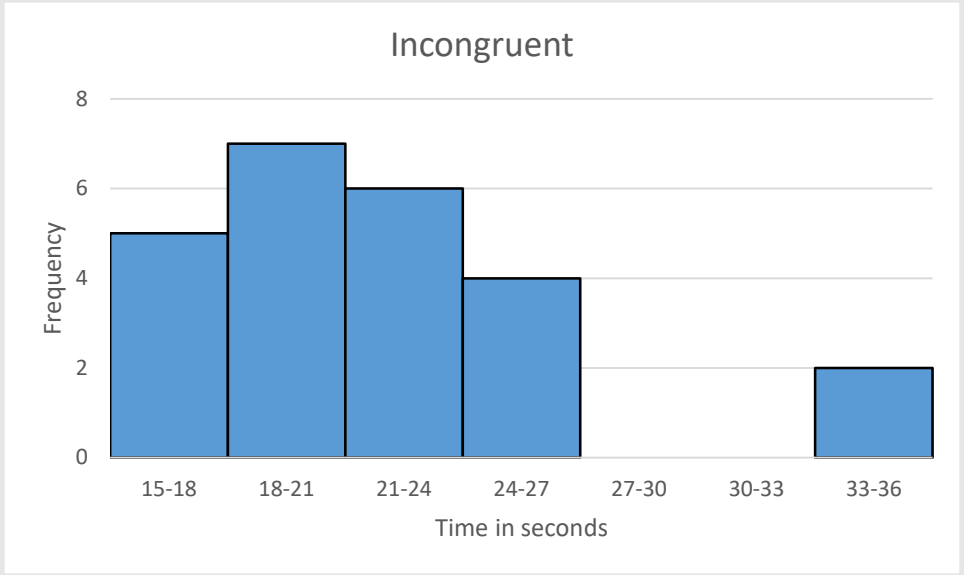
$\overline{x}_{difference} = -7.965$

$s_{difference} = 4.865$

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.

When plotting the histograms of the two conditions I notice the incongruent group has 2 empty bins, 27-30 and 30-33. I also notice the range of times taken to complete the task is larger in the incongruent group (there are 2 more bins).





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?

With an alpha level of 0.05, the confidence level is 95% and the t critical value is ± 2.069.

$t = (\bar{x}_{congruent} - \bar{x}_{incongruent}) / (s_{difference} / (n^{(1/2)}))$
$t = (-7.965) / (4.865 / (24^{(1/2)}))$
$t = -8.021$

We reject the null hypothesis H_0 because p is < 0.0001, which is less than our alpha level of 0.05. Our t statistic is also in one of the critical regions because our t statistic -8.021 < the t critical value of -2.069.

Therefore, there is a significant difference between the times taken to complete the task of naming the ink colors between the two conditions, congruent and incongruent.