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# Project 1

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## 1 TEST A PERCEPTUAL PHENOMENON

### 1.1 IDENTIFY VARIABLES IN THE EXPERIMENT

What is our independent variable? What is our dependent variable?

In this experiment, the independent variable is congruence or incongruence of words and colors. The dependent variable is the time of response under each condition.

### 1.2 ESTABLISH A HYPOTHESIS AND STATISTICAL TEST

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  $H_0$ : the time of response under congruent condition is greater than or equal to the time of response under incongruent condition.

The alternative hypothesis  $H_A$ : the time of response under congruent condition is less than the time of response under incongruent condition.

Since we don't have information about the mean of population, the t-test should be used. From common sense we believe that time under incongruent condition should be greater than time under congruent condition, so a one-tail test is setup.

### 1.3 REPORT DESCRIPTIVE STATISTICS

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

Here we define some notations of statistics.

- $\bar{t}_c$ : the mean time under congruent condition
- $\bar{t}_i$ : the mean time under incongruent condition
- $s_c$ : the sample standard deviation of time under congruent condition
- $s_i$ : the sample standard deviation of time under incongruent condition
- $n$ : the sample size (of either condition)

The sample size of each group is 24.

The mean time under congruent condition  $\bar{t}_c = 14.05$ . Its sample standard deviation is  $s_c = 3.56$ .

The mean time under incongruent condition  $\bar{t}_i = 22.02$ . Its sample standard deviation is  $s_i = 4.80$ .

#### 1.4 PLOT THE DATA

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.