

Statistics Projects

Question 1

Independent Variable - Congruent words condition and incongruent words condition

Dependent Variable - The time it takes for participants to name the ink colors in equally-sized lists

Question 2

2a

Null Hypotheses - The population mean of response time under congruent word condition is the same with the population mean of response time under incongruent condition.

$$t_{congruent} = t_{incongruent}$$

Alternative Hypotheses - The population mean of response time under congruent words condition is less than the population mean of response time under incongruent words condition.

$$t_{congruent} < t_{incongruent}$$

2b

For the stroop experiment, we are gathering data by using the same sample under different conditions. This is a dependent test. Also, since we only have several sample data not the population data, it will be reasonable to use student t-test instead of z-test. Therefore, this is going to be a dependent t-test. Under t-test, we will use sample mean and standard deviation to represent the population's mean and standard deviation. Because this is a dependent t-test, instead of using the mean from each data sets, we need to use the differences between these two conditions to calculate the mean and standard deviation of the differences between the two datasets.

The equation to calculate mean is $\frac{\sum X_1 - X_2}{n}$. The degree of freedom will be $n - 1$. The equation for standard deviation is $\sqrt{\frac{\sum (X_i - \bar{X})^2}{n-1}}$.

Question 3

	Congruent	Incongruent
Mean	14.051125	22.01591667
Median	14.3565	21.0175
Range	13.698	19.568
IQR	4.3055	5.33475
Var	12.66902907	23.01175704
Stdev	3.559357958	4.797057122

Question 4



Bar Plot



Line Plot

These two plots are the same data with different plot type. Since the data is about the time each participant spent on the test, I want to do a visualization on the comparison between congruent and incongruent condition. Bar plot is very helpful when comparing two related datasets. I cannot choose histogram since this is not a series. However, bar plot is a little bit hard to read when there are lots of data.

Based on this plot, it seems that the time spent on incongruent words condition is much more than the time spent on congruent words condition.

Question 5

This is the summary of the statistical calculation results. The functions to calculate them are in the Excel file. I choose 95% as confident level.

Name	Number
Average Diff	-7.964791667
Variance	23.66654087
Std	4.86482691
n	24
df	23
Standard Error	0.993028635
t value	-8.020706944
t critical	-1.713871528
p value	2.0515E-08

This is a one-tail test. Since the t value is smaller than t critical value. We will reject the null hypothesis. There is a difference between time spent for congruent words condition and incongruent words condition. The reacting time for congruent words condition is significantly less than that for incongruent words condition.

Question 6

Part 1

Per the article I found online, here is a conclusion drew by the Stroop Experiments:

“His experimental results showed that people are more practiced at word reading than naming colors, there is less interference with word reading than there is with naming colors. As learnt experiences become part of our memory, it teaches us over time that the meaning of words holds greater significance than the colors they are written in.” ^[1]

Based on my understanding, people, who have developed the language skills, can automatically read the words. When they are told to read the color instead, it will cause more time for their brain to process. Therefore, people can read the word faster than read the color.

Part 2

I played a simple game online that performed Stroop task before. On a screen, on the middle top of the screen, there is a colored vocabulary. The first part of the game is congruent word conditions, and the second part of the game is incongruent word conditions.

Below the word, there are a couple of color options. There is no word, just the color. People need to choose the same color with the vocabulary's color. When I did it, it was very simple under congruent condition, but it took me very long to do them right under incongruent word conditions.

1. Stroop Effect ↩