Test a Perceptual Phenomenon

Question 1: Identify variables in the experiment

> - Independent variable: word condition (congruent or incongruent)
> - Dependent varaible: Time to name the ink colors

Question 2a: Establish hypotheses

> - Null hypotheses: It doesn't take longer time to name the ink colors in the incongruent word condition than it does in the congruent word condition.
>
> $H_0 : \mu_{incongruent} <= \mu_{congruent}$
> - Alternative hypotheses: It takes longer time to name the ink colors in the incongruent word condition than it does in the congruent word condition.
>
> $H_A : \mu_{incongruent} > \mu_{congruent}$

Question 2b: Establish a statistical test

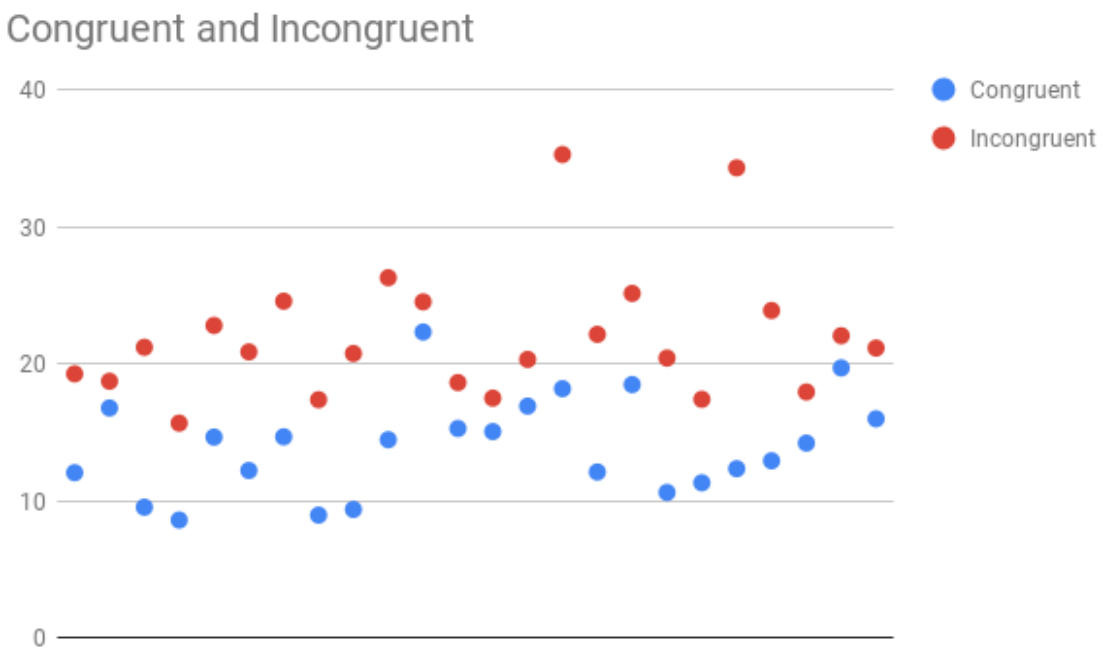
> We choose positive direction, one-tailed dependent t test to decide to accept or reject the null hypotheses based on these assumptions:
>
> - the incongruent word condition has impact on the time of naming the ink colors, so we use dependent t test on the same samples (participants) with different conditions
> - we guess the incongruent word condition may slow down the speed of naming the ink colors, so we choose positive (longer time) direction, one-tailed t test

Question 3: Report descriptive statistics

> - In congruent word condition
>   - Centrality
>   - Sample mean: 14.05
>   - Variability
>   - Standard deviation: 3.56
> - In incongruent word condition
>   - Centrality
>   - Sample mean: 22.02
>   - Variability
>   - Standard deviation: 4.80
> - The difference of two conditions
>   - Centrality
>   - Difference of the sample mean: 7.96
>   - Variability

- Standard deviation of the difference: 4.86

Question 4: Plot the data



We can see the time to name the ink colors in incongruent word condition is longer than that in congruent condition for all participants. So I think the incongruent condition will increase the reaction time.

Question 5: Perform the statistical test and interpret your results

The result of given test:

- t(23)=8.02, p<0.0001,one-tailed

I performed a test on 6 participants and get the following results:

- Number of samples: 6
- Degree of freedom: 5
- Difference of sample mean: 27.32
- Standard deviation of the difference: 20.33
- t value: 3.29
- p value: 0.01085

We think these results show that the incongruent word condition statistically significantly slow down the speed of naming the ink colors.

List of websites I referred

- https://www.graphpad.com/quickcalcs/
- https://docs.google.com/spreadsheets