Final Project - Stroop Effect - Submission

Project material for Stroop Effect

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> date: 2017-8-18

1. Dependent and Independent Variable

1. Independent variable:
   Whether it is an incongruent test where the words are not same with their printed color or a congruent test where the words and their printed color are the same.

2. Dependent variable:
   The reaction time from each condition.

2. Design of Test

I dount that the test in incongurent condition will take more time than it is in an congruent condition. To prove this, I'd like to disign a test to analize the give data set.

1. Hypothesis

   First of all, I'd like to define the concepts of H_0 and H_a:

   - H_0: the mean of the population reaction time under the incongruent test condition is not significantly longer than that under the congruent test condition
   - H_a: the mean of the population reaction time under the incongruent test condition is significantly longer than that under the congruent test condition.

   Suppose that μ_c is the population mean of results for congruent test, while μ_i is the population mean of results for incongruent test, then:

   - $H_0: \mu_c - \mu_i \leq 0$ (There is no difference in population means of response time under incongruent and congruent scenarios)
   - $H_a: \mu_i - \mu_c > 0$ (The population mean of respones time under incongruent scenario is bigger than the the time under congruent.)

2. Kind of test

   From the already known varaibles, we can confirm that:

   - the samples' size (`n`) eqauls to 24, that is smaller than 30;
   - Population Standard Deviation σ is unknown;
   - There dependent variables to be comparied with.

With above conditions, a paried-samples T-Test is appropriate for us to make the Hypothesis test.

3. Calculation

Here's the sheet for time recording, and some calculations I've done on it.

Participant	Congruent	Incongruent	Difference
1	12.079	19.278	7.199
2	16.791	18.741	1.95
3	9.564	21.214	11.65
4	8.63	15.687	7.057
5	14.669	22.803	8.134
6	12.238	20.878	8.64
7	14.692	24.572	9.88
8	8.987	17.394	8.407
9	9.401	20.762	11.361
10	14.48	26.282	11.802
11	22.328	24.524	2.196
12	15.298	18.644	3.346
13	15.073	17.51	2.437
14	16.929	20.33	3.401
15	18.2	35.255	17.055
16	12.13	22.158	10.028
17	18.495	25.139	6.644
18	10.639	20.429	9.79
19	11.344	17.425	6.081
20	12.369	34.288	21.919
21	12.944	23.894	10.95
22	14.233	17.96	3.727
23	19.71	22.058	2.348
24	16.004	21.157	5.153

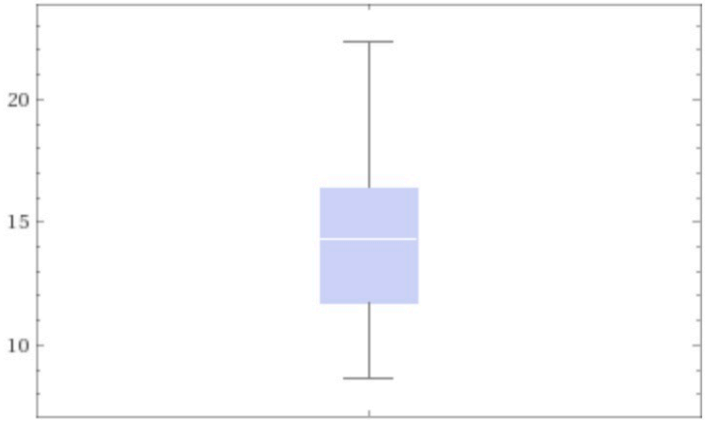
Central Tendency and variability:

Item	Congurent	Incongurent	Difference
n	24	24	24
mean	14.051125	22.01591667	7.964791667
median	14.3565	21.0175	7.6665
standard deviation(SD)	3.559357958	4.797057122	4.86482691
standard error(SEM)	0.7265509007	0.9791951848	0.9930286348
df	23	23	23

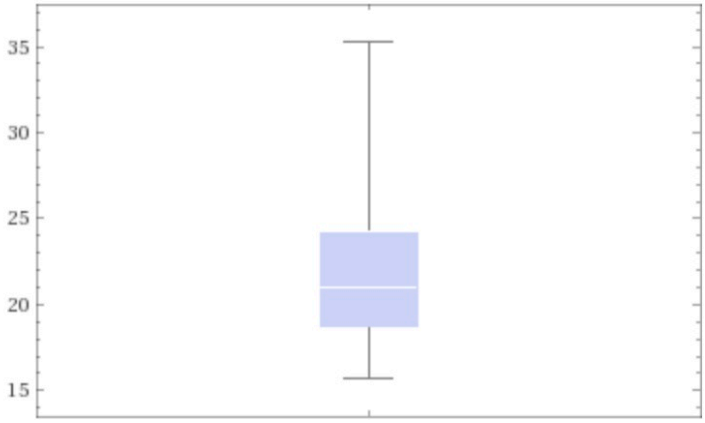
4. Plot

Box Chart

The box chart of Congurent:



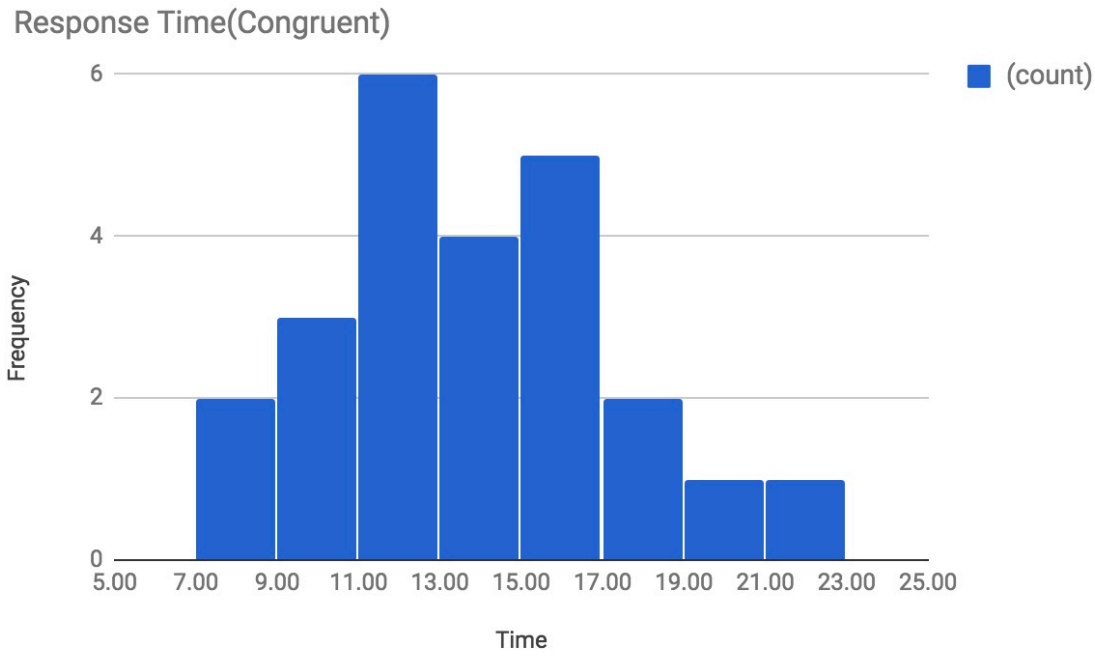
The box chart of Incongurent:



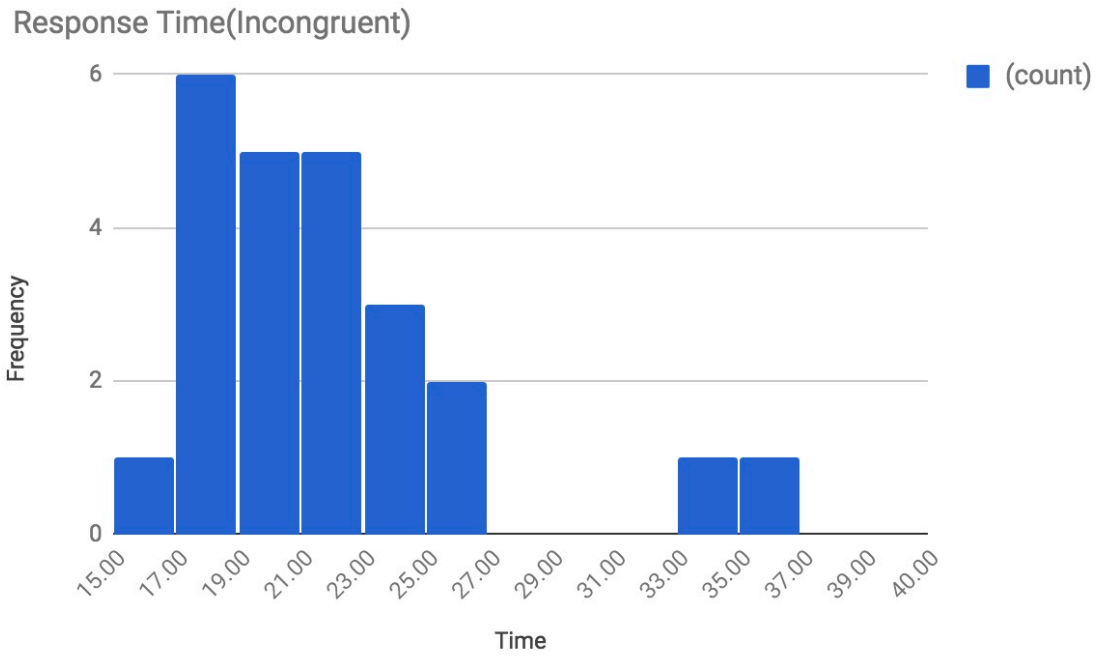
Conclution: By comparing the above two box charts, we can tell that the reaction time of congurent test is shorter than that of incongurent test.

Histogram

The Histogram of Congurent condition:



The Histogram of Incongurent condition:



5. T-Test

A dependent sample one-tailed test with confidence area $\alpha = 0.05$ will be conducted.

First, do some calculation.
Look up for the t-table with params (α = 0.05, df = 23):

> t-critial = 1.714

According to the calucation in above stpes, we already have something to use:

> $\bar{x_i} - \bar{x_c}$ = 7.965
> SD = 4.865
> n = 24

Now we can calculate the t-statistical:

> standard error(SE) =
> t-statistic = $\frac{\bar{x_i} - \bar{x_c}}{\frac{SD}{\sqrt{n}}}$ = 8.02

Finally, by comparing the t-critical and t-statiscal values, we found that t-statiscal value is far more bigger than the t-critical value, which mean that t-statical value falls in the confidenc area. As a result, the concolusions for this test:

> We reject the *null*,
> and the H_a is correct hypothesis.
> The test result matches up with the expectation.

Reference

- t-testing the stroop effect
- wiki - stroop effect
- Google Spread Sheet of My Calculation