Question 1: Identify variables in the experiment

independent variable	list of words in congruent and incongruent
dependent variable	time to name the ink colors

Question 2: Establish a hypothesis and statistical test

From stroop data

1. Data is show sample size is < 30
2. Don't know population variance
3. Assume data is nomal distribution (plot in Q4)
4. Data is in the interval scale
5. Sample variance is unequal
6. Data is from pared sample

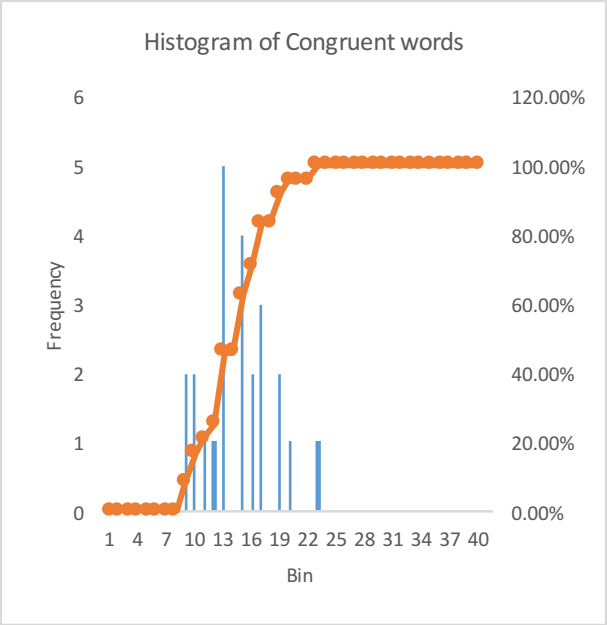
We want to know the average time between
congruent and incongruent is different or not

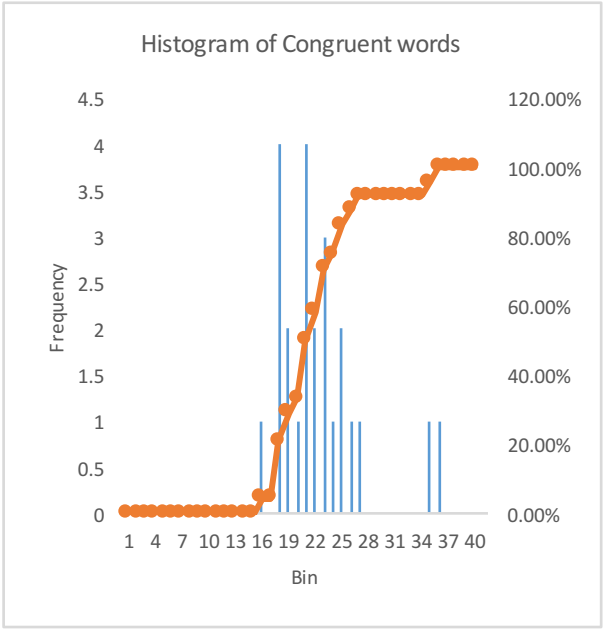
From data showed that consistent with preliminary agreement of paired t-test

Question 3: Report descriptive statistics

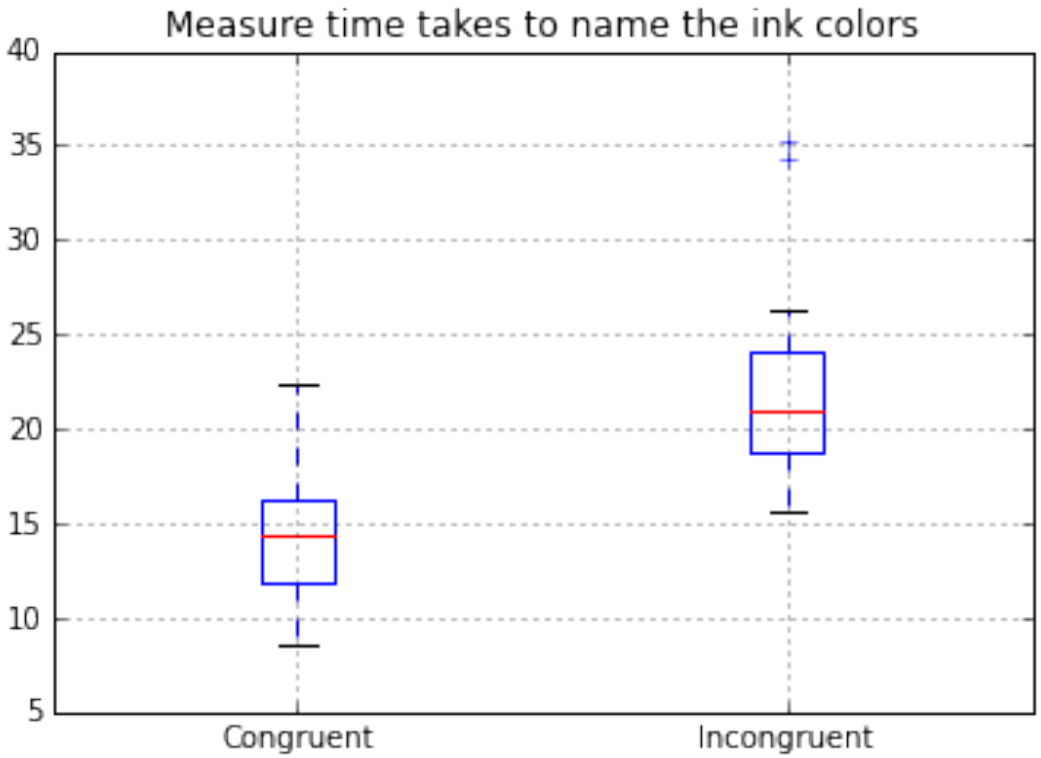
	Congruent	*Incongruent*
Mean	14.051125	22.01592
Standard Error	0.7265509	0.979195
Median	14.3565	21.0175
Mode	#N/A	#N/A
Standard Deviation	3.559358	4.797057
Sample Variance	12.669029	23.01176
Kurtosis	-0.2052248	2.6889
Skewness	0.4168999	1.54759
Range	13.698	19.568
Minimum	8.63	15.687
Maximum	22.328	35.255
Sum	337.227	528.382
Count	24	24
Confidence Level(95.0%)	1.5029851	2.02562

Question 4: Plot the data





the histogram show that data is similar normal ditribution
the data of incongruent a bit shift and had some outlier



the box plot showed average time of congruent was less than incongruent
the average time of congruent ~14 compare to incongruent ~22
the incongruent word show two sample was outlier,
this data set need to verify, may be something wrong during collect the data.

Question5 : Perform the statistical test and interpret your results

Participant	Congruent	Incongruen	d
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
Average			-7.9647917
Stdev			4.86482691
n			24
df			23
SE			0.99302863
t			-8.0207069

Starting analysis

1.Find the difference between each pair of sample d_i

where $d_i = X_I - X_C$

$X_I = \text{time of Incongruent world}$

$X_C = \text{time of Congruent world}$

2.Find the average of the difference. $\overline{d}$

where $$\overline{d} = \sum_{i=1}^{n} \frac{d_i}{n} \qquad = -7.9647917$$

3. Establish the hypothesis test, if the congruent and incongruent not different then $\overline{d} = 0$

if assigned $\mu_d = \overline{d}$ for one tail test

$H_0: \mu_d = 0$

$H_a: \mu_d < 0$

4. Assigned $\propto = 0.05$

5. Find statistical t-test

$$t_0 = \frac{\overline{d}}{S_d/\sqrt{n}}$$

$$t_0 = \frac{-7.96479167}{4.86482691/\sqrt{24}} = -8.02070694$$

6. Find degree of freedom $df = n - 1$

df = 24 - 1

= 23

7. Find $t_{critical}$

$t_{(0.05,23)}$

t-Test: Paired Two Sample for Means

	Variable 1	*Variable 2*
Mean	14.051125	22.01592
Variance	12.669029	23.01176
Observations	24	24
Pearson Correlation	0.3518195	
Hypothesized Mean Diffe	0	
df	23	
t Stat	-8.0207069	
P(T<=t) one-tail	2.05E-08	
t Critical one-tail	1.7138715	
P(T<=t) two-tail	4.103E-08	
t Critical two-tail	2.0686576	

8.The hypothesis testing

$$t_0 < t_{critical} \quad -8.02070694 < -1.7138753$$

$$p - value < \alpha \quad 2.0515002928556E - 08$$

then reject H_0

9.Conclusion

There was a significant difference in time for
congruent(M=14.0511, SD=3.5594) and
incongruent(M=22.01591, SD=4.7971)
t(24)= 1.71387152774705, p-value = 2.0515002928556E-08

The average time to name ink color in concgruent
is less than average time to name incongruent

Question 6: Digging deeper and extending the investigation

This test is show the effect of he human brain
is reconize color before alphabet.
The similar task is Search engines replacing our memory.
Research name : Google Effects on Memory
: Cognitive Consequences of Having Information at Our Fingertips
by Betsy Sparrow, Jenny Liu, Daniel M. Wegner

Reference

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