PROJECT 1 - CONGRUENT AND INCONGRUENT WORDS TEST

1. What is our independent variable? What is our dependent variable?

    Independent variable: The participant's task is to say out loud the color of the ink in which the word is printed both the congruent words condition and an incongruent words condition.

    Dependent variable: the time it takes to name the ink colors.

2. What is an appropriate set of hypotheses for this task? What kind of statistical test do you expect to perform? Justify your choices.

    H- Null= The average time it takes to name the ink colors for both congruent and incongruent words conditions papulation are same.
    $$\mu1 - \mu2 = 0$$
    H-Alternative= The average time it takes to name the ink colors for both congruent and incongruent words conditions population are not same.
    $$\mu1 - \mu2 \neq 0$$

    I chose the population because t-test uses the sample data to test the entire population.

    Kind of statistical test: I prefer doing tow-tailed t-test because the data given is not the entire population it's a sample of the entire population. To be more specific I prefer doing two-tailed t-test for dependent samples. The test is done on the same subject (I meant he/she) with to two different condition, first the person takes congruent words conditions test and then incongruent word condition test. Yes, this might have a negative cross-over effect.

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

    No of sample n = 24
    Degree of freedom=23
    t-critical for (alpha=95%) = (-2.069, 2.069)
   Standard error of mean=0.99303
    Mean different (mean of congruent-mean of incongruent test) = -7.964

    I was asked to provide the calculation for mean different by my reviewer. I'm not sure why my mean different is wrong. I subtracted the value in congruent – value in incongruent and filled the column d and finally found out there mean.

Congruent	Incongruent	d
12.079	19.278	-7.199
16.791	18.741	-1.95
9.564	21.214	-11.65
8.63	15.687	-7.057
14.669	22.803	-8.134
12.238	20.878	-8.64
14.692	24.572	-9.88
8.987	17.394	-8.407
9.401	20.762	-11.361
14.48	26.282	-11.802
22.328	24.524	-2.196
15.298	18.644	-3.346
15.073	17.51	-2.437
16.929	20.33	-3.401
18.2	35.255	-17.055
12.13	22.158	-10.028
18.495	25.139	-6.644
10.639	20.429	-9.79
11.344	17.425	-6.081
12.369	34.288	-21.919
12.944	23.894	-10.95
14.233	17.96	-3.727
19.71	22.058	-2.348
16.004	21.157	-5.153
14.051125	22.0159167	-7.964791667

4. 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.
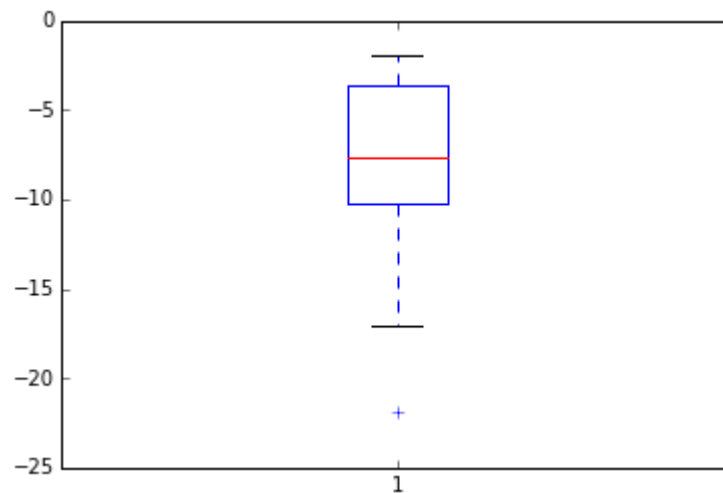
   Histogram for mean different between congruent and incongruent
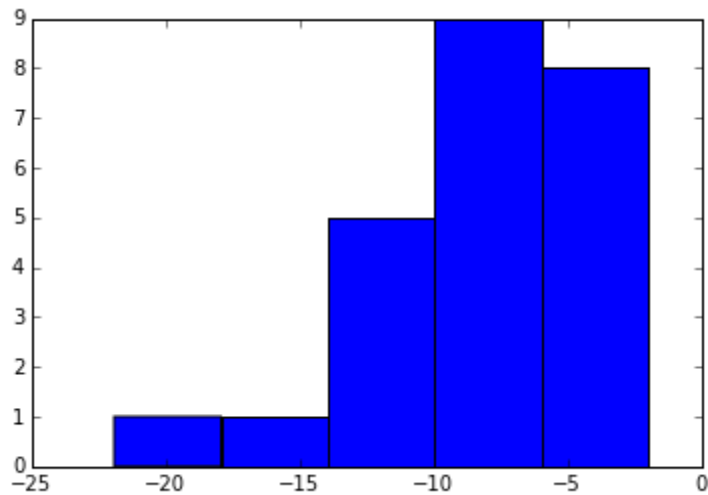
It is very hard to say that the sample follows a normal distribution from the above histogram. But there is definitely indication pointing that the time taken to complete the incongruent test is much longer then the congruent.
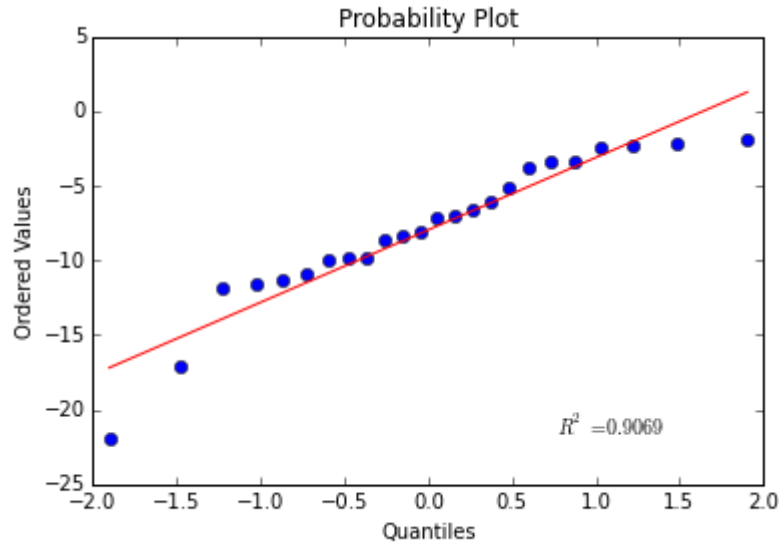
Test for normality:

BOX PLOT

The box plot has an outlier but I still can't say it is normally distributed since the box plot is not symmetric

QQ-plot

Probability Plot

QQ-plot shows there is long tails at both ends of the data distribution but I can say the sample is approaching the normality or in other word there is slight evidence of normality. This is good enough to proceed with two-tailed t-test for dependent samples.

5. Now, perform the statistical test and report your results. What is your confidence level and your critical statistic value? Do you reject the null hypothesis or fail to reject it? Come to a conclusion in terms of the experiment task. Did the results match up with your expectations?

Statistical test: two-tailed t-test for dependent samples

- Result:
  No of sample n = 24
  Degree of freedom=23
  Mean different (mean of congruent-mean of incongruent test) = -7.964
  t-statistic = -8.02071
  P-value= 0.00001
  t-critical for (alpha=95%) = (-2.069, 2.069)
  95% confidence level = (-10.019,-5.910)
  Cohen's d= -1.63

- The t-statistic falls in the critical region so the test is significant and we reject null hypotheses and accept alternate-hypotheses.

Conclusion:
- The mean time different in completing the tests is -7.964 which initially made me think that it's take on average 7.964 units(they haven't mentioned it is sec or min) more time to complete the incongruent test then the congruent test.

- After preforming the two tailed t-test for dependent sample which has the p-value =0.001 which proves that there is a significant different in the time take between both the test.
- For 90% confidence interval for the mean time different for between the tests lies between -10.01 and -5.91 which means we are 95% confident that the average more time taken to complete the incongruent test lies between 5.91 to 10.01 units more than a congruent test.
- Yes this is what exactly I thought when I calculated the mean time different.

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