Test_a_Perceptual_Phenomenon

March 22, 2018

0.0.1 Analyzing the Stroop Effect

Perform the analysis in the space below. Remember to follow the instructions and review the project rubric before submitting. Once you've completed the analysis and write up, download this file as a PDF or HTML file and submit in the final section of this lesson.

(1) What is the independent variable? What is the dependent variable?

Independent variable:-independent variable, sometimes called an experimental or predictor variable, is a variable that is being manipulated in an experiment in order to observe the effect on a dependent variable, sometimes called an outcome variable.

Dependent variable:-It is dependent on another variable .It depends on another factor.

Eg:-Recognition of color of ink is depdendent on color of ink from which is it has written.This is called stroop effect.People will be able to color of ink more clearly if it is written in same color.

Congruent stimuli are those in which the ink color and the word refer to the same color.

Incongruent stimuli are those in which the ink color and the word refer to the differ color.

(2) What is an appropriate set of hypotheses for this task? Specify your null and alternative hypotheses, and clearly define any notation used. Justify your choices.

Null hypothesis (H0)

The null hypothesis states that a population parameter is equal to a value. The null hypothesis is often an initial claim that researchers specify using previous research or knowledge.

Alternative Hypothesis (H1)

The alternative hypothesis states that the population parameter is different than the value of the population parameter in the null hypothesis. The alternative hypothesis is what you might believe to be true or hope to prove true.

Hypothesis to determine whether a population mean, , is equal to some target value 0 include the following:

Ho: = 0

H1: < 0 (a lower-tailed test) or

H1: > 0 (a upper-tailed test) or

H1: 0 (a two-tailed test)

Hypothesis to determine whether one population mean, 1 is equal to different population mean 2 include the following:

H0: 1 = 2

H1: 1< 2 or

H1: 1> 2 or

H1: 1 2

```
In [47]:
          import pandas as pd
          import matplotlib.pyplot as plt
          import statsmodels.api as sm
          import scipy.stats as stats
          import numpy as np

          %matplotlib inline

          df=pd.read_csv('stroopdata.csv')
          df.head()
```

Out[47]:

	Congruent	Incongruent
0	12.079	19.278
1	16.791	18.741
2	9.564	21.214
3	8.630	15.687
4	14.669	22.803

```
In [48]: df.shape

Out[48]: (24, 2)

In [49]: df['Congruent'].mean(),df['Incongruent'].mean()

Out[49]: (14.051124999999999, 22.015916666666666)

In [50]: df['Congruent'].std(),df['Incongruent'].std()

Out[50]: (3.5593579576451955, 4.7970571224691376)
```

We have chosen t-independent test because of following reason.
i>Random sampling from a defined population
ii>Samples are independent; no overlap between group members
iii>Scores are normally distributed in the population
iv>Interval or ratio scale of measurement (approximately interval)
In t-Independent we will compare means of two values we compare.
It has small sample of size 24 .This is a two-sided test for the null hypothesis that 2 independent samples have average difference smaller
NULL Hyphothesis:-We believe both congruent and incongruent will take same time to recognize
Alternative hyphohthesis :-We believe congruent and incogruent will not take same time to recognize

(3) Report some descriptive statistics regarding this dataset. Include at least one measure of central tendency and at least one measure of variability. The name of the data file is 'stroopdata.csv'.

```
In [52]: df.describe()
```

```
Out[52]:        Congruent  Incongruent
         count  24.000000    24.000000
         mean   14.051125    22.015917
         std     3.559358     4.797057
         min     8.630000    15.687000
         25%    11.895250    18.716750
         50%    14.356500    21.017500
         75%    16.200750    24.051500
         max    22.328000    35.255000
```

We can see that mean of congruent is 14.05 and mean of Incongruent is 22.015.

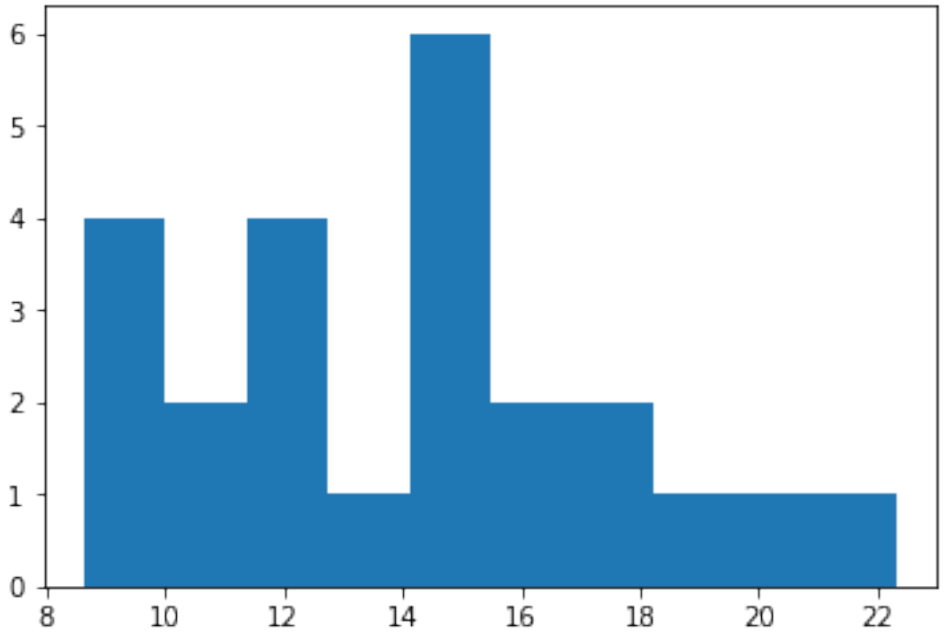
So congruent words will take less time to recognize the ink since word name and color of ink are same

Incongruent word will take more time to recognize because the color of ink and word name are different

(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.

```
In [53]: plt.hist(df['Congruent'])
```

```
Out[53]: (array([ 4.,  2.,  4.,  1.,  6.,  2.,  2.,  1.,  1.,  1.]),
          array([  8.63  ,   9.9998,  11.3696,  12.7394,  14.1092,  15.479 ,
                  16.8488,  18.2186,  19.5884,  20.9582,  22.328 ]),
          <a list of 10 Patch objects>)
```



Answer:- We can see the most of congruent are between 14 and 16 .There are less number of congruent between 18 to 22

(5) Now, perform the statistical test and report your results. What is your confidence level or Type I error associated with your test? What is your conclusion regarding the hypotheses you set up? Did the results match up with your expectations? **Hint:** Think about what is being measured on each individual, and what statistic best captures how an individual reacts in each environment.

```
In [54]: df.head()
```

```
Out[54]:    Congruent  Incongruent
         0     12.079       19.278
         1     16.791       18.741
         2      9.564       21.214
         3      8.630       15.687
         4     14.669       22.803
```

```
In [55]: stats.ttest_ind(df['Congruent'],df['Incongruent'],equal_var=True)
```

```
Out[55]: Ttest_indResult(statistic=-6.5322505539032285, pvalue=4.5949489622951854e-08)
```

NULL Hyphothesis:-We believe both congruent and incongruent will take same time to recognize

Alternative hyphohthesis :-We believe congruent and incogruent will not take same time to recognize

Since p-value<0.05 .So we will reject the null hyphothesis.

So There is significant time difference to recognize congruent and incongruent

t-score=-6.5322 The t score is a ratio between the difference between two groups and the difference within the groups. So there

difference between mean of congruent and incogruent is -6.5322 .So incogruent will take approximately 6 times the

congruent in recognition time of ink

(6) Optional: What do you think is responsible for the effects observed? Can you think of an alternative or similar task that would result in a similar effect? Some research about the problem will be helpful for thinking about these two questions!

–write answer here–