Test a Perceptual Phenomenon

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Questions for Investigation

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

   Independent Variable: Condition (congruent/incongruent)

   Dependent Variable: The time it takes to name the ink colors in equally-sized lists

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_0: Time to name colours is the same for congruent and incongruent tasks

   H_0: $\mu C = \mu I$

   H_A: Time to name colours in incongruent task takes longer than congruent task.

   H_A: $\mu C < \mu I$

   I will be using a t-test instead of a z-test because

   1) The population parameters (Mu and Standard Deviation) are unknown,

   2) We have two dependent samples of data to compare with i.e. time to name the colours in congruent and incongruent conditions.

   3) The sample set is less than 30. The t-test will be a one tailed paired t-test i.e. my directional alternative hypothesis is that participant's incongruent sample mean will be larger than the participant's congruent sample mean.

   A paired t-test will be used because the data set is of one group of participants tested twice under different conditions (congruency).

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

Congruent:

Mean: 14.05

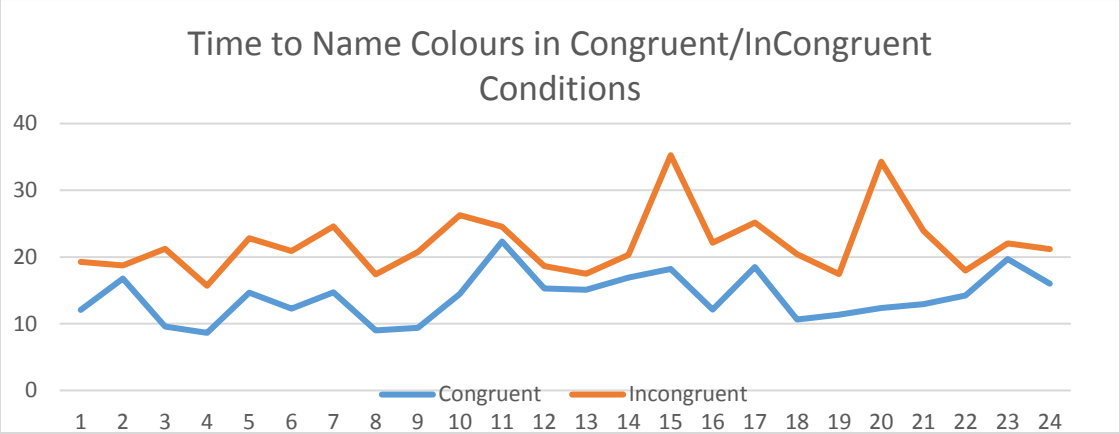
Standard Deviation: 3.56

Incongruent:

Mean: 22.02

Standard Deviation: 4.80

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.**



Congruent tasks appear to be consistently completed faster than incongruent tasks.

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?**

μD: 7.96

SD (Difference): 4.86

SE (Difference): 0.99

DF: 23

t-stat: 8.02

At α 0.05, t-critical: 1.714

P: 0.0001

Margin of Error: 2.09

95% CI: (6.26, 9.67)

R-Squared Value: 0.74

Null hypothesis rejected. At α 0.05, the *time to name colours in congruent tasks is significantly larger* than incongruent tasks. People do not name colours at the same speed when the word's meaning and its colour match, as when they do not match. The result confirms my expectations.

6. **Optional: What do you think is responsible for the effects observed?**

I believe it's a subconscious or habitual behavior where commonly used words are glanced over and easily recognized in your mind and therefore, because the color and words match, it takes little effort to say the word/colour. However, when the word and colour are mismatched, we first think of the word and then need to correct ourselves to say the colour causing either errors or more time to provide the correct response.

Another similar task: Asking the user to type a message on a mobile phone in normal conditions and then do the same task while driving. The dependent variable would be the time it took the user to type the whole message and the independent variable would be the different conditions the user would be asked to type the message in.

References

https://en.wikipedia.org/wiki/Stroop_effect

http://www.statstutor.ac.uk/resources/uploaded/paired-t-test.pdf

https://s3.amazonaws.com/udacity-hosted-downloads/t-table.jpg