The Stroop Effect

1. Independent variable: Congruency of word and color (match or mismatch)
   Dependent variable: Time it takes to name the ink color

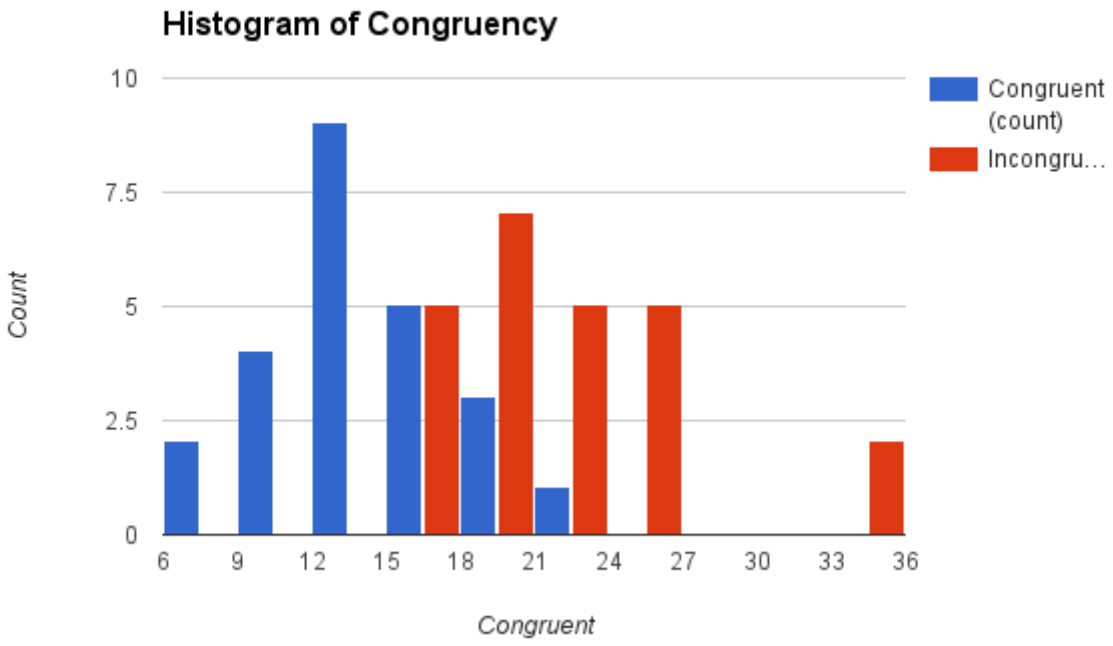
2. Null Hypothesis: There is no difference in naming time with different congruency, or the naming time will be less for in case of word/color mismatch.
   Alternative Hypothesis: There will be an increase in naming time for word/color mismatch compared to word/color match.

   The alternative hypothesis is formulated this way because the author expects that the brain will interfere with naming the ink color if the text does not match the ink.

   A one-sided dependent sample t-test will be used to evaluate the hypothesis. The population standard deviation and mean are unknown and the test is a within-subjects test since the same group of people is observed under different conditions. Also, the number of samples is small, so a t-test is more appropriate than a z-test.

Note: I don't think that sample size is given as an important factor in the class, but a hard value of n > 30 for z-test is given in other sources, e.g. here and here

3. For congruent word/ink, the mean is 14.051, the variance is 12.669 and the standard deviation 3.559.
   For incongruent word/ink, the mean is 22.016, the variance is 23.012 and the standard deviation 4.797.
   The mean for the difference between congruent and incongruent values is -7.965 and the standard error is 1.219.
   (All values are in seconds.)
4. The following plot shows a histogram of congruent vs incongruent results (bucket size 3).



   There is a clear shift between the two graphs. The mode for matching word/ink is around 12 while the mode for mismatch is around 20.
5. For the t-test, a confidence level of 95% is used, which corresponds to a t critical value of

-1.711 (since incongruent values are subtracted from congruent ones, the mean is negative, so the t-test needs to be focused on the lower-end tail).
With a mean difference of -7.965 and a standard error for the mean difference of 1.219, the t-statistic is -6.532. Since the t-statistic is far lower than the t critical value, the Null Hypothesis is rejected at a confidence level of 95%.
Note: The t-statistic is sufficiently low to reject the Null Hypothesis even for a confidence level of 99.9% (t critical: -3.467)

The conclusion is that people take significantly longer to name the color of ink if the ink's color does not match the word's meaning (also a color).

The way this experiment was conducted does not allow conclusions about the cause of the effect. It is not clear if the difference is due to the fact that color recognition is sped up if the word matches the ink color, or if the mismatch of word and ink slows recognition down.
To test this, there would need to be a neutral test as well: The words would need to be completely unrelated to the colors. This would establish a base line and further tests could be conducted to see if congruency speeds up recognition, if incongruency slows it down, or both, or neither.

6. Sources: Wikipedia, Link, Link
   According to online resources, the brain processes words faster than color, so when the user is given the task to tell the color of a word in an incongruent case, the text evaluation is complete before the color evaluation leading to a conflict that then needs to be consciously resolved. This becomes obvious when the user is told to simply focus on the written word and ignore the color: The difference between congruency and incongruency is insignificant.

   Alternative yet similar tests have been conducted with words related to colors (fire, ocean, etc.) or made-up words sounding similar to colors (wred, bloo, etc.).