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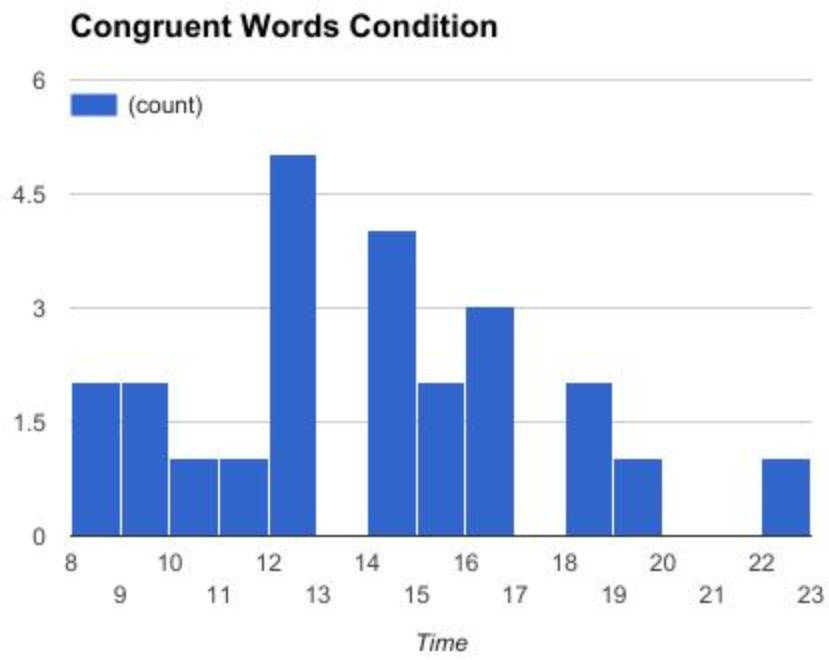
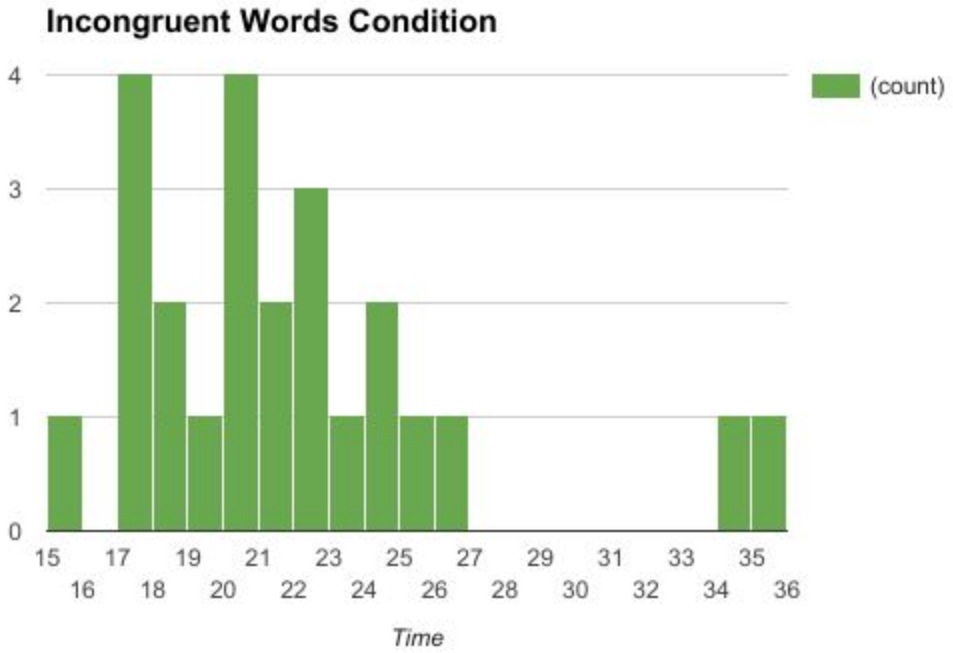
Statistics: The Science of Decisions Project

1. Our independent variables are the congruent words condition task and the incongruent words condition task. Our dependent variable is the time it takes for participants to complete each task.
2. Our null hypothesis is that the population mean of time to complete the congruent task will be equal to or larger than the population mean of time to complete than the incongruent task. Our alternative hypothesis is that the population mean of time to complete the congruent task will be less than that of the incongruent task. Using the standard symbol for population average μ, let μ_C denote the population mean of time to complete the congruent words condition task. Similarly, let μ_I denote the population mean of time to complete the incongruent words condition task. We can then state our null hypothesis mathematically as H_0: $\mu_C \geq \mu_I$, or letting $\mu_D = \mu_I - \mu_C$, H_0: $\mu_D \leq 0$. Similarly, our alternative hypothesis is H_A: $\mu_C < \mu_I$, or H_A: $\mu_D > 0$. I will do a one-tailed t-test with an α level of 0.05 to see if the difference in the sample means are by chance or because the population means are different. I will be doing a dependent t-test instead of a z-test since the population parameters are unknown and each subject will perform both tasks. I chose a one-tailed test because I want to confirm that the incongruent task will take more time, not just be different from, the congruent task. By performing the two tasks myself and getting times of 12.255 for the congruent task and 19.9 for the incongruent task as well as researching the stroop effect, I expect to reject the null.
3. The times for the congruent words condition task had a mean of 14.051, median of 14.357, sample standard deviation of 3.559, and standard error of 0.726.
   The times for the incongruent words condition task had a mean of 22.016, median of 21.018, sample standard deviation of 4.797, and standard error of 0.979.

4.



The congruent words condition graph appears to be heading towards a normal distribution. There is too little data to be sure.



Like the above graph, there is too little data to tell for sure if this will have a normal distribution. The two outliers of over 34 seconds are interesting which could mean that this type of task might be abnormally difficult for some.

5. I performed a one-tailed t test on the data using an α level of 0.05. This gives us a t-critical of 1.714 and a confidence interval (5.91, 10.02). Analyzing the difference of $t_{congruent}$ and $t_{incongruent}$ gives $s_D = 4.865$ and $SEM_D = 0.993$. Using this information and our means from answer 3 above, we get a t-statistic of 8.02, well within the critical region defined earlier and with a p-value of less than 0.0001 thus we reject the null. These results match up with my expectations stated in answer 2 above.

6. I believe in the most common theory that automaticity is the cause for the stroop effect because in my own experience, reading is an automatic process for me and when something when I am reading that I cannot do it in this automatic way, it takes me much longer. A similar task would be looking at a screen of yourself. On the screen, a dot would be shown on one of your body parts and you would have to touch it. After, you would perform the same task but with the screen would have you reversed (your the right side of your body would be on the left and vise versa).

Websites Used:

http://vassarstats.net/tabs.html#t
https://en.wikipedia.org/wiki/Stroop_effect