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

   According to the description given, independent variable is the congruence condition

   Dependent Variable would be the reaction time that a participant takes to identify the font color for both congruent and incongruent words.

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

   From the description given and the notes I read from Google search I think this is a directional hypothesis.
   One of the possible hypothesis is that the difference between reaction time to recognize the colors between congruent and incongruent words, where Stroop effect exist

   H_0: (Null Hypothesis): The difference between the congruent and incongruent population means is zero
   H_a: (Alternative Hypothesis): The difference between the congruent and incongruent population means is not zero

   To state the above condition mathematically,

   H_0: (Null Hypothesis): Mu1- Mu2=0
   H_a: (Alternative Hypothesis): Mu1- Mu2=0

   Where Mu1 refers to incongruent sample population mean and Mu2 refers to congruent population mean

   With this hypothesis we can identify the difference between the reaction time for congruent and incongruent groups by calculating the Standard deviations and means for the sample we have chosen from a population. This sample can give us a fair view of Stroop effect data that is been collected.

   Secondly, I would go for a Paired T-Test because, with paired T-Test can address the uncertainty in sample standard error resulted from the unknown population standard deviation. We are using the same dependent samples for the experiment under both conditions.

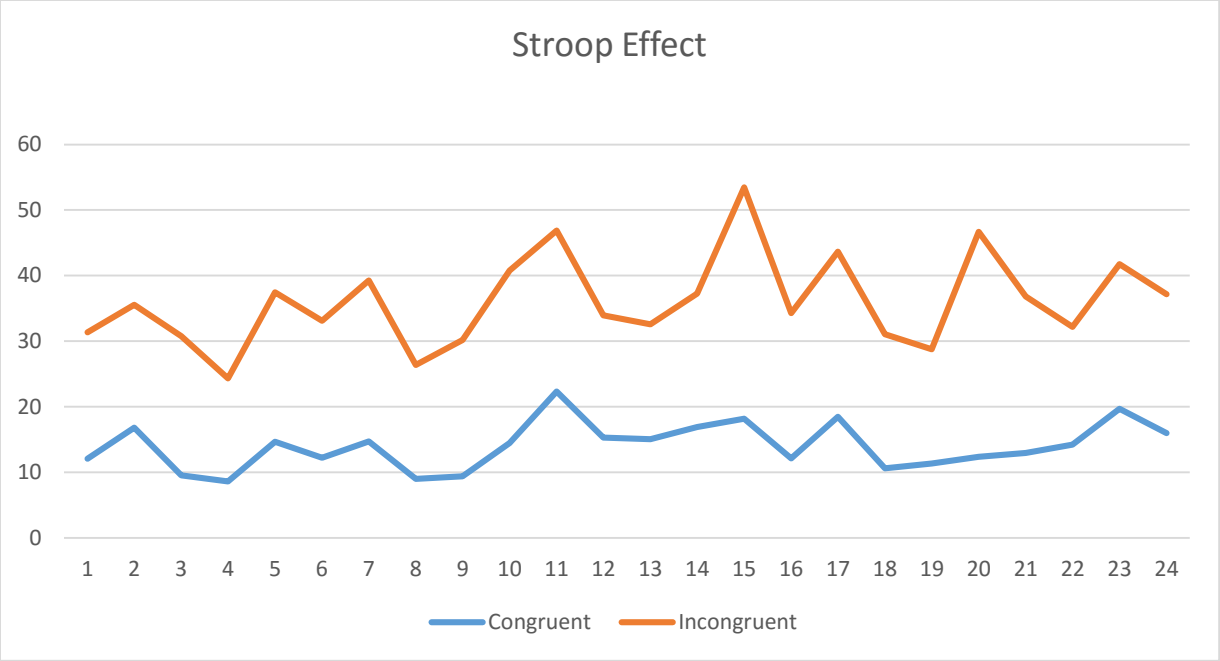
Now it's your chance to try out the Stroop task for yourself. Go to this link, which has a Java-based applet for performing the Stroop task. Record the times that you received on the task (you do not need to submit your times to the site.) Now, download this dataset which contains results from a number of participants in the task. Each row of the dataset contains the performance for one participant, with the first number their results on the congruent task and the second number their performance on the incongruent task.

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

	Congruent	Incongruent	sum of squares (congruent)	sum of squares (incongruent)
	12.079	19.278	3.889277016	7.496187674
	16.791	18.741	7.506915016	10.72507917
	9.564	21.214	20.13429077	0.64307034
	8.63	15.687	29.38859627	40.05518617
	14.669	22.803	0.381769516	0.619500174
	12.238	20.878	3.287422266	1.29485434
	14.692	24.572	0.410720766	6.533562007
	8.987	17.394	25.64536202	21.36211367
	9.401	20.762	21.62366252	1.572307007
	14.48	26.282	0.183933766	18.19946701
	22.328	24.524	68.50665977	6.290482007
	15.298	18.644	1.554697266	11.36982201
	15.073	17.51	1.044228516	20.30328501
	16.929	20.33	8.282164516	2.842315007
	18.2	35.255	17.21316377	175.2733275
	12.13	22.158	3.690721266	0.020187674
	18.495	25.139	19.74802502	9.753649507
	10.639	20.429	11.64259702	2.518304507
	11.344	17.425	7.328525766	21.07651584
	12.369	34.288	2.829544516	150.6040293
	12.944	23.894	1.225725766	3.527197007
	14.233	17.96	0.033078516	16.45046001
	19.71	22.058	32.02286627	0.001771007
	16.004	21.157	3.813720766	0.73773784
Mean	14.051125	22.01591667	291.3876686	529.2704118
Standard Deviation	3.559357958	4.797057122		
Median	14.3565	21.0175		
Variance	12.66902907	23.01175704		

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.

From the bellow chart we can note that incongruent group took longer time to identify the words or we can say that the reaction time for the incongruent group is longer than that of congruent group.



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?

T-Statistic= -8.020706944
Degrees of Freedom= 23
Standard Error= 1.219
Difference of Means= -7.964791667
At α=0.05 i.e. at 95 % confidence interval
P value is less than 0.0001
T-Critical Value= 1.714

We thus reject the null hypothesis as we can see a clear Stroop effect between the samples. Yes, Results matched up to my expectations

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!

I think this effect is due to the variation in the words with different color name. As per my knowledge and the examples I have looked for identifying the shapes and their name would be a similar task that would result the similar effect.

References:

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

http://www.snre.umich.edu/eplab/demos/st0/stroopdesc.html

https://faculty.washington.edu/chudler/words.html