1. the independent variable is the list of words in different color ink; the dependent variable is the time it takes for the participants to name the ink colors.

2. μ_c represents the population mean in congruent condition, and μ_i represents the population mean in incongruent condition. Because we don't know the population means in both conditions, we compare two sample means(in this case we have 24 samples in each condition) to illustrate whether the color stimuli has any effect on the time of naming ink color for the entire populations.

Stimuli in Stroop paradigms can be divided into 3 groups: neutral(when the ink color and word do not interfere with each other), congruent and incongruent. The experiment finds that naming the ink color of neutral stimuli is faster than in incongruent condition, whereas that naming the ink of congruent stimuli is faster than when neutral stimuli are presented.[1]

Therefore,

Null hypothesis $H_0 : \mu_c = \mu_i$

Alternative hypothesis $H_a : \mu_c < \mu_i$

If the test shows that the p-value is not in the critical area, which means it's not statistical significant, we'll keep the null hypothesis, as the p-value tells us the difference between our two sample means is just due to chance, and we could conclude that there actually is no significant difference between two population means.

Otherwise, for the same reason the other way around, we'll reject the null hypothesis.

In this Stroop effect test, we have two paired samples, participants take one in congruent condition, and take the other in incongruent condition, and we compare the distribution of these two conditional sample means to make inferences about the two population means; the central limit theorem tells us that the distribution of large random sample means is approximately a normal one.

According to the experiment findings, if there is actual effect, μ_c ought to be less than μ_i, so we only consider one-directional test; as we don't know the population means and its standard deviations, but we've only got 24(less than 30) samples in each sample size, which is much less than whole population, then the t-test is required, 23 is its degree of freedom.

In summary, this Stroop effect test is a dependent paired-sample, one directional t-test.

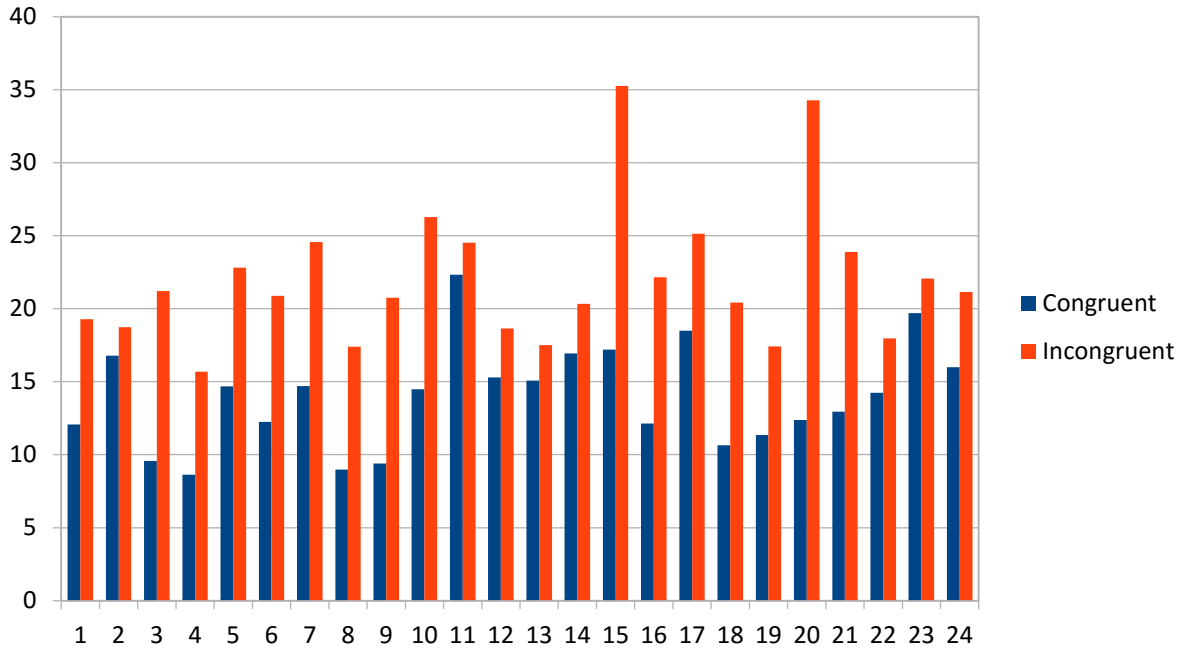
3. the mean of the congruent condition sample x_c=14.051, sample standard deviation SD_c=3.559

the mean of the incongruent condition sample x_i=22.016, sample standard deviation SD_i=4.797

The mean of difference $x_c - x_i$=-7.965

The standard deviation of difference S=4.865

4.



Under congruent condition, the time range is between around 8 and 22, while under incongruent condition, the time range is between around 16 and 35, which is much longer than under congruent condition, and whose out-spreadness is wider.

5. at level α=.05, t(23)=-8.021, p<.0005, one-directional test

Cohen's d = -1.637

R2 = 0.737

I reject the null hypothesis because p-value is less than .05.

Confidence interval on the mean difference: 95% CI=(-10.019,-5.910)

Conclusion: two different conditions have different effect on the time difference to name the ink colors, and it's faster under congruent condition than that under incongruent condition.

6. I think the effect is mainly caused by the psychological reaction to the difference between what the word itself presents and what the word actually tells, there is kind of conflict between two so that participants need time to recognize the difference and reflect on it.

There are two different theories that have been proposed to explain this phenomenon:

a) Selective Attention Theory – According to this theory, naming the actual color of the words requires much more attention that simply reading the text.

b) Speed of Processing Theory – According to this theory, people can read words much faster than they can name colors. The speed at which we read makes it much more difficult to then name the color of the word.[2]

The similar experiment is such as emotional investigation.

Related to the standard Stroop effect, the emotional Stroop test works by examining the response time of the participant to name colors of negative emotional words. Depressed participants will be slower to say the color of depressing words rather than non-depressing words. The emotional Stroop does not involve an effect of conflict between a word meaning and a color of text, but rather appears to capture attention and slow response time due to the emotional relevance of the word for the individual.3

So, there is a strong negative effect on participant's psychology as for the depressing words which

could provoke individual emotional reaction so as to prolong the reponse time.

Reference:

1. Wikipedia “Stroop effect”: https://en.wikipedia.org/wiki/Stroop_effect
2. “What is Stroop effect” by **Kendra Cherry**: https://www.verywell.com/what-is-the-stroop-effect-2795832
3. Wikipedia “Emotional Stroop test”: https://www.verywell.com/what-is-the-stroop-effect-2795832