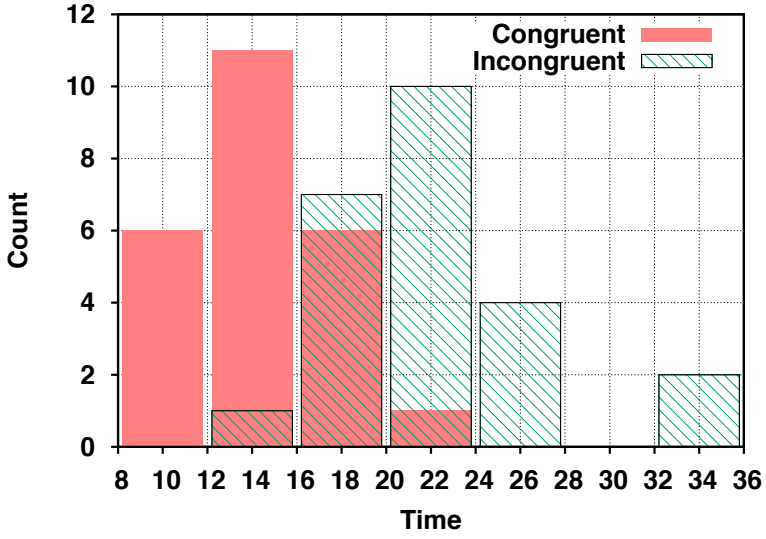
1. The independent variable is a list of words, with each word displayed in a color of ink. The dependent variable is the time it takes to name the ink colors in equally-sized lists.
2. If we consider the average reaction time it takes to name the ink colors in equally-sized lists from the samples as x in the congruent words condition and as x_I in the incongruent words condition, the set of hypotheses [Ref. 1] can be expressed as
    a. The null hypothesis H_0: $\mu = \mu_I$, the reaction time in both conditions is not significantly different to each other.
    b. The alternative hypothesis H_a: $\mu < \mu_I$, or $\mu > \mu_I$, or $\mu \neq \mu_I$. The incongruent words condition has a significant effect on the reaction time.

    Here the two-tailed test was performed so that the alternative hypothesis was determined as H_a: $\mu \neq \mu_I$. Since we don't have the access to the population, we are dealing with the samples in both words condition. [Ref. 2] Because the sample size 24 is small, t-test should be used. [Ref. 3] Each participant has gone through and recorded reaction time from both conditions, participants are considered as paired/dependent. In other word, paired-sample t-test was performed.

3. Measure of central tendency: The data had shown that time average in the congruent words condition (14.05) is shorter than in the incongruent words condition (22.02). Measure of variability: The time range in the congruent words condition (13.698) is also shorter than in the incongruent words condition (19.568). [Ref. 4] The standard deviation of the sample is 3.56 in the congruent words condition and is 4.80 in the incongruent words condition. [Ref. 5]
4. The spending time of majority portion of participants in the incongruent words condition (20-24 seconds) is noticeable longer than in the congruent words condition (12-16 seconds). Furthermore, the data is more diverge in the incongruent words condition (from 12 to 36) than in the congruent words condition (from 8 to 24).



5. In order to test the effect of the spending time in different words condition with the rather small sample size (24 in each condition), dependent t-test for paired samples was performed. Considering the α level equals 0.05 in the two-tailed t-test, the critical values of t = ±2.069 for degrees of freedom equal 23. We know that the average spending time is 14.05 (x_c) in the congruent words condition and is 22.02 (x_i) in the incongruent words condition. The set of hypotheses can be written as
    a. The null hypothesis H_0: $\mu_c = \mu_i$, the reaction time in both conditions is not significantly different to each other.
    b. The alternative hypothesis H_a: $\mu_c \neq \mu_i$. The words condition has a significant effect on the reaction time.

    Alternative, we can express the hypothesis using $x_D = x_c - x_i$. Or H_0: $\mu_D = 0$, H_a: $\mu_D \neq 0$. The mean difference is -7.96 (x_D) and the sample deviation of the differences is about 4.86 (s_D). For α level equals 0.05 (t = ±2.069), the confidence level is

$$(x_D - t_{critical}\frac{s_D}{\sqrt{n}}, x_D + t_{critical}\frac{s_D}{\sqrt{n}}) = (-7.96 - 2.069 \times \frac{4.86}{\sqrt{24}}, -7.96 + 2.069 \times \frac{4.86}{\sqrt{24}}),$$

    or (-10.01, -5.91). It means that there is a higher chance the reaction time is about 5.91 to 10.01 seconds less in the congruent words condition than in the incongruent words condition.

    The t-value can be obtained through the following formula

$$t = \frac{x_c - x_i}{s/\sqrt{n}} = \frac{14.05 - 22.02}{4.86/\sqrt{24}} = -8.03$$

    Since the obtained t value |-8.03| > 2.069 ($p < 0.05$), we reject the null hypothesis. It means the words condition has significant effect on the average reaction spending time. The results match my expectation that spending time is longer in the incongruent words condition than in the congruent words condition.

6. The effect was explained by the automation of reading, where the mind automatically determines the semantic meaning of the word, and then must intentionally check itself and identify instead the color of the word, a process that is not automated. [Ref. 6] The similar effect might be observed if different types of font are used. For instance, word in regular font, in bold, and in italic format, i.e., regular, **bold**, and *italic*, respectively. The reaction time should be shorter in the congruent condition (regular, **bold**, and *italic*) than in the incongruent condition (i.e., *regular*, bold, **italic**).

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