Testing the time taken to words when conflicting visual and semantic information ...

Sociology, Social Issues

Abstract

Three conditions were used to evaluate a replica of the Stroop effect in an experiemt where 287 participants took place. The experiment was carried out on university undergraduate students selected randomly irrespective of gender. The aim of the experiment was to replicate the basic Stroop effect. The experiment was guided by three hypotheses. First, Colour naming will be fastest when the word is a colour name and it is presented in the colour it names. Second, colour naming will be slowest when the word is a colour names and it is presented in a colour other than that it names, and third colour naming will be performed at an intermediate speed when the word is not a colour name. From the results, it was identified that higher response times were observed in non-colour words, followed by colour incongruent words, and finally, the colour congruent words recorded the least response time.

Introduction

Human beings look at some cognitive processes as automatic because they require no extra effortful thoughts. Every skills acquired by an individual is learned to a certain degree of atomicity. Less attention is required for skills that are automatic (Coch, Fischer & Dawson, 2007: Bayne, Cleeremans & Wilken, 2009). Ridley Stroop discovered the stroop effect in 1935 (Stroop, 1935). Stroop studied the interference in serial verbal reactions of individuals. He believed there was evidence that word identification may form a type of an automatic process. In his research, Stroop called upon a number of people and presented them with different colored fonts where

they were expected to read aloud color words such as red, blue, green etc. Stroop discovered that people responded fast in naming color fonts that matched the color of the font but, slower when a mismatch occurred (De Young, 2007). This slowness in responding to the actual font color is an evidence of interference of cognitive processes (Pothos & Tapper, 2009). The Stroop effect experiment assumes reading as an automatic processes engaged by human beings without guesswork. According to Stroop (1935), the process of color identification requires more attention compared to the process of reading dimensions. According to Gerritsen, (1983), once a person sees a word written in a certain color ad asked to state its font color, the automatic reading process comes into the mind. Some processes become automatic when used over a long period. Automatic processes are fast, unavoidable and require no specific attention (Raz et al, 2006). Directed attention used in managing people's thoughts through inhibiting ones response to direct a certain act or utterance is the cognitive mechanism employed in the Stroop effect experiment. Direction of attention is the foundational mental resource that allows people to manage focus of their thoughts (Kaplan, 2001).

Stroop used a number of colors to carry out his study. For example, when a person is presented with a word " RED" written in blue font, the reading process takes place first that enables him or her determine the semantic meaning of that word. Secondly, a secondary process occurs that overrides the impression created in the reading process that enables a person name the font color as blue. Stroop observed that participants made more mistakes when given such tasks in addition to delayed responses (Kahneman

& Henik, 1981).

Different methods are used in measuring individuals' color identification process. These are congruent condition, incongruent condition and non-color condition. In the congruent condition, the words are written and printed using respective color names (Dishon-Berkovits, 1999). For example the word, " RED' is printed with red font, and " BLUE" with blue font etc. In the incongruent condition, words are printed with different font color names. For example, " RED" printed using a green font. The final condition called Non color involves printing words with certain color fonts but not the name of the color. The Stroop effect finds use in different areas of psychology in detecting certain behavioral traits and deficits (Heflin et al, 2011). In addition, Stroop affects assists in identifying certain conditions associated with eating disorders (Johannsen et al, 2008).

The following experiment was aimed at replicating the basic Stroop Effect. After the experiment, learners are expected to find out how automatic cognitive processes, interference, and use of reaction time in analyzing human cognitive processes occur in a Stroop Effect. The presence of words in the experiment interferes with the participants' ability to name colors. In the Stroop effect, words that have a strong relationship to color such as blood have more interference than other unrelated colors. In addition, words that are high in emotional content produce more interference (Demetriou, Efklides & Platsidou, 1993).

Hypothesis

H0: The mean response time was the same for all conditions

H1: Colour naming will be fastest when the word is a colour name and it is presented in the colour it names.

H2: Colour naming will be slowest when the word is a colour names and it is presented in a colour other than that it names.

H3: Colour naming will be performed at an intermediate speed when the word is not a colour name.

Method

Participants

287 undergraduate students from first year psychology class selected randomly participated in the experiment

Design

A repeated measured design was used with one independent variable, which was the word type (congruent of visual and semantic information of displayed word). The repeated measured design was selected because it takes into account individual differences since all participants are their own control and it requires fewer participants. In addition, repeated measured design is more convenient and efficient and the most useful in detecting the effect of independent variables irrespective of the size of the effect (Salkind, 2010). The three levels of the independent variable were:

Colour congruent (red)

Colour incongruent (red) and

Non-colour words (bed).

Every participant was given a series of 96 trials to complete with 48 trials for non-colour words (each of the four words had 12 times) and 48 trials for colour words with 12 times for each colour name. The time taken for a participant to report the correct colour of each word was measured as the dependent variable.

Apparatus

The apparatus consisted series of words presented on a 17-inch computer monitor. A word was displayed in blue, green, yellow or a red font with each color was shown with a button on the screen where the participant had to click to make a selection.

Procedure

On each trial:

- An equal number of red, green, yellow and blue colored words were used to avoid biases
- The color words used were presented equally in either a consistent or inconsistent color
- The non-color words had the same length, frequency and orthography. For example, red-bed, blue-true or yellow-mellow.
- The participant clicked the next word button on the 17-inch computer screen to present a word
- The participant then clicked the corresponding colour button to identify the colour the word was printed with as fast as possible.
- Wrong responses and very slow responses (greater than 2 seconds) were excluded from the average reaction time calculations.

- The order for undertaking all the three type trials was randomly ordered over 96 trials.

Results

Analysis

The results recorded consisted of time taken by each participant to choose the colour of the words presented on the computer screen. A data containing mean delays for each of the three conditions is shown on table 1. From this table, the colour incongruent condition recorded the highest delays with a mean of 783 ms and a standard deviation of 102 ms. The non-colour words condition took the second place with a mean of 741 ms and standard deviation of 82ms. The condition that students recorded the fastest response time was the colour congruent condition. In this condition, participants recorded a mean of 726 ms and a standard deviation of 80 ms. In addition, the variability of each participant's delay was small in both non-colour condition and colour congruent condition. However, a larger variability delay was recorded in colour incongruent condition.

On the other hand, the t-test represented the dependent variable's results as shown on table 2. From the results on table 2, a significance difference in the mean time taken between the colour incongruent condition and the colour congruent words was recorded {t(286)= -14. 67, p <. 001}. A similar significance difference in the delays between non-colour words and colour incongruent was seen, {t (286) = 11. 81, p <. 001}. Finally, a significance difference was seen on the time delays between the colour congruent and non-colour words, {t (286) = -6. 12, p <. 001}.

Discussion

The color congruent condition recorded the shortest mean response time of 726 ms. Results in table 1 show that the Stroop effect is stronger with similar color responses than with different color responses. Words are directly connected with automatic response and require some response time to translate the font color in an individual's mind (Bartholow, Bushman & Sestir, 2006). The high rate of response produces more interference with color naming as seen in the color congruent condition.

The t-test shown on table 1 indicated that the hypotheses is true. From the results, the test of null hypotheses that the mean response time was the same for all conditions gave p= <. 001. the 95% confidence interval for the difference in mean time was -14. 67 for color congruent versus color incongruent. The analysis shows that the null hypotheses is not true since it created a negative response time. According to Anonymous (2003), a 95% confidence interval for a t-test that yields a p <0. 005 rejects the null hypotheses and accepts the alternative hypotheses.

Figure 1: The relationship between the participant's response mean time and the conditions 1, 2 and 3 for color congruent, color incongruent and non-color words respectively.

In conclusion, the following experiment showed a strong Stroop effect with a replication of the basic Stroop effect. A close interference in responding to colors on the screen was observed for color fonts and words. The experiment aims were achieved and all the hypotheses met. Moreover, the experiment encourages future investigation of the color recognition Stroop effect because it provides essential issues in the Stroop literature.

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