

## **The Stroop Task: Gender Differences between College Students**

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*There were six male and six female students from Lindenwood University that participated and they were recruited through the human subject pool office. The hypothesis tested was that females are faster at completing the Stroop test than the males. The students were presented with a color key that had the numbers that matched the colors they were required to correspond with onto the computer monitor. There was a practice session at the beginning and then condition one that contained four color-words, red, blue, green and yellow that were printed in any one of the other colors stated above, totaling to 12 words. The second condition contained 4 color-words printed in black, totaling the stimuli to 12 to words. There was no significance found in any of the trials.*

Are there any differences between male and female college students when it comes to the Stroop Task? The Stroop Task is a color-word interference test that measures reaction time in identifying the color of the word versus reading the color. It is a psychological test of our mental strength and flexibility. The task takes advantage of our ability to read words more quickly and automatically than we can name colors. The purpose of this study was to test the Stroop effect on gender among college students. This study was used to test whether gender differences affect our automatic process of reading, if this process is immediate and cannot be prevented or interrupted, with speed and accuracy as variables. This experiment is worthy for investigation because it could help teachers and other educators understand gender differences in certain tasks, which

could be accommodated for in the classroom. It also would help in student placement in educational settings in different levels of reading skills.

The original experiment was performed by J. Ridley Stroop in 1935. Since then this has become one of the most famous effects in all of psychology. When John Ridley Stroop created his test in 1935, he used five words for the basis of the examination: red, blue, green, purple, and brown. He first asked participants to read the list of words as fast as they possibly could. In this first test, the colors of the words were congruent with the color-word (i.e. a red ink was used to write the word "red"). As for the second test, the color of the ink used was incongruent with that of the color-word (i.e. the word "green" was written in a blue ink). This time he asked the participants to say aloud the color they perceived instead of the word. In his conclusion, Stroop stated that incongruity of colors and color-words resulted in a longer response time, but that participants could adjust to the incongruity and reduce response times. (MacLeod, 1991).

“Current research on the Stroop effect emphasizes the interference that automatic processing of words has on the more mentally "effortful" task of just naming the colors. The task of making an appropriate response when given two conflicting signals has tentatively been located in a part of the brain called the *anterior cingulate*. This is a region that lies between the right and left halves of the frontal portion of the brain. It is involved in a wide range of thought processes and emotional response” (This study dealt with color- words; red, blue, green and yellow, that were printed or displayed in a color different from the color it actually named; for example, the word "red" was written in blue ink, one was likely to say the word "red" more readily than naming the color in which it was displayed, which the case was "blue." The study was not modified and was

like that of Stroop's original test. Gender was recorded to account for differences in males and females (not recorded by Stroop), but only university age students were tested, therefore, age was not taken into consideration (nor was it a consideration for Stroop) and could affect the conclusion based on such response times.

The hypothesis tested was that the female students were faster than male students. A review of the Stroop effect literature stated that, "there are no sex differences in the Stroop interference" (MacLeod, 1991). In another article by (Sarmany, 1977), found that "women performed significantly better on all the five repetitions (of a color-word test) than men". In another study done, "women were consistently faster than the men over the trials" (Mekarski & Cutmore, 86).

Six male and female students from Lindenwood University participated, and ranged from freshmen to junior class as they represented the median age group and they were recruited through the human subject pool office. The students were presented with a color key that had the numbers that matched the colors of which they were required to press on the computer monitor. The colors and number keys presented were red was 2, blue 4, green 0 and yellow 8.

## Method

### *Participants*

The participants in this study were 12 students, (6 males and 6 females) recruited from Lindenwood University's Human Subject Pool. They ranged from freshmen to juniors who were enrolled in Psychology 100 and 101, Anthropology 112 and Sociology 102. For their participation, each participant received one bonus point toward their respective course.

### *Materials*

The experiment was carried out in the psychology lab that is located in Young Hall in Lindenwood University's main campus. The room contained one computer, two chairs and one desk that contained the feedback letters, informed consent forms, participant receipts. A pen was used by the participants to fill in the forms named above, a note book for the experimenter to record the data after the completion of the experiment and a floppy disk that was used to save the data from the computer.

### *Procedure*

Each participant was asked to read and sign the informed consent form first as the experimenter set up the program on the computer. Participants were tested individually. Each participant was presented with color stimuli presented on the computer monitor. There were 2 conditions and one practice condition, each with 12 stimuli. The practice condition contained color-blocks that were red, blue, green and yellow. The first condition contained the color-words, red, blue, yellow and green that were written in colors that differed from the color written. For example, the color-word "blue" was written in either of the other colors named previously in random order, this been repeated for the other colors, having each color written in three different colors for a total of 12 words (stimuli). The second condition contained the same color-words named above, written in black, having a total of 12 words (stimuli).

The participant's task was to press the key on the computer key board that corresponded to the color being presented. The color key was red=4, blue=2, yellow=8 and green=0. It was emphasized that they should always report its color for the practice and condition one and for condition two, report the word of the stimulus. During the

experiment, the color key was presented at the beginning of the experiment during the practice session as they were required to know the correct keys without the key for the other conditions. The program was recording their number of errors, average of correct and incorrect time in each of the conditions.

The experimenter recorded on a separate sheet of paper the gender of the participants as they took the experiment because the program only recognized the participants as numbers.

### Results

The data were compiled using the SPSS program, which aided in the computation of results by conducting multiple independent t-tests. The degree of freedom was 10; the level of significance used was at the .05 level and the N group was 12 (6 males and 6 females). The dependent variables that were measured included, the number of errors in condition one. This is amount of time recorded for the number of wrong stimuli each participant had in condition one. There was no significance found as  $t_{(10)} = .729, p > .05$ . The number of errors measured in condition two was  $t_{(10)} = .985, p > .05$ , thus no significance. The variable that measured the speed in which the participants corresponded the correct keys to the matching color words was recorded as the average correct time in condition one (in sec), and was  $t_{(10)} = .839, p > .05$ . There was no statistical significance. The average correct time in condition two (in sec) was calculated and found to be  $t_{(10)} = -1.302, p > .05$ , no significance was found.

The amount of time that the participants corresponded the wrong keys with the color words was recorded as the average incorrect time in condition one (in sec) and was found to be  $t_{(10)} = 1.093, p > .05$ , finding no significance. The average incorrect time in

condition two (in sec) was  $t_{(10)} = -.977, p > .05$ . There was no significance found in any of the trials/conditions stated above, thus accepting the null hypothesis.

### Discussion

There was no significance found due to a number of probable reasons. First, the number of participants was small thus creating a limited sample. Some participants that had signed up for the experiment were not sampled as the program, (the Stroop Task) on the computer that was used for testing was deleted and hence the participants were compensated for their effort and their willingness to participate. Some of the participants tested were international students who did not understand the directions handed to them at the beginning of the experiment, thus they asked many questions as the experiment was running and making many mistakes along the way. Other participants carried out the experiment at later times of the day, either at noon or early evening, and were exhausted and thus not been able to remember the color-key, which lead them to ask for assistance and delaying their time response.

If this study is to be replicated and carried out in the future, color-vision should be a factor that would interfere with results and should be addressed in the informed consent or the participants should be asked before the experiment. For example, the time that the participants are recruited should be controlled, that is have a specific time, be it morning or mid-noon that ensures that the participants' minds are fresh and undistracted. There should be set instructions that should accommodate international students who are having problems with the instructions. The practice time should be more extensive for the participants to be come more familiar with the keys and corresponding colors.

Another probable cause of accepting the null hypothesis is, past experiments were carried out using stimuli that was represented on cards not computer; thus having a difference in materials and procedure, hence creating room for error this indicating more research using stimuli on computers is need.

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