

Abstract

Color exposure has been shown to have an effect on the way humans solve simple problems. When primed with a color, the human brain makes an association with something that the person has experienced. This association can also affect task performance; particular colors have been shown to affect the way people work during tests. Previous research has demonstrated that exposure to red patches or print tends to yield a decrease in task performance, since the color red has been correlated with danger or failure (teachers typically use red pens to mark exams). The current research investigated the effects of different colors (red, yellow, blue and black) on performance on an anagram task. High school students (N=55) at Brooklyn Academy of Science and the Environment (BASE) were randomly assigned to different color conditions and were asked to unscramble 15 anagrams. Based on previous research, we hypothesized that compared to the control group (anagrams printed in black), performance would be worse for those with anagram packets printed in red compared to the other color conditions.

Introduction

Research on the effect of color exposure on cognitive processes is not new. Murray & Deabler (1957) has shown that under particular conditions, that exposure to a certain color can affect mood. Color have also been shown to be related to the success or failure on word tasks and exams. One explanation for this phenomenon is that the mind implicitly makes affective and cognitive associations of color, which can hinder performance. Furthermore, the way that we interpret certain colors have been socially ingrained. For example, we have been taught at that red “means” stop, is associated with heat and danger, and is thought to impair one’s performance because of its association with failure (Sinclair, Soldat & Mark, 1998; Elliot, Maier, Moller, Friedman & Meinhardt, 2007). Therefore, the ability to answer the questions confounded by the color is more of a factor than intelligence. Other research has shown no effect of paper color on exam performance (Tal, Akers & Hodge, 2008). To reconcile these differences, we wanted to see if such an effect between words printed in color (red, blue, yellow or black) and performance was found for high school students.

The current research study used anagrams as a dependent variable. An anagram is typically defined as a word formed by rearranging the letters of another, and every letter is used (i.e. *mary* and *army*). However, the the words we used were scrambled words, in which there is only one solution--also known as imperfect, or *single-solution anagrams*, used in Elliot, et al., 2007.

Method

Anagram packets

Packets were created for each color condition. Single-solution anagrams were printed in all capital letters in Arial font, size 54 and depending on the condition, all words were printed in one color (red, blue, yellow or black). The hues that were chosen for each color appeared to represent a bright essence of the color. A digital color meter (Mac software program) was used to obtain color hue statistics (Red: R=255, G=0, B=0; Blue: R=0, G=15; B=255; Yellow: R=255, G=235, B=0; and Black: R=0, G=0, B=0). Each packet contained 15 five-letter anagrams, 3 printed on each page, with a line between each word. Each packet also contained a blank cover page and on the last page, questions asking for demographic information on the last page.

Examples of Single-Solution Anagrams

PREAP _____
IFGTH _____
USDNO _____

Color Conditions



Participants and Procedure

Fifty-five high school students (29 males, 21 females) with ages ranging between 14 and 18 years old were recruited from 3 classes at the Brooklyn Academy for Science and the Environment (BASE). Participants were randomly assigned to either one of three between-subjects experimental conditions: red, blue and yellow, or the control condition (black). Participants were tested in a classroom setting and were informed that the experiment involved how well they can unscramble words. However, they were blind to the purpose and hypothesis of the study, as they were not aware that other students had different color packets. An example anagram and its answer was presented to them (NDKRI = DRINK) before they began. Students were given 10 minutes to unscramble 15 words. Students were debriefed after all packets had been collected.

Results

Three anagrams were eliminated from the final analysis because it was discovered that there was more than one solution. We performed a one-way analysis of variance (ANOVA) with number of anagrams correct as the dependent variable, and color as a fixed factor. Results from the analysis reveal that color yielded no significant difference. However, upon close inspection of the means we found a trend in the data. Compared to black (control condition), participants with red packets had the lowest average (M=5.71).

Color	n	Mean
Yellow	14	7.29
Blue	13	7.00
Black	14	6.86
Red	14	5.71

Although those with the yellow packets had the highest average, the difference between yellow (M=7.29) and blue (M=7.00) was small. Furthermore, there was one less participant in the blue condition compared to the other conditions, which may have contributed to the slight difference.

Discussion

While we found no significant differences among color conditions, the data revealed a trend showing a decrement in performance of participants in the red condition. Although performance was better for blue compared to black (control) and red, the yellow condition had the highest mean score. However, since results were not significant, we are conservative with our interpretation of this finding. Increasing internal validity of the experiment (increased sample size, testing participants individually) could perhaps reveal more differences in future research based on this trend. This may provide insight that besides content, contextual associations such as color can affect performance in high school students. It can also change the way that teachers present exams so that it is not a variable that interferes with a student’s performance.

References

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