

The Effect of Red Study Materials on Test Performance in Academic Settings

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Abstract

The experiment set out to determine whether the use of green, white, or red study material has an impact on academic test performance; the hypothesis was that red study materials will have an adverse effect on academic test performance. Participants were 156 male and female undergraduate students enrolled in Psych 301W at the Pennsylvania State University. Students were given 12 minutes to study a red, green, or white pamphlet of study materials, and were then given a 15-question true/false quiz to measure retention of the information presented in the pamphlet. Both activities—studying and quiz-taking—took place in a classroom setting. Statistical analysis indicated that there is no significant difference between the three conditions, so the hypothesis is not supported by the findings. The findings suggest that the use of red study materials would not have a significant adverse effect on academic test performance.

The Effect of Red Study Materials on Test Performance in Academic Settings

In an academic setting, so much of a student's classroom experience revolves around grades. Tests are one of the more prevalent forms of assessing information retention and understanding in a classroom setting, especially at large universities such as Penn State where class sizes often exceed 100 students. Considering the importance of grades as a means of classifying students' abilities, it is important to protect students from being evaluated using measures and procedures that are flawed. If a confounding factor is identified—one that affects students' grades, but is not an indication of students' comprehension—then teachers and students alike should amend their habits and practices to create a more fair and more accurate testing environment.

Prior studies have indicated that exposure to the color red may have negative effects on an individual's performance. In a 2007 experiment, it was found that undergraduate American college students who were exposed to the color red performed more poorly on an academic-type, performance-based test than those who were exposed to the color green or the color black. In the study, the independent variable was exposure to red, green, or black; participants had a red, green or black number written in pen on their anagram test. The dependent variable was graded performance on a fifteen-minute, five-question anagram test. Statistical analysis indicated that participants in the red condition performed worse than those in the green condition and those in the black (neutral) condition. Performance among participants in the green and black conditions was similar (Elliot, Moller, Friedman, Maier, & Meinhardt).

Based on prior studies' findings, the hypothesis is that exposure to the color red while studying has a negative effect on academic test performance. It is expected that participants using green or white study materials will perform better on the true/false test than participants

using red study materials, and that there will be no significant difference between performance of participants using green and white materials.

Methods

The experiment was conducted to determine if exposure to one of three different colors while studying has an effect on academic test performance. The colors were red, to test the hypothesis; green, because it is opposite red on the color wheel; and white, because it is a neutral color. The independent variable is color of study material: red, green, or white (neutral). The dependent variable is score on a true/false quiz measuring comprehension of the material, given in an academic setting.

Participants

A total of 156 undergraduate students from the Penn State University Park campus participated in the study. All students who participated in the study are enrolled in Psych 301W. Data from four students was eliminated from the study; data from three students was eliminated because these students did not follow directions, and data was dropped from one student because the student reported having red-green color blindness. The results are based on the 152 qualified participants. 135 of the participants were psych majors, and 14 were psych minors (three students did not respond). 36 of the participants were male and 114 of the participants were female (two students did not respond). The participants' mean age was 20.60 years. One of the participants was a sophomore in class standing, 80 participants were juniors, 63 participants were seniors in their fourth year of college, and 6 participants were seniors in their fifth year of college or beyond (two students did not respond). Three students reported having a high amount of prior knowledge of the subject matter, 127 students reported having a medium amount of prior

knowledge of the material, and 18 students reported having little or no prior knowledge of the material (six students did not respond).

Materials

Materials for this study included study materials, and a quiz. The study materials were compiled into an eight-page pamphlet containing text and diagrams about weather. The quiz was a one-page, 15-question true/false format quiz. An example of one of the statements included on the true/false quiz is, “the Earth’s seas and oceans cover approximately 70% of the planet’s surface” (this statement is true). On the back of the quiz, several background information questions were typed.

Design and Procedure

The study took place in a classroom during a scheduled lab period. Participants were first given the opportunity to opt out of the study and were assured that participation (or lack thereof) would not affect their grade in the class. After informed consent was given, the lab instructor read a statement to the participants; participants were told that they would have twelve minutes to read and study an eight-page pamphlet before taking a 15 question true/false quiz based on the information presented in the pamphlet. Participants were encouraged to use any types of study techniques and strategies that they would typically use to prepare for any academic test or quiz of a similar nature. They were also informed that they would not be able to refer to the reading while taking the true/false quiz. The lab instructor then allowed each participant to choose an envelope from a large box. Students were instructed not to open the envelope until directed to do so by the lab instructor. Each of the envelopes contained an eight-page pamphlet about the processes and factors that affect weather. The text and diagrams featured on the pamphlets were identical. The envelopes contained a pamphlet printed on one of three colors of paper: red, green,

and white. As the envelopes were opaque, participants were not aware of what color paper they would be getting and thus chose their envelopes at random, ensuring random assignment of participants to the red, green, or white (neutral) condition.

After the envelopes were passed out, the students were instructed to open their envelopes and begin studying the pamphlet. After ten minutes had elapsed, the lab instructor told the participants they would have two more minutes to study the pamphlet. After twelve minutes had elapsed, the lab instructor told the participants to stop studying, put the pamphlet back in the envelope, and return the envelope to the large box. The lab instructor then passed out the true/false quiz; participants were instructed to take the quiz without writing their name anywhere on the paper. Participants had unlimited time to answer the questions on the quiz. After answering the true/false questions, participants answered questions pertaining to their background; these questions included age, year in school, gender, prior knowledge of the information presented in the pamphlet, and whether pursuing a psych major or a psych minor. After all the students had completed the true/false quiz and the background information questions, the lab instructor went over the answers to the quiz and participants self-graded their quizzes. After handing in the quizzes, participants were then debriefed as to the purpose of the study (to determine whether the use of red, green, or white study materials affects academic test performance) and were released from the class.

Results

Statistical analysis indicates that there is no significant difference between the three conditions. ANOVA analysis yielded the following results: $F(2,145) = 1.216$ and $p = 0.299$. Because $p > 0.05$, the results cannot be considered statistically significant. The average score for participants who used green study materials was 10.8 points (out of 15 points), the average score

for participants who used white study materials was 10.4 points (out of 15 points), and the average score for participants who used red study materials was 10.2 points (out of 15 points); see Figure 1.

Discussion

The research does not support our hypothesis, and it is inconsistent with the findings of Elliot et al. because the results were not found to be statistically significant. However, because the average score of students who studied from red materials was lower than the average score of students who studied from white and green materials, the direction of the means that resulted from our study was consistent with both our hypothesis and the results of the 2007 study conducted by Elliot et al.

Several factors may have influenced the findings of our study. Because students self-graded their true/false quizzes, there may have been some grade inflation due to students who scored their quizzes dishonestly. It is possible that the true/false quiz was too easy, and that some of the students were able to answer a number of the questions correctly using common sense rather than knowledge gleaned from studying the material provided in the experiment. Perhaps there was contamination; if students' performance is affected by merely glimpsing the color red before a test or during studying activities, then the performance of students with green or white study materials may have been adversely affected by simply sitting adjacent to participants with red study materials.

Although the results of this study were not statistically significant, there were slight differences in performance between students using white, green, and red study materials. Based on the findings of this study, the use of red study materials instead of green or white study materials would have a negligible negative effect, if any, on academic test performance.

However, considering the fact that red has been shown to impair performance in previous studies (Elliot et al., 2007), and considering the fact that students using red study material had marginally lower quiz scores than students using green study materials, vigilant students may find it to their advantage to avoid red study materials and to seek out study materials that are green. Further research on the topic, controlling for variables such as difficulty of the quiz, standardization of grading procedures, and visual contamination is needed. Further research may yield statistically significant results or it may reinforce the conception that there is no significant difference in performance between students who use red study materials and students who use green or white study materials.

References

- Elliot, A., Moller, A., Friedman, R., Maier, M., & Meinhardt, J. (2007). Color and psychological functioning: The effect of red on performance attainment. *Journal of Experimental Psychology: General*, *136*, 154–168.

Figure 1. Mean quiz scores out of 15 points for the green, white, and red study materials conditions.

