The Effect of Red on Performance in an Achievement Task: Fourth Failure to Replicate

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Introduction

Elliot et al. (2007) hypothesized that the color red would produce a state of avoidance motivation in an achievement context and that would interfere with cognitive performance. They reported that a brief exposure to red reduced the number of correctly-solved anagrams relative to viewing green or black.

The general purpose of our experiments is to replicate and verify the 2007 result because it was the initial color-priming effect from Elliot and colleagues, and is cited consistently by the group as a representative effect of red on achievement (e.g., Elliot & Maier, 2012).

Our procedure was modeled on the procedures of Exp. 1 and Exp. 2 in Elliot et al. (2007). We used the same task as in Exp. 1 of Elliot et al. Anagrams came from the same source. We used the Elliot et al. procedure of keeping experimenters blind to group assignment and their later instruction to equate red and green on saturation and lightness. We report results here using the same analytic strategy as in Elliot et al.

Steele et al. (2015) used color values taken from Elliot et al. reports but found no effect of red. Steele et al. (2016) increased the chroma (saturation) values of red and green to produce a stronger "dose" but did not find a red effect. Steele et al. (2017) used a different set of anagrams but no effect of red was found.

The current experiment reduced the lightness of colors to a value used in other Elliot et al. studies to see if these new color values would work.

Our sample size was such that we had over a 90% chance of finding a medium-size effect, as with our earlier studies.

Method

Participants
414 ASU undergraduate students (328 females, 86 males) participated in the study for course credit.

Apparatus
Four Dell computers used E-Prime software to conduct the sessions. The monitors were color calibrated with a Spyder4 colorimeter.

Procedure
Participants were told they would be solving verbal puzzles and that their results would be compared to other participants (to activate achievement motivation).

Each person was seated in front of a PC. Instructions informed the person that the session would begin with a 5-min "practice" phase. The goal was to solve as many anagrams as possible. Next was a 5-min "test" phase with new anagrams. Anagrams appeared in randomized order. The final phase contained questions about strategy (taken from studies by Elliot and colleagues) and other questions to distract attention from the color manipulation.

The color manipulation was a 5-s presentation of the phrase "Test Puzzles" on either a Red (*LCh* 40.1, 49.9, 30.2), Green (*LCh* 40.0, 48.5,148.6), or Gray (*LCh* 40.0, 0, -) background immediately prior to the test phase. The color was assigned at random by the program and the experimenter was blind to color assignment.

After the session was over, the experimenter asked the participant to guess the purpose of the experiment (to probe for color awareness).

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Results

Red Did Not Decrease Anagram Solutions.

The Figure shows the *M* and *SE* for the number of correctly-solved anagrams per person as a function of color condition.

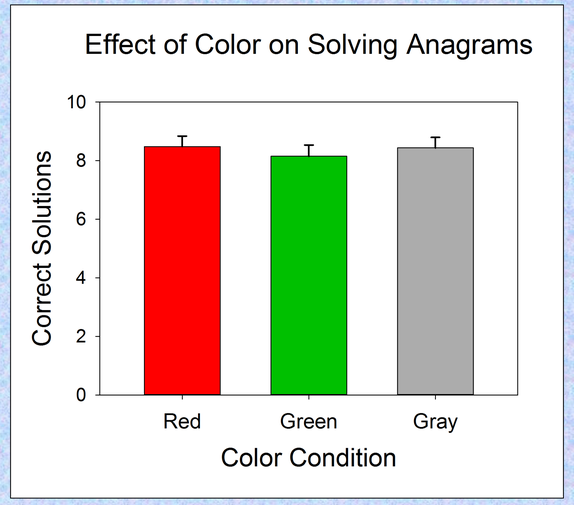
Overall, the participants in the current study solved more anagrams (*M* = 8.36, *SE* = 0.2) than in the Elliot et al. (2007) study (*M* = 5.36). This difference likely is related to the difference between our computer-based responses vs. the Elliot et al. paper-and-pencil responses.

Following Elliot et al. (2007), an ANCOVA was performed using the results of the practice phase and sex as covariates. Practice phase was statistically significant, $F(1, 409) = 202.9$, $p < .001$, partial $\eta^2 = 0.33$. The influence of sex was not significant, $F(1, 409) = 3.4$, $p = .068$, partial $\eta^2 = 0.008$. These results replicate the outcomes reported by Elliot et al.

But the influence of color was not statistically significant, $F(2, 409) = 0.39$, $p = .68$, partial $\eta^2 = 0.002$. The result is in contrast to the significant difference reported in Elliot et al. (2007).

An ANOVA was performed using Color as the IV and number of successful solutions as the DV. The effect of color was not statistically significant, $F(2, 411) = 0.24$, $p = .79$, $\eta^2 = 0.001$.

Finally, planned comparisons were performed for the Red vs. Gray and Red vs. Green groups. The Red vs. Gray contrast was not statistically significant, $t(280) = 0.09$, $p = .93$, $d = 0.01$. The Red vs. Green contrast was not statistically significant, $t(275) = 0.63$, $p = .53$, $d = 0.08$.



Discussion

Elliot et al. (2007) hypothesized that the color red would produce a state of avoidance motivation in an achievement context and reduce cognitive performance in an anagram task.

Steele et al. (2015, 2016, 2017) were not able to produce the red interference effect even though they used anagrams from the same source, a range of color values used in other Elliot et al. studies, a session procedure modeled closely on Elliot et al. (2007), the same statistical analyses, and an increased number of participants.

The current experiment investigated whether the red interference effect would be produced if the color lightness values were reduced.

No significant interference effect of red was observed, in contrast to Elliot et al. (2007).

The lack of an interference effect of red has now been observed over 4 large replications (*N* = 1376). The failure to find an effect suggests that the original finding may not be reliable.

Reprint of Steele et al. (2015) Poster

Reprint of Steele et al. (2016) Poster

Reprint of Steele et al. (2017) Poster

Reprint of Steele et al. (2018) Poster

References

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