Does the Color Red Reduce Performance in an Achievement Task?

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Introduction

Elliot, Maier, Moller, Friedman and Meinhardt (2007) hypothesized that the color red would produce a state of avoidance motivation in an achievement context 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 purpose of our experiment was to replicate and verify the 2007 result because it was the initial color-priming effect from Elliot and colleagues and is consistently cited by the group as a representative effect of red (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. Color values were taken from later Elliot et al. studies because the color manipulation in Exp. 1 used pen inks, which would be difficult to control. 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.

Differences include the use of computers here to present stimuli and record responses whereas Elliot et al. used printed inks, and a paper-and-pencil measure. Additionally, we lacked access to participant *SAT* scores that Elliot et al. used in their analysis.

Finally, we increased the number of participants such that the statistical power of the critical tests was over 95% to detect a medium size effect.

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Reprint of Steele et al. (2015) Poster

Method

Participants
310 ASU undergraduate students (199 females, 111 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 diffuse attention.

The color manipulation was a 5-s presentation of the phrase "Test Puzzles" on either a Red (*LCh* 50.13, 50.03, 30.17), Green (*LCh* 49.95, 50,145.35), or Gray (*LCh* 50.03, 0, -) background immediately prior to the test phase. The color was assigned by the computer 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).

References

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

Elliot, A. J., & Maier, M. A. (2012). Color-in-context theory. In P. Devine & A. Plant (Eds.) *Advances in experimental social psychology, vol. 45* (pp. 61- 125), San Diego: Academic.

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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* = 7.08, *SE* = 0.23) than in the Elliot et al. (2007) study (*M* = 5.36). This difference likely is related to the difference between computer-based responses vs. paper-and-pencil responses.

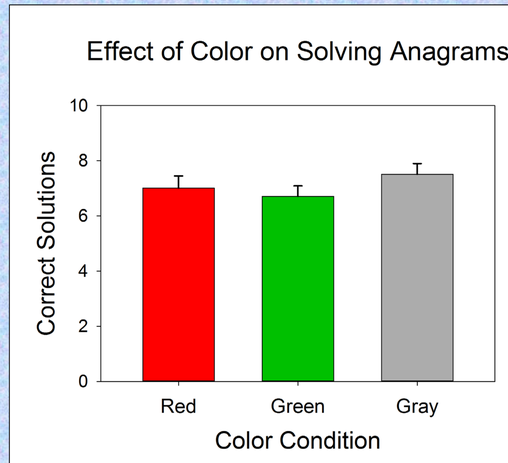
Following Elliot et al. (2007), an ANCOVA was performed using the results of the practice phase and sex as covariates. Practice phase was statistically significant, $F(1, 305) = 213.0$, $p < .001$, partial $\eta^2 = 0.41$. The influence of sex was not significant, $F(1, 305) = 0.03$, $p = .88$, partial $\eta^2 = .00008$. These results replicate the results reported by Elliot et al.

But the influence of color was not statistically significant, $F(2, 305) = 0.45$, $p = .64$, partial $\eta^2 = .0003$. The result is in contrast to the result reported in Elliot et al. (2007).

An ANOVA was performed using Color condition as the IV and number of successful solutions as the DV. The effect of color was not statistically significant, $F(2, 307) = 1.02$, $p = .36$, $\eta^2 = .007$.

Finally, planned comparisons were performed for the Red vs. Gray and Red vs. Green groups. The Red vs. Gray contrast was not statistically significant, $t(204) = 0.84$, $p = .40$, $d = .12$. The Red vs. Green contrast was not statistically significant, $t(201) = 0.52$, $p = .61$, $d = -.07$, and the difference was in the wrong direction.

Reprint of Steele (2014)



Discussion

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.

Our experiment was not a direct replication of their paper and pencil method because we used a computer-based method. However we used anagrams from the same source, colors as specified in other Elliot and colleagues studies, a session procedure modeled closely on Elliot et al. (2007), and the same statistical analyses. Our experiment increased the number of participants such that statistical power to detect the effect was 95% or greater.

Our results replicated the Elliot et al. report of the effect of practice anagram performance and the lack of a sex difference effect.

However, no significant difference among color conditions was observed in contrast to the Elliot et al. results. The lack of effect of red was similar to that reported in Steele (2014).

Future experiments should vary systematically both the colors and anagrams to establish which result is the more general effect.