

# The Effect of Red on Performance in an Achievement Task: A Second Attempt

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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 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. Here, we increased the chroma (saturation) values of red and green to produce a stronger “dose.” The new values are still within the range reported in studies by Elliot and colleagues.

Differences include the use of computers here to present stimuli and record responses whereas Elliot et al. (2007) used printed inks, and a paper-and-pencil measure.

Finally, we increased the number of participants such that the statistical power was greater than 90% to detect a medium size effect.

## Method

### Participants

266 ASU undergraduate students (198 females, 68 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 ( $LCh$  49.91, 77.92, 29.99), Green ( $LCh$  51.66, 77.17, 142.28), or Gray ( $LCh$  50.03, 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).

## 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 ( $M = 6.48$ ,  $SE = 0.24$ ) 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.

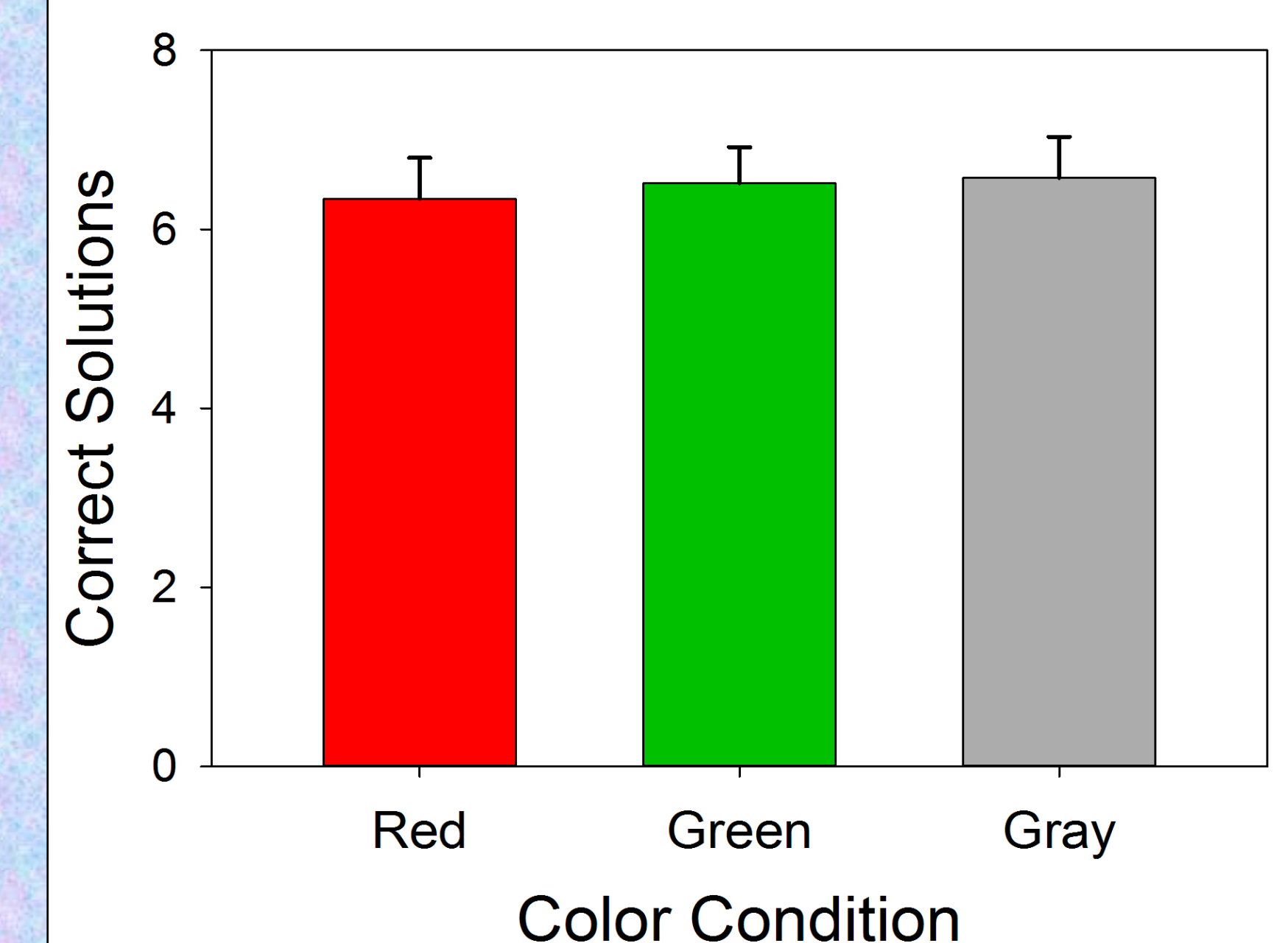
Following Elliot et al. (2007), an ANCOVA was performed using the results of the practice phase and sex as covariates. Practice phase was statistically significant,  $F(1, 261) = 136.4$ ,  $p < .001$ , partial  $\eta^2 = 0.34$ . The influence of sex was not significant,  $F(1, 261) = 0.18$ ,  $p = .90$ , partial  $\eta^2 = .00007$ . These results replicate the results reported by Elliot et al.

But the influence of color was not statistically significant,  $F(2, 261) = 0.90$ ,  $p = .41$ , partial  $\eta^2 = .007$ . The result is in contrast to the result 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,  $F(2, 263) = 0.08$ ,  $p = .92$ ,  $\eta^2 = 0.00006$ .

Finally, planned comparisons were performed for the Red vs. Gray and Red vs. Green groups. The Red vs. Gray contrast was not statistically significant,  $t(161) = 0.38$ ,  $p = .70$ ,  $d = .06$ . The Red vs. Green contrast was not statistically significant,  $t(186) = 0.30$ ,  $p = .77$ ,  $d = .05$ .

Effect of Color on Solving Anagrams



## Discussion

Elliot et al. (2007) hypothesized that the color red would produce a state of avoidance motivation in an achievement context and reported that a brief exposure to red reduced the number of correctly-solved anagrams relative to other colors.

Steele et al. (2015) was not able to produce the red-effect even though they 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), the same statistical analyses, and an increased number of participants.

The current experiment investigated whether the red-effect would be produced if the strength of red was increased by increasing chroma.

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 et al. (2015).

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

## References

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Reprint of Steele et al. (2016) Poster

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