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FlashReport

The effect of color (red versus blue) on assimilation versus contrast in prime-to-behavior effects

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ABSTRACT

This paper examines whether color can modify the way that primed constructs affect behavior. Specifically, we tested the hypothesis that, compared to the color white, blue is more likely to lead to assimilative shifts in behavior, whereas red is more likely to lead to contrastive changes in behavior. In our experiment, previous findings were replicated in the white color condition: participants' behavior assimilated to primed stereotypes of (un)intelligence and contrasted away from primed exemplars of (un)intelligence. However, in the blue color condition, participants' behavior assimilated to the primed constructs, whereas in the red color condition, participants' behavior contrasted away from the primed constructs, irrespective of whether the primed constructs were stereotypes or exemplars.

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Colors are omnipresent in our surroundings (people, objects, environments). Although there has been a vast amount of research on color in physics, physiology, and human perception, there is surprisingly little work on the effect of color on human behavior (Fehrman & Fehrman, 2004; Whitfield & Wiltshire, 1990). Recently, Elliot, Maier, Moller, Friedman, and Meinhardt (2007) (see also Elliot & Maier, 2007) proposed that colors are not just aesthetic elements but carry psychological meanings. Individuals form specific associations to colors due to repeated encounters of situations in which colors are accompanied with particular concepts or experiences. Red is typically associated with danger (e.g., stop lights, warnings), whereas blue is linked with openness (e.g., ocean, sky). Consequently, exposure to red in an achievement context can evoke avoidance behavior (Elliot, Maier, Binser, Friedman, & Pekrun, 2009) and impair intellectual performance (Elliot et al., 2007; Maier, Elliot, & Lichtenfeld, 2008) because red is associated with the danger of failure in achievement contexts (i.e., red pens to indicate errors). Further, Mehta and Zhu (2009) found that whereas red enhances performance on a detail-oriented task, blue facilitates creative thinking.

In the present paper, we test the novel hypothesis that the colors red and blue can modify the nonconscious influence of primed constructs on behavior. It is well established that primed social constructs influence behavior in an assimilative (e.g., when primed with a stereotype) or contrastive manner (e.g., when primed with an extreme person exemplar). Specifically, we examine whether red can lead to behavioral contrast, due to a dissimilarity focus, whereas blue can lead to behavioral assimilation, due to a similarity focus, irrespective of whether a stereotype or exemplar is primed.

Color and prime-to-behavior effects

Red and blue colors can induce different motivations in individuals (Mehta & Zhu, 2009). Red, associated with danger and mistakes, induces an avoidance motivation and makes people become vigilant (Friedman & Förster, 2005). As a result, exposure to red (versus blue) narrows the scope of attention, enhancing among others performance on detailed-oriented tasks (Mehta & Zhu, 2009). On the other hand, blue, associated with openness, induces an approach motivation. Consequently, exposure to blue broadens the scope of attention, causing people to behave in an explorative way (Mehta & Zhu, 2009). Thus, red and blue tune the scope of attention differentially, with blue [red] leading to attentional broadening [narrowing] (Friedman & Förster, 2010). Consistent with this notion, Maier et al. (2008) showed that participants exposed to red focused on the detailed local feature (triangle) of a target figure (a square composed of symmetrically arranged triangles) and ignored the broad global form (square). People's scope of attention, narrow or broad, further shifts their (dis)similarity focus (Förster, 2009). This is because attentional broadening (global focus) enhances inclusive categorization and involves finding relations and similarities between stimuli, whereas attentional narrowing (local focus) fosters exclusive categorization and entails searching for dissimilarities to distinguish between stimuli (Förster, Liberman, & Kuschel, 2008). To demonstrate the link between attentional broadening [narrowing] and similarity [dissimilarity] focus, Förster (2009) found that people who narrowly focused on the details of a map generated more differences (but fewer

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similarities) between a dolphin and a dog compared to those who broadly focused on the shape of a map.

Bridging previous literature, we hypothesize that red [blue] can induce a focus on differences [similarities] and consequently result in behavioral contrast [assimilation] in a prime-to-behavior context. In our study, we first exposed participants to one of the three color conditions: red, blue, or white (the neutral color, see Elliot et al., 2007). We then used a paradigm by Dijksterhuis et al. (1998) (Study 1), in which participants were primed either with stereotypes associated with intelligence (professors) or unintelligence (supermodels), or with extreme exemplars from these categories (Albert Einstein versus Kate Moss). We examined the effect of these primes on the number of correct answers given in a general knowledge test. In the conditions where participants were exposed to the color white, we expected to replicate previous findings on stereotype and extreme exemplar priming.

Priming with stereotypes (e.g., professors) typically leads to behavioral assimilation (e.g., increased performance on a knowledge test, Dijksterhuis & van Knippenberg, 1998). Primed stereotypes can lead to behavioral assimilation because the traits associated with stereotypes (e.g., professors and intelligence) can change the self-concept in line with the primed construct (Wheeler, DeMarree, & Petty, 2007; Wheeler & Petty, 2001). The changed self-concept then guides behavior. Hansen and Wänke (2009) demonstrated that participants, exposed to a professor prime, answered more knowledge questions correctly because the prime made them view themselves as more intelligent and increased belief in their intellectual abilities. However, priming with extreme exemplars (e.g., Einstein) leads to behavioral contrast (e.g., decreased intellectual performance, Dijksterhuis et al., 1998). The reason is that extreme exemplars, which are more concrete and distinct than broad categories such as stereotypes, induce implicit comparison processes, which can lead people to contrast their self-perception *and* behavior away from the exemplars. Therefore, in our study, we expected that participants in the white condition would perform better when primed with the professor stereotype compared to the supermodel stereotype (assimilation), but worse when primed with Albert Einstein compared to Kate Moss (contrast).

We expected different behavioral results in the blue and red conditions. Due to a focus on similarities, participants in the blue condition should assimilate their self-concept to the primed construct, because similarity processing produces selective accessibility of prime-consistent self-knowledge (Mussweiler, 2001, 2003; Smeesters, Mussweiler, & Mandel, 2010; Wheeler et al., 2007). Hence, participants should show behavioral assimilation when primed with both stereotypes and exemplars. Thus, participants in the blue condition should perform better when primed with intelligence (professors and Albert Einstein) than with unintelligence (supermodels and Kate Moss).

We predicted the opposite in the red condition. Due to a focus on dissimilarities, participants in the red condition should contrast their self-concept from the primed construct, because dissimilarity processing activates prime-inconsistent self-knowledge (Mussweiler, 2001, 2003; Smeesters et al., 2010; Wheeler et al., 2007). Hence, we expected participants to show behavioral contrast when primed with both exemplars *and* stereotypes. Thus, participants in the red condition should perform worse when primed with intelligence (Albert Einstein and professors) than with unintelligence (Kate Moss and supermodels).

Method

Participants

One hundred sixty-nine undergraduates (89 females, 80 males) participated in partial fulfillment of course requirements. They were randomly assigned to the conditions of a 3 (color: blue vs. white vs. red) × 2 (prime: stereotype vs. exemplar) × 2 (dimension: intelligent vs. unintelligent) between-participants design.

Procedure

Participants were told that they would participate in several unrelated tasks. First, they received a booklet in a plastic file folder. Participants were instructed to take the booklet out of the folder and fill it out. They were asked to place the folder at the top of their desk, and put the booklet back into the folder after they completed the booklet (which they all did). The folders only differed in color: red, blue, or white (see the online supplemental material for a pilot test on these colors). The booklet contained the stereotype or exemplar priming manipulation. Under the cover story of a pretest for future studies, participants were asked to imagine a professor, a supermodel, Albert Einstein, or Kate Moss. They had 5 min to list the typical behaviors, lifestyle, and appearance attributes of their target on a sheet of paper (Dijksterhuis et al., 1998). A pretest with 40 participants, who rated the used stereotypes and exemplars (between-participants, 10 per condition) on a 9-point scale (1 = not intelligent at all, 9 = very intelligent), indicated that professors ($M = 7.50$, $SD = 1.71$) were perceived as more intelligent than supermodels ($M = 3.60$, $SD = 1.58$), $t(18) = 5.29$, $p < .01$, and that Albert Einstein ($M = 8.20$, $SD = 1.03$) was perceived as more intelligent than Kate Moss ($M = 3.10$, $SD = 1.37$), $t(18) = 9.40$, $p < .001$.

After participants completed the priming procedure, the colored plastic file folder was removed from their desk. Participants continued to fill out several measures. They completed a "Picture Comparison Task," which assessed their similarity focus. Participants were informed that the task was a pretest for research on visual perception, and that they had to carefully inspect and compare the two pictures (Mussweiler, Rüter, & Epstude, 2004). Subsequent to comparing those pictures, participants indicated how similar these were using a 9-point rating scale that ranged from 1 (not at all similar) to 9 (very similar).

Participants also answered 20 multiple-choice questions. We told participants that we were testing the validity of a "general knowledge" scale, which contains questions that differ in difficulty. They would receive the most difficult questions and had to answer each question by choosing one of four options. An example question is "What is the capital of Kazakhstan?": (a) Tblisi, (b) Astana, (c) Baku, or (d) Yerevan. This measure was counterbalanced with the similarity measure (order did not affect the results).

We also administered the 20-item version of the PANAS (Watson, Clark, & Tellegen, 1988) to measure whether color influences positive and negative affect. Items were rated on a 7-point scale (1 = not at all, 7 = extremely). Finally, participants were probed for suspicion, and none of them guessed the goal of the study or indicated any relatedness between the phases of the experiment.

Results

Similarity focus

A 3 (color: blue vs. white vs. red) × 2 (prime: stereotype vs. exemplar) × 2 (dimension: intelligent vs. unintelligent) between-participants ANOVA on participants' similarity rating of the two pictures only revealed a main effect of color, $F(2, 157) = 7.69$, $p < .01$. Participants exposed to blue ($M = 5.66$, $SD = 2.12$) perceived more similarities compared to those exposed to white ($M = 4.95$, $SD = 1.70$), $F(1, 157) = 3.92$, $p < .05$, whereas participants exposed to red ($M = 4.18$, $SD = 2.05$) perceived less similarities compared to those exposed to white, $F(1, 157) = 3.93$, $p < .05$.

Number of correct answers

The same ANOVA on the number of correct answers yielded a significant three-way interaction between color, prime, and dimension, $F(1, 157)=3.08$, $p<.05$ (see Fig. 1). We further analyzed this significant three-way interaction by conducting separate 2 (prime: stereotype vs. exemplar) × 2 (dimension: intelligent vs. unintelligent) ANOVAs at each level of color.

The ANOVA in the white condition revealed a significant prime × dimension interaction, $F(1, 157)=8.59$, $p<.01$. Participants primed with an intelligent stereotype ($M=12.07$, $SD=2.78$) gave more correct answers than those primed with an unintelligent stereotype ($M=9.78$, $SD=2.66$), $F(1, 157)=4.41$, $p<.05$ (an assimilation effect). Further, participants primed with an unintelligent exemplar ($M=11.71$, $SD=2.87$) gave more correct answers than those primed with an intelligent exemplar ($M=9.56$, $SD=2.83$), $F(1, 157)=4.17$, $p<.05$ (a contrast effect).

The ANOVA in the blue condition only revealed a significant effect of dimension, $F(1, 157)=9.68$, $p<.01$. Participants exposed to an intelligent prime ($M=11.93$, $SD=2.98$) answered more questions correctly compared to participants exposed to an unintelligent prime ($M=9.53$, $SD=2.87$). Hence, blue leads to behavioral assimilation irrespective of whether the prime is an exemplar or stereotype.

The ANOVA in the red condition also only revealed a significant effect of dimension, $F(1, 157)=9.15$, $p<.01$. Participants exposed to an unintelligent prime ($M=11.59$, $SD=2.86$) answered more questions correctly compared to participants exposed to an intelligent prime ($M=9.25$, $SD=2.77$). Thus, red leads to behavioral contrast irrespective of the type of prime.

We conducted two mediated moderation analyses to examine whether the increased similarity focus in the blue (versus white) condition was responsible for the behavioral assimilation when primed with an intelligent or unintelligent exemplar and whether the increased dissimilarity focus in the red (versus white) condition accounts for behavioral contrast when primed with an intelligent or unintelligent stereotype. These analyses indicated that, compared to white, blue led to more correct answers in the intelligent exemplar condition ($z=1.96$, $p=.05$) and fewer correct answers in the unintelligent exemplar condition ($z=-1.97$, $p<.05$) due to an increased similarity focus. Further, compared to white, red led to fewer correct answers in the intelligent stereotype condition ($z=-2.40$, $p<.05$) and more correct answers in the unintelligent stereotype condition ($z=2.17$, $p<.05$) due to an increased dissimilarity focus. See the supplemental online materials for full information on these analyses.

Analyses on the positive ($\alpha=.86$) and negative affect ($\alpha=.88$) scores did not reveal any significant effects ($Fs<1$, $ps>.41$).

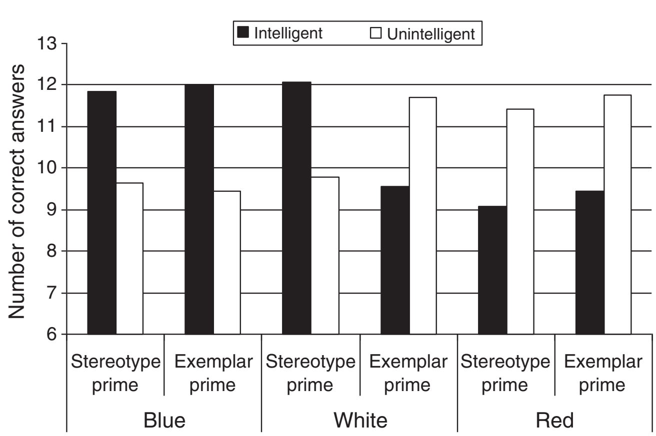

Fig. 1. Number of correct answers as a function of color, prime, and dimension.

General discussion

The findings of this study demonstrate that color can modify the prime-to-behavior effect. Whereas primed stereotypes [extreme exemplars] typically lead to assimilation [contrast] in behavior (shown in the white condition), exposure to the colors blue and red altered these effects. Specifically, independent of the type of prime, blue led participants to assimilate to the primed construct, whereas red caused participants to contrast away from the primed construct. This occurrence of assimilation [contrast] was induced by a focus on similarities [dissimilarities] in the blue [red] condition.

Whether assimilation or contrast is the result of priming depends on a host of moderators, such as properties of the prime (e.g., extremeness, Dijksterhuis et al., 1998) and aspects of the self-concept of the prime recipient (see Wheeler et al., 2007; Wheeler & DeMarree, 2009). Very few papers have examined whether assimilation or contrast occurs depending on features of the physical environment. Such features are often used as a priming tool to activate certain constructs. For instance, Kay, Wheeler, Bargh, and Ross (2004) demonstrated how business-related objects activated the construct of competitiveness (see also Berger & Fitzsimons, 2008; Maimaran & Wheeler, 2008). However, the current research shows that a physical cue, unrelated to the primed constructs, can influence the direction of the priming effect.

Our finding that colors can determine the way accessible constructs affect behavior contributes to the literature on color (Elliot et al., 2007, 2009; Mehta & Zhu, 2009), which mainly focused on the direct effects of colors on behavior (IQ test performance, performance on a detail-oriented task, creativity). This paper shows that colors can also exert indirect effects on behavior by modifying the relationship between primed constructs and behavior. Further, this paper also corroborates the link between color and avoidance/approach motives (Mehta & Zhu, 2009) in the context of prime-to-behavior effects, and further demonstrates that cues that activate approach (blue) or avoidance (red) are likely to lead to assimilation or contrast respectively (Friedman & Förster, 2010).

All together, the current paper adds to the growing body of literature on color psychology and shows a new moderator of assimilative and contrastive behavioral priming effects. As such, our research helps to advance knowledge of how subtle contextual cues can shape behavior.

Appendix A. Supplementary data

Supplementary data to this article can be found online at doi:10.1016/j.jesp.2011.02.010.

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