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## FlashReports

## Message framing and color priming: How subtle threat cues affect persuasion

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## ABSTRACT

Message framing involves the presentation of equivalent decision outcomes in terms of either gains or losses. Loss-framed messages tend to be more persuasive than gain-framed messages when the decision is perceived to involve uncertainty or threat. The current study examined whether the effectiveness of loss-framed information would be enhanced by the presence of a peripheral threat cue – the color red – which was expected to prime threat via its association with blood and danger. In addition to being primed with the color red or gray (control), male participants ( $n = 126$ ) read either a gain- or loss-framed pamphlet promoting human papillomavirus vaccination. As predicted, vaccination intentions were higher among participants exposed to a loss-framed message than to a gain-framed message, but only when primed with red (not gray). Findings shed light on the interactive effects of message framing and color priming, and demonstrate that peripheral threat cues may affect processing of persuasive health messages.

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## Introduction

Imagine being at the doctor's office for a routine visit and the nurse hands you a pamphlet describing an important new vaccine. Do you think your decision to get vaccinated would be influenced by subtleties such as the tone of the writing or the color of the pamphlet? Although one might think that important decisions such as this would be guided by thoughtful analysis of the health information, we hypothesize that such decisions can, in fact, be affected by the presence of subtle, threat-related cues contained in the content and color of the message. This prediction is based upon an integration of theory and research pertaining to message framing and color priming.

Message framing is a theoretically-grounded persuasive communication strategy aimed at motivating behavior through presentation of equivalent appeals framed in terms of either gains or losses. A gain-framed appeal emphasizes the benefits of engaging in the behavior, whereas a loss-framed appeal emphasizes the costs of not engaging in the behavior. Drawing on prospect theory (Kahneman & Tversky, 1979; Tversky & Kahneman, 1981), Rothman and Salovey (1997) proposed that whether a gain- or loss-framed message will be more effective depends largely upon whether the behavior described in the message is perceived to involve risk, threat, or uncertainty. Because people are relatively open to taking risks when faced with potential losses, loss-framed appeals should be most effective in promoting behaviors thought to involve potential risk or uncertainty (e.g., being screened for a life-threatening disease). In contrast, because people tend to avoid

risks in the face of potential gains, gain-framed appeals should be most effective in promoting behaviors associated with safety and certainty (e.g., exercising). Existing evidence is largely supportive of this framework (see Rothman, Bartels, Wlaschin, and Salovey (2006) for a review; however see also Lauver and Rubin (1990) and Lerman et al. (1992)).

Rothman and Salovey's framework rests upon the notion that perceptions of risk or threat stem from the behavior under consideration; some behaviors are viewed as entailing more risk than others. Vaccination is an interesting health behavior because, although its health benefits are widely accepted by medical science, the public often is skeptical about vaccines. Indeed, studies suggest that vaccination is permeated with perceptions of threat, both in terms of its immediate consequences (pain, side effects) and its long-term effects (effectiveness) (Bekker, Gough, & Williams, 2003; Smith, Yarwood, & Salisbury, 2007; Weinstein et al., 2007). When considering a new vaccine, therefore, an individual may be more responsive to a loss-framed message because people tend to be more willing to take risks (i.e., receive a new vaccine) when faced with losses than with gains. Indeed, recent evidence suggests that, under certain circumstances—particularly circumstances that amplify the salience of threat—loss-framed messages are more persuasive than gain-framed messages in promoting interest in vaccination (Gerend & Shepherd, 2007; Gerend, Shepherd, & Monday, 2008).

Yet effects of message framing may also depend on threat cues that are incidental to the behavior targeted in the message. One intriguing idea is that color—particularly the color red—could serve as a subtle cue that primes threat. Recent research (Elliot, Maier, Moller, Friedman, & Meinhardt, 2007; Elliot & Niesta, 2008; Maier, Elliot, & Lichtenfeld, 2008) suggests that color can communicate

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specific information, the meaning of which depends on the situation or context. For example, Elliot et al. (2007) demonstrated that brief exposure to the color red (versus gray or green) resulted in decreased performance on intelligence tests. In explaining their findings, the authors proposed that red primes the threat of failure in an academic context due to learned associations between failing a class and red ink marks on a term paper or exam. The threat of failure in turn evokes avoidance motivation and (ironically) results in diminished test performance.

Why might red prime threat in a health context? Threats to people's health are both manifested and communicated by the color red. Red commonly conjures images of blood, injury, and infection. Moreover, the color red is used regularly to denote physical risk and danger on warning labels, traffic signals, and threat advisory systems. Indeed, evidence suggests that red is the single color most commonly associated with threat in our society (Wogalter, Conzola, & Smith-Jackson, 2002). At a biological level, red may instinctively signal the presence of impending personal danger (e.g., red signals fighting ability in primates; Setchell & Wickings, 2005). Thus, for both cultural and biological reasons, the color red is likely to signal possible health threats.

The purpose of this study was to investigate the combined effects of message framing and color on the effectiveness of persuasive health messages. The messages pertained to vaccination against a common sexually transmitted infection (STI) known as human papillomavirus (HPV). Infection with certain HPV types can cause genital warts, while infection with other types can cause cervical and anogenital cancers (Bosch, Lorincz, Muñoz, Meijer, & Shah, 2002; Lacey, Lowndes, & Shah, 2006, chap. 4). Young adults under age 25 are at highest risk for HPV infection (Koutsky, 1997). The current study was conducted with a sample of young men, for whom the HPV vaccine is expected to be available within the next few years. Previous studies have focused almost exclusively on women's acceptance of the HPV vaccine (Zimet, Shew, & Kahn, 2008), thus relatively little is known about men.

Participants were randomly assigned to read a gain- or loss-framed pamphlet about HPV vaccination. The pamphlet was accented with either the color red or gray (control). We hypothesized that the loss-framed message would be more effective than the gain-framed message (i.e., lead to higher vaccination intentions), but only when other peripheral cues in the situation signaled the presence of threat, that is, when the color red was also present.

## Methods

Male undergraduates ( $N = 134$ ) participated for course credit. Men who reported (off-label) receipt of the HPV vaccine ( $n = 3$ ) and men who were red-green colorblind ( $n = 2$ ) or suspected they were colorblind ( $n = 3$ ) were excluded, leaving a final sample of 126 men. Mean age was 19.9 years ( $SD = 1.9$ ). Eighty-three percent had engaged in sexual intercourse and about half (54%) had a current sexual partner.

After completing a baseline survey, participants were randomly assigned to receive one of four binders. Participants were given 5 min to read the binder and then completed a follow-up survey.

We used a 2 (message frame: gain versus loss)  $\times$  2 (color: gray versus red) between-subjects design. On the binder cover, a gain- or loss-framed title was printed in black lettering and centered over a  $7 \times 4$  in rectangle filled with either gray or red. The two pages inside the binder described HPV infection (its prevalence, transmission, consequences, diagnosis, treatment, risk factors, and association with cervical cancer, anogenital cancer, and genital warts) and the quadrivalent HPV vaccine. Participants were told that the HPV vaccine has been approved for women and will likely be approved for men in the next few years. Gain and loss-framed information about the HPV vaccine was surrounded by a gray or red  $7 \times 4$  in rectangle (6-pt width, no fill) to highlight the framed content. Message content was identical across conditions; only the frame and color differed. Messages were modeled after previous research (Gerend & Shepherd, 2007; Gerend et al., 2008). See Table 1 for excerpts. Gray and red were equated on value (the relative lightness versus darkness of a color).

The baseline survey assessed sexual history (whether they had ever had sexual intercourse, whether they had a current partner) and the follow-up survey assessed general evaluations of the information (the extent to which it was interesting, easy to understand, believable), a framing manipulation check, intentions to receive the HPV vaccine, HPV vaccination status, whether they were red-green colorblind, and demographic information.

As the HPV vaccine has not yet been approved for men, our primary outcome variable was men's intentions to receive the HPV vaccine. Intentions were assessed using five items from previous research (Gerend & Shepherd, 2007; Gerend et al., 2008): How likely is it that you will: (a) try to get more information about, (b) consider getting, (c) try to get, and (d) actually get the HPV vaccine once it is available for men? Participants also rated (e) the likeli-

**Table 1**  
Gain- and loss-framed content about the HPV vaccine.

Gain	Loss
<p><b>Genital HPV infection: protect yourself and your partner</b>  <i>What are the benefits of getting the HPV vaccine?</i>            If you get the vaccine you may decrease your chances of contracting genital HPV</p> <p>Getting vaccinated may help you feel the peace of mind that comes with taking charge of your body and your health            By choosing to get the HPV vaccine you may be less likely to develop penile and anal cancers and may be less likely to get genital warts            Finally, by getting vaccinated you can help protect your sexual partner from developing genital warts and cancer</p> <p>It is important that you get vaccinated because condoms may not provide complete protection. By getting the HPV vaccine, you can be confident that you are doing everything you can to stay healthy. Overall, getting vaccinated could have positive effects on your health</p> <p>If you have been sexually active, or think you may be sexually active in the future, it is important that you consider getting the HPV vaccine once it is available</p> <p>Protect yourself and stay healthy! Remember to get vaccinated for HPV!</p>	<p><b>Genital HPV infection: do not fail to protect yourself and your partner</b>  <i>What are the risks of not getting the HPV vaccine?</i>            If you decide not to get the vaccine you may increase your chances of contracting genital HPV</p> <p>Not getting the vaccine may keep you from feeling the peace of mind that comes with taking charge of your body and your health            By choosing not to get the HPV vaccine you may be more likely to develop penile and anal cancers and may be more likely to get genital warts            Finally, by not getting vaccinated you would not be able to help protect your sexual partner from developing genital warts and cancer</p> <p>It is important that you do not fail to get vaccinated because condoms may not provide complete protection. By not getting the vaccine, you can not be confident that you are doing everything you can to stay healthy. Overall, failing to get vaccinated could have negative effects on your health</p> <p>If you have been sexually active, or think you may be sexually active in the future, it is important that you do not fail to consider getting the HPV vaccine once it is available</p> <p>Do not expose yourself and get infected! Do not forget to get vaccinated for HPV!</p>

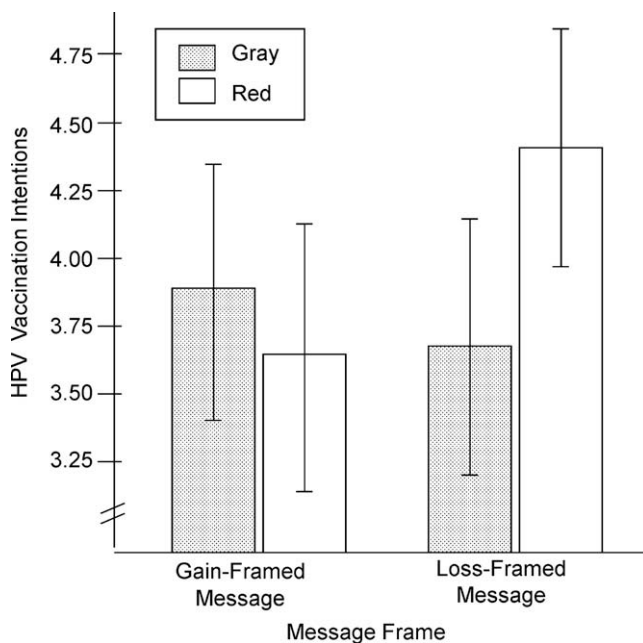
hood they will get the HPV vaccine if a health care provider offers it to them in the next 3 years (1 = *very unlikely* to 6 = *very likely*). The average of these five items was computed to create a composite representing intentions to receive the HPV vaccine ( $\alpha = .96$ ).

## Results

We conducted a preliminary series of factorial analyses of variance (ANOVA) to assess effects of message frame and color on the manipulation check and evaluations of the health information. Relative to participants in the loss-framed condition ( $M = 3.06$ ,  $SD = 1.62$ ), those in the gain-framed condition reported that the information focused more on the benefits of getting vaccinated than on the costs of not getting vaccinated ( $M = 4.15$ ,  $SD = 1.67$ ),  $F(1, 122) = 13.78$ ,  $p < .001$ ,  $\eta^2 = .10$ ; no main effect of color or frame by color interaction was observed. No significant effects of message frame, color, or their interaction were found for participants' general evaluations of the health information.

For the primary analysis, we conducted a 2 (message frame: gain versus loss) by 2 (color: gray versus red) ANOVA on HPV vaccination intentions. Because men with a current sexual partner reported higher vaccination intentions,  $F(1, 121) = 13.43$ ,  $p < .001$ ,  $\eta^2 = .10$ , analyses controlled for whether participants had a current sexual partner. This analysis revealed the predicted frame by color interaction,  $F(1, 121) = 3.96$ ,  $p < .05$ ,  $\eta^2 = .032$  (see Fig. 1). No main effects of frame or color were observed.

Tests of simple effects revealed that, among participants primed with red, those exposed to the loss-framed message reported higher vaccination intentions (covariate-adjusted means:  $M = 4.41$ ;  $SE = .237$ ) than those exposed to the gain-framed message ( $M = 3.62$ ;  $SE = .259$ ),  $F(1, 121) = 5.09$ ,  $p < .05$ ,  $\eta^2 = .040$ . Among participants primed with gray, no difference in vaccination intentions was observed for those exposed to the loss- ( $M = 3.67$ ;  $SE = .250$ ) versus the gain-framed message ( $M = 3.86$ ;  $SE = .251$ ),  $F(1, 121) = .30$ ,  $p > .50$ ,  $\eta^2 = .002$ .



**Fig. 1.** Covariate-adjusted means of HPV vaccination intentions as a function of message frame and color with 95% confidence intervals. Participants exposed to a loss-framed message reported significantly higher vaccination intentions than participants exposed to a gain-framed message, but only when red was primed.

## Discussion

The current study suggests that incidental threat cues can shape the persuasiveness of health information. We demonstrated that exposure to a subtle threat cue—the color red—amplified effects of a loss-framed message promoting a new vaccine. As predicted, individuals exposed to a loss-framed message reported stronger interest in receiving a prophylactic vaccine than individuals exposed to a gain-framed message, but only when the color red (not gray) was primed. Findings extend our understanding of the psychological effects of color to a health context, and shed light on the interactive effects of message framing and color priming.

This study is the first to integrate theories of message framing and color priming, theories that share important similarities. Beyond their dependence on context, effects of frame and color also hinge upon the presence of avoidance versus approach motives. Indeed, responses to loss-framed messages (Gerend & Shepherd, 2007; Mann, Sherman, & Updegraff, 2004; Rothman et al., 2006) and the color red (Elliot et al., 2007; Maier et al., 2008) are thought to reflect a motivational orientation aimed at avoidance of potential negative outcomes. Although we did not directly examine participants' motives, findings are consistent with the possibility that observed effects reflected the presence of avoidance motivation.

Our research has important theoretical and practical implications. On a theoretical level, findings add to an increasing body of research on the powerful effects of priming (Bargh & Chartrand, 1999) and suggest that motivational processes can be affected by the perception of subtle environmental cues. Moreover, these effects often appear to occur outside of conscious awareness. Research investigating the effect of red on achievement, for example, reported that participants were aware of the color in their booklet, but no one attributed their performance to their color exposure (Elliot et al., 2007). Indeed, combined with the current findings, this research suggests that, even in the context of important medical decisions, the persuasiveness of a health message can be affected by cues peripheral to the information being processed.

On a practical level, findings suggest that subtle changes in wording and color could be integrated into public health campaigns to promote health behavior. At the same time, these techniques—like other social influence practices—could be used to manipulate people and thus should be used judiciously (Cialdini, 1993).

It is important to consider the role of context when examining effects of color. Although the color red appears to serve as a threat cue in some health and achievement contexts, red may not always prime threat. Indeed, recent research suggests that in a mating or relationship context, exposure to the color red may prime intimacy and sexual attraction. For example, Elliot and Niesta (2008) demonstrated that men rated women as more physically attractive and sexually desirable when women's pictures were accented with a red background versus a white, gray, or green background. This finding could pose an interesting caveat to the current research. We found that red helped to promote interest in vaccination against a sexually transmitted infection; yet red could also plausibly promote unsafe sexual behavior—the very behavior that puts people at risk for such infections. Further research should investigate these possibilities more carefully, as they could have interesting (and unintended) implications for safer sex campaigns.

Study limitations should be noted, as they provide valuable opportunities for future research. The study was limited to male participants and assessed vaccination intentions rather than uptake. In addition, the observed effect size was relatively small. Although a gray control condition was included, failure to include a comparison color (e.g., green) prevented us from evaluating ef-

fects of chroma (the relative intensity or saturation of a color). Examining the combined effects of the color green with framed messages could be an interesting topic for future study, as both green and gain-framed messages have been associated with approach motivation (Elliot et al., 2007; Maier et al., 2008; Mann et al., 2004). Future research is needed to explore the underlying mechanisms responsible for the present findings. Avoidance motivation has been linked with both the color red and loss-framed messages (Elliot et al., 2007; Mann et al., 2004), and is thus a promising candidate.

In conclusion, although one might hope that important medical decisions would be immune to factors incidental to the choice being considered, findings from the present study suggest that subtle threat cues can affect the way people evaluate health information. Understanding these effects can provide a valuable means for improving the persuasiveness of health messages, and ultimately, for increasing behaviors designed to enhance health. More broadly, the current research provides a framework for understanding the interactive effects of message framing and priming – effects that could be applied in a variety of persuasion contexts.

## References

- Bargh, J. A., & Chartrand, T. L. (1999). The unbearable automaticity of being. *American Psychologist*, *54*, 462–479.
- Bekker, H. L., Gough, D., & Williams, M. (2003). Attendance choices about the influenza immunization programme: Evidence for targeting patients' beliefs. *Psychology, Health and Medicine*, *8*, 279–288.
- Bosch, F. X., Lorincz, A., Muñoz, N., Meijer, C. J., & Shah, K. V. (2002). The causal relation between human papillomavirus and cervical cancer. *Journal of Clinical Pathology*, *55*, 244–265.
- Cialdini, R. B. (1993). *Influence. The psychology of persuasion* (rev. ed.). New York: Morrow.
- 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. *Journal of Experimental Psychology General*, *136*, 154–168.
- Elliot, A. J., & Niesta, D. (2008). Romantic red: Red enhances men's attraction to women. *Journal of Personality and Social Psychology*, *95*, 1150–1164.
- Gerend, M. A., & Shepherd, J. E. (2007). Using message framing to promote acceptance of the human papillomavirus vaccine. *Health Psychology*, *26*, 745–752.
- Gerend, M. A., Shepherd, J. E., & Monday, K. A. (2008). Behavioral frequency moderates the effects of message framing on HPV vaccine acceptability. *Annals of Behavioral Medicine*, *35*, 221–229.
- Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, *47*, 263–291.
- Koutsky, L. (1997). Epidemiology of genital human papillomavirus infection. *American Journal of Medicine*, *102*, 3–8.
- Lacey, C. J., Lowndes, C. M., & Shah, K. V. (2006). Burden and management of non-cancerous HPV-related conditions: HPV-6/11 disease. *Vaccine*, *24*, S35–41.
- Lauer, D., & Rubin, M. (1990). Message framing, dispositional optimism, and follow-up for abnormal Papanicolaou tests. *Research in Nursing and Health*, *13*, 199–207.
- Lerman, C., Ross, E., Boyce, A., Gorchov, P. M., McLaughlin, R., Rimer, B., et al. (1992). The impact of mailing psycho educational materials to women with abnormal mammograms. *American Journal of Public Health*, *82*, 729–730.
- Maier, M. A., Elliot, A. J., & Lichtenfeld, S. (2008). Mediation of the negative effect of red on intellectual performance. *Personality and Social Psychology Bulletin*, *34*, 1530–1540.
- Mann, T., Sherman, D., & Updegraff, J. (2004). Dispositional motivations and message framing: A test of the congruency hypothesis in college students. *Health Psychology*, *23*, 330–334.
- Rothman, A. J., Bartels, R. D., Wlaschin, J., & Salovey, P. (2006). The strategic use of gain- and loss-framed messages to promote health behavior: How theory can inform practice. *Journal of Communication*, *56*, S202–220.
- Rothman, A. J., & Salovey, P. (1997). Shaping perceptions to motivate healthy behavior: The role of message framing. *Psychological Bulletin*, *121*, 3–19.
- Setchell, J. M., & Wickings, E. J. (2005). Dominance, status signals, and coloration in male mandrills (*Mandrillus sphinx*). *Ethology*, *111*, 25–50.
- Smith, A., Yarwood, J., & Salisbury, D. M. (2007). Tracking mother's attitudes to MMR immunisation 1996–2006. *Vaccine*, *25*, 3996–4002.
- Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science*, *211*, 453–458.
- Weinstein, N. D., Kwitel, A., McCaul, K. D., Magnan, R. E., Gerrard, M., & Gibbons, F. X. (2007). Risk perceptions: Assessment and relationship to influenza vaccination. *Health Psychology*, *26*, 146–151.
- Wogalter, M. S., Conzola, V. C., & Smith-Jackson, T. L. (2002). Research-based guidelines for warning design and evaluation. *Applied Ergonomics*, *33*, 219–230.
- Zimet, G. D., Shew, M. L., & Kahn, J. A. (2008). Appropriate use of cervical cancer vaccine. *Annual Review of Medicine*, *59*, 223–236.