

# Perceived Risk as a Moderator of the Effectiveness of Framed HIV-Test Promotion Messages Among Women: A Randomized Controlled Trial

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**Objective:** Researchers argue that gain-framed messages should be more effective for prevention behaviors, while loss frames should be more effective for detection behaviors (Rothman & Salovey, 1997). Evidence for this taxonomy has been mixed. This study examines whether the effects of gain- and loss-framed messages on HIV-testing intentions is moderated by perceived risk of a positive result.

**Method:** This experiment was conducted online and utilized a single factor (frame: gain/loss) between subjects design, with a separate HIV-test promotion control and a no message control to examine whether perceived risk of a positive test result moderates the effects of framed messages on intentions to seek an HIV test in the next 3 months. The sample ( $N = 1052$ ;  $M$  age = 22,  $SD = 2.22$ ), recruited through Survey Sampling International, included 51% Black women (49% White women). **Results:** HIV-test promotion messages were more effective than no message, but there were no other main effects for condition. Results also demonstrated a significant interaction between message frame and perceived risk, which is mediated through elaborative processing of the message. The interaction demonstrated an advantage for the loss-framed message among women with some perceived risk and an advantage for the gain-framed message among women with low perceived risk. **Conclusion:** Results imply that the prevention/detection function of the behavior may be an inadequate distinction in the consideration of the effectiveness of framed messages promoting HIV testing. Rather, this study demonstrates that risk perceptions are an important moderator of framing effects.

**Keywords:** prospect theory, HIV testing, gain loss frame, perceived risk, elaboration

Among those who are HIV-positive, more than 30% received testing late in the progression toward an AIDS diagnosis (Kaiser Family Foundation, 2010). Increases in HIV testing, especially when coupled with timely initiation of treatment could reduce HIV transmission (Centers for Disease Control and Prevention [CDC], 2006; De Cock, Gilks, Lo, & Guerma, 2009; Granich, Gilks, Dye, De Cock, & Williams, 2009; Janssen et al., 2001; Marks, Crepaz, Senterfitt & Janssen, 2005). Messages promoting testing often highlight the desirable consequences that result from seeking testing (*gain frame*; e.g., gain the opportunity to know for sure) or the undesirable consequences resulting from failure to seek testing (*loss frame*; e.g., don't lose out on the opportunity to know for

sure). Previous research has demonstrated differential effects of message frame for prevention and detection behaviors, but relatively few studies have examined potential mechanisms of framing effects. This study examines the effects of gain- and loss-framed messages on intentions to be tested for HIV antibodies among a sample of young women; it considers the moderating role of perceived risk in the framing taxonomy and explores whether message elaboration is a mediator of any moderated effects.

## Gain and Loss Framing

According to prospect theory (Kahneman & Tversky, 1979, 1981), under conditions of risk or uncertainty, loss-framed messages should be relatively more persuasive than gain-framed messages, with the inverse expected under conditions of certainty. Rothman and Salovey (1997) argue that prevention behaviors should be associated with little risk because they are performed to *reduce* future risk, while detection behaviors should be associated with relatively higher risk because individuals “run the risk” of discovering an illness. Consequently, gain-framed messages should be more effective for promoting prevention behaviors and loss-framed messages should be more persuasive for the promotion of detection behaviors.

Experimental framing manipulations have provided some support for this framework. Rothman, Martino, Bedell, Detweiler and Salovey (1999) manipulated the prevention or detection function of a behavior and found that gain-framed messages were more persuasive in the prevention condition and loss-framed messages were more persuasive in the detection condition (also see Kelly &

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Rothman, 2001, as cited in Rothman, Bartels, Wlaschin, & Salovey, 2006). In the context of HIV-test promotion, Kalichman and Coley (1995) compared effectiveness of a loss-framed message and informational control messages and found greater effectiveness for the loss-framed message. While these results provide some support for the expectation of greater effectiveness for the loss-framed message in the context of HIV testing, this study did not include a gain-framed message. The widely accepted interpretation of the framing taxonomy asserts that, in the context of this detection behavior, loss-framed messages should be more persuasive relative to gain-framed messages. Thus, it is predicted that, in this study, participants who are exposed to loss-framed messages will demonstrate greater intentions to receive testing relative to participants in the gain-framed condition.

### Perceived Risk as a Moderator

The effectiveness of a given message frame should be dependent upon the amount of risk *the individual* associates with the behavior (Abhyankar, O'Connor, & Lawton, 2008; Latimer, Salovey & Rothman, 2007; Rothman, Salovey, Antone, Keough, & Martin, 1993; Rothman & Salovey, 1997), rather than the behavior's function. Variation in agreement between the prevention/detection heuristic and participants with regard to whether the behavior is considered risky may have contributed to the findings of a recent meta-analysis (O'Keefe & Jensen, 2006, 2009), which failed to demonstrate a significant advantage for loss-framed messages promoting detection behaviors.

Lee and Aaker (2004) provided strong experimental evidence for moderating the role of risk perceptions by varying the extent to which participants thought they were at risk for mononucleosis (mono). The loss-framed message resulted in more positive attitudes toward a mono-fighting supplement among participants with high perceived risk, whereas the gain-framed message was significantly more persuasive among participants with low perceived risk. In the context of HIV testing, Apanovitch, McCarthy, and Salovey (2003) found a significant interaction between message frame and perceived risk, such that, for women with low perceived risk, gain-framed messages were significantly more persuasive for promoting testing. Loss-framed messages were not significantly more persuasive than gain-framed messages for women with high-perceived risk, but the relationship was in the expected direction. In that study, there was inconsistency between intentions and behavior measures, such that HIV-testing behavior was assessed 6 months after message exposure, but the measure of intention asked each participant if she intended to seek testing 'in the next year.' It is plausible that, given adequate time, a sufficient number of women would have sought HIV testing to warrant a statistically significant difference between conditions. Nonetheless, Apanovitch et al. (2003) provide support for the contention that risk perceptions are consequential for framing effects, but theirs is the only study of its kind in the context of HIV testing. In the current study, it is expected that the effects of message frame will be moderated by perceived risk of a positive HIV-test result.

### Elaborating on the Role of Message Processing

This study relies on the assumption that the differential effectiveness of framed messages is due to risk seeking/risk aversion

motivations arising from risk perceptions (Tversky & Kahneman, 1981). Risk perceptions also motivate elaboration (Das, de Wit & Stroebe, 2003; Dinoff & Kowalski, 1999), which in turn may influence persuasion. Thus, in this study it is predicted that participants with higher perceived risk of a positive test result will demonstrate significantly more effortful processing of the message relative to those with lower perceived risk.

Heightened risk perceptions are expected to enhance elaboration of message content, but according to Rothman, Salovey, Antone, Keough & Martin (1993), that elaborative processing is likely to be biased, favoring the frame that is consistent with the behavior under consideration. One interpretation of this argument suggests that, while deeper processing among those with high perceived risk should result in greater effectiveness for the loss frame, heuristic processing is likely to occur among those with low perceived risk, which may result in insensitivity to framing features of the message. Thus, there is inconsistency in frame effectiveness. Consequently, it is hypothesized that, for women who are relatively high in perceived risk, the loss-framed messages will be more effective in encouraging HIV-antibody testing, compared to gain-framed messages. There is no expectation of significant differences in frame effectiveness among women with low perceived risk. Furthermore, if perceived risk motivates elaboration, which in turn results in differential frame effectiveness, message elaboration should mediate the moderated effect of perceived risk on intentions to seek testing. Consequently, it is hypothesized that elaboration will mediate the interaction between perceived risk and message condition.

### Method

Sample size was determined using power analysis with  $\beta = .80$  and  $\alpha = .05$ , two-tailed (Cohen, 1977). A sample of women was recruited using an online survey company, Survey Sampling International (SSI), during November and December 2009. Participants who completed the study were compensated with \$3.00 and the chance to win prizes in the SSI lottery. Panelists were invited to participate based on several criteria, which were chosen to maximize relevance of the message content and ensure variation in risk perceptions: race (Black and White), gender (female), age (18–25), marital status (unmarried), and having ever engaged in sexual intercourse (vaginal or anal). As shown in Figure 1, there were 3,189 people invited by SSI who entered the study website, and 1,539 (48%) of them were ineligible to participate, 529 abandoned the survey, and 1,121 women completed the study; 1,052 (64% of eligible participants) completed the measures of interest and were retained for analysis.

### Procedure and Materials

This experiment utilizes a single factor (Frame: Gain/Loss) between subjects (multiarm parallel) design, with a separate informational HIV-test promotion message control group and a no message control group. Respondents were invited to participate in a study evaluating the content of a women's health website. Upon entry to the site, participants were consented, briefed about procedures, and warned about the sensitive nature of some questions. In order to mask the purpose of the study, several filler questionnaire items about other health topics were included on the pretest.

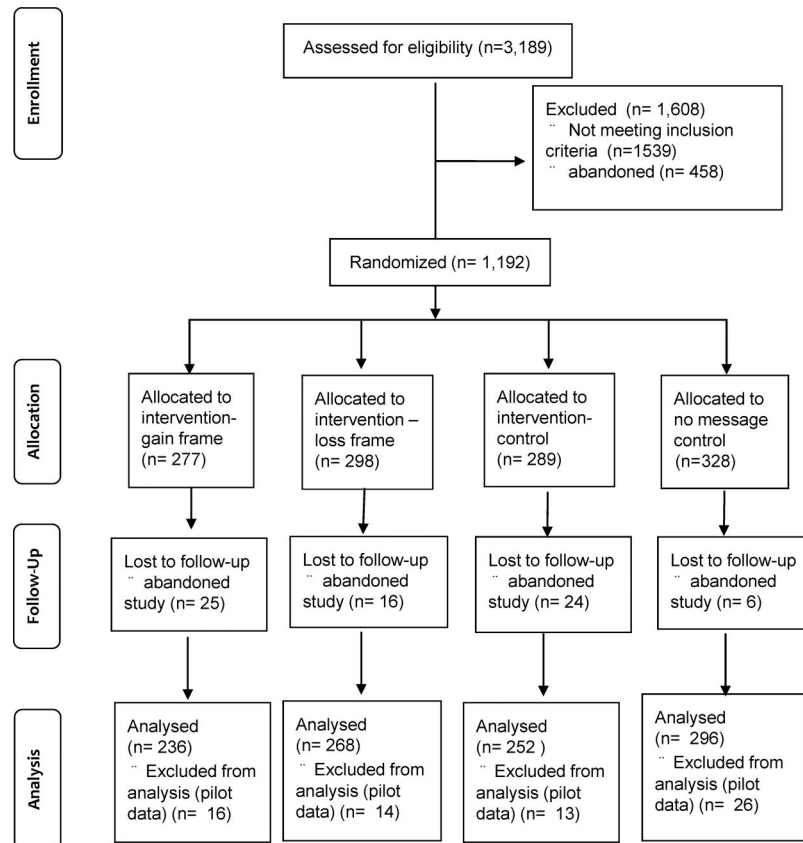


Figure 1. Consort flow diagram for this study.

Participants were randomly assigned to a condition using a random numbers generator, exposed to a stimulus, and directed to complete the posttest questionnaire. This project was approved by the Institutional Review Board at the University of Pennsylvania.

Message creation was informed by previously successful framed and HIV-test promotion manipulations (De Wit, Das, & Vet, 2008; Hullett, 2004; Kalichman & Coley, 1995; Meyerowitz & Chaiken, 1987) and in-depth interviews with HIV-positive minority women (Siegel, Raveis & Gorey, 1998). Stimuli featured a young, Black HIV-positive woman who described the reasons she believed she was not at risk for HIV, the reasons she sought testing, and her perceptions of the consequences of testing. For example, the framed messages read, “By [getting/not getting] this simple test, you can [gain/lose out on] benefits like emotional support and the opportunity for treatment that may keep you healthy.” Stimuli were approximately 350 words in length, and the Flesch Kincaid reading level was rated 4.3.

## Measures

**Demographics.** Age, gender, ethnicity and sexual preference were assessed using single-item measures.

**Behavioral intention.** Behavior intention was assessed using three 5-point scales ranging from 1 (*disagree*) to 5 (*agree*): “I plan/will/intend to get tested for HIV/AIDS in the next 3 months.” These items were combined, posttest  $\alpha = .99$ .

**HIV anxiety.** HIV anxiety was measured using two items: “How worried are you that you might get AIDS some day?” and “How worried are you that you might have the AIDS virus in your body now?” Participants were asked to rate these items on a scale of 1 (*not at all*) to 5 (*very*), pretest  $r = .67, p < .001$ . The scale was dichotomized by recoding *not at all* as 0 (“none” = 40.6%) and all other responses as 1 (“some”).

**Perceived risk.** *Perceived risk* is conceptualized as the extent to which an individual is certain of a negative test result. Those who are certain of a negative test result should perceive little risk associated with receiving testing (see Apanovitch et al., 2003 and Hullett, 2004 for an extended discussion). Perceived risk was measured using three 5-point scales ranging from 1 (*extremely unlikely*) to 5 (*extremely likely*): “If you get tested, how likely is it that the test results will be positive?” “How likely is it that you have HIV?” “How likely is it that you will get HIV in the future?” This scale ( $\alpha = .85$ ) was dichotomized due to a positive skew. *Extremely unlikely* responses were considered “very low perceived risk,” pretest = 51%, while scores above 1 were collapsed into a single category labeled “some perceived risk.”

**Message elaboration.** Message elaboration was assessed using four 5-point scales ranging from 1 (*not at all*) to 5 (*very much*): “Overall, how much did the HIV PSA make you (a) think about the arguments for getting tested for HIV, (b) think rather than feel, (c) think about the consequences of getting tested that are shown in

the PSA, (d) think about how getting tested might affect my life?" The mean of these items was used to create a scale ( $\alpha = .84$ ).

**Framing manipulation checks.** Framing manipulation checks were rated on 7-point scales (1 = *strongly disagree* to 7 = *strongly agree*): "I can gain important health benefits if I receive HIV testing." "I can lose important health benefits if I don't receive HIV testing." "The HIV testing message I read highlighted the good things that could happen if I get tested for HIV." "The HIV testing message I read highlighted the bad things that could happen if I don't get tested for HIV." The positively framed items (1 and 3) were combined to reflect a gain-framed manipulation check,  $r = .38$ ,  $p < .001$ . The negatively framed items (2 and 4) were combined to create a loss-framed manipulation check,  $r = .26$ ,  $p < .001$ .

**Message comprehension.** Message comprehension assessed the extent to which the HIV message was *extremely difficult to read* (1) to *extremely easy to read* (5),  $M = 4.33$ ,  $SD = 1.01$ , and *extremely difficult to understand* (1) to *extremely easy to understand* (5),  $M = 4.51$ ,  $SD = .83$ .

**Education.** Education was measured based on highest level of education completed (some high school, high school, some college, completed college, postgraduate).

## Analysis

Chi-square and  $t$  tests were utilized to examine treatment group by participant race, age, education, income, previous HIV testing, HIV experience, objective risk and pretest risk perceptions in order to determine whether randomization was successful. For the manipulation check, an ANOVA was used to determine whether there were significant differences by condition. Since two of the items were specific to the message, while the other two items referred to the costs/benefits of testing more generally (i.e., "I can gain/lose important health benefits if I receive/don't receive HIV testing"), ANOVA was used to examine whether the distribution of participants who agreed with the message-specific, gain- and loss-framed manipulation check items differed by condition.

For hypothesis tests, mean comparisons involving more than two groups were tested using ANCOVA, treating race as a covariate in all analyses. Comparisons between multiple groups were examined using pairwise comparisons with the sequential Sidak adjustment. The Sidak adjustment was utilized for hypothesis testing in lieu of planned contrasts because it is a relatively liberal correction while maintaining a familywise  $\alpha = .05$  (Hayes, 2005) since the SPSS statistical package does not permit the use of planned contrasts for an interaction in ANCOVA. The more conservative Bonferroni correction was used for post hoc analyses.

Mediation analysis was conducted utilizing the SPSS multiple mediation macro (Preacher & Hayes, 2008). The macro tested mediation (by elaboration) of a moderated effect (the interaction of perceived risk and condition) on intentions. An interaction term was constructed by multiplying perceived risk ("none" = 0; "some" = 1) by condition (gain = 1; loss = 2;  $n = 485$ ). The interaction term was entered into the model as the focal predictor, treating the main effects for condition, risk, and race as covariates (Hayes, 2009).

## Results

The final sample included 51% Black women, and the average age of participants was 22 ( $SD = 2.22$ ). Most women who abandoned the survey (85%) did so prior to encountering demographic variables and prior to assignment to condition. The final sample was not substantially younger than the women who had abandoned, but the difference approached significance,  $N = 249$ ,  $M = 21.69$ ,  $SD = 2.15$ ,  $t(1302) = -1.91$ ,  $p = .06$ . The sample of women who abandoned the study consisted of a greater proportion of Black women than White women, (61% vs. 39%, respectively),  $t(1239) = -2.69$ ,  $p < .001$ , whereas the final sample contained nearly equal proportions of Black and White women (49%). The final sample contained a higher proportion of Black women in the control condition (59%) than White women (41%) than would be expected by chance,  $\chi^2(3, n = 1007) = 8.43$ ,  $p = .038$ . No other significant differences between conditions were detected.

## Manipulation Checks

An ANOVA predicting the gain-framed manipulation check (including both items) from condition revealed no main effect based on simple contrasts, gain  $M = 5.01$ ,  $SD = 1.24$ ; loss  $M = 5.03$ ,  $SD = 1.41$ ; control  $M = 5.09$ ,  $SD = 1.32$ . An ANOVA examining the two-item loss-framed manipulation check revealed a main effect,  $F(2, 747) = 3.97$ ,  $p = .02$ , for the loss-framed condition,  $M = 4.81$ ,  $SD = 1.74$ , relative to the gain-framed condition,  $M = 4.40$ ,  $SD = 1.74$ ;  $p = .01$ , and the control condition,  $M = 4.44$ ,  $SD = 1.86$ ;  $p = .02$ , based on simple contrasts. Looking only at the message-specific manipulation check items, the ANOVA revealed differences for the gain-framed item such that women in the gain-framed condition reported higher agreement with the item,  $M = 4.94$ ,  $SD = 1.51$ , relative to women in the loss-framed condition,  $M = 4.67$ ,  $SD = 1.76$ ;  $t(743) = -1.86$ ,  $p = .06$ , but not the control condition,  $M = 4.97$ ,  $SD = 1.54$ ;  $t(743) = .21$ ,  $p = .83$ . Women in the loss-framed condition reported stronger agreement with the message-specific, loss-framed manipulation check item,  $M = 4.81$ ,  $SD = 1.74$ , relative to women in the gain,  $M = 4.40$ ,  $SD = 1.78$ ;  $t(747) = 2.53$ ,  $p = .01$ , and control conditions,  $M = 4.44$ ,  $SD = 1.86$ ;  $t(747) = -2.30$ ,  $p = .02$ . These findings, along with the fact that message construction followed closely the example set by widely cited gain/loss frame message manipulations (Maheswaran & Meyers-Levy, 1990; Meyerowitz & Chaiken, 1987), provide increased confidence in the manipulation. There were no significant differences between conditions in terms of comprehensibility of messages,  $F(2, 747) = 1.61$ ,  $p = .20$ , but the difference in readability between the gain,  $M = 4.21$ ,  $SD = 1.09$ , and loss conditions,  $M = 4.42$ ,  $SD = .91$ ; Control  $M = 4.32$ ,  $SD = 1.00$ , demonstrated a trend toward significance,  $F(2, 744) = 2.77$ ,  $p = .06$ .

## Hypothesis Tests

As expected, the theoretical mediator was positively associated with the risk perceptions and intentions to seek testing (see Table 1). Notably, Black women demonstrated higher elaboration of message content, risk perceptions, HIV anxiety, and intentions to seek testing.

Table 1  
Correlations Among HIV Test Intentions and Proposed Mediators and Moderators

Variable	1	2	3	4	5
Perceived risk	—				
HIV anxiety	.52***	—			
Elaboration	.14***	.22***	—		
Race	-.07*	-.09**	-.23***	—	
Intention (posttest)	.19***	.29***	.46***	-.42**	—

Note. Perceived risk and HIV anxiety = dichotomy; 1 = Black, 2 = White.  
\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

The first analysis examined the effectiveness of exposure to an HIV-test promotion message condition relative to no message. An ANCOVA examining posttest intentions by condition, pretest perceived risk status, and their interaction with race as a covariate, demonstrated a significant main effect for perceived risk,  $F(1, 996) = 30.43, p < .01; \eta_p^2 = .03$ , and condition,  $F(3, 996) = 5.02, p < .01; \eta_p^2 = .02$ . Simple contrasts comparing the HIV-test promotion treatment conditions with the no message control condition demonstrated significant effects of condition, such that all HIV-test promotion messages, gain  $M = 3.21, SE = .09, N = 226$ ; loss  $M = 3.14, SE = .09, N = 259$ ; control  $M = 3.11, SE = .09, N = 240$ , resulted in significantly higher intentions to seek testing (all  $p < .01$ ) relative to no message,  $M = 2.78, SE = .08, N = 280$ . When the comparison group was the gain-framed condition, no other significant differences between conditions were evident. The interaction term for condition and perceived risk failed to reach conventional levels of significance, but it approached significance,  $F(3, 996) = 2.15, p = .09$ . While results demonstrated a main effect for message exposure relative to no message, there was no main effect of the loss-framed message relative to the gain-framed message. This analysis fails to provide support for the first hypothesis.

The next analysis considered whether the gain- and loss-framed messages produced the theoretically based, hypothesized interaction. This set of analyses required a focus on the framed message conditions (gain and loss), excluding the control groups. An ANCOVA predicting intentions demonstrated a significant main effect for perceived risk,  $F(1, 480) = 24.60, p < .001, \eta_p^2 = .05$ , but no main effect for condition,  $F(1, 480) = .34, p = .56$ . As Figure 1 demonstrates, the interaction between perceived risk and experimental condition was significant,  $F(1, 480) = 4.26, p = .04$ , providing support for the second hypothesis.

Pairwise comparisons of cells were conducted to test whether individuals who are relatively higher in perceived risk are more persuaded by the loss framed message relative to the gain framed message. While the interaction effect was significant, results failed to reveal significant differences between cells for women with high perceived risk when comparing the effects of framed messages. Thus, the hypothesis that among women with high perceived risk, the loss frame would be more effective in encouraging HIV-antibody testing relative to the gain frame was not supported (see Table 2).

As previously argued, the impact of risk perceptions should lie in their ability to sensitize individuals to the framing features of the message. Under conditions of relatively higher perceived risk, individuals should be more likely to scrutinize the message. An ANCOVA predicting elaboration revealed significant main effect for perceived risk,  $F(1, 481) = 4.08, p = .04$ ; some perceived risk  $M = 3.79, SE = .06, n = 243$ ; very low perceived risk  $M = 3.61, SE = .06, n = 242$ . When entered into the model, the interaction between perceived risk and condition was significant,  $F(2, 480) = 5.09, p = .03; \eta_p^2 = .01$ , indicating that among women with some perceived risk, the loss frame was associated with increased elaboration of the message relative to the gain-framed condition. Women with low perceived risk demonstrated decreased processing in the loss-framed condition relative to the gain-framed condition (see Figure 2) although differences between cell means were not significant (see Table 3).

### Post Hoc Analysis: HIV Anxiety

Rothman and Salovey (1997) argue that the differential effects of message frame are the result of more or less depth of processing, which is motivated by variables such as perceived risk. If this

Table 2  
Estimated Marginal Means for Intentions by Condition and Perceived Risk

Stimulus condition	Perceived risk	Mean <sup>1</sup>	Std. error	95% CI	N
Gain	Very low	3.00 <sub>a</sub>	.13	2.74, 3.25	111
	Some	3.36 <sub>b</sub>	.13	3.11, 3.61	115
Loss	Very low	2.67 <sub>c</sub>	.12	2.44, 2.90	132
	Some	3.54 <sub>b</sub>	.12	3.30, 3.78	127

Note. Std. error = Standard error. Means with differing subscripts are significantly different at  $p < .05$ , based on pairwise comparisons with Sidak adjustment.

<sup>1</sup> Covariates: race = 1.5196.

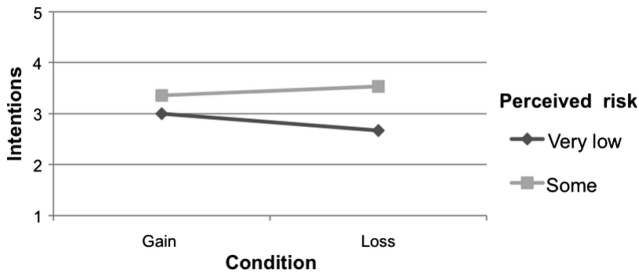


Figure 2. Posttest intentions by condition and perceived risk.

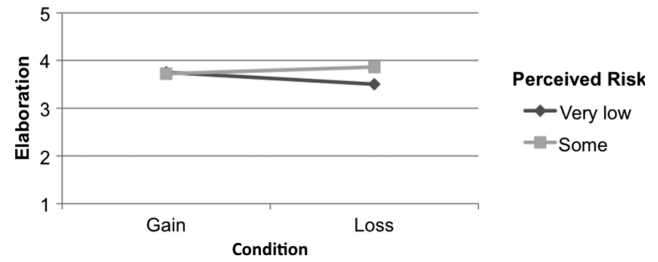


Figure 3. Means for message elaboration by perceived risk and condition.

argument is accurate, other variables that promote elaborative processing should demonstrate similar interactions with message frame. An analysis was conducted examining a related measure of risk, HIV anxiety, to explore this possibility. Perceived risk and HIV anxiety are moderately correlated, which indicates that they are similar but are not confounded (see Table 1). An ANCOVA predicting intentions from HIV anxiety, condition, and their interaction (with race as a covariate) found results consistent with the results of the perceived risk analysis (see Figure 4). Considering gain- and loss-framed conditions, there was no main effect for condition,  $F(1, 479) = .85, p > .05$ , a significant main effect of HIV anxiety,  $F(1, 479) = 44.99, p < .001; \eta_p^2 = .09$ ; some HIV anxiety  $M = 3.48, SE = .08, n = 284$ ; none  $M = 2.66, SE = .09, n = 200$ , and a significant interaction between condition and HIV anxiety,  $F(1, 479) = 8.45, p < .01; \eta_p^2 = .02$ . As Figure 3 illustrates, among women with HIV anxiety, intentions were higher among women exposed to the loss-framed message relative to the gain frame. The reverse pattern of effects was evident for women with no HIV anxiety. Table 4 provides means for HIV anxiety by condition.

**Mediation Analysis**

The direct relationship between the interaction term and the intention was significant,  $B = .51, p = .04$ . The relationship between the interaction term and the elaboration was also significant,  $B = .39, p < .02$ , as was the relationship between elaboration and intention, controlling for race, perceived risk, condition, and their interaction,  $B = .51, p < .001$ . The remaining effect of the interaction on intention, controlling for elaboration and all covariates was not significant,  $B = .31, p = .18$ . The crucial test indicated significant mediation; the indirect effect of the interaction of perceived risk and condition through the proposed mediator was significantly different from zero,  $B = .20, 95\% CI = .02, .40$ .

This analysis provides evidence for mediation of the effect of the interaction between perceived risk and experimental condition on intention through elaboration of message content.

**Discussion**

The results of this analysis provide evidence that the HIV-test promotion messages outperformed the no message control. This is not surprising but does show the value of HIV testing information enhancing intentions to achieve desirable behaviors. The magnitude of the effect of exposure to the HIV-test promotion messages on intention is moderate and results from a single message exposure. It is plausible that the changes in intention evident in this study could translate to substantial amounts of behavior change across a population over time (Hornik, 2002; Snyder et al., 2004).

There was no main effect for the loss-framed message. According to the framing taxonomy, the loss-framed message should be more persuasive in the context of HIV testing, a disease detection behavior. Instead, the persuasiveness of the message depended on the amount of risk women associated with testing. There was evidence of a reversal in frame effectiveness, dependent on risk perceptions. While the simple difference between cells was not significant, the significant interaction term revealed a tendency toward enhanced message effectiveness of the loss-framed message among women with some perceived risk. On the other hand, effectiveness of the gain-framed message was enhanced among women with low perceived risk. These results are consistent with the argument set forth by Rothman and Salovey (1997).

This study also demonstrates that the effects of HIV anxiety are parallel to perceived risk, such that the loss-framed message was somewhat more persuasive for women with some HIV anxiety, whereas the gain-framed message was somewhat more effective among women with no HIV anxiety. Evidence of an interaction which is identical in nature and effect size, with different but

Table 3  
*Estimated Marginal Means for Elaboration by Condition and Perceived Risk*

Stimulus condition	Perceived risk	Mean <sup>1</sup>	Std. error	95% CI	N
Gain	None	3.75	.09	3.57, 3.93	114
	Some	3.72	.09	3.54, 3.89	121
Loss	None	3.50	.08	3.33, 3.66	137
	Some	3.86	.08	3.69, 4.03	130

Note. Means were not significantly different at  $p < .05$  based on pairwise comparisons with Sidak adjustment.  
<sup>1</sup> Covariates: race = 1.52.

Table 4  
*Estimated Marginal Means for Posttest Intentions by HIV Anxiety and Condition*

Stimulus condition	HIV Anxiety	Mean <sup>1</sup>	Std. error	95% CI	N
Gain	None	2.89 <sub>ad</sub>	.14	2.61, 3.17	89
	Some	3.36 <sub>ae</sub>	.13	3.14, 3.58	136
Loss	None	2.42 <sub>bd</sub>	.13	2.17, 2.67	111
	Some	3.60 <sub>ce</sub>	.11	3.39, 3.82	148

*Note.* Means with differing subscripts are significantly different at the  $p < .05$  based on pairwise comparisons with Bonferroni adjustment.

<sup>1</sup> Covariates: race = 1.52.

related measures, provides increased confidence that the findings are not an anomaly and the variables are likely reflecting real patterns in the data.

The proposition that, among women with some perceived risk, the loss-framed message would be significantly more persuasive than the gain-framed message in terms of cell differences was not supported. The simple cell differences were not statistically significant, which implies that the reversal in frame effectiveness based on risk perceptions is evident relative to one another rather than in absolute terms. The results of this study suggest that, within a particular disease category, viewer risk perceptions are consequential for message effectiveness. The significant interaction between perceived risk and message frame implies that, rather than considering the function of a particular behavior, targeting or tailoring framed health messages may be more appropriately based on risk perceptions with regard to performance of the behavior.

The expectation that women with some perceived risk would demonstrate significantly more effortful processing of the message, relative to the very low perceived risk group, was supported. This analysis further demonstrates that the interactive effects of perceived risk and message condition exposure are mediated through message elaboration. The mediation analysis shows that women with some perceived risk reported more elaborative processing of the loss-framed message relative to the gain-framed message, with a reversal of frame effectiveness among women with low perceived risk. If people who associate little risk with a behavior are less likely to employ effort in processing the message, those individuals may rely on heuristics in the processing of message. In the case of this disease-detection behavior, it may be that the efficacy of the gain-framed message among women with low perceived risk is a consequence of heuristic processing of positive language (Rothman & Salovey, 1997).

Evidence suggests that information that is processed more deeply can result in more enduring attitudes that are more resistant

to change than those formed under relatively lower levels of elaboration. Evidence also suggests that attitudes formed during elaboration of the message can be more likely to result in subsequent behavior change (Petty & Cacioppo, 1986). This study suggests that framed messages may be differentially effective in terms of the duration of the effect and the extent to which intentions are translated into behavior. These data suggest that women with some perceived risk who are exposed to a loss-framed message may experience more enduring intentions and be more likely to seek testing relative to women with very low perceived risk who are also exposed to a loss-framed message. However, the opposite seems to be true for those with low perceived risk, who are more likely to be affected by the gain-framed message.

While this study was carefully designed, it is subject to limitations. A measure of overt behavior is the ideal outcome measure for this study. However, past research has demonstrated that the most proximal determinant of behavior is the intention to perform the behavior (Fishbein & Ajzen, 2010), and in the context of sexual health behaviors, intentions have been moderately correlated with behavioral outcomes (Albarracín, Fishbein, Johnson & Muellerleile, 2001). It is plausible that effect sizes are underestimated because results are based on a single exposure, but framed messages are likely abundant in everyday social and media environments. A longitudinal design with multiple message exposures would be better equipped to enhance the external validity. This study makes no attempt to examine the duration of framing effects. However, the mediation analysis suggests that the framed messages may be differentially enduring. Future research should examine this possibility. Finally, 16% of the sample abandoned the study. While randomization to condition should distribute any systematic differences between women across conditions, the possibility remains that the sample was biased in some undetected way.

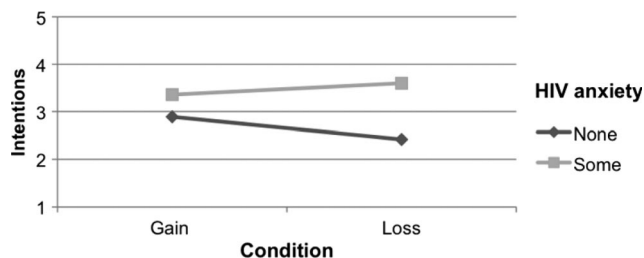


Figure 4. Posttest intentions by HIV anxiety and condition.

## Conclusion

This study utilized prospect theory to explore the differential effectiveness of gain- and loss-framed messages in the promotion of HIV testing among young women. The results of this study imply that practitioners should consider the amount of risk associated with the behavior when constructing health promotion messages which utilize gain- or loss-framed messages, rather than relying on the function of the behavior as a heuristic for determining the most appropriate message frame.

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