



**Perceived Risk as a Moderator of the Effectiveness of  
Framed HIV Test Promotion Messages Among Women**

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**July 2010**

**Russell Ackoff Fellowship of the Wharton Risk Center  
Working Paper # 2010-07-03**

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Messages Among Women

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The authors wish to acknowledge the funding support of the National Cancer Institute's Center of Excellence in Cancer Communication (CECCR) located at the Annenberg School for Communication, University of Pennsylvania (P20-CA095856). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Cancer Institute or the National Institutes of Health. This research was also supported in part by the Russell Ackoff Doctoral Student Fellowship, Wharton Risk Management and Decision Processes Center, University of Pennsylvania

### Abstract

**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. **Methods:** This experiment was conducted on-line and utilizes 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; age M = 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 demonstrate 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

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The Centers for Disease Control and Prevention report that in 2006 an estimated 56,300 people were newly infected with HIV/AIDS (CDC, 2008). Among those who are HIV positive, more than 30% received testing within 1 year of their AIDS diagnosis (Kaiser Family Foundation, 2010). This implies that a large proportion of the population may go a number of years without developing warning signs of HIV or AIDS infection, thus the infection remains unnoticed and untreated.

Increases in HIV testing coupled with timely initiation of anti-retroviral therapy could reduce HIV-transmission (De Cock, Gilks, Lo, et al., 2009; Granich, Gilks, Dye, De Cock, et al., 2009; Janssen, Holtgrave, Valdiserri, Shepherd, et al., 2001). Individuals who test positive may reduce risky sexual behavior (Marks, Crepaz, Senterfitt, & Janssen, 2005) or choose to engage in sexual intercourse only with others who test positive. In addition, “reduction in viral load through timely initiation of HAART (highly active antiretroviral therapy) might reduce transmission, even for HIV-infected patients who do not change their risk behavior” (CDC, 2006, p. 6). Furthermore, knowledge of infection may also decrease the likelihood of perinatal transmission as medical advances have afforded infected mothers the opportunity to protect their unborn children (CDC, 2006; Rotheram-Borus et al., 2001). Thus, while safer-sex campaigns should most certainly be encouraged, messages should also address HIV sero-status awareness.

This study examines the effects of message framing on intentions to be tested for HIV-antibodies among a sample of young women and addresses two questions: (1) Are framing effects evident in this context? (2) What are the mechanisms by which the framing phenomenon

occurs? The purpose of this study is to provide a greater understanding of the processes underlying the differential effectiveness of message frames by examining the moderating role of perceived risk.

### **Message Framing: Gain vs. Loss**

There are multiple ways to construct a persuasive HIV test promotion message. A message could emphasize the *desirable* or *undesirable* outcomes that an individual will *obtain* or *avoid* as a consequence of performing the recommended behavior. The way in which a message is framed has been demonstrated to contribute to the persuasiveness of the message. While some research demonstrates the differential effectiveness of gain and loss framed messages, the field is far from consensus regarding the optimal uses of message framing.

According to prospect theory (Kahneman and Tversky, 1979, 1981), when an outcome is framed in terms of gains, people are risk averse. When an outcome is framed in terms of potential losses people are willing to accept risk (risk-seeking) in an attempt to avoid incurring a loss. Rothman and Salovey (1997) offer an interpretation of risk that facilitates the use of prospect theory in health communication research, which translates objective probabilities of risk into a subjective judgment with regard to costs and benefits. They refer to risk as the extent to which “people perceive the behavior will afford an unpleasant outcome” (p.5; also see Rothman, et al, 2006). From this perspective, prevention behaviors should be associated with little risk because prevention behaviors are performed to *reduce* future risk. Detection behaviors should be associated with relatively higher perceptions of risk because by performing the behavior, individuals “run the risk” of discovering an illness. Consequently, gain-framed messages should be relatively more effective for promoting prevention behaviors and loss-framed messages should be relatively more persuasive for the promotion of detection behaviors.

Experimental framing manipulations have provided support for the framework.

Rothman, Martino, Bedell, Detweiler and Salovey (1999) manipulated the function of a specific behavior (prevention or detection) as well as the frame of messages viewed by participants. The findings of the two experiments were consistent with the taxonomy: Gain-framed messages were more persuasive in the prevention condition, and loss-framed messages were more persuasive in the detection condition. Kelly and Rothman (2001) also manipulated the function of a screening test; the test either detected a health problem or a health benefit (cited in Rothman et al., 2006). When the test was described as a screening test for a health problem, loss-frames were more effective. Gain-frames were more effective for the screening test that functioned to detect a health benefit (also see O'Keefe & Jensen, 2009).

In the context of HIV test promotion, Kalichman and Coley (1995) investigated the effectiveness of a loss-framed message compared to informational control messages. The loss-framed message was more effective relative to the control messages. These results provide some support for the expectation of effectiveness of the loss framed message in the context of HIV testing, but this research was limited in that it did not include a gain framed message and it is unclear whether the results of the study can be attributed to other differences between the framed and informational messages. 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.

*Hypothesis 1:* Participants who are exposed to loss-framed messages will demonstrate greater intentions to receive testing relative to participants in gain- framed condition.

### **Perceived risk as a moderator**

In a recent meta-analysis, O’Keefe and Jensen (2006) examined the relative utility of framed messages for promoting disease detection and prevention behaviors. The findings of this study are inconsistent with the taxonomy insofar as there was a small advantage of gain over loss-framed messages for some prevention behaviors, but there was no difference between gain- and loss-frames with regard to detection behaviors<sup>1</sup>. Variation in agreement between the researcher (using the heuristic determination) and the participant with regard to risk may have contributed to the null findings reported by O’Keefe and Jensen (2006). The effectiveness of a given message frame, should be dependent upon the amount of risk *the individual* associates with the behavior (as opposed to the heuristic use of prevention/detection behaviors; Abhyankar, O’Connor & Lawton, 2008; Rothman, Salovey, Antone, Keough and Martin, 1993; Rothman & Salovey, 1997). In other words, Latimer, Salovey and Rothman (2007) suggest that risk perceptions will moderate framing effects. Consistent with this argument, Lee and Aaker (2004) provide strong experimental evidence for the moderating role of risk perceptions by varying the extent to which participants thought they were at risk for mononucleosis. Participants in the high-risk condition were told that the disease is spread via common behaviors (i.e. kissing). Participants in the low risk condition were told that mononucleosis is spread through uncommon behaviors such as receiving a blood transfusion. The loss framed message resulted in more positive attitudes toward a mononucleosis fighting supplement among participants in the high risk condition whereas the gain-framed message was significantly more persuasive among participants in the low-risk condition.

While Lee and Aaker (2004) provide relatively strong evidence for the role of risk perceptions in the framing taxonomy, evidence is far from conclusive. In the context of HIV-

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<sup>1</sup> HIV related studies are not included in the meta-analysis.

testing, Apanovitch et al (2003) showed that gain- and loss-framed messages were effective depending upon the participants' perceived risk of an HIV-antibody test. They found a significant interaction between message frame and perceived risk. For women who were certain of the test outcome, thus low in perceived risk, gain-framed messages were significantly more effective in promoting self-reported 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. Never the less, this study suggests that risk perceptions are consequential for framing effects.

*Hypothesis 2:* The effects of message frame will be moderated by perceived risk of a positive HIV test result.

### **Elaborating on the Role of Message Processing**

Researchers have made similar arguments with reference to the role of involvement in moderating framing effects. Maheswaran and Meyers-Levy (1990) demonstrated an interaction between involvement and message frame such that for a detection behavior, under conditions of high involvement, loss-framed messages were more persuasive than gain-framed messages. Under conditions of low involvement, gain-framed messages were more persuasive. Studies have demonstrated similar interactions between involvement and message frame on intentions to seek skin cancer examinations (Rothman, et al., 1993) and mammography (Finney & Iannotti, 2002). A reasonable alternative explanation for the findings in each of these studies is that what was actually manipulated (or manipulated in addition to involvement) was perceived risk. Increasing one's involvement with heart disease by making it a relevant health issue for one's age group is also likely to increase one's perceived risk of developing heart disease. This study relies on the assumption that the differential effectiveness of framed messages is due to risk

seeking/risk aversion motivations, which are a function of risk perceptions (Tversky & Kahneman, 1981). This study examines the moderating role of risk perceptions, but looks to the literature examining the moderating role of involvement for theoretical guidance.

In their interpretation of the findings regarding involvement, Rothman et al (1993) suggest that high issue-involvement “may favor the information frame that corresponds best to the type of behavior being promoted” (p.428). When individuals’ are high in involvement, they engage in biased elaborative processing of the message, favoring the frame that is consistent with the behavior under consideration (gain-prevention, loss-detection). This claim is consistent with previous research (e.g. Petty & Cacioppo, 1990), which demonstrates that as involvement increases, the intensity of processing increases as well. Just as increased involvement with an issue is associated with more elaborative processing, risk perceptions have been associated with more effortful processing of messages (Das, de Wit & Stroebe, 2003; Dinoff & Kowalski, 1999). Consequently, in this study it is expected that increased perceived risk will result in enhanced processing of the message.

*Hypothesis 3:* Participants with higher perceived risk of a positive test result will demonstrate significantly more effortful processing of the message relative those with lower perceived risk.

One interpretation of this argument, which diverges from previous interpretations of the taxonomy suggests that in this context, the loss framed message will result in deeper processing among those with high perceived risk whereas among those with low perceived risk, heuristic processing of the message may result in insensitivity to framing features of the message. Following the logic of Rothman’s argument regarding involvement, when risk perceptions are

high, individuals are more likely to carefully process the message, resulting in sensitivity to the framing features.

*Hypothesis 4:* For individuals who are uncertain about getting a negative test result thus higher in perceived risk, the loss-framed messages will be more effective in encouraging HIV-antibody testing, relative to the gain-framed messages.

The final hypothesis considers whether message elaboration mediates the moderated effect of perceived risk on intentions to seek testing.

*Hypothesis 5:* Elaboration will mediate the interaction between perceived risk and message condition.

## **Methods**

This experiment utilizes a single factor (frame: gain/loss) between subjects design, with a separate informational HIV test promotion message control group and a no message control group. Respondents were invited to participate anonymously in an on-line study to evaluate 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, such as knowledge, beliefs and past behavior regarding heart disease and mammography were included on the pre-test. Upon completion of the pre-test, participants were randomly assigned to condition, exposed to the message stimulus and then directed to complete the post-test questionnaire. This project was approved by the Institutional Review Board at the University of Pennsylvania.

A sample of women was recruited using an online survey company, called Survey Sampling International (SSI). Participants who completed the study were compensated \$3.00,

and the chance to win one of many prizes in the SSI quarterly and bi-weekly prize lottery. Panelists were invited to participate in this study based on several criteria: race (Black and White), gender (female), age (18-25), marital status (unmarried) and having ever engaged in sexual intercourse (vaginal or anal). Participants who did not qualify were terminated from the study and re-routed back to the SSI panel website. In total, 3,189 people who were invited by SSI entered the study website. Of those people, 1,539 (48%) were ineligible to participate in the study, 529 abandoned the survey and 1,121 women completed the study. Of those women who completed the study, 1052 (33% of the total sample, 64% of eligible participants) completed the measures of interest and were retained for analysis. The final sample was 51% Black and the average age of participants is 22 ( $SD = 2.22$ ).

Chi square and independent samples t-tests were used to determine whether the final sample differed from women who failed to complete the study. The final sample was not significantly different from the sample of women who abandoned the study in terms of age ( $N^2 = 249$ ,  $M = 21.69$ ,  $SD = 2.15$ ,  $t(1302) = -1.91$ ,  $p > .05$ ). The final sample contained nearly equal proportions of Black women (51%) and White women (49%), whereas the sample of women who abandoned the study consisted of a greater proportion of Black women than White women (61% vs. 39%, respectively;  $t(1239) = -2.69$ ,  $p < .05$ ).

## **Stimuli**

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 &

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<sup>2</sup> The n for abandons for analyses is lower than the total N for abandon. These women likely abandoned the study before encountering the demographic variables (age and race), which were early in the survey. These data suggest that at least 85% of participants who abandoned the survey did so prior to assignment to condition.

Gorey, 1998). Stimuli featured a young, HIV+ Black woman describing the reasons she believed she was not at risk for HIV, what led her to seek and some of the consequences of testing. Stimuli were approximately 350 words and the Flesch Kincaid reading level was rated 4.3.<sup>3</sup>

## Measures

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

*Behavioral intention* was assessed using the following 5-point scales ranging from (1) disagree to (5) agree: “I plan to get tested for HIV/AIDS in the next 3 months.” “I will get tested for HIV/AIDS in the next 3 months.” “I intend to get tested for HIV/AIDS in the next 3 months.” These items demonstrated good internal consistency and were combined to create a scale (pre-test  $\alpha = .97$ ,  $M = 2.81$ ,  $SD = 1.48$ ; post-test  $\alpha = .99$ ,  $M = 3.05$ ,  $SD = 1.96$ )

*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?” (1) ‘Not at all,’ (2) ‘a little,’ (3) ‘somewhat,’ (4) ‘quite’ (5) ‘very’ (pre-test  $M = 1.84$ ,  $SD = 1.05$ ; post-test  $M = 1.86$ ,  $SD = .99$ ). The scale was dichotomized by recoding ‘not at all’ as 0 (‘none;’ pre-test = 40.6%; post-test = 35.7%) and all other responses as ‘some’ (1).

*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. In contrast, participants who are uncertain of the test result (in terms of whether it would be positive or negative) as well as those who are certain of a positive

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<sup>3</sup> For example: *Gain/Loss:* 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. *Control:* There are many benefits to testing, like emotional support and the opportunity for treatment that may keep you healthy.

test result should associate the test with some risk (of finding out or confirming that she is ill; Siegel, Raveis, & Gorey, 1998). This definition of risk can also be described as the extent to which the participant believes that it is *possible* that she is HIV positive (see Apanovitch et al., 2003 and Hullett, 2004 for an extended discussion). Following procedures used by Apanovitch et al (2003), perceived risk is measured using three 5-point scales (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?” These items demonstrated good internal consistency and were averaged to create a scale (pre-test  $\alpha = .85$ ,  $M = 1.57$ ,  $SD = .87$ ; post-test  $\alpha = .89$ ,  $M = 1.63$ ,  $SD = .89$ ). As in previous research (Apanovitch et al, 2003) this item was dichotomized. ‘Extremely unlikely’ responses on the perceived risk scale were considered “very low perceived risk” (pre-test = 51%; post-test = 47%) while scores above 1 were collapsed into a single category labeled “some perceived risk”

*Message elaboration* was assessed using a four 5-point scales (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 ( $\alpha = .84$ ,  $M = 3.69$ ,  $SD = .99$ ).

*Framing manipulation checks* were adapted from previous research (Maheswaran & Myers-Levy, 1990). The following items are 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 ( $r = .38, p < .001; M = 5.04, SD = 1.33$ ). The negatively framed items (2 and 4) were combined to create a loss framed manipulation check ( $r = .26, p < .001; M = 4.56, SD = 1.80$ ).

*Message Comprehension* assessed the extent to which the HIV message was (1) ‘extremely difficult’ to (5) ‘extremely easy to read’ ( $M = 4.33, SD = 1.01$ ) and ‘understand’ ( $M = 4.51, SD = .83$ ). These items were adapted from Kalichman and Coley (1995).

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

## **Analysis**

These data are analyzed using chi-square for categorical variables and t-tests for mean comparisons between two groups and analysis of covariance (ANCOVA) for mean comparisons involving more than two groups. For the ANCOVAs, comparisons between multiple groups are examined using pairwise comparisons with the sequential Sidak adjustment for hypothesis testing. Sequential Sidak adjustment is 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 the examination of cell differences for an interaction in ANCOVA when a covariate is included in the model. The more conservative Bonferroni correction was used for post-hoc analyses.

Mediation analysis is conducted utilizing the SPSS multiple mediation macro provided by Preacher and Hayes (2008). First, the relationship between the independent and dependent variable is established (path “c”). Next the relationships between the independent variables and each of the proposed mediators are established (path “a”). The macro then establishes the

relationships between the proposed mediators and the dependent variable (path “b”). Using these analysis procedures allows for the examination of the mediation paths ( $a*b$ ) for significance, as well as the remaining direct effect of the independent variable on the dependent variable. The coefficients for the mediators and the remaining direct effect of the dependent variable ( $c'$ ) are unstandardized OLS regression weights. This macro allows for testing of the mediation (by elaboration) of a moderated effect (the interaction of perceived risk and message exposure on intentions) when the interaction term is entered into the model as the focal predictor, treating the main effects as covariates (Hayes, 2009). For the mediation analysis, an interaction term was created by multiplying perceived risk by condition (gain & loss;  $n = 485$ ).

## Results

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 pre-test risk perceptions in order to determine whether randomization to conditions was successful. Results indicated significant differences in the distribution of Black and White women by condition ( $X^2(3, n = 1007) = 8.43, p < .05$ ). Examination of expected and observed values indicated that there was a higher proportion of Black women in the control condition (59%) than White women (41%) than would be expected by chance ( $\rho = -.03, p < .05$ ). Therefore, race is included as a covariate in all analyses. No other significant differences between conditions were detected.

### Manipulation Checks

An ANOVA treating the gain framed manipulation check as the dependent variable and condition (gain, loss, control) as the dependent variable revealed no main effect for condition, based on simple contrasts with the gain framed condition as the reference group (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

loss framed manipulation check revealed a main effect for condition ( $F(2,747) = 3.97, p < .05$ ). Simple contrasts with the loss framed group as the reference category revealed a main effect for the loss framed condition ( $M = 4.81, SD = 1.74$ ), relative to the gain framed condition ( $M = 4.40, SD = 1.74$ ) and the control condition ( $M = 4.44, SD = 1.86$ ; all  $p < .05$ ).

Two of the manipulation check items were specific to the message<sup>4</sup>, while the other two items referred to the costs/benefits of testing more generally<sup>5</sup>. T-tests were used to examine whether the distribution of participants who agreed with the message specific gain and loss framed manipulation check items differed by condition. Message specific items were recoded into dichotomous variables (1 through 3 = disagree coded as -1; 5 through 7 = agree coded as 1, excluding 4 = neither). A significantly larger proportion of women in the gain framed condition agreed with the message specific gain frame manipulation check item (81.3%) than women in the loss framed condition (71.9%;  $t(402) = 2.22, p < .05$ ). Conversely, a significantly larger percentage of women in the loss framed condition agreed with the message specific loss frame manipulation check item (74.7%) relative to women in the gain framed condition (62.8%;  $t(406) = -2.59, p < .05$ ). Taken together, these findings along with accepted standards for producing framing manipulations provide increased confidence in the framing manipulation.

There were no significant differences between conditions in terms of the readability of the gain, loss and control message ( $F(2,744) = 2.77, p > .05$ ). Similarly, no differences between conditions were detected with regard to the comprehensibility of the gain, loss and control messages ( $F(2,747) = 1.61, p > .05$ ).

### **Hypothesis tests**

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<sup>4</sup> “The HIV testing message I read highlighted the good/bad things that could happen if I get/don’t get tested for HIV.”

<sup>5</sup> I can gain/lose important health benefits if I receive/don’t receive HIV testing.”

Table 1 provides the correlation matrix for variables included in the analysis. As expected, the theoretical mediator is positively associated with the risk perceptions and intentions to seek testing. Notably, Black women demonstrate higher elaboration of message content, risk perceptions, HIV anxiety and intentions to seek testing.

---TABLE 1 GOES ABOUT HERE---

The first analysis examines the effectiveness of exposure to an HIV test promotion message condition relative to no message. An ANCOVA examining post-test intentions by condition, pre-test perceived risk status and their interaction with race as a covariate demonstrated a significant main effect for condition ( $F(3,996) = 5.02, p < .01; \eta_p^2 = .02$ ) and perceived risk ( $F(1,996) = 30.43, p < .01; \eta_p^2 = .03$ ). 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 message conditions (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 the no message control group ( $M = 2.78, SE = .08, N = 280$ ). When the comparison group was the gain framed message condition, no other significant differences between conditions were evident. Women with very low perceived risk demonstrated significantly lower intentions to seek testing ( $M = 2.83, SE = .04, n = 517$ ) relative to women with some perceived risk ( $M = 3.30, SE = .05, n = 488$ ). The interaction term for condition and perceived risk failed to reach conventional levels of significance, but was marginally significant ( $F(3,996) = 2.15, p = .09$ ).

Results of this analysis demonstrate a main effect for message exposure relative to no message, but no main effect of the loss framed message relative to the gain framed message as

would be expected based on the generally accepted interpretation of the framing taxonomy, which assumes that loss framed messages are more persuasive for detection behaviors. This analysis fails to provide support for Hypothesis 1.

Given the positive effects of exposure to the HIV testing messages, the next analysis considers whether the gain and loss framed messages produce the theoretically based hypothesized interaction (Hypothesis 2). This set of analyses requires a focus on the framed message conditions (gain and loss), excluding the control groups. An ANCOVA predicting intentions from condition, risk perceptions and their interaction, treating race as a covariate demonstrated a significant main effect for perceived risk ( $F(1,480) = 24.60, p < .05, \eta_p^2 = .05$ ), but no main effect for condition ( $F(1,480) = .34, p > .05$ ). Of particular interest in this analysis is the interaction between condition and perceived risk. As Figure 1 demonstrates, the interaction between perceived risk and experimental condition was significant ( $F(1,480) = 4.26, p < .05$ ), providing support for Hypothesis 2.

---FIGURE 1 GOES ABOUT HERE---

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 pairwise comparisons of cells using Sidak adjustment were conducted. Results failed to reveal significant differences between cells for women with high perceived risk in the gain and loss framed conditions. Hypothesis 4 was not supported (see Table 2).

---TABLE 2 GOES ABOUT HERE---

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 (Hypothesis 3). To examine this hypothesis, an ANCOVA predicting elaboration from perceived risk, condition and their interaction, controlling for race was conducted. There was a main effect for perceived risk ( $F(1,718) = 11.07, p < .001; \eta_p^2 = .02$ ) such that women who reported some perceived risk ( $M = 3.83, SE = .05, n = 351$ ) demonstrated significantly more message elaboration than women who were very low on perceived risk ( $M = 3.58, SE = .05, n = 374$ ). The interaction between perceived risk and condition was significant in this analysis ( $F(2,718) = 3.53, p < .05; \eta_p^2 = .01$ ) such that in the loss framed condition, some perceived risk was associated with increased elaboration of the message relative to the gain framed condition. Low perceived risk was associated with decreased processing among women in the loss framed condition relative to the gain framed condition. Figure 2 provides an illustration of the interaction between perceived risk and condition on message elaboration.

---FIGURE 2 GOES ABOUT HERE---

### **Post Hoc Analysis: HIV Anxiety**

Rothman & 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 involvement (as demonstrated in previous research) and as argued here, perceived risk. If this argument is accurate, other variables that promote elaborative processing should demonstrate similar interactions with message frame. To explore this possibility, an analysis was conducted examining a related measure of risk- HIV anxiety. Conceptually, HIV anxiety is close to perceived risk as operationalized in this study. HIV anxiety and perceived risk are moderately correlated, which indicates that these variables are similar, but are not confounded (Table 1).

An ANCOVA was conducted treating intentions as the dependent variable with HIV anxiety, condition and their interaction as factors with race as a covariate. Consistent with the results from the perceived risk analysis, considering gain and loss framed conditions, there was no main effect for condition ( $F(1, 479) = .85, p > .05$ ) and 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  $M = 2.66, SE = .09, n = 200$ ). The interaction between condition and HIV anxiety was significant ( $F(1, 479) = 8.45, p < .01; \eta_p^2 = .02$ ). As Figure 3 illustrates, relative to the women with some HIV anxiety in gain framed condition, intentions were enhanced among women with some perceived risk in the loss framed condition. Having no HIV anxiety suppressed intentions to seek testing among women in the loss framed condition relative to women with no HIV anxiety in the gain framed condition.

---FIGURE 3 GOES ABOUT HERE---

### **Mediation Analysis**

For the formal mediation analysis, the interaction between condition and risk perceptions was entered into the macro provided by Preacher and Hayes (2008) as the independent variable with elaboration as the mediator and intentions as the dependent variable. Experimental condition, perceived risk and race were included in the model as covariates. In this model, the direct relationship between the interaction term and the intention was significant (c path,  $B = .51, p < .05$ ). The relationship between the interaction term and the elaboration was also significant (a path,  $B = .39, p < .05$ ) as was the relationship between elaboration and intention, controlling for race, perceived risk, condition and their interaction (b path,  $B = .51, p < .05$ ). The remaining effect of the interaction on intention, controlling for elaboration and all covariates was not significant (c' path,  $B = .31, p > .05$ ). The crucial test indicated significant mediation;

the indirect effect of the interaction of perceived risk and condition through the proposed mediator ( $a*b$ ) was significantly different from zero ( $B = .20$ , 95% CI = .03, .42). 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, Hamilton, Mitchell, Kiwanuka-Tondo, et al., 2004).

There was no main effect of message condition for the loss framed message. While the framing of messages does not outperform the control HIV test promotion message in terms of effects on intentions to seek testing, it is likely that messages in the communication environment are often presented in terms of positive and/or negative frames. Thus, it is of theoretical interest to understand the routes through which the framing of messages in terms of gain and losses influences intentions to act. According to the taxonomy provided by Rothman and Salovey (1997), 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 (relative to each other), dependent on risk perceptions. The significant interaction term revealed that among women with some perceived risk, the loss framed message was more effective

relative to the gain framed message. Whereas, among women with low perceived risk, gain framed message was more effective relative to the loss framed message. These results are also 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 among women in the loss framed condition, the message was significantly more persuasive for women with some HIV anxiety whereas the gain framed message was more persuasive among women with no HIV anxiety. Evidence of an interaction, which is identical in nature and effect size with different, but 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 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 in the construction of health communication campaign messages, targeting of messages may be more appropriately based on risk perceptions with regard to performance of the behavior.

The expectation that women with the some perceived risk would demonstrate significantly more effortful processing of the message relative to the very low perceived risk group was also supported. Furthermore, this analysis demonstrates that the interactive effects of perceived risk and message condition exposure are mediated through message elaboration. The mediation analysis suggests that women with some perceived risk reported more elaborative

processing of the loss framed message relative to gain framed message, with a reversal of frame effectiveness among women with low perceived risk. If people who associate little risk with the behavior are less likely to effortfully process the message, those individuals may rely on heuristics in the processing of message. In the case of this disease detection behavior, it may be the case that the efficacy of the gain framed message among women with low perceived risk is the consequence of heuristic processing of the positive language. According to Rothman & Salovey (1997) "the positive affect elicited by a gain-framed appeal may be ascribed to the behavior in question, thus resulting in greater compliance with the message" (pg. 14). This finding has implications for persuasion. 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 framed messages may be differentially effective in terms of the duration of the effect and the extent to which intentions are translated in to behavior. For example, if intentions that are formed under conditions of relatively higher elaboration should be more enduring, resistant to change and likely to result in message consistent behavior (Petty & Cacioppo, 1986), women with some perceived risk who are exposed to a loss framed message should demonstrate 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 risk, who are more likely to be affected by the gain framed message.

While this study provides strong evidence for the moderating effect of perceived risk in the framing taxonomy, 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, 1975) and in the context of sexual health behaviors, intentions have been moderately correlated with behavioral outcomes (Albarracín, Fishbein, Johnson & Muellerleile, 2001

A related limitation has to do with a single exposure. It is plausible that effect sizes are underestimated, given that gain and loss framed messages are likely abundant in the everyday media environment. A longitudinal design with multiple message exposure instances would be better equipped to enhance the external validity of these findings. 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.

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 findings are consistent with the contentions of Rothman and Salovey (1997) insofar as the effects of message frame were reversed, dependent upon the amount of risk associated with the behavior. Further, this effect was mediated by message elaboration. 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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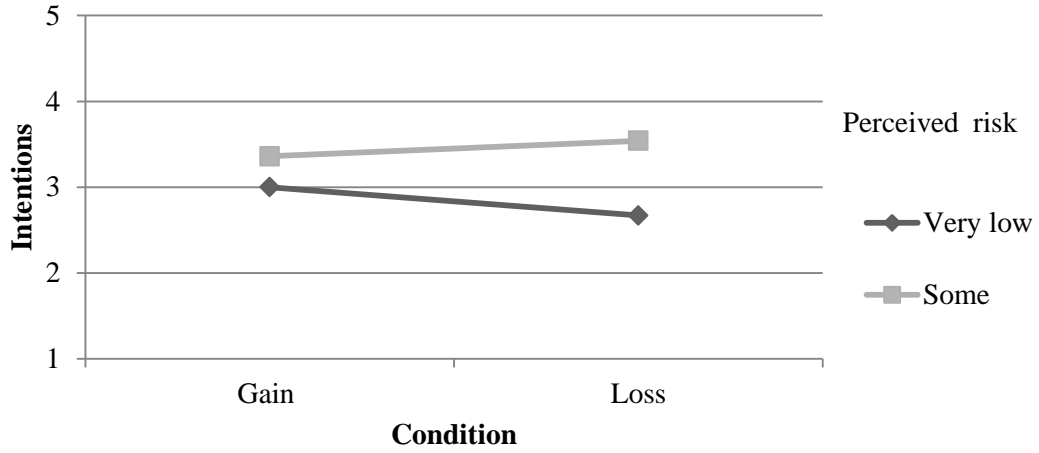


Figure 1. Post-test intentions by condition and perceived risk

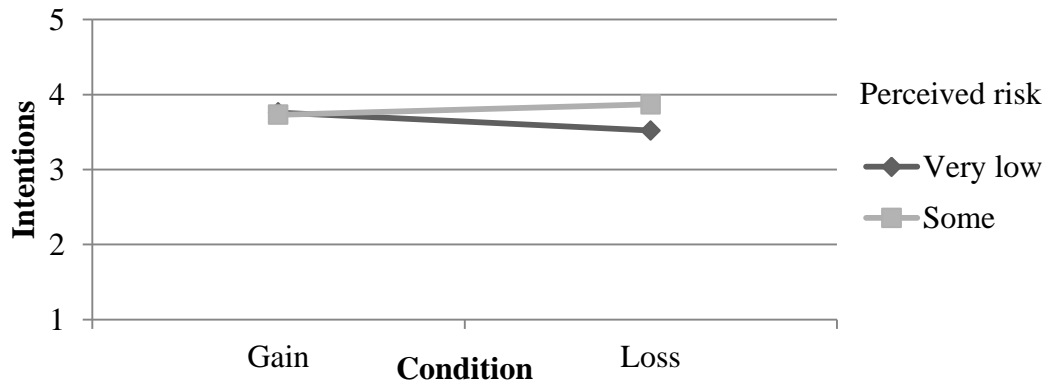


Figure 2. Means for message elaboration by perceived risk and condition

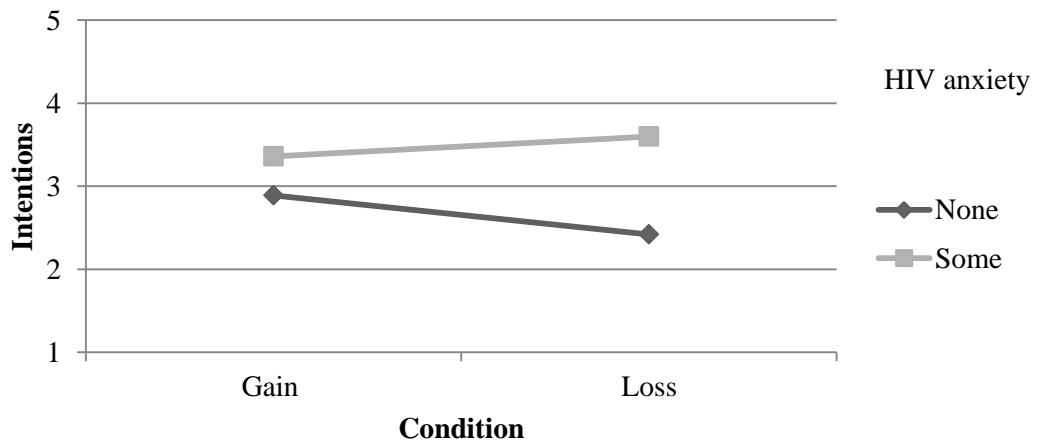


Figure 3. Post-test intentions by HIV anxiety and condition

	Perceived risk	HIV anxiety	Elab.	Race
Perceived risk	1			
HIV anxiety	.52***	1		
Elaboration	.14***	.22***	1	
Race	-.07*	-.09**	-.23***	1
Intention (post-test)	.19***	.29***	.46***	-.42**

Notes: \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ ; Perceived risk & HIV anxiety = dichotomy; Race 1= Black 2= White

Table 1. Correlation matrix for study variables

Condition	Perceived risk	Mean <sup>*</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

\*Covariates: race = 1.5196; Means with differing subscripts are significantly different at the  $p < .05$  based on pairwise comparisons with Sidak adjustment

Table 2. Estimated marginal means for post-test intentions by pre-test condition and perceived risk