Published in final edited form as:

J Health Commun. 2015 February ; 20(2): 230–236. doi:10.1080/10810730.2014.920062.

The Impact of Brief Messages on HSV-2 Screening Uptake Among Female Defendants in a Court Setting: A Randomized Controlled Trial Utilizing Prospect Theory

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Abstract

Epidemiologic data demonstrate that women involved with the criminal justice system in the United States are at high risk for sexually transmitted infections, including herpes simplex virus type 2 (HSV-2). Female defendants were recruited from a misdemeanor court to assess whether brief framed messages utilizing prospect theory could encourage testing for HSV-2. Participants were randomly assigned to a message condition (gain, loss, or control), completed an interviewer-administered survey assessing factors associated with antibody test uptake/refusal and were offered free point-of-care HSV-2 serologic testing. Although individuals in the loss-frame group accepted testing at the highest rate, an overall statistical difference in HSV-2 testing behavior by group ($p = .43$) was not detected. The majority of the sample (74.6%) characterized receiving a serological test for HSV-2 as health affirming. However, this did not moderate the effect of the intervention nor was it significantly associated with test acceptance ($p = .82$). Although the effects of message framing are subtle, the findings have important theoretical implications given the participants' characterization of HSV-2 screening as health affirming despite being a detection behavior. Implications of study results for health care providers interested in brief, low cost interventions are also explored.

Herpes simplex virus type 2 (HSV-2) is a highly prevalent sexually transmitted infection; approximately one in six U.S. adults are HSV-2 seropositive (Centers for Disease Control and Prevention, 2010). Consequences of infection include recurrent genital ulcers, neonatal herpes (Corey & Wald, 2009), psychological distress linked to outbreak reoccurrence and

disclosure of serostatus (Merin & Pachankis, 2011), and a two- to fivefold increased risk for HIV-1 acquisition (Brown et al., 2007; Freeman et al., 2006; Wald & Link, 2002). Despite the prevalence of this condition, up to 90% of seropositive individuals are asymptomatic and unaware of their status (Wald et al., 2000). These persons may not have cues to modify sexual behavior or seek treatment but are still capable of transmitting the infection through genital tract viral shedding (Tronstein et al., 2011; Wald et al., 2000). Therefore, the identification of asymptomatic seropositive individuals through improved coverage of testing is an important starting point for interventions aiming to curb transmission. HSV-2 seropositive individuals, realizing they are infected, could implement behavioral strategies to curb transmission such as disclosing HSV-2 serostatus, using condoms, or beginning suppressive therapy (Corey et al., 2004; Martin et al., 2009; Wald et al., 2001; Wald et al., 2006). Despite the magnitude of HSV-2 and related morbidities, interventions to increase HSV-2 testing behavior remain understudied.

Given the potential benefits of early disease recognition, messages that encourage testing are an integral part of any health promotion campaign. Prospect Theory, which examines decisional strategies in situations where uncertainty occurs, posits that individual decision-making is based on the evaluation of probabilities and the likelihood of outcomes (Tversky & Kahneman, 1981). Empirical tests of Prospect Theory initially used framed probability statements to examine decision making when individuals were presented with a hypothetical public health problem. In the classic example, participants chose between two programs developed to combat a disease outbreak (Tversky & Kahneman, 1981). In one experiment, two programs were presented to research participants (in Program A, 200 people will be saved and in Program B, there is a one-third probability that all 600 will be saved and a two-thirds probability that none will be saved). In the second experiment, another set of programs is presented (in Program C, 400 people will die and in Program D, one third probability that nobody will die, and two-thirds probability that 600 people will die). Participants avoided taking risks (i.e., they selected the certain option) when potential gains (presented as lives saved or not saved) were made salient, but were willing to take risks (i.e., they selected the uncertain option) when losses were emphasized (presented as deaths avoided or not avoided), even though the information presented in the messages was factually equivalent. Consequently, the authors determined that messages can be manipulated to impact an individual's willingness to make decisions under conditions of certainty (when the message should emphasize the desirable outcome; i.e., gains) or uncertainty (when the message should emphasize the undesirable outcome; i.e., losses).

Because of Prospect Theory's potential utility in predicting health behavior, Rothman and Salovey (1997) adapted it for personal health decision-making applications. They characterized preventive behaviors, such as using suntan lotion to prevent sunburn and sun exposure that may cause skin cancer, as health affirming—having relatively low or no associated risks (Detweiler et al., 1999). When performing health-affirming behaviors, individuals are hypothesized to be risk averse and to respond better to gain-framed appeals that emphasize the benefits of compliance (O'Keefe & Jensen, 2007). Conversely, diagnostic procedures such as a mammogram or Pap testing, are labeled as illness detecting because of the potential risk individuals may discover ill health (Apanovitch, McCarthy, & Salovey, 2003; Banks et al., 1995; Meyerowitz & Chaiken, 1987). When the outcome is

uncertain, loss-framed appeals that emphasize negative health effects of nonperformance should more effectively encourage behavior (O’Keefe & Jensen, 2009).

Several objections of Prospect Theory research have been raised. In most message framing research, *situational uncertainty* is inaccurately operationalized (Cox, Cox, & Zimet, 2006). In Tversky and Kahneman (1981), risk arising from a situation where the outcome is ambiguous or unknown is characterized as uncertain, not inherently negative. However, many health applications equate risk with the possibility of hearing bad news. Second, many framing studies fail to include a control group. Comparing only gain framing to loss framing cannot determine whether either approach is better than no framing. Third, many studies fail to use a manipulation check that assesses whether participants perceived a given message as gain framed or loss framed. Last, most research fails to evaluate how participants perceive the targeted health behavior, assuming that all health-protective behaviors would be seen as not risky and that all detection behaviors would be seen as risky. Although the outcome of health detection behaviors, such as diagnostic procedures, may be uncertain (e.g., the participant does not know whether a test will be positive or negative), it is important to note that situational ambiguity may only be internalized as risky if the participant believes that he or she is (a) susceptible to the condition and (b) the condition is undesirable.

This article describes a study that attempts to address these limitations through the use of a randomized design that includes a control group, while also measuring for the potential moderating effect of message congruency (when a participant receives a message that matches, or is congruent with, their characterization of testing as either being health-affirming or illness detecting). We hypothesized that (a) the loss-framed messages would more effectively encourage uptake of the HSV-2 screening test, given the outcome of the behavior (i.e., HSV-2 seropositivity) is uncertain; and (b) individuals who received a message congruent with their perception of the behavior would be more likely to accept testing. Observation of a moderation effect for message congruency would explain more of the variance in testing behavior than that explained by the message framing alone.

Method

Study Site

Participants were recruited from The Indianapolis Community Court, a free-standing, neighborhood-based court handling misdemeanor criminal cases. The court’s focus on connecting defendants with needed health and social services offered a unique opportunity for public health intervention and research with high-risk individuals involved in the criminal justice system. Epidemiologic data demonstrate that these individuals are at high risk for adverse sexual health outcomes (Centers for Disease Control and Prevention, 2009; Flanigan et al., 2010; Hammett, Harmon, & Rhodes, 2002). From September 2009 to 2010, the Indianapolis Community Court adjudicated approximately 2,700 cases. Women comprised 21% of all defendants; the two most common charges for arrest were public intoxication and prostitution. Intoxicated individuals and women engaging in sex work may be particularly vulnerable to STI/HIV because of the likelihood of engaging in multiple concurrent unprotected sexual relationships, and increased sexual risk taking with limited agency to use condoms. The present study builds upon collaborative efforts between

academic researchers, the local public health department, and the judicial system that aim to increase access to testing court-involved women (Roth et al., 2012).

Procedure

A female co-investigator (A.M.R.) approached women in the waiting room outside of the public defender's office. Female defendants were taken to a private space and informed about the study purpose and procedures. Consenting participants were randomized to one of three conditions (control, gain-framed, or loss-framed), completed an interviewer-administered questionnaire, were offered a no-cost test for HSV-2 with results available within 20 min, and were compensated US\$20 for their time. HSV-2 testing was performed using the HerpeSelect Express assay which has sensitivity and specificity of 93.4% and 92.4%, respectively (Focus Diagnostics, 2007). All participants received posttest counseling. Individuals testing HSV-2 antibody positive were offered a 90-day prescription of suppressive medication and were referred to their primary care physician for continued treatment. All procedures were approved by the Indiana University Institutional Review Board.

Measures

Scales and items were developed based on health belief theories and prior empiric research on HSV-2 test acceptance (Zimet et al., 2004). Demographic data included age, ethnicity, race, and education level. Participants indicated whether they had ever had any of the following nine STI or STI-related conditions: chlamydia, gonorrhea, syphilis, trichomonas, cervical dysplasia, genital warts, HIV/AIDS, pelvic inflammatory disease, or genital herpes. A response of *yes* to one or more items was considered indicative of a history of STI. Participants were also asked whether they were currently experiencing genital symptoms (*yes/no*). Recent health care utilization was assessed by asking participants to identify what routine health screens they had received within the past 36 months.

Genital herpes knowledge was measured using 13 true/false items addressing a broad range of issues, including modes of HSV-2 transmission, symptoms, treatment, and reoccurrence. Key constructs from the Health Belief Model were also measured (Rosenstock, 1974). The Health Belief Model theorizes health behavior results from an individual's perceived threat of a particular health condition (i.e., the likelihood of acquiring the condition and the perceived severity of the condition), tempered by his or her perceived ability to positively affect that condition through his or her behavior (in this case through testing and, if positive, taking suppressive therapy), and his or her perception of the negative consequences associated with the behavior (e.g., costs of testing, fears about disclosure of serostatus, and hassles of medication taking if positive). Thirteen items with 5-point response scales ranging from 1 (*strongly disagree*) to 5 (*strongly agree*) were adapted from previous research on herpes (Zimet et al., 2004) to capture key constructs from the Health Belief Model, including perceived severity of a genital herpes infection (seven items; $\alpha = 0.84$; e.g., "Having genital herpes is as bad as having cancer"), perceived susceptibility to infection (four items; $\alpha = 0.80$; e.g., "There are things that I have done that could have led me to get infected with genital herpes"), and perceived benefits of being tested for genital herpes (two items; $\alpha = 0.63$; e.g., "Getting a test for genital herpes would be an important part of taking

care of my health”). In addition, five items (Zimet et al., 2004) measured the likelihood that having HSV-2 would impede initiating or sustaining romantic relationship ($\alpha = 0.85$; e.g., “It would be difficult to meet a boyfriend/husband if I had genital herpes”). We also measured participants’ characterization of being tested for HSV-2 as either “health affirming” or “illness detecting.” Participants indicated whether their decision to get HSV-2 testing would be influenced by “thinking that you have a problem and wanting proof” versus “thinking that you did not have a problem but wanting proof.” Responses indicating “have a problem” were coded as “illness detecting” and those indicating “did not have a problem” were coded as “health affirming.”

The intervention messages, which were read aloud to the participants prior to offering them the free, point-of-care HSV-2 test, are depicted in Table 1. Probability statements were developed based on findings from a study that found that approximately 25% of individuals who were tested for HSV-2 at a local public health department sexually transmitted disease clinic tested seropositive (Fife et al., 2009). We anticipated the burden of disease in this population would be slightly higher. Therefore, we hypothesized approximately 70% of participants would test negative and amended the probability statements accordingly. For all analyses, the outcome measure was uptake of point-of-care genital herpes testing (elected to receive testing versus chose not to be tested).

Statistical Methods

Group comparisons were assessed using chi-squared tests (categorical variables) and independent-samples *t* tests (continuous variables). Binary logistic regression was used to assess whether the intervention predicted HSV-2 test acceptance and whether message congruency moderated this effect. Forward stepwise procedures were then performed to identify significant independent predictors. All analyses were performed using SPSS 19.0.

Results

Descriptive Statistics

Subject identification is depicted in Figure 1. One hundred fifty-two female defendants completed the interviewer-administered survey. Eight women indicated they had a history of genital herpes and their data was excluded from all analysis. Intervention group assignment was not recorded for one participant. Her data was also excluded from analysis. After removing these subjects from the sample, 143 participants remained. Of these, 44 were randomized to the control group, 51 to the gain-frame group and 48 to the loss-frame group using a random number generator. Their baseline demographic, sexual health/behavioral, and attitudinal data are presented in Table 2. There were no statistically significant differences across any of these variables between the groups indicating the randomization process was successful.

Intervention Effects

Individuals in the loss-frame group accepted the test at a higher rate than persons in the gain-framed or control group (72.9%, 67.0%, and 61.4%, respectively; see Table 3). There was not an overall statistical difference in HSV-2 testing behavior by intervention group (*p*

<.43). As the results suggest, however, the loss-framed group came closer to reaching significance (compared to the no-framed group: $p < .25$) than did the gain-framed group ($p < .95$). Because the loss-framed effect came closer to statistical significance, we conducted a post hoc power analysis to determine the necessary number of participants required for the randomized controlled trial to be able to detect an effect size of $\omega = .12$ (the proportional difference in uptake between the loss-frame and control group) with 80% power. Given the observed effect size, the study was underpowered to detect the small, but clinically meaningful effect size identified in this study. Assuming that the effect size would stay constant, a total sample size of approximately 550 participants across the three groups would be required to detect statistical significance ($p < .05$) at 80% power (Fleiss, 1981).

HSV-2 Characterization and Message Congruency

We hypothesized that each participant's characterization of being tested as either health affirming or illness detecting and message congruency (the frame being matched to the characterization) would moderate the effect of the intervention. Specifically, we theorized that participants whose characterization of HSV-2 testing was health affirming (i.e., "did not have a problem and want proof") would respond better to the gain-framed probability statement (30% odds of testing positive) and those characterizing HSV-2 testing as illness detecting (i.e., "have a problem and want proof") would respond better to the loss-framed probability statement (70% odds of testing positive). The majority of the sample (74.6%) characterized receiving a serological test for HSV-2 as health affirming. Characterization of the test was not significantly associated with test acceptance ($p < .82$). Although characterization of the test was not independently predictive of uptake, we ran a moderation model to assess the differential impact of message congruency. However, we detected no statistical difference in HSV-2 testing behavior by intervention group when the participant received a message that matched their characterization of the behavior (as being either health affirming or illness detecting). While not statistically significant, loss-framed messages were more strongly associated with the odds of receiving testing across both groups.

Discussion

When offered for free, the HSV-2 point-of-care test was widely accepted (65.7%) by this population of women at high-risk for STI, a finding consistent with a study of STD clinic patients (Zimet et al., 2004). Receiving a brief framed message was not associated with a higher rate of test uptake nor was an individual's assessment of the test as being either health-affirming or illness-detecting. This set of findings suggests that the effects of message framing—if any—are relatively small. Higher acceptance HSV-2 testing acceptance rates in response to both loss-framed and gain-framed messages suggests that provision of any additional outcome information improves testing uptake.

The subtle effect of message framing we detected is in sharp contrast with other studies of Prospect Theory (Rothman & Salovey, 1997). These studies differ from ours in several key features. First, the majority use a hypothetical situation in which participants are asked to differentiate between two theoretical outcomes whereas in our study we measure the impact

of messages on behavior (e.g., whether the participant accepts point-of-care genital herpes testing). Second, these studies occur in controlled environments, such as a laboratory or classroom. Our study was set in a busy urban court, participants were approached while waiting for court to begin, and the interviews occurred in a private space that was still within earshot of the waiting room; time constraints and auditory distractions may have discouraged some individuals from participating and others from being tested. Last, future research may be needed to determine whether message congruency—when a participant receives a framed message that matches his or her beliefs about the behavior—does impact behavior.

The majority of participants in this high-risk sample (74.6%) viewed this detection behavior as health affirming, not disease detecting. In this sample, the mean perceived susceptibility score was not particularly high ($M=10.65$; range =4–20) despite the majority of participants reporting a variety of sexual risk behaviors that could increase their chances of contracting HSV-2 such as lifetime number of sexual partners (58% reported 10 or more) and sexual partners over the preceding 90 days ($M=3.23$, $SD=2.52$). Moreover, women in this sample were relatively knowledgeable about HSV-2 transmission and treatment (mean score =9.91, range =0–13). However, knowledge and sexual risk behaviors were not associated with a perception that HSV-2 testing is an illness detecting behavior. This set of findings challenges the premise that uncertainty faced by individuals during diagnostic testing is inherently perceived as being risky or perilous. This argues for a priori assessment of an individual's perceptions of susceptibility to a condition, rather than assuming high perceived susceptibility.

In addition, finding that uncertainty is not inherently perceived as perilous raises some concerns about the applicability of Prospect Theory to primarily asymptomatic conditions. Perhaps given the majority of our participants had no physiological cues to suspect an infection (less than 20% were experiencing genital symptoms), their characterization of the test as health affirming is reasonable. If the moderation effect had an effect on the efficacy of the intervention, there would have been converging evidence for the framework offered by Rothman and Salovey (1997). However, in this study, the loss-frame message more effectively encouraged behavior regardless of the participant's characterization of testing. Whether this is due to the limited power of this pilot research or whether the application of prospect theory to asymptomatic conditions should be revised warrants further study.

Despite the strengths of the design, these results need to be considered with several caveats. This study explored whether brief framed messages, on the basis of Prospect Theory, could encourage genital herpes testing among female defendants. Participants represent a small subsection of women involved in the justice system within a single geographic locale. Therefore, our sample is not representative of women in other corrections settings or cities. Our analysis may be subject to a ceiling effect given high rates of uptake among this sample. Although we found no statistical differences between the groups, post hoc power analysis revealed that our sample was underpowered to detect a small effect size that may nonetheless be clinically meaningful. When we left the proportional differences between the groups the same and theoretically expanded our sample to 572 individuals (the original data set replicated four times), there was a significant difference between groups in the

hypothesized direction. Loss-frame messages more effectively encouraged detection behaviors regardless of the participant's characterization of the test. Future research should continue to include an assessment of the participant's characterization of the behavior as opposed to arbitrary assignment. Our findings demonstrate that the participant's characterization may not be congruent with what is expected. Last, it may be important to explore issues of numeracy when using probability statements with populations with lower educational attainment. The majority of the participants in this study (>85%) had a high school or equivalent education but that does assure their ability to correctly interpret statistical health information. Future studies should include assessments of numeracy as a potentially important construct in how participants comprehend and process probability statements regarding health issues. Furthermore, graphical representation of probabilistic information may help to enhance understanding among individuals with limited numeracy.

Despite the limitations, our findings illustrate how Prospect Theory can be utilized to encourage behavior among an at-risk population. Although this study was underpowered to detect the small effect of our intervention ($\omega = .12$), if subsequent larger studies show statistical significance, these messages may still have some utility for providers interested in brief, low-cost interventions to encourage testing behavior. Individuals in the loss-frame group accepted the test at a higher rate than did persons in the gain or no-framed group (72.9%, 67%, and 61.4%, respectively). Although this was not a statistically significant difference, a 10% difference in uptake may be clinically meaningful for providers. If future research demonstrates a significant effect for loss-framed messages, incorporation of these messages in clinical settings into risk-based counseling, which would require very little time or effort, could increase uptake of voluntary testing.

Acknowledgments

The authors acknowledge the support of Indiana University School of Public Health-Bloomington Faculty Research Support Program, Indiana University School of Medicine Infectious Disease Laboratory & Division of Adolescent Medicine, and the Indianapolis Community Court.

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Fig. 1.
Subject identification. HSV-2 =herpes simplex virus type 2.

Table 1

Persuasive messages

Group and message
Gain frame
Today you have the opportunity to be tested for genital herpes for free. You will be tested using blood obtained from a finger stick and will receive your results within 30 minutes. Based on the best information that we have, we think there is about a 70% chance that the test will show that you do not have herpes.
Loss frame
Today you have the opportunity to be tested for genital herpes for free. You will be tested using blood obtained from a finger stick and will receive your results within 30 minutes. Based on the best information that we have, we think there is about a 30% chance that the test will show that you do have herpes.
Control
Today you have the opportunity to be tested for genital herpes for free. You will be tested using blood obtained from a finger stick and will receive your results within 30 minutes.

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Table 2

Baseline characteristics, by study group

Variable	Overall sample (N =143)	Control group (n =48)	Gain-frame group (n =51)	Loss-frame group (n =44)	p
Age	32.84 (1.91)	32.86 (1.60)	34.41 (1.50)	31.15 (1.60)	.33
Ethnicity					
Latino	4.9	6.8	2.0	6.3	.49
Race (%)					
Non-Black	55.2	59.1	49.0	58.3	.54
Black	44.8	40.9	51.0	41.7	
Highest level of education					
Less than high school	7.1	4.5	8.3	8.3	.30
High school or equivalent	77.9	75.0	72.9	85.4	
College or beyond	15.0	20.5	18.8	63.3	
Employment					
Unemployed	74.1	81.8	70.6	70.8	.38
Arrested on prostitution charge (n =34)	22.4	22.7	23.5	20.8	.95
Received preventative health screen within 36 months	74.8	75.0	72.5	77.1	.87
Lifetime sex partners					
1–5	19.6	15.9	19.6	22.9	
6–10	22.4	25.0	18.8	23.5	
More than 10	58.0	59.1	56.9	58.3	.90
Sex partners within 90 days	3.25 (0.21)	3.25 (0.42)	2.82 (0.23)	3.71 (0.43)	.22
History of STD diagnosis	71.3	68.2	72.5	72.9	.86
Current genital symptoms	16.8	13.6	21.6	14.6	.52
HSV-2 knowledge score (0–13)	9.91 (0.10)	9.60 (0.18)	10.0 (0.16)	10.16 (0.16)	.06
HSV-2 health beliefs					
Perceived susceptibility (4–20)	10.65 (0.32)	10.41 (0.54)	10.34 (0.52)	11.21 (0.59)	.46
Perceived severity (7–35)	20.25 (0.50)	19.95 (0.95)	19.82 (0.65)	20.98 (1.0)	.56
Perceived benefits (2–10)	8.93 (0.08)	8.95 (0.13)	8.74 (0.14)	9.10 (0.14)	.17
Characterization of HSV-2 test					
Health affirming	74.6	86.4	72.5	66.0	.075

Variable	Overall sample (N =143)	Control group (n =48)	Gain-frame group (n =51)	Loss-frame group (n =44)	p
Disease detecting	25.4	13.6	27.5	34.0	

Note. Group comparisons were conducted with chi-square (categorical variables) and independent-samples *t* tests continuous variables. Data are expressed as mean (SE), *p* = .08.

Table 3

Test acceptance, by study group

Variable	Overall sample (N =94)	Control group (n =27)	Gain-frame group (n =32)	Loss-frame group (n =48)	p
Accepted test	65.7%	61.4%	67.0%	72.9%	.43

Note. Group comparisons were made with chi-square.