

## ABSTRACT

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DIARY STUDY OF MEN WHO HAVE SEX  
WITH MEN

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Men who have sex with men (MSM) are disproportionately affected by HIV. Although some theoretical models created to explain why individuals engage in risky sexual behavior contain an affective component, there has been relatively little focus on the influence of affect on sexual risk-taking. The goal of this study is to investigate the relationship between affect and condom use in men who have sex with men (MSM) in an archival dataset from a survey of users of a popular sex-oriented website. Multilevel modeling was used to analyze daily diary data from 2,871 MSM. At the within-person level, positive affect was positively related to risk-taking, whereas negative affect was negatively related to risk-taking. However, these results were qualified by interactions of trait affect and relationship to sex partner. These findings suggest that interventions focused on emotional regulation may have the potential to reduce sexual risk taking among MSM.

AFFECT AND CONDOM USE IN A DAILY DIARY STUDY OF MEN WHO  
HAVE SEX WITH MEN

By

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## Chapter 1: Introduction

The goal of this study is to investigate the relationship between affect and condom use in men who have sex with men (MSM) in an archival dataset from a survey of users of a popular sex-oriented website. Using short daily surveys, MSM were asked to report on aspects of their daily sexual behavior, including condom use during insertive and receptive anal intercourse, as well as their affect, for a period of 30 days. This study will examine the relationship between positive and negative affect and condom use at the within-person level, as well as explore trait affect and relationship to partner as potential moderators of this relationship.

The number of new HIV infections in young people aged 13 to 29 years increased by 21% from 2006 to 2009. This alarming increase is fueled by a 34% increase in new HIV infections among gay and bisexual men (Centers for Disease Control and Prevention [CDC], 2012a). Although MSM represent only about 4% of the male population in the United States, MSM accounted for 78% of the new HIV infections among males in 2010 (CDC, 2012b). MSM also accounted for 63% of all primary and secondary syphilis cases in the United States in 2008 (CDC, 2010). MSM are disproportionately affected by HIV and other sexually transmitted infections (STIs), and prevention is a serious concern in this population.

The disturbingly high rate of HIV incidence among MSM has spurred much research dedicated to identifying factors that promote sexual risk behaviors. Several theoretical models, including Theory of Reasoned Action (Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975), Theory of Planned Behavior (Ajzen, 1985, 1988), Social Cognitive Theory (Bandura, 1986), Health Belief Model (Becker, 1974; Janz and

Becker, 1984; Rosenstock, 1974), AIDS Risk Reduction Model (Catania et al., 1990), and the Information-Motivation-Behavioral Skills Model (Fisher et al., 1994, 1996), have attempted to explain why individuals engage in sexual behavior which puts them at risk for HIV infection. These models, however, are largely focused on cognitive-informational bases of behavior. Although some components of certain theoretical models contain an affective component, there has been relatively little focus on the influence of affect on sexual risk-taking behavior (Kalichman & Weinhardt, 2001; Marks, Bingman, & Duval, 1998; Mustanski, 2007).

McKirnan, Ostrow, and Hope (1996) highlighted this deficit in psychosocial models of HIV risk behavior, which tend to emphasize variables such as knowledge, attitudes, behavioral intentions, or perceptions of others. These models assume that people behave as “rational operators,” such that knowledge and attitudes affect behavior in a straightforward fashion, which may not be appropriate for behaviors as emotionally charged as sexual behavior. Sexual risk-taking behavior cannot be completely understood through cognitively based constructs because this ignores the non-rational component of this behavior. The authors posit that this “non-rationality” could be influenced by a number of factors, which include “emotional states that distort perceptions of personal vulnerability” (McKirnan, Ostrow, & Hope, 1996, p. 3).

Furthermore, Mustanski (2007) pointed out that, “If affective factors promote engagement in HIV risk behaviors, then interventions that target these affective states directly, or teach individuals techniques to increase their self-regulatory strength while in these affective states, may help to reduce rates of HIV transmission” (p.



618). The proposed study addresses this neglected area of research by focusing on affective states and their association with condom use in men who have sex with men.

### *Affect and Risk Taking*

The relationship between affect and risky decision-making has been explored in previous research; however, a consensus on the association of affect and risk-taking has not been reached. Research points to two possible components of risk-taking that could be influenced by the experience of positive affect: perceived probability, such that positive affect reduces perceptions of risk; and subjective utility, such that positive affect increases the expected impact of a negative outcome of risk-taking (Nygren, Isen, Taylor, & Dulin, 1996). Nygren and colleagues (1996) acknowledged these contradictory effects of positive affect on risk-taking, but asserted that positive affect will ultimately result in less risk-taking behavior.

Research on the relationship between negative affect and risk-taking has similarly yielded mixed results. Although some research has shown that negative affect was related to a global increase in judged frequency of risk (Johnson & Tversky, 1983), and would thus lead to less risky behavior, other research has shown that negative affect resulted in high risk taking (Leith & Baumeister, 1996). Leith and Baumeister did not find evidence that negative affect causes a change in subjectivity utility (as with positive affect); however, they did find support for the hypothesis that negative affect leads to impaired self-regulation, which, in turn, increases impulsive and irrational decision-making.

### *Affect, Sexuality, and Sexual Risk-Taking*

Research has demonstrated a relationship between affect, sexual behavior, and sexual risk-taking in heterosexual men. One study found that although the majority of heterosexual men reported decreased sexual interest when depressed or anxious, a sizable minority (20.6%) experienced increased sexual interest when anxious (Bancroft, Janssen, Strong, Carnes, Vukadinovic, & Long, 2003a). Qualitative data from this study revealed that sex was believed to serve needs of intimacy and validation when feeling depressed, and that sexual release can have a calming effect when feeling anxious. A second study found that although men who reported increased sexual interest in states of depression tended to have more partners within the past year and more lifetime one night stands, increased sexual interest in states of depression did not predict number of partners with whom condoms were not used (Bancroft, Janssen, Carnes, Goodrich, Strong, & Long, 2004).

Research has also indicated a relationship between affect, sexual behavior, and sexual risk-taking in MSM, although findings are complex and sometimes contradictory. In a meta-analysis, Crepaz and Marks (2001) found little evidence that negative affect was related to increased sexual risk-taking behavior. However, in their review of this meta-analysis, Kalichman and Weinhardt (2001) suggest that the lack of evidence for an association between negative affect and sexual risk behavior is likely due to the fact that these studies investigated this relationship using cross-sectional, between-person designs, and are thus insensitive to within-person associations. Cross-sectional research designs make it impossible to determine a temporal association between affect and sexual behavior. Additionally, previous

studies have used global measures of current or recent affective states in relation to sexual behaviors practiced at an earlier time, making it more difficult to gain an accurate narrative of the relationship between affect and sexual risk taking.

Although Crepaz and Marks' (2001) meta-analysis revealed no relationship between negative affect and sexual risk-taking, other studies have found relationships between anxiety, depression, and sexual interest in MSM, which could have implications for sexual-risk taking behavior. Like heterosexual men, most MSM in one study reported decreased sexual interest when feeling depressed or anxious, although some men reported increased sexual interest when experiencing negative affect (Bancroft, Janssen, Strong, & Vukadinovic, 2003). The participants in this study also had similar reasons for having sex when depressed: "Increased sexual activity when depressed was...in some cases explained as a need for contact with or validation from another person" (Bancroft, Janssen, Strong, & Vukadinovic, 2003, p. 240). Like heterosexual men, sex was also seen as a way to alleviate the anxiety. Fourteen percent of gay men in this study also reported reduced concern about sexual risk when depressed. In another study, unprotected anal intercourse (UAI) was more likely in MSM who had low trait anxiety, whereas high numbers of casual partners and frequent cruising were associated with increased sexual interest in states of depression (Bancroft, Janssen, Strong, Carnes, Vukadinovic, & Long, 2003b).

Mustanski (2007) conducted one of the few studies exploring the within-person relationship between daily affect and HIV risk behavior in MSM. He examined the influence of positive affect, negative affect, and anxious affect on several variables related to HIV risk; in addition, trait affect was examined as a

moderator of these relationships. Results indicated that state positive affect was negatively associated with behavioral risk (e.g., unprotected insertive or receptive anal intercourse), but was not associated with partner-related risk (e.g., having a partner who has many sex partners, uses IV drugs, is infected with HIV, or has another sexually transmitted disease). The author attributed these findings to the probability and utility explanations for positive affect's influence in risk-taking behavior:

When in high PA states, people may be more likely to consider sexually transmitted infections (STIs) and HIV as dangerous or damaging (Isen et al., 1988), although their perceptions of the probability of infections may be shifted toward perceiving themselves as safer from infection (Johnson & Tversky, 1983; Nygren et al., 1996)... high PA may induce avoidance of risk behaviors because of the salience of the negative aspects of infection, but it may not influence selection of sex partners because risk may be conceptually linked to behaviors and not to partners (p. 624).

Results also revealed that state anxious affect was positively associated with behavioral risk. In addition, trait anxious affect moderated the relationship between state anxious affect and partner-related risk, such that those with high trait anxiety were less likely to engage in partner-related risk when experiencing state anxiety, and the opposite pattern was found for those with low trait anxiety. State negative affect was not related to any HIV risk outcome variables in this study.

Mustanski (2007) attributed the positive relationship between anxiety and sexual risk-taking found in this study to the fact that perhaps the “keyed up” aspect of anxiety could be linked to feelings of excitement that could potentiate risky behavior. However, he does not indicate a reason for the moderation of state anxiety by trait anxiety based on previous research. There are several possible reasons why, contrary

to hypothesis, Mustanski (2007) did not find any effects of negative affect on sexual risk-taking behavior. The first is that, although this study did investigate trait affect as a moderator of the relationship between state affect and sexual risk-taking, only interactions between the same trait and state affect were investigated (e.g., the interaction between trait positive affect and state positive affect was investigated, but not the interaction between trait positive affect and state negative affect). Therefore, it may have appeared that there was no relationship between negative affect and sexual risk-taking when in fact this relationship simply differs across participants, depending on individuals' trait affect.

For example, individuals with high trait positive affect (e.g., those who tend to be happy) may exhibit more sexual risk-taking when experiencing state negative affect (e.g., feeling depressed one day), because distress is especially discrepant from their typical experience and thus more likely to cause impaired self-regulation. In contrast, individuals with high trait negative affect (e.g., those who tend to be depressed) may have no increase in sexual risk-taking when experiencing state negative affect because a spike in distress does not represent a marked change from their usual mood. These state by trait affect interactions could cause the main effect of state negative affect on sexual risk behavior to appear nonsignificant. To address this, the current study will investigate all possible interactions between trait and state affect.

Another possible explanation for the lack of association between negative affect and sexual risk-taking in Mustanski's (2007) study is that there may have been an unexamined within-level moderator, such as relationship to their sex partner(s).

Participants in this study did not report relationship to partner as a part of the daily surveys about their sexual behavior. Research has shown that relationship to partner is an influential factor in the decision of whether or not to engage in “bareback sex” (sex without a condom; Dudley et al., 2004; Hays, Kegeles, & Coates, 1990; Koblin et al., 2003; Semple, Patterson, & Grant, 2003). Mustanski, Newcomb, and Clerkin (2011) found that considering the relationship to be serious was the strongest predictor of unprotected sex (resulting in an eightfold increase in rate of unprotected sex). The tendency not to use a condom with a serious romantic partner could override any potential effect of negative affect on sexual-risk taking behavior. It seems possible that negative affect may be linked to sexual risk behavior only when the sexual experience is not with a serious romantic partner. The current study will examine this possibility by testing relationship to partner at each sexual encounter as a moderator of the relationship between affect and condom use.

In short, the proposed study replicated and extended previous studies on the relationship between affect and condom use in MSM at the within-person level using daily diary data. To address limitations of previous studies, the current study used a large and diverse sample of MSM and investigated both trait affect and relationship to partner as moderators of the relationship between state affect and condom use. This study contributes knowledge relevant to preventing the spread of HIV and other STIs in MSM by elucidating the possible role of event-level factors, such as affect, in the decision to engage in risky sex. This could aid in developing interventions that are less focused on cognitive-informational components of decision-making and place

more emphasis on identifying how one's emotional state may be linked to sexual decision making.

## Chapter 2: Literature Review

The spread of HIV is a serious concern for men who have sex with men (MSM), who constitute the population most heavily affected by HIV in the United States (CDC, 2012b). Sexually transmitted infections (STIs) are also a persistent problem for this population, particularly syphilis; in 2008, MSM accounted for 63% of primary and secondary syphilis cases in the United States (CDC, 2010). Although many theoretical models have been proposed to identify the conditions surrounding sexual risk-taking behavior, these models have largely neglected affect as a factor in the decision to engage in sex without using a condom (Kalichman & Weinhardt, 2001; Marks, Bingman, & Duval, 1998; Mustanski, 2007). These models tend to focus on knowledge, attitudes, or behavioral intentions and cannot fully capture experiences related to sexuality because they do not consider the affective component of this behavior, including “emotional states that distort perceptions of personal vulnerability” (McKirnan, Ostrow, & Hope, 1996, p. 3).

Most of the studies that have explored the relationship between affect and sexual risk-taking have done so only at the between-person level, i.e., the level that reflects only differences between individual participants in affect and risk-taking. This does not take into account changes within the individual, nor does it allow for differentiation between state affect (which may fluctuate day to day) and trait affect (which is a general tendency). Furthermore, most research on this relationship has been conducted retrospectively, which does not allow for the investigation of specific instances of unsafe sexual behavior, which is important as risk-taking theories tend to



focus on situational influences rather than global traits. Using alternatives to retrospective self-report, such as a daily diary method, also produces more reliable data that is less subject to memory bias (Fenton, Johnson, McManus, & Erens, 2001). The present study aims to add to the empirical literature investigating the relationship between affect and condom use in MSM at the within-person level using daily diary data.

The literature review that follows begins with a summary of research on the relationship between affect and risk. This is followed by sections summarizing the literature on the relationship between affect and sexuality—both the broad domain of sexuality (particularly sexual interest) and the narrower domain of sexual risk-taking—with attention to research on heterosexual men and MSM. The section on affect and sexual risk-taking among MSM explores how HIV risk among MSM has been conceptualized and assessed in recent literature, and reviews evidence for relationships between affect and sexual risk-taking at both the between-person and within-person levels.

### *Affect and Risk*

#### Positive affect and risk

Research has focused on ways positive affect influences (a) perception of risk, (b) the anticipated impact of losses or gains in a risky decision-making context, and (c) actual risk-taking behavior. In one of the earliest studies of its kind, Johnson and Tversky (1983) conducted a series of experiments to assess the effect of affect on perceptions of the frequency of a variety of risks. The first three experiments focused on the effects of negative affect on risk perceptions, but the last experiment induced

positive affect in half of the participants by having them read a story describing “a series of fortunate events occurring to a young male, including admission to medical school and success on a difficult exam” (p. 28). Participants, after the experimental manipulation, rated the likelihood of 21 events occurring, including events with a high risk of fatality (e.g., stomach cancer), lower risk of fatality (e.g., exposure to toxic chemicals), and little risk of fatality (e.g., divorce). The researchers found that reading a positive mood-inducing story caused a global *decrease* in estimates of frequency of negative events, regardless of the seriousness of risks.

Although the results of Johnson and Tversky’s (1983) experiment are relatively straightforward as to the relationship between positive affect and risk perception (i.e., how likely one believes it is that negative events will occur), other experiments have found an inconsistent relationship between positive affect and risky decision-making (i.e., choosing a high-risk option when presented with both a high-risk and low-risk option in a gambling situation). Although these two outcome variables are not equivalent, they are related: One’s perception of risk is likely to affect one’s subsequent decision-making. If positive mood causes one to perceive the risk in a gambling situation to be fairly low, one is more likely to go “all in” on his next hand.

Nygren and colleagues (1996) summarized and replicated several previous studies that have shown that positive affect affects both risk perception as well as risky decision-making. Although positive affect increases optimism and decreases risk perception, it also tends to encourage behavior that is more conservative or self-protective in situations where there is a real threat of loss (Isen & Patrick, 1983;

Arkes, Herren, & Isen, 1988; Isen, Nygren, & Ashby, 1988). A possible mediator of the observed differences in risky decision-making between positive affect participants and control participants could be a change in the subjective utility of the losses taking place. Subjective utility is a person's perception of the impact a given loss or a gain will have. High subjective utility would mean that the impact of a specific loss or gain is considered great. The authors believe that positive affect increases subjective utility for a given loss. They relate this to evidence from social psychology literature that suggests that people who are feeling happy are motivated to maintain their positive states, and thus have more to lose than those with neutral mood in the same situation.

Isen, Nygren, and Ashby (1988) tested whether positive affect increases subjective utility by presenting participants with a series of trials in which they had to choose between two gambles, both of which concerned whether a particular event occurred. Gamble 1 was always a sure loss gamble, where the participant would lose 10 points whether or not the event occurred. Gamble 2 always had one outcome of winning 10 points and one outcome of losing between 10 and 50 points (varying across trials). The researchers asked the question, "How many points would a participant have to risk losing in Gamble 2 to prefer Gamble 1?" A higher number of points would indicate that a participant was less concerned about the potential loss, i.e., that the participant assigned relatively low subjective utility to this loss.

Participants were told that the probability of the event occurring for each gamble was .5 for each trial. Fixing the probability in this way was critical to the study because it meant that results would be related to subjective utility rather than risk perception. Moreover, to increase the realism of the gambles, participants—who were students—

were told that as a result of gambling they might lose their extra credit hour, retain it, or gain an additional hour.

Results indicated a difference between the positive affect group and control group in the subjective utility of losses, particularly large losses: Losing seemed worse to subjects in which positive affect had been induced than to control subjects. This finding is offered as a possible explanation for the result that positive-affect participants tend to be more conservative or self-protective in gambling situations than control participants (Isen & Patrick, 1983; Arkes, Herren, & Isen, 1988; Isen, Nygren, & Ashby, 1988). These results are also consistent with what has been called the mood maintenance hypothesis (Isen & Patrick, 1983): Happy people are motivated to maintain their positive state, and thus are less willing than others to engage in gambling behavior due to the risk of not only material loss but also loss of positive mood.

The authors also pointed out that the results for the positive affect participants were not replicated for the subjective utility of *gains*: Although positive affect participants perceived the impact of losses as greater than control participants, they showed only a slight tendency to perceive gains as having more impact than control participants did. This implies that those who are experiencing positive affect are sensitive specifically to loss and are more likely to avoid risking loss than those who are experiencing neutral affect.

However, Isen, Nygren, and Ashby (1988) noted that their results do not rule out the possibility of positive affect increasing risk-taking behavior. The authors suggested that positive affect participants may have been more inclined to make less

conservative, more risky decisions if the probability of outcomes had been unknown to participants in their study. This discussion suggests that there are two mechanisms by which affect can have an effect on risky decision-making: utility and probability. One process may be more central in consideration of gains and the other may be more central in consideration of losses. The authors summarize these relationships:

Persons who are in a positive affective state and are considering the positive outcomes in risky situations may focus, for decision making, on the probability of winning... When making decisions under uncertainty, these individuals may place less importance on the actual value of a positive outcome and more importance on the likelihood of occurrence. On the other hand, when considering possible losses, these persons may focus on how the loss will feel (its *subjective utility*) rather than on its likelihood (emphasis added; Isen, Nygren, & Ashby, 1988, p. 716).

Nygren and colleagues (1996) refer to the complex relationship between positive affect and decision-making as “cautious optimism.” “Optimism” refers to the bias in overestimating the likelihood of positive outcomes and underestimating that of negative outcomes. “Caution” refers to the aversion to risk and loss in actual choice behavior, under uncertain or risky conditions. Although these two factors operate in tandem, the authors believe that ultimately, “This reevaluation of losses typically overrides any overestimation and underestimation that may be applied to the initial anchor probabilities of good and bad outcomes, respectively” (Nygren, Isen, Taylor, & Dulin, 1996, p. 61). In other words, these scholars argued that positive affect is more likely to lead to more conservative decisions. To test this hypothesis, the authors conducted two experiments to test the influence of positive affect on both probability estimation and actual betting behavior.

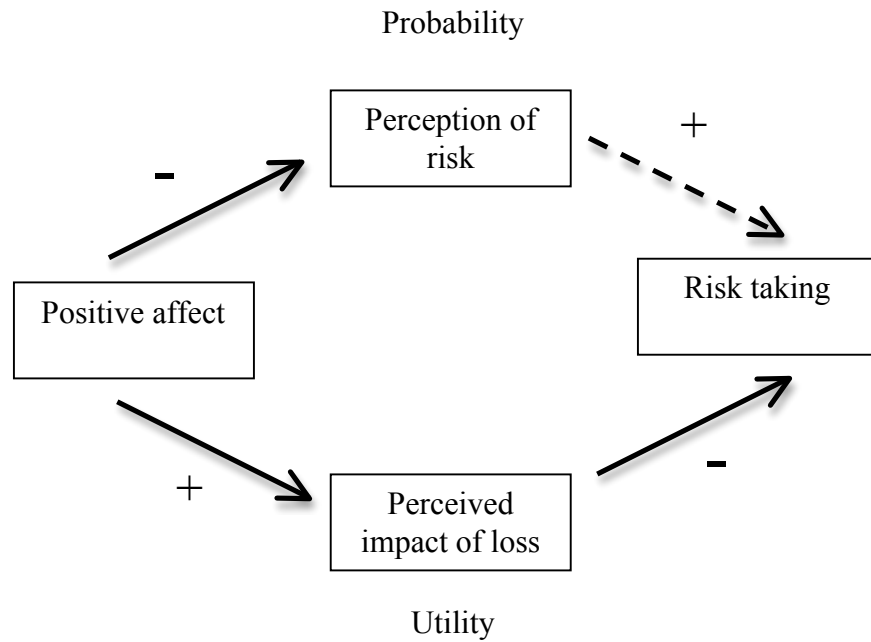
In the first experiment, positive affect was induced in participants in the experimental group, and all participants were given both a betting task, in which real losses were involved (in terms of number of credit hours for participating), as well as a probability estimation task. The results of the experiments confirmed authors' hypotheses: Although positive mood decreased participants' willingness to bet when potential losses were great, the same participants' initial estimates of the probability of winning were generally increased. These results indicate that a plausible model for decision-making is one that distinguishes between initial estimations of probabilities and actual betting behavior in risky situations. Therefore, the cautious optimist is one who,

Because of some natural or temporarily induced positive feeling state, expresses a greater likelihood ratio of good-to-bad probabilities than might otherwise be expected when asked to interpret probabilities, but who is also distinctly aware of his or her potential loss and does not lose sight of its potential impact. (Nygren, Isen, Taylor, & Dulin, 1996, p. 70).

The authors theorized that most people generally operate using a "decision rule," which says, "don't be too reckless or too risk-seeking; avoid alternatives with large or moderate probability of loss, even if the amount to lose is relatively moderate or small" (Nygren, Isen, Taylor, & Dulin, 1996, p. 70). Positive mood causes a switch from this decision rule to one that focuses less on the probabilities and more on the actual outcomes of the gambles, particularly those involving the avoidance of potential loss. This is consistent with literature that happy participants will change their behavior in order to maintain a positive state.

In summation, research has suggested that those experiencing positive affect have inflated estimates of the probabilities of winning (Nygren, Isen, Taylor, &

Dulin, 1996) and decreased estimates of risk (Johnson & Tversky, 1988). However, it seems that the influence of positive affect on subjective utility of losses is more likely to cause a change in behavior, making participants more risk-averse.



*Figure 1.* The two mechanisms whereby positive affect influences risk-taking. Dashed arrows indicate relationships that have only been theorized to exist; solid arrows indicate relationships that have been evidenced by research.

## Negative Affect and Risk

Much like the literature on positive affect and risk, research on negative affect and risk has also explored the potential influences of negative affect on both perception of risk as well as the anticipated impact of losses in a risky decision-making situation. Johnson and Tversky's (1983) study, partially described in the previous section, was one of the first to examine links between negative affect and risk perception. The experimenters induced negative affect through fictional newspaper stories describing circumstances of a person's death but with no estimates of the prevalence of the tragic incident. Estimates of frequencies of risks differ from other types of estimates because such risks do not typically occur in an emotionally neutral context. We experience worry, anxiety, and fear as a result of such experiences with risk and death. The authors contend that it is not only the mere exposure to a risky event—direct or indirect—that increases estimates of risk, but also the emotions that reading such a story would elicit (Johnson & Tversky, 1983).

The authors proposed four competing hypotheses. Newspaper stories may have no effect on participants' estimates because stories focusing only on the death of a single person may not justify significant changes in frequency estimates. Second, reading the newspaper stories may produce a local effect, such that frequency estimates would only increase for those types of death that were described in the newspaper stories. Third, newspaper stories could induce increased judgments of frequency of fatalities that are the same or similar to that described in the story. Finally, reading the stories could induce a global effect, such that participants will experience an increase in judged frequency of both related and unrelated risks



equally. This final hypothesis would indicate that the affect induced by the newspaper stories caused the increase in judged frequency of risks.

In the first experiment, participants read the newspaper stories and rated their estimates of the frequency of various fatalities. Results indicated a global increase in judged frequency of risks, and no local effects. Although the second experiment was designed to be more sensitive to local effects, the results again indicated only a global increase in judged frequency of risk. The third experiment was conducted to judge whether or not a sad story, unrelated to death, would produce similar results; this experiment reproduced the same results as the previous two. The authors concluded that “the overriding factor in these increases is not the story told but rather the mood it induces in the reader” (Johnson & Tversky, 1983, p. 27). They supported this hypothesis using a results from a post-experimental questionnaire in which half of experimental participants agreed that reading the newspaper stories had influenced their mood. Results from this series of studies led the researchers to conclude “we tend to make judgments that are compatible with our current mood, even when the subject matter is unrelated to the cause of that mood” (Johnson & Tversky, 1983, p. 30).

Johnson and Tversky’s (1983) study found that just as positive affect was related to a global decrease in estimates of frequency of risk, negative affect was related to a global increase. However, negative mood, like positive mood, has the potential to influence both perception of risk and actual risk-taking behavior. Are there two possible mechanisms by which negative affect influences risk-taking tendencies (i.e., probability and subjective utility)? Leith and Baumeister (1996)

conducted a study to answer this question. The researchers hypothesized that happy people are risk averse because they want to stay happy (Nygren, Isen, Taylor, & Dulin, 1996), whereas people who feel bad are willing to take risks in the interest of feeling better. Negative affect therefore would have the opposite effect on subjective utility as positive affect:

To the person in a good mood, a high payoff is less desirable because he or she is already feeling good and will not necessarily feel much better if something else good happens. However, the impact of a significant bad experience would be amplified because—in addition to the pragmatic consequences—one's current, pleasant mood would be ruined. In contrast...a person in a bad mood might downplay the costs of a bad outcome because the fact of being already in a bad mood reduces the affective loss one would suffer. Crucially, the benefits of a large payoff would be increased because (in addition to the pragmatic rewards) one might escape from the bad mood into a good mood (Leith & Baumeister, 1996, p. 1251).

The authors' second hypothesis involved self-regulatory failure. The first hypothesis suggested that people engage in a rational calculation of how possible outcomes would alter their mood. They then figure out that it would be better to take a risk in pursuit of a large reward because they have less to lose and more to gain. However, self-regulatory failure involves ignoring such calculations and neglecting to review all possible outcomes. When feeling upset, a person may become unable or unwilling to control his or her immediate impulse in favor of what will be, in the long-run, most beneficial. Emotionally distraught people may prefer a high-risk, high-reward option simply because they only consider the high payoff, and neglect to evaluate the risk involved.

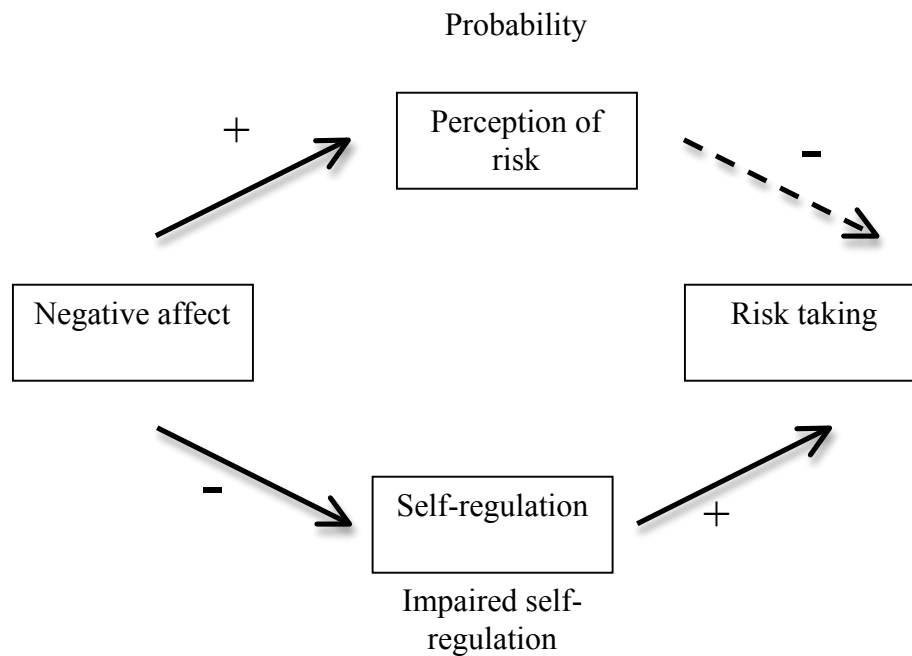
In their first study, Leith and Baumeister (1996) used accounts from participants about times in which their actions led to consequences that they later

regretted to investigate whether participants would mention negative affect in these accounts. The narratives were also analyzed to see if they conformed more to a change in subjective utility or a loss of self-regulation. Negative mood was mentioned in more than half of the narratives (55%), and the majority of narratives (60%) involved some loss of self-control, supporting the self-regulation hypothesis.

To conduct a direct test of their hypotheses, Leith and Baumeister (1996) conducted a second study in which negative mood was induced in participants and risk-taking behavior was measured by giving participants a choice between two lotteries: a low-risk, low-reward scenario, and a high-risk, high-reward scenario. Both scenarios ensured that real loss was involved. Results showed that the negative-mood group was more likely than the neutral mood group to choose the high-risk, high-reward option. A third study replicated the second but also investigated whether or not negative mood caused a change in subjective utility. The results did not support the view that changes in subjective utility occur as a result of negative affect.

In a similar fourth study, participants were instructed to think carefully about the possible outcomes before making their choice regarding the lottery. Results showed that this careful consideration of outcomes eliminated the risk-taking tendency shown by negative affect participants in the previous studies. These results confirm the prediction based on the impaired-self regulation hypothesis. Although subjective utility appears to be the predominant mechanism by which people feeling happy tend to make more risk-averse decisions (Nygren, Isen, Taylor, & Dulin, 1996), impaired-self regulation appears to be the mechanism by which people feeling distressed tend to take more risks.

To summarize, although research has shown that positive and negative affect have opposite influences on perceptions of risk (Johnson & Tversky, 1988), additional studies have indicated that this pattern may not apply to actual risk behavior. Nygren and colleagues (1996) have shown that although positive affect influences changes in estimates of probability in hypothetical situations, it is a change in subjective utility that results in the tendency for those experiencing positive affect to be more risk averse in actual situations. However, Leith and Baumeister (1996) have shown that for those experiencing negative affect, subjective utility does not appear to be relevant in determining actual risk behavior (see Figure 2). Instead, it is impaired self-regulation that leads those in distress to favor a high-risk, high-reward option. This was shown when participants' tendency for risk-taking behavior was eliminated when they were asked to think more carefully about their options. This result is in line with the risk-as-feelings hypothesis, which emphasizes that when emotional reactions and cognitive evaluations of a situation are divergent, the emotional reaction often will act as the determinant of behavior.



*Figure 2.* The two mechanisms whereby negative affect influences risk-taking. Dashed arrows indicate relationships that have only been theorized to exist; solid arrows indicate relationships that have been evidenced by research.

What are the implications of this research for sexual risk taking? The findings of Nygren and colleagues (1996) suggest that those who are happy may be less likely than others to engage in sexual risk-taking behavior due to the high subjective utility of the potential negative consequences (e.g., contracting HIV). Additionally, those who are experiencing negative affect may be more likely than others to engage in sexual risk-taking behavior because of impairment in self-regulation resulting from negative mood. The extent to which such possibilities are true is addressed, at least partially, by the research literature on the relationship between affect and sexual risk-taking, which is reviewed in the next section.

### *Affect, Sexuality, and Sexual Risk Taking*

Before exploring the relationship between affect and condom use, it is important to engage in a more general discussion of studies examining links between affect and sexuality. This research has focused on the relationship between mood and sexual interest or sexual arousal, and is relevant to the proposed study because increased interest in sex has been positively associated with unprotected anal intercourse (Groves, Golub, Mustanski, & Parsons, 2010; Mustanski, 2007). This section will go on to discuss the literature on the direct relationship between affect and sexual risk-taking in heterosexual men and MSM, respectively.

#### Heterosexual Men

Most previous research on the relationship between mood and sexuality in heterosexual men has been focused on those with diagnosable mood or anxiety disorders; few studies have investigated this relationship in nonclinical participants. A study on the relationship between mood and sexuality among heterosexual men indicated that a majority of men reported decreased sexual interest when feeling depressed or anxious (Bancroft, Janssen, Strong, Carnes, Vukadinovic, & Long, 2003a). However, for the minority who reported an increase in sexual interest when depressed or anxious (9.4% for depression and 20.6% for anxiety), this tendency was positively correlated with depression proneness and propensity for sexual excitation, and negatively correlated with sexual inhibition. Qualitative data indicated that these participants believed sex served needs of intimacy and validation when feeling depressed, and that sexual release can have a calming effect when feeling anxious.

Although most heterosexual men appear to lose interest in sex when depressed or anxious, Bancroft and colleagues (2003a) posit a relationship between negative mood and sexual interest that could lead to increased sexual risk. If sex is viewed as a way to quell feelings of anxiety or depression, the subsequent increase in desire to have sex for its soothing effects may lead to less of a concern over the possible risk posed. The results of this study indicate that those who are more prone to depression and sexual excitation experience increased sexual interest when depressed. Experiencing negative emotion and the desire to use sex to ameliorate those feelings could conceivably lead to impaired self-regulation (Leith & Baumeister, 1996). Bancroft and colleagues (2003a), however, provided no direct evidence of either phenomenon.

If sex alleviates feelings of anxiety or depression in some heterosexual men, then negative mood “may lead to inappropriate or high risk sexual behavior or the establishment of ‘out of control’ patterns of sexual behavior,” (Bancroft, Janssen, Strong, Carnes, Vukadinovic, & Long, 2003a, p. 229). What may be the only study to have tested this hypothesis provided mixed support (Bancroft, Janssen, Carnes, Goodrich, Strong, & Long, 2004). Men who reported increased sexual interest in states of depression tended to have more partners within the past year and more lifetime one night stands. However, increased sexual interest in states of depression did not predict number of partners with whom condoms were not used.

The authors pointed out that although these results do not apply to the majority of participants (who reported decreased sexual interest when depressed), seeking out sexual partners could be a part of a mood-regulating pattern for those who

reported increased sexual interest when depressed. These results also appear to provide evidence for the impaired self-regulation hypothesis, because those participants who have an inability to self-regulate may engage in sexual behavior in an attempt to regulate their mood without considering the risks it could pose.

## MSM

This section summarizes the literature on links between affect and both sexual interest and sexual risk taking among MSM. Additionally, norms regarding the assessment of sexual risk taking in MSM are reviewed.

### **Affect and Sexual Interest**

Bancroft, Janssen, Strong, and Vukadinovic (2003) investigated the relationship between negative mood and sexual interest in gay men much like Bancroft and colleagues (2003a) had in heterosexual men. As with heterosexual men, the majority of participants reported decreased sexual interest when experiencing negative affect, although some men reported increased sexual interest when feeling depressed or anxious. Similar results were found based on interview data. Participants who reported decreased sexual interest when feeling anxious noted that they were more focused on dealing with, or at least worrying about, whatever it was that was making them anxious than on sexual thoughts and feelings. As was found for heterosexual men, “Increased sexual activity when depressed was not only reported as a consequence of increased sexual interest, but in some cases explained as a need for contact with or validation from another person, and in other cases because sex improved the depressed mood if only transiently” (Bancroft, Janssen, Strong, &



Vukadinovic, 2003, p. 240). For those reporting increased sexual interest when anxious, sexual activity was also seen as a way to alleviate the anxiety.

Unlike heterosexual participants, 14% of MSM in this study reported less concern for the consequences of risk when feeling depressed, which is congruent with the impaired self-regulation hypothesis (Leith & Baumeister, 1996). If an individual is feeling depressed, he may impulsively choose to engage in high-risk sex in the interest of relieving feelings of depression in the short-term, while ignoring the potential risks as a result of impaired self-regulation. Some participants in this study reported being drawn to have sex when depressed—even if risky—because they believed it would improve their mood or fulfill a need to be validated by another person. “This was not a matter of needing to do something risky nor did they forget about the potential consequences of such behavior; rather, it seemed to be a case of not caring about the consequences, what one man described as ‘What the heck’” (Bancroft, Janssen, Strong, & Vukadinovic, 2003, p. 239).

As in their research with heterosexual men, the researchers predicted that increased sexual interest in negative mood states was more likely in MSM with both a high propensity for sexual excitation (e.g., “When an attractive person flirts with me, I easily become sexually aroused”) and a low propensity for inhibition of sexual response due to fear of performance consequences (e.g., “If I realize that there is a risk of catching a sexually transmitted disease, I am unlikely to stay aroused”). They found that high propensity for sexual excitation was predictive of increased sexual interest when anxious, but not when depressed. They attributed this result to what they refer to as “excitation transfer,” whereby the arousal associated with anxiety is

transferred to augment the arousal of a sexual stimulus. Low propensity for inhibition of sexual response due to fear of performance consequences was predictive of increased sexual interest in both negative mood states. These scholars explain this result by asserting that, “some gay men may be in the ‘increased’ group because the depressed mood reduces their concern about risk or erectile failure, rather than actually increasing their sexual interest” (Bancroft, Janssen, Strong, & Vukadinovic, 2003, p. 240).

The following section reviews the literature on how sexual risk has been assessed among MSM, as well as the research on the relationship between affect and sexual risk-taking in this population. The majority of literature on this subject has measured this relationship at the between-person level using retrospective data collection techniques; however, in order to collect data on the relationship between state affect and specific instances of risky sex, measuring this relationship at the within-person level using a daily diary method appears to be more appropriate, although only a small body of research has been conducted in this way.

### **Conceptualization and Assessment of HIV Risk**

The behavior that has been identified as the most likely to lead to the transmission of HIV is unprotected anal intercourse (UAI; Bancroft, Janssen, Strong, Carnes, Vukadinovic, & Long, 2003b). In a study of per-contact risk of HIV transmission among MSM, the estimated per-contact risk from receptive UAI with a partner who is known to be HIV+ was 0.82%, and 0.27% when partners of unknown serostatus were included, making this behavior the riskiest (Vittinghoff, Douglas, Judson, McKirnan, MacQueen, & Buchbinder, 1999). The Centers for Disease

Control and Prevention (CDC) echo these findings: “In the United States, HIV is spread mainly by...having unprotected sex (sex without a condom) with someone who has HIV. Anal sex is the highest-risk sexual behavior.” (CDC, 2013).

Although UAI has been identified as the most significant behavior in terms of HIV transmission, there are multiple levels of assessment that must be taken into account in order to accurately assess risk. First there are “event level” factors, meaning those variables associated with a particular sexual experience which act to increase the potential for transmission of HIV. One of these is whether the participant was the insertive or receptive partner. According to the CDC, “Receptive anal sex (bottoming) is riskier than insertive anal sex (topping)” (2013). Mustanski (2007) incorporated this consideration into his assessment of HIV risk by creating a composite variable through a consensus meeting with sexual health researchers. He assigned various values to different sexual acts based on their level of risk for contracting HIV, with higher numbers indicating greater levels of risk; unprotected receptive anal intercourse (“bottom”) had the highest value (7), and unprotected insertive anal intercourse (“top”) had a slightly lower value (4).

Although many studies have focused specifically on UAI, others have incorporated event level variables related to oral sex into their assessments of HIV risk (Bancroft, Janssen, Strong, Carnes, Vukadinovic, & Long, 2003b; Grov, Golub, Mustanski, & Parsons, 2010; Mustanski, 2007). However, the per-contact risk of HIV transmission from oral sex is considerably lower than that from anal sex (Vittinghoff, Douglas, Judson, McKirnan, MacQueen, & Buchbinder, 1999). Therefore, it is important that research involving HIV risk assessment of both anal and oral sex

reflect this difference in level of risk; for example, Mustanski's (2007) composite behavioral risk variable used the following values for occurrences of oral sex: 0 = gave or received oral sex with a condom; 1 = received oral sex without a condom; 2 = gave oral sex without a condom.

In addition to event level variables related to particular sexual experiences, HIV risk can also be assessed at the "person level," meaning variables associated with a particular person that increase the potential for transmission of HIV. For example, many studies have assessed how often one engages in UAI, because risk is measured on a per-contact basis and thus increases with each contact (Bancroft, Janssen, Strong, Carnes, Vukadinovic, & Long, 2003b; Grov, Golub, Mustanski, & Parsons, 2010; Mustanski, 2007). Relatedly, many studies assess number of partners with which UAI occurred (Bancroft, Janssen, Strong, Carnes, Vukadinovic, & Long, 2003b; Ekstrand, Stall, Paul, Osmond, & Coates, 1999), because a greater number of partners means a greater number of occurrences. For example, Mustanski (2007) summed the number of occurrences of receptive UAI across partners for each participant each day, such that a participant who had engaged in risky sexual behavior with multiple partners in one day received a higher risk score than a participant who had only engaged in risky sexual behavior with only one partner.

Other person-level variables are related not to the individual reporting on his sexual experiences, but to his partner. For example, measuring number of partners is also relevant because a greater number of partners introduces the possibility that one of them may have unknown or HIV-positive serostatus. Many studies also take into account the relationship of the participant to the partner and directly assess whether

serostatus of the partner is known or the partner is known to be serodiscordant (e.g., the participant is HIV-negative and the partner is known to be HIV-positive). Relationship to partner is typically broken down into two categories: a “main” or “regular” partner (e.g., a boyfriend or lover), or a “non-main” or “casual” partner. UAI is typically considered riskiest when it occurs either with a serodiscordant main partner, or with any non-main partner, presumably under the assumption that serostatus of a non-main partner is unknown (Crawford, Rodden, Kippax, Van de Ven, 2001; Grov, Golub, Mustanski, & Parsons, 2010; Ross et al., 2001). Additional relevant person-level variables include whether or not the partner has many sex partners, uses IV drugs, or has another sexually transmitted disease (Mustanski, 2007), all of which increase the likelihood that the partner is HIV-positive (CDC, 2003).

It is important to note that most studies assess the occurrence of risky sex retrospectively during periods of time ranging from the last three months to one’s lifetime (Bancroft, Janssen, Strong, Carnes, Vukadinovic, & Long, 2003b; Ekstrand, Stall, Paul, Osmond, & Coates, 1999; Ross et al., 2001). This introduces the issue of retrospective memory bias with respect to sexual experiences. One may not be able to accurately remember how many “one night stands” one has had over the course of one’s lifetime, or how many partners one has had sex with over the last three years with whom no condoms were used. It may be that participants will be biased toward remembering instances of sex in which condoms were used because of guilt or shame over those instances in which they were not (Fenton, Johnson, McManus, & Erens, 2001; Schroder, Carey, & Venable, 2003). There are some studies, however, that

address retrospective memory bias by using daily diary methods, which ask participants to report on their sexual behavior only within the last 24 hours (Groves, Golub, Mustanski, & Parsons, 2010; Mustanski, 2007).

### **Affect and Sexual Risk Taking at the Between-Person Level**

Bancroft, Janssen, Strong, Carnes, Vukadinovic, and Long (2003b) investigated the relationship between mood and sexual risk-taking in gay men. Sexual risk was measured using specific behaviors (e.g., unprotected anal intercourse), characteristics of the person (e.g., number of sexual partners), as well as “long-term risk,” which compounded both sexual acts and number of partners over a longer period of time. Results of this study showed that depression was not a predictor of sexual risk-taking behavior, but anxiety was negatively associated with UAI and insertive oral sex. However, a meta-analysis conducted by Crepaz and Marks (2001) found no compelling evidence for any relationship between negative affect and sexual risk-taking. The results of 34 studies were included in this analysis, chosen on based on three criteria: The study measured depressive symptoms, anxiety, or anger; the study had a measure of sexual risk behaviors that have been found to be associated with HIV transmission (i.e., UAI or unprotected oral sex, number of sex partners, and composite indices that combined two or more components of the previous two categories); and the study had some type of statistical test of association between affective states and sexual behavior.

Although there was wide variability in the effect sizes across study samples, results showed that the overall effect size corresponded to a correlation coefficient of .05, suggesting that negative affect is unrelated to risky sex. The authors proposed

two explanations for this finding. It is possible that there is a true lack of association between the two variables. Alternatively, methodological and conceptual limitations of the studies may have diminished investigators' ability to detect significant associations. Several methodological issues merit consideration.

First, even those studies which Crepaz and Marks (2001) considered to have strong designs had problems with the temporal association between measures of affect and behavior (e.g., some studies measured affect from the past week and behavior in the past month). Second, these studies did not allow for the measurement of a possible curvilinear association between affect and sexual behavior. For example, sexual risk may be highest among those with moderate depressive symptomatology, and lower for those with either low or high symptomatology. Third, potential moderators not studied previously could account for an association between negative affect and sexual risk-taking behavior. Fourth, the studies used in this meta-analysis include both HIV-positive and HIV-negative samples. It is important to consider that the meaning and consequences of unprotected sex differ for HIV-positive and HIV-negative persons and may be influenced by specific negative affective states. For example,

A seropositive person who is experiencing anger directed toward other persons may be at elevated risk for engaging in sexual behaviors that may harm others...For sexually active HIV-negative persons, self-directed anger may elevate risk for unsafe sex by reducing motivation to care for oneself or by activating motivation to escape the aversive state. It is less clear whether other-directed anger would cause one to behave in a manner that places oneself at risk for infection (Crepaz & Marks, 2001, p. 297).

Finally, it is important to note that although many of the studies reviewed in this meta-analysis suggest that negative affect may promote sexual risk-taking, the

causal direction may also occur in the opposite way. Engaging in high-risk sex may promote anxiety, stress, or other negative mood states. The authors encourage future research to use measures that are more sensitive to overlapping recall periods for assessing affect and sexual behavior, examine moderator variables (e.g., subjective meanings of a negative affective state), statistically model curvilinear associations, and conduct studies to determine the direction of causality. Nonetheless, the authors conclude that the current body of empirical research does not provide compelling evidence for the hypothesis that negative affect is associated with increased sexual risk behavior.

#### **Affect and Sexual Risk Taking at the Within-Person Level**

In a response to the meta-analysis conducted by Crepaz and Marks (2001), Kalichman and Weinhardt (2001) noted additional methodological considerations to account for the lack of evidence for the association between negative affect and sexual risk behavior. First, the studies used in Crepaz and Marks' (2001) meta-analysis rely heavily on cross-sectional designs, which make it very difficult to determine temporal associations and impossible to determine the direction of causation. Second, studies of negative affect and sexual risk have relied on global measures of current or recent affective states in relation to sexual behaviors practiced at an earlier time, which are insensitive to the co-occurrence of mood and sexual events; thus, event-level analyses are required. Finally, Kalichman and Weinhardt point out that for many persons, negative affect may indirectly affect sexual risk behavior. For example, negative affect may make it more likely that an individual will use alcohol or drugs to relieve emotional distress, which, in turn, may initiate



behaviors leading to sexual risks. The authors conclude, “We believe...that the jury on the association between negative affect and sexual risks remains out until prospective event-level analyses with at-risk populations are conducted” (Kalichman & Weinhardt, 2001, p. 301).

In the study of the relationship between affect and sexual risk-taking behavior, the distinction between cross-sectional research and research with a within-person component is an important one. Much of the research in this area has been conducted using cross-sectional designs in which participants are asked to recall their behavior and moods over the course of a set period of time (e.g., the previous year). These data are examined by comparing participants to one another to test for any significant relationships between mood and sexual risk-taking. However, this research is more likely to reveal associations between the more global variable of trait affect and sexual risk-taking, rather than state affect, a variable that can fluctuate from day to day and may be more likely to influence specific instances of risky sex. For example, exploring sexual risk-taking behavior and mood across participants could yield significant differences, but these would be difficult to interpret, given that some of these participants may have more positive trait affect (i.e., tend to be in a positive mood most of the time) and some may have more negative trait affect (i.e., tend to be in a negative mood most of the time).

Therefore, it would behoove scholars to use within-person designs, particularly those which do not use retrospective self-report, to study the association between mood and sexual risk-taking among MSM. Within-person designs using a daily diary method involve a longitudinal approach in which participants are asked to

fill out brief surveys over a period of several days that ask both about their mood and their sexual behavior over the previous 24 hours. Within-person designs allow researchers to examine patterns of mood and sexual behavior for each participant because these variables are measured in the same person at multiple time points, allowing for a more fine-grained method of assessing the temporal association between them. Rather than measuring general affective tendencies and general patterns of sexual risk-taking behavior (i.e., asking participants to report on what they tend to do when feeling a certain way), daily diary studies allow for data to be collected at the event level. This allows for the empirical evidence on affect and sexual risk-taking to be integrated with current theories of the mechanisms behind risky sex, which are based on situational influences (e.g., state affect, being under the influence of drugs or alcohol) rather than general attributes about a person (e.g., trait affect, personality type). Within-person designs using a daily diary method also have the added advantage of more accurate data collection by asking participants to report on mood and behavior within the last 24 hours, rather than the last six months or year.

A study of the relationship between affect and sexual risk-taking conducted by Mustanski (2007) addresses some of the methodological issues raised by Crepaz and Marks (2001) and Kalichman and Weinhardt (2001). Each day, MSM reported their state affect as well as their sexual behaviors. State affect was measured with a scale created for the study that had subscales for positive affect (labeled “positive activation”), negative affect (labeled “negative activation,” with items focusing on feelings of sadness and distress), and anxiety (labeled “anxious arousal”). Sexual risk taking was measured using two composite variables, one of partner-related risk and

one of behavioral risk. He examined both main effects of state affect on all sexual risk taking variables as well as the cross-level interactions between trait and state affect.

Mustanski (2007) reviewed two opposing hypotheses as to the relationship between positive affect and risk-taking behavior: probability and utility. However, given evidence—discussed earlier—that the link between positive affect and risk behavior is better explained by utility than probability, Mustanski sided with the utility hypothesis for his study: “...individuals who are experiencing high levels of [positive affect] should be less likely to believe they are at risk for contracting HIV but perhaps are more likely to consider HIV as dangerous to their health, with the net outcome being greater risk aversion” (Mustanski, 2007, p. 619). As to the relationship between negative affect and sexual risk-taking behavior, Mustanski hypothesized that individuals who are high in states of negative activation will be more likely to make impulsive choices, which will translate to engagement in risky sexual behavior. This hypothesis was based on evidence, reviewed earlier, supporting impaired self-regulation. No hypothesis was offered as to the relationship between anxious arousal and sexual risk-taking behavior, given mixed research evidence.

Results of this study indicated that, consistent with Mustanski’s hypothesis, state positive activation was negatively associated with behavioral risk; no cross-level interactions were found between state and trait positive activation. Mustanski referenced the mood-maintenance hypothesis (Isen and Patrick, 1983), and suggested that these results confirm that idea that those who are experiencing positive mood will be risk averse to maintain their mood. State anxious arousal was positively associated with behavioral risk. In addition, the relationship between state anxious arousal and

partner-related risk was moderated by trait anxiety, such that for those with high trait anxiety, state anxiety was associated with decreased partner-related risk, but the opposite was found for those with low trait anxiety.

Mustanski (2007) attributes the main effect of anxious arousal on behavioral risk to the possibility that the “keyed up” aspect of anxiety could be related to feelings of excitement that potentiate sexual risk-taking behavior. This is similar to Bancroft, Janssen, Strong, & Vukadinovic’s (2003) concept of “excitation transfer,” whereby the arousal associated with anxiety is transferred to augment the arousal of a sexual stimulus. This result could also be attributed to the impaired self-regulation hypothesis, such that those with anxiety experience an impulsive desire to engage in high-risk sexual behavior in order to achieve the benefits (i.e., a reduction in anxiety) without assessing the risks involved.

The relationship between state anxiety and partner-related risk, with trait anxiety as a moderator, is less straightforward. Perhaps, as Crepaz and Marks (2001) suggested, there is a curvilinear association between anxiety and sexual behavior. For those with low trait anxiety and high state anxiety, there may be a greater tendency for sexual risk-taking because this combination is optimal for excitation transfer. However, for those with high trait anxiety, the addition of state anxiety may create too much arousal, which results in less sexual risk-taking. As was reported by Bancroft, Janssen, Strong, and Vukadinovic (2003), those with both high trait and state anxious arousal may be too preoccupied with dealing with, or worrying about, whatever was making them anxious to focus on sexual thoughts or feelings.

However, contrary to hypothesis, no association was found between negative activation and any measure of sexual risk behavior, and no cross-level interactions were found between state and trait negative activation. Mustanski suggested that this lack of association could indicate a lack of a relationship between these variables, or could be attributed to “differences in the symptom profile of the sample or the choice of measure” (Mustanski, 2007, p. 624). However, the lack of association found in this study could also be due to an unexamined interaction between state and trait affect, or a moderator variable – both of which will be investigated in the current study.

In conclusion, it seems that positive affect is related to risk aversion. However, the relationship between negative affect and sexual risk-taking seems more complex – although some research has indicated that such a relationship exists (Bancroft, Janssen, Strong, & Vukadinovic, 2003; Bancroft, Janssen, Strong, Carnes, Vukadinovic, & Long, 2003b, Mustanski, 2007), other research has not provided evidence for such an association (Crepaz & Marks, 2001; Mustanski, 2007).

## Chapter 3: Statement of the Problem

New cases of HIV among young gay and bisexual men increased by 34% from 2006 to 2009 (CDC, 2012a). Today, men who have sex with men (MSM) remain the population most heavily affected by HIV (CDC, 2012b). In addition to these high rates of HIV, MSM also accounted for 63% of all primary and secondary syphilis cases in 2008 in the United States (CDC, 2010). Clearly, HIV and other STIs remain a serious issue for this population.

The alarming rate of new HIV infections in MSM has driven a growing body of research on identification factors that may be related to risky sexual behavior. Although many theoretical models have attempted to explain why individuals engage in sexual behavior that puts them at risk for HIV infection, these models all emphasize cognitive-informational bases of behavior (Kalichman & Weinhardt, 2001; Marks, Bingman, & Duval, 1998; Mustanski, 2007). These models tend to focus largely on variables such as knowledge, attitudes, behavioral intentions, or perceptions of others, and assume that these variables affect behavior in a straightforward fashion. This assumption is likely not appropriate for behaviors as emotionally charged as sexual behavior, which likely involves non-rational behavior which could be influenced by affect (McKirnan, Ostrow, & Hope, 1996).

Although some empirical literature has shown that there is a relationship between affect and sexual behavior, this research has not been consistent. In one study of gay men, 14% reported reduced concern about sexual risk when feeling depressed (Bancroft, Janssen, Strong, Vukadinovic, 2003). Another study found that

MSM who reported increased sexual interest in states of depression also reported higher numbers of sexual partners and more frequent cruising (Bancroft, Janssen, Strong, Carnes, Vukadinovic, & Long, 2003b). A meta-analysis conducted by Crepaz and Marks (2001), however, did not conclude that there was sufficient evidence that negative affect influence sexual risk-taking behavior. Kalichman and Weinhardt (2001) suggest that this lack of evidence is likely due to the fact these studies have only investigated this relationship at the between-person level, and are not sensitive to within-person associations between affect and sexual behavior.

In order to add to the literature on mood and sexual risk-taking behavior at the within-person level, the proposed study used archival daily diary data to investigate the relationship between mood and sexual risk-taking behavior in men who have sex with men. The goal of this study was to explore not only the within-person associations of both positive and negative affect with sexual risk-taking, but also the extent to which these associations are moderated by a person's trait affect and type of relationship with the sexual partner.

Empirical literature has indicated multiple possible relationships between positive affect and risk-taking. Research has indicated that positive affect reduces the perception of risk (Johnson & Tversky, 1983). Positive affect has also been associated with increased subjective utility for a given loss, meaning those experiencing positive affect will perceive losses as greater (Isen, Nygren, & Ashby, 1988; Isen & Patrick, 1983). Despite these seemingly contradictory effects of positive affect on risky decision-making, Nygren and colleagues (1996) asserted that, ultimately, positive affect is associated with more conservative behavior. In addition, previous daily diary

research on affect and sexual risk-taking has indicated that positive affect is negatively associated with risk behavior (Mustanski, 2007). Mustanski suggested that this finding could indicate that positive affect increased the perception of HIV infection as damaging or dangerous, rather than perception of oneself as safer from infection. Hence, the following hypothesis was proposed:

**Hypothesis 1:** Positive affect will be negatively associated with sexual risk taking at the within-person level.

Research on the relationship between negative affect and risk taking has also yielded mixed results. Although negative affect has been associated with increased perception of risk (Johnson & Tversky, 1983), participants experiencing negative affect have been found to be more likely to favor a high-risk, high-reward option in actual gambling situations (Leith & Baumeister, 1996). Leith and Baumeister also concluded that, unlike positive affect, negative affect is not related to a change in subjective utility but rather to impaired self-regulation, such that those experiencing negative affect are less likely to make rational decisions and are thus more likely to engage in risk-taking behavior.

Such findings in basic research, however, have not been replicated in studies on sexual risk taking among MSM. A meta-analysis focused on between-person relations between negative affect and sexual risk taking found little evidence for an association between these variables (Crepaz & Marks, 2001). However, in one of the only studies at the within-person level, Mustanski (2007) found a positive main effect between state anxiety and sexual risk-taking, but no relationship between other aspects of negative affect and sexual risk-taking.



Given the tension between these findings in basic and applied research, as well as the lack of research at the within-person level, the main effect of negative affect on sexual risk-taking was investigated as a research question in the proposed study:

**Research question 1:** What is the relationship between negative affect and sexual risk-taking behavior at the within-person level?

Some researchers have suggested that the relation between state affect and sexual risk-taking in MSM may depend, in part, on trait affect. For example, Mustanski (2007) found that MSM with high trait anxiety were less likely to have sex with risky partners when experiencing high state anxiety, whereas the opposite was true for MSM with low trait anxiety. Although this was the only statistically significant interaction between state and trait affect found in the study, it is worth noting that Mustanski examined only interactions between corresponding state and trait affect variables (e.g. the interaction between trait negative affect and state negative affect). There are reasons to believe that cross-level interactions pairing different types of affect might have yielded significant results if they had been studied. For example, a spike in negative affect may be experienced as especially jarring and distressing for people with generally high positive affect, as state negative affect is experienced as deviation from the status quo. Therefore, there may be a stronger relationship between state negative affect and sexual risk-taking behavior for those with high trait positive affect than those with low trait positive affect because the especially distressing experience of negative affect may be more likely to lead to lapses in self-regulation. Similarly, a spike in positive affect may be experienced as

particularly different from the norm for people with generally high negative affect; therefore, there may be a stronger relationship between state positive affect and sexual risk-taking for those with high trait negative affect than those with low trait negative affect because it may be even more important not to risk losing a positive mood for those who experience it more rarely, causing an increase in subjective utility for a given loss. Hence, the following research questions were proposed, two of which replicated Mustanski's focus on interactions between corresponding state and trait affect and two of which concerned interactions between different facets of affect at the state and trait levels:

**Research question 2:** What is the cross-level interaction between trait positive affect and state positive affect?

**Research question 3:** What is the cross-level interaction between trait negative affect and state negative affect?

**Research question 4:** What is the cross-level interaction between trait positive affect and state negative affect?

**Research question 5:** What is the cross-level interaction between trait negative affect and state positive affect?

An additional moderator which has not been explored in previous daily diary research on affect and sexual behavior is relationship to partner. Research at the between-persons level has indicated that condom use is highly influenced by one's relationship to one's partner (Mustanski, Newcomb, & Clerkin, 2011). Because considering the relationship to one's partner to be serious is such a strong predictor of unprotected sex, the relationship between affect and sexual risk-taking may not be as

pronounced in those who are having sex with a partner who is a boyfriend or spouse. Therefore, relationship to partner was investigated at the within-persons level in the study, and the following hypothesis was proposed:

**Hypothesis 2:** The relationship between affect (positive and negative) and risk-taking at the within-person level will not be as strong when the relationship to partner is considered serious (i.e., boyfriend, significant other, spouse, or domestic partner) than when the relationship is more casual (e.g., casually dating or someone the participant just met).

## Chapter 4: Method

### Participants

The full sample of respondents was 2,871. The mean age of participants was 38.12 ( $SD = 12.65$ ); ages ranged from 18 years to 79 years. Participants identified their race as African American/Black (3.3%), White (83.9%), Hispanic/Latino (6.1%), Asian/Pacific Islander (2.5%), or Other (3.6%). Participants identified their sexual orientation as Homosexual/Gay (84.3%), Bisexual (12.4%), Heterosexual/Straight (0.3%), Unsure/Questioning (1.4%) or Other (1.4%). The sample was generally highly educated (60.6% had at least their Bachelor's degree). For relationship status, 55.7% of participants reported that they were not dating anyone, 7.9% reported that they were dating more than one person, and 35.8% reported that they were in a relationship with one person (with relationship duration from less than 3 months to more than 5 years).

### Measures

#### Demographic Form

As a part of the baseline survey, participants completed a variety of demographic questions including age, gender, race/ethnicity, current relationship status, sexual orientation, level of education, employment status, general health, and HIV status.

## Daily Affect

Affect was measured using a scale adapted from a previous study of emotional correlates of sexual events (Tanner, Hensel, & Fortenberry, 2010). The measure contains 10 items, nine of which will be used for the present study, with two subscales, positive affect (2 items; e.g., “Happy”) and negative affect (7 items; e.g., “Sad”). The tenth item, “Horny,” will not be used for the purposes of this study because it was not found to have a strong factor loading onto either of the two subscales. Participants reported how much they felt each emotion during the past day on a Likert-type scale ranging from “None” to “A lot.” In this study, Cronbach’s alpha for positive emotions was 0.77, and for negative emotions was 0.87.

Although validity evidence for these measures is limited, the items of this affect measure have considerable overlap with items from various subscales of positive and negative affect of the Positive and Negative Affect Schedule – Expanded Form (PANAS-X), which has demonstrated strong construct validity (Watson & Clark, 1994). The two items that make up the positive affect subscale in the present study are included in the Joviality subscale; the seven items that make up the negative affect subscale in the present study overlap with items on the Fear, Hostility, and Sadness subscales. Additionally, many other daily diary studies of affect and sexual behavior have similarly used ad hoc measures (e.g., Grov, Golub, Mustanski, & Parsons, 2010; Hensel, Fortenberry, & Orr, 2008; Hensel, Fortenberry, & Orr, 2010; Mustanski, 2007; Tanner, Hensel, & Fortenberry, 2010); this has proven to be an effective method particularly because of the need to create brief measures, which are more practical for use in daily diary surveys (Reis & Gable, 2000).

### Daily Sexual Risk Taking

Sexual-risk taking behavior was operationalized as the number of incidences of receptive and insertive anal intercourse each day during which condoms were not used. To calculate this, information was drawn from responses to a few items within a set of items drawn from valid measures used in national studies of sexual behaviors (Reece, Herbenick, Schick, Sanders, Dodge, & Fortenberry, 2010). Participants first indicated which sexual behaviors they had engaged in during the based day, using a checklist of 17 items. The two items from this checklist that will be used for this study are “Inserted my penis into another man’s anus (anal sex/topping)” and “Had another man insert his penis into my anus (anal sex/bottoming).”

Condom use was assessed for each sexual behavior reported by the participant that day. If participants reported engaging in a behavior more than once in the past day, they were asked about condom use each time they engaged in that behavior. Participants who reported engaging in insertive anal intercourse were asked “For this sexual encounter, did you wear a condom on your penis?” Participants who reported engaging in receptive anal intercourse were asked “For this sexual encounter, did your partner wear a condom on his penis?” Response choices included “Yes” and “No.” The index of sexual-risk taking behavior was calculated by summing the number of instances of insertive and receptive anal intercourse, respectively, during which condoms were not used. Because insertive and receptive intercourse carry different levels of risk, and have been treated as such in other indexes of behavioral risk (Mustanski, 2007), they will be analyzed separately in this study.

## Relationship to Partner

Relationship to partner was assessed for each behavior reported by the participant that day. Participants were asked, “Which of the following best describes who this person was?” The answer choices included: “Boyfriend or significant other,” “Someone I was casually dating/hanging out with,” “A friend,” “Someone I just met,” “My spouse or domestic partner,” “Someone who paid me or gave me something for sex,” “Someone who I paid or gave something to for sex,” and “Other, please specify.” Participants were given a text box to specify the relationship if they chose “Other.” The three moderators were created by re-coding the variable that asked participants to describe the partner with whom they engaged in each sexual behavior they reported each day. The variable initially had the following response options: 1. Boyfriend or significant other, 2. Someone I was casually dating/hanging out with, 3. A friend, 4. Someone I just met, 5. My spouse or domestic partner, 6. Someone who paid me or gave me something for sex, 6. Someone who I paid or gave something to for sex. These seven response options were collapsed into three dummy-coded relationship-type variables: Serious Relationship, Friend, and Casual Relationship. If the participant answered “1” or “5,” this was recoded as a “1” for Serious Relationship, if the participant answered “3,” this was recoded as a “1” for Friend, and if the participant answered “2,” “4,” “6,” or “7,” this was recoded as a “1” for Casual Relationship. These three variables were then averaged across days, such that each participant would have an average number of instances of insertive and receptive anal intercourse with each type of partner

### Procedure

This study used archival data collected for the Men's Annual National Sex Study (Rosenberger, Reece, Schick, Herbenick, Novak, Van Der Pol, & Fortenberry, 2011). Recruitment was conducted with the cooperation of one of the world's largest operators of websites that facilitate social and sexual interaction among men who have sex with men. In October 2010, recruitment e-mails were sent to all registered users of the company's two largest websites, Manhunt.net and DList.com, who indicated that they lived in one of the 50 US states or in the District of Columbia. Participants were recruited without respect to reported sexual orientation or sexual behavior. This message provided a brief description of the study as well as the link to the study's website. At the study website, individuals read a detailed description of the study and were given the opportunity to proceed to the study consent form if interested. Those who consented to participate in the study were directed to the study questionnaire; completion took approximately 20 minutes. Participants were not given incentives to participate in this portion of the study.

Following completion of this baseline questionnaire, participants were given an opportunity to participate in the second phase of the study in which they would be e-mailed instructions on how to complete 30-day sexual diaries. Participants were informed that they would receive daily e-mail reminders that would ask them to return to the study website each day to complete a short survey about their sexual behaviors over the course of four weeks. Participants were eligible to enter a lottery to win a \$100 Visa gift card each day they participated in the daily diary portion of the study. Included in the daily reminder e-mails was a link to the daily survey. These



surveys took approximately 5 minutes to complete. These diaries measured daily occurrence of a range of sexual behaviors, including manual, oral, and insertive and receptive anal sex behaviors, as well as external characteristics associated with each individual event, including whether or not condoms were used. Additional questions associated with each sexual behavior that which not used for the purposes of this study included partner's gender and age, whether or not lubricants or enemas were used, where the sexual act occurred and how long it lasted, how pleasurable and satisfying the behavior was, and whether or not the participant had difficulty attaining or maintain an erection. Additional data collected as a part of the daily diaries that were not used in this study included measures of Internet behaviors and sexual experiences.

Of the 32,831 men who completed the baseline survey, 13.5% ( $n = 4,439$ ) opted to participate in the daily diary phase of the study and completed some portion of the 30 diaries ( $M = 11$  days,  $SD = 15$  days). Another study using these data used the exclusion criteria of HIV-negative status at the time of recruitment, which yielded a subset of 3,877 participants (Hensel, Rosenberger, Novak, & Reece, 2012). This HIV-negative subset did not differ from the larger sample in terms of age, ethnicity, education, health status, sexual activity history, and recency of any STI. This subset also had similar levels of diary completion. Approximately 25% of this HIV-negative sub-sample completed diaries on all 30 days; an additional 30% completed more than half of the 30 diaries.

### Data Analysis

Multilevel modeling was used to analyze the daily diary data for the relationship between daily affect and condom use in order to account for the dependency of observations in nested, multilevel data such as days (level 1) nested within participants (level 2). The data was analyzed at the within-subjects level, such that the relationship between affect and condom use was modeled individually for each participant, and the average relationship across participants was also estimated as a random effect. In order to examine interaction effects, relationship to partner was included in the model as a possible moderator of the relationship between affect and condom use. Trait affect, which was assessed using an aggregate of the moods reported by each participant each day, was also examined as a level 2 variable which could moderate the relationship between affect and condom use.

Adequate sample size is an important consideration. Previous multilevel modeling research has indicated that, for a simple fixed effect of medium size, high statistical power (0.80) can be achieved with a level 1 sample size of 15 and a level 2 sample size of 30 (Scherbaum & Ferrerter, 2009). The archival data set for the proposed study had an average level 1 sample size of 13 days per participant and a level 2 sample size of 4,170 participants, which is clearly sufficient to achieve high statistical power with a medium effect size.

An exploratory factor analysis was conducted to examine the structure of mood items to confirm that they follow a general two-factor structure (positive mood and negative mood), and to see if there are any factors that emerge within those two,

particularly within the construct of negative mood, as certain items (e.g., stressed and anxious) may be related to one another.

## Chapter 5: Results

### *Data Management*

A series of steps were taken to develop a dataset that was appropriate for the planned analyses. The original dataset contained 4,439 participants and 29,773 cases (a case representing one daily entry for one participant). First, 1,497 participants (33.7%) who completed only one day of the survey were removed from the dataset because at least two observations per person is required to examine within-person variation.

Next, several procedures were used to ensure that missing data and inconsistent data were handled appropriately. All system-missing values were given a defined missing data code. Ninety-seven cases were removed from the dataset because all daily dairy data were missing, and an additional 117 cases were removed because all daily diary data relating to sexual experiences were missing (only mood variables were reported).

It was found that the same code was used to indicate data that were missing due to nonresponse and data that were not collected because they were not relevant to the case (e.g., data on sexual partner type during anal intercourse when the participant did not have anal intercourse that day). In these cases, it was possible to determine whether the data were missing due to nonresponse by checking whether the participant had indicated engaging in the relevant sexual behavior. If the participant did indicate that he engaged in the behavior that day, then the sexual experience variables were missing due to nonresponse and given a missing data code (99). In

contrast, if the participant did not indicate having engaged in the behavior that day, then the sexual experience variables were not relevant to the case and coded as zero (to reflect the lack of occurrence that day).

For the insertive anal intercourse variables, 37 cases were found in which the total number of times the participant reported having insertive anal intercourse that day was not consistent with the data on individual experiences (e.g., the total number of instances of insertive anal intercourse was reported as one, but the participant answered questions about two instances of insertive anal intercourse that day). In 29 of these cases, the total number of instances of insertive anal intercourse was changed to be consistent with the data on the individual experiences. In the remaining 8 cases, data on the total number of instances of insertive anal intercourse for that day, as well as the data on the individual experiences, were missing, and so these cases were removed from the dataset. There were 20 cases in which insertive anal intercourse was not checked on the behavior checklist for that day, but the total number of instances of insertive anal intercourse was greater than zero, and data was reported on individual experiences; those cases were changed such that insertive anal intercourse was checked for that day (e.g., changed from zero to one).

For the receptive anal intercourse variables, there were 24 cases in which the variable indicating the total number of instances of receptive anal intercourse and the variable indicating the total number of instances of receptive anal intercourse with a male partner were not equal. In 15 of these cases, the total number of instances of receptive anal intercourse was reported as zero, but the total number of instances of receptive anal intercourse with a male partner was greater than zero. In these cases,

the total number of instances of receptive anal intercourse was changed to equal the total number of instances of receptive anal intercourse with a male partner, and the experience data was recoded to indicate whether they were missing or irrelevant to the case. In 9 of these cases, the total number of instances of receptive anal intercourse with a male partner was reported as zero, but the total number of instances of receptive anal intercourse was greater than zero. Eight of these cases were retained because the data on individual experiences was consistent with the total number of instances of receptive anal intercourse, and the total number of instances of receptive anal intercourse with a male partner was changed to equal that number. One case was removed because the data on individual experiences was inconsistent with the total number of instances of receptive anal intercourse reported.

In sum, this process of data cleaning led to removal of 1,830 cases (6.14%) from the original dataset. After this process of data cleaning was completed, the amount of missing data was minimal (1.72%). For this reason, complete case analysis was used to minimize convergence problems in the computationally intensive analyses featured in this study.

### *Descriptive Statistics*

In the final sample of 2,871 MSM, the mean number of daily diaries completed was 9.73 ( $SD = 8.39$ ), for a total of 27,943 days of diary entries. Across all participants and all days of diary entries, participants reported 1,534 days (5.6%) on which at least one instance of insertive anal intercourse occurred. Participants reported their condom use for 1,976 instances of insertive anal intercourse across all days of diary entries; of these instances, 1,267 (64.1%) occurred without a condom.

Participants reported 2,584 days (9.2%) on which at least one instance of receptive anal intercourse occurred. Participants reported their condom use for 1,861 instances of receptive anal intercourse across all days of diary entries; of these instances, 1,279 (68.7%) occurred without a condom.

Across all participants and all days of diary entries, 492 instances (24.9%) of insertive anal intercourse occurred with someone with whom the participant was in a serious relationship, 1,058 instances (53.5%) occurred with a casual partner, and 351 instances (17.8%) occurred with a friend. For instances of receptive anal intercourse, 394 (21.2%) occurred with a serious partner, 871 (46.8%) occurred with a casual partner, and 382 (20.5%) occurred with a friend. See Table 1 for descriptive statistics for predictor and outcome variables.

Table 1

*Person-Level Descriptive Statistics for Predictor and Outcome Variables (N = 2,871)*

	ICC	<i>M</i>	<i>SD</i>	Median	Min.	Max.
<b>Predictors</b>						
Joviality	0.50	2.93	0.67	2.91	1	4
Hostility	0.44	1.87	0.54	1.80	1	4
Sadness	0.58	1.75	0.64	1.58	1	4
<b>Outcomes</b>						
Daily instances of insertive anal intercourse without condoms		0.06	0.22	0	0	3
Daily instances of receptive anal intercourse without condoms		0.06	0.20	0	0	3
<b>Moderators</b>						
<b>Insertive anal intercourse</b>						
Serious Relationship		0.02	0.12	0	0	3
Friend		0.02	0.09	0	0	2
Casual Relationship		0.05	0.18	0	0	3
<b>Receptive anal intercourse</b>						
Serious Relationship		0.02	0.09	0	0	2
Friend		0.01	0.08	0	0	1
Casual Relationship		0.04	0.16	0	0	3

*Development of Mood Subscales*

Before conducting data analyses related to hypotheses and research questions, it was necessary to investigate the latent dimensions of affect underlying participants' responses to the mood items used in this study using a series of multilevel exploratory factor analyses (MEFAs). This allows for the possibility that the dimensions of affect that differentiate one person from another (Level 2: between-person) differ from those differentiating a person's mood from one day to the next (Level 1: within-person). A major goal of these analyses was to determine the number and content of factors at each level of analysis. All other matters being equal, a preference was given for solutions that yielded identical subscales at both levels of analysis.



As recommended by Reise et al. (2007), intraclass correlation coefficients (ICCs) for each of the affect items was examined prior to factor analysis (see Table 2). In the context of this study, an ICC could be interpreted as the proportion of item variance attributable to the person level of analysis. ICCs ranged from .35 (“Irritable”) to .55 (“Lonely”), indicating the presence of item variance at both the within-person and between-person level of analysis. Two items (Depressed and Lonely) had an ICC greater than .50, which suggested that a substantial proportion of item variance was explained by differences between persons. This analysis of item variance supported the use of a multilevel factor analysis.

Factor analyses were run for models with different numbers of within-person and between-person factors, ranging from 1 to 3 factors at each level. This analysis was conducted using the robust maximum likelihood estimation capabilities of Mplus software, version 7.1 (Muthén & Muthén, 2010), as were all subsequent multilevel analyses. Factors were rotated using oblique geomin method. The fit of the models was evaluated through examination of the Root Mean Square Error of Approximation (RMSEA), the Standardized Root Mean Square Residual (SRMR), and the Comparative Fit Index (CFI). Goodness-of-fit was assessed using the following guidelines for good fit suggested by Hu and Bentler (1999) with respect to covariance structure analysis: RMSEA ( $\leq .06$ ), SRMR ( $\leq .08$ ), and CFI ( $\geq .95$ ). The model with three factors at each level of analysis clearly had the best profile of fit indices: RMSEA = .06, SRMR(within-person) = .03, SRMR(between-person) = .03, and CFI = .96. Given this favorable profile relative to the other models, along with a

clear and interpretable factor structure, this model was used as the basis for the multilevel confirmatory factor analysis.

Inspection of structure coefficients suggested that the structure and meaning of factors was the same at the within-person and between-person levels (see Table 2). The Joviality factor had the strongest loadings on items “Happy” and “Cheerful.” The Hostility factor had the strongest loadings on the items “Angry,” “Irritable,” and “Stressed.” The Sadness factor had the strongest loadings on the items “Depressed,” “Sad,” and “Lonely.” One item, “Anxious” was not included in any of the affect subscales because it did not cleanly load onto any factor; strong loadings were found on both “Hostility” and “Sadness,” which did not meet our criteria that loadings on each of the factors had to have a difference of at least .2 in order to be retained. Affect variables were scored by averaging across all items within each factor. Within-person coefficient alphas for the factors were .78 for Joviality, .73 for Hostility, and .79 for Sadness.

Table 2

*Structure Coefficients for Multilevel Factor Analysis of Mood Items*

Item	ICC	<u>Within Person</u>			<u>Between Person</u>		
		1	2	3	1	2	3
Happy	0.43	-0.28	<b>0.79</b>	-0.33	-0.25	<b>0.98</b>	-0.53
Sad	0.40	0.37	-0.26	<b>0.57</b>	0.67	-0.44	<b>0.91</b>
Angry	0.35	<b>0.64</b>	-0.21	0.32	<b>0.86</b>	-0.25	0.65
Irritable	0.35	<b>0.69</b>	-0.23	0.28	<b>0.94</b>	-0.29	0.63
Stressed	0.41	0.50	-0.26	0.30	0.72	-0.30	0.71
Cheerful	0.43	-0.23	<b>0.60</b>	-0.28	-0.17	<b>0.87</b>	-0.41
Anxious	0.44	0.36	-0.19	0.33	0.67	-0.31	0.74
Depressed	0.50	0.36	-0.31	<b>0.74</b>	0.59	-0.51	<b>0.93</b>
Lonely	0.55	0.22	-0.24	<b>0.50</b>	0.49	-0.42	<b>0.81</b>

*Note.* ICC = Intraclass Correlation Coefficient. Bolded structure coefficients indicate that the item was retained.

### Data Analysis Plan

Links between daily mood and anal intercourse without a condom could potentially exist at both the within-person level (Level 1) and between-person level (Level 2), as reflected by the multilevel structure of the data where days were nested within people. To examine relations at both levels of analysis, I used a multilevel latent covariate model that has been shown to offer higher power to detect contextual effects relative to more traditional multilevel regression models (Lüdtke et al., 2008). This model separated daily mood ratings into latent within- and between-person components, permitting tests of links between mood and sexual behavior at both Level 1 and Level 2. We interpreted the latent between-person component as a measure of trait affect because it represented the part of daily affect that, for each participant, was stable over the course of the study. Robust standard errors were used in all analyses. A negative binomial model was used to model the outcomes, as is recommended for overdispersed count variables such as the anal intercourse variables in the present study (Gardner, Mulvey, & Shaw, 1995). Dimensions of mood were each tested in separate regression models due to convergence difficulties that occurred when testing the three mood variables simultaneously.

The model building strategy started with the most basic model investigated, which was a random intercepts regression featuring a mood variable as a predictor of one of the sexual risk taking variables. Regression intercepts were allowed to randomly vary across participants (reflecting individual differences in sexual behavior), and could be interpreted as a person's average levels of condomless anal intercourse on a day when the person had his average level of state affect. Regression

slopes were estimated at both Level 1 and Level 2. After estimating this model, a test was conducted to determine whether the within-person relation between mood and unprotected anal intercourse (i.e., the Level 1 slopes) varied randomly across participants. Variability in these slopes would indicate that participants differed from one another in the link between state mood and sexual behavior. In cases where significant variability was detected in Level 1 slopes, these slopes were allowed to vary randomly across participants in all subsequent analyses. The most complex models tested were those in which Level 2 variables (trait affect, types of sexual partners) were examined as potential moderators of the within-person relation between affect and sexual risk taking. Such moderation effects are referred to as cross-level interactions because they feature an interaction between a Level 2 variable (e.g., tendency to have sex with a serious relationship partner) and a Level 1 variable (e.g., state Hostility). Cross-level interactions were investigated only in cases where the Level 1 slope was found to vary across participants.

### *Main Effects of Daily Mood on Sexual Risk Taking*

Hypothesis 1 specified that positive affect would be negatively associated with sexual risk taking at the within-person level. To test this hypothesis, multilevel models were estimated using daily Joviality as a predictor of the number of instances of unprotected insertive (hereafter referred to as UIAI for unprotected insertive anal intercourse) and receptive anal intercourse (hereafter referred to as URAI for unprotected receptive anal intercourse) per day. Within-person slopes between Joviality and anal intercourse without condoms were found to vary randomly across people for both UIAI ( $z = 10.16, p < .001$ ) and URAI ( $z = 9.52, p < .001$ ), indicating

that links between state happiness and risky sexual behavior varied across participants. Tests of Level 1 slopes indicated that Hypothesis 1 was not supported (see Table 3). In fact, the opposite relationship was found: Regardless of trait positive affect levels, state Joviality was positively associated with both UIAI ( $B = 0.353, p < .001$ ) and URAI ( $B = 0.490, p < .001$ ). Similarly, at the between-person level, trait Joviality was positively associated with URAI ( $B = -0.383, p = .049$ ). No significant relationship emerged between trait Joviality and UIAI.

Research Question 1 focused on the relation between negative affect and sexual risk taking at the within-person level. I first present results for Hostility. Within-person slopes between Hostility and sexual risk taking were found to vary randomly across people for both UIAI ( $z = 10.21, p < .001$ ) and URAI ( $z = 11.69, p < .001$ ). Regardless of trait Hostility, state Hostility was negatively associated with both UIAI ( $B = -0.388, p < .001$ ) and URAI ( $B = -0.340, p < .001$ ). At the between-person level, no significant relationship was found between trait Hostility and URAI. However, greater trait Hostility was positively associated with UIAI ( $B = .379, p = .021$ ). Thus, the relation between Hostility and UIAI was negative at the within-person level but positive at the between-person level.

Within-person slopes between Sadness and anal intercourse without condoms were found to vary randomly across people for both UIAI ( $z = 7.56, p < .001$ ) and URAI ( $z = 8.65, p < .001$ ). Regardless of trait Sadness, state Sadness was negatively associated with UIAI ( $B = -0.381, p < .001$ ) and URAI ( $B = -0.491, p < .001$ ). At the between-person level, there was no significant relationship between trait Sadness and

UIAI; however, greater trait Sadness was found to be positively associated with average URAI ( $B = 0.357, p = .023$ ).

In short, positive state affect was positively related to sexual risk-taking, whereas negative state affect was negatively related to sexual risk taking. These within-person associations were found to vary significantly across participants, indicating that the strength or direction of these associations may depend on characteristics of participants (such as the proposed moderators examined below). Finally, at the between-person level, both Joviality and Sadness were positively related to URAI (but not UIAI); Hostility, in contrast, was positively related to UIAI (but not URAI).

Table 3

*Insertive and Receptive Anal Intercourse without a Condom: Within- and Between-Person Effects*

Predictors	Outcomes					
	Number of instances of insertive anal intercourse without a condom			Number of instances of receptive anal intercourse without a condom		
	<i>B</i>	<i>SE</i>	<i>p</i>	<i>B</i>	<i>SE</i>	<i>p</i>
Within-person						
Joviality	0.55	0.04	.000	0.34	0.12	.004
Hostility	-0.25	0.03	.000	-0.30	0.03	.000
Sadness	-0.36	0.04	.000	-0.42	0.07	.000
Between-person						
Joviality	-0.17	0.15	.259	-0.11	0.46	.804
Hostility	0.22	0.18	.208	0.32	0.15	.034
Sadness	0.08	0.14	.587	0.53	0.35	.131

### Cross-Level Interactions: Trait Affect as Moderator

Research questions 2, 3, 4, and 5 concerned the possibility that trait affect may explain individual differences in within-person links between state affect and sexual risk taking (i.e., that trait affect interacts with state affect in predicting sexual behavior). These questions involved testing 18 cross-level interactions (3 moderators x 3 predictors x 2 outcomes), and probing all statistically significant interactions. Results are presented below. Results for moderators of state positive affect and presented first, followed by results for moderators of state negative affect, and then summarized at the end of this section.

Question 2 focused on potential cross-level interactions with state Joviality. Each of the three potential moderators was tested separately due to problems with convergence when they were tested simultaneously. Testing trait Joviality as a moderator involved a simple extension of the simpler main effect models tested above. In the previous model, the latent trait Joviality variable was included only as a predictor of average daily frequency of unprotected intercourse (i.e., predictor of intercepts). In the new model, trait Joviality was also included as a predictor of the Level 1 relation between state Joviality and instances of unprotected intercourse (i.e., predictor of slopes).

The interaction between trait and state Joviality was significant for both UIAI ( $B = -0.530$ ,  $SE = 0.071$ ,  $p < .001$ ) and URAI ( $B = -0.233$ ,  $SE = 0.056$ ,  $p < .001$ ). All significant interaction effects were probed by examining the simple slopes at low (one standard deviation below the mean), moderate (at the mean), and high (one standard deviation above the mean) values of the trait affect moderator variable (in this case,

trait Joviality). State Joviality was positively related to UIAI for those with low and moderate levels of trait Joviality, and this relationship was stronger for those with low levels of trait Joviality ( $B = 0.584, SE = 0.085, p < .001$ ) than for those with moderate levels of trait Joviality ( $B = 0.256, SE = 0.080, p = .001$ ). State Joviality was unrelated to UIAI for those with high levels of trait Joviality ( $B = -0.071, SE = 0.097, p = .464$ ).

State Joviality was significantly positively related to URAI at all three levels of trait Joviality, and this relationship became stronger with lower levels of trait Joviality. In other words, the positive association between state Joviality and URAI was strongest for those with low levels of trait Joviality ( $B = 0.725, SE = 0.055, p < .001$ ), weaker for those with moderate levels of trait Joviality ( $B = 0.581, SE = 0.058, p < .001$ ), and weakest for those with high levels of trait Joviality ( $B = 0.437, SE = 0.078, p < .001$ ).

Research question 5 concerned trait Hostility and Sadness as moderators of the relationship between state Joviality and sexual risk taking. Neither of the models with trait Hostility as a moderator converged on solutions. In contrast, significant interactions emerged for trait Sadness as a moderator with respect to both URAI ( $B = 0.256, SE = 0.025, p < .001$ ) and UIAI ( $B = 0.488, SE = 0.040, p < .001$ ). The positive relationship between state Joviality and UIAI was weakest for those with low levels of trait Sadness ( $B = 0.236, SE = 0.042, p < .001$ ), stronger for those with moderate levels of trait Sadness ( $B = 0.530, SE = 0.036, p < .001$ ), and strongest for those with high levels of trait Sadness ( $B = 0.824, SE = 0.045, p < .001$ ). The same pattern was found for URAI: The strength of the relationship was weakest for low levels ( $B =$



0.526,  $SE = 0.030$ ,  $p < .001$ ), stronger for moderate levels ( $B = 0.680$ ,  $SE = 0.024$ ,  $p < .001$ ), and strongest for high levels ( $B = 0.834$ ,  $SE = 0.026$ ,  $p < .001$ ) of trait Sadness. In summary, the positive relationship between state Joviality and sexual risk taking tended to be stronger at lower levels of trait Joviality and higher levels of trait Sadness.

To test research question 3, trait (e.g., aggregated daily) negative affect was tested as a moderator of the relationship between state negative affect and the sexual risk taking variables. Because there were two dimensions of negative mood, four cross-level interactions were tested: the interaction of trait Hostility with both state Hostility and state Sadness, and the interaction of state Sadness with both state Hostility and state Sadness. When the predictor and moderator variables were the same dimension of mood, analyses were conducted in the same fashion as those for the interaction between trait and state Joviality (described above). A slightly different strategy was used, however, when the predictor and moderator were different dimensions of mood. In such a case, the latent covariate approach was used to split the moderator into a Level 1 component (state affect) and a Level 2 component (trait affect). The latent measure of trait affect on the moderator was then included as a predictor of the random intercepts and slopes at Level 2.

I begin by presenting results for state Hostility. The interaction between trait and state Hostility was significant for both UIAI ( $B = -0.530$ ,  $SE = 0.092$ ,  $p < .001$ ) and URAI ( $B = -0.819$ ,  $SE = 0.119$ ,  $p < .001$ ). A simple slopes analysis indicated that state Hostility was negatively related to UIAI for those with moderate ( $B = -0.417$ ,  $SE = 0.071$ ,  $p < .001$ ) and high ( $B = -0.684$ ,  $SE = 0.087$ ,  $p < .001$ ) levels of trait Hostility,

and this association was stronger for those with high levels of trait hostility than for those with moderate levels. State Hostility was unrelated to UIAI for those with low levels of trait hostility ( $B = -0.151, SE = 0.083, p = .067$ ).

State Hostility was also significantly negatively related to URAI for those with moderate ( $B = -0.200, SE = 0.091, p = .027$ ) and high ( $B = -0.612, SE = 0.113, p < .001$ ) levels of trait Hostility, and this association was stronger for those with high levels of trait Hostility than for those with moderate levels. However, unlike the interaction of state Hostility and trait Hostility for UIAI, state Hostility was significantly positively related to URAI without a condom for those with low levels of trait Hostility ( $B = 0.211, SE = 0.104, p = .043$ ).

The interaction between trait Sadness and state Hostility was statistically significant for prediction of UIAI ( $B = 0.299, SE = 0.053, p < .001$ ). Specifically, state Hostility was negatively related to UIAI for low levels of trait Sadness ( $B = -0.192, SE = 0.052, p < .001$ ). In contrast, state Hostility was unrelated to UIAI at moderate levels of trait Sadness ( $B = -0.011, SE = 0.034, p = .735$ ) and was positively related to UIAI at high levels of trait Sadness ( $B = 0.169, SE = 0.041, p < .001$ ). The interaction between state Hostility and trait Sadness was not significant for URAI ( $B = 0.053, SE = 0.042, p = 0.209$ ). To summarize, the negative relationship between state Hostility and sexual risk taking was generally stronger at higher levels of trait Hostility, and lower levels of trait Sadness. However, state Hostility was positively related to sexual risk taking for those with low levels of trait Hostility and high levels of trait Sadness.

Results for state Sadness are presented next. The model with trait Sadness moderating the relationship between state Sadness and UIAI was unable to converge on a solution. However, a significant interaction between trait and state Sadness was found for URAI ( $B = -0.249$ ,  $SE = 0.057$ ,  $p < .001$ ). State Sadness was negatively related to URAI for low ( $B = -0.641$ ,  $SE = 0.094$ ,  $p < .001$ ), moderate ( $B = -0.791$ ,  $SE = 0.081$ ,  $p < .001$ ), and high ( $B = -0.941$ ,  $SE = 0.082$ ,  $p < .001$ ) levels of trait Sadness. The negative relationship between state Sadness and URAI was stronger at higher levels of trait Sadness.

A significant interaction between trait Hostility and state Sadness emerged when UIAI was the outcome ( $B = 0.406$ ,  $SE = 0.074$ ,  $p < .001$ ). State Sadness was negatively related to UIAI for low ( $B = -0.406$ ,  $SE = 0.072$ ,  $p < .001$ ) and moderate ( $B = -0.203$ ,  $SE = 0.061$ ,  $p < .001$ ) levels of trait Hostility; this relationship was stronger for those with low trait Hostility than for those with moderate trait Hostility. State Sadness was unrelated to UIAI for high levels of trait Hostility ( $B = 0.001$ ,  $SE = 0.071$ ,  $p = .992$ ). The interaction between state Sadness and trait Hostility was not significant for URAI ( $B = 0.052$ ,  $SE = 0.083$ ,  $p = .528$ ). In summary, the negative relationship between state Sadness and sexual risk taking was stronger at higher levels of trait Sadness and lower levels of trait Hostility.

Research question 4 concerned trait Joviality as a moderator of the relationship between state negative mood and the sexual risk taking outcomes. Again, the results for state Hostility will be presented first, followed by the results for state Sadness. The model with trait Joviality moderating the relationship between state Hostility and UIAI was unable to converge on a solution; however, an interaction

emerged when the outcome was URAI ( $B = 0.196$ ,  $SE = 0.040$ ,  $p < .001$ ). State Hostility was significantly negatively associated with URAI for low ( $B = -0.581$ ,  $SE = 0.023$ ,  $p < .001$ ), moderate ( $B = -0.460$ ,  $SE = 0.044$ ,  $p < .001$ ), and high ( $B = -0.339$ ,  $SE = 0.067$ ,  $p < .001$ ) levels of trait Joviality. This negative relationship between state Hostility and URAI was weaker at higher levels of trait Joviality. The interaction between state Sadness and trait Joviality was not significant for UIAI ( $B = 0.108$ ,  $SE = 0.065$ ,  $p = .096$ ) or URAI ( $B = -0.005$ ,  $SE = 0.053$ ,  $p = .926$ ). In sum, the negative relationship between state Hostility and URAI was stronger for those with lower levels of trait Joviality.

To summarize the statistically significant results, state positive affect was positively related to sexual risk-taking outcomes, and this positive relationship was stronger for those with lower levels of trait positive affect, as well as for those with higher levels of trait Sadness.

State Hostility was negatively related to sexual risk-taking outcomes, and this negative relationship was stronger for those with higher levels of trait Hostility, and for those with lower levels of trait positive affect (when URAI was the outcome). However, for those with low levels of trait Hostility, state Hostility was significantly *positively* related to URAI.

For the interaction between trait Sadness and state Hostility, the relationship between state Hostility and UIAI was negative for low levels and positive at high levels of trait Sadness. State Sadness was also negatively related to UIAI, but this negative relationship was stronger at lower levels of trait Hostility.

Cross-Level Interactions: Relationship Type as a Moderator

I next tested Hypothesis 2, that the relationship between positive and negative affect and sexual risk-taking at the within-person level will be weakened when the relationship to partner is considered serious than when the relationship is more casual. This involved testing 18 cross-level interactions (3 moderators x 3 predictors x 2 outcomes), and probing all statistically significant interactions. All significant interaction effects were probed by examining the simple slopes at low (one standard deviation below the mean), moderate (at the mean), and high (one standard deviation above the mean) values of the relationship type moderator variable. Results are presented below, and then summarized at the end of this section.

The interactions between state Joviality and Serious Relationship ( $B = -0.480$ ,  $SE = 0.092$ ,  $p < .001$ ), Friend ( $B = 0.967$ ,  $SE = 0.282$ ,  $p = .001$ ), and Casual Relationship ( $B = -0.623$ ,  $SE = 0.211$ ,  $p = .003$ ) were all significant for UIAI. When URAI was the outcome, interactions between Joviality and Serious Relationship ( $B = -0.826$ ,  $SE = 0.411$ ,  $p = .045$ ), Friend ( $B = 0.850$ ,  $SE = 0.367$ ,  $p = .020$ ), and Casual Relationship ( $B = -0.488$ ,  $SE = 0.159$ ,  $p = .002$ ) were significant as well. I will begin with the results related to serious relationships. Joviality was positively related to UIAI, and this positive relationship was strongest at low levels ( $B = 0.617$ ,  $SE = 0.050$ ,  $p < .001$ ), weaker at moderate levels ( $B = 0.560$ ,  $SE = 0.048$ ,  $p < .001$ ), and weakest at high levels ( $B = 0.503$ ,  $SE = 0.048$ ,  $p < .001$ ). The same pattern was found for URAI, such that the positive relationship between Joviality and sexual risk taking was strongest at low levels ( $B = 0.548$ ,  $SE = 0.071$ ,  $p < .001$ ), weaker at moderate levels ( $B = 0.470$ ,  $SE = 0.053$ ,  $p < .001$ ), and weakest at high levels ( $B = 0.392$ ,  $SE =$

0.060,  $p < .001$ ). This indicates that, as hypothesized, the positive relationship between positive affect and sexual risk taking was weaker for people whose sexual partner often was someone considered to be a serious relationship partner.

When Friend was the moderator of the relationship between positive affect and sexual risk taking, the positive relationship between Joviality and UIAI was in the opposite direction: weakest at low levels ( $B = 0.473$ ,  $SE = 0.056$ ,  $p < .001$ ), stronger at moderate levels ( $B = 0.560$ ,  $SE = 0.048$ ,  $p < .001$ ), and strongest at high levels of Friend partners ( $B = 0.647$ ,  $SE = 0.053$ ,  $p < .001$ ). The same pattern was observed for URAI; the positive relationship between Joviality and URAI was weakest at low levels ( $B = 0.406$ ,  $SE = 0.065$ ,  $p < .001$ ), stronger at moderate levels ( $B = 0.470$ ,  $SE = 0.053$ ,  $p < .001$ ), and strongest at high levels ( $B = 0.534$ ,  $SE = 0.053$ ,  $p < .001$ ) of Friend. This indicates that as instances of anal intercourse with friends increases, the relationship between positive affect and sexual risk taking becomes stronger.

Contrary to hypothesis, the interaction between positive affect Casual Relationship followed the same pattern as that of positive affect and Serious Relationship. The positive relationship between positive affect and UIAI was strongest at low levels ( $B = 0.669$ ,  $SE = 0.065$ ,  $p < .001$ ), weaker at moderate levels ( $B = 0.560$ ,  $SE = 0.048$ ,  $p < .001$ ), and weakest at high levels ( $B = 0.451$ ,  $SE = 0.055$ ,  $p < .001$ ) of casual relationship partners. Similarly, the positive relationship between positive affect and URAI was strongest at low levels ( $B = 0.547$ ,  $SE = 0.065$ ,  $p < .001$ ), weaker at moderate levels ( $B = 0.470$ ,  $SE = 0.053$ ,  $p < .001$ ), and weakest at high levels ( $B = 0.393$ ,  $SE = 0.051$ ,  $p < .001$ ) of casual relationship partners. This indicates that as instances of anal intercourse with casual relationship partners

increase, the positive relationship between positive affect and sexual risk taking grows weaker.

I will now present the results for negative affect, beginning with Hostility. The interaction between state Hostility and Serious Relationship was not significant for UIAI ( $B = -0.344$ ,  $SE = 0.312$ ,  $p = .270$ ); however, the interactions between state Hostility and Friend ( $B = -1.368$ ,  $SE = 0.448$ ,  $p = .002$ ), and Casual Relationship ( $B = 0.957$ ,  $SE = 0.237$ ,  $p < .001$ ) were significant. For the Friend moderator, the negative relationship between state Hostility and UIAI was weakest at low levels ( $B = -0.328$ ,  $SE = 0.070$ ,  $p < .001$ ), stronger at moderate levels ( $B = -0.452$ ,  $SE = 0.050$ ,  $p < .001$ ), and strongest at high levels ( $B = -0.576$ ,  $SE = 0.057$ ,  $p < .001$ ). Thus, the negative relationship between Hostility and UIAI was strongest as instances of insertive anal intercourse with friends increased. However, like the interaction of casual partners with positive affect, the opposite relationship emerged for casual partners: The negative relationship between state Hostility and UIAI was strongest at low levels ( $B = -0.620$ ,  $SE = 0.072$ ,  $p < .001$ ), weaker at moderate levels ( $B = -0.452$ ,  $SE = 0.050$ ,  $p < .001$ ), and weakest at high levels ( $B = -0.284$ ,  $SE = 0.056$ ,  $p < .001$ ) of Casual Relationship. Thus, contrary to hypothesis, the negative relationship between negative affect and UIAI was weaker as instances of anal intercourse with casual relationship partners increased. The interactions between state Hostility and Serious Relationship ( $B = 0.087$ ,  $SE = 0.387$ ,  $p = .821$ ), Friend ( $B = -0.860$ ,  $SE = 0.496$ ,  $p = .083$ ), and Casual Relationship ( $B = 0.186$ ,  $SE = 0.267$ ,  $p = .486$ ) were not significant when URAI was the outcome.

Next I will present the results for moderation of state Sadness and sexual risk-taking. The interactions between state Sadness and Serious Relationship ( $B = -0.335$ ,  $SE = 0.767$ ,  $p = .662$ ), Friend ( $B = -0.753$ ,  $SE = 0.675$ ,  $p = .264$ ), and Casual Relationship ( $B = 0.974$ ,  $SE = 0.921$ ,  $p = .290$ ) were not significant for UIAI. When URAI was the outcome, however, significant interactions emerged for Serious Relationship ( $B = -0.900$ ,  $SE = 0.372$ ,  $p = .015$ ), Friend ( $B = -1.114$ ,  $SE = 0.368$ ,  $p = .002$ ), and Casual Relationship ( $B = 0.590$ ,  $SE = 0.193$ ,  $p = .002$ ).

For Serious Relationship, results did not appear to support the hypothesis. The negative relationship between state Sadness and URAI was weakest at low levels of the moderator ( $B = -0.532$ ,  $SE = 0.056$ ,  $p < .001$ ), stronger at moderate levels ( $B = -0.617$ ,  $SE = 0.042$ ,  $p < .001$ ), and strongest at high levels ( $B = -0.702$ ,  $SE = 0.054$ ,  $p < .001$ ), indicating that as instances of receptive anal intercourse with serious partners increased, the relationship between negative affect and URAI grew stronger. For Friend, the negative relationship between state Sadness and URAI was also weakest at low levels of the moderator ( $B = -0.533$ ,  $SE = 0.054$ ,  $p < .001$ ), stronger at moderate levels ( $B = -0.617$ ,  $SE = 0.042$ ,  $p < .001$ ), and strongest at high levels ( $B = -0.701$ ,  $SE = 0.046$ ,  $p < .001$ ). This indicates that as instances of receptive anal intercourse with friends increased, the relationship between Sadness and URAI grew stronger. The interaction of Sadness with Casual Relationship, however, showed the opposite pattern, contrary to hypothesis: The relationship between Sadness and URAI was strongest at low levels ( $B = -0.710$ ,  $SE = 0.056$ ,  $p < .001$ ), weaker at moderate levels ( $B = -0.617$ ,  $SE = 0.042$ ,  $p < .001$ ), and weakest and high levels ( $B = -0.524$ ,  $SE = 0.048$ ,  $p < .001$ ) of the moderator, indicating that as instances of receptive anal



intercourse with casual partners increased, the relationship between Sadness and URAI grew weaker.

To summarize, support was mixed for the hypothesis the relationship between affect and sexual risk taking would be weaker when the relationship to partner is considered serious than when the relationship is more casual. For interactions in which Serious Relationship was the moderator, the hypothesis was supported only for positive affect. The interactions with state Hostility were nonsignificant for both outcomes; the interaction with state Sadness was nonsignificant for UIAI and showed the opposite pattern for URAI (i.e., the relationship between Sadness and URAI was stronger with more serious partners). Hypothesis 2 did not specifically address interactions with Friend, because it was not clear whether or not someone who is a friend would be considered a serious or casual partner. However, for interactions that were statistically significant, Friend appeared to moderate the relationship between affect and sexual risk taking in the way that was expected for a casual partner. The relationship between positive affect and sexual risk taking grew stronger for greater numbers of partners who were friends. This same pattern was found for state Hostility with respect to UIAI and for state Sadness with respect to URAI, but the other interactions between Friend and negative affect were nonsignificant. Finally, for interactions in which Casual Relationship was the moderator, where significant, interactions with positive and negative state affect were in the opposite than expected direction. As instances of anal intercourse with casual partners increased, the relationship between affect and sexual risk-taking grew weaker.



## Chapter 6: Discussion

The present study is one of a small handful of investigations examining within-person associations between affect and sexual risk taking among HIV-negative men who have sex with men, a population that has been disproportionately impacted by HIV and continues to see increases in HIV infection in subgroups (CDC, 2012b). Current models of sexual risk taking do not emphasize the role of affect, although it is reasonable to believe that mood would play a role in decision making around sexual behavior (Kalichman & Weinhardt, 2001; Marks, Bingman, & Duval, 1998; McKirnan, Ostrow, & Hope, 1996; Mustanski, 2007). Results from a large sample of MSM recruited from a sex-oriented Internet service supported the notion that daily affect is linked with day-to-day differences in sexual risk behavior. A number of the relations found between affect and sexual behavior, however, differed from both expected directions and previous research. Moreover, as described below, most of the within-person associations between affect and sexual behavior were moderated by trait affect and relationship to partner.

### *Positive Affect*

It was hypothesized that positive affect would be negatively associated with sexual risk taking at the within-person level. Results indicated that the opposite relationship was found: Regardless of trait positive affect levels, state positive affect was positively associated with sexual risk taking. This finding is also contrary to Mustanski's (2007) study of the within-person associations between affect and sexual

risk, which found that positive affect was negatively associated with sexual risk taking.

This hypothesis was based on not only Mustanski's (2007) findings but also experimental research that has supported an inverse relationship between positive affect and risk taking behavior. This research demonstrated that positive affect reduces risk taking behavior by increasing the subjective utility of losses, i.e., the perceived impact of a given loss (Isen & Patrick, 1983; Arkes, Herren, & Isen, 1988; Isen, Nygren, & Ashby, 1988). Less support emerged for a competing hypothesis proposed on the basis of evidence that positive affect reduces the perceived likelihood that a loss will occur (Johnson & Tversky, 1983). This competing hypothesis, which was not supported in lab studies, suggested that positive affect increases risky behavior by reducing the perceived likelihood that a loss will occur. Taken together, these findings led researchers to conclude that positive affect makes people more risk averse despite its effect on perceived likelihood of risk occurrence (Nygren, Isen, Taylor, & Dulin, 1996).

When applied to sexual behavior, this research suggests that the perceived impact of becoming infected with HIV would be greater for those who were experiencing an increase in positive affect. Results from the present study, however, were in the opposite direction, indicating that the effect of increased positive affect on sexual behavior may have been influenced more by its impact on the estimated probability of risk than on subjective utility. Specifically, when experiencing a relative spike in positive affect, participants' willingness to have condomless sex may have been more influenced by decreases in their assessed likelihood of becoming

infected with HIV than by increases in the perceived negative impact of contracting HIV from that sexual encounter. From this perspective, participants experiencing positive affect believed they were less likely to contract HIV and were consequently more likely to have risky sex.

Although positive affect increases optimism and decreases risk perception, scholars have argued that it also tends to encourage behavior that is more conservative or self-protective in situations where there is a real threat of loss (Arkes, Herren, & Isen, 1988; Isen, Nygren, & Ashby, 1988; Isen & Patrick, 1983). For example, Nygren, Isen, Taylor, and Dulin (1996) found that although participants' initial estimates of the probability of winning were generally increased, positive mood decreased participants' willingness to bet when potential losses were great. However, sexual behaviors may not be equivalent to the gambling paradigms used in this research. Perhaps the sexual encounters in which these participants engaged did not represent those in which there was a "real threat of loss," because participants were more focused on the benefits they would receive from engaging in sexual behavior, rather than focused on the potential losses they might experience (i.e., becoming infected with HIV). Additionally, men who use sex-oriented websites to find sexual partners likely do not associate sex with potential losses, but with potential gains.

Related to the awareness of the threat of loss is the awareness of the probability of that loss occurring. Isen, Nygren, and Ashby (1988) acknowledged that positive affect participants in their experiment may have been more inclined to make less conservative, more risky decisions if the probability of outcomes had been unknown to them. "Persons who are in a positive affective state and are considering

the positive outcomes in risky situations may focus, for decision making, on the probability of winning...*When making decisions under uncertainty*, these individuals may place less importance on the actual value of a positive outcome and more importance on the likelihood of occurrence” (emphasis added; Isen, Nygren, & Ashby, 1988, p. 716). This seems more likely to apply to participants of this study, because it is unlikely that they would be aware of the probability of contracting HIV from any given sexual encounter.

It is also important to keep in mind when reviewing all results for this study that there is no way to determine direction of causality. Although, theoretically, affect is believed to influence behavior, it is equally as likely that behavior could influence affect. When the direction of causality is reversed, these results could be viewed in a different light. It could be that engaging in sexual behavior, regardless of whether or not condoms are used, caused participants in this study to experience more positive affect. Or, more specifically, it could be that engaging in risky sex, specifically, increased positive affect, taking into account research that has shown that anal intercourse is thought to be more pleasurable when condoms are not used (Calabrese, Reisen, Zea, Poppen, & Bianchi, 2012).

Trait positive and negative affect were examined as moderators of the relationship between state positive affect and sexual risk taking. Results indicated that the positive relationship between state positive affect and sexual risk taking was stronger for those with low levels of trait positive affect, and for those with high levels of trait Sadness. A spike in state positive affect may be experienced as particularly different from the norm, and therefore more impactful on decisions about

condom use, for people with low trait positive affect and high trait Sadness; therefore, there may be a stronger relationship between state positive affect and sexual risk-taking for those with low trait positive affect and high trait Sadness than those with high trait positive affect or low trait Sadness.

An alternative explanation taking into account the reverse causal direction could be that for those who are typically low in positive affect and high in Sadness, having sex is particularly powerful in increasing state positive affect. This is supported by findings from Bancroft and colleagues' study on affect and sexual behavior: "Increased sexual activity when depressed was not only reported as a consequence of increased sexual interest, but in some cases explained as a need for contact with or validation from another person, and in other cases because *sex improved the depressed mood* if only transiently" (emphasis added, Bancroft, Janssen, Strong, & Vukadinovic, 2003, p. 240).

### Negative Affect

The relationship between negative affect and sexual risk taking at the within-person level was also investigated. Results indicated that, for both dimensions of negative affect (Hostility and Sadness), regardless of trait negative affect, state negative affect was inversely associated with sexual risk taking. These results contradict Crepaz and Marks' (2001) meta-analysis that found little evidence for an association between negative affect and sexual risk taking, although that analysis focused on trait affect. Mustanski's (2007) daily diary study used two separate measures of negative affect: negative activation (NA) and anxious activation (AA), and found that NA and sexual risk taking were unrelated at the within-person level,

but that AA was positively related to HIV risk behaviors (and negatively related to having a sex partner).

Much like the research on positive affect and risk taking behavior, research on negative affect and risk taking also suggested competing hypotheses, one based on the effects of negative affect on perception of risk, and the other based on a theory of impaired self-regulation (i.e., when feeling upset, a person may become unable or unwilling to control his or her immediate impulse in favor of what will be, in the long-run, most beneficial; Leith & Baumeister, 1996). The present results are more consistent with Johnson and Tversky's (1983) findings that the experience of negative affect is related to an increased perception of the probability of risk, which was expected to lead to more conservative, less risky behavior.

These results could also be attributed to the effects of negative affect on sexual interest: the majority of MSM in one study reported decreased sexual interest when experiencing negative affect (Bancroft, Janssen, Strong, & Vukadinovic, 2003). Similarly, Mustanski (2007) found that state anxiety, characterized by feelings of anxiety, fear, and jitteriness, was significantly negatively associated with having a sex partner. Thus, participants in this study may have been generally less likely to have sex when experiencing negative affect, which translated to less sexual risk taking.

Two additional research questions focused on trait affect as a moderator of the relationship between state negative affect and sexual risk taking. Results revealed that the inverse relationship between state Hostility and sexual risk taking was stronger for those with high levels of trait Hostility; similarly, the inverse relationship between state Sadness and sexual risk taking was stronger for those with high levels of trait



Sadness. Interactions with trait positive affect appeared consistent with these results, such that the inverse relationship between state negative affect and sexual risk taking was stronger for those with low levels of trait positive affect. Taken together, these results seem to indicate that high or moderate levels of trait negative affect and low levels of trait positive affect may act to intensify the effects of state negative affect on sexual risk taking – if one generally experiences more negative affect (or less positive affect), then the experience on a particular day of a spike in these emotions may be more distressing and contribute to greater perception of risk, or a general disinterest in sexual activity. The latter is consistent with study by Bancroft, Janssen, Strong, and Vukadinovic's (2003) finding that, when experiencing negative affect, participants reported being more focused on dealing with, or at least worrying about, whatever it was that was upsetting them than on sexual thoughts and feelings.

Looking at these interactions in conjunction with the findings for interactions of trait affect with state positive affect, both the positive relationship between positive affect and sexual risk taking as well as the inverse relationship between negative affect and sexual risk taking are stronger for those with low trait positive affect and high trait negative affect. It appears that the relationship between affect and sexual risk taking, in general, is stronger for those who have a tendency toward negative mood rather than positive mood. This could be supported by research that has found that, on days with higher than usual stress, individuals who had a tendency toward depression experienced greater stress-reactivity and benefitted more from positive affect than those without a tendency toward depression (O'Hara, Armeli, Boynton, & Tennen, 2014). Thus, individuals in this sample with typically high negative affect

and low positive affect, which could be characterized as a form of, or similar to, depression, experienced more of an impact of both state positive and state negative affect on perceptions of risk, which in turn led to stronger effects on sexual risk taking behavior.

Interestingly, for those with low levels of trait Hostility, state Hostility was unrelated (when UIAI was the outcome) or positive related (when URAI was the outcome) to sexual risk taking. These results, along with the cross-level interactions between state Hostility and trait Sadness, as well as state Sadness and trait Hostility, are more challenging to interpret. The relation between state Hostility and UIAI shifted from negative, to zero, to positive as levels of trait Sadness increased from low, to moderate, to high. Similarly, the relation between state Sadness and UIAI shifted from negative to zero as levels of trait Hostility increased from low, to moderate, to high. Neither interaction was statistically significant for URAI.

The variation in results for Hostility and Sadness could potentially be explained by Lerner and Keltner's (2001) finding that different dimensions of negative affect may have different relationships to risk taking. The authors theorized that specific emotions are associated with specific judgments and appraisals of a given situation, which, in turn, have specific effects on behavior. Their study investigated differences between fear and anger, which are both negatively valenced but differ in cognitive appraisals of *control* and *certainty*. Control represents the extent to which one believes one has the ability to influence what is happening in a situation. Certainty represents the extent to which one believes one understands what

is happening in a situation. Fear is characterized by low control and uncertainty, whereas anger is characterized by high control and certainty.

Lerner and Keltner (2001) investigated whether these appraisal themes would mediate the relation between emotion and judgments, such as risk preferences. They found that fearful participants were more risk averse, and angry participants were more risk-seeking. Although Lerner and Keltner's (2001) study examined fear instead of sadness, their work was based on Smith and Ellsworth's (1985) theoretical framework, which characterized sadness as similar to fear on the dimensions of control and certainty. This could explain the result that Hostility was positively related to URAI at the between-person level, and that for those with low levels of trait Hostility, state Hostility was positively related to sexual risk taking (when URAI was the outcome). Thus, people with high levels of trait Hostility are more likely to engage in URAI, and people with low levels of trait Hostility are more likely to engage in URAI when they have a spike in state Hostility. In other words, the experience of generally high levels of Hostility or the experience of a spike in state Hostility (for those with generally low levels of Hostility) could make participants more risk-seeking, like the angry participants in Lerner and Keltner's (2001) research.

This could also explain the result that state Sadness was negatively related to UIAI for low and moderate levels of trait Hostility, and that this relationship was stronger for those with low trait Hostility than for those with moderate trait Hostility. It could be that any potential tendency for state Sadness to increase risk aversion is negated by high trait Hostility, which would be associated with a general preference for risk taking. In contrast, without the counterbalance of high trait Hostility, state

Sadness may reduce risk taking—similar to the fearful participants in Lerner and Keltner’s (2001) study. This explanation, however, contradicts the interaction between trait and state Hostility, such that risk taking was most strongly negative at high levels of trait Hostility, while according to Lerner and Keltner’s (2001) theory, there should be a stronger positive relationship. This theory also fails to provide an explanation for the interaction between state Hostility and trait Sadness, or for why these interactions were only significant for UIAI.

To summarize, results seem to be most consistent with Johnson and Tversky’s (1983) theory that affect influences sexual risk taking via a change in perception of risk. These results were amplified for those who were high in trait negative affect and low in trait positive affect, consistent with research that indicates that those who have experienced depression are more sensitive to both negative and positive affect (O’Hara, Armeli, Boynton, & Tennen, 2014); increased sensitivity to affect could strengthen its effect on risk perception. However, these results are also amenable to interpretations that assume the opposite causal relationship. Regardless of the use of condoms, it could be that having sex increase positive affect, and not having sex increases negative affect. It is unclear how Lerner and Keltner’s (2001) theory of differences in the effects of anger and fear on risk behavior can be applied to these results, although they may have played a role specifically for those who are high in trait Hostility, or those who are low in trait Hostility and experience a spike in state Hostility.

### Relationship Type

Support was mixed for the hypothesis that the relationship between state affect and risk taking would not be as strong when the relationship to partner is considered serious (i.e., boyfriend, significant other, spouse, or domestic partner) than when the relationship is more casual (e.g., casually dating or someone the participant just met). For interactions in which Serious Relationship was the moderator, the hypothesis was supported only for positive affect, and in the case of the moderation of state Sadness and URAI, was the opposite of the hypothesized relationship. For interactions in which Casual Relationship was the moderator, where significant, interactions with positive and negative affect were in the opposite than expected direction. As instances of anal intercourse with casual partners increased, the relationship between affect and sexual risk-taking grew weaker. A third relationship type, Friend, was examined separately from serious or casual relationship type moderators because it was unclear whether such “friends” would be viewed as more similar to serious relationship partners or to casual partners. All significant interactions of affect with Friend indicated that the relationship between affect and sexual risk taking was stronger for those who had more partners who were friends.

These results can be partially explained by evidence that unprotected sex is more common in committed, serious relationships. This pattern has been suggested to be due to greater trust and familiarity of serious partners, the perception that condoms interfere with intimacy, and the negotiation of agreements about acceptable sexual behaviors for the partners as a strategy to increase safety (Mustanski, Newcomb, & Clerkin, 2011). Therefore, it seems that the general tendency not to use condoms with

serious partners makes the relationship between affect and condom use less relevant. In other words, regardless of affect, MSM are more likely not to use condoms with serious relationship partners.

The findings related to casual relationship partners could be explained by research that has shown that with partners who have been met through the Internet (many of whom are likely to be considered casual partners), condom use was more likely than with other types of partners (Mustanski, 2007b). This finding is particularly relevant to this sample of MSM who were recruited from a sex-oriented website and likely met many of their sex partners via the Internet. The majority (71.5%) of participants in that study also reported that they “always” or “almost always” used a condom with new sex partners. Just as the relationship between affect and sexual risk taking was hypothesized to be weaker for serious relationships because condoms almost always are *not* used, the weaker relationship between affect and sexual risk taking could be occurring for casual partners because condoms almost always *are* used. In this way, anal intercourse with serious partners and casual partners have in common a weak relationship between affect and sexual risk taking because they both involve a particular condom use tendency, either in the direction of unprotected anal intercourse (with serious partners), or in the direction of protected anal intercourse (with casual partners).

The opposite finding when Friend was the moderator may indicate that the label of “friend” is somewhat ambiguous to those involved in a sexual encounter, and there is less of an established protocol for condom use with someone who is

considered a friend. Thus the relationship between affect and sexual risk taking is strengthened with a greater number of instances of anal intercourse with friends.

### Limitations

Findings should be interpreted in light of some limitations. It is important to consider the generalizability of the results of this study, given that participants were all recruited from a website designed for use by MSM seeking sex partners. It is unclear how the results would generalize to MSM who find sex partners through different services (including those catering to different subpopulations or using mobile technologies) or other means altogether. It is possible that, had the sample been recruited through less sex-oriented channels, fewer instances of anal intercourse would have been reported overall, and, in turn, fewer instances of UIAI and URAI. This type of sample could also result in more reports of sex with serious relationship partners, and thus more condom use, regardless of affect. Also, because reporting on one's sex life was a requirement for full participation, the sample may overrepresent MSM who are willing to disclose such personal information and who, compared to others, may feel less shame in reporting instances of anal sex in which condoms were not used. The sample is also composed mostly of White men; this raises questions about the generalizability of results to MSM of color, who carry a disproportionate burden of HIV infection (CDC, 2014).

Another limitation of this study is its inability to provide information about direction of influence or causality. Although the daily diary method is able to establish a closer temporal association between mood and risky sexual behavior relative to many other research methods, significant findings may reflect a situation in

which having unprotected anal sex could affect mood rather than vice versa. Lastly, the items used to measure mood in this study were not drawn from an existing scale (despite some overlap with tested scales). Items were limited in variety, particularly for the two-item Joviality measure. Additionally, although an anxiety item was included in the data, it could not be used in the analyses because it did not load cleanly onto any of the three mood factors.

### *Implications and Future Research*

The findings of this study indicate that affect is connected to sexual risk taking, and should be considered in conjunction with other theoretical models that have attempted to explain why individuals engage in risky sexual behavior, such as the Theory of Reasoned Action (Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975), Theory of Planned Behavior (Ajzen, 1985, 1988), Social Cognitive Theory (Bandura, 1986), Health Belief Model (Becker, 1974; Janz and Becker, 1984; Rosenstock, 1974), AIDS Risk Reduction Model (Catania et al., 1990), and the Information-Motivation-Behavioral Skills Model (Fisher et al., 1994, 1996). These models tend to focus on variables such as knowledge, attitudes, behavioral intentions, or perceptions of others, and assume that they affect behavior in a straightforward fashion. Based on results that indicate that affect affects perception of risk, it appears that these cognitive variables should be viewed as mediators, rather than as having direct effects on decision-making. For example, positive affect could act to influence sexual risk behavior via a change in perceptions of others (e.g., that an individual is less likely to have HIV, and therefore one is less likely to contract HIV from having unprotected anal intercourse with that person). Therefore, perceptions of others acts



as a mediator of the relationship between affect and sexual risk behavior, rather than assuming that this cognitive variable affects behavior directly.

The results of this study also have implications for interventions geared toward promoting condom use, which could involve a psychoeducational component about links between affect and decision-making, and more specifically links between affect and sexuality. This could help make people aware of their own sexual risk taking tendencies during different affective states, and encourage use of emotion regulation practices to lessen the influence of mood on decisions to have risky sex.

It appears that those who experience affect as most impactful to decisions about condom use are those who were high in trait negative affect and low in trait positive affect, which could constitute a depressed population. If so, then interventions could act to educate those experiencing depression about the power that affect has on sexual risk taking, in addition to providing psychotherapy and possibly psychopharmacological treatment. It is important to convey that, for those who are depressed, achieving positive affect may have increased benefits, but with some caveats; namely, that the experience of positive affect could result in a decreased perception of the risk associated with unprotected anal intercourse. Alternatively, if the influence is in the opposite direction and having sex increases positive affect for those who are depressed, an intervention could explore how to achieve the emotional benefits of sex while using condoms.

This study also has implications for future research conducted on the relationship between affect and sexual risk taking among MSM. Additional research should be conducted to address limitations of the present study by using more varied

recruitment methods to achieve a more representative sample of MSM, along with a more well-established mood measure with better psychometrics, such as the PANAS-X (Watson & Clark, 1994). In order to establish direction of causality, future research could incorporate methods such as ecological momentary assessment (EMA; Stone & Shiffman, 1994), which could allow for assessments of mood immediately before and after sexual behaviors, rather than once per day. Along with assessments of mood, EMA could assess perceptions of risk (e.g., “How likely do you think it is that you will contract HIV from this sexual encounter?”) to test whether this is, in fact, the process whereby affect influences sexual risk taking, as these results suggest. Related to the results found for the relationship between affect and sexual risk taking when the sexual partner was considered a friend, additional research should investigate condom use norms for friends, perhaps using a qualitative approach to get a richer perspective on the nature of this somewhat ambiguous relationship type.

# Appendices

## Appendix A: Demographic Form

### Men's National Sex Study

**First we are going to ask you some questions about your background.  
In what state do you currently live? (pull down menu, include a single non-US option)**

**Which of the following best describes where you live?**

Large city (like New York or Los Angeles) or the suburban areas surrounding it  
Medium city (like Indianapolis or Fresno) or the surrounding area  
Small city (like Boulder or Little Rock) or the surrounding area  
Small town not very close to a city  
Rural area

**How long have you lived in this city/town?**

Less than 1 yr  
1-2 yrs  
Longer than 2 yrs

**What is your age?** (text box)

**What is your gender?**

Male  
Female  
Transgender Male to Female  
Transgender Female to Male  
Other

**Which of the following best describes your race/ethnicity?**

African-American/Black  
White  
Hispanic/Latino  
Asian/Pacific Islander  
Other

**Are you currently dating or in a relationship?**

No, not currently dating anyone  
Yes, currently dating more than one person  
Yes, for less than 3 months, with the same person  
Yes, for between 3-6 months, with the same person  
Yes, for between 6 months-1 year, with the same person

Yes, for between 1-5 years, with the same person  
Yes, for longer than 5 years, with the same person

***If in any single “relationship” option (c-g previous)***

**Is this relationship partner a:**

Male  
Female  
Transgender Male to Female  
Transgender Female to Male  
Other

***If “dating more than one person” option (b from previous)***

**Are you dating:**

Only Men  
Both Men and Women  
Only Women

**Generally, which of the following describes your sexual activities with other people during the past year (by “sexual activities” we mean have you engaged in genital touching, mutual masturbation, oral genital contact, deep kissing, intercourse or other similar types of behaviors)?**

I have not engaged in sexual activities with anyone during the past year  
I have engaged in sexual activities with only one person during the past year  
I have have engaged in sexual activities with more than one person during the past year

***If sexual activities with “only one person” or “more than one” (b or c from previous)***

**During the past year, with whom have you been sexually active:**

Only men  
Both men and women  
Only women

**Which of the following terms best describes your sexual orientation?**

Homosexual/Gay  
Bisexual  
Heterosexual/Straight  
Unsure/Questioning  
Other (text box)

**Which of the following do you most identify as?**

Top  
Bottom  
Versatile  
I do not identify with any of those choices

**What is the highest level of education you have completed?**

Less than High School  
High School or GED  
Some College or Associate's Degree (Two-Year Degree)  
Bachelors Degree  
Masters Degree  
Professional (M.D., J.D., Ph.D.)  
Other

**Are you currently employed?**

Yes, full time (35+ hours per week)  
Yes, part-time  
Full time student  
No, looking for work  
No, not looking for work

**How often do you attend religious services of any kind?**

More than once a week  
Once a week  
Once a month  
Special occasions or holidays  
I do not attend religious services

**Would you say that in general your health is:**

Excellent  
Very Good  
Good  
Fair  
Poor

**In the past year, have you had a physical exam by a healthcare provider (i.e., annual wellness visit)?**

Yes  
No

**In the past year, have you been tested for sexually transmitted diseases (STDs) or infections (other than HIV-infection)?**

Yes  
No

***If yes to "tested for STDs"***

When was the last time you were tested for STDs (other than HIV-infection)?

Within the past 30 days  
Within the past 3 months  
Between 3-6 months ago  
Between 6 months – 1year ago  
Over 1 year ago

**Have you been told by a health care provider in the past two years you had any of the following:**

[Table with response choices: No, Yes, Unsure]

Syphilis  
Gonorrhea  
Chlamydia  
HPV/Genital warts  
Genital herpes

**Have you ever been tested for HIV-infection?**

Yes  
No  
Unsure

***If yes to “tested for HIV”***

When was the last time you were tested for HIV-infection?

Within the past 30 days  
Within the past 3 months  
Between 3-6 months ago  
Between 6 months – 1year ago  
Between 1-2 years ago  
Over 2 year ago

**Have you been told by a health care provider that you have HIV-infection?**

Yes  
No

***If yes to “had HIV-infection”***

When were you diagnosed with HIV-infection?

Within the past 30 days  
Within the past 3 months  
Between 3-6 months ago  
Between 6 months – 1year ago  
Between 1-2 years ago  
Over 2 year ago

**Is your penis circumcised?**

Yes, I am circumcised (cut)  
No, I am uncircumcised (uncut)  
Unsure

## Appendix B: Affect Measure

### **MOOD**

*To start, we would like to know how you have been feeling within the past 24 hours. Please indicate below how much or how little you experienced these feelings since your last diary.*

#### **During the past day I have felt:**

##### **Happy**

None  
Some  
A little  
A lot  
No response

##### **Sad**

None  
Some  
A little  
A lot  
No response

##### **Angry**

None  
Some  
A little  
A lot  
No response

##### **Irritable**

None  
Some  
A little  
A lot  
No response

##### **Stressed**

None  
Some  
A little  
A lot  
No response

##### **Cheerful**

None  
Some  
A little  
A lot  
No response

**Anxious**

None  
Some  
A little  
A lot  
No response

**Depressed**

None  
Some  
A little  
A lot  
No response

**Lonely**

None  
Some  
A little  
A lot  
No response

**Horny**

None  
Some  
A little  
A lot  
No response



## Appendix C: Sexual Behavior Measure

### **SEXUAL BEHAVIORS**

*In this last set of questions, we will ask you about sexual behaviors you engaged in within the past day. To proceed, you will need to answer every question. If you choose not to answer some questions, you should choose the “no response” option.*

*Throughout the questions in this phase of the study, the word “partner” is used to refer to anyone with whom you have had sexual activity. This could be anyone with whom you have had a sexual encounter in the past day and does not necessarily mean someone with whom you are in a relationship.*

**During the past day, in which sexual behaviors have you engaged (check all that apply):**

- Kissed a sexual partner on the mouth
- Masturbated alone (jacking/jerking off)
- Masturbated with another person
- Inserted my penis into another man’s anus (anal sex/topping)
- Had another man insert his penis into my anus (anal sex/bottoming)
- Inserted my penis into another man’s mouth (oral sex/getting a blowjob)
- Had another man insert his penis into my mouth (oral sex/giving a blowjob)
- Put my mouth or tongue on or in a man’s anus (eating butt/rimming)
- Had another man put his mouth or tongue on or in my anus (had my butt eaten/rimmed)
- Inserted my penis into a woman’s vagina (vaginal sex)
- Inserted my penis into a woman’s anus (anal sex)
- Inserted my penis into a woman’s mouth (oral sex/getting a blowjob)
- Put my mouth or tongue on or in a woman’s vulva/vagina (eating pussy)
- I interacted sexually with another person via the internet (had chat room sex, web cam sex, etc)
- I interacted sexually in person with someone that I met online (hooked up)
- I have used an enema (douching, cleaning out)
- None of the above
- No response

***If insertive anal intercourse (option “d” & “k” from behavior list):***

*The next set of questions will ask you to provide more detailed information about your experiences during which you were the insertive (top) partner in anal intercourse (you put your penis inside a partner’s anus) during the past day.*

*In the past 24 hours, how many times were you the insertive (top) partner in anal intercourse?*

X (drop box) number of times with X (drop box) female partners

X (drop box) number of times with X (drop box) male partners

You indicated that you were the insertive (top) partner in anal intercourse *I* times during the past 24 hours. We will ask you to provide some information about each of the times (up to 3) that you were the insertive (top) partner in anal intercourse.

### **Insertive Anal Intercourse #1**

For the **first** time that you were the insertive (top) partner in anal intercourse in the past day, provide the approximate time of day when this episode of anal intercourse occurred.

Approximate time of day: X (drop box) am/pm (drop box)

What was the gender of this partner:

Male

Female

Other (text box)

No response

Which best describes this partner's age:

More than 10 years older than me

5-10 years older than me

2-5 years older than me

About the same age (within 2 years)

2-5 years younger than me

5-10 years younger than me

More than 10 years younger than me

Unsure

No response

Is this the first time that you have ever had anal intercourse (insertive or receptive) with this partner?

Yes

No

Unsure

No response

Is this the first time that you were ever the insertive (top) partner in anal intercourse with this partner?

Yes

No  
Unsure  
No response

Do you expect to be the insertive (top) partner in anal intercourse with this partner again?

Yes  
No  
Unsure  
No response

***If receptive anal intercourse (option “e” from behavior list):***

*The next set of questions will ask you to provide more detailed information about your experiences during which you were the receptive (bottom) partner in anal intercourse (you put your penis inside a partner’s anus) during the past day.*

*In the past 24 hours, how many times were you the receptive (bottom) partner in anal intercourse?*

X (drop box) number of times with X (drop box) male partners

You indicated that you were the receptive (bottom) partner in anal intercourse ***I*** times during the past 24 hours. We will ask you to provide some information about each of the times (up to 3) that you were the receptive (bottom) partner in anal intercourse.

### **Receptive Anal Intercourse #1**

For the **first** time that you were the receptive (bottom) partner in anal intercourse in the past day, provide the approximate time of day when this episode of anal intercourse occurred.

Approximate time of day: X (drop box) am/pm (drop box)

Which best describes this partner’s age:

More than 10 years older than me  
5-10 years older than me  
2-5 years older than me  
About the same age (within 2 years)  
2-5 years younger than me  
5-10 years younger than me  
More than 10 years younger than me  
Unsure  
No response

Is this the first time that you have ever had anal intercourse (insertive or receptive) with this partner?

Yes

No

Unsure

No response

Is this the first time that you were ever the receptive (bottom) partner in anal with this partner?

Yes

No

Unsure

No response

Do you expect to be the receptive (bottom) partner in anal intercourse with this partner again?

Yes

No

Unsure

No response

## Appendix D: Condom Use Measure

For this sexual encounter, did you wear a condom on your penis?

Yes

No

No response

If “No”

Why did you decide not to use a condom with this partner? (Text Box)

If “Yes”

Which of the following best describes how you used a condom during sex?

We used a condom the entire time (our genitals never touched each other’s without a condom)

We started to have sex without a condom, but then stopped and put on a condom on my penis and continued having sex

We put a condom on my penis before starting sex but then took the condom off and continued having sex without it

For this sexual encounter, did your partner wear a condom on his penis?

Yes

No

No response

If “No”

Why did you decide not to use a condom with this partner? (Text Box)

If “Yes”

Which of the following best describes how your partner used a condom during sex?

We used a condom the entire time (our genitals never touched each other’s without a condom)

We started to have sex without a condom, but then stopped and put on a condom on his penis and continued having sex

We put a condom on his penis before starting sex but then took the condom off and continued having sex without it

No response

## Appendix E: Relationship to Partner Measure

Which of the following best describes who this person was?

Boyfriend or significant other

Someone I was casually dating/hanging out with

A friend

Someone I just met

My spouse or domestic partner

Someone who paid me or gave me something for sex

Someone who I paid or gave something to for sex

Other, please specify (text box)

No response

## Appendix F: IRB



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DATE: August 22, 2013

TO: Elissa Sarno  
FROM: University of Maryland College Park (UMCP) IRB

PROJECT TITLE: [503886-1] Affect and Condom Use in a Daily Diary Study of Men Who Have Sex with Men

SUBMISSION TYPE: New Project

ACTION: DETERMINATION OF NOT HUMAN SUBJECT RESEARCH  
DECISION DATE: August 22, 2013

Thank you for your submission of New Project materials for this project. The University of Maryland College Park (UMCP) IRB has determined this project does not meet the definition of human subject research under the purview of the IRB according to federal regulations.

We will retain a copy of this correspondence within our records.

If you have any questions, please contact the IRB Office at 301-405-4212 or [irb@umd.edu](mailto:irb@umd.edu). Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within University of Maryland College Park (UMCP) IRB's records.

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