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Influences of Sexual Sensation Seeking, Alcohol Consumption, and Sexual Arousal on Women's Behavioral Intentions Related to Having Unprotected Sex

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Abstract

This experimental study examined effects of alcohol consumption and sexual sensation seeking on unprotected sex intentions, taking into account sexual arousal, indirectly discouraging sex, and condom insistence. Women ($N=173$; M age = 25.02) were randomly assigned to a control, placebo, low dose (target blood alcohol level = .04), or high dose (target blood alcohol level = .08) beverage condition. Participants projected themselves into a hypothetical sexual interaction with a man in which no condom was available. Structural equation modeling demonstrated that both sexual sensation seeking and alcohol dose directly increased sexual arousal early in the interaction, but later sexual arousal indirectly increased unprotected sex intentions by decreasing endorsement of indirect discouragement and, in turn, condom insistence. These findings help to clarify the role of alcohol consumption and sensation seeking in women's sexual decision making and point to the importance of examining it as a multi-stage process.

Keywords

Alcohol Consumption; Sensation Seeking; Sexual Arousal; Risky Sex; Condom Negotiation

The proportion of AIDS cases in the US composed of women has increased dramatically over the last two decades, rising from 8% of the total in 1985 to 27% in 2005. Approximately 80% of new HIV cases in women are attributable to heterosexual transmission (Centers for Disease Control and Prevention, 2008). Because consistent use of the male condom is still the most effective preventive strategy, intervention efforts have focused on ways to increase its use. However, for a woman to "use" a male condom, she must be able to insist on using one, and ultimately refuse to have sex if her male partner refuses to use one.

Sexual decision making is a multi-stage process, involving a series of interactions with and responses to one's partner. When a woman wants to use a condom with a man, she may engage in a series of strategies, such as discouraging him from continuing to pursue sex if one is not available and insisting on using one before ultimately deciding whether or not to have unprotected sex. Contributing to the complexities of these interactions is likely to be concurrent

sexual arousal. To obtain a full understanding of how sexual decisions are made, it is necessary to study both situational and predispositional influences on this process. Alcohol consumption and sensation seeking are two such influences that have jointly been associated with risky sexual behavior (Hendershot, Stoner, George, & Norris, 2007; Kalichman & Cain, 2004; Kalichman, Simbayi, Jooste, Cain, & Cherry, 2006). However, little research has addressed the nexus of alcohol consumption, sensation seeking, and sexual arousal in affecting sexual decisions, especially among women. The present study investigated the extent to which these factors influenced a series of behavioral intentions related to having unprotected sexual intercourse in women.

Sensation Seeking, Alcohol Consumption, and Sexual Risk Taking

Sensation seeking, “the propensity to seek optimal arousal and sensory-stimulating experiences” (Kalichman et al., 2006, p. 298), has been identified as a predispositional predictor of high risk sexual behavior (Hoyle, Fejfar, & Miller, 2000; Logan, Cole, & Leukefeld, 2002) and heightened alcohol consumption (Hittner & Swickert, 2006). Three studies, which have included women, have examined relationships among sensation seeking, alcohol consumption, and high risk sexual behavior. Kalichman and Cain (2004), in a six-month prospective study of men and women seeking treatment in a sexually transmitted infections (STI) clinic, tested a model in which sensation seeking was proposed to predict unprotected sexual intercourse both directly and indirectly through alcohol use in sexual contexts and alcohol sexual enhancement expectancies, while examining gender differences. Although they found that the model was supported across the total sample, among women neither sensation seeking nor any alcohol variables were related to unprotected sex at follow-up. This raises the question of whether there are other variables that might serve as intermediaries between sensation seeking and alcohol-related variables, on the one hand, and risky sexual behavior on the other. Kalichman, Simbayi, Jooste, Cain, and Cherry (2006), in a retrospective survey of South African STI clinic patients, demonstrated that, controlling for gender, alcohol use in sexual contexts partially mediated the effect of sensation seeking on risky sexual practices. Hendershot, Stoner, George, and Norris (2007) extended this work by incorporating several indicators of each construct into the model and specifically testing for gender differences, using multiple-group structural equation modeling, as well as by employing a general population sample of young adult, heterosexual social drinkers. They found that sensation seeking was directly and indirectly related to number of sex partners through frequency of drinking before sex and that these relationships held for both men and women.

These studies illuminate to some extent our understanding of the associations among sensation seeking, alcohol consumption, and risky sexual behavior, but are limited in some ways as well. First, Hendershot et al. suggested that future work in this area should focus on variables specific to sexual behavior and traits, noting that sexuality-relevant constructs loaded considerably higher on their latent measure of sexual sensation seeking than did non-sexual sensation seeking. Among heterosexual men and women *sexual* sensation seeking, that is, the propensity to seek optimal *sexually* arousing and sensory-stimulating *sexual* experiences, has been positively correlated with frequency of unprotected sex, number of sex partners, and pleasure ratings of a variety of sexual activities, whereas it has been negatively associated with sexual risk-reducing behaviors (Kalichman & Rompa, 1995). Thus, in this study we employed a measure of sexual sensation seeking.

Second, there is a need to examine the possible influence of sexual arousal in this constellation of relationships since sexual decisions are frequently made when sexually aroused. Third, studies to date have depended on measures of self-reported alcohol use in sexual contexts overall, which are subject to possible memory distortion and attempts to present oneself in the best light. Fourth, even when employing prospective survey designs, causal connections

between overall drinking in sexual contexts and risky sexual behavior are difficult, if not impossible, to establish. Experiments in which alcohol dose is controlled provide the means to establish causal “in-the-moment” connections between alcohol consumption and risky sexual behavioral intentions in specific sexual encounters (Hendershot & George, 2007), while also examining the moderating and mediating influences of sensation seeking and sexual arousal. Fifth, previous studies do not take into account a woman’s need to communicate with her partner that she wants to use a condom or may not want to continue their sexual interaction in the absence of one. This study attempted to address these issues to further extend this field of research.

Sexual Arousal, Alcohol Consumption, and Sexual Risk Taking

The role of sexual arousal in sexual risk taking has not been extensively examined, although some studies have found a negative impact of sexual arousal on condom use. In a retrospective survey of male and female undergraduates, Boldero, Moore, and Rosenthal (1992) found that those who reported the greatest sexual arousal in a previous sexual encounter were least likely to have used a condom. Two experimental studies found that sexual arousal resulted in decreased condom use intentions in men (Ariely & Loewenstein, 2006) and in men and women (Abbey, Saenz, & Buck, 2005).

Two sets of researchers have examined the combined influence of alcohol consumption and sexual arousal on risky sex intentions. Aggregating findings from seven experimental studies of male participants conducted by their research group, MacDonald, MacDonald, Zanna, and Fong (2000) found that sexually aroused, intoxicated men reported a higher intention to have sex without a condom than those who received either a control or a placebo beverage or those who were not sexually aroused. These authors concluded that, consistent with alcohol myopia theory (Steele & Josephs, 1990; Taylor & Leonard, 1983), alcohol focused participants’ attention on situational impelling cues, in particular their sexual arousal, while limiting their ability to attend to inhibiting risk cues. George et al. (in press) conducted an experimental analogue study in which men and women, recruited from a university and the community at large, projected themselves into a sexually explicit scenario with an opposite-sex first-time partner after undergoing a sexually arousing priming procedure. They found that for both men and women alcohol dose indirectly increased the intention to have sex without a condom through increased sexual arousal.

Although these studies indicate that sexual arousal either alone or in combination with alcohol consumption decreases condom use intentions, questions remain about these relationships. First, only one study (George et al., in press) has examined how alcohol and sexual arousal together affect risky sex intentions in women; further research is needed to replicate and extend the findings. Second, experiments that assess sexual arousal have generally done so either once at the end of a stimulus story or prior to a story using a sexual arousal priming procedure. Research is needed to address how sexual arousal may vary over the course of a sexual event in response to changing situational cues. Third, how sexual arousal is related to behaviors leading up to having unprotected sex is important to understanding the entire sexual decision making process and, therefore, needs to be examined.

Finally, the relative contribution of alcohol expectancy and physiological effects to this process in women is not clear. Researchers have developed two means of examining alcohol effects that result from learned expectations about alcohol’s effects. One way is to assess research participants’ alcohol outcome expectancies, that is, beliefs about what effects alcohol will have (cf. Leigh, 1989). A second way is to experimentally administer an alcohol “placebo” to compare its effects to a nonalcoholic beverage (cf. Marlatt & Rohsenow, 1980). Controlling for potential confounds, differences that occur between the two conditions are attributable to

expectancies evoked by the belief that one has consumed alcohol. Although this test of “expectancy set” has shown that a number of social behaviors are at least in part affected by beliefs about alcohol’s effects (cf. Hull & Bond, 1986), expectancy effects have not been reliably demonstrated in women (Testa et al., 2006), especially with regard to sexual behavior (George & Stoner, 2000).

MacDonald et al.’s (2000) findings in men lend support to a cognitive impairment explanation since they did not find an expectancy set effect. Because George et al. did not include a placebo condition in their study, it is not yet known whether expectancy effects might occur in women’s sexual decision making. Studying women, Maisto and colleagues (Maisto, Carey, Carey, & Gordon, 2002; Maisto, Carey, Carey, Gordon, & Schum, 2004) found that perceived intoxication, rather than alcohol dose, predicted decrements in verbally assertive responses to a hypothetical man’s suggestion for unprotected sex, suggesting that psychological effects of alcohol played a role in women’s sexual communication. To investigate whether expectancy effects make a unique contribution to women’s sexual decision making, this study tested expectancy set in addition to two alcohol doses.

Study Overview and Hypothesized Model

The purpose of this experimental study was to examine the influences of predispositional sexual sensation seeking (SSS) and in-the-moment alcohol consumption on women’s sexual arousal and behavioral intentions related to engaging in risky sexual behavior. As such, the study was designed to examine women’s sexual decision making as a multi-stage process. After completing background measures and the alcohol administration protocol, participants projected themselves into a story that simulated a consensual sexual encounter with a first time partner in which no condom was available. Participants answered questions concerning their sexual arousal at three key points in the story, as well as intentions to discourage further sexual contact, to insist on using a condom, and to have unprotected sex at the end of the story.

The hypothesized model is shown in Figure 1. We hypothesized, based on George et al.’s (in press) study, that alcohol dose would indirectly affect behavioral intentions through sexual arousal, with the high alcohol condition having the strongest effect. Because evidence is scant and inconclusive regarding expectancy set effects on women’s sexual behavior (George & Stoner, 2000), we did not make a firm prediction in this regard, but included a placebo condition to explore the possibility that expectancy set would affect sexual arousal and behavioral intentions. At the first two assessments of sexual arousal, story cues were largely excitatory, but at the third assessment a strong inhibitory cue of condom unavailability was introduced along with the excitatory sexual cues. Therefore, we expected that alcohol dose would be positively related to sexual arousal at the first two assessments, but not at the third.

We also hypothesized that SSS would indirectly affect behavioral intentions through sexual arousal because by definition sensation seekers pursue maximally arousing experiences (Kalichman & Rompa, 1995). That is, the powerfully reinforcing effects of sexual arousal would lead those with a heightened sensation seeking propensity to manifest lower sex discouraging behavior and condom insistence and higher endorsement of unprotected sex than low sensation seekers. Furthermore, we examined the interaction between sensation seeking and alcohol consumption on sexual arousal. Consistent with a cognitive impairment explanation (Steele & Josephs, 1990; Taylor & Leonard, 1983), we expected that intoxication would focus those with a predisposition toward SSS on early excitatory story cues to a greater extent than those lower in SSS. In other words, we predicted a synergistic effect of intoxication and sexual sensation seeking on early onset sexual arousal.

Rather than a direct effect of sexual arousal on unprotected sex intentions, we hypothesized that the effect would occur indirectly through the woman indirectly discouraging further sexual contact before insisting on condom use. This would mirror what actually occurs in women's sexual interactions with a new male partner in which desire to use a condom is prominent. That is, before openly insisting on using a condom, a woman might attempt to take control of the situation by slowing the negotiation process. In balancing her positive feelings for the man with her concerns about sexual safety, a woman might begin with a subtle, indirect approach before assertively stating her desire for a condom. Thus, we believed that heightened sexual arousal would lead to lowered endorsement of indirect discouragement and condom insistence, which in turn would lead to higher endorsement of having unprotected sex.

Method

Participants

One hundred seventy-three women participated of whom 12 were dropped - 10 because of incomplete data or equipment problems and 2 because of manipulation failures. The final sample consisted of 161 women (M age = 25.02, SD = 3.85). Sixty-five percent identified as European American/White, 14.3% as African American, 12.4% as multiracial, 6% as Native American, 2.5% as Asian American/Pacific Islander, and 5.6% as "other". Of the total sample 10.6% of women identified their ethnicity as Hispanic or Latina. Sixty-three percent were employed, 53% of these full-time. Thirty-four percent were full- or part-time students. Most (71.5%) had incomes less than \$21,000 a year.

Advertisements in local newspapers and posted flyers recruited single female social drinkers between the ages of 21 and 35 to participate in a study on social interactions between men and women. Exclusion criteria included being in a committed, exclusive relationship, having no interest in a relationship with a man, and never having had consensual vaginal sex with a man. This ensured that all participants would find the experimental story relevant to their current dating status and lifestyle. Callers were screened for medical conditions, such as heart, blood pressure, liver, and psychiatric problems, and medication usage that would contraindicate alcohol consumption. They were also questioned about their usual and peak drinking habits. Abstainers, those who drank more than 40 drinks per week, and those who reported past or present problem drinking were excluded. Participants reported an average of 10.19 (SD = 7.83) drinks per week. Participants were instructed not to eat for 3 hours prior to their appointment, not to drive nor to use any alcohol or other drugs that day, including over-the-counter medications, and to bring picture ID. Because of lagging recruitment, hourly compensation was increased from \$10 to \$15 partway through the study.

Procedure

The session consisted of two parts. In the first, participants completed a set of background questionnaires; the second involved the experimental protocol. Upon arrival, a female experimenter checked the participant's photo identification and verified her age. A breathalyzer (Alco-Sensor IV, Intoximeters, Inc.) was used to ensure that the participant's blood alcohol level was at .00%. The experimenter obtained informed consent and left the room so that the participant could complete the computerized background questionnaires in private. Upon completion, the experimenter debriefed the participant and read a second informed consent form describing the second part of the study.

Following the beverage administration procedure (see below), the experimenter left the room to allow the participant privacy while reading the stimulus story and completing the dependent measures. Afterwards the experimenter offered the participant food and water. Alcohol participants were situated in a comfortable room until their BAL fell below .03%. All

participants were fully debriefed, paid, and given resource materials on STDs and HIV prior to release. Participants were paid an additional \$5 for returning a follow-up survey, which was mailed approximately two weeks after the laboratory session, and which concerned the effects of participation. No adverse effects were reported.

Beverage Administration—Participants were randomly assigned to a high dose (target BAL 0.08%), low dose (target BAL 0.04%), placebo, or control condition. Alcohol doses were .325g ethanol/kg body weight for the .04% target BAL and .682 g/kg for the .08% BAL. One-hundred proof vodka presented in a brand-name bottle was mixed with orange juice in a 1:4 ratio. In the alcohol and placebo conditions, to prevent experimenters from conveying subtle cues about the participant's beverage condition, a supervisor instructed the experimenter to use one of four vodka bottles, the contents of which were unknown to the experimenter. Each brand-name vodka bottle contained either 100-proof vodka (alcohol conditions) or flat tonic water plus a trace amount of vodka (placebo condition). In the alcohol and placebo conditions, beverage cups were misted with 100-proof vodka, and lime juice previously mixed with a small amount of vodka was added to the beverage. The beverage was mixed in full view of the participant who had three minutes to consume each of three cups of the beverage. Control participants drank an equivalent amount of pure orange juice. Prior to drinking, the participant was directed to rinse with a strongly flavored mouthwash and was told that this would allow a more accurate breathalyzer reading. This procedure was standardized across all conditions even though it was only necessary to prevent placebo participants from recognizing the lack of alcohol in their beverage.

In the alcohol conditions, after a 4 to 5 minute initial absorption period, participants were breathalyzed every 2 to 5 minutes until they reached a criterion BAL of .025 (low dose) or .055 (high dose). These criterion BALs were selected to insure that participants began reading the story while their BALs were ascending toward the target. Average absorption times for the low and high dose participants respectively were 11.2 ($SD = 4.0$) and 16.7 ($SD = 5.7$) minutes. Each alcohol participant had a control participant "yoked" to her to control for individual variation in time to criterion BAL. The yoked control participant was breathalyzed at the same time points and began reading the story after the same number of minutes as her counterpart in the alcohol condition (George et al., 2004; Giancola & Zeichner, 1997).

Placebo participants were yoked to low alcohol participants. The experimenter breathalyzed the placebo participant at the same time point at which her yoked alcohol participant had reached the criterion BAL. The experimenter told the placebo participant she was right on target with a BAL of .027, and the participant started reading the story at the same time point as the alcohol participant to whom she had been yoked. A yoked placebo was not included for the high alcohol participants because of known difficulties in maintaining successful placebo deception for high doses (Sayette, Breslin, Wilson, & Rosenblum, 1994). These procedures resulted in the following cell sizes: high dose – $n = 32$; low dose – $n = 32$; placebo – $n = 33$; high dose control – $n = 30$; low dose/placebo control – $n = 34$. (T tests performed on all variables in these analyses produced no differences between the two control groups. Therefore, analyses of variance and structural equation modeling collapsed across these two groups.)

Experimental story—The story contained approximately 2200 words and depicted a social interaction between a woman and a man to whom the woman was very attracted, but with whom she had never had sexual intercourse. Written in the second person – "Your good friend Anita invites you...", the story was designed to assist the participant in projecting herself into the situation and to the greatest extent possible experience the encounter as if it were actually happening to her. The beverage consumed by both individuals in the story matched the participant's expected alcohol condition. Placebo participants read the alcohol version of the story. Participants were told to project themselves into the story at their current level of

intoxication. The story was pilot tested with 20 women recruited in the same manner as experimental participants.

The story began with a conversation between the woman (i.e., the participant) and a female friend in which the friend invited her to hang out at her boyfriend's place to watch movies. The friend mentioned that Nick, the boyfriend's roommate, would be there, and the woman commented on Nick's attractiveness and her interest in getting to know him better. The evening progressed with Nick and the woman talking, watching movies, and drinking either alcoholic or nonalcoholic beverages depending on the beverage condition. This initial part of the story provided the background for the woman's subsequent interaction with Nick and increasing sexual attraction between the couple.

After watching movies, the woman and Nick went to Nick's room and began to kiss. Their interaction was very sexually charged. The story continued with descriptions of escalating passion until both were undressed. At this point, they discovered that neither could locate a condom. The story ended when Nick suggested that they engage in vaginal penetration without a condom.

Measures

Sexual sensation seeking—The Sexual Sensation Seeking Scale (Kalichman & Rompa, 1995), an 11-item questionnaire that assesses the tendency to search out arousing and exciting sexual experiences, was employed. Items were rated on 4-point scales from 1 (not at all like me) to 4 (very much like me). Mean (*SD*) was 2.60 (.59). Cronbach's α was .82. This measure was embedded midway through several others of varying content that in total took approximately 1 hour to complete.

Sexual arousal—Sexual arousal was assessed three times - early in the story after the man had kissed the woman on the cheek, but before any physical touching had occurred; after partially clothed petting, but before any mention of a condom; and after engaging in extensive petting, the couple realized no condom was available and the man suggested having intercourse without one. Four questions assessed participants' general sexual excitement and arousal, genital sensations, and breast sensations. Responses were rated on 7-point scales from 0 (not at all) to 6 (extremely), and were averaged at each time point. Means (*SD*) for the three assessments respectively were 3.15 (1.42); 4.00 (2.60); and 4.08 (1.74). Cronbach's α s were .92, .95, and .95 respectively.

Indirect discouragement—Eight indirect sex-discouraging behaviors, rated on 0 (definitely unlikely) - 6 (definitely likely) scales, were assessed after the couple realized no condom was available and the man suggested having intercourse without one. Examples include: try to cool things down and tell Nick that I like him but I'm not ready for this. Items were averaged to form a scale with a mean of 2.85 (1.42) and $\alpha = .84$.

Condom insistence—As above, condom insistence was assessed after the couple realized that no condom was available and the man suggested having sex without one. Three subscales adapted from the Condom Influence Strategy Scale (Noar, Morokoff, & Harlow, 2002) assessed likelihood of using three different strategies: direct request, withholding sex, and verbally providing risk or sexually transmitted disease (STD) information. Each subscale was composed of three items with responses ranging from 0 (definitely unlikely) to 6 (definitely likely), and responses were averaged to form a score for each subscale. Direct request items were: ask that we use condoms during sex; tell Nick that I would be more comfortable using a condom; and be clear that I'd like us to use condoms, $M = 4.93$ (1.45); Cronbach's $\alpha = .84$. Withholding sex items were: tell Nick that I will not have sex with him if we do not use

condoms; let Nick know that no condoms means no sex; and tell Nick I have made the decision to use condoms, so we are going to use them, $M = 4.78$ (1.70); Cronbach's $\alpha = .94$. Risk and STD information items were: explain to Nick that there are too many sexually transmitted diseases going around to not use a condom; tell Nick that we need to use condoms to protect ourselves from AIDS; and tell Nick that we both would be safer from disease if we used a condom, $M = 3.65$ (2.11); Cronbach's $\alpha = .92$.

Unprotected sex intentions—Three questions, rated from 0 (definitely unlikely) to 6 (definitely likely), assessed likelihood of having unprotected sex after Nick suggested having sex without a condom: At this point in your encounter with Nick, how likely are you to have sex with Nick?; How likely are you to rub your clitoris against Nick's penis without a condom?; and How likely are you to allow Nick to put his penis inside your vagina without a condom? Items were averaged to form a scale with a mean of 1.84 (1.79); Cronbach's $\alpha = .85$.

Results

Manipulation Checks

The alcohol manipulations were successful. Two types of manipulation checks were conducted to assess participants' assigned alcohol condition. First, a one-way ANOVA of achieved BAL, assessed prior to the participant reading the story, by beverage condition was significant, $F(4, 156) = 29.62, p < .001$. Post-hoc comparisons, using Fisher's LSD, found no significant difference between control and placebo participants ($M = .00, SD = .00$). Low dose participants ($M = .034, SD = .008$) achieved a higher BAL than control and placebo participants, and high dose participants ($M = .064, SD = .009$) achieved a higher BAL than low dose, control, and placebo participants. Post-story mean (SD) BALs for the low and high dose conditions respectively were .033 (.009) and .081 (.011). Second, perceived intoxication was assessed just prior to the experimental story with the item "How intoxicated do you feel right now?" ranging from 0 (not intoxicated at all) to 6 (extremely intoxicated). To determine effectiveness of the placebo manipulation, a one-way ANOVA of perceived intoxication by beverage condition was performed and found to be significant, $F(4, 156) = 113.92, p < .001$. Post-hoc LSD comparisons found each condition significantly different from the others in ascending order of control ($M = 0.05, SD = 0.38$), placebo ($M = 2.09, SD = 1.16$), low dose ($M = 3.09, SD = 1.07$), and high dose ($M = 3.91, SD = 0.93$). As noted earlier, two participants (one each in the low and high dose conditions) were dropped because of manipulation failures in which participants reported not feeling intoxicated. One control subject reported being slightly intoxicated, but also reported not having received any alcohol. Therefore, her data were included in the analyses. There were no manipulation failures in the placebo condition.

Preliminary Data Analyses

Two questions, rated on 0 (not at all) - 6 (extremely well) scales, assessed the realism of the experimental story: How realistic was the story? ($M = 4.73, SD = 1.73$); and How well were you able to project yourself into the story? ($M = 4.24, SD = 1.38$). Thus, it appeared that participants were able to relate well to the story context.

Correlations among the study variables appear in Table 1. The alcohol dose variable was coded: 0 = control, 1 = low dose, and 2 = high dose. The placebo variable was coded: -1 = low dose/placebo control, 1 = placebo, and 0 = low and high doses, and high dose control. As expected, indices within the condom insistence construct were moderately to highly intercorrelated as were the sexual arousal assessments. Alcohol dose was positively related to Time 1 sexual arousal and endorsement of unprotected sex, whereas placebo was positively related to indirect discouragement and negatively related to endorsement of unprotected sex. Sexual sensation seeking was positively related to alcohol dose, sexual arousal, and unprotected sex intentions

and negatively related to indirect discouragement and condom insistence indices. Times 1 and 2 sexual arousal were negatively related to indirect discouragement and condom insistence intentions. Only Time 1 was positively related to endorsement of unprotected sex whereas Time 3 was negatively related to indirect discouragement. Condom insistence indices were negatively related to unprotected sex.

To test the hypotheses concerning the main effect of alcohol on sexual arousal and the interaction between alcohol and SSS, a repeated measures analysis of variance was performed (SSS $\times$ beverage group $\times$ time). Using the general linear model (GLM) framework (SPSS Inc., Chicago, IL), SSS was entered as a continuous variable, and beverage group was entered as a discrete variable with four conditions (control, placebo, low dose, and high dose). The GLM framework allowed for investigating main effects of both predictors collapsed across time, as well as the interaction between each predictor with arousal over time.

Results indicated a significant interaction between beverage group and time, $F(6, 306) = 2.11$, $p = .05$. Follow-up post-hoc LSD analyses revealed significant differences that were limited to Time 1. At Time 1 women in the high dose condition ($M = 3.69$, $SE = .25$) reported higher arousal than those in the control or placebo conditions ($M = 2.93$, $SE = .18$ and $M = 2.88$, $SE = .24$ respectively). Women in the low dose condition did not significantly differ from any of the other beverage conditions ($M = 3.30$, $SE = .25$). No significant differences between beverage groups were found for sexual arousal at Time 2 or 3. Thus, the hypothesis concerning alcohol's effect on sexual arousal was partially supported. There was also a significant between-participants main effect for SSS, $F(1, 154) = 5.97$, $p < .05$, which indicated that sexual sensation seeking was positively associated with sexual arousal at all assessment points (as shown in Table 1). However, the interaction between SSS and alcohol was not significant.

Structural equation modeling (SEM)

To test the hypothesized model, shown in Figure 1, we performed SEM with Mplus statistical modeling software for Windows (version 4; Muthén & Muthén, 2007), using maximum likelihood estimation. The alcohol dose and placebo variables were dummy-coded. A latent variable for condom insistence was formed using the three condom insistence indices: direct request, withholding sex, and presenting risk or STD information. This was done to capture three aspects of the strategies women endorsed in the situation. Factor loadings for the indicators of these strategies were .90, .93, and .62 ($ps < .001$), respectively. Because assessment of sexual arousal at Time 2 was highly correlated with Times 1 and 3, for greater parsimony only Times 1 and 3 were included in the model.

The hypothesized structural path model was tested such that paths not represented by solid lines in Figure 1 were fixed to zero. This model (Model A) demonstrated good fit, $\chi^2(41) = 57.48$, $p = .045$, CFI = .967, RMSEA = .050, SRMR = .076. Paths from low dose and placebo to Time 1 sexual arousal were not significant ($zs < 1.96$, $ps > .05$). Therefore, we tested a second model (Model B) in which these paths were fixed to zero. Model B also demonstrated good fit, $\chi^2(43) = 60.47$, $p = .040$, CFI = .965, RMSEA = .050, SRMR = .078. Chi-squared difference testing indicated that Model B was equivalent in fit compared to Model A, $\Delta\chi^2(2) = 2.99$, $p = .224$. Because Model B was the more parsimonious model, it was considered final. Model B accounted for 50% of the variance in sex without a condom, 34% of the variance in condom insistence, and 3% of the variance in indirect discouragement, and 6% and 29% of the variance in Times 1 and 3 sexual arousal, respectively. Regarding the latent variable of condom insistence, the model accounted for 86% of the variance in withholding sex, 80% of the variance in direct request, and 38% of the variance in risk and STD information.

Following procedures outlined by Bryan and colleagues (Bryan, Schmiede, & Broaddus, 2007), we tested the significance of indirect effects using a version of the Sobel test accessed

through the Mplus MODEL INDIRECT subcommand. Bias-corrected bootstrapping with 5000 resamples was used to generate estimates for the indirect effects (MacKinnon, Lockwood, & Williams, 2004; Preacher & Hayes, 2008; Cheung & Lau, 2008).

The indirect effect of high dose alcohol on Time 3 sexual arousal was significant ($\beta = .10$, $z = 2.61$, $p = .009$); however, the indirect effects of high dose alcohol on unprotected sex, condom insistence, and indirect discouragement were not significant. The indirect effects of Time 3 sexual arousal were significant for unprotected sex ($\beta = .07$, $z = 2.00$, $p = .046$) and condom insistence ($\beta = -.10$, $z = -2.06$, $p = .039$). The indirect effect of indirect discouragement on unprotected sex was also significant ($\beta = -.41$, $z = -6.59$, $p < .0001$). There were no significant indirect effects of sexual sensation seeking or Time 1 sexual arousal.

Discussion

Findings from this study extend previous research on the relationships among alcohol consumption, sexual sensation seeking, and risky sexual behavior in women. In this experimental study we constructed a scenario that included several elements that women are likely to encounter in sexual situations with a new partner. In particular assessing sexual arousal both before and after presenting information about condom availability, as well as verbal negotiation responses, provides insight about the complexity of sexual decision making.

In this study, only a high alcohol dose, rather than a low dose or placebo, affected sexual arousal. This finding is in line with and extends those of both George et al. and MacDonald et al., which have also demonstrated a link between high intoxication level and sexual arousal in predicting risky sex intentions. Some previous work (Gillmore et al., 2002; Morrison et al., 2003) has cast doubt on the relationship between alcohol consumption and high risk sexual behavior. This study may shed light on the controversy surrounding this issue since we found neither a significant direct nor indirect effect of alcohol on the intention to have unprotected sex, but rather a direct effect on early sexual arousal and an indirect effect on later sexual arousal. Later sexual arousal in turn had an indirect effect on both condom insistence and endorsement of unprotected sex. Although the indirect effect of alcohol on behavioral intention outcomes was not significant, these relationships suggest that taking alcohol consumption into account may nonetheless be advisable when examining the relationship between sexual arousal and risky sexual behavior. It is possible that the absence of an indirect effect of alcohol on behavioral intentions was due to the rather lengthy string of mediating variables in the model (Li, 1975). Sexual arousal is a powerful motivator, and alcohol through its cognitively-based focusing effects may serve to enhance its motivational force (Cooper, 2002; MacDonald et al., 2000).

Although other researchers have recognized the importance of considering sexual arousal's effects on risky sexual behavior (Ariely & Loewenstein, 2006; George et al., in press; Gerrard, Gibbons, & Bushman, 1996; Strong, Bancroft, Carnes, Davis, & Kennedy, 2005), the emphasis has been on sexual arousal that occurs close to the act of intercourse. This study suggests that, at least for women, sexual arousal may have varying influences over the course of an encounter. Evoked early, it can increase sexual motivation or expectation, perhaps invoking a cognitive set that codes the event as one that will likely lead to sexual intercourse. Placed on this course, later condom insistence may be inhibited. Some women might expect to discuss condoms "in the heat of the moment," but for a woman who quickly becomes aroused, this might be too late to begin the discussion. An effective intervention for this type of situation might be to teach women to recognize the potential for arousal to drive their subsequent actions much earlier than they might have expected.

The negative relationship between sexual arousal later in the encounter and indirect discouragement suggests that some women might not become as highly aroused as others, perhaps because they are more attuned to the presence of an inhibitory cue, such as lack of a condom. These women may be more likely to discourage further sexual contact unless a condom can be used and ultimately may be less likely to consent to having unprotected sex. This finding is contrary to popular notions of sexual arousal overwhelming reason at the point of penetration, which in general tend to focus on the power of men's arousal rather than on women's to determine sexual outcomes. To fully understand how sexual arousal might affect women's sexual risk taking, it is important to examine women's sexual processes experimentally while controlling for their male counterpart's sexual arousal and behavior.

We cannot state unequivocally that alcohol's effects were due to cognitive impairment; other physiological effects of alcohol, such as its stimulant effects, could be important. However, this study demonstrated that a purely psychological effect, resulting entirely from expectancies evoked by consuming a placebo beverage, was ruled out. Because all participants in the alcohol conditions knew that they received an alcoholic beverage, as in MacDonald's and George's studies, it is likely that alcohol effects demonstrated in this study were due to a combination of cognitive impairment and expectancies.

Our work here differs from previous studies of alcohol and high risk sexual behavior in examining behaviors leading up to intercourse, namely indirect discouragement and condom insistence. These are crucial aspects of women's sexual decision making (Yzer, Siero, & Buunk, 2001) since they can have a significant impact on women's ability to protect themselves from STI transmission. Having found that sexual arousal affected unprotected sex intention indirectly through indirect discouragement and condom insistence points to the importance of taking these factors into account when studying women's sexual decision making.

Maisto et al. (2002, 2004) have noted the importance of condom negotiation skills, which include the ability to discourage further sexual contact and to express a desire to use a condom to one's partner. However, Maisto et al. demonstrated that perceived intoxication, but not actual alcohol dose, affected women's skills during a role play exercise, indicating some influence of a learned association between intoxication and verbal ability. In addition to investigating the intervening role of sexual arousal, our study did not examine verbal skills per se, but rather behavioral intentions. The endorsement of an intended behavior may have been less subject to associations generated by previous experiences of having one's verbal skills deteriorate from being intoxicated. On the other hand, by focusing attention on sexual arousal, cognitive impairment resulting from alcohol consumption may have played a greater role than learning in affecting the intention to insist on using a condom. These findings indicate that HIV prevention programs should continue to emphasize teaching women to insist on condom use wherever feasible. Teaching women to say no to unprotected sex, that is, to have a gatekeeper role, is part of the prevention process, but women also need to be proactive in protecting themselves by asserting their desire to use condoms.

Sexual sensation seeking was directly related to sexual arousal. Because sexual sensation seekers are characterized by seeking to obtain maximal arousal from their sexual experiences, becoming sexually aroused probably provides some motivation for taking sexual risks. Although a great deal of research has been conducted on the association between sensation seeking and high risk sexual behavior (Hoyle et al., 2000), it is surprising that, to our knowledge, no other studies have examined the role of sexual arousal in the relationship between sexual sensation seeking and sexual risk taking. Additional research is needed to further substantiate and parse the role of sexual arousal in this relationship.

That we did not find an interaction between alcohol and sensation seeking does not preclude the possibility of any relationship between them. We predicted that high sensation seekers' sexual arousal might be enhanced by alcohol consumption, since they enter sexual encounters with a predisposition to seek sexual excitement. It may be that among this group this predisposition is not further enhanced by alcohol consumption. Previous research (Kalichman, Heckman, & Kelly, 1996) suggests that sensation seeking may motivate individuals both to drink and to take sexual risks. Since participants in this study were assigned either an alcoholic or a nonalcoholic beverage before projecting themselves into the hypothetical encounter, this motivational hypothesis could not be directly tested. Future research could potentially do so by allowing participants to choose their level of alcohol consumption before engaging in the rest of the experimental protocol.

Experimental studies provide a means to examine the causal effects of specific alcohol doses, as well as to separately study expectancy set effects, but of necessity they cannot completely replicate the conditions found in a natural environment. Although our participants found the experimental story realistic, future studies should investigate whether our findings generalize to other circumstances. Similarly, it is unknown to what extent participants' responses in the lab correspond to those in naturalistic circumstances. Studies are needed to assess to what extent this occurs. In addition, because ethical requirements limit administering alcohol to those of legal drinking age and to those with no known drinking problems, we cannot determine how responses of underage or problem drinkers might differ from our participants'. Another limitation of the study is that participants completed pre-test questionnaires in the same session as the alcohol administration protocol, thereby potentially priming responses to dependent measures. However, the sexual sensation seeking measure was embedded among several others of varying content; therefore, it is unlikely that participants were keyed to the study's exact purpose or to responding in a manner consistent with it. Finally, although our model accounted for 50% of the variance in predicting the likelihood of having sex without a condom, some of our effect sizes, although statistically significant, were rather small. Future studies are needed to replicate and extend these findings.

This study highlights the importance of examining women's sexual decision making as a multi-stage process involving dispositional and situational influences. In particular, it has shown that sexual arousal is an important element in understanding the influences of both alcohol consumption and sensation seeking on women's sexual decision making. HIV prevention programs can benefit from incorporating this information in several ways. First, as suggested by Strong et al. (2005) regarding men, making women aware of the importance of sexual arousal in making sexual decisions can help motivate them to exert personal control within a sexual encounter. Addressing the role of early sexual arousal (that is, before heavy petting and disrobing) can be discussed in a wide range of settings is thus particularly apt for HIV prevention programming. Furthermore, by targeting those with sensation seeking tendencies, this information can be made especially relevant to them. Prevention efforts, too, need to stress how alcohol consumption may play some role in sexual risk taking through its effect on sexual arousal. As demonstrated here, in the presence of largely excitatory cues, it can enhance sexual arousal feelings early in an encounter and set the stage for escalating sexual contact. This is not to say that these feelings necessarily lead to risky sexual behavior. By continuing to stress the importance of insisting on condom use and teaching a broad range of sexual refusal skills, that is, how to begin to say no before the point of sexual penetration, prevention programs can show women how to manage potentially risky situations to their advantage even when sexually aroused.

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Figure 1.

Path model and standardized path coefficients for prediction of unprotected sex intentions. Bold arrows show significant paths. * $p < .05$ ** $p < .01$ *** $p < .001$

Table 1

Correlations Among Study Variables

Variable	1	2	3	4	5	6	7	8	9	10	11
1. Alcohol Dose	--	--	-.03	.22**	.07	-.01	-.03	-.12	-.12	-.01	.15*
2. Placebo		--	-.01	-.07	-.16	-.21 ⁺	.18*	.19	.14	-.14	-.24*
3. Sexual Sensation Seeking			--	.16*	.18*	.18*	-.29***	-.15 ⁺	-.17*	-.16*	.22**
4. Time 1 Sexual Arousal				--	.78***	.54***	-.15*	-.23**	-.18*	-.16*	.17*
5. Time 2 Sexual Arousal					--	.79***	-.15*	-.18*	-.16*	-.16*	.13
6. Time 3 Sexual Arousal						--	-.17*	-.10	-.09	-.12	.12
7. Indirect Discouragement							.52***	.51**	.41***	-.50***	
8. Direct Request								--	.83***	.57***	-.62***
9. Withholding Sex									--	.58***	-.67***
10. Risk Information										--	-.36***
11. Unprotected Sex											--

p<.001,**
p<.01,*
p<.05,+
p<.10