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The Effects of Alcohol and Sexual Arousal on Determinants of Sexual Risk in Men Who Have Sex with Men

Stephen A Maisto,

Department of Psychology, Syracuse University, Syracuse, NY 13244, USA

Tibor Palfai,

Department of Psychology, Boston University, Boston, MA, USA

Peter A. Venable,

Department of Psychology, Syracuse University, Syracuse, NY 13244, USA

Jessie Heath, and

Department of Psychology, Syracuse University, Syracuse, NY 13244, USA

Sarah E. Woolf-King

Department of Psychology, Syracuse University, Syracuse, NY 13244, USA

Stephen A Maisto: samaisto@syr.edu

Abstract

Primary prevention efforts aimed at sexual risk behaviors are critical. This experiment was designed to investigate the effects of alcohol intoxication and sexual arousal, as well as person variables of alcohol sex expectancies and attitudes toward condom use, on hypothesized determinants of sexual risk behaviors among men who have sex with men (MSM). The participants were 117 MSM aged 21–50 years who were randomly assigned to one of six separate experimental conditions created by the combination of beverage administration (water control, placebo or alcohol designed to raise blood alcohol level to .07%) and sexual arousal (low or high, manipulated by participants' viewing non-erotic or mildly erotic film clips). Participants attended two experimental sessions. The first session included completing questionnaires about beliefs about alcohol's effects on sex and attitudes toward condoms' effect on sexual pleasure. The second session involved the beverage condition and arousal manipulations. Following these, participants viewed and responded to two interactive videos depicting high sexual risk scenarios. Participants also completed the CARE, a measure of risk perceptions. The dependent variables were behavioral skills, intentions to have unsafe sex, and "risk exposure," derived from responses to the videos. The results of both planned and exploratory analyses showed general support for the hypothesized enhancement of alcohol's effects on sexual risk by both sexual arousal and expectancies. Also as predicted, condom attitudes showed direct relationships to risk exposure and intentions. Implications of the findings for models of alcohol's effects on sexual risk and for the development of HIV prevention interventions were discussed.

Keywords

Alcohol; Sexual arousal; Sexual risk; Men who have sex with men

Introduction

In the early 2000s, there was an alarming resurgence of high-risk sexual behavior, sexually transmitted diseases (STDs), and new HIV infections among men who have sex with men (MSM) (Ekstrand, Stall, Paul, Osmond, & Coates, 1999; Katz et al., 2002; Strathdee et al., 2000; Wolitski, Valdiserri, Denning, & Levine, 2001), which has not changed significantly since then. Furthermore, MSM continue to be the subgroup in the United States that is most affected by HIV/AIDS (Irwin, Morgenstern, Parsons, Wainberg, & Labouvie, 2006; Koblin et al., 2006; Patterson, Wolf, Hall, & Golder, 2009). Stemming the tide of new infections among MSM and reducing transmission of STDs and drug resistant HIV strains among MSM already living with HIV are public health priorities.

Because there still is no medical cure or effective HIV vaccine for it, the application of behavioral interventions aimed at decreasing the incidence of HIV through promotion of safer sexual practices remains the best approach to ameliorating the HIV epidemic (Kalichman & Weinhardt, 2001). Accordingly, there has been an emphasis among researchers in identifying biological, psychological, and social/situational factors that may be associated with the occurrence of unsafe sex, and their inter-relationships (Cooper, 2010; Mustanski, 2008). Among MSM, “unsafe sexual behavior,” or risky sex, has been defined primarily, although not exclusively, as unprotected anal intercourse (UAI). In this article, “risk” broadly refers to the “possibility of loss” (Yates, 1992) resulting from enacting voluntary behaviors, and “risky sex” refers to unprotected anal intercourse or intercourse with a partner whose HIV status has not been ascertained as negative (Kelly & Kalichman, 1995). Given the consequences of HIV transmission, the concept of risk clearly is applicable.

Alcohol and Sexual Risk Among MSM

Interest in clarifying the association of alcohol use to sexual risk stems from findings first appearing in the literature indicating that heavier drinkers tend to engage in sexual risk behaviors more frequently. However, event level studies focusing on the association of alcohol use on specific occasions with high-risk sex have yielded inconsistent findings (e.g., Cooper, 2010; Weinhardt & Carey, 2001). Furthermore, recent findings suggest that the association of alcohol use with risky sexual behavior is best considered a function of the interplay of situational and person variables at the level of the sexual event (Barta et al., 2008; Cooper, 2010; Vanable et al., 2004).

A number of experimental studies primarily involving heterosexual young adult men and women have shown an association between alcohol consumption and decreased sexual risk perception, intentions to engage in unsafe sexual practices in an analogue situation or poorer condom use negotiation skills. Risk perceptions, partner negotiation skills, and behavioral intentions are important determinants of sexual risk behavior that figure prominently in social-cognitive models relevant to HIV prevention programming (e.g., Fisher & Fisher, 2000). Therefore, in the absence of ethically being able to directly observe or measure sexually risky behaviors, experimental analogue studies have been used to investigate alcohol's effects on risk perceptions, partner negotiation, and condom use intentions. In this experiment, therefore, these determinants of safer/unsafe sex are called indicators of “sexual risk” for convenience, but it should be clear that the goal of the experimental research has been to study alcohol's effects on determinants of (temporally precede the occurrence of) sexually risky behavior. One possible moderator of the effects of alcohol on sexual risk that has received relatively little attention is sexual arousal.

Sexual Arousal and Sexual Risk Behaviors

Loewenstein (1996) argued that discrepancies between apparent self-interest (in the longer-term) and behavior on a given occasion are due to what he called “visceral” factors. Such factors include sexual desire and emotion. Loewenstein noted that visceral factors are defined by their direct hedonic effects and by their alteration of the level of desirability of different objects or behaviors. Critical for an analysis of risky sex, visceral factors emphasize the immediate context rather than future considerations (Ariely & Loewenstein, 2006), and typically the immediate context of sexual behavior is highly positively reinforcing. Loewenstein, Weber, Hsee, and Welch (2001) formalized these ideas into the “risk as feelings” model, which was created to account for affect’s influence on risk perception, which cognitive analyses of risk perception have not been able to achieve. A central feature of Loewenstein et al.’s model is that visceral factors not only affect the cognitive evaluation of a consequence of a behavior, but, with sufficient intensity, they may also bypass cognition entirely and directly influence behavior. This analysis is similar to Zajonc’s (1980) “primacy of affect” theory. Neither Zajonc nor Loewenstein specified the level of intensity required for visceral factors to affect risk perceptions and behavior directly.

Besides the possibility that visceral factors (in this case, sexual arousal) directly influence behaviors and perceptions related to sexual risk, it is also possible that, in the context of alcohol intoxication, they strengthen alcohol’s sexual risk-enhancing effects. This analysis suggests that arousal is synergistic with the way in which alcohol is hypothesized to influence sexual risk behavior based on the oft-cited alcohol myopia model (Steele & Josephs, 1990). The myopia model suggests that alcohol and arousal interact to enhance sexual risk-related perceptions and behaviors, under typical conditions when the immediate context in which sex occurs is positively reinforcing and the associated cues are the most salient.

Despite the apparent importance of sexual arousal in understanding sexual risk cognitions and behaviors, it has received limited research attention, and most of the experiments that have been published have appeared recently. In an early experiment, Blanton and Gerrard (1997) found that male heterosexual undergraduates perceived less risk in having sex with a hypothetical high-risk partner if the latter was depicted as having high “sex appeal.” The assumption was that a sexually appealing partner induces a higher level of motivation to have sex in the same way that sexual arousal purportedly operates. Consistent with Loewenstein’s (2001) risk as feelings model, Ariely and Loewenstein (2006) found that male heterosexual undergraduates made a series of riskier judgments and decisions, including several relevant to HIV-related sexual risk, when sexually aroused compared to when not aroused.

Several recently published experimental studies have investigated the combined effects of alcohol and sexual arousal on sexual risk-related variables. All of these studies were conducted with heterosexual participants. Ebel-Lam, MacDonald, Zanna, and Fong (2009) investigated the effects of a moderate dose of alcohol and sexual arousal (manipulated through having participants read an erotic magazine story) on male undergraduates’ intentions of having unprotected sex with an attractive partner acting in a video depicting a common sexual-risk situation that a single young adult might encounter. This experiment’s results were consistent with a synergistic effect between alcohol intoxication and arousal. Individuals in the high arousal condition and who drank alcohol reported the highest likelihood (intention) of having unprotected sex with the video character if they actually had been presented with the opportunity to do so. George et al. (2009) tested the effects of alcohol and sexual arousal (stimulated through the use of erotic film clips) in young adult men and women on intentions of having unprotected sex with the opposite-sexed character

presented in a written vignette describing a sexual risk situation. The main findings of the three experiments that George et al. reported were that alcohol increased intention of having unprotected sex, but through subjective (not measured physiological) sexual arousal. That is, alcohol's effects were not direct but were indirect (mediated) through its effects on subjective arousal, but no mediation of alcohol's effects through physiological arousal was found. The interaction between alcohol and arousal was not tested in these experiments. George et al. interpreted the pattern of findings of the three experiments as consistent with and extending alcohol myopia theory.

Experimental Research on Alcohol and Sexual Risk Variables Among MSM

The question of the relationship between alcohol and sexual risk is particularly important for MSM, because they tend to be heavier drinkers than matched groups of heterosexual individuals (Patterson et al., 2009). Despite the importance of clarifying the association of alcohol use to sexual risk-taking among MSM, there have been no published experimental studies of alcohol and sexual risk in this population. Experimental alcohol administration studies are essential to clarifying the causal role of alcohol use as a determinant of risky decision-making (Hendershot & George, 2007). Furthermore, there are scientific problems with assuming that findings about alcohol's complex relationships to complex human sexual behaviors, which have biopsychosocial determinants (Bloemers et al., 2010; Janssen, 2002). This article is a report of the first experimental study of acute alcohol intoxication and HIV-related sexual risk in MSM.

In summary, the evidence suggests that sexual arousal may be directly related to sexual risk-relevant behaviors or cognitions. Two other possibilities are apparent. First, alcohol may be related to sexual risk directly, and the effect is enhanced by sexual arousal and, second, alcohol may be related to sexual risk through its effects on arousal. Although both of these possibilities have been interpreted as consistent with alcohol myopia theory, it would appear that a finding of an arousal-enhancing effect of alcohol's effects on sexual risk is a more direct extension of the myopia model than are mediation effects.

Person Variables, Alcohol, and Risky Sex

Personality and other individual differences (i.e., person) variables may help to explain the absence of consistent "main" effects of alcohol in correlational or experimental studies (McKirnan, Vanable, Ostrow, & Hope, 2001; Weinhardt & Carey, 2001; Weinhardt, Otto-Salaj, Brondino, Norberg, & Kalichman, 2002), as such variables may moderate alcohol's effects on risky sex. Furthermore, person variables might be identified that are associated with risky sex independent of alcohol, knowledge of which would aid the development of multivariate theoretical models that likely would be a better fit to data on the relationship between alcohol and risky sex than are univariate models. Two person variables that have received the most attention are expectancies that alcohol enhances sexual experiences and attitudes toward condom use.

Alcohol Expectancies—Theoretically, in order for alcohol-related expectancies to have any effect on behavior, they must be "activated," which may occur through actual alcohol consumption or through an individual's perception that he or she has consumed alcohol and is experiencing some degree of intoxication as a result (Goldman, Del Boca, & Darkes, 1999; Oei & Baldwin, 1994). Findings of a perception of intoxication by expectancies interaction in Gordon, Carey, and Carey (1997) on attitudes toward condom use and Maisto, Carey, Carey, and Gordon (2002) on condom use negotiation skills were consistent with this hypothesis.

However, the literature also shows that expectancy effects have not been found in a number of experiments (MacDonald, MacDonald, Zanna, & Fong, 2000 on likelihood of engaging in unprotected sex [intentions]; Maisto et al., 2004b on behavioral skills, risk perception, and intentions), and have not been found consistently across dependent variables in the same experiment. In this regard, for example, Maisto et al. (2002) found expectancy effects on behavioral skills but not on risk perception or intentions. Furthermore, several experiments (Fromme, D'Amico, & Katz, 1999, estimates of the likelihood of positive consequences associated with having risky sex; Gordon et al., 1997, behavioral skills; Maisto, Carey, Carey, Gordon, & Schum, 2004a, behavioral skills) revealed a direct relationship between alcohol expectancies with dependent variables relevant to risky sex. The latter correlations were parallel to alcohol effects, but expectancies apparently were not triggered by any event that should have done so, such as external instructions regarding beverage content, actual beverage content or the perception of intoxication. In this regard, there may be individual differences variables that are correlated both with alcohol sex expectancies and sexual risk outcomes whose effects are sometimes manifested in sexual risk outcomes.

In summary, expectancies are theoretically important in investigations of alcohol and risky sex (e.g., Dermen & Cooper, 2000; Fromme et al., 1999), and their effects have been manifested in several experiments in which they were measured sensitively. Nevertheless, there remains a need for information on the conditions under which expectancy effects might be predicted to emerge, such as arousal level and the sexual risk behaviors or cognitions in question.

Attitudes Toward Condom Use—Attitudes toward condom use have been relevant to theories applied to HIV prevention and have been shown to have predictive value in correlational research in HIV prevention intervention trials (Kelly & Kalichman, 2002; Morrill, Ickovics, Golubevich, Beren, & Rodin, 1996). However, attitudes toward condom use have been included as dependent or predictor variables in only two alcohol-risky sex experiments (Gordon et al., 1997; Maisto et al., 2004b). Maisto et al. used the information-Motivation-Behavioral Skills (IMB) model (Fisher & Fisher, 2000) of safer sexual behavior, which is a prominent model of HIV prevention, to predict a direct relationship between attitudes toward condom use and other variables relevant to sexual risk. The IMB model represents the occurrence of safer sexual behavior as determined by information about HIV/AIDS and other STDs and motivation to engage in safer sex; the effects of both of these constructs are hypothesized to be mediated through actual behavioral skills to enact safer sexual practices. Along these lines, Maisto et al. computed correlations between scores on three dimensions of the Multidimensional Condom Attitudes Scale (MCAS; Helweg-Larsen & Collins, 1994) (a measure of motivation to engage in safer sex) and measures of behavioral intentions (motivation) and condom use negotiation skills. The data revealed the expected associations between condom use attitudes, intentions, and skills, and the pleasure dimension of the MCAS showed the most consistent and largest correlations. In exploratory multiple regression modeling, the pleasure score independently accounted for well over 30% of the variance in both intentions and behavioral skills measures.

Maisto et al.'s (2004b) finding that MCAS pleasure was an important, independent predictor of intentions and skills is consistent with the IMB model, with the theoretical analysis of alcohol effects presented earlier, and with empirical studies showing the importance of pleasure as a motivation to have sex among males (e.g., Hoffman & Bolton, 1997; Nadeau, Manon, & Biron, 2000). Therefore, condom attitudes seem to be a critical person variable in explaining variation in sexual risk. Unlike alcohol sex expectancies, condom use attitudes were not expected to interact with beverage condition, and, theoretically, such attitudes are viewed as relatively enduring and unaffected by a state of alcohol intoxication. Thus, a beverage condition by condom use attitudes moderation effect was not tested.

Hypotheses

The purpose of this study was to conduct the first experiment on the effects of alcohol intoxication, sexual arousal, and the person variables of alcohol sex expectancies and condom attitudes on hypothesized determinants of safer sexual behavior in MSM. Participants were randomly assigned to one of six conditions created by the combination of beverage condition (water control, placebo, or alcohol) and arousal (high sexual arousal or low, manipulated by viewing of erotic or non-erotic film clips). Indicators of constructs relevant to determinants of safer sexual behavior according to the IMB model were the primary dependent measures, and one hypothesized safer sex determinant, condom attitudes, was investigated as a 'direct effect' predictor variable. As noted earlier, although condom attitudes were construed as a motivational determinant of sexual risk, they were studied as a "direct effect" predictor variable because they were viewed as relatively stable and likely unaffected by a state of alcohol intoxication. This contrasts with risk perception and intentions, which seem to be more situationally-based motivational determinants of sexual risk. It was hypothesized that both beverage condition and arousal would have direct effects on the dependent variables in the direction of greater sexual risk, but that beverage condition and arousal would interact such that individuals who were intoxicated and sexually aroused would show the highest degree of sexual risk. Direct effects of condom use attitudes were predicted in the direction of safer sex, and alcohol expectancies were predicted to interact with beverage condition, that is, expectancies would exert risk-enhancing effects only in individuals who consumed alcohol. The primary dependent variables included condom use negotiation skills (an indicator of behavioral skills in the IMB model), HIV-related risk perception (an indicator of motivation), and intentions of having unsafe sex (motivation). In addition, the effects of the independent variables on a novel measure of risk exposure were investigated. This variable was included as a reflection of the importance of situational factors, in particular "high risk situations," in the occurrence of risky sexual behavior (Kelly, 1995).

Method

Participants

The participants were 117 MSM who were recruited from the Syracuse, NY ($n=31$) and Boston, MA ($n=86$) communities by advertisements in regional publications that cover social and other news events that are of interest to the gay/lesbian population in central NY and Boston, respectively, internet social networking sites, and participant driven recruitment. The men were required to meet several criteria to be eligible to participate in the study: aged 21–50 years; history of sexual activity with men; sexually active in the last year but not in a steady, committed relationship for the last 3 months, because individuals in such a relationship are less likely to experience conflicts with their partners over condom use; current drinking pattern classified as moderate or heavy; no current or history of alcohol or psychiatric problems, a criterion required by our local IRB for its approval of this research; and no medical problems such as HIV, liver disorders or diabetes that would contraindicate the use of alcohol.

Of the 366 men screened for participation, 171 were identified as eligible and consented to participate. The main reasons that individuals screened out at the initial phone interview included a history of alcohol-related problems, taking of medications for medical or psychiatric reasons, and failure to meet the relationship criterion. Of the 171 men who were identified as eligible and who consented, 53 did not complete session 2 of the experiment, with some participants failing to return for their second session ($n=9$) and the others ($n=44$) being identified as ineligible at the completion of session 1. The most frequent reasons for ineligibility included high scores on measures of depression ($n=15$), alcohol-related

problems ($n=6$), and having a predominately heterosexual sexual identity ($n=8$). Men defined as ineligible ($n=53$) at the time of session 1 did not differ from the men who completed the experiment in its entirety ($n=117$) on race, marital status, employment status, year in school or income. Men who completed both sessions 1 and 2 reported higher ratings of homosexual sexual orientation (as per the Kinsey Scale) and were slightly younger in age as compared to those who did not go on to complete the study. There were no other significant differences in the variables listed in Table 1 between these 53 men and the full sample that completed the experiment.

Table 1 shows participant descriptive information by each of the six experimental conditions for individuals included in the final analyses; all conditions had an $n=19$, except for the placebo-arousal condition ($n=20$) and the water-non-arousal condition ($n=21$). Beverage Condition $\times$ Arousal analyses of variance (ANOVA) or chi-squared tests revealed no statistical differences among the six groups on any of the variables shown in Table 1. Among the variables listed in Table 1, participants recruited from Syracuse ($M=34.2$ years, $SD=9.6$) and Boston ($M=30.5$ years, $SD=9.0$) and included in the final analyses differed only in age, $t(114)=2.17$, $p<.05$. As presented later, age was included as a covariate in all of the primary analyses that were conducted, as it did show statistically significant simple correlations with several of the dependent variables.

Measures

Three categories of measures were collected: Screening and descriptive measures, manipulation checks, and dependent variables. Only the measures pertinent to this report are presented here.

Screening and Descriptive Measures—The Short Michigan Alcoholism Screening Test (SMAST; Selzer, Vinokur, & van Rousien, 1975) was used to screen for history of alcohol problems and has been shown to have good validity as a screening measure for adults (Maisto, Connors, & Allen, 1995). Individuals with a history of alcohol problems were not eligible to participate in the experiment.

The Kinsey Scale (KS; Kinsey, Pomeroy, & Martin, 1948) is a 7-point scale used to assess self-identified sexual orientation, with zero representing exclusive heterosexuality and 6 representing exclusive homosexuality. The Kinsey Scale remains the most common way to measure sexual orientation (Zucker, 2005). In addition, it takes little time to complete and yields a desired categorical measure of sexual orientation. Both of these features are highly desirable in a screening measure. Furthermore, evidence for the validity of the Kinsey Scale is at least as good as it is for other measures of sexual orientation (Zucker, 2005), and measures of self-identified sexual orientation like the Kinsey correlate highly with measures of erotic fantasies, which are a critical component of sexual orientation (Mustanski, Chivers, & Bailey, 2002; Storms, 1980). Only participants scoring a 3 or higher were included in this experiment.

The Center for Epidemiologic Studies-Depressed Mood Scale (CES-D; Radloff, 1977) was used to help screen for current significant depressed mood. Evidence of reliability and validity is excellent (Fischer & Corcoran, 1994). Individuals who scored ≥ 16 were excluded from participation in the experiment because such scores indicate possible symptoms of depression that might be exacerbated by alcohol consumption.

The Brief Symptom Inventory (BSI; Derogatis & Melisaratos, 1983) was used to confirm participants' reports of psychological health. Scores of ≥ 2 on any BSI item reflecting acute psychiatric distress or thought disorder led to the research assistant's further inquiry to rule out psychiatric impairment and thus contraindicate alcohol administration. If, in the RA's

judgment, there was evidence of such impairment, the principal investigator (the first author and licensed clinical psychologist) was contacted and met with the participant to make the final determination. There were no cases of participants being asked to withdraw from the study for psychiatric reasons.

The Demographic Questionnaire asked about age, marital status, length of current relationship, highest grade completed in school, race, employment status, and income.

The Quantity-Frequency-Variability (QFV) Questionnaire (Cahalan, Cisin, & Crossley, 1969) was used to measure usual drinking patterns in the last 3 months. Individuals in the moderate to heavy range were defined as eligible to participate.

The Sexual Behavior Survey (Gordon, Carey, & Carey, 1997) was used to obtain self-reports of number of sexual partners (life-time, previous year, and the previous 3 months), and condom use (previous year, previous 3 months). Only individuals who were sexually active in the last year were eligible to participate.

Sex-Related Alcohol Expectancies were measured with Leigh's (1990) 13-item questionnaire. Participants rated how much alcohol affects them, with higher scores reflecting a greater degree of belief that alcohol positively affects sexual arousal and behavior. In this sample, the coefficient alpha for the overall scale=.86.

The 25-item Multidimensional Condom Attitudes Scale (MCAS; Helweg-Larsen & Collins, 1994) was used to measure five dimensions of condom attitudes, and this study involved analyses of data from one of them, the pleasure associated with condom use. The pleasure factor (5 items) had coefficient alpha of .73 in this sample.

The Marlowe-Crowne Social Desirability Scale (SDS; short form) was used to measure participants' motivation to present themselves in a favorable light (Reynolds, 1982). The scale has good internal consistency (.76) and test-retest reliability ($r = .88$). Social desirability was measured in this study to enable evaluation of its contribution to variance in measures of risk perception, risk exposure, and behavioral skills.

Dependent Variables—*Risk perception* was measured with the Cognitive Appraisal of Risky Events (CARE) Questionnaire (Fromme et al., 1999). The two variables of interest in this study were ratings on a 1–7 scale of the likelihood of positive consequences and negative consequences, respectively, of engaging in sex with a new partner. Summed item ratings on each dimension were the dependent measures, following Maisto et al. (2004a). The coefficient alphas for these two subscales in this sample were .66 and .66 for positive and negative, respectively.

Behavioral skills and *risk exposure* were measured with two interactive videos developed for this experiment. The procedures followed in developing the videos were described in detail in Woolf-King, Maisto, Carey, and Venable (2010). Both interactive videos provided indicators of the behavioral skills needed for safer sex in situations that would (1) be familiar to participants, (2) pose moderate difficulty to communicate feelings about condom use, and (3) elicit moderate sexual interest. The first interactive video depicted two men who had recently met and were eventually faced with the decision of having sexual intercourse for the first time without the use of condoms. The second interactive video depicted two men who were friends and were faced with their first sexual experience and eventually the decision of whether their first sexual encounter together would involve the use of condoms. The videos were enacted by professional actors according to a script and were filmed by professional videographers.

Table 2 shows the means and SDs of ratings that participants assigned the videos for each of four criterion dimensions: how “realistic” the videos were perceived to be, the “attractiveness” of the actors, how “difficult” it would be to negotiate safe sex in the situations depicted in the videos, and how “arousing” the videos were. Each participant viewed both of the interactive videos, which were presented in a random order. The two interactive videos, and the accompanying post-video ratings, required approximately 10 min to administer.

Each interactive video had a *risk exposure* component and a *behavioral skills* component. For the *risk exposure* component, each video began by setting a scene in which “Jim” (the protagonist) and “Dave” (the character with whom the participant was asked to identify) meet up with each other. The participant was asked to make a series of binary choices (yes/no) about engaging in various increasingly high-risk sexual activities with Jim, which constituted the basis of the interactive *risk exposure* measure. The 5 choice points were (1) “Do you go with Jim (the protagonist) to his apartment?”; (2) “Do you accept a drink from Jim?”; (3) “Do you go upstairs with Jim (video 1)?” or “Do you get in the hot tub with Jim (video 2)?”; (4) “Do you have anal sex with Jim?”; (5) “Do you have barebacked, receptive anal sex with Jim?” Participants received 1 point for each time they answered “yes” and thus made a progressively risky choice. The *risk exposure* portion of the video terminated with the first “no” response to the choice points. Subsequently, the participant was returned to the fifth choice point to begin the *behavioral skills* component of the video.

The *behavioral skills* portion of the video required participants to negotiate sexual situations using verbal communication skills in an interactive role-play. Participants were asked to respond first to Jim’s comment that he desires to have unprotected anal sex and that there is no cause for concern because he is safe (“prompt 1”). The video then paused for 60 s to allow the participant to respond by speaking into a microphone placed next to the computer monitor. Subsequently, Jim delivered a second, more insistent comment that was a reminder to the participant that UAI would not be risky and would be pleasurable and that the participants could trust Jim (“prompt 2”).

Participants’ responses to each of the prompts were scored (on a 0–2 scale) on the following five dimensions (higher score = better communication skills): (1) use of an “I” statement of intention of safer sexual behavior or refusal of unsafe sexual behavior; (2) presence of a positive statement about the other person in the scenario; (3) provision of a statement of a reason for safer sexual behavior; (4) suggestion of a specific alternative behavior that was safer; and (5) indications that the participant’s response was direct, serious, and clear. Scores for each of the response dimensions were assigned according to criteria specified in a rating manual based on previous research by our team (Maisto et al., 2002, 2004a, 2004b). Two raters independently coded each of these five dimensions across the two prompts and the two videos (117 participants $\times$ 5 dimensions $\times$ 2 prompts = total number of codes). The two raters agreed on 93% of the codes, and the discrepancies on the remaining codes were resolved through discussion.

A *Post-video rating* was obtained following presentation of each of the interactive videos on a 0–6 Likert-type scale of the likelihood that the participant would have UAI (this rating was highly similar to ratings of “intention to have unprotected sex”; e.g., George et al., 2009).

Manipulation Checks—Actual Blood Alcohol Concentration (BAC) was estimated by breath analysis (Alcosensor FST, Intoximeters, Inc.).

Perception of the amount of alcohol consumed was measured by asking participants to estimate the number of shots of vodka that they consumed. A score of 0 (None), 1 (1–2 shots), 2 (3–4 shots), 3 (5–6 shots), or 4 (>6 shots) was assigned on this variable.

Perception of intoxication was measured on a 10-point (1 = not all, 10 = more intoxicated than you've ever been) scale.

Sexual arousal was rated by the participant on a 0–6 Likert-type scale. Sexual arousal was measured in response to the arousal manipulation (viewing the film clips).

In addition to the likelihood of having UAI, post-video ratings were obtained following presentation of each of the role-play scenarios on a 0–6 Likert-type scale of the following dimensions: realistic situation; attractiveness of the male actor in the scenario; participant's interest in having sex if he were actually in the situation depicted in the role-play; difficulty of responding to the role-play; how accurate the participant believed he responded to the role plays; and how sexually arousing he found the video.

Procedure

Recruitment and Screening—Participants were recruited with newspaper advertisements for a “social communication” study, placement of flyers on campus and in the community, and advertisements on internet social networking sites. Men who responded to the advertisements were invited to participate in two sessions and were screened initially over the telephone by a research assistant (Syracuse, 2 females, Boston, 1 male, 1 female), who followed a written script for this purpose. If individuals agreed to these terms, an appointment for Session 1 was scheduled. Participants were also told at this time that, if they were invited back for the second session, there was a chance that they would consume alcohol.

Session 1—This session began with a research assistant checking proof of the participant's age and then testing his breath to confirm a BAC of zero; two participants showed a BAC > 0 at this point and were rescheduled. Participants were then given a brief overview of the study and read and signed a consent form that explained the procedures in detail. After participants gave their consent to participate in the experiment, eligibility criteria were confirmed by interview and administration of the SMAST, KS, BSI, CES-D, and QFV. Upon confirmation of their meeting eligibility criteria, participants were asked to complete the Sexual Behavior Survey, Leigh Questionnaire, and MCAS questionnaires. After these instruments were completed, the second experimental session was scheduled. Participants were reminded not to use any substances for 24 h prior to Session 2, and they were asked not to drink any beverage except water or eat for 3 h prior to Session 2. Participants were instructed not to drive a motor vehicle to Session 2 because they might drink alcohol, and they were told that transportation would be arranged for them free of charge. Participants were paid \$25 for their full participation in Session 1 and \$15 to cover transportation costs.

Session 2—This session began by two research assistants introducing themselves to participants as co-experimenters. One of the research assistants (research assistant 1) then breath-tested the participant to confirm that his BAC was zero. Participants were also asked if they complied with the substance use and food and beverage intake requirements; all of the participants said that they had (failure to comply, or a BAC > 0, would have required a rescheduling of the participant's appointment). Participants were then weighed to determine the amount of alcohol individuals in the alcohol conditions would receive. After research assistant 1 left the room, the second research assistant (research assistant 2) entered the room to “assign” participants to their beverage condition (in fact, participants' beverage condition

assignments had been determined randomly at the end of Session 1). Individuals who were actually assigned to the alcohol or placebo conditions were told that they would be drinking alcohol.

Participants assigned to the alcohol group received .70 g alcohol/kg body weight, in the form of a chilled beverage of 80-proof vodka mixed with tonic water and lime juice in a 1:4 ratio. Participants in the placebo group received drinks containing tonic and lime juice, with a minimum amount of vodka rubbed on the rim of the glass to enhance alcohol cues. Limes soaked in vodka were also added to the placebo beverage to enhance the alcohol cues. One-fifth of the total volume of the placebo beverage was in the form of flat tonic water poured from a vodka bottle. Placebo group participants received a volume of beverage equivalent to what they would have received in the alcohol condition. Participants in the no alcohol (control) condition were told in their initial instructions that they were assigned to the control condition and therefore would not receive alcohol. As in the placebo condition, control participants drank a volume of water comparable to the volume of beverage they would have received in the alcohol condition. Participants' drinks were divided into three equal doses. They sat alone while they consumed their drinks and were asked to take a total of 20 min to finish them. Participants were asked to take about the same amount of time to finish each drink, and the research assistant checked on the participant every 6 or 7 min to assure that the instructions were being followed. Newspapers and general news magazines that did not include mention of HIV or AIDS were available to the participants while they consumed their beverages.

The research assistant who administered the measures to participants in Session 2 was not aware of their beverage condition. In this regard, research assistant 1, who greeted the participant, completed the session's preliminary details and administered all measures except breath testing and beverage manipulation checks. Research assistant 2 assigned the participants to beverage condition, administered the beverages, measured BAC by breath analysis, and administered beverage manipulation checks.

Upon finishing their drinks, participants began the "initial (alcohol) absorption" period, which lasted 10 min. At this time, research assistant 2 breath tested the participant and left the room. Research assistant 1 then administered an information processing task (this computer-administered divided attention task had no sexual content and took about 5 min to complete; the data are not presented here), after which research assistant 2 returned to breath test the participant again.

Subsequently, research assistant 1 administered the arousal manipulation. The procedures for the arousal manipulation followed those established and used in recent experimental research on erotica and sexual arousal and described in detail in Woolf-King et al. (2010). Research assistant 1 instructed the participant that this part of the session concerned emotional reactions to different kinds of visual stimuli. Dependent on the condition to which the participant had been assigned, he was told that he would view either the sexual stimuli (erotic film clip condition) or "scenes of the countryside" (neutral film clip condition). Note that the film clips in the arousal condition were selected to elicit moderate arousal, because of the importance that the level of arousal not overpower the contribution of the beverage manipulation.

In each of the arousal conditions, the research assistant left the room after giving the participant instructions that his task was to watch the 6-min film clips and engage in their contents as much as possible. After viewing the 6-min film clips, all participants were asked to rate the following variables on a 0 (not at all) to 6 (extremely) Likert-type scale: subjective sexual arousal, absorption, positive feelings, anxiety, disgust, entertainment,

boredom, anger, and curiosity. Upon completion of the ratings, research assistant 1 collected the data, left the room, and then research assistant 2 entered to breath test the participant.

Following the breath test, research assistant 1 asked the participant to complete the positive and negative consequences section of the CARE. Upon completing the CARE, research assistant 1 asked participants to complete the intoxication/amount consumed manipulation checks. When research assistant 1 left the room upon collection of the data, research assistant 2 entered the room to breath test the participant. All participants were given feedback about their BACs; participants in the placebo condition were given bogus feedback yoked to the actual BAC of a randomly selected participant in the alcohol/moderate condition, consistent with the volume of beverage that they received. Participants in the control condition were told their actual BAC of zero research assistant 2 then asked the participant to complete the manipulation check measures of estimating amount of alcohol consumed and perceived intoxication.

When the participant completed the two manipulation check measures, research assistant 1 returned to administer the risk exposure and role-play tasks. The research assistant administered them from an adjoining room to allow pauses of the tapes when participants were required to respond to the prompts but yet allow participants to be in the room alone during the role-plays. Participants viewed the scenarios through a computer monitor and their responses to the prompts were digitally recorded. The order of administration of the two videos was determined randomly for each participant. Upon completion of each of the two different versions of the risk exposure/role-play task, participants were asked to complete the set of post-video ratings that were described earlier.

Upon the participant's completion of the ratings following the second video, research assistant 2 returned to breath test the participant and to give feedback appropriate to the participant's actual beverage condition. Participants were then asked by research assistant 1 to complete a 5-min "opinion survey," administered to disguise the true purpose of the experiment. Research assistant 1 asked the participant about a few of his responses to the opinion survey following procedures described in Maisto et al.(2002). When the survey was completed, research assistant 2 returned to breath test the participant and to give final BAC feedback appropriate to the participant's beverage condition. Participants then were asked to complete a brief unstructured questionnaire regarding their perceptions of the experimental hypotheses. After this procedure, research assistant 1 debriefed the participant about the true purpose of the research in a global way, but the specific hypotheses being tested were not discussed. Participants who drank alcohol then were breath tested every 15 min and were not permitted to leave the laboratory until their BACs were .02%. Participants who completed Session 2 were paid \$35 for study participation and \$15 for transportation expenses.

Statistical Analyses

The analyses may be classified into two sets. The preliminary analyses explored the distributional properties of the primary dependent variable scores: CARE-positive and negative consequences, respectively, behavioral skills (prompt 1 and prompt 2), risk exposure, and intentions (to have risky sex), as measured by post-video rating of "likelihood of having sex without a condom" following video 1 and video 2, respectively, and tested for group differences on the manipulation check measures.

The primary analyses were concerned with investigating the effects of alcohol and arousal condition on the dependent variables. The first step of these analyses involved analyzing the manipulated variables, so that a Beverage Condition $\times$ Arousal Condition analysis of covariance (ANCOVA), with age and social desirability as the covariates, was conducted. Following these analyses, hierarchical multiple regression models were run to test the effects

of arousal and beverage condition in the context of the person variables of alcohol sex expectancies and condom attitudes. These analyses were followed by exploratory analyses testing the same models with arousal indicated by a continuous measure. In this regard, the post-film clip sexual arousal ratings were viewed as a more direct indicator of the degree of sexual arousal that participants were experiencing following the arousal manipulation, and that the rating was likely a more sensitive indicator of arousal than a dichotomous variable of arousal condition (MacCallum, Zhang, Preacher, & Rucker, 2002). Of course, the continuous indicator does not have the same clarity in making causal inferences as does the dichotomous indicator of arousal condition.

Results

Preliminary Analyses

Following Maisto et al. (2004b), we combined the behavioral skills (respective prompt scores), the risk exposure scores, and the likelihood of having UAI ratings from each of the videos to yield one score for each of these measures. Therefore, there was a score for each prompt (prompt 1 and prompt 2) for the behavioral skills outcome variable, one score for the risk exposure variable, and one score for the likelihood of UAI outcome variable, respectively. As in Maisto et al., the respective scores for each video were significantly correlated: $r = .36$ for Prompt 1, $.52$ for Prompt 2, $.38$ for Risk Exposure, and $.51$ for Likelihood of UAI, all $ps < .01$. Exploratory analyses revealed that the combined scores were approximately normally distributed, with the exception of likelihood of UAI. A logarithmic transformation was applied to the positively skewed likelihood data and brought skewness and kurtosis statistics to the statistically non-significant range. The distribution of the two CARE measures scores approximated normal.

Manipulation Checks—Individuals assigned to the alcohol/erotic film clip condition achieved a peak BAC of .068% (.016) and individuals in the alcohol/neutral film condition achieved a BAC of .061% (.019). The mean BACs of men assigned to the alcohol conditions did not differ statistically.

A Beverage Condition $\times$ Arousal Condition factorial ANOVA was run on the perception of intoxication and perceptions of amount of alcohol consumed ratings, respectively. The analyses showed a main effect of beverage on perception of intoxication rating, $F(2, 111) = 95.50, p < .01$. The mean estimates were 5.00 (1.79), 2.56 (1.14), and 1.07 (.62) for participants in the alcohol, placebo, and control conditions, respectively. Each group's estimate differed significantly ($p < .01$) from each other's. The findings for estimates of the amount of alcohol consumed were similar to the perception of intoxication results. The analysis showed a significant main effect of beverage, $F(2, 111) = 78.88, p < .01$. The mean estimates were .13 (.65), 1.67 (.84), and 2.05 (.66) for participants in the control, placebo, and, alcohol conditions, respectively. Each group's estimate differed significantly from each other's at $p < .01$, except for the alcohol-placebo comparison ($p < .05$).

The final manipulation check was the rating of sexual arousal after participants viewed the erotic (arousal) and neutral (non-arousal) film clips. The mean rating following the neutral clip was .29 (.67) and the mean rating following the erotic clip was 2.86 (1.43), $t(115) = 12.42, p < .01$.

Primary Analyses

The ANCOVA showed across the six dependent measures that the placebo and control groups did not differ from each other or by arousal condition. Therefore, for the hierarchical regression models that we tested, the beverage condition variable was represented by an

effect coded vector alcohol (+1) versus no alcohol (−1) (combined control and placebo groups; see also Ebel-Lam et al., 2009 and Maisto et al., 2004b). Similarly, individuals in the erotic film condition were assigned a code of +1, and those in the neutral film condition were assigned a code of −1. In testing the models, the alcohol expectancies variable was centered before entry into the models as a “direct effect” and before computing the interaction (with beverage condition) product terms.

The same hierarchical regression model was tested for each of the six dependent variables. The first step included entry of the participant’s age and social desirability score, functioning as covariates in the model. The second step included entry of alcohol expectancies total score and MCAS-Pleasure score as substantively relevant person variables. The third step entered the beverage and arousal conditions, both representing the experimental manipulations. The fourth and final step was the entry of the predicted Beverage × Expectancies and Beverage × Arousal interactions, respectively.

Table 3 summarizes the findings of testing the hierarchical multiple regression model’s fit to the data for each of the six dependent variables. First, there was a wide range of effect sizes for the model across the dependent variables, ranging from $R^2 = .05$ for risk exposure to $R^2 = .23$ and $.29$ for skills prompt 1 and prompt 2, respectively. Second, in the final models, beverage condition showed a significant “main effect” in the prompt 1 and prompt 2 data, but the Beverage × Expectancies interaction also was significant in the prompt 2 data and this effect was at $p < .10$ in the prompt 1 data. As hypothesized, both main effects of beverage condition and its interaction with expectancies were in the direction of increased sexual risk when alcohol was consumed compared to when it was not. Third, there was a main effect of arousal in the prompt 2 data, and the main effect in the prompt 1 data was at $p < .10$. The Beverage × Arousal interaction was significant only in the prompt 2 data. The arousal main effects and interaction were in the predicted direction. Fourth, alcohol expectancies showed a direct effect in the CARE-Positive data and was at $p < .10$ in the likelihood data. Fifth, MCAS-Pleasure was related to risk exposure and likelihood in the expected way. Finally, an unexpected finding was the significant positive relationship between age and sexual risk (older participants tended to show greater sexual risk) on both skills measures and CARE-Negative Consequences.

These same hierarchical linear regression models were run as exploratory analyses with one change, that of substituting the (centered) sexual arousal ratings following the film clip viewing for the dichotomous arousal condition variable. These analyses showed several changes of interest when compared with the final models observed with the dichotomous arousal indicator. In the prompt 1 data, social desirability was significant at $p = .05$, but in the direction of riskier sex, as participants scoring higher in social desirability tended to have lower prompt 1 scores. In addition, the Beverage Condition × Expectancies interaction was significant in the predicted direction at the $p < .05$ level. In the prompt 2 data, the arousal direct effect was significant at $p < .05$. In the likelihood data, the Beverage Condition × Arousal effect was significant at $p < .05$ in the expected direction. Finally, in the CARE-Positive data, both the MCAS-Pleasure and Beverage Condition × Arousal effects were at $p < .10$, again in the hypothesized direction, as participants scoring higher on MCAS-Pleasure tended to perceive fewer positive consequences in engaging in risky sex, and consuming alcohol and higher ratings of sexual arousal tended to be associated with the opposite perception. Figure 1a–c depict the Beverage Condition × Arousal interactions observed in the exploratory analyses, and Fig. 2a and b depict the Beverage Condition × Expectancies interactions in those same analyses. The Figures are consistent in showing especially that arousal (and alcohol’s) main effects, if present, were enhanced by the presence of higher arousal or a higher degree of expectancies. In the case of Likelihood and CARE-Positive, there were no alcohol effects outside of the context of sexual arousal.

Discussion

The findings of this experiment generally supported the hypotheses: Across the six dependent variables, the manipulated variables of beverage condition, sexual arousal, and their interaction, and the person variables of attitudes about the effects of condoms on sexual pleasure and beliefs about the effects of alcohol on sex, were related to indicators of sexual risk in predicted ways. In particular, alcohol intoxication, both in direct effects and in interaction with sexual arousal or alcohol expectancies, affected indicators of hypothesized determinants of risky sexual behavior in the direction of greater risk. Similarly, sexual arousal showed direct effects on sexual risk indicators and interacted with alcohol to enhance sexual risk. As in previous research, the most consistent effects observed for beverage were in behavioral skills. The same was true for arousal. The person variables of expectancies and condom attitudes-pleasure were significantly related to indicators of sexual risk as hypothesized, with one exception. There was a direct effect of expectancies on CARE-positive ratings, as Fromme et al. (1999) and Maisto et al. (2004a) found. Overall, this study has provided the first experimental demonstration of the influences of situational (alcohol intoxication, sexual arousal) and person variables on indicators of determinants of sexual risk in MSM.

This experiment breaks new ground by providing information on causal relationships between alcohol and sexual arousal on multiple determinants of sexual risk (behavioral skills, risk perceptions, intentions) that are considered central to the IMB model. In this regard, these data provide a base for refinement of the IMB model to include factors that individuals bring to situations in which sex might occur, such as alcohol intoxication and sexual arousal, and how they might alter hypothesized determinants of sexual risk behaviors. On the other hand, this experiment, like those of Ebel-Lam et al. (2009) and George et al. (2009), does not provide a direct test of models or hypotheses about the mechanisms underlying alcohol's effects on determinants of risky sexual behaviors, such as alcohol myopia theory. It is noteworthy that, like the Ebel-Lam et al. experiment with heterosexual young adults, the findings of this study support the extension of alcohol myopia theory to include sexual arousal.

It is evident from Table 3 that the independent variables in this study did not have consistent effects across the six dependent variables that were predicted. For example, beverage condition and interactions involving beverage condition had their greatest effects by a considerable margin on the two skills measures. The same was true for sexual arousal. In contrast, when arousal condition was coded as a dichotomous variable, beverage and arousal effects on the other indicators of sexual risk in no case reached conventional levels of statistical significance. This finding is consistent with the pattern of findings in human alcohol administration experimental studies investigating sexual risk that were reviewed earlier, and systematic research is needed to enhance understanding of the patterns of alcohol's and other independent variables' effects on different indicators of sexual risk.

An unexpected finding was the significant, direct relationship between age and sexual risk, as older MSM in this experiment tended to score more in the risk direction on indicators of sexual risk (behavioral skills, perception of negative consequences of risky sex) that were investigated. This finding is consistent with Mustanski's (2008) daily diary survey study of MSM, which showed that alcohol was most strongly associated with risky sexual behavior among individuals who were 37 years old or older (the 75th percentile of participant age in the study's sample). As Mustanski noted, this finding is counter to the general trends that have been observed in studies of heterosexual participants, who tend to show lower sexual risk with age. Mustanski proposed several post hoc hypotheses to explain these findings; for example, one hypothesis is that older MSM tend to be more "burned out" by hearing HIV/

AIDS prevention messages and accompanying effort to prevent contraction of HIV/ AIDS than are younger MSM. According to this hypothesis, the direct effects of age observed in this study would be a result of greater attending and response to the benefits of risky sex than to its possible negative consequences, which older MSM are more likely to ignore regardless of whether they have consumed alcohol (note CARE-Negative findings). It is the case that neither Mustanski's nor this study's design can address the burnout hypothesis about a possible age-alcohol-sexual risk relationship among MSM. However, given that this experiment's results also suggest the importance of age in studies of sexual risk among MSM, it would seem that how age is related to sexual risk among MSM is a topic that warrants additional research attention.

As discussed earlier, theoretically alcohol sex expectancies should have little relationship to sexual risk behaviors outside of the context of actual or perceived alcohol intoxication. Nevertheless, the results of this study showed a direct effect of expectancies in the CARE-Positive data, which Fromme et al. (1999) also reported. The analyses also showed a trend effect of expectancies in the likelihood data. These results, especially given other studies cited earlier showing direct alcohol sex expectancies' effects on other sexual risk measures, warrant study of the mechanism through which direct alcohol sex expectancies–sexual risk behaviors relationships might occur. In this regard, it is likely that alcohol sex expectancies are correlated with some third variable(s) that also are positively related to sexual risk but operate outside the context of alcohol consumption. One possible example is sexual sensation seeking (Kalichman, Weinhardt, DiFonzo, Austin, & Luke, 2002). To date, no experiment or other type of study has been designed to address this question.

One limitation of this study in interpreting its findings is that it was an experimental analogue, so that the generalizability of its findings may be questioned. However, generalizability of findings of studies following any kind of research design is an empirical question. In this regard, the results of this experiment on the effects of alcohol, sexual arousal, alcohol expectancies, and condom attitudes were consistent with observational studies of both MSM and heterosexual adults, and experimental studies of heterosexuals. Moreover, it is important to note that this study included a sample of MSM who spanned a wide age range (21–50) and tested models on multiple dependent variables. Overall, this experiment's data were highly consistent with the body of relevant published experimental and correlational research literature on alcohol, sexual arousal, person variables, and sexual risk. Another possible limitation of this study is that data were collected at two different sites, and the sample size was insufficient to test for site differences directly. However, any variable, in this case age, that distinguished the sites and was correlated with the dependent measures was used as a covariate in the statistical models that were tested. In addition, as noted earlier, the pattern of this study's findings is generally highly consistent with those of relevant experimental and correlational research done in a range of contexts with different populations, which lends confidence that this study's results are not an artifact of site differences or confounds.

Another limitation of this experiment was that the videos used to measure risk exposure and behavioral skills were, by necessity, restricted by the demographic characteristics of the actors and the risky-sex situations that were sampled. However, as Woolf-King et al. (2010) described in detail, the situations sampled were a result of extensive formative studies of MSM who matched this experiment's participants on demographic, sexual orientation self-identity, and alcohol-related characteristics. Therefore, the situations were, by necessity, restricted in number and range but were chosen by empirically meeting several criteria relevant to the experiment's aims. In addition, the demographic characteristics of the actors that are pertinent to their roles in the videos were young adult, White MSM. Such actors were selected because it was thought in the early stages of this research project that the large

majority of the participants in the experiment reported here would be young adult, White, MSM. Naturally, it would have been desirable to have actors and an accompanying number of videos whose racial backgrounds matched the range of those represented in the sample of MSM who participated in the experiment, although there is some evidence that race may not be an important factor in this context (Hughes & Anderson, 2007). Unfortunately, the cost of creating such a set of videos would have gone far beyond what the budget for the project allowed. Ultimately, restricting the characteristics of the video actors may have decreased the sensitivity of the research design to some degree. Of course, replication of this experiment's findings by other laboratories would give the best estimate of the degree to which the stimuli used in it may have affected the results.

In conclusion, the results of this experiment generally supported predictions about the effects of alcohol, sexual arousal, and person variables on hypothesized determinants of risky sexual behavior. As such, the data reaffirm the importance of the need to take into account the role of alcohol in conjunction with sexual arousal in developing HIV and other STD prevention interventions that target MSM, particularly in the context of teaching condom use negotiation skills. In this regard, major HIV prevention interventions advocated on the Centers of Disease Control and Prevention Web site (<http://www.cdc.gov/hiv/topics/research/prs/evidence-based-interventions.htm>) do not incorporate alcohol or sexual arousal in their content. Further-more, the data support the need to incorporate person variables in intervention design and implementation. From a research perspective, as Hendershot and George (2007) noted, it would seem important to enhance prevention interventions further by experimental studies that can directly test predictions of theories such as alcohol myopia on the mechanisms underlying the connection among alcohol, sexual arousal, and sexual risk, and how they might be moderated by person variables.

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Fig. 1.

a The relationship between continuous arousal rating and behavioral skills prompt 2 score for the alcohol and no alcohol conditions, respectively. **b** The relationship between continuous arousal rating and (log) rating of likelihood of unprotected anal intercourse for the alcohol and no alcohol conditions, respectively. **c** The relationship between continuous arousal rating and CARE ratings of likelihood of benefits of risky sex for the alcohol and no alcohol conditions, respectively

Fig. 2.

a The relationship between alcohol sex expectancies and behavioral skills prompt 1 score for the alcohol and no alcohol conditions, respectively. **b** The relationship between alcohol sex expectancies and behavioral skills prompt 2 score for the alcohol and no alcohol conditions, respectively

Table 1

Participant variables by beverage and arousal condition

	Alcohol				Placebo				Control			
	Aroused		Not aroused		Aroused		Not aroused		Aroused		Not aroused	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Age (in years)	29.4	9.7	30.8	9.4	30.0	9.8	32.7	8.8	30.6	8.7	33.4	9.3
No. men sex/3 Mos.	5.1	7.4	3.1	3.7	5.1	5.2	4.4	5.7	2.7	2.0	3.1	2.7
No. times sex without condom/3 Mos.	8.5	18.8	10.3	16.9	15.5	34.05	4.3	6.3	2.0	3.4	4.2	5.0
Race (% Caucasian)	42.1		63.2		55.0		47.1		73.7		68.7	
QFV index (% heavy drinkers)	68.4		73.7		60.0		78.9		63.2		71.4	

Note: Total Ns = 116 or 117. Aroused = Aroused (erotic film clips) condition, Not Aroused = Not Aroused (Neutral film clips) condition. QFV Quantity-Frequency-Variability drinking pattern index (Cahalan et al., 1969)

Table 2

Post-video ratings of the two role-play videos

	<u>Realistic</u>			<u>Attractive</u>			<u>Difficult</u>			<u>Arousing</u>		
	<i>M</i>	<i>SD</i>	<i>Mdn</i>	<i>M</i>	<i>SD</i>	<i>Mdn</i>	<i>M</i>	<i>SD</i>	<i>Mdn</i>	<i>M</i>	<i>SD</i>	<i>Mdn</i>
Video												
1	3.99	1.52	4.00	2.85	1.63	3.00	1.91	1.73	2.00	2.28	1.61	2.00
2	4.03	1.58	4.00	2.85	1.59	3.00	1.90	1.64	2.00	2.43	1.61	2.00

Note: *N* = 117. Ratings of the 4 dimensions were on a 0–6 Likert scale

Table 3
Results of testing the hierarchical regression model for each of the six dependent measures

Predictors	Dependent variables					
	Risk exposure			Prompt 1		
	β	ΔR^2	β	ΔR^2	β	ΔR^2
Step 1		.02		.12**		.10**
Age	-.11		-.30**		-.32**	
Social desirability	-.08		-.16		-.02	
Step 2		.03		.00		.01
Age	-.11		-.33**		-.37**	
Social desirability	-.03		-.18 ^a		-.03	
Alcohol expectancies	.02		-.06		.04	
MCAS pleasure	-.17 ^a		.02		.08	
Step 3		.01		.07**		.10**
Age	-.12		-.33**		-.37**	
Social desirability	-.03		-.18 ^a		-.03	
Alcohol expectancies	.00		-.06		.01	
MCAS pleasure	-.18 ^a		-.03		.05	
Beverage	-.06		-.21*		-.24**	
Arousal	-.05		-.17 ^a		-.21*	
Step 4		.00		.03		.08**
Age	-.17		-.33**		-.36**	
Social desirability	-.03		-.18 ^a		-.03	
Alcohol expectancies	.01		-.07		.00	
MCAS pleasure	-.18 ^a		.00		-.01	
Beverage	-.06		-.21*		-.23**	
Arousal	-.05		-.17 ^a		-.21**	
Beverage × expectancies	-.04		-.17 ^a		-.23**	

Predictors	Dependent variables					
	Risk exposure			Prompt 1		
	β	ΔR^2	β	ΔR^2	β	ΔR^2
Beverage $\times$ arousal	-.01		-.09		-.21*	
Total R^2		.05		.23		.29

Predictors	Dependent variables					
	Likelihood UAI			CARE-negative		
	β	ΔR^2	β	ΔR^2	β	ΔR^2
Step 1		.00		.08**		.04
Age	.00		-.22*		.00	
Social desirability	-.03		-.16		-.20*	
Step 2		.19**		.00		.10**
Age	-.02		-.23*		-.05	
Social desirability	.09		-.16		-.12	
Alcohol expectancies	.16 α		.05		.26**	
MCAS pleasure	-.40**		.01		-.14	
Step 3		.01		.01		.00
Age	-.01		-.23*		-.05	
Social desirability	.08		-.16		-.13	
Alcohol expectancies	.16 $\beta\alpha$		.05		.26**	
MCAS pleasure	-.39**		.01		-.14	
Beverage	.09		-.03		.02	
Arousal	.02		.09		-.01	
Step 4		.01		.01		.01
Age	-.01		-.23*		-.05	
Social desirability	.08		-.15		-.13	
Alcohol expectancies	.16 α		.06		.26**	
MCAS pleasure	-.40**		.02		-.13	
Beverage	.10		-.03		.02	

Predictors	Dependent variables					
	Likelihood UAI		CARE-negative		CARE-positive	
	β	ΔR^2	β	ΔR^2	β	ΔR^2
Arousal	.03		.09		-.02	
Beverage $\times$ expectancies	-.09		.10		.02	
Beverage $\times$ arousal	.06		-.01		.07	
Total R^2		.21		.10		.14

Note: MCAS Multidimensional Condom Attitudes Scale, UAI/Unprotected Anal Intercourse; Betas are standardized. Ns for the models = 109-112

**
 p .01

*
 p < .05

α < .10