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Effects of Alcohol and Expectancies on HIV-Related Risk Perception and Behavioral Skills in Heterosexual Women

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Abstract

This experiment tested the effects of alcohol and expectancies on determinants of safer sex according to the Information-Motivation-Behavioral Skills model. Sixty heterosexual women attended two sessions. During session 1, participants completed a set of descriptive measures; during session 2 they were randomly assigned to one of four beverage conditions: control, alcohol/low (.35 gm alcohol/kg. body weight), alcohol/moderate (.70 gm alcohol/kg. body weight), or placebo. After beverage consumption, all participants completed measures of motivation to engage in risky sex and condom use negotiation skills. Results showed that the higher dose of alcohol and stronger alcohol expectancies were associated with greater motivation to engage in risky sexual behavior. However, perceived intoxication, rather than actual alcohol consumption or expectancies, was the best predictor of condom use negotiation skills. Integration of the findings with past research and their implication for the design of HIV prevention programs are discussed.

Despite the decline in the incidence of HIV transmission in the United States for males during the 1990s, the rates increased for heterosexual women in the young adult age range (18–30 years; Karon, Fleming, Steketee, & De Cock, 2001; Logan, Cole, & Leukefeld, 2002). Although there have been major advances in pharmacological management of HIV disease in recent years, this disease has no known cure. Accordingly, emphasis continues to be placed on the prevention of HIV transmission (Centers for Disease Control, 2000).

Because of the importance of prevention of HIV infection, many studies of the hypothesized determinants of condom use, including alcohol use, have been conducted. The large majority of these studies have been cross-sectional, interview or survey studies of a variety of population subgroups. The most useful of these studies for describing the association between acute alcohol intoxication and failure to use condoms or other risky (for transmission of HIV) sexual practices are *event-level* studies (Leigh, 2002; Weinhardt & Carey, 2001). Both Leigh's and Weinhardt and Carey's reviews show that there is no general, negative association between acute alcohol intoxication and the use of condoms during sex, as *global association* studies have implied. Instead, the relationship between acute alcohol intoxication and the likelihood of the occurrence of risky sexual behavior seems to be dependent on characteristics of the individuals involved and contextual factors.

The correlational research literature on the determinants of HIV/AIDS risky sexual behavior has helped to advance knowledge about factors associated with such behavior, with consequent improvement in the effectiveness of primary prevention efforts. The effectiveness of empirically-based prevention programs could be advanced further by identifying causal mechanisms underlying the relationship between alcohol and risky sexual behavior, but correlational data do not allow causal inferences. Accordingly, experimental studies have been done to complement correlational research on HIV/AIDS risky sex determinants.

Only a few of the experiments on the relationship between acute alcohol intoxication and other factors and risky sex have involved young adult females. Because of gender differences (Peplau, 2003), it is essential to conduct research on both men and women if HIV prevention interventions are to be developed and targeted effectively. In Murphy, Monahan, and Miller's (1998) experimental study of young adult women, they manipulated both beverage content (alcohol or no alcohol) and instructions (i.e., expectancy set) regarding beverage content (alcohol or no alcohol). Their data showed that alcohol consumption increased ratings of the potential to have a sexual relationship in the context created by a male video actor rated as physically attractive and higher risk for unsafe sex. Furthermore, expectancies about beverage content were important, as participants who were told that they drank alcohol perceived less risk and more relationship potential in this same experimental context. Data from this same experiment showed that instructions regarding beverage content, but not actual beverage content, were a determinant of confidence in detecting if a potential partner was HIV+ (Monahan, Murphy, & Miller, 1999). Participants who expected to drink alcohol reported more confidence in being able to detect HIV than participants who did not drink alcohol. Confidence in the ability to judge HIV serostatus and acting on such judgments implies occasions of risky sexual behavior.

Experimental studies of alcohol and risk perception relevant to HIV have shown a balanced representation of male and female participants. These studies showed that young adults who have consumed alcohol perceive less risk than individuals who have not, and individuals who believe more strongly that alcohol consumption has positive effects on sexual arousal and performance tend to perceive less risk (Fromme, D'Amico, & Katz, 1999; Fromme, Katz, & D'Amico, 1997). The importance of these findings is that individuals who perceive less risk in a situation (in this case, a HIV risky sexual encounter) are less motivated to avoid it.

This research team (Gordon & Carey, 1996; Gordon, Carey, & Carey, 1997; Maisto, Carey, Carey, & Gordon, 2002) has conducted research on the relationship of alcohol consumption and alcohol sex expectancies on several hypothesized antecedents of the occurrence safer (or riskier) sexual behavior according to the Information-Motivation-Behavioral Skills (IMB) model, which has been the basis of creating a number of HIV prevention interventions (J. Fisher & Fisher, 1992; W. Fisher & Fisher, 1998). These experiments investigated the constructs of risk perception, attitudes toward condom use, and behavioral intentions to engage in risky sex as indicators of motivation to engage in safer sex, and verbal skills in negotiating condom use as an indicator of behavioral skills needed to engage in safer sex. Only the Maisto et al. (2002) experiment involved heterosexual women, who were randomly assigned to one of three conditions: water control, placebo, or alcohol in a dose designed to raise blood alcohol concentration (BAC) to .070% – .075% (gm alcohol/100 ml blood). Following their beverage consumption, participants completed a measure of risk perception, and then completed a role-play measure of condom use negotiation skills. The participants also rated their hypothetical intentions to engage in risky sex with the male character depicted in the role-play measure. The results showed that alcohol sex expectancies were directly related to the degree of positive consequences perceived to follow from engaging in unprotected sex with a new partner. Furthermore, beverage content did not affect behavioral skills. However, perceived degree of intoxication, alone or in interaction with expectancies, was negatively related to performance

on the measure of condom use negotiation skills. In contrast to these findings, only beverage condition affected intentions: individuals who drank alcohol reported a higher likelihood of engaging in unprotected sex compared to participants in the other two beverage conditions, which did not differ from each other.

The purpose of this experiment was to replicate and extend Maisto et al.'s (2002) study. The absence of a beverage condition effect on all of the dependent variables except intentions was surprising, given the findings in the literature reported for males and for experiments on risk perception. Maisto et al.'s results may have been due to an inadvertent under-dosing of alcohol; although the dose administered was designed to raise participants' BAC to .070% – .075%, they in fact reached an average BAC of only .060%. Therefore, in this experiment, a higher dose of alcohol was administered in an effort to induce the desired BAC. This experiment also added a lower alcohol dose condition, designed to raise participants' BACs to .035%. This dose was chosen because it marks the lower end of the continuum of alcohol doses that might affect information processing capabilities, which have been argued to underlie alcohol's effects on sexual risk (e.g., Finnegan & Hammersley, 1992; MacDonald, MacDonald, Zanna, & Fong, 2000). Therefore, this experiment's multi-dose design allowed a dose-response specification of alcohol's acute effects on theoretical antecedents of safer sex. Such specification has not been possible, as previous published experiments all have included only a single dose of alcohol.

Based on our own and others' previous findings, it was hypothesized that both beverage condition and alcohol sex expectancies would be negatively related to risk, as women who consumed the higher dose of alcohol were expected to perceive less risk, as were individuals with stronger alcohol sex expectancies. Only beverage condition was hypothesized to affect intentions, as participants who consumed the higher dose of alcohol were expected to show a greater degree of intentions to engage in unprotected sex. Finally, it was hypothesized that perceived degree of intoxication and expectancies separately, or in interaction, would be negatively related to condom use negotiation skills.

Method

Participants

The participants were 60 women who were recruited from campus and community flyers and newspaper advertisements. The women were required to meet several criteria to be eligible to participate in the study, as follows: aged 21–30; predominantly heterosexual; sexually active in the last year; not pregnant; current drinking pattern classified as moderate or heavy; no current or history of alcohol or psychiatric problems; and no medical problems such as liver disorders or diabetes that would contraindicate the use of alcohol.

Of the 93 women evaluated for participation, 60 were identified as eligible and consented to participate in this experiment. Women defined as ineligible ($n = 26$) did not differ from the women who participated ($n = 60$) on age, race, marital status, employment status, year in school, amount of time in current relationship, or income. In addition, 6 women completed their first experimental session but did not return for session 2, and 1 woman did not complete session 2 because she felt sick. There were no differences between these 7 women and the full sample that completed the experiment. Table 1 shows that women assigned randomly to one of the four beverage conditions and who completed the experiment averaged 23 years of age. The mean duration of their current relationship was 19.1 months, they reported 2 sexual partners in the last year and 1 in the last 3 months. The participants averaged 11.0 occasions of sex without a condom in the last 3 months and 4.6 occasions of sex with a condom. A total of 78% of the sample was Caucasian and 60% were classified as heavy drinkers.

After the experiment was completed it was discovered that, due to an error by the research assistants, one woman classified as a light drinker completed the experiment. As a result, all of the analyses reported later were run with and without this participant included. Because there were no differences in the findings, the analyses with the full $N = 60$ are reported.

Measures

Three categories of measures were collected: Screening and descriptive measures, manipulation checks, and dependent variables.

Screening and Descriptive Measures

Short Michigan Alcoholism Screening Test (SMAST; Selzer, Vinokur, & van Ruyven 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 et al., 1995).

The Kinsey Scale (KS; Kinsey, Pomeroy, & Martin, 1948) is a 7-point scale used to assess sexual orientation, with zero representing exclusive heterosexuality and 6 representing exclusive homosexuality. Only participants scoring a zero or 1 were included in this experiment.

Quick-Vue-One-Step LCG (human chorionic gonadotropin) urine test (General Medical Corporation) was self-administered by each participant in the alcohol and placebo conditions to screen for current pregnancy at the beginning of session 2. This test provides a quick analysis of a urine sample with strong sensitivity, specificity, and accuracy (all $> .99$).

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.

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.

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

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 et al., 1997) was used to obtain self-reports of number of sexual partners (lifetime, 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 = .89.

Dependent Variables

Risk perception was measured with the Cognitive Appraisal of Risky Events (CARE) Questionnaire (Fromme et al., 1999). The variables of interest in this study were ratings on a 1–7 scale of the likelihood of positive and negative consequences, respectively, of engaging in sex with a new partner. Average item rating on each dimension was the dependent measure. The coefficient alphas for these two subscales in this sample were .84 and .86 for positive and negative, respectively.

Behavioral Skills were measured with seven audio-video role-play scenarios that were developed for this experiment. All seven scenarios were equivalent in duration and were adapted from those that Gordon et al. (1997) used and required participants to negotiate the social situation using verbal communication skills. Five of the role-plays were “filler items” intended to reduce reactivity to two sexual role-plays. These five scenarios and accompanying role plays concerned reacting to an elderly man apparently having a heart attack while working in front of his home, discussing a pattern of reckless behavior with a friend, asking a co-worker to follow through on his job responsibilities, encouraging and supporting a friend who is depressed, and reacting to a man who looks as if he is going to physically punish his child, respectively. The two sexual and five filler role-plays and the accompanying post-video ratings required 20 minutes to administer. Two of the seven scenarios provided indicators of the behavioral skills needed to negotiate safer sex verbally in situations that would (a) be familiar to participants, (b) pose moderate difficulty to communicate feelings about condom use, and (c) elicit moderate sexual interest. The first role-play scenario depicted two individuals who were in a steady relationship for six months and were faced with the decision of having sexual intercourse for the first time without the use of condoms. The second scenario depicted two individuals who were close friends and were faced with their first sexual experience. The couple must make a decision of whether their first sexual encounter together should involve the use of condoms. The scenarios were enacted by professional actors according to a script and were filmed by professional videographers.

Participants were asked to make verbal responses to 3 prompts in each of the two sexual scenarios. Prompt 1 consisted of the male’s suggestion that not using a condom during sex is not risky and that it would enhance the pleasure of the situation. Prompt 2 consisted of another statement by the male that having unprotected sex would not be risky. Prompt 3 consisted of the male’s suggestion that not agreeing to have unprotected sex would reveal a lack of trust in him.

Participants’ responses to each of the prompts were scored (on a 0–2 scale) for 5 dimensions (higher score = better communication skills): (a) use of an “I” statement of intention of safer sexual behavior or refusal of unsafe sexual behavior; (b) presence of a positive statement about the other person in the scenario; (c) provision of a statement of a reason for safer sexual behavior; (d) suggestion of a specific alternative behavior that is safer; and (e) 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 (Forsyth, Carey, & Fuqua, 1997, Gordon et al., 1997; Maisto et al., 2002).

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 she were actually in the situation depicted in the role-play; the likelihood that she would have sex without a condom (this rating is highly similar to ratings of “intention to have unprotected sex”; MacDonald et al., 2000); and difficulty of responding to the role-play.

Manipulation Checks

Actual Blood Alcohol Concentration (BAC) was estimated by breath analysis (Alcosensor III, 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. Participants' *Perception of Intoxication* was measured on a 10-point (1=not all, 10= more intoxicated than you've ever been) scale.

Procedures

Recruitment and screening—Participants were recruited with newspaper advertisements for a “social communication” study and by placement of flyers on campus and in the community. Women who responded to the advertisements were invited to participate in two sessions and were screened initially over the telephone by a female research assistant (RA), who followed a written script for this purpose. If individuals agreed to these terms, an appointment for Session 1 was scheduled. Participants also were 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 female RA checking proof of the participant's age and then testing her breath to confirm a BAC of zero; no participant showed a BAC > 0 at this point. Participants then were given a brief overview of the study and they 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, BSI, CES-D, and QFV. Upon confirmation of their meeting eligibility criteria, participants were asked to complete the Sexual Behavior Survey and Leigh Questionnaire. After these instruments were completed, the second experimental session was scheduled. Participants were reminded not to use any substances for 24 hours prior to Session 2, and they were asked not to drink any beverage except water or eat for 3 hours 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 \$20 for their full participation in Session 1, and \$10 to cover transportation costs.

Session 2—This session began by two female RAs introducing themselves to participants as co-experimenters. One of the RAs (RA 1) then breath tested the participant to confirm that her BAC was zero. Participants also were 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 then were asked to self-administer the pregnancy test. After completion of the pregnancy test, participants were weighed to determine the amount of alcohol individuals in the alcohol conditions would receive. After confirming that the participant was not pregnant, RA 1 left the room, and the second RA (RA 2) entered the room to “assign” participants to their beverage condition (in fact, participants' beverage condition assignments were determined randomly at the end of Session 1). Individuals who actually were assigned to the alcohol or placebo conditions were told that they would be drinking alcohol.

Participants assigned to the alcohol/low group received 35 gm. 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. The dose administered to participants in the alcohol/moderate group was .70 gm. alcohol/kg. body weight. 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 also were 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. One half of the placebo group participants received a volume of beverage equivalent to what they would have received in the alcohol/low condition and one half received a volume linked to the alcohol/moderate 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 either of the alcohol conditions, as relevant. Participants' drinks were divided into 2 equal doses. They sat alone while they consumed their drinks and were asked to take a total of 20 minutes to finish both of them. Participants were asked to take about the same amount of time to finish each drink, and the RA checked on the participant every 6 or 7 minutes 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 RA who administered the measures to participants in Session 2 was not aware of their beverage condition. In this regard RA 1 who greeted the participant completed the session's preliminary details and administered all measures except breath testing and beverage manipulation checks. RA 2 assigned the participants to beverage condition, administered the beverages, measured BAC by breath analysis, and administered beverage manipulation checks. Neither RA was aware of the experiment's hypotheses.

Participants read for about 15 minutes after they finished their second drink, when the first breath test was administered. RA 1 then asked the participant to complete some "opinion surveys," which were used as a time filler activity, following Maisto et al.'s (2002) procedures. After 5 minutes of the participant's completing these "surveys," she then was asked to complete the positive and negative consequences sections of the CARE. RA 1 collected the CARE data after the participant completed the instrument, and RA 2 again breath tested 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/low or alcohol/moderate condition, consistent with the volume of beverage that they received. Participants in the control condition were told their actual BAC of zero. RA 2 then asked the participant to complete the manipulation check measures of estimating amount consumed and perceived intoxication.

When the participant completed the two manipulation check measures, RA 1 returned to administer the role-plays. The RA administered them from an adjoining room using a remote control and an intercom system, 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 combined VCR-monitor, and their responses to the prompts were audiotaped. The order of administration of the two risky sex scenarios was determined randomly for each participant, with the restriction that they did not begin or end the series of seven role-plays, or follow each other in succession. Upon completion of each of the seven role-plays, participants were asked to complete the set of post-video ratings that were described earlier.

After participants completed the last post-video rating, RA 1 entered the room and, following Maisto et al. (2002), asked them about their responses to a few of the items on the opinion survey in order to further divert participants' attention from the true purpose of the experiment. When the survey was completed, RA 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, RA 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 minutes and were not permitted to leave the laboratory until their BACs were $< .02\%$. Participants who completed Session 2 were paid \$30.

Overview of the Statistical Analyses

The analyses may be classified into two sets. The *preliminary* analyses (a) evaluated the psychometric properties of the behavioral skills measures; (b) compared the four beverage conditions on demographic, drinking pattern, and sexual history variables; and (c) tested for beverage group differences on the manipulation check measures. The preliminary analyses also (d) explored the distributional properties of the primary dependent variable scores: CARE – positive and negative consequences, behavioral skills Prompt 1, Prompt 2 and Prompt 3, 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. The *primary* analyses were concerned with investigating the effects of alcohol on and the relationship of expectancies and perception of intoxication with the dependent variables. The primary analytic methods included both analysis of covariance and hierarchical multiple regression.

Results

Preliminary Analyses

Psychometric properties of the role-play measure—The inter-rater reliabilities of the behavioral skills score for each of the five dimensions were based on 30 scores (five dimensions for each response to three prompts across two scenarios) for each participant. For these analyses, two raters who were not aware of the participant’s beverage condition independently rated the tapes, and the scores that they assigned were compared. Statistics were computed for each response dimension for each scenario. Role-play data were lost for five different participants due to tape recording difficulties. Together, 5.6% of the role-play responses were missing. The analyses showed that percent agreement for the five response dimensions and the two scenarios (10 comparisons) ranged from 97.7% to 100%. The kappas for these data ranged from .96 to 1.00, except for “alternative,” scenario 2, which was .85.

The next analyses concerned the post-video ratings. The first question was the overall mean of the ratings assigned to the dimensions of realistic situation, attractiveness of the male actor, interest in having sex with the male actor, and difficulty of response (to prompts), as these were the basic criteria for the control selection of the scenarios. The overall means, standard deviations, and medians for ratings of each of these dimensions are presented in Table 2. A 4 (beverage condition) $\times$ 2 (scenario) analysis of covariance (ANCOVA) with repeated measures tested for main effects of scenario and for a beverage $\times$ scenario interaction (covariate= number of times having sex without a condom in the last 3 months, as analyses reported later showed differences among the beverage conditions on this variable). These analyses showed no significant main effects or interactions.

The inter-rater reliability and scenario comparison data provided the basis for the creation of a behavioral skills score that consisted of the sum of the five dimension scores for each of the three responses to the comparable prompts for each scenario. Therefore, the score for responses to the first prompt of each scenario was based on 10 individual scores (5 dimensions $\times$ 2 scenarios). Cronbach’s alpha was computed for each of the 10 dimension scores (possible range = 0–2 for each dimension) that were summed to derive a total score (range = 0–20) for Prompts 1, 2, and 3, respectively. The results showed alpha = .60 for Prompt 1, .70 for Prompt 2, and .65 for Prompt 3.

Comparison of the beverage conditions—The beverage condition group means or percentages presented in Table 1 were compared with use of one-way ANOVAs or chi-square, respectively. Because the number of times having sex without a condom in the past 3 months was positively skewed, a square root transformation was applied to these scores before the analyses. The results of the analyses showed a significant difference among the beverage groups only on number of times in the past 3 months having sex without a condom, $F(3,48) = 3.95, p < .02$. Control participants reported more frequent (t -test, $p < .05$) sex without a condom than did participants in the alcohol/moderate or placebo groups. Further analyses showed that this variable was not significantly related to any of the dependent variables so this pre-experimental factor was not included as a covariate in subsequent analyses.

Manipulation checks—Participants in the four beverage conditions were compared on (a) the mean estimates of the number of drinks of alcohol that they consumed, (b) their perceived degree of intoxication, and (c) their actual BAC. An ANOVA of the estimated amount of alcohol consumed revealed a significant effect of beverage, $F(3,55) = 50.04, p < .0001$. Paired comparisons (t -tests) showed that the alcohol/moderate group's estimate (mean = 2.20 [SD = .56]) was significantly higher than that of the control (mean = 0.00 [SD = .00], $p < .001$, and alcohol/low (mean = 1.73 [SD = .59]), $p < .05$ groups, but did not differ from the placebo group (mean = 1.93 [SD = .74], $p < .05$). In addition, the control group's mean differed from that of the alcohol/low and placebo group's, respectively, and the latter two group means did not differ from each other.

An ANOVA on the perception of intoxication data showed a significant main effect of beverage condition, $F(3,56) = 27.49, p < .0001$. Paired comparisons showed that the alcohol/moderate group's mean (5.33 [SD = 1.84]) differed significantly from that of the control (1.00 [SD = 0.00]), alcohol/low (3.93 [SD = 1.33]), and placebo groups (2.87 [1.46]), all $ps < .007$). In addition, the alcohol/low and placebo group means each was higher than that of the control group ($p < .001$), and the placebo group's mean was lower than that of the alcohol/low group's ($p < .05$).

The mean peak BAC of participants in the alcohol/low group was recorded on the first breath test (.039% [.010]), with a median BAC on trial 1 of .037%. In the alcohol/moderate condition, the mean peak BAC occurred on trial 3 (.067% [.016]), with a median BAC on trial 3 of .07%. For comparison purposes, the mean trial BAC 3 of participants in the alcohol/low condition was .031% (SD = .007), median = .030%. The BAC of participants in the control and placebo conditions was .000%.

Exploratory analyses—Before proceeding with the primary analyses, the distributions of scores on measures of the main dependent variables were examined for departures from normality. Each of the three behavioral skills scores was normally distributed. For the four intentions and motivation dependent variables the distributions were highly skewed: positively for both intentions measures and CARE new partner-positive consequences, and negatively for CARE new partner-negative consequences. Therefore, a logarithmic transformation was applied to each of the four sets of scores. The transformed intentions scores did approximate a normal distribution in both cases. Although the transformation did improve the approximation to normality of the CARE score distributions, the shape of each of these two distributions still was not normal. The transformed CARE scores were analyzed, but the interpretation of the results should be viewed in this context.

Patterns of simple correlations were examined to determine if participant demographic or sexual history characteristics were correlated with the dependent variables and thus of potential value in enhancing the predictive power of statistical models. These analyses revealed that number of sexual partners (last year) was correlated with six of the seven dependent variables

consistent with survey studies of young women (Quina, Harlow, Morokoff, Burkholder & Deiter, 2000). Age also was included in the models because of its value in predicting risky sexual behavior among heterosexual young adults (Cerwonka, Isbell, & Hansen, 2000).

Primary Analyses: Analysis of beverage condition effects

Univariate ANCOVAs tested the effects of beverage condition and its interaction with expectancies on each of the seven dependent variables. Age, total partners, and total expectancy score were entered in the model as covariates, and a general linear model approach was used. Table 3 presents the means and standard deviations of the raw scores on each of the dependent variables by beverage condition.

Risk perception—The analysis of the log CARE new-partner-positive scores showed a significant beverage condition $\times$ expectancy interaction, $F(3,47) = 3.72, p < .02$. The total R^2 for the model = .30. Examination of the expectancy $\times$ new partner-positive scatter plots for each beverage condition showed a negative relationship between these two variables in the control group, but a positive correlation in each of the other three beverage conditions.

Analysis of the new partner-negative scores revealed a main effect of beverage condition, $F(3,47) = 3.80, p < .02$. Total R^2 for the model was .29. Paired comparisons among the beverage means (t -tests, $p < .05$) revealed that the alcohol/moderate group estimated a significantly lower likelihood of negative consequences than did participants in each of the other three beverage conditions, which did not differ from each other.

Behavioral skills—The analyses of scores for each of the three prompts in each case yielded a significant negative association between number of partners and the respective prompt score, all p s $< .02$. The R^2 s for these three full models ranged from .26 (Prompt 2) to .21 (Prompt 1).

Intentions—Analysis of the transformed likelihood ratings following the first video revealed a significant positive association between likelihood and expectancies, $F(1,47) = 9.20, p < .005$. Number of partners also showed a marginally significant positive association with likelihood, $F(1,47) = 3.49, p < .07$. Total R^2 for the model was .30.

The analysis of the log of the likelihood rating following the second video showed a significant positive association between number of partners and likelihood, $F(1,47) = 4.44, p = .04$, and a positive association between expectancies and likelihood, $F(1,47) = 6.02, p < .02$. There also was a significant effect of beverage, $F(3,47) = 2.70, p = .05$. Paired comparisons among beverage means (t -tests, $p < .05$) showed that alcohol/moderate participants gave significantly higher ratings than did control or placebo participants. The two alcohol conditions did not differ from each other. Alcohol/low participants did not differ from placebo or control group participants. Total R^2 for this model was .32.

Primary Analyses: Perception of Intoxication

Each of the seven dependent variables was predicted by use of the same model as that used for testing beverage effects, except that perception of intoxication replaced beverage condition in the model. Moreover, both expectancy score and perception of intoxication were centered before the analysis (Aiken & West, 1991). Hierarchical multiple regression was used in this set of analyses. The first variable set entered in the model was age, number of partners, and expectancies. Perception of intoxication was entered second, and the perception $\times$ expectancies interaction was entered third.

Risk Perception—The model predicting the log of new partner-positive scores revealed no significant associations between the predictor and dependent variables. Total R^2 for this model

was .11. The same results were found in prediction of the log of new partner-negative scores, with a total R^2 for this model of .16.

Behavioral skills—The results of the regression analyses predicting each of the three prompt scores are summarized in Table 4. For Prompt 1, entry of the first set of variables was significant, F change (3,49) = 3.12, $p < .05$, change $R^2 = .16$. In this step number of partners was significant, $t = -2.66$, $p = .01$, reflecting the negative relationship between this variable and Prompt 1 scores. Entry of the second and third steps did not result in significant changes in R^2 . As can be seen in Table 4, number of partners remained significant in the full model, with $R^2 = .22$.

In the analyses of the Prompt 2 data, entry of the first set of variables again resulted in a significant change in R^2 , F change (3,49) = 3.16, $p < .04$, R^2 change = .16. This finding reflects the negative association between number of partners and Prompt 2 scores, $t = -2.93$, $p < .001$. Entry of the second step also resulted in a significant change in R^2 , F change (1,48) = 7.03, $p = .01$, change $R^2 = .11$, reflecting the negative association between perception of intoxication and Prompt 2 scores, $t = 2.65$, $p = .01$. Entry of the interaction term in the third step was not significant. In the final model, number of partners, $t = -3.74$, $p < .0001$, and perception of intoxication, $t = -2.70$, $p = .01$, were significant, with $R^2 = .31$.

The findings for Prompt 3 data were similar to those for Prompt 2. Entry of the first step revealed a significant F change (3,50) = 3.09, $p < .01$, change $R^2 = .16$. In this step, both number of partners, $t = -2.58$, $p = .01$, and age, $t = -2.02$, $p < .05$, were negatively associated with Prompt 3 scores. Entry of the second step also resulted in a significant F change (1,49) = 5.06, $p < .03$. Perception of intoxication, $t = -2.25$, $p < .03$, was negatively correlated with Prompt 3 scores. Entry of the interaction term in step 3 did not result in significant change in R^2 . In the full model, number of partners, $t = -2.92$, $p < .005$, age, $t = -2.35$, $p < .03$, and perception of intoxication, $t = -2.23$, $p < .04$, all were negatively correlated with Prompt 3 scores. The total R^2 for this model was .24.

Intentions—Analysis of the log of the likelihood rating following the first video showed a significant change in R^2 with entry of the first set of variables, F change (3,53) = 5.05, $p < .005$. In this set of variables, number of partners, $t = 2.28$, $p < .03$, and expectancies, $t = 3.19$, $p < .003$, were positively associated with likelihood ratings. Change in R^2 was .22. Entry of the second and third steps of the model did not result in significant changes in R^2 . In the full model, number of partners, $t = 2.16$, $p < .04$, and expectancies, $t = 3.17$, $p < .004$, remained significant. Total R^2 for the full model was .23.

Entry of the first step of the model predicting likelihood ratings following the second video also resulted in a significant change in R^2 , F change (3,53) = 3.82, $p < .02$, change $R^2 = .18$. As with the first likelihood rating, both number of partners, $t = 2.45$, $p < .02$, and expectancies, $t = 2.29$, $p < .03$, were positively associated with likelihood ratings. Entry of the second and third steps was not statistically significant. In the full model, number of partners, $t = 2.61$, $p < .02$, and expectancies, $t = 2.32$, $p < .03$, were significant. The R^2 for the full model was .22. Table 5 summarizes the significant findings for beverage content, perception of intoxications, and expectancies.

Discussion

The findings of this study support the hypothesis that moderate acute intoxication can have negative effects on motivation to have safer sex, which is a theoretical antecedent to enacting behavioral skills consistent with safer sexual behavior according to the IMB model. Beverage content effects emerged in the CARE likelihood of negative consequences data with the

addition of a higher dose of alcohol, which is consistent with previous research (Fromme et al., 1999; Fromme et al., 1997). As Maisto et al (2002) found, beverage content also affected intentions in the predicted direction, although these results were found for only one of the two intentions scores. In addition, the negative association between perception of intoxication and behavioral (verbal) skills replicated Maisto et al.'s data, although this experiment did not reveal an interaction with perception of intoxication and expectancies as Maisto et al.'s experiment did for two of the prompts. (Prompt 3 showed only a perception of intoxication association, as in this experiment). Nevertheless, this experiment provides the second set of findings from our laboratory that show that, in women, perception of intoxication, rather than actual intoxication, is important for enacting behavioral skills relevant to safer sex. As predicted, perception of intoxication was negatively correlated with behavioral skills.

With the emergence of beverage content effects in women in measures of motivation to have safer sex, this experiment's findings provide evidence that is consistent with the results of studies of heterosexual men (Fromme et al., 1999; Fromme et al., 1997; Mac Donald et al., 2000), that both alcohol consumption at a moderate dose and expectancies may be associated with motivation to have risky sex. However, in both men and women, there is no consistent pattern in the degree to which different measures are related to beverage content or expectancies, or if an interaction between these two variables is observed. Greater precision in theoretical models is needed. Along these lines, future research needs to specify the conditions that affect whether alcohol intoxication or expectancies are associated with motivation to have safer sex, and what mechanisms might underlie such relationships.

Data on the relationships between acute intoxication and behavioral skills relevant to risky sex have been published only by this research team (Gordon & Carey, 1996; Gordon et al., 1997; Maisto et al., 2002). This research shows a separation of findings according to gender. Beverage content effects on behavioral skills performance are evident in men, but this experiment and Maisto et al. show that perception of intoxication is more important than actual intoxication in women. This pattern of findings is consistent with the general literature on sexual arousal and behavior (Crowe & George, 1989). In this regard, at BACs greater than .05%, beverage effects on sexual arousal and behavior typically emerge more strongly in men, although expectancies may still have some influence. However, in women, psychological factors such as expectancies and perception of intoxication retain their relatively strong relationship with behavioral variables when the BAC exceeds .05% to levels approaching .10%. This still leaves unexplained why beverage content effects do not differ between men and women on measures of motivation to have safer sex; further research is needed to address this question.

In summary, the results of this experiment show that the consumption of a moderate, but not a low, dose of alcohol, and expectancies about the effects of alcohol on sex, may be related to indicators of theoretical antecedents of safer sex. However, still unspecified are the conditions under which alcohol or expectancy relationships would be most prominent, and the mechanisms underlying those relationships.

This experiment also revealed interesting but unanticipated findings that relate to the predictive power of expectancies. Previous experiments found a positive relationship between expectancies and the perceived likelihood of positive consequences of having unprotected sex with a new partner (Fromme et al., 1999; Maisto et al., 2002), but this experiment is the first to show an interaction between beverage condition and expectancies for this risk perception dimension. In this regard, expectancies were positively associated with perceived likelihood of positive consequences, but only in the three conditions in which participants were told they would be drinking alcohol. Otherwise, for participants in the control group, likelihood and expectancies were negatively related. This new finding warrants replication to gauge its importance. Another finding that was not predicted was the significant association between

expectancies and intentions. Gordon et al. (1997) found a significant relationship between expectancies and another indicator of motivation, attitudes toward condom use in men, but previous experiments including men and women found that beverage content but not expectancies were related to intentions. Again, the association between expectancies and intentions requires replication to evaluate its importance.

Consistent with survey/interview studies of young adult women, number of previous sexual partners explained variance in the behavioral skills and intentions measures. In contrast, however, age was significantly related only to Prompt 3 scores. The poor predictive power of age in this experiment may have been due to the restricted age range of participants in this study, as about 82% of the participants were between 21–24 years of age.

This study has a few limitations. As Maisto et al. (2002) found in their experiment with women, the CARE and intentions raw score distributions were highly skewed, all in the direction of “safer sex.” (This same trend was evident in ratings of attractiveness of the male actor in the videos and interest in having sex with him; see Table 2.) Therefore, it is essential to interpret the relationships among beverage content, expectancies, risk perception, and intentions with this in mind. The consistency of this finding across two experiments with women in our lab, and the absence of extreme skew in the same score distributions in men (Maisto, Carey, Gordon, Schum, & Lynch, in press), suggest that there may be a gender difference. Along these lines, it appears that women are more reluctant than men to report sexual interest in contexts that do not provide response anonymity, due to differential societal norms regarding men’s and women’s sexual behavior (Alexander & Fisher, 2003).

A second limitation of this experiment is that about 80% of the participants were Caucasian. Although the preliminary analyses showed no significant relationships between race and any of the dependent variables, it is critical for basic research on the determinants of safer sex to expand to allow in-depth study of specific subgroups, such as those defined by race or sexual orientation. Although research findings based on one subgroup may be applicable to others, because human sexual behavior has complex biological, psychological, social, and situational determinants, generalizability from one subgroup to another cannot be assumed but must be established empirically (Janssen, 2002).

In conclusion, this experiment showed that both pharmacological and psychological factors associated with acute alcohol consumption in women covary with antecedents of safer sexual behavior according to the IMB model. Furthermore, the results of this experiment combined with findings from previous research suggest that pharmacological effects of alcohol tend to emerge in women at BACs of at least .07%. These data reaffirm the importance of the pharmacological properties of alcohol and their psychological correlates in motivation for and actually using behavioral skills conducive to safer sex in women, and thus these topics need to be incorporated in HIV prevention programs. Such programs at the very least would benefit by including components that educate participants about changes in motivation to engage in sexual risk that are associated with moderate alcohol intoxication. Furthermore, prevention programs targeting young adult women should increase their awareness that merely the perception of intoxication may be associated with impairment in the verbal skills needed to negotiate condom use with a sexual partner. From a theoretical perspective, prominent models of HIV prevention, such as the IMB, would enhance their predictive power by incorporating setting variables such as acute alcohol or other drug intoxication and variables related to such drug states. Overall, research on mechanisms underlying the association between acute intoxication and antecedents of safer sex, and extension of experimental research to targeted subgroups, would result in enhanced effectiveness of HIV prevention programs.

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Participant Characteristics by Beverage Condition

Variable	Beverage Condition									
	Control		Placebo		Alcohol-Low		Alcohol-Moderate		Total	
	<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	23.4	3.1	22.9	2.3	23.3	1.6	22.6	2.4	23.0	2.4
Length current relationship (mos.)	27.3	44.2	12.2	12.7	19.7	11.6	15.3	18.2	19.1	26.3
No. partners, past year	2.5	1.5	1.5	0.9	1.9	1.2	2.1	1.5	2.0	1.3
No. partners, past 3 mos.	1.1	0.5	1.0	0.8	1.0	0.5	0.9	0.7	1.0	0.6
No. times sex without condom, past 3 mos.	21.4	26.5	4.7	6.7	16.2	19.5	2.9	4.9	11.0	17.8
No. times sex with condom, past 3 mos.	5.1	7.2	6.3	11.7	1.7	2.7	5.4	8.3	4.6	8.1
Race, (% Caucasian)	80		73		80		80		78	
QF drinking class (% heavy)	43		67		64		67		60	

* $p < .05$ (control > placebo; control > alcohol-moderate).

Note: Beverage conditions were compared on all continuous variables by use of one-way analysis of variance. Because of significant departure from normality, the transformed (square root) scores of times without a condom and length of current relationship (log) were analyzed. Beverage conditions were compared on race and QF (quantity-frequency) by use of chi-square; $n = 15$ participants per group.

Table 2
Means, Standard Deviations, and Medians of Postvideo Ratings of Two Sexual Role-Play Scenarios

Dimension	Scenario 1		Scenario 2	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Realistic Situation	4.5	1.4	4.4	1.3
Attractiveness of the Male	2.7	1.7	2.3	1.5
Interest in Sex	2.4	1.7	1.8	1.6
Difficulty of Role-Play	1.7	1.7	2.0	1.9
				<i>Mdn</i>
				4.0
				2.5
				2.0
				2.0

Note. *N* = 60. Ratings of dimensions made on a 0 (*lowest*) to 6 (*highest*) Likert-type scale.

Table 3
Means and Standard Deviations of Raw Scores on Primary Dependent Variables by Beverage Condition

Dependent Variable	Beverage Condition								
	N	Control		Placebo		Alcohol/Low		Alcohol/Moderate	
		M	SD	M	SD	M	SD	M	SD
CARE-NPP	60	1.67	1.03	1.60	1.09	1.27	0.55	1.43	0.80
CARE-NPN	60	6.63	0.57	6.80	0.46	6.33	1.53	5.00	2.53
Prompt 1	56	7.23	3.15	8.50	3.55	8.17	2.28	7.39	3.54
Prompt 2	56	8.92	3.65	8.39	4.07	8.43	1.90	6.18	3.99
Prompt 3	57	8.79	3.53	9.21	4.14	9.33	3.00	6.93	2.80
Likelihood, Video 1	60	1.47	1.92	0.73	1.22	1.33	1.35	0.87	1.19
Likelihood, Video 2	60	1.40	2.06	0.93	1.58	1.60	1.45	2.33	2.02

Note: CARE = Cognitive Appraisal of Risky Events Questionnaire; NPP = New Partner-Positive; NPN = New Partner-Negative. Likelihood = rating on a 0 (*lowest*) to 6 (*highest*) Likert-type scale of likelihood of having sex without a condom.

Table 4
Summary of Results of Hierarchical Regression Model Predicting Response to Three Prompts Across Two Role-Play Videos

	Prompt 1 B	SE B	R ² Change	Prompt 2 B	SE B	R ² change	Prompt 3 B	SE B	R ² Change
<i>Step 1</i>									
No. partners, past year	-0.87	0.33**	0.16*	-1.10	0.37**	0.16*	-0.94	0.36**	0.16**
Age	-0.25	0.19		-0.23	0.22		0.43*	0.21*	
Leigh total score	-0.56	0.41		-0.44	0.46		-0.23	0.45	
<i>Step 2</i>									
No. partners, past year	-0.94	0.33**	0.03	-1.20	0.35**	0.11**	-1.05	0.35**	0.08*
Age	-0.29	0.19		-0.30	0.21		-0.49	0.21*	
Leigh total score	-0.52	0.41		-0.35	0.44		-0.16	0.44	
Perception intoxication	-0.58	0.43		-1.21	0.46**		-1.02	0.45*	
<i>Step 3</i>									
No. partners, past year	-1.11	0.34**	0.03	-1.34	0.36**	0.04	-1.07	0.37**	0.00
Age	-0.37	0.20		-0.41	0.21		-0.51	0.22*	
Leigh total score	-0.48	0.40		-0.30	0.43		-0.15	0.44	
Perception intoxication	-0.59	0.42		-1.22	0.45**		-1.02	0.46*	
Perception X Leigh	0.66	0.47		0.81	0.50		0.14	0.52	

*
 $p \leq .05$,

**
 $p \leq .01$

Note: Leigh and perception of intoxication data were centered before analysis.
 N s = 53, 53, and 54 for analyses of the prompts 1, 2, and 3 data, respectively.

Summary of Statistically Significant Effects of Beverage Context (BC), Expectancy (E), and Perception of Intoxication (PI) on the Primary Dependent Variables

Dependent Variable	Models Testing for BC		Models Testing for PI		PI<E
	BC	E	BC<E	PI	
Risk Perception					
New Partner-positive	*		*		
New Partner-negative					
Skills					
Prompt 1				*	
Prompt 2				*	
Prompt 3					
Intentions					
Scenario 1		**			**
Scenario 2	*	*			*

* $p \leq .05$
** $p \leq .01$