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Alcohol Use, Partner Type, and Risky Sexual Behavior Among College Students: Findings from an Event-Level Study

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Abstract

Alcohol use is prevalent among college students and may contribute to elevated rates of sexual risk taking. Using event-level data, the hypothesis that partner type would moderate the effect of alcohol consumption on condom use was tested. Sexually active college students ($N = 330$; 67% female) reported on characteristics of their most recent sexual encounter, including partner type, alcohol use, and condom use, along with measures of sex-related alcohol expectancies, sensation seeking, and typical alcohol use. Unprotected vaginal sex (UVS) was reported by 39% of the sample and 32% reported alcohol use prior to sex. For the complete sample, UVS was just as likely for non-drinking events as for events involving alcohol use. However, for sexual encounters involving a non-steady partner, alcohol consumption was associated with an increase in UVS, whereas rates of UVS did not vary by drinking status for encounters involving a steady partner. These effects remained in analyses that controlled for sex-related alcohol expectancies, sensation seeking, and typical alcohol use. Findings confirm that the effects of alcohol vary according to the context in which it is used.

Keywords

alcohol; partner type; risky sexual behavior; condom use; HIV

1. Alcohol Use, Partner Type, and Risky Sexual Behavior Among College Students: Findings from an Event-Level Study

Alcohol use is highly prevalent among college students and may contribute to elevated rates of sexual risk taking (Cerwonka, Isbell, & Hansen, 2000; Hingson, Heeren, Zakocs, Kopstein, & Wechsler, 2002; Perkins, 2002; Wechsler, Lee, Kuo, & Lee, 2000). Indeed, an estimated 42% of college aged students engage in binge drinking (Wechsler, Lee, Kuo, & Lee, 2000), and as many as 400,000 college students have unprotected sex after drinking in a given year (Hingson, Heeren, Zakocs, Kopstein, & Wechsler, 2002). However, empirical research exploring the causal linkage of alcohol use to high risk sexual behavior has yielded mixed findings among college students (Anderson & Mathieu, 1998; Cooper, 2002) and other at-risk populations (Weinhardt & Carey, 2000). Global association studies that focus on overall

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patterns of alcohol use and high-risk sexual practices suggest a positive association between drinking and sexual risk behavior (for a review, see Dingle & Oei, 1997). In contrast, event-level studies that link alcohol use to sexual activity for specific encounters often show no difference in condom use for drinking versus non-drinking encounters (Desiderato & Crawford, 1995; Senf & Price, 1994; Temple & Leigh, 1992; Temple, Leigh, & Schafer, 1993). Clarifying the alcohol-risky sex linkage among young adults is of considerable public health importance. Approximately 12% of newly diagnosed cases of HIV in the United States occur among young adults between the ages of 15 and 24 (CDC, 2003). Furthermore, of the twelve million cases of sexually transmitted diseases (STDs) diagnosed yearly, approximately four million cases are diagnosed in college-aged individuals (CDC, 2002; Rimsza, 2005). On college campuses in particular, date rape, sexual harassment, and unintended pregnancy are also pressing concerns, and alcohol use in sexual contexts may contribute to each of these outcomes (Abbey, 2002; Adams-Curtis & Forbes, 2004; Menard, Hall, Phung, Ghebrial, & Martin, 2003; O'Sullivan, Byers, & Finkelman, 1998; Oswalt, Cameron, & Koob, 2005).

To clarify the linkage of alcohol use to sexual risk taking, both laboratory and survey-based studies have sought to characterize the influence of individual and situational factors on alcohol use and sexual decision making. For example, beliefs about how alcohol affects sexual behavior, as well individual differences in a person's motivation to satisfy sensation seeking needs have been shown to influence the alcohol-risky sex relationship (for reviews, see Cooper, 2002, 2006; Dingle & Oei, 1997; George & Stoner, 2000; Kaly, Heesacker, & Frost, 2002; Weinhardt & Carey, 2000). The primary focus for the present study is to characterize the role of *partner type* as a potential moderator of the alcohol-risky sex association. Several studies suggest that the association of alcohol use to high risk sexual behavior may vary as a function of relationship characteristics (Cooper & Orcutt, 2000; Corbin & Fromme, 2002; Fortenberry, Orr, Katz, Brizendine, & Blythe, 1997; Seage et al., 1998; Testa & Collins, 1997). For example, Corbin and Fromme (2002) found that *relationship duration* moderated the effect of alcohol use on condom use among college students, with alcohol effects observed for first time sexual encounters, but not for encounters that occurred with the same partner later in the relationship. Similarly, in a within-subjects comparison of two sexual encounters, women were more likely to report having sex with new partners after drinking, relative to encounters that did not involve alcohol use (Testa & Collins, 1997). Other studies indicate that *partner type*, defined in terms of whether a partner is identified as "steady" versus "non-steady", influences the degree to which alcohol is associated with risky sex (Seage et al., 1998; Venable et al., 2004). In an event level study involving men who have sex with men (MSM) from three U.S. cities, alcohol use prior to sex was strongly associated with unsafe sex, but only for heavy drinking encounters involving non-steady partners (Venable et al., 2004). Rates of risk behavior were identical for drinking and non-drinking occasions involving partners who were identified as primary partners (Venable et al., 2004). Of note, decisions about whether to drink or not were also found to be associated with partner type in the Venable et al. (2004) study, with alcohol use being nearly three times more prevalent for occasions involving a non-steady partner.

The emergence of differences in the alcohol-risky sex connection based on partner type is consistent with alcohol myopia theory (Steele & Josephs, 1990), which specifies that alcohol exerts its largest effect on social behaviors in contexts where there are both strong instigatory and inhibitory cues to engage in a desired behavior (Steele & Josephs, 1990). When strong instigatory and inhibitory cues are present, alcohol myopia theory specifies that alcohol use limits a drinker's capacity to attend to distal inhibitory cues (e.g., potential STDs, unintended pregnancy) in the face of more powerful situational cues to engage in a desired behavior (e.g., sex without a condom). In support of alcohol myopia theory, experimental laboratory studies with college students indicate greater intentions to engage in sexual risk behavior (Abbey, Saenz, Parkhill, & Hayman, 2006; MacDonald, Zanna, & Fong, 1996) and less ability to delay rewards when drinking than sober control participants (Ortner, MacDonald, & Olmstead,

2003). Without alcohol, encounters involving non-primary partners often activate high levels of sexual restraint and inhibition of highly desired behaviors because of reduced partner familiarity and concerns about a partner's sexual history (Macaluso, Demand, Artz, & Hook, 2000). In such circumstances, alcohol may lead to unsafe sex by narrowing attentional focus to the most salient aspects of the sexual situation (e.g., pleasurable sex without a condom) while reducing a person's capacity to focus on distal consequences of engaging in a desired behavior (MacDonald, MacDonald, Zanna, & Fong, 2000). In contrast, for couples in a committed relationship, norms for condom use are typically well established, with most partners opting for sex without a condom (Corbin & Fromme, 2002). Because there may be less to negotiate with steady partners, alcohol-related impairment may have little influence on decisions about condom use.

In this report, we sought to extend findings from previous research by characterizing partner type differences in the association between alcohol use and unprotected sex in a sample of young adults recruited in a university setting. Although studies involving adolescents and college students point to an association between alcohol use and sexual risk during first time sexual encounters (Cooper, 2002), less is known about the impact of self-labeling of *partner type* on drinking decisions and condom use during encounters involving alcohol consumption among college-aged drinkers. To characterize these associations, participants in our College Health study were asked to report on their most recent sexual encounter, including partner characteristics, alcohol use, and sexual behavior choices. Consistent with earlier findings, we predicted that alcohol use would be more prevalent for sexual encounters involving non-steady partners. In addition, it was predicted that alcohol use would be more strongly associated with unprotected sex for encounters involving non-steady partners relative to sexual encounters involving steady romantic partners.

Although the primary focus for this study is to clarify the impact of partner type on the alcohol-risky sex association, we also tested three additional hypotheses to clarify the importance of partner type relative to other variables found to influence the alcohol-risky sex relationship in prior research. First, to rule out the possibility that global patterns of alcohol use account for partner type differences in sexual risk for drinking and non-drinking occasions, we present analyses in which global alcohol use patterns were included in the model prior to entering event level alcohol use and sexual behavior data. Second, based on findings suggesting that sex-related alcohol expectancies may influence drinking decisions and subsequent sexual behavior (e.g., Carey, 1995; Dermen, Cooper, & Agocha, 1998; Katz, Fromme, & D'Amico, 2000; LaBrie, Earleywine, Schiffman, Pedersen, & Marriot, 2005), we present data on the association of sex-related alcohol expectancies to alcohol use and test the hypothesis that sex-related alcohol expectancies would moderate the association of drinking to high risk sexual behavior. Third, to clarify whether individual differences in sensation seeking disposition account for observed associations between alcohol use and risky sex as suggested by several previous studies (e.g., Kalichman, Heckman, & Kelly, 1996; Kalichman, Tannenbaum, & Nachimson, 1998; Wagner, 2001), we tested the hypothesis that sexual sensation seeking would mediate the association of alcohol use to high risk sexual behavior in our sample of college students. To our knowledge, this is the first study to examine the combined effects of alcohol use, partner type, and other competing hypotheses on drinking decisions and sexual risk behaviors in a large sample of college students using event-level data.

2. Method

2.1 Participants

Young adults were eligible to participate if they were at least 18 years of age. A total of 547 participants provided completed surveys. For the present study, the sample was restricted to a subset of participants who reported having vaginal sex during their most recent sexual

encounter ($N = 330$). Among participants reporting vaginal sex during their last sexual encounter, 67% were female, with a median age of 19 years ($M = 18.9$, $SD = 1.4$). Participants self-identified as Caucasian (82%), Asian/Pacific Islander (4%), African-American (6%), Latino (4%), and "Other" (4%). A minority of respondents reported that they were currently employed (27%), working an average of 10 hours per week ($SD = 5.9$). In a behavioral measure of sexual orientation, the majority of participants indicated that they are attracted *only* to the opposite sex (90%). Among the sample, 3% reported a lifetime history of one or more STD.

2.2 Procedure

Participants were recruited from introductory psychology courses to participate in a study described as focusing on "health behaviors among college students." In exchange for participation, all participants received course credit. All participants provided written informed consent prior to completing the survey. Surveys were completed via paper-and-pencil self-administered questionnaires during small group survey administrations, with attendance ranging from 10–25 participants. The questionnaire took approximately 45 minutes to complete. To insure confidentiality, participants were instructed not to put their name or other identifying information on their survey.

2.3 Measures

Demographic variables—The questionnaire included demographic items assessing gender, age, ethnicity, and employment status. In addition, a behavioral measure of sexual orientation and dichotomous items assessing participants' sexual history and prior STD diagnosis were included for descriptive purposes.

Event-level assessment of sexual behavior and substance use—An event level measure of sexual risk behavior and alcohol use was adapted from our previous research (Venable et al., 2004). Participants were asked to recall their most recent sexual experience, including items assessing which sexual behaviors occurred (i.e., oral, vaginal, and anal sex). For each of these behaviors, respondents also indicated if a condom was used. By focusing on a single memorable event, this measure provides a more reliable index of sexual risk than retrospective assessments of multiple events (Schroder, Carey, & Venable, 2003) and allows for an analysis that links alcohol use to a specific occasion of sexual activity. The primary outcome measure of interest for this study was the occurrence of unprotected vaginal sex (UVS) because of its association with the acquisition and transmission of STDs and unintended pregnancy.

Alcohol use was also assessed for the most recent sexual encounter. Participants were asked to describe whether they consumed alcohol "prior to the sexual encounter" and, if alcohol use was reported, to indicate the number of drinks consumed.

Relationship status—As part of the event-level questionnaire, participants were asked to characterize the nature of their relationship with their most recent sexual partner. Specifically, participants were asked if their partner was someone they consider to be (a) a boyfriend/girlfriend or steady partner, (b) a person they knew, but *not* a steady partner, or (c) a casual acquaintance or someone they just met. For this report, the latter two categories were collapsed to provide a dichotomously coded index of whether the encounter involved a (a) steady partner or (b) non-steady partner.

Global alcohol consumption—To assess typical patterns of alcohol consumption, two questions requested that participants indicate: (a) the average number of days during a week when they consumed one or more drinks and (b) the typical quantity of alcohol consumed per

day. As an indicator of global drinking patterns, the average number of days drinking alcohol per week was multiplied by the typical number of drinks consumed (Sobell & Sobell, 2003).

Sex-related alcohol expectancies—To measure alcohol expectancies for sexual behaviors, a previously validated, 11-item questionnaire asks respondents to indicate the extent to which they agree or disagree with each statement using a five point Likert scale (Dermen & Cooper, 1994a, 1994b). A sample item is: “When I am high or drunk I am more likely to do sexual things I usually wouldn't do.” A total score across all items was calculated for each participant. Coefficient alpha in the present sample was = .88.

Sexual sensation seeking—The 6-item sexual sensation seeking scale measures the extent to which individuals seek out exciting sexual encounters using a four point Likert scale. A sample item from this measure is: “I like exciting, uninhibited sexual encounters.” Scores on this measure have been correlated with substance use and high risk sexual behaviors (Kalichman, Heckman, & Kelly, 1996). A summed score across all items was calculated for each participant. Coefficient alpha in the present sample was = .78.

2.4 Overview of Analyses

Study data were double entered and verified for consistency before conducting analyses. All statistical tests were two-tailed and alpha was set at .05. Of the full sample ($N = 330$), a small subset of participants did not report on their use of condoms during the last sexual encounter. Therefore, analyses examining condom use were based on those providing complete data ($N = 320$). First, descriptive statistics were conducted to characterize the prevalence and demographic correlates of alcohol consumption and high-risk sexual behavior. Next, chi-square analyses characterized the association of partner type to alcohol use prior to sex and the bivariate associations of alcohol use and partner type to UVS at last intercourse. The primary study hypothesis concerning the interaction of alcohol use and partner type was tested using a hierarchical logistic regression analysis, with demographic variables predictive of UVS entered at Step 1, the main effects of partner type and alcohol use entered at Step 2, and the partner type $\times$ alcohol use interaction term entered at Step 3. Significant interactions were characterized further through subgroup analyses of the relationship between alcohol use and UVS, stratified by partner type.

In addition, we also examined the role of global alcohol consumption patterns, sex-related alcohol expectancies, and sexual sensation seeking on UVS for the last sexual encounter. To test the competing hypothesis that global patterns of alcohol consumption accounted for potential differences in sexual risk behavior, analyses as described above were repeated, with global alcohol use included in the regression equation at Step 2. For the global alcohol indicator, outliers as indicated by $z > 3.29$ were adjusted to one more than the next largest value (Schroder et al., 2003; Tabachnick & Fidell, 2001). Next, the hypothesis that sex-related alcohol expectancies would moderate the effect of alcohol use on UVS was tested in a logistic regression analysis in which age was entered at Step 1 of the model, with the main effects of alcohol use and sex-related alcohol expectancies entered at Step 2, and the alcohol consumption $\times$ alcohol expectancies interaction term entered at Step 3 of the model. Finally, the relationship between sexual sensation seeking, alcohol consumption, and UVS was examined to test the hypothesis that sensation seeking mediates the association between alcohol use and UVS.

3. Results

3.1 Descriptive Findings

Instances of UVS at last intercourse were reported by 39% of participants and nearly one third of the sample (32%) consumed alcohol before the sexual encounter. Over half of the encounters

occurred in the last month (51%) with the average encounter occurring two months ago ($M = 2$ months, $SD = 3.8$ months). The length of time since the encounter did not differ by partner type or alcohol use, $p's > .05$. Among participants reporting alcohol use prior to sex, typical alcohol consumption was heavy ($M = 5.4$ drinks, $SD = 3.6$). Participants who reported using a condom during their last sexual encounter were younger ($M = 18.8$, $SD = 1.3$) than those reporting UVS ($M = 19.3$, $SD = 2.2$), $t(2, 315) = -2.61$, $p < .01$, but did not differ from those reporting UVS in terms of gender, ethnicity, or employment status. Age was controlled for in subsequent multivariate analyses.

3.2 Primary Analyses

As predicted, alcohol consumption was more than twice as likely for encounters involving a non-steady partner relative to encounters involving a steady partner (55% vs. 22%), $\chi^2(1, N = 330) = 35.2$, $p < .001$. Additionally, the amount of alcohol consumed with non-steady partners ($M = 6.2$ drinks, $SD = 3.5$) was greater than the quantity of alcohol consumed with steady partners ($M = 4.5$ drinks, $SD = 3.5$), $t(2, 97) = -2.41$, $p < .05$.

Rates of UVS were similar for encounters occurring with steady partners and encounters involving non-steady partners (41% vs. 34%), $\chi^2(1, N = 320) = 1.39$, $p = .27$. A univariate analysis of the overall effect of alcohol consumption on sexual risk behavior (irrespective of partner type) showed that 47% of participants who drank prior to sex engaged in UVS, whereas among participants who reported no alcohol use, 35% engaged in UVS. Although this trend was in the expected direction for an alcohol effect on UVS, the effect was not statistically significant, $\chi^2(1, N = 320) = 3.77$, $p < .07$.

To test for partner type differences in the association of alcohol use to risky sex, a hierarchical logistic regression was conducted, with age controlled for at Step 1, the main effects of partner type and alcohol consumption prior to sex entered at Step 2, and the partner type $\times$ alcohol use interaction term entered at Step 3. The regression model revealed that the partner type $\times$ alcohol use interaction contributed significantly to the overall model ($\Delta \text{Model } \chi^2 = 5.94$, $p < .001$; see Table 1). For sexual encounters involving a steady partner, there were no differences in the percentage of participants engaging in UVS for occasions involving alcohol use (46%; $n = 23$ out of 50 occasions) versus occasions during which no alcohol was consumed (39%; $n = 70$ out of 178 occasions), $\chi^2(1, N = 228) = .72$, ns . However, for sexual occasions involving a non-steady partner, the percentage of participants reporting UVS was greater among those who drank (47%; $n = 24$ out of 51 occasions) relative to those reporting no alcohol use (17%; $n = 7$ out of 41 occasions), $\chi^2(1, N = 92) = 9.15$, $p < .005$. Thus, as hypothesized, alcohol use was associated with increased sexual risk for encounters with non-steady partners, but showed no association to sexual risk behavior for encounters involving steady partners. This interaction effect is illustrated in Figure 1, which shows the percentage of participants engaging in UVS for drinking versus non-drinking occasions, stratified by partner type.

3.3 Test of Alternative Hypotheses: Global Alcohol Consumption, Sex-Related Alcohol Expectancies, and Sexual Sensation Seeking

3.3.1 Global alcohol consumption—To test the competing hypothesis that global patterns of alcohol consumption could account for potential differences in sexual risk behavior observed at last intercourse, the association of global alcohol use to UVS during the last sexual encounter was examined in both bivariate and multivariate analyses. In the bivariate analysis, typical alcohol consumption for the previous month (based on quantity – frequency alcohol data) was not associated with UVS for the most recent sexual encounter, $t(2, 312) = -.01$, ns . In the multivariate analysis, with age controlled for at Step 1, typical alcohol consumption, alcohol use prior to sex, and partner type entered at Step 2, and the partner type $\times$ alcohol use interaction term entered at Step 3, the interaction of alcohol use and partner type again contributed

significantly to the overall model ($\Delta \text{Model } \chi^2 = 6.29, p < .05$), even with global alcohol consumption included in the model.

3.3.2 Sex-related alcohol expectancies—To test the hypothesis that sex-related alcohol expectancies would moderate the association of alcohol use with UVS, a hierarchical logistic regression was again conducted, with age controlled for at Step 1, the main effects of sex-related alcohol expectancies and alcohol consumption prior to sex entered at Step 2, and the alcohol expectancy $\times$ alcohol use interaction term entered at Step 3. Sex-related alcohol expectancies were associated with alcohol use prior to the last sexual encounter, $t(2, 325) = -5.13, p < .001$. However, sex-related alcohol expectancies were not associated with differences in UVS, $t(2, 315) = -1.49, ns$, and the alcohol expectancy $\times$ alcohol use interaction at Step 3 did not significantly contribute to the overall model ($\Delta \text{Model } \chi^2 = .64, ns$). In a separate analysis that included sex-related alcohol expectancies, alcohol use, and partner type as main effects in the model, the alcohol use $\times$ partner type interaction remained a significant predictor of UVS ($\Delta \text{Model } \chi^2 = 5.78, p < .05$).

3.3.3 Sexual sensation seeking—Sexual sensation seeking was tested as a potential mediator of the association between alcohol consumption and UVS during last intercourse. In the bivariate analysis, sexual sensation seeking levels did not differ for those who drank alcohol prior to sex compared to those who did not drink, $t(2, 318) = -1.93, ns$. In addition, sensation seeking levels did not vary among participants who reported UVS at last sex relative to participants who reported using a condom during their last sexual occasion, $t(2, 328) = -1.61, ns$. Because sexual sensation seeking was not associated with either alcohol consumption or UVS, a formal mediational analysis was not warranted. Finally, we conducted a logistic regression to determine whether the alcohol use $\times$ partner type interaction remained associated with UVS after controlling for individual differences in sensation seeking. Controlling for age, partner type, alcohol use prior to sex, and sensation seeking, results revealed that the alcohol use $\times$ partner type interaction remained a significant predictor of UVS ($\Delta \text{Model } \chi^2 = 5.97, p < .05$).

4. Discussion

Consistent with prior research, findings point to high rates of alcohol use and unprotected sex among college students (Hingson et al., 2002). Indeed, nearly 40% of participants reported that they did not use a condom during their last occasion of sex and 32% reported alcohol consumption prior to sex. Among those who reported alcohol use at last sex, participants consumed on average nearly five drinks, a quantity that is sufficient to cause substantial cognitive impairment (Birnbaum, Hartley, Johnson, & Taylor, 1980; Steele & Josephs, 1990). Whereas alcohol and sexual activity often co-occurred, results indicate that alcohol did not have a simple “main effect” on sexual risk. Across the entire sample, UVS was just as likely for non-drinking events as for events when alcohol was consumed. However, alcohol use prior to sex was strongly related to unprotected sex for encounters involving non-steady partners. Rates of UVS did not vary by drinking status for encounters involving a steady partner. The interaction of alcohol use and partner type in predicting UVS remained significant in separate analyses that controlled for typical alcohol use for the previous month, sex-related alcohol expectancies, and sensation seeking.

The moderating effect of partner type observed in this study is particularly noteworthy in light of the fact that alcohol use itself was far more common for sexual encounters involving non-steady partners. Whereas 55% of encounters with non-steady partners involved alcohol use, only 22% of sexual occasions with a steady partner were preceded by alcohol use. Thus, consistent with findings observed in previous studies involving MSM (Venable et al., 2004), results from this college student sample confirm the importance of partner characteristics as a

determinant of whether alcohol is consumed at all and in terms of whether alcohol use contributes to sexual risk behavior. We speculate that alcohol often contributes to unplanned sexual activity with a new or “casual” partner. Perhaps because such drinking-related sexual encounters are more spontaneous, they are also less likely to include condom use. In contrast, for the small subset of people who have casual sex with a non-steady partner while sober (only 13% of our complete sample), such encounters may be more purposeful or planned; part of planning for such occasions may include having a condom ready for use during such encounters.

Our findings are largely consistent with alcohol myopia theory, which posits that alcohol exerts its largest effect on social behaviors in contexts where there are both strong instigatory and inhibitory cues (Steele & Josephs, 1990). Thus, sexual encounters with a steady partner may not induce the “inhibitory conflict” necessary to result in disinhibited behavior (MacDonald et al., 2000). In such contexts, norms for sexual safety are likely to be well established between partners (e.g., Macaluso et al., 2000; Semple, Patterson, & Grant, 2003). Thus, regardless of whether alcohol is used, couples in established relationships may be less motivated to use condoms because of heightened familiarity and, in some instances, adoption of alternative forms of birth control. In fact, recent findings confirm that non-condom use at last intercourse with a steady partner is most common among college students who report decreased perceptions of partner risk and among those who report adoption of alternative forms of birth control (Corbin & Fromme, 2002). Because there may be less to negotiate and decide upon, alcohol-related impairment may have little effect on whether condoms are used. However, in situations with non-steady partners, where both instigatory cues (arousal) and inhibitory cues to avoid sexual health risks with a new partner are presumed to be high, alcohol may limit a person's capacity to process more distal health concerns. As a result, alcohol use may lead to greater sexual risk taking for occasions where the partner is less familiar.

As expected, sex-related alcohol expectancies were associated with alcohol use prior to the most recent sexual encounter. This finding is consistent with past investigations noting an association between positive alcohol expectancies and alcohol use (e.g., Carey, 1995; Katz, Fromme, & D'Amico, 2000). However, we found no evidence to support the hypothesis that sex-related alcohol expectancies would moderate the association of alcohol use to sexual risk behavior. Thus, despite experimental evidence suggesting that beliefs about the effects alcohol can influence subsequent behavior, the association of alcohol use to sexual risk behavior in this sample of college students did not vary as a function of participants' sex-specific beliefs about alcohol. Similarly, our analyses found no support for the hypothesis that individual differences in sensation seeking would account for the association between drinking and high-risk sexual behavior. This finding is contrary to prior studies involving other study populations that have noted a relationship between sensation seeking, alcohol use, and risky sexual behavior (e.g., Kalichman et al., 1996; Kalichman, Tannenbaum, & Nachimson, 1998; Wagner, 2001). It may be that the null finding for sensation seeking and alcohol use during the last encounter is due to the nature of the sensation seeking measure used. Our measure focuses exclusively on *sexual* sensation seeking and therefore may not capture the broader construct of sensation seeking that would be more apt to be associated with alcohol use. Alternatively, sensation seeking may be more strongly associated with substance use and risk taking in specific sub-populations, such as MSM. Further research is warranted to clarify the importance of alcohol expectancies and sensation seeking as it relates to alcohol use in sexual situations and condom use decisions.

Prior research on the association between alcohol and risky sexual behaviors among college students has largely relied upon global assessments of drinking and risk behaviors (Dingle & Oei, 1997). This study improves upon earlier research through the use of event-level measurement of alcohol consumption and condom use for the most recent sexual encounter.

By focusing upon the last sexual experience, the cognitive burden of the recall task is reduced and the temporal relationship between alcohol and unprotected sex can be better examined (Schroder et al., 2003; Venable et al., 2004). Previous empirical investigations using event-level data have often found no association between alcohol consumption and sexual risk behavior (Desiderato & Crawford, 1995; Senf & Price, 1994; Temple & Leigh, 1992; Temple et al., 1993), but these studies have presented data that are collapsed across partner type. By stratifying our analyses by partner type, this study adds to a growing body of research to suggest that alcohol use does indeed have a negative impact on sexual risk behavior, but primarily in contexts where partner familiarity is low.

Several methodological limitations should be noted. First, our sample of heterosexual college students limits our ability to generalize the study's findings to other at-risk populations. Nonetheless, there is growing interest in research that clarifies the causes and consequences of problem drinking among college students (Carey, 2001; Cooper, 2002; Perkins, 2002; Vicary & Karshin, 2002) and young adults are disproportionately vulnerable to adverse consequences associated with risky sexual behavior. Second, because of our interest in sexual behavior on the most recent occasions of sexual activity, we were not able to conduct within person analyses of sexual behavior for drinking and non-drinking occasions. A study that contrasts within subject changes in risk behavior for drinking and non-drinking occasions with steady and non-steady partners would provide an even stronger test of our study hypotheses. Similarly, we did not assess whether the encounter reported upon was the first with the sexual partner. Previous sexual experience and established sexual behavior patterns with the partner may affect the extent to which drinking influences the decision to use condoms. More generally, self-report assessments of sexual risk behavior and substance use are subject to a range of biases that are difficult to control for.

The high rates of unprotected sex observed in this sample confirm that college students continue to be vulnerable to a range of undesirable consequences associated with sexual activity, including STDs and unintended pregnancy. Drinking on college campuses is often a primary social outlet for students and social venues where alcohol use is common provide a means for young adults to seek out new partners. Given the clear association of drinking to unprotected sex with non-steady partners observed in this sample, our findings point to the importance of developing interventions geared to preventing substance-related sexual risk taking among college students. Given the high rates of risk behavior observed among those in a steady relationship, interventions should also focus on college students' ability to negotiate and establish protective sexual behavior practices early in a relationship with a steady partner. For individuals using oral contraception as the primary form of birth control in steady relationships, interventions could also reinforce the need to protect against STDs and the importance of discussing past sexual behaviors and STD/HIV testing histories with partners. Ultimately, by clarifying the contextual and individual level factors that contribute both to substance use in sexual settings and the degree to which substance use leads to sexual risk taking, investigators will be better equipped to implement tailored interventions to reduce substance-related sexual risk taking.

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References

- Abbey A. Alcohol-related sexual assault: A common problem among college students. *Journal of Studies on Alcohol* 2002;(Supplement 14):118–128.
- Abbey A, Saenz C, Parkhill MR, Hayman LW. The effects of acute alcohol consumption, cognitive reserve, partner risk, and gender on sexual decision making. *Journal of Studies on Alcohol* 2006;67:113–121. [PubMed: 16536135]
- Adams-Curtis LE, Forbes GB. College women's experiences of sexual coercion: A review of cultural, perpetrator, victim, and situational variables. *Trauma Violence & Abuse* 2004;5:91–122.
- Anderson PB, Mathieu D. Drinking and safer sex: Are college students at risk? *Journal of Sex Education & Therapy* 1998;23:297–301.
- Birnbaum IM, Hartley JT, Johnson MK, Taylor TH. Alcohol and elaborative schemes for sentences. *Journal of Experimental Psychology: Human Learning and Memory* 1980;6:293–300. [PubMed: 7373249]
- Carey KB. Alcohol-related expectancies predict quantity and frequency of heavy drinking among college students. *Psychology of Addictive Behaviors* 1995;9:236–241.
- Carey KB. Understanding binge drinking: Introduction to the special issue. *Psychology of Addictive Behaviors* 2001;15:283–286. [PubMed: 11767257]
- CDC. Special focus profiles: STDs in adolescents and young adults. *STD Surveillance* 2002;2002:51–57.
- CDC. Special focus profile: Adolescents and young adults. *2003 STD Surveillance Report* 2003:53–61.
- Cerwonka ER, Isbell TR, Hansen CE. Psychosocial factors as predictors of unsafe sexual practices among young adults. *AIDS Education and Prevention* 2000;12:141–153. [PubMed: 10833039]
- Cooper ML. Alcohol use and risky sexual behavior among college students and youth: Evaluating the evidence. *Journal of Studies on Alcohol* 2002;(Supplement Number 14):101–117.
- Cooper ML. Does drinking promote risky sexual behavior? A complex answer to a simple question. *Current Directions in Psychological Science* 2006;15:19–23.
- Cooper ML, Orcutt HK. Alcohol use, condom use, and partner type among heterosexual adolescents and young adults. *Journal of Studies on Alcohol* 2000;61:413–419. [PubMed: 10807212]
- Corbin WR, Fromme K. Alcohol use and serial monogamy as risks for sexually transmitted diseases in young adults. *Health Psychology* 2002;21:229–236. [PubMed: 12027028]
- Dermen KH, Cooper ML. Sex-related alcohol expectancies among adolescents: I. Scale development. *Psychology of Addictive Behaviors* 1994a;8:152–160.
- Dermen KH, Cooper ML. Sex-related alcohol expectancies among adolescents: II. Prediction of drinking in social and sexual situations. *Psychology of Addictive Behaviors* 1994b;8:161–168.
- Dermen KH, Cooper ML, Agocha VB. Sex-related alcohol expectancies as moderators of the relationship between alcohol use and risky sex in adolescents. *Journal of Studies on Alcohol* 1998;59:71–77. [PubMed: 9498318]
- Desiderato LL, Crawford HJ. Risky sexual behavior in college students: Relationships between number of sexual partners, disclosure of previous risky behavior, and alcohol use. *Journal of Youth and Adolescence* 1995;24:55–68.
- Dingle GA, Oei TPS. Is alcohol a cofactor of HIV and AIDS? Evidence from immunological and behavioral studies. *Psychological Bulletin* 1997;122:56–71. [PubMed: 9204781]
- Fortenberry JD, Orr DP, Katz BP, Brizendine EJ, Blythe MJ. Sex under the influence: A diary self-report study of substance use and sex behavior among adolescent women. *Sexually Transmitted Diseases* 1997;24:313–319. [PubMed: 9243736]
- George WH, Stoner SA. Understanding acute alcohol effects on sexual behavior. *Annual Review of Sex Research* 2000;11:92–124.
- Hingson RW, Heeren T, Zakocs RC, Kopstein A, Wechsler H. Magnitude of alcohol-related mortality and morbidity among U.S. college students ages 18–24. *Journal of Studies on Alcohol* 2002;63:136–144. [PubMed: 12033690]

- Kalichman SC, Heckman T, Kelly JA. Sensation seeking as an explanation for the association between substance use and HIV-related risky sexual behavior. *Archives of Sexual Behavior* 1996;25:141–154. [PubMed: 8740520]
- Kalichman SC, Tannenbaum L, Nachimson D. Personality and cognitive factors influencing substance use and sexual risk for HIV infection among gay and bisexual men. *Psychology of Addictive Behaviors* 1998;12:262–271.
- Kaly PW, Heesacker M, Frost HM. Collegiate alcohol use and high-risk sexual behavior: A literature review. *Journal of College Student Development* 2002;43:838–850.
- Katz EC, Fromme K, D'Amico EJ. Effects of outcome expectancies and personality on young adults' illicit drug use, heavy drinking, and risky sexual behavior. *Cognitive Therapy and Research* 2000;24:1–22.
- LaBrie J, Earleywine M, Schiffman J, Pedersen E, Marriot C. Effects of alcohol, expectancies, and partner type on condom use in college males: Event-level analyses. *The Journal of Sex Research* 2005;42:259–266.
- Macaluso M, Demand MJ, Artz LM, Hook EWI. Partner type and condom use. *AIDS* 2000;14:537–546. [PubMed: 10780716]
- MacDonald TK, MacDonald G, Zanna MP, Fong GT. Alcohol, sexual arousal, and intentions to use condoms in young men: applying alcohol myopia theory to risky sexual behavior. *Health Psychology* 2000;19:290–298. [PubMed: 10868774]
- MacDonald TK, Zanna MP, Fong GT. Why common sense goes out the window: Effects of alcohol on intentions to use condoms. *Personality & Social Psychology Bulletin* 1996;22:763–775.
- Menard KS, Hall GC, Phung AH, Ghebrial MF, Martin L. Gender differences in sexual harassment and coercion in college students: Developmental, individual, and situational determinants. *Journal of Interpersonal Violence* 2003;18:1222–1239.
- O'Sullivan LF, Byers ES, Finkelman L. A comparison of male and female college students' experiences of sexual coercion. *Psychology of Women Quarterly* 1998;22:177–195.
- Ortner CN, MacDonald TK, Olmstead MC. Alcohol intoxication reduces impulsivity in the delay-discounting paradigm. *Alcohol & Alcoholism* 2003;38:151–156. [PubMed: 12634263]
- Oswalt SB, Cameron KA, Koob JJ. Sexual regret in college students. *Archives of Sexual Behavior* 2005;34:663–669. [PubMed: 16362250]
- Perkins HW. Surveying the damage: A review of research on consequences of alcohol misuse in college populations. *Journal of Studies on Alcohol* 2002;(Supplement Number 14):91–100. [PubMed: 11925064]
- Rimsza ME. Sexually transmitted infections: new guidelines for an old problem on the college campus. *Pediatric Clinics of North America* 2005;52:217–228. [PubMed: 15748932]
- Schroder KE, Carey MP, Venable PA. Methodological challenges in research on sexual risk behavior: I. Item content, scaling, and data analytical options. *Annals of Behavioral Medicine* 2003;26:76–103. [PubMed: 14534027]
- Seage GR, Mayer KH, Wold C, Lenderking WR, Goldstein RB, Cai B, et al. The social context of drinking, drug use, and unsafe sex in the Boston Young Men Study. *Journal of Acquired Immunodeficiency Syndromes and Human Retrovirology* 1998;17:368–375.
- Semple SJ, Patterson TL, Grant I. HIV-positive gay and bisexual men: predictors of unsafe sex. *AIDS Care* 2003;15:3–15. [PubMed: 12655829]
- Senf JH, Price CQ. Young adults, alcohol and condom use: What is the connection? *Journal of Adolescent Health* 1994;15:238–244. [PubMed: 8075094]
- Sobell, LC.; Sobell, MB. Alcohol consumption measures.. In: Allen, JP.; Wilson, VB., editors. *Assessing alcohol problems: A guide for clinicians and researchers*. Vol. 2nd ed.. NIAAA; Washington D. C.: 2003. p. 75-79.
- Steele CM, Josephs RA. Alcohol myopia. Its prized and dangerous effects. *American Psychologist* 1990;45:921–933. [PubMed: 2221564]
- Tabachnick, BG.; Fidell, LS. *Using multivariate statistics*. Vol. 4th ed.. Allyn & Bacon; 2001.
- Temple MT, Leigh BC. Alcohol consumption and unsafe sexual behavior in discrete events. *Journal of Sex Research* 1992;29:207–219.

- Temple MT, Leigh BC, Schafer J. Unsafe sexual behavior and alcohol use at the event level: Results of a national survey. *Journal of Acquired Immunodeficiency Syndromes* 1993;6:393–401.
- Testa M, Collins RL. Alcohol and risky sexual behavior: Event-based analyses among a sample of high-risk women. *Psychology of Addictive Behaviors* 1997;11:190–201.
- Venable PA, McKirnan DJ, Buchbinder SP, Bartholow BN, Douglas JM Jr, Judson FN, et al. Alcohol use and high-risk sexual behavior among men who have sex with men: the effects of consumption level and partner type. *Health Psychology* 2004;23:525–532. [PubMed: 15367072]
- Vicary JR, Karshin CM. College alcohol abuse: A review of the problems, issues, and prevention approaches. *Journal of Primary Prevention* 2002;22:299–331.
- Wagner MK. Behavioral characteristics related to substance abuse and risk-taking, sensation seeking, anxiety sensitivity, and self-reinforcement. *Addictive Behaviors* 2001;26:115–120. [PubMed: 11196285]
- Wechsler H, Lee JE, Kuo M, Lee H. College binge drinking in the 1990s: A continuing problem. *Journal of American College Health* 2000;48:199–210. [PubMed: 10778020]
- Weinhardt LS, Carey MP. Does alcohol lead to sexual risk behavior? Findings from event-level research. *Annual Review of Sexual Research* 2000;11:125–157.

Figure 1.
Percentage reporting unprotected vaginal sex (UVS) as a function of partner type and alcohol consumption.

Hierarchical Logistic Regression Analysis Modeling the Direct and Interactive Effects of Partner Type and Alcohol Use on Unprotected Vaginal Sex During the Most Recent Sexual Encounter (N = 320)

Predictor	Model χ^2	Δ Model χ^2	p	OR	95% CI
Step 1: Age	6.89		<.01		
Step 2	13.85	6.97	<.01		
Partner Type			>.05		
Steady				Reference ^a	
Non-steady				.59	.34, 1.0
Alcohol Use			<.05		
No Alcohol				Reference ^a	
Alcohol				1.9	1.1, 3.3
Step 3: Partner Type $\times$ Alcohol Use	19.79	5.94	<.001		

Note. The significance test for the model chi-square provides an indication of whether a given block of predictor variables adds significantly to the model at the point at which it is entered into the equation. OR = odds ratio; CI = confidence interval.

^aThe reference group is the group against which other categories were compared.