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# Does Drinking Lead to Sex? Daily Alcohol-Sex Behaviors and Expectancies among College Students

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## Abstract

Most research on the links between alcohol use and sexual behavior has used cross-sectional and between-subjects designs. However, a pivotal question is whether sexual behavior is more likely when the same persons drink more heavily than when they do not. A within-person approach was used in the current study to model the links between alcohol use and sex. Participants (51.4% male) were traditionally-aged first-year college students. Multilevel models were conducted for up to 14 days of sexual behavior data for each person with occasions (Level 1, *N*=2879 days) nested within people (Level 2, *N*=218 people). Between-persons (Level 2) effects were gender, relationship status, person means of alcohol use (aggregated across days), and alcohol-sex expectancies for sexual affect and sexual drive. Within-person (Level 1) effects were weekend days, the number of drinks of alcohol consumed on a given day, and the interaction between drinks consumed and alcohol-sex expectancies. Independent of average alcohol use, consuming more drinks on a given day was associated with a greater likelihood of oral sex and with experiencing more short-term positive (but not negative) consequences of sex on that day. Significant Alcohol Use × Alcohol-Sex Expectancies interactions were found for oral sex and total sex behaviors, indicating that individuals with more positive expectancies were more likely to have sex after drinking. The negative association between drinking and condom use was at a trend level of significance. Results support the potential for promoting sexual health by focusing on cross-behavior expectancies among late adolescents.

### Keywords

alcohol use; sexual behavior; expectancies; college; daily data

Alcohol use is widely understood to be a common part of the collegiate experience (Schulenberg & Maggs, 2002; Straus & Bacon, 1953), based on a strong cultural expectation that drinking is central to the experience of the mythically carefree college years (Maggs, 1997). In addition, despite alcohol's pharmacological impairment on sexual performance and inconsistent empirical evidence of alcohol's effect on sexual behaviors (Leigh, 1993), there is a strong cultural belief that drinking may lead to pleasurable sexual experiences (Goldman & Roehrich, 1991; Leigh & Stall, 1993). It could be argued that public health warnings that drinking leads to sex may actually strengthen alcohol-sex expectancies and thus promote both drinking and sex by creating a self-fulfilling prophecy, or an "excuse in a bottle" (p. 75,

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Coleman & Cater, 2005; Dermen, Cooper, & Agocha, 1998). As the result of an expectancy bias, individuals may mistakenly attribute their sexual behavior to drunkenness, even in the absence of any causal disinhibitory effect of alcohol use (Cooper, 2002). The current work examines associations of alcohol use with sexual behaviors and consequences, and tests whether within-person links are larger for students with stronger expectancies that alcohol enhances their sexual affect and sexual drive (Abbey, McAuslan, Ross, & Zawacki, 1999).

## Alcohol Use and Sexual Behavior

In the past two decades, over 600 studies have investigated the association between using alcohol and having sex (Cooper, 2006). The majority of studies have found a positive association (Cooper, 2002, 2006; Leigh & Stall, 1993), although most have used purely cross-sectional, between-subjects, and correlational designs (Cooper, 2006; Cooper & Orcutt, 2000; Leigh & Stall, 1993). Emerging adults commonly consume alcohol before having sex (Cooper, Peirce, & Huselid, 1994): estimates range from ¼ to more than ½ of people at the most recent sexual occasion (Desiderato & Crawford, 1995; MacNair-Semands & Simono, 1996). Hingson et al. (2005) estimated that 8% of U.S. college students aged 18 to 24 (474,000 people) have unprotected sexual intercourse resulting from alcohol use annually. In addition, students tend to overestimate the number of drinks they can consume without experiencing negative consequences such as unwanted sex (Mallett, Lee, Neighbors, Larimer, & Turrisi, 2006). However, a more complete picture of the associations between alcohol use and sexual behaviors within-persons and across occasions is required to understand whether a link between alcohol and sex is prevalent and whether it is perceived as rewarding (i.e., experienced positive sex consequences) or not (i.e., negative sex consequences). The perceived consequences of sex after drinking have particular relevance for the potential reinforcement of alcohol-sex expectancies and the perpetuation of both alcohol use and sexual behaviors.

Alcohol use may lead to sex directly through disinhibition (Kaly, Heesacker, & Frost, 2002; MacDonald, MacDonald, Zanna, & Fong, 2000; Steele & Josephs, 1990). Alcohol myopia theory, for example, states that the acute disinhibitory effects of alcohol reduce ability to process complex information (such as long-term goals), thus allowing immediate and salient goals (such as sexual arousal) to influence behavior more strongly (Cooper, 2002; Dermen & Cooper, 2000; Steele & Josephs, 1990). Conversely, the desire to engage in sexual behavior may lead to heavier drinking because of the belief that alcohol favorably influences sexuality (Abbey et al., 1999; Goldman & Roehrich, 1991). Based on alcohol expectancy theory (Cooper, 2002; Dermen & Cooper, 2000), one of the reasons some college students use alcohol is their expectation that alcohol facilitates sexual drive and sexual affect (Abbey et al., 1999) and decreases sexual inhibitions (Kotchick, Shaffer, Forehand, & Miller, 2001). An analysis of interviews with sexually active women, for example, revealed that about half had used alcohol or drugs instrumentally to make sex more likely to occur (Taylor, Fulop, & Green, 1999).

## The Importance of Positive Expectancies

Alcohol expectancies are beliefs about the probability of experiencing positive and negative effects of alcohol (Baer, 2002; Cooper, 1994; Kuntsche, Knibbe, Gmel, & Engels, 2005; Leigh, 1989) and they include anticipated effects of alcohol on sex (Goldman & Roehrich, 1991). Alcohol use and sexual experiences are likely related by some sort of reciprocal or feedback association between expectancies about links between drinking and sex, sexual behaviors, and perceived positive and negative consequences of these events (Cooper, Frone, Russell, & Mudar, 1995). The large body of research regarding alcohol expectancies and the smaller body of research focusing on alcohol-sex expectancies both suggest the importance of positive anticipated consequences as predictors of behavior. Having positive alcohol expectancies, or anticipating rewarding effects as a result of drinking, is consistently associated with higher

rates of alcohol use (Baer, 2002; Leigh & Stacy, 2004) and with experiencing positive alcohol consequences among college students (Park & Grant, 2005). Consistent with a positive feedback loop, Patrick and Maggs (2008) found that experiencing more positive consequences from alcohol use in the prior week was associated with increases in plans to drink and in motivations to experience positive alcohol consequences the following week. Although less research has addressed alcohol-sex expectancies and experienced consequences of sexual behavior, it is similarly likely that individual differences in expectancies for the effects of alcohol use on sex (e.g., enhancing sexual feelings and arousal) predict both sexual behaviors and the likelihood of reporting positive and negative consequences as a result of sexual behaviors. Some data suggest that it is important both to have *positive expectancies* that alcohol leads to having sex and to *consume alcohol* in order to exhibit riskier sexual behavior on a given occasion (Dermen et al., 1998; Dermen & Cooper, 2000). In other words, alcohol-sex expectancies may be activated by drinking alcohol.

## Within-Person Findings

As noted previously, the majority of studies regarding alcohol use and sexual behavior have employed correlational, cross-sectional designs (Cooper, 2006; Cooper & Orcutt, 2000; Leigh & Stall, 1993). However, global predictors measured cross-sectionally provide little information about whether individuals engage in alcohol use and sexual behaviors on the same days or what factors determine whether they use condoms on one occasion and not on another. To elucidate the within-person associations requires models that track behaviors in the same people across multiple occasions, thus providing natural controls for between-persons differences (Raudenbush & Bryk, 2002).

Cooper's (2006) comprehensive review of studies linking alcohol use with sexual behavior and related consequences determined that within-person associations were inconclusive. Some within-person studies comparing behavior on drinking versus non-drinking occasions suggested that alcohol use was unrelated to condom use (Leigh, Ames, & Stacy, 2008). Among adults (aged 18 to 60 years old), alcohol did not predict engagement in sexual behaviors that posed risks for transmission of STDs (Leigh, 1993). In a diary study with individuals 15 to 21 years old with substance use disorders, event-level alcohol use did not predict condom use (Bailey, Gao, & Clark, 2006). Finally, in a sample of gay men 18 to 35 years old, daily diary reports showed no association between alcohol use and condom use with anal sex (Gillmore et al., 2002).

However, other repeated measures studies provide evidence that alcohol use may be associated with sexual behavior. For example, among individuals living with HIV/AIDS, alcohol use was associated with increased unprotected sex acts for men and decreased unprotected sex acts for women (Barta et al., 2008). A daily diary study of HIV-negative men who have sex with men found that alcohol use was associated both with having sex and a composite variable indicating sexual risk (Mustanski, 2008), although this study did not control for average alcohol use. Among college students, intoxication on a given day was not predictive of any sex, but did predict unsafe sex that day (Neal & Fromme, 2007). Similarly, among sexually active male college students, alcohol consumption was associated with decreased condom use with casual partners (but not with new partners or regular partners) with some evidence that decreased condom use after drinking was especially likely for individuals with stronger alcohol-sex expectancies (LaBrie et al., 2005).

It is likely that alcohol can have various effects, promoting or inhibiting sexual behavior, depending on characteristics of the people (e.g., expectancies), relationships, and situations (Cooper, 2006). Both drinking and condom use are more common with casual partners, but after controlling for partner type, greater alcohol use (within-person) has been shown to be

associated with less condom use (Cooper & Orcutt, 2000). In a study using retrospective reports of the most recent sexual event, drinking was not related to condom use in the full sample (Brown & Vanable, 2007). However, for sexual events involving a non-steady partner, alcohol use was associated with a greater likelihood of unprotected intercourse. Other evidence suggests that individuals may be more likely to have sex with a new or casual partner after drinking (Cooper, 2002; Testa & Collins, 1997).

## The Current Study

The current paper focuses on both objective behavioral co-occurrence of alcohol use with sexual behavior and the subjective consequences associated with sex in an effort to describe the covariation. Specifically, analyses address whether the number of drinks consumed on a given day is associated with sexual behaviors (i.e., oral sex, penetrative sex, any sex, number of sexual behaviors, and condom use) and short-term subjective consequences of sex (positive and negative), as well as the ways in which these associations may differ as a function of alcohol-sex expectancies regarding sexual affect and sexual drive. Gender and relationship type were included as between-persons controls. In addition, weekend days were included to control for the greater use of alcohol on weekends (Del Boca et al., 2004). Two specific research questions were addressed.

1. Are first-year college students more likely to engage in sexual behaviors and to experience short-term consequences of sexual behaviors on days they drink more alcohol?
2. Are within-person daily associations between alcohol use and sexual behaviors stronger for those with more positive alcohol-sex expectancies?

It was anticipated that all measures of sexual behavior (i.e., oral sex, penetrative sex, any sex, sum of sexual behaviors) would be positively predicted by the number of drinks consumed. It was also expected that the subjective experience of sex would differ, such that sexual occasions occurring after a greater number of drinks may be associated with more positive and negative consequences, compared to sexual occasions occurring after drinking fewer drinks. Based on research previously described, it was hypothesized that within-person associations of drinking with sexual behaviors and consequences would be stronger among individuals who expected alcohol to enhance their sexual affect and sexual drive (Abbey et al., 1999).

## Method

### Participants

Participants in the present analyses ($N$=218, 51.4% male) were recruited as part of a study to examine daily alcohol use and sexual behavior among traditionally-aged college students. Eligible participants were first-year, first-time, full-time students at a large state university in the Northeastern U.S., were 18 to 20 years of age, and were U.S. citizens or permanent residents. Individuals from racial and ethnic minorities were over-sampled for participant diversity. Based on self-reports, 27.9% of participants identified as Hispanic/Latino. Among non-Hispanic/Latino students, 27.0% identified as European American, 15.5% as African American, 19.3% as Asian American/Hawaiian/Pacific Islander, and 10.3% as more than one race. In the Spring semester, recruitment letters were sent to 330 students with a pen and $5 in cash enclosed. Email invitations followed, with secure links to the surveys administered via the world wide web. On campus residence was reported by 96.8% of the students. Mean age was 18.85 years ($SD$=0.38, range 18.12 – 20.74).

Students were invited to complete a baseline web-based survey and then 14 consecutive daily web-based surveys. After the baseline was completed, an invitation with a secure link was sent

to participants to sign into the daily online survey. Once a participant started the daily surveys, an email reminder was sent each day. Incentives for participation were the $5 pre-incentive, a $25 baseline survey incentive, and $3 per daily survey with an $8 completion bonus (maximum $80 total for all surveys). Participants provided an electronic signature on an online consent form. The study was approved by The Institutional Review Board and protected by a federal Certificate of Confidentiality. Data collection was confidential, and tracking information was stored in separate and secured files.

Recruitment rate (i.e., percent of invited individuals who provided data) was 70.6% ($N$=233) for the baseline survey and 68.8% ($N$=227) for at least one daily survey. Of those who provided any data, the retention rate (i.e., percent who provided enough data to be included in the analyses presented here) was 93.6% ($N$=218). All 14 days were completed by 74.7% ($n$=174) and 12 or more days were completed by 88.4% ($n$=206) of the total sample. Of the possible 3262 days (233 people × 14 days), data on 3004 days (92.1%) were collected and data on 2879 (88.3% of possible) days were used in the present analyses.

## Measures

**Baseline Survey—**Relationship Status was reported by the question, “Which of the following best describes you right now?” coded as 0=*not dating anyone right now*, 1=*casually dating someone*, and 2=*in a serious and committed relationship/living with my partner*. The majority of participants (52.8%) were not dating, 16.5% were casually dating, and 30.7% were in a serious relationship.

Alcohol Expectancies Regarding Sex were assessed by two subscales from Abbey et al.’s (1999) 25-item AESASVQ (Alcohol Expectancies Regarding Sex, Aggression, and Sexual Vulnerability Questionnaire). Scales measured beliefs about *Sexual Affect Alcohol Expectancies* (6 items; e.g., when drinking alcohol, I say and do romantic things, α=.89) and *Sexual Drive Alcohol Expectancies* (6 items; e.g., when drinking alcohol, I am likely to initiate sex, α=.96). Responses ranged from 0=*not at all* to 4=*very much*. The AESASVQ has demonstrated convergent validity with other measures of alcohol expectancies; discriminant validity by being uncorrelated with measures of social desirability, aggression, and sexuality; and predictive validity with actual alcohol use (Abbey et al., 1999). Sexual Affect and Sexual Drive Alcohol Expectancies were highly correlated in the present sample, $r$=.73, and therefore entered separately as predictors in analytical models.

**Daily Survey (14 Days)—**Weekend Days were coded as 1=Thursday, Friday, or Saturday and 0=Sunday, Monday, Tuesday, or Wednesday (similar to Lee, Maggs, & Rankin, 2006).

Alcohol Use was measured by reports of the number of standard drinks consumed in the prior day. The definition of “a drink” provided to respondents was “half an ounce of absolute alcohol, for example: 12 ounce can or glass of beer or cooler, 5 ounce glass of wine, drink containing 1 shot of liquor” (NIAAA, 2003). Respondents were asked, “How many drinks of alcohol did you drink yesterday?” A drop down menu allowed responses from *0 drinks* to *25 or more drinks*.

**Sexual Behavior:** Each day, participants were asked whether they had had oral sex (2 questions: “Did you perform oral sex on a partner yesterday?” and “Did a partner perform oral sex on you yesterday?”), vaginal sex (“Did you have vaginal sex yesterday?”), and anal sex (“Did you have anal sex yesterday?”). For each day, sexual behavior was coded in four ways to explain different aspects of behavior: (1) whether oral sex (received or performed) was reported (0=*no*, 1=*yes*); (2) whether penetrative sex (vaginal or anal) was reported (0=*no*, 1=*yes*); (3) whether any sex was reported (0=*none*, 1=*oral and/or penetrative*); and (4) a sum of the four sex behaviors (i.e., performing oral, receiving oral, vaginal, and anal).

Sexual behaviors were assessed with a variety of indicators to reflect a range of physical intimacy and health risk associated with multiple forms of sexual contact. For example, after drinking, individuals may be more likely to engage in behaviors with no risk for pregnancy and lower risk for STDs (i.e., oral sex rather than penetrative sex), or to engage in a wider variety of behaviors due to real or perceived disinhibition (i.e., sum of behaviors). Specifically, differentiating oral sex behaviors is especially important in this young college sample, 38% of whom had never engaged in penetrative sex, because individuals often engage in oral sex before they initiate penetrative sex (Prinstein et al., 2004; Schwartz, 1999). Participating in oral sex, vaginal sex, or anal sex each involve specific cumulative health risks of oral and genital STD contraction (CDC, 2000; Chambers, 2007).

On days participants reported engaging in any of the sexual behaviors, a series of follow-up questions were asked. First, participants reported if they used contraception or disease protection. If yes, they were asked to check all forms of protection that applied. In the present analyses, Condom Use was coded only for days with penetrative sex as 0=*no* and 1=*yes*. Second, experienced short-term Positive and Negative Consequences of Sex associated with any sex were assessed. The stem question read, "As a result of your sexual experiences yesterday, did you…" with a 0=*no* and 1=*yes* response for 19 consequences. Positive consequences (7 items, α=.67; e.g., feel attractive, feel closer to your partner) and negative consequences (12 items, α=.73; e.g., feel like things moved too fast, worried about pregnancy) were summed separately. Finally, on days with any sexual behavior, participants were asked about Drinking Prior to Sex with the question, "Did you or your partner consume alcohol before or during this sexual experience?" Responses were coded based on the participants' drinking, 0=*neither of us did* or *just my partner did* and 1=*we both did* or *just I did*. This measure was used to ensure that on days when participants reported both drinking and sex, the alcohol use occurred before or during the sexual encounter. Therefore, the six days (out of 43 days on which both drinking and sex occurred) on which a participant reported both consuming alcohol and having sex but did not report drinking prior to or during sex were excluded from the analyses (yielding drinking before sex days, *n*=37).

## Plan of Analysis

The extent to which there were daily associations between alcohol use and sexual behaviors and the extent to which these varied as a function of between-persons differences in alcohol-sex expectancies were the focus of the current work. Multilevel models (MLMs) (Raudenbush & Bryk, 2002; Singer & Willett, 2003; Snijders & Bosker, 1999) were used to model up to 14 days of data for each person using HLM 6.04 software (Raudenbush & Bryk, 2002). These MLMs modeled days (Level 1) nested within people (Level 2) to test for both within-person and between-persons associations (example equations shown below). Seven daily dependent variables were modeled: oral sex, penetrative sex, any sex, the sum of sexual behaviors, condom use with penetrative sex, and short-term positive and negative consequences of sexual behavior. Between-persons (Level 2) effects were gender, relationship status, person means of alcohol (aggregated across days), and alcohol-sex expectancies (sexual affect and sexual drive, tested separately). Person means of alcohol use across days controlled for individual differences in the average levels of individuals' drinking to isolate the effects of a given day's drinking within individuals. Within-person (Level 1) effects were whether it was a weekend day, the (person-centered) number of drinks of alcohol consumed that day, and the interaction between number of drinks and alcohol-sex expectancies. The following equations describe the within-person (Level 1) and between-persons (Level 2) portions of the MLM:

$$\text{Sexual Behavior}_{it}=\beta_{0i}+\beta_{1i}{}^{*}\text{Weekend Day}+\beta_{2i}{}^{*}\text{Number of Drinks}+r_{it} \quad \text{Level 1}$$

$$\beta_{0i} = \gamma_{00} + \gamma_{01}{}^{*}\text{Male Gender} + \gamma_{02}{}^{*}\text{Relationship Status} + \gamma_{03}{}^{*}\text{Person Mean Alcohol Use} + \gamma_{04}{}^{*}\text{Alcohol–Sex Expectancies} + u_{0i}$$

$$\beta_{1i} = \gamma_{10}$$

$$\beta_{2i} = \gamma_{20} + \gamma_{21}{}^{*}\text{Alcohol–Sex Expectancies}$$

Level 2

As described in the Level 1 equation, sexual behavior for a given person on a given day was modeled as a function of an intercept ($\beta_{0i}$), a slope indicating the incremental change in sexual behavior on weekend days ($\beta_{1i}$), a slope indicating the incremental change in sexual behaviors with every additional drink consumed ($\beta_{2i}$), and a within-person error term ($r_{it}$). At Level 2, the model includes the sexual behavior intercept ($\gamma_{00}$); the effect of being male ($\gamma_{01}$); the effect of being in a more committed relationship ($\gamma_{02}$); the effect of between-persons differences in average alcohol use across the measured days ($\gamma_{03}$); the effect of between-persons differences in alcohol-sex expectancies ($\gamma_{04}$); and between-persons residuals ($u_{0i}$). The slope indicating the incremental change in sexual behavior on weekend days ($\gamma_{10}$) is also included. Finally, the within-person alcohol-sexual behavior slopes ($\beta_{2i}$) were modeled as the average association of daily alcohol use and sexual behavior across all individuals in the sample ($\gamma_{20}$) plus the effect of between-persons differences in alcohol-sex expectancies on this association ($\gamma_{21}$; i.e., the Alcohol Use × Alcohol-Sex Expectancies interaction). In addition, the potential for gender to moderate the association of daily drinking with the seven outcomes was tested for all models, but there was no evidence for gender moderation so these effects were not included in the final models shown.

The equations described above are linear. However, the varied distributional properties of the seven daily dependent variables necessitated the use of three types of MLMs. A logistic Bernoulli distribution was used for the dichotomous outcomes of oral sex, penetrative sex, any sex, and condom use (Raudenbush & Bryk, 2002), a Poisson distribution was used for the sum of sexual behaviors which was skewed with a large number of zeroes (Snijders & Bosker, 1999), and a linear model was used for the positive and negative sexual consequences outcomes which approximated a normal distribution. Results with trend level significance ($p < .10$) were reported and interpreted with caution, due to modest sample size and the relatively rare occurrence of the behaviors of interest (e.g., penetrative sex was reported on only 4.6% of days) and resulting low power to detect effects.

## Results

### Daily Behaviors

Data were available from 218 people on 2879 days. Table 1 shows the number of people who reported at least one occasion of each behavior, and the number of days that each behavior was reported in this sample. The majority of days (81.2%) were both non-drinking and non-sex days. Participants reported consuming five or more drinks on 236 days (59.0% of drinking days). In total, 87.6% of drinking days and 53.3% of sexual behavior days were on a weekend. Of days when participants reported both drinking and having sex, 94.9% were weekend days. Consistent with previous research (Desiderato & Crawford, 1995;MacNair-Semands & Simono, 1996), 40% of the students who had sex in the 14 days used alcohol prior to sex at least once. Alcohol use preceded sex on a total of 21% of days on which sex occurred. Table 2 reports descriptive statistics for all measured variables.

### Alcohol Use Predicting Sexual Behaviors Across Days

**Oral sex and penetrative sex—**Logistic MLMs were computed predicting the likelihood of engaging in oral sex and penetrative sex on a given day. Results with sexual affect alcohol

expectancies are shown in Table 3. Similar models were tested substituting sexual drive alcohol expectancies for sexual affect alcohol expectancies and the results were similar, except as noted in the text.

Between-persons, the likelihood of engaging in oral and penetrative sex on average across the 14 days did not differ between men and women ($\gamma_{01}$) or as a function of person mean drinks ($\gamma_{03}$). On average, participants in more committed relationships ($\gamma_{02}$) were more likely to report oral sex and penetrative sex. Stronger sexual affect alcohol expectancies ($\gamma_{04}$) were marginally significantly associated with a greater likelihood of penetrative sex only. Results with sexual drive expectancies (not tabled) showed that, on average, stronger sexual drive alcohol expectancies were associated with a greater likelihood of reporting oral sex (Odds Ratio [OR] =1.43, Confidence Interval=[1.09, 1.87], $p < .01$) and penetrative sex (OR=1.74 [1.32, 2.30], $p < .001$).

Examining the within-person associations, participants had a higher likelihood of having oral and penetrative sex on weekend days ($\gamma_{10}$). Addressing Research Question 1, the number of drinks consumed ($\gamma_{20}$) predicted a greater likelihood of oral sex. Specifically, for every additional drink, the odds of having oral sex on that day were 12% greater. Number of drinks consumed did not significantly predict the likelihood of penetrative sex. Examining Research Question 2, the between-persons differences in the association of alcohol use with oral and penetrative sex ($\gamma_{21}$), there was a significant Alcohol Use × Sexual Affect Alcohol Expectancies interaction and a trend level Alcohol Use × Sexual Drive Alcohol Expectancies interaction (OR=1.07 [0.99, 1.16], $p$=.094). The shape of these interactions suggested that for people with stronger alcohol-sex expectancies, consuming more drinks was associated with a greater likelihood of engaging in oral sex. For people with less positive alcohol-sex expectancies, there was a weaker positive association between daily alcohol use and oral sex. Neither the Alcohol Use × Sexual Affect nor the Alcohol Use × Sexual Drive Alcohol Expectancies interactions were significant for penetrative sex.

**Any sex—**Models with the binomial outcome of any sex were also conducted (not tabled). Between-persons, the likelihood of engaging in any sex on average across days did not differ by gender ($\gamma_{01}$) or by person mean drinks ($\gamma_{03}$). On average, participants in more committed relationships ($\gamma_{02}$) were more likely to report any sex (OR=3.07 [2.29, 4.11], $p$<.001). Stronger sexual affect alcohol expectancies ($\gamma_{04}$) were marginally significantly associated with a greater likelihood of any sex (OR=1.30 [0.98, 1.74], $p$=.073). In a separate model, stronger sexual drive alcohol expectancies were associated with a greater likelihood of reporting any sex (OR=1.49 [1.22, 1.82], $p$<.001).

Examining the within-person associations, participants had a greater likelihood of having any sex on weekend days ($\gamma_{10}$; OR=1.61 [1.08, 2.40], $p$=.021). Addressing Research Question 1, the number of drinks consumed ($\gamma_{20}$) did not significantly predict a greater likelihood of any sex in models with sexual affect (OR=1.07 [0.98, 1.16], $p$=.129) or sexual drive (OR=1.07 [0.96, 1.17], $p$=.104). Examining Research Question 2 ($\gamma_{21}$), there were no significant Alcohol Use × Alcohol Expectancies interactions for any sex.

**Condom use—**On average, participants in more committed relationships were less likely to report using condoms with penetrative sex ($\gamma_{02}$). No other between-persons variables (i.e., gender [$\gamma_{01}$], person mean drinks [$\gamma_{03}$], alcohol-sex expectancies [$\gamma_{04}$]) uniquely predicted average levels of condom use across the 14 days, nor did the likelihood of condom use with penetrative sex differ within-person by whether the sex occurred on a weekday or weekend ($\gamma_{10}$). However, a greater number of drinks consumed on a given day ($\gamma_{20}$) predicted lower odds of condom use at a trend level of significance (Research Question 1). The interactions of

Alcohol Use × Sexual Affect (or Sexual Drive) Alcohol Expectancies ($\gamma_{21}$) were not significantly associated with condom use (Research Question 2).

**Daily sum of sexual behaviors—**Results for the sum of sexual behaviors outcome variable using MLM with a Poisson distribution are shown in Table 4. Between-persons, gender ($\gamma_{01}$) and person mean drinks across the 14 days ($\gamma_{03}$) were not predictive of the number of sexual behaviors reported. On average, individuals in more committed relationships ($\gamma_{02}$) reported a greater number of sexual behaviors. In addition, people with more positive sexual affect alcohol expectancies ($\gamma_{04}$) and sexual drive alcohol expectancies (not tabled, Coefficient=1.54, Confidence Interval=[1.23, 1.93], $p<.001$) reported more sexual behaviors.

Within-person, on weekend days ($\gamma_{10}$) participants reported engaging in a greater number of sexual behaviors. On days individuals consumed a greater number of drinks ($\gamma_{20}$), they reported no difference in the number of sexual behaviors, providing a null result for Research Question 1. However, there was an Alcohol Use × Sexual Affect Alcohol Expectancies interaction ($\gamma_{21}$) supporting hypotheses regarding Research Question 2. In other words, the effect of alcohol use on the sexual behaviors sum was contingent on sexual affect alcohol expectancies. That is, number of drinks only predicted a greater number of sexual behaviors among individuals who reported stronger alcohol-sex expectancies. The same interaction with sexual drive alcohol expectancies was not significant.

**Positive and negative sex consequences—**Variations in short-term positive and negative consequences of sex across days with oral or penetrative sex were modeled using linear MLM equations. Results with sexual drive alcohol expectancies are shown in Table 5; results with sexual affect expectancies are not tabled but differences obtained in analyses are noted in the text. Between-persons variables including gender ($\gamma_{01}$), relationship status ($\gamma_{02}$), and person mean drinks ($\gamma_{03}$) did not uniquely predict consequences. On average, sexual drive alcohol expectancies ($\gamma_{04}$) were associated with more positive (but not more negative) sexual consequences across days. Sexual affect alcohol expectancies (not tabled) were not associated with consequences of sex across days.

Within-person, reported sex consequences did not differ between weekdays and weekends ($\gamma_{10}$). Number of drinks ($\gamma_{20}$) was significantly associated with number of positive (but not negative) consequences of sex in the models with sexual drive alcohol expectancies (Research Question 1). There was an interaction of Alcohol Use × Sexual Drive Alcohol Expectancies ($\gamma_{21}$) at a trend level of significance predicting negative sex consequences (Research Question 2). The shape of the interaction suggested that for people with stronger sexual drive alcohol expectancies, consuming more drinks was associated with experiencing more negative consequences. For people with weaker sexual drive alcohol expectancies, consuming more drinks was associated with experiencing fewer negative consequences. In models with sexual affect expectancies, number of drinks and the Alcohol Use × Sexual Affect Alcohol Expectancies interactions were both non-significant.

**Gender interactions—**The potential moderating role of gender was tested in a series of additional models by adding a Gender × Alcohol Use ($\gamma_{22}$) coefficient to all models shown. However, there was no evidence that the association between alcohol use and sexual behavior or consequences on a given day differed for men and women in these analyses.

## Discussion

After controlling for individual differences in alcohol use and for whether the day was on a weekend, within-person variation in the number of drinks consumed was positively associated with variation in oral sex. This provided only partial support for the hypothesis regarding the

first research question, that drinking and sex would be associated on a day-to-day basis. No significant main effect of within-person variation in drinking was found for penetrative sex, any, sex, or the sum of sexual behaviors; a trend level of significance was found indicating a lower likelihood of condom use after drinking. The second research question pertained to the potential moderating role of alcohol-sex expectancies. Hypotheses were partially supported, in that individuals with stronger alcohol-sex expectancies were more likely to engage in oral sex and to report a greater total number of sexual behaviors after drinking, compared to individuals with weaker alcohol-sex expectancies. This moderation effect was not significant for penetrative sex, any sex, or condom use.

Perhaps oral sex is a behavior that is more likely to result from the disinhibitory effects of alcohol, while penetrative sex is more often determined by other factors including the strength of the interpersonal relationship. Developmentally, oral sex behaviors are often engaged in prior to individuals' first penetrative sexual encounter (Prinstein et al., 2004; Schwartz, 1999), and suggesting that it may require less commitment in a relationship. Although we cannot address these issues with the present data, we also speculate that the meanings and norms surrounding oral sex versus penetrative sex are likely to differ, due to some combination of the differences in risk for pregnancy and for STDs, perceptions that oral sex is less intimate (Chambers, 2007), and ambiguity regarding whether or not it is "sex" (Saunders & Reinisch, 1999).

Findings related to consequences of sexual behavior were also mixed. Alcohol-sex expectancies had a direct association with perceived positive (but not negative) consequences of sex. In addition, on heavier drinking days, participants reported experiencing more short-term positive (but not negative) consequences of sex. When students perceive more positive sex consequences on days they consume more drinks, compared to days they consume fewer drinks, expectancies about alcohol's facilitative effects on sex may be reinforced. There is likely a reciprocal association between alcohol use, positive sex consequences, and alcohol-sex expectancies that perpetuates both alcohol use and sexual behaviors (Cooper, Frone, Russell, & Mudar, 1995). For negative consequences, an interaction at a trend level of significance suggested that individuals with stronger sexual drive expectancies were more likely to experience negative consequences of sex after drinking than those individuals with weaker expectancies. This was consistent with the hypothesized link between drinking and negative consequences for persons with stronger expectancies, but awaits replication in an independent and larger sample.

Gender was not a significant main effect predictor of sexual behaviors or a moderator of the effect of consuming a greater number of drinks on a given day in this study of first-year college students. Prior research is not consistent in predicting a gender difference in the prevalence of sexual behaviors in this age range, and findings of higher prevalence among men have been questioned (e.g., Lefkowitz & Gillen, 2005). The assessment of recent (i.e., daily) rather than long-term retrospective (e.g., lifetime) of sexual behaviors is less impacted by cognitive aggregation biases in reported sexual behaviors that result in gender differences across longer but not shorter reporting periods (Brown & Sinclair, 1999). In addition, this null result may be the result of insufficient variation to test for significant gender differences in within-person associations, given the relatively low frequency of sexual behaviors. However, future research should utilize research designs with greater power to investigate the whether alcohol use may differentially influence sexual behaviors of male and female college students, given evidence of gender differences in the association of alcohol use on sexual behaviors among people living with HIV/AIDS (e.g., Barta et al., 2008).

Use of alcohol and other substances is commonly understood as a contributor to risky sexual behavior, defined as behavior that increases the probability of negative outcomes such as

unwanted pregnancy or STDs (e.g., Hingson et al. 2005). It is important to note, however, that although drinking did predict oral sex on a given day, on the majority of days on which sex was reported there was no alcohol use reported, and vice versa. In fact, on four-fifths of all days, participants reported neither drinking nor sexual behaviors. On the other hand, although students abstained from drinking and from sex on the great majority of days, behavioral risk across days was arguably high. That is, on days that college students reported drinking, they consumed more than 5 drinks over half of the time, and on days they had penetrative sex they did not use condoms half of the time.

## Implications

This study illustrated that alcohol use and sexual behavior were related particularly among people who expected that alcohol facilitated sexual affect and sexual drive. Independent of individual differences in relationship status and average drinking level, holding stronger beliefs that alcohol enhances sexual affect or sexual drive predicted a greater likelihood of sexual behaviors (except condom use) and positive consequences of sex. This supports alcohol expectancy theory, which states that drinking may lead to sexual risk-taking because of the self-fulfilling prophecy that alcohol is believed to lead to sexual behavior (Cooper, 2002; Dermen & Cooper, 2000; Goldman & Roehrich, 1991). The central role of expectancies suggests that expectancy challenge approaches (Darkes & Goldman, 1993) focusing on alcohol-sex expectancies may be particularly appropriate. Furthermore, researchers and practitioners should be cautious about public health messages implying that alcohol use has a causal effect on sexual behavior, because strong statements that lead people to believe that alcohol is universally associated with sexual behavior may have an iatrogenic effect by reinforcing alcohol-sex expectancies and thereby increasing health risk behaviors.

## Strengths and Limitations

The current study addressed an important gap in the research literature. Despite the hundreds of research studies focusing on the behaviors of alcohol use and sexual behavior (Cooper, 2006), less empirical data has linked the behaviors on a day-to-day basis. Strengths of the present study include the within-person analysis of daily data on alcohol use and sexual behavior across 14 consecutive days and controlling for weekend fluctuations and individual differences in behavior. The use of daily person-centered number of drinks as the predictor provides an appropriately conservative test that isolates the within-person association between alcohol use and sexual behavior, because it requires that individuals drink more or less than usual (i.e., differ from their own mean number of drinks) to find a statistical relationship. Level of relationship commitment was also considered and was a consistent predictor of sexual behavior.

Limitations include a sample of first-year college students in a single academic institution and data from a two-week period that may or may not generalize to other times in the academic and calendar years (e.g., Del Boca et al., 2004). The time period contains limited variation, particularly for sexual behaviors, and therefore reduced power to demonstrate associations among variables. Therefore, null results are less conclusive than would be the case in a larger sample or with a longer time interval. Another limitation is that the perceived desirability of alcohol's effects on sexual affect and sexual drive was not measured. Some individuals may view an enhancing effect of alcohol on sexual drive as highly rewarding, whereas others may see this as a reason to avoid drinking. The extent to which sex after drinking was a desired goal (e.g., drank alcohol expressly to affiliate with romantic partners) or a mistake (e.g., judgment was impaired) was not assessed.

### Future Directions

According to alcohol myopia theory, if the strongest and most salient cues encourage sex (e.g., arousal) then an individual may be more likely to have risky sex. On the other hand, when the environmental cues highlight behavioral risks (e.g., "AIDS Kills" stamped on bar patrons hands), intoxicated individuals have been found to be more likely to have safe sex intentions than sober individuals (MacDonald, Fong, Zanna, & Martineau, 2000; Steele & Josephs, 1990). As a result, future studies with innovative measures of environmental cues supporting or inhibiting sex will be especially helpful in elucidating how drinking affects sexual behaviors. This includes a better understanding of where and with whom individuals are drinking. In particular, drinking venues (e.g., bars, clubs) also tend to be places to interact with potential partners (Abbey, Saenz, & Buck, 2005; Cooper, 2002; Dermen & Cooper, 2000; Leigh, 1993) and may be a third variable explanation for associations between drinking and sex.

Future research should incorporate additional behaviors (e.g., kissing), distinguish alcohol's effects on oral sex versus penetrative sex, and explore potential similarities and differences between homosexual and heterosexual behaviors in more diverse samples to more fully describe how alcohol use is associated with behaviors that have important personal, relational, developmental, and public health significance (Gulledge, Stahmann, & Wilson, 2004; Welsh, Haugen, Widman, Darling, & Grello, 2005). In addition, a wider variety of expectancies should be investigated, including expectancies for one's ability to use condoms when intoxicated (Gebhardt, Kuyper, & Gruensven, 2003). Finally, the ways in which behavioral links between drinking and sex may change over time developmentally and within and across specific relationships are areas for future investigation.

Understanding the processes linking alcohol use and sexual behavior is necessary to inform more differentiated and effective interventions to reduce health risks and promote relational and sexual health. For instance, the expanding market for brief, motivation-based approaches to intervention demands specific knowledge of the role of expectancies in producing behavior and behavioral consequences (Burke, Arkowitz, & Menchola, 2003; Tevyaw & Monti, 2004). As expectancies for drinking and sex are better understood, it will become clearer whether these behaviors could be targeted together in motivation-based interventions designed to promote public health by reducing the harm associated with alcohol use (e.g., alcohol poisoning) and sexual behavior (e.g., STDs).

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**Table 1**

Alcohol Use and Sexual Behavior: Prevalence across People and Days

| | Drinking | Oral Sex | Penetrative Sex | Any Sex | No Condom† | Drinking and Sex‡ |
|---|---|---|---|---|---|---|
| Number of People (%) | 132 (60.6) | 58 (26.6) | 60 (27.5) | 72 (33.0) | 33 (55.0) | 29 (40.3) |
| Number of Days (%) | 400 (13.9) | 120 (4.2) | 133 (4.6) | 177 (6.1) | 65 (48.9) | 37 (20.9) |

*Note*. Total people $N = 218$, Total days $N = 2879$.

†Reported for penetrative sex days only; denominators for percentages are 60 people and 133 days.

‡Reported for any sex days only; denominators for percentages are 72 people and 177 days.

**Table 2**

Descriptive Statistics

| | *M* | *SD* | Actual Range |
|---|---|---|---|
| Within-person Constructs (Level 1), Measured Daily | | | |
| Number of Drinks (All Days) | 0.85 | 2.59 | 0–20 |
| Number of Drinks (Drink Days) | 6.15 | 4.00 | 1–20 |
| Oral Sex | 0.04 | 0.20 | 0–1 |
| Penetrative Sex | 0.05 | 0.21 | 0–1 |
| Any Sex | 0.06 | 0.24 | 0–1 |
| Number of Sex Behaviors | 0.10 | 0.43 | 0–3 |
| No Condom Use† | 0.49 | 0.50 | 0–1 |
| Positive Sex Consequences‡ | 4.14 | 1.48 | 0–7 |
| Negative Sex Consequences‡ | 0.67 | 1.21 | 0–6 |
| Between-persons Constructs (Level 2) | | | |
| Male Gender | 0.51 | 0.50 | 0–1 |
| Mean Drinks Per Day | 0.89 | 1.23 | 0–6 |
| Relationship Status | 0.78 | 0.89 | 0–2 |
| Sexual Affect Expectancies | 1.68 | 1.01 | 0–4 |
| Sexual Drive Expectancies | 1.47 | 1.20 | 0–4 |

*Note*. Level 1 $N = 2879$ person days, Level 2 $N = 218$ people.

† Measured only on days with penetrative sex.

‡ Reported for any sex days only.

## Table 3

Predicting Oral Sex, Penetrative Sex, and Condom Use with Alcohol-Sex Expectancies and Daily Drinking

| | **Oral Sex OR [CI]** | **Penetrative Sex OR [CI]** | **Condom Use with Penetrative Sex‡ OR [CI]** |
|---|---|---|---|
| Average Outcome over 14 Days, $\beta_0$ | | | |
| Intercept, $\gamma_{00}$ | 0.002 [0.001, 0.003]*** | 0.002 [0.001, 0.004]*** | 12.433 [0.465, 332.746] |
| Male Gender, $\gamma_{01}$ | 1.484 [0.734, 3.004] | 1.240 [0.615, 2.499] | 3.756 [0.432, 32.634] |
| Relationship Status, $\gamma_{02}$ | 3.744 [2.554, 5.489]*** | 3.590 [2.472, 5.215]** | 0.136 [0.029, 0.628]* |
| Person Mean Drinks, $\gamma_{03}$ | 0.867 [0.621, 1.211] | 1.059 [0.728, 1.542] | 0.918 [0.338, 2.492] |
| Sexual Affect Expectancies, $\gamma_{04}$ | 1.273 [0.899, 1.802] | 1.435 [0.983, 2.093]† | 0.442 [0.153, 1.275] |
| Average Effect of Weekend, $\beta_1$ | | | |
| Intercept, $\gamma_{10}$ | 1.952 [1.173, 3.249]* | 2.573 [1.555, 4.258]*** | 2.300 [0.279, 18.925] |
| Average Fluctuations in Daily Alcohol Use, $\beta_2$ | | | |
| Intercept, $\gamma_{20}$ | 1.117 [1.012, 1.233]* | 0.979 [0.888, 1.080] | 0.636 [0.371, 1.089]† |
| Sexual Affect Expectancies, $\gamma_{21}$ | 1.106 [1.007, 1.214]* | 1.078 [0.953, 1.219] | 1.150 [0.799, 1.651] |

*Note*.

† $p < .10$,

* $p < .05$,

** $p <. 01$,

*** $p < .001$. Level 1 $N = 2879$ person days, Level 2 $N = 218$ people, unless otherwise noted.

‡Reported for penetrative sex days only, Level 1 $N = 133$ person days, Level 2 $N = 60$ people. OR = odds ratio; CI = 95% confidence interval. β coefficients (Level 1) are estimated for each person. γ coefficients (Level 2) are aggregate estimates across the sample and are presented in the table.

## Table 4

Predicting Sum of Daily Sexual Behavior with Alcohol-Sex Expectancies and Daily Drinking

| | Sexual Behavior Sum | |
|---|---|---|
| | **Coefficient (SE)** | **Event Rate Ratio** |
| Average Outcome over 14 Days, $\beta_0$ | | |
| Intercept, $\gamma_{00}$ | −5.472 (0.323)*** | 0.004 |
| Male Gender, $\gamma_{01}$ | 0.402 (0.303) | 1.494 |
| Relationship Status, $\gamma_{02}$ | 1.310(0.167)*** | 3.706 |
| Person Mean Drinks, $\gamma_{03}$ | −0.002 (0.155) | 0.998 |
| Sexual Affect Expectancies, $\gamma_{04}$ | 0.330 (0.157)* | 1.391 |
| Average Effect of Weekend, $\beta_1$ | | |
| Intercept, $\gamma_{10}$ | 0.680 (0.188)** | 1.974 |
| Average Fluctuations in Daily Alcohol Use, $\beta_2$ | | |
| Intercept, $\gamma_{20}$ | 0.035 (0.037) | 1.036 |
| Sexual Affect Expectancies, $\gamma_{21}$ | 0.101 (0.043)* | 1.107 |

Note.

* $p < .05$,

** $p <. 01$,

*** $p < .001$. Level 1 $N = 2879$ person days, Level 2 $N = 218$ people.

## Table 5

Predicting Daily Sexual Behavior Consequences with Alcohol-Sex Expectancies and Daily Drinking

| | Positive Consequences | Negative Consequences |
|---|---|---|
| | Coefficient (SE) | Coefficient (SE) |
| Average Outcome over 14 Days, $\beta_0$ | | |
| Intercept, $\gamma_{00}$ | 4.247 (0.468)*** | 1.554 (0.544)** |
| Male Gender, $\gamma_{01}$ | 0.107 (0.306) | −0.120 (0.319) |
| Relationship Status, $\gamma_{02}$ | −0.110 (0.077) | −0.382 (0.253) |
| Person Mean Drinks, $\gamma_{03}$ | 0.077 (0.139) | −0.110 (0.107) |
| Sexual Drive Expectancies, $\gamma_{04}$ | 0.273 (0.126)* | −0.134 (0.253) |
| Average Effect of Weekend, $\beta_1$ | | |
| Intercept, $\gamma_{10}$ | −0.089 (0.254) | −0.143 (.168) |
| Average Fluctuations in Daily Alcohol Use, $\beta_2$ | | |
| Intercept, $\gamma_{20}$ | 0.171 (0.077)* | −0.105 (0.075) |
| Sexual Drive Expectancies, $\gamma_{21}$ | −0.125 (0.079) | 0.134 (0.077)† |

Note.

† $p < .10$,

* $p < .05$,

** $p <. 01$,

*** $p < .001$. Reported on days with any sex only, Level 1 $N = 177$ person days, Level 2 $N = 72$ people.