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Use of Drinking Protective Behavioral Strategies in Association to Sex-Related Alcohol Negative Consequences: The Mediating Role of Alcohol Consumption

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Abstract

Alcohol use has been implicated as a risk factor for sexual negative consequences, such as unprotected sexual intercourse. The present research was conducted to examine the relationship between drinking protective behavioral strategies and consensual sex-related alcohol negative consequences, and whether this relationship varied by gender. Additionally, typical number of drinks during sexual behavior was evaluated as a potential mediator of this association. Heavy drinking, sexually active college students ($N = 297$, 50.2% female) completed self-report measures of drinking protective behavioral strategies, alcohol consumption, and sex-related alcohol negative consequences. Findings indicated that women who used drinking protective behavioral strategies more frequently were less likely to experience sex-related alcohol negative consequences whereas this relationship was not significant for men. For women, this relationship was mediated by the typical number of drinks consumed during sexual behavior. The current research demonstrates that use of drinking protective behavioral strategies is related to a reduction in women's sex-related risks when drinking. Findings are discussed in terms of alcohol myopia theory. Implications for interventions aimed to reduce higher risk sexual behavior among college students are discussed.

Keywords

alcohol; alcohol-related problems; protective behavioral strategies; sexual behavior; sexual risk taking

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Sexual risk taking behavior, such as multiple or casual partners, unprotected sexual activity, and coinciding substance use, puts adolescents and young adults at risk for experiencing sexually transmitted infections (STIs) and HIV (American College Health Association [ACHA], 2008; Centers for Disease Control and Prevention [CDC], 2008a; Weinstock, Berman, & Cates, 2004) and unwanted pregnancies (ACHA, 2008; Henshaw, 1998). The use of alcohol and other substances appears to be related to sex-related risks. Previous research indicates that young adults who report substance abuse are at greater risk for STIs (Substance Abuse and Mental Health Services Administration, 2007) and unprotected sex when drinking (Hingson, Heeren, Winter, & Wechsler, 2005). Because of the negative consequences associated with alcohol-related sexual risk taking behaviors, it is critical to identify factors that may decrease these consequences. Thus, the purpose of the present study was to examine the relationship between drinking protective behavioral strategies (PBS) and consensual sex-related alcohol negative consequences among college students, and whether this relationship varied by gender. Moreover, we aimed to examine if this relationship was mediated by alcohol consumption.

Drinking Protective Behavioral Strategies

Drinking PBS are cognitive-behavioral strategies used to limit alcohol consumption and/or minimize related negative consequences (Benton et al., 2004; Delva et al., 2004; Glassman, Werch, & Jolbi, 2007; Martens et al., 2004, 2005, 2008; Martens, Ferrier, & Cimini, 2007a; Martens, Pederson, LaBrie, Ferrier, & Cimini, 2007b; Sugarman & Carey, 2007). These strategies include spacing drinks, alternating alcoholic drinks with non-alcoholic beverages, setting a limit on consumption, or finding alternative activities that do not include alcohol. Many college student prevention and intervention efforts include drinking PBS as a skills-training component (Barnett, Murphy, Colby & Monti, 2007; Carey, Scott-Sheldon, Carey, & DeMartini, 2007; Dimeff, Baer, Kivlahan, & Marlatt, 1999; Larimer & Cronce, 2007; Larimer et al., 2007; Walters & Baer, 2006). While research has identified both direct and mediating effects of increased drinking PBS on decreasing alcohol use and general alcohol-related negative consequences (Benton et al., 2004; Delva et al., 2004; Glassman et al., 2007; Martens et al., 2004, 2005, 2007a, 2007b, 2008, Sugarman & Carey, 2007), the current study extends this research literature by examining the specific impact of drinking PBS on sex-related alcohol negative consequences.

The majority of studies examining the use of drinking PBS evaluate drinking behaviors and general alcohol-related negative consequences as dependent variables. If sex-related outcomes are included at all, they tend to be measured by a single item or not evaluated independent of general alcohol-related negative consequences. For example, researchers have consistently found a relationship between increased use of drinking PBS and decreased alcohol-related consequences for college students (Martens et al., 2005, 2007a, 2007b, 2008) and college student athletes (Yusko, Buckman, White, & Pandina, 2008), but utilized measures that did not include any sex-related items (e.g., Rutgers Alcohol Problem Index, White & Labouvie, 1989). Other studies have included sex-related negative consequence items, but these items were not evaluated separately from alcohol consequences unrelated to sexual behavior or outcomes (Clapp, Shillington, & Segars, 2000; Delva et al., 2004; Haines, Barker, & Rice, 2006; LaBrie, Kenney, Lac, Garcia, & Ferraiolo, 2009). One exception in the literature is Martens and colleagues (2004), where they examined one sex-related alcohol negative consequence (i.e., unprotected sex) in association with use of drinking PBS. While use of strategies was negatively associated with unprotected sex, this study did not examine if the association varied by gender.

Previous research has identified gender differences in the frequency of using drinking PBS, with women consistently using strategies more often than men (Benton et al., 2004; Benton,

Downey, Glider, & Benton, 2008; Walters, Roudsari, Vader, & Harris, 2007). Because women are more likely to use these strategies in comparison to men, strategies may make a larger impact at reducing sex-related alcohol negative consequences for women than men. Furthermore, women may be more sensitive to the need to protect themselves from these sexual risks, such as neglecting to protect oneself from an unwanted pregnancy or STI, or regretted sexual behavior. Prior research has shown that women are particularly at risk for contracting STIs and HIV/AIDS (CDC, 2008b; Padian, Shiboski, & Jewell, 1991); and, research has demonstrated that men are more likely to report condom use than women (Sheeran, Abraham, & Orbell, 1999). Because men ultimately have the decision to use a condom, women must successfully negotiate condom use (Noar, Morokoff, & Harlow, 2002; Norris, Masters, & Zawacki, 2004). Additionally, prior research has found that college women report being more likely to regret sexual behavior because they felt pressured by their partner (Oswalt, Cameron, & Kobe, 2005). Women may perceive consuming too much alcohol as a barrier to successful condom negotiation or as a risk factor for regretted sexual situations, and thus use strategies to reduce or limit their alcohol consumption. Finally, research has shown that women generally achieve higher BACs (blood alcohol concentration) than men at equivalent consumption levels, due to differences in body size, composition, and metabolism (Mumenthaler, Taylor, O'Hara, & Yesavage, 1999). Moreover, research has shown that among college students, women are reaching equivalent BACs (Hustad & Carey, 2005), or even higher BACs (Kypri, Langley, & Stephenson, 2005) than men, even when consuming less alcohol. Because of these gender differences, using drinking PBS to limit the amount of alcohol one consumes or to change the manner of one's drinking is likely to have a larger impact on reducing negative consequences for women than for men.

In sum, while many studies have examined the associations between drinking PBS with alcohol consumption and alcohol-related negative consequences, there is notably less research evaluating the association between use of strategies and sex-related alcohol negative consequences. To our knowledge, this is the first study to examine if drinking PBS are associated with multiple consensual sex-related alcohol negative consequences, and whether this relationship varies by gender.

Alcohol Myopia

Several theories have been proposed to explain the relationship between alcohol and various negative sexual outcomes. These theories include the role of childhood abuse, personal characteristics, or attitudes about women or sexuality (Abbey, Zawacki, Buck, Clinton, & McAuslan, 2004). However, one difficulty is that most of these theories may not address the relationship between alcohol use and negative sexual outcomes per se. Alcohol myopia theory proposes a causal effect of alcohol on sexual behavior, such that it hypothesizes that alcohol use affects social behaviors by producing a "myopic" focus on certain cues (Steele & Josephs, 1990; Taylor & Leonard, 1983). This theory suggests that when drinking, college students are presented with both inhibiting cues (e.g., acquiring a STI, unwanted pregnancy) and impelling cues (e.g., sexual arousal; Cooper, 2002; George & Stoner, 2000; Kaly, Heesacker & Frost, 2002). Alcohol myopia theory explains alcohol effects on sexual behavior as a result of cognitive function impairment, which in turn prevents individuals from processing all information from the environment. This theory suggests that when one is faced with the urge to engage or not engage in sexual behavior, cognitive impairment promotes attention to impelling cues at the expense of inhibiting cues (Abbey et al., 2004; Testa & Livingston, 1999). When intoxicated, impelling cues are most salient and thus focused on more so than inhibiting cues (Cooper, 2002; George & Stoner, 2000; Kaly et al., 2002). Thus, according to alcohol myopia theory, in order to reduce sex-related alcohol negative consequences, it may be necessary to first reduce alcohol consumption.

The Present Research

The present research will expand the knowledge pertaining to drinking PBS by examining their association to consensual sex-related alcohol negative consequences. Based on the above considerations, we expected drinking PBS to be negatively associated with sex-related alcohol negative consequences, and that this relationship would be stronger for women than for men. We expected the relationship between drinking PBS and sex-related alcohol negative consequences to be mediated by the typical number of drinks consumed during sexual behavior.

Method

Participants and Procedures

A sample of 3,457 undergraduate students aged 18 to 25 were mailed and e-mailed invitations to participate in a longitudinal study assessing a Web-based high-risk drinking and sexual behavior intervention. Of the invited students, 1,731 (50.1%) completed a 20-minute Web-based screening survey. Recruitment rates were comparable to other large scale studies in this population (e.g., Marlatt et al., 1998; McCabe, Boyd, Couper, Crawford, & D'Arcy, 2002). There were no significant differences in ethnic composition (Caucasian, Asian, other) based on whether students completed the screening survey, $\chi^2(2, n = 3457) = 4.56, p = .10$, Cramer's $V = .036, p = .10$. However, there were differences based on gender. Participants who completed the screening survey were 56.1% women and 43.9% men, whereas the original sample was 49.8% women and 50.2% men. Thus, women were more likely to participate in the screening survey than men, $\chi^2(1, n = 3457) = 56.29, p < .001$, Cramer's $V = .128, p < .001$.

Inclusion criteria for longitudinal participation included reporting (1) at least one heavy drinking episode during the last month (having five or more drinks in one occasion for men, and four or more drinks in one occasion for women), (2) typically have sex with members of the opposite sex in the past 12 months, and (3) not currently being in a monogamous relationship. The inclusion criteria of typically having sex with members of the opposite sex in the past 12 months was selected to ensure that components of the preventative intervention were relevant to participants (e.g., condom-related PBS). Students who completed the screening survey and who met inclusion criteria ($n = 332$) were invited to complete a 40-minute Web-based baseline survey. Of those students who met screening criteria, there was no significant difference in ethnic composition (Caucasian, Asian, other) based on whether they participated in the baseline survey, $\chi^2(2, n = 332) = 1.52, p = .47$, Cramer's $V = .068, p = .47$. Of the students who met screening criteria, 49.4% were women and 50.6% were men. Those who participated in the baseline survey were 50.2% women and 49.8% men. Thus, women and men were equally likely to participate in the baseline survey, $\chi^2(1, n = 332) = 0.67, p = .41$, Cramer's $V = .045, p = .41$.

The present study included 287 students who completed, and 10 students who partially completed, the baseline survey ($n = 297$; 89.5%), which occurred prior to the intervention. The mean age of this sample was 19.82 ($SD = 1.35$). Ethnicity of the sample was 77.3% Caucasian, 10.0% Asian, 5.8% multiracial, 2.4% Black/African American, and 4.5% other. All study procedures were approved by the university's institutional review board, and a Federal Certificate of Confidentiality was obtained for this research.

Measures

Drinking protective behavioral strategies—Participants identified their use of drinking PBS using a modified version of the Protective Behavioral Strategies Survey (PBSS; Martens et al., 2005). This measure was modified to assess the use of drinking PBS specifically during the last three months. In addition, two questions were added to the original 15 items (“ate before drinking to reduce the effects of alcohol” and “kept track of how much you drank”). Participants

rated how frequently they engaged in each drinking behavioral strategy using the scale from 0 = *Never* (0%) to 4 = *Always* (100%). This 17-item measure assesses three types of strategies, including limiting/stopping drinking ($\alpha = .83$), manner of drinking ($\alpha = .68$) and serious harm reduction ($\alpha = .52$). Example items include “alternated alcoholic and non-alcoholic drinks” (limiting/stopping drinking); “drank slowly rather than gulped or chugged” (manner of drinking); and “made sure that you went home with a friend” (serious harm reduction). Scores for the three subscales represent the mean of the items.

Typical number of drinks consumed during sexual behavior—Students were asked to report the number of sexual experiences they had in conjunction with alcohol during the last three months by responding to the following question: You said you had sex ___ times in the past three months. Of the ___ times, how many times did you consume alcohol before or during the sexual encounter? Responses ranged from 0 (*0 times*) to 15 (*15 or more times*). Students who responded having one or more experience were then asked “You said you had consumed alcohol before or during sex ___ times in the past three months. How many drinks on average did you consume?” Students reported the average number of drinks consumed from a scale of 1 (*1 drink*) to 25+ (*25 or more drinks*). For the present study, in order to include those who reported never having consumed alcohol in conjunction with sexual behavior in the analyses, we recoded them as having an average of 0 drinks during sexual behavior.

Sex-related alcohol negative consequences—A modified version of the sex-related alcohol negative consequences subscale (Larimer, Lydum, Anderson, & Turner, 1999; Wood, Read, Palfai, & Stenvenson, 2001) of the Young Adult Alcohol Problem Screening Test (YAAPST; Hurlbut & Sher, 1992) was used to assess frequency of sex-related alcohol negative consequences in the last three months. Participants were asked four questions related to engagement of risky sexual behavior due to drinking: (1) Has drinking ever gotten you into sexual situations which you later regretted?, (2) Because you had been drinking, have you ever neglected to use birth control or neglected to protect yourself from sexually transmitted diseases?, (3) Because you had been drinking, have you ever had sex when you didn't really want to?, and (4) Because you had been drinking, have you ever had sex with someone you wouldn't ordinarily have sex with? Responses ranged from 0 (*No, never*), 1 (*Yes, but not in the past 3 months*), 2 (*1 time in the past three months*), 3 (*2 times in the past three months*), and 4 (*3 or more times in the past three months*). Scores represent the sum of these four items ($\alpha = .81$).

Results

Analysis Strategy

Structural equation modeling (SEM) with AMOS 7.0 software (Arbuckle, 2006a, 2006b) was utilized to analyze data. Drinking PBS were modeled as a latent variable with the three subscales as manifest indicators. For identification purposes, the path from the latent drinking PBS variable to one of its indicators (limiting drinking) was set to 1. Typical drinks consumed during sexual behavior was specified as a mediating variable. Frequency of alcohol-related sexual behavior was included as an exogenous covariate. Finally, sex-related alcohol negative consequences was modeled as a manifest endogenous variable. Maximum likelihood estimation was used for all analyses, which is robust to minor deviations from normality (Chou, Bentler, & Satorra, 1991; McDonald & Ho, 2002). Skewness values > 2 and kurtosis values > 7 among individual variables are considered problematic (Curran, West, & Finch, 1996). In the present study the largest skewness and kurtosis values were 1.81 and 3.56 (frequency of alcohol-related sexual behavior), respectively. The normed fit index (NFI; Bentler & Bonett, 1980), the comparative fit index (CFI; Bentler, 1990), and the root mean square error of approximation (RMSEA; Browne & Cudeck, 1993) were used as model fit indices. Good

model fit is indicated by values of .90 or above for the NFI and values above .95 or close to 1 for the CFI. Values below .05 indicate close fit for the RMSEA (Browne & Cudeck, 1993). Finally, chi-square difference tests were used to compare model fit between nested models.

MacKinnon and colleagues (1998, 2002) noted one serious problem with the Sobel, Aroian, and Goodman approaches to test mediation, such that power is often low because the product of regression coefficients α and β is not normally distributed. Thus, an alternative approach suggested by MacKinnon and colleagues (1998, 2002) was utilized. Mediation was formally evaluated by testing indirect effects using the product of coefficients with the empirical

distribution of $\frac{\alpha\beta}{\sigma_{\alpha\beta}}$ method described by MacKinnon and colleagues (1998, 2002). The test for indirect effects was estimated using Aroian's second-order exact solution with a .05 critical value cutoff of .90 for a sample size of approximately 200 from MacKinnon and colleagues

(1998) empirical distribution of $\frac{\alpha\beta}{\sigma_{\alpha\beta}}$, or z' .

Descriptive Information

Results from Mahalanobis' Distance calculations did not reveal any multivariate outliers (Tabachnick & Fidell, 2001). Table 1 provides means and standard deviations, by gender, for drinking PBS, sex-related alcohol negative consequences, typical number of drinks consumed during sexual behavior, and frequency of alcohol-related sexual behavior. Findings indicated that women were more likely than men to use strategies for limiting drinking, manner of drinking, and serious harm reduction.

Zero-order correlations, by gender, are presented in Table 2. For women, more frequent use of drinking PBS related to limiting drinking and manner of drinking were associated with fewer sex-related alcohol negative consequences. For men, strategies related to manner of drinking were negatively associated with sex-related alcohol negative consequences. For both men and women, typical drinks consumed during sexual behavior and sex-related alcohol negative consequences were positively associated.

Drinking Protective Behavioral Strategies and Sex-Related Alcohol Negative Consequences

Fit was tested for a model examining the association between latent drinking PBS and sex-related alcohol negative consequences, when controlling for frequency of alcohol-related sexual behavior. Fit indices suggested that the model fit the data well: $\chi^2 (4, N = 297) = 4.91$, $p = .30$, NFI = .98, CFI = .99, RMSEA = .028. The model indicates that more frequent use of drinking PBS was associated with experiencing fewer sex-related alcohol negative consequences ($B = -.86$, $SE = .30$, $p < .01$). Overall, the model accounted for 17% of the variance in sex-related alcohol negative consequences.

Multi-group SEM was then used to evaluate this model across gender. A model was compared in which factor loadings were constrained to be equal across genders to a model in which factor loadings were unconstrained. Freedom of the equality constraints among factor loadings across gender, $\chi^2 (8) = 7.05$, $p = .53$, NFI = .97, CFI = 1.00, RMSEA = .000, did not significantly improve model fit when compared to the constrained model, $\chi^2 (10) = 11.17$, $p = .34$, NFI = .96, CFI = .99, RMSEA = .020, as indicated by the chi-square difference test, $\chi^2 \Delta (2, N = 297) = 4.12$, $p = .13$. Thus, the measurement model was invariant across gender.

To determine if there were gender differences in the relationship between drinking PBS and sex-related alcohol negative consequences, we limited specific invariance tests to evaluate gender differences in the path coefficients between drinking PBS and sex-related alcohol negative consequences. Models were compared in which factor loadings were constrained to

equality across gender and the path coefficient between drinking PBS and sex-related alcohol negative consequences was allowed to vary across gender versus that in which all factor loadings and the path coefficient between drinking PBS and sex-related alcohol negative consequences were held constant across gender. Freedom of the equality constraint between drinking PBS and sex-related alcohol negative consequences across gender, $\chi^2(12) = 11.61$, $p = .48$, NFI = .96, CFI = 1.00, RMSEA = .000, did not provide significant improvement in model fit versus the model in which the path between drinking PBS and sex-related alcohol negative consequences was constrained to equal, $\chi^2(13) = 12.28$, $p = .51$, NFI = .95, CFI = 1.00, RMSEA = .000, as indicated by the chi-square difference test, $\chi^2 \Delta(1, N = 297) = .67$, $p = .42$. Thus, findings indicate that the relationship between drinking PBS and sex-related alcohol negative consequences does not vary across gender. While the path between drinking PBS and sex-related alcohol negative consequences did not significantly vary among gender, findings did indicate the negative relationship between drinking PBS and sex-related alcohol negative consequences was significant for women ($B = -1.08$, $SE = .36$, $p < .01$) but not for men ($B = -.60$, $SE = .46$, $p = .19$). The model and unstandardized regression weights are presented in Figure 1.

Reduced Drinking During Sexual Behavior Mediates the Relationship between Drinking Protective Strategies and Sex-Related Alcohol Negative Consequences

Finally, we evaluated if typical number of drinks consumed during sexual behavior mediated the relationship between latent drinking PBS and sex-related alcohol negative consequences, when controlling for frequency of alcohol-related sexual behavior. The overall model provided good fit, $\chi^2(6, N = 297) = 4.93$, $p = .55$, NFI = .99, CFI = 1.00, RMSEA = .000. Significant direct relationships existed between drinking PBS and typical number of drinks during sexual behavior ($B = -.80$, $SE = .32$, $p < .05$), and between typical number of drinks during sexual behavior and sex-related alcohol negative consequences ($B = .19$, $SE = .05$, $p < .01$). Based on the critical value cutoff of $\pm .90$ for a sample size of approximately 200 from MacKinnon and

colleagues (1998, 2002) empirical distribution of $\frac{\alpha\beta}{\sigma_{\alpha\beta}}(z')$, results indicated that the indirect relationship between drinking PBS and sex-related alcohol negative consequences via typical number of drinks consumed during sexual behavior was statistically significant ($z' = -2.04$, $p < .05$). Overall, the model accounted for 21% of the variance in sex-related alcohol negative consequences.

Next, we limited specific invariance tests to evaluate gender differences in the path coefficients between drinking PBS and typical number of drinks during sexual behavior, and between typical number of drinks during sexual behavior and sex-related alcohol negative consequences. Models were compared in which factor loadings were constrained to equality across gender and these path coefficients were allowed to vary across gender versus that in which all factor loadings and these path coefficients were held constant across gender. Freedom of the equality constraints in these paths across gender, $\chi^2(18) = 15.26$, $p = .65$, NFI = .96, CFI = 1.00, RMSEA = .000, did not provide significant improvement in model fit versus the model in which the paths were constrained to equal, $\chi^2(20) = 15.36$, $p = .76$, NFI = .96, CFI = 1.00, RMSEA = .000, as indicated by the chi-square difference test, $\chi^2 \Delta(2, N = 297) = .10$, $p = .95$. Thus, findings indicate that the indirect relationship between drinking PBS and sex-related alcohol negative consequences does not significantly vary across gender. While the paths between drinking PBS and typical number of drinks during sexual behavior and between typical number of drinks during sexual behavior and sex-related alcohol negative consequences did not significantly vary among gender, findings did indicate relationships that were significant for women but not for men. The negative relationship between drinking PBS and typical number of drinks consumed during sex was significant for women ($B = -.57$, $SE = .28$, $p < .05$) but not for men ($B = -.68$, $SE = .58$, $p = .24$). Findings also indicated that the

relationship between typical number of drinks consumed during sexual behavior and sex-related alcohol negative consequences was significant for both women ($B = .23$, $SE = .09$, $p < .01$) and men ($B = .20$, $SE = .06$, $p < .001$). For women, the test of the indirect relationship between drinking PBS and sex-related alcohol negative consequences via typical number of drinks consumed during sexual behavior was significant ($z' = -1.52$, $p < .05$). These findings suggest that, for women, typical number of drinks during sexual behavior mediates the relationship between drinking PBS and sex-related alcohol negative consequences, even when accounting for frequency of alcohol-related sexual behavior. The model and unstandardized regression weights are presented in Figure 2

Discussion

Prior research has found that more frequent use of drinking PBS is associated with both decreased alcohol consumption and fewer alcohol-related negative consequences (Benton et al., 2004; Delva et al., 2004; Glassman et al., 2007; Martens et al., 2004, 2005, 2007a, 2007b, 2008, Sugarman & Carey, 2007). However, much of this research did not include sex-related alcohol negative consequence items in the measure of consequences, or did not examine sex-related alcohol negative consequences separate from other consequences, with the exception of Martens and colleagues (2004). The present findings indicated a significant negative relationship between drinking PBS and consensual sex-related alcohol negative consequences, such that more frequent use of these strategies was associated with experiencing fewer sex-related negative consequences. When examining this relationship by gender, it was significant only for women. Thus, this study expands the research literature on drinking PBS by showing that these strategies are specifically associated with decreased sexual consequences when drinking for women.

Results also suggested that the relationship between drinking PBS and sex-related alcohol negative consequences was mediated by alcohol consumption. Specifically, for women, typical number of drinks during sexual behavior mediated the relationship between drinking PBS and sex-related alcohol negative consequences, even when accounting for frequency of alcohol-related sexual behavior. Alcohol myopia theory (Steele & Josephs, 1990; Taylor & Leonard, 1983) posits one way of understanding this finding, such that students who used drinking PBS more frequently consumed fewer drinks during sexual behavior and may then have been more likely to attend to both impelling and inhibiting cues, rather than impelling cues alone, leading to experiencing fewer sex-related alcohol negative consequences. Based on zero-order correlations, strategies related to drinking reductions (i.e., limiting drinking, manner of drinking) may be particularly useful at reducing sex-related alcohol negative consequences.

There are several reasons as to why drinking PBS would be more strongly associated with experiencing fewer sex-related alcohol negative consequences for women than for men. In this study and previous research (Benton et al., 2004, 2008; Walters et al., 2007), women were more likely than men to use drinking PBS related to limiting drinking, manner of drinking, and serious harm reduction. Although there were no gender differences in experiencing sex-related alcohol negative consequences in the present study, women may be more sensitive to the need to protect themselves from these sexual risks (Oswalt et al., 2005; Padian et al., 1991). A qualitative study conducted by Young and colleagues (2005) found that college women reported feeling pressure to drink heavy amounts of alcohol because doing so would result in a favorable impression of their male peers. While many of the heavy drinking women in their study indicated that “drinking like a guy” described their drinking behavior (defined as frequently consuming four or more drinks in one sitting), women reported that doing so provided them with a means to emphasize their heterosexuality. The authors indicated that while this may afford women with positive attention from male peers, it is likely to increase their vulnerability to sex-related alcohol negative consequences. Finally, because women

generally achieve higher BACs than men when consuming equivalent amounts of alcohol (Mumenthaler et al., 1999), using drinking PBS is likely to have a larger impact on reducing negative consequences for women than for men.

Implications for Preventative Interventions

Findings from the present study suggest that preventative interventions that incorporate drinking PBS aimed to reduce alcohol consumption may be particularly useful in reducing sex-related alcohol negative consequences for women. Specifically, these findings suggest that it may be useful for preventative interventions to address reductions in alcohol consumed before or during sexual behavior in order to reduce sex-related alcohol negative consequences. Cooper (2002, 2006) suggested that interventions designed to reduce drinking in situations where one could encounter a sexual partner could lower sexual risks associated with alcohol use. However, targeting drinking behavior as part of a strategy to reduce alcohol-related risky sexual behavior will only be effective to the extent that alcohol causally promotes this behavior (Cooper, 2002).

Although research has yet to examine drinking PBS as a stand alone preventative intervention, these strategies are often included as a component in preventative interventions aimed to reduce alcohol consumption and related risks among college students (Carey et al., 2007; Larimer & Cronce, 2007). Furthermore, research has demonstrated that increased use of drinking PBS mediated the efficacy of a mailed multi-component alcohol feedback intervention (Larimer et al., 2007). However, despite including feedback about alcohol and sexual behavior the relationship between increased use of strategies and sex-related alcohol negative consequences was not evaluated. Thus, future research is needed to examine the impact of interventions that include a drinking PBS component on sexual risk taking and related negative consequences, as well as evaluate drinking PBS as a single-component preventative intervention.

Interventions that have been shown to reduce drinking behavior may hold particular promise in reducing sex-related alcohol negative consequences. For example, personalized feedback interventions, such as BASICS (Baer, Kivlahan, Blume, McNight, & Marlatt, 2001; Carey et al., 2007; Dimeff, Baer, & Kivlahan, & Marlatt, 1999; Marlatt et al., 1998; Larimer & Cronce, 2007) and personalized normative feedback (Neighbors, Larimer, & Lewis, 2004; Neighbors, Lewis, Bergstrom, & Larimer, 2006; Lewis & Neighbors, 2007; Lewis, Neighbors, Oster-Aaland, Kirkeby, & Larimer, 2007), have been shown to reduce alcohol consumption among college students. If existing interventions are found to be efficacious at reducing sex-related alcohol behaviors and negative consequences, then it may be more cost-effective to maximize these already existing alcohol preventative intervention resources. For example, Ingersoll and colleagues (2005) evaluated a brief intervention aimed to reduce alcohol-related pregnancy risks among college women, which consisted of personalized feedback and goal setting delivered in a motivational interviewing counseling style (Miller & Rollnick, 2002). Preliminary findings at a one-month follow-up indicated support for the intervention, such that women were less likely to engage in risky drinking, more likely to use effective contraception, and at lower risk for alcohol-related pregnancy if they received the intervention. Leveraging empirically supported alcohol interventions for reducing sex-related alcohol negative consequences may be useful as there are few empirically based interventions for some sexual risk taking behaviors.

Additionally, because more frequent use of drinking PBS is associated with consuming fewer typical drinks during sexual behavior, including these strategies in an intervention may help address a behavior that could reduce the efficacy of interventions aimed to increase safer sex behavior. Previous research has demonstrated ways in which alcohol use interferes with a desired outcome or target behavior. For example, among a sample of HIV-positive men and women reporting problem-level drinking, consumption of alcohol significantly increased the

odds of not adhering to medication regimens, prompting the conclusion that addressing alcohol use could ultimately impact medication compliance (Parsons, Rosof, & Mustanski, 2008). Moreover, Kalichman and colleagues (2008) evaluated the efficacy of a brief HIV-alcohol risk-reduction intervention among men and women in South Africa. At the three month follow-up, findings indicated that intervention effects were moderated by alcohol use, such that lighter drinkers demonstrated significantly greater gains from the intervention in comparison to heavier drinkers. Future studies could evaluate the impact of including drinking PBS as a component of efforts designed to increase behaviors related to safer sex.

Limitations

While the present findings are promising, there are a number of limitations to consider. Results were based on cross-sectional data, and longitudinal data would be needed both to determine causal relationships and to better understand the relationship between use of drinking PBS and safer sex behaviors. An additional limitation is that this study utilized student reports of estimated typical behaviors (i.e., estimated number of typical drinks before sexual behavior over the past three months). Moving from global-level research to an event-level evaluation could add to the understanding of the relationships described in the present study, particularly if there are perceived high-risk events for which strategies are used more or less often. Additionally, data were self-report and relied on retrospective accounts of behavior, though use of self-report measures is generally supported in confidential research contexts when measures with established reliability and validity are utilized (Babor, Steinberg, Anton, & Del Boca, 2000). Finally, the present study focused on students who were sexually active, consumed alcohol heavily, and were not in a monogamous relationship. Use of drinking PBS and the association with sex-related alcohol negative consequences among students who do not typically consume alcohol heavily and who are in monogamous relationships could be considered in future studies.

Conclusions

The current findings extend research examining drinking PBS by showing that, for women, more frequent use of strategies is associated with experiencing fewer sex-related alcohol negative consequences, and that this relationship is mediated by reduced number of drinks during sexual behavior. Future research is necessary in order to determine how this knowledge can be incorporated into brief preventative interventions programs aimed at reducing sexual risks associated with drinking behavior among college students.

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Figure 1.

Negative relationship between drinking protective behavioral strategies and sex-related alcohol negative consequences. Model estimated as cross-groups comparison between college women (first parameter estimate, before/) and college men (second parameter estimate, after/). Values are unstandardized regression weights. ** $p < .01$. *** $p < .001$.

Figure 2.

Typical drinks consumed during sexual behavior as a mediator for the relationship between drinking protective behavioral strategies and sex-related alcohol negative consequences. Model estimated as cross-groups comparison between college women (first parameter estimate, before/) and college men (second parameter estimate, after/). Values are unstandardized regression weights. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 1
Means and Standard Deviations by Gender

Variable	Men		Women		<i>t</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Protective Behavioral Strategies: Limiting Drinking	1.51	0.67	1.74	0.73	2.74**
Protective Behavioral Strategies: Manner of Drinking	1.48	0.72	1.79	0.76	3.55***
Protective Behavioral Strategies: Serious Harm Reduction	2.45	0.95	3.02	0.79	5.58***
Sex-Related Alcohol Negative Consequences	2.65	3.25	3.20	2.82	1.59
Typical Drinks Consumed During Sexual Behavior	3.51	4.19	2.86	2.67	-1.61
Frequency of Alcohol-Related Sexual Behavior	1.51	2.17	1.91	2.27	1.55

Note. Ns ranged from 289 to 297 due to missing data.

**
 $p < .01$.

 $p < .001$.

Table 2

Zero-Order Correlations by Gender

Variable	1	2	3	4	5	6
1. Protective Behavioral Strategies: Limiting Drinking	-	.63***	.42***	-.22**	-.11	.01
2. Protective Behavioral Strategies: Manner of Drinking	.58***	-	.24**	-.20*	-.10	.07
3. Protective Behavioral Strategies: Serious Harm Reduction	.44***	.36***	-	-.12	-.12	-.06
4. Sex-Related Alcohol Negative Consequences	-.10	-.19*	-.03	-	.41***	.40***
5. Typical Drinks Consumed During Sexual Behavior	-.12	-.08	.02	.38***	-	.64***
6. Frequency of Alcohol-Related Sexual Behavior	-.07	-.05	-.02	.36***	.47***	-

Note. Ns ranged from 143 to 149 for men and women due to missing data.

[†]
p < .10.

*
p < .05.

**
p < .01.

p < .001.

Correlations for women are displayed on the top half of the diagonal in bold text, and correlations for men are shown on the bottom half of the diagonal.