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The Use of Drinking and Condom-Related Protective Strategies in Association to Condom Use and Sex-Related Alcohol Use

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Abstract

Approximately 40% of American college students engage in heavy drinking, and heavy drinking is associated with sexual risk behaviors. It is imperative to gain a better understanding of the relationship between alcohol and sexual risk behaviors for prevention efforts. We examined the use of drinking and condom-related protective behavioral strategies (PBS) in relation to drinking and condom-use outcomes in 436 college students. Drinking PBS are related to drinking and negative-related drinking consequences. Furthermore, condom-related PBS are related to condom use; however, it is unclear if drinking PBS are related to condom use, particularly condom use when drinking. It was hypothesized that the use of drinking PBS would be related to less alcohol-related sexual activity, that the use of condom-related PBS would be related to greater condom use and condom use while drinking, and that drinking PBS would be related to greater condom use, especially condom use when drinking. We found that condom-related PBS were associated with condom behavior and drinking PBS were related to drinking behavior, but we did not find support for a relationship between drinking PBS and condom use. This suggests that condom-related PBS may be a more effective target for increasing condom use than drinking PBS alone.

Keywords

alcohol and safer sex; AIDS/HIV; College Students; STDs

Introduction

Approximately 40% of American college students engage in heavy drinking, and research suggests that heavy drinking is more likely to occur in college students compared to non-students (Mitka, 2009; Substance Abuse and Mental Health Services Administration, 2009). Heavy drinking in college students is associated with negative sexual health outcomes, including sexual risk taking behavior (Cooper, 2002; George & Stoner, 2000), sexual assault (Abbey, 2002; Testa & Livingston, 2009), and sexual dysfunction (Sobczak, 2009). Sexual risk taking behavior includes behaviors such as unprotected sex, sexual activity while intoxicated, and multiple or casual partners. These behaviors put college students at increased risk for sexually transmitted infections (STIs). According to the Centers for Disease Control and Prevention (2010), sexual contact with opposite sex partners accounts for 31% of new HIV infections. An additional concern of sexual risk taking behavior is unplanned pregnancies (American College Health Association, 2008; de Visser, 2005; Henshaw, 1998).

Because alcohol use has been related to sexual risk taking behavior in both survey and experimental research (Cooper, 2002; George & Stoner, 2000; Kaly, Heesacker, & Frost, 2002; Leigh, 1999) and because of the high rates of both of these behaviors in college, numerous prevention efforts target both heavy drinking and sexual risk among college students. However, fewer prevention efforts combine both of these issues, and less is known about how to most efficiently decrease heavy drinking while simultaneously increasing protective sexual behaviors. Therefore, in this study we focused on the relationship between drinking and sexual risk taking behavior because both behaviors occur at particularly high rates in college student populations. Specifically, we examined the relationship between protective behavioral strategies (PBS) and behaviors related to drinking and sexual risk taking. It is important to examine PBS, as they can provide insight to improving intervention programs for both alcohol and STI risk reduction. Thus, the purpose of the present study was to examine the use of drinking and condom-use PBS in relation to sex-related alcohol use and condom-use outcomes in college students. For example, we do not know if drinking PBS are effective in decreasing problematic drinking outcomes like sexual risk behavior or if PBS are behaviorally specific (i.e. drinking PBS are related only to drinking outcomes and condom PBS are related only to condom outcomes). We examined the relationship between drinking PBS and condom-related PBS in relation to sex-related alcohol use and condom use to determine if drinking PBS predict sexual risk behaviors. It may be possible to target multiple behaviors using the associations between two health behaviors, also known as the multiple behavioral approach (Noar, Chabot, & Zimmerman, 2008). We used the multiple behavioral approach to examine the relation between PBS and alcohol use and sexual risk taking behavior. It is possible that drinking PBS may be associated with an array of outcomes, including drinking behaviors and other behaviors associated with drinking like condom use. However, if this is not the case, it is important for sexual risk taking prevention efforts to have a better understanding of what types of strategies are related to condom use.

Drinking Protective Behavioral Strategies

One method utilized to reduce college drinking is to teach skills to decrease high-risk alcohol consumption as well as negative alcohol-related outcomes. Drinking PBS are skills utilized in high-risk alcohol use reduction programs. Examples of drinking PBS include eating before drinking, alternating alcoholic and non-alcoholic drinks, and keeping track of amount of drinks. These are only a few of the drinking PBS typically taught to decrease alcohol use and negative alcohol-related outcomes (Dimeff, Baer, Kivlahan, & Marlatt, 1999; Kulesza, Apperson, Larimer, & Copeland, 2010; Larimer & Cronce, 2007; Lewis, Rees, Logan, Kaysen, & Kilmer, 2010).

Drinking PBS could elicit safe cues in a drinking environment, making an individual more likely to engage in safe behaviors while consuming alcohol. Alcohol myopia theory posits that individuals focus on the most salient information while intoxicated (Steele & Southwick, 1985). For example, at a college party where sexual activity is occurring or expected, a salient cue that could be present may be sexual arousal. In that situation, if sexual arousal is the most salient cue, other cues like STI risk that include more distal consequences may not drive the behavior. However, research has found that if safety cues are salient, individuals may be more likely to engage in safety behaviors when intoxicated (for a review, see Moss & Albery, 2009). Teaching drinking PBS may allow for safety cues to be salient to individuals while drinking, thus decreasing the likelihood of engaging in risky behaviors. Using the same example of sexual risk behavior while intoxicated, if an individual is primed to think about safety cues and possible risky outcomes that could occur while drinking, it is possible that these safety cues could become more salient than the sexual arousal cue.

Drinking PBS may also counteract the effects of alcohol expectancies. According to alcohol expectancy theory, an individual behaves in a particular way while intoxicated because they expect to engage in that behavior (MacAndrew & Edgerton, 1969). For example, if an individual expects that alcohol enhances his/her social behavior, s/he is more likely to be social while intoxicated. Drinking PBS introduce ways to reduce harm when drinking, which could in turn counteract the expectancies held by individuals. For example, if an individual believes that s/he will be more sexual while intoxicated but engages in drinking PBS, perhaps his/her beliefs about that drinking episode will be different. In other words, drinking PBS may give an individual the belief that s/he has control over their behaviors even while drinking. One way to view alcohol expectancies is that an individual may believe that his/her behavior is occurring due to the effects of alcohol. However, if drinking PBS are taught and used, it is possible that these may counteract or diminish the effects of positive alcohol expectancies previously held by an individual.

It has been well-established that drinking PBS are associated with decreased alcohol use and negative alcohol-related outcomes (e.g., Dimeff et al., 1999; Kulesza et al., 2010; Larimer & Cronce, 2007). However, few studies have focused on sexual outcomes. One study examined the relation between drinking PBS and sexual assault outcomes and found that higher rates of unwanted sexual contact were associated with using fewer drinking PBS (Palmer, McMahon, Rounsaville, & Ball, 2010). To our knowledge, only two studies have examined drinking PBS in relation to alcohol-related sexual risk outcomes, such as unprotected sex while intoxicated. Martens et al. (2004) found that drinking PBS were related to negative alcohol-related consequences, including unprotected sex. Lewis et al. (2010) found that alcohol consumption mediated the relationship between drinking PBS and negative sexual outcomes, including unprotected sex, regretting sex, and unwanted sex while drinking. Because drinking PBS are related to sexual outcomes including condom use, one could conclude that using drinking PBS alone in an intervention would increase condom use. However, no research to date has assessed whether drinking PBS predict general condom use. Instead, only alcohol-related sexual risk outcomes have been examined. It is possible that decreasing risk for one behavior (i.e. drinking) could transfer to decrease risk for another behavior (i.e. condom use). This could be due to the interrelatedness of the two or because individuals who are protective in one area may be more likely to be protective in another. The information gained by examining both condom use and condom use while drinking could inform sexual risk reduction programs.

Drinking PBS would be expected to increase condom use while intoxicated because if an individual uses protective strategies that decrease one's drinking behavior, they would be expected to have lower blood alcohol concentrations and therefore would be less influenced by alcohol's cognitive and learned effects. Both alcohol myopia and alcohol expectancy theories suggest that alcohol intoxication increases sexual risk behaviors. As previously discussed, intoxicated individuals are more likely to focus on salient cues like sexual arousal in a sexual situation rather than potential distal cues like potential STI acquisition or unplanned pregnancy. Thus, drinking PBS would decrease the likelihood of drinking to intoxication which would provide individuals with their normal cognitive capacities, allowing for individuals to pay attention to both proximal and distal cues. However, it is unclear if drinking PBS are the most effective tools for decreasing negative alcohol-related outcomes or if it would be more effective to target the specific outcomes. For example, when examining alcohol-related sexual risk behavior, it is unclear if targeting drinking PBS alone is effective at decreasing alcohol-related sexual risk behavior or if targeting the alcohol-related sexual risk behavior itself would be more effective.

Condom-Related Protective Behavioral Strategies

Condom-related PBS are strategies used to increase the likelihood of condom use during sexual activity. By adapting strategies used in research by Bryan, Fisher, and Fisher (2002), Lewis, Logan, and Neighbors (2009) developed condom-related PBS that, like drinking PBS, could be taught to decrease the target behavior (i.e. unprotected sex) as well as associated negative consequences (i.e. STI acquisition risk and/or unplanned pregnancy). Condom-related PBS include strategies like telling a partner you want to use a condom, carrying a condom and keeping it handy, and having a mental plan to avoid unsafe sex. These strategies are related to condom use during sexual activity in high school (Bryan et al., 2002; Zimmerman et al., 2007) and college student samples (Abraham et al., 1999; Bryan et al., 2002; Lewis, Kaysen, Rees, & Woods, 2010). In one study, implementation intentions and commitment to engage in condom-related PBS predicted the use of condom-related PBS two months later for young women (De Vet et al., 2011).

Bryan et al. (2002) found that preparatory safer sexual behavior mediated the effect of intentions to use condoms on condom use behaviors in both high school and college students. A more recent study examined the use of condom-related PBS in both global- and event-level condom outcomes for college students (Lewis et al., 2010). When examining event-level condom outcomes, college students who reported using condom-related PBS more were more likely to discuss STI risks, status, and protection when having vaginal sex for the first time with their most recent sexual partner. For global-level condom outcomes, college students who reported using condom-related PBS more were also more likely to use condoms during sexual activity in the past three months. Together, these two studies suggest that the use of condom-related PBS impact an individual's condom use in both event-level (Lewis et al., 2010) and global-level (Bryan et al., 2002; Lewis et al., 2010) condom outcomes. These studies also reveal that both longitudinal and cross-sectional research on condom-related PBS have convergent findings: condom-related PBS predict condom use. However, the use of condom-related PBS may differ while drinking compared to when sober. Alcohol use is related to sexual risk behaviors (Cooper, 2002; George & Stoner, 2000; Kaly et al., 2002; Leigh, 1999), suggesting that drinking PBS and condom use may be associated.

According to alcohol myopia theory, impelling cues such as sexual arousal may be more salient than inhibiting cues like sexual risk when intoxicated (Cooper, 2002; George & Stoner, 2000). Lewis et al. (2009) examined the relationship between condom-related PBS and condom use during alcohol-related sexual activity in a sample of heavy drinking and sexually active college students. They found that more frequent use of condom-related PBS were related to more consistent condom use during alcohol-related sexual activity. These studies suggested that condom-related PBS are associated with greater condom use in general (Bryan et al., 2002) and condom use while drinking (Lewis et al., 2009). However, given the interactive nature of alcohol and condom use, a more in-depth understanding of effective intervention strategies is warranted.

Current Study

Previous research has found that drinking PBS are related to less drinking and less negative-related drinking consequences and that condom-related PBS are related to greater condom use; however, it is unclear if drinking PBS are related to condom use in general, or just to condom use while drinking. In the current study, we examined the relationships among drinking PBS, condom-related PBS, condom use, and alcohol-related sexual activity. It was hypothesized that the use of drinking PBS would be associated with less alcohol-related sexual activity, including number of drinks prior to sexual activity and frequency of drinking prior to sexual activity. It was also hypothesized that the use of condom-related PBS would

be associated with greater condom use and greater condom use while drinking. Finally, we hypothesized that drinking PBS would be associated with greater condom use and greater condom use when drinking.

Method

Participants

A random sample of undergraduates aged 18 to 30 obtained from the university registrar's office were recruited through mail and email. Individuals were invited to take part in an initial 20-minute Web-based screening survey for a larger intervention study on sexual behavior and alcohol use. A total of 1,468 (45.5%) participated in the study, and of those, 1,387 (94.5%) completed the survey. Those who completed the screening survey were younger than those who did not complete the screening survey, $t(3,223) = 2.23, p < .05$. There were significant differences in ethnic representation (i.e., Caucasian, Asian, and other) based on whether students decided to participate or not, $\chi^2(2, n = 4106) = 14.96, p = .001$, Cramer's $V = .060, p < .001$; Caucasians were more, and Asians were less, likely to participate in the screening survey. Women were also more likely to participate than men, $\chi^2(1, n = 4659) = 17.66, p < .001$, Cramer's $V = .062, p < .001$. Participants received \$10 for completing the survey.

Ethnicity of the final sample was 70.4% Caucasian, 13.4% Asian, 9.3% multi-racial and 6.9% other. A small proportion of the sample (5%) identified as Hispanic. The mean age for participants was 20.12 years old ($SD = 1.50$). The majority of students (58.3%) reported currently being in a monogamous relationship and 97.4% identified as heterosexual. All study procedures were approved by the university's institutional review board, and a Federal Certificate of Confidentiality was obtained for this research.

Procedure

Data for the current research were secondary data from a larger longitudinal study. Inclusion criteria for longitudinal participation in the study included reporting (1) at least one heavy drinking episode during the last month (having five or more drinks on one occasion for men, and four or more drinks on one occasion for women) and (2) typically have sex with members of the opposite sex in the past 12 months. Those that endorsed sexual activity with same sex partners were only excluded if they indicated that they did not typically have sex with members of the opposite sex. Students who completed the screening survey and who met inclusion criteria for longitudinal participation ($n = 575$) were invited to complete a 40-minute Web-based baseline survey. Of the students who completed the baseline survey ($n = 503$; 87.5%), only those who indicated having sex within the past three months were included in the present study ($n = 436$). The gender of sexual partners was assessed using the question "With whom have you typically had sex within the past 12 months?" and those who answered "opposite sex" were included in the study. 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).

Measures

Modified Drinking Protective Behavioral Strategies—A modified protective drinking behaviors scale was used (Lewis et al., 2010). The original scale (Protective Behavioral Strategies Survey; Martens et al., 2005) was a 15-item questionnaire examining behavioral strategies individuals engage in after drinking or "partying" in the past three months. In the modified version, two items were added, measuring the degree to which participants ate prior to drinking to reduce the effects of alcohol and kept track of how much they drank. Other sample items included the degree to which participants "use a designated

driver,” “avoid drinking games,” or “drink water while drinking alcohol.” Response options were measured on a Likert scale ranging from 1 (*no, never*) to 5 (*always*). Final scores represent the mean of the items. Cronbach’s alpha was .86. This scale has adequate predictive validity (Lewis et al., 2010).

Condom-related Protective Behavioral Strategies—Condom-related protective behavioral strategies were assessed using six items (Lewis et al., 2009) to address condom protective behavioral strategies during consensual sexual behavior in the past three months. Sexual behavior was defined as oral, vaginal, or anal intercourse. Example items included “how much did you engage in carrying a condom and keeping it handy” and “how much did you engage in talking about condom use with a partner prior to sex.” Response options were measured on a Likert scale ranging from 1 (*no, never*) to 5 (*always*). Final scores represent the mean of items. Cronbach’s alpha was .89. This scale has adequate predictive validity (Lewis et al., 2009).

Condom Use—Participants were asked how many times they used condoms in the past three months. They were additionally asked to report how many times they had used condoms after having consumed alcohol prior to engaging in sexual behavior.

Alcohol Use prior to Sexual Behavior—Alcohol consumption related to sexual behavior was assessed by asking participants how many times during the past three months they had consumed alcohol prior to having sex. Participants were then asked an open ended question about how many drinks on average they consumed during these occasions.

Results

Data Analysis Strategy

Prior to analyzing data, data were checked for normality. Distributions were considered skewed if Skewness (S) and Kurtosis (K) were significantly different from zero (Tabachnick & Fidell, 2007). Preliminary analyses revealed non-normal distributions for condom use ($S = 1.16$, $K = 0.20$), condom use when drinking ($S = 2.86$, $K = 12.18$), frequency of drinking prior to sex ($S = 1.69$, $K = 3.61$), and typical number of drinks consumed prior to sex ($S = 0.69$, $K = 0.64$). Means, standard deviations, and zero-order correlations are presented in Table 1. For all variables the distribution was positively skewed, approximating a negative binomial distribution with the exception of a disproportionately large number of zero values for condom use (27.8%), condom use when drinking (47.3%), frequency of drinking prior to sex (16.7%), and typical number of drinks consumed prior to sex (16.7%). Because the data reflected a positively skewed distribution, zero-inflated binomial regression (ZINB) was selected as the primary analysis strategy for all outcomes (i.e., condom use, condom use when drinking, and frequency of drinking prior to sex) to account for the distribution (Atkins & Gallop, 2007; Heilbron, 1994; Hilbe, 2007; Simons, Neal, & Gaher, 2006).

Zero-inflated count models are accompanied by simultaneous tests for two dimensions of a distribution. The logistic portion of the model examined the likelihood of the observation being a zero-value, such that it predicts the excess zeros (i.e., zero-scores that exceed what would be expected in a negative binomial distribution). The second set of tests focused on the count portion of the model, in this case the negative binomial distribution. Four ZINB regression analyses were performed with condom use, condom use when drinking, frequency of drinking prior to sex, and typical number of drinks prior to sex as the dependent variables. Gender, frequency of sex, and typical drinks per week were controlled for in the analyses. Gender was controlled for because previous research has found that gender may play a role in condom-related PBS (Lewis et al., 2009). We examined if the

relationship between the types of PBS and outcomes differed by gender and there was only one significant gender difference; we have therefore presented the more parsimonious findings that simply controlled for gender. Frequency of sex and typical number of drinks per week were controlled for to ensure that the effects found for use of drinking PBS and condom-related PBS were not based on the number of times in situations that would allow for these PBS to be used. Predictors for each regression included gender, frequency of sex, typical drinks per week, drinking PBS, and condom PBS. Because outcomes were all frequencies (i.e., count variables) rather than percentages, we controlled for the frequency of sex.

ZINB Regression Results Evaluating Condom Use

Results of the ZINB regression evaluating condom use as the dependent variable are presented in Table 2. Results for the logistic portion of the model represent unique associations between each predictor and expected zero-scores, and are presented at the top of Table 2. Results for the counts portion of the model represent unique associations between each predictor and the number of times a condom was used (count) and are presented at the bottom of Table 2.

The likelihood ratio for the full ZINB model was $X^2(10) = 513.39, p < .001$; maximum likelihood $R^2 = .70$, which indicated that the overall model was significant. Findings indicated strong support for the ZINB model over other possible count models. The Vuong test for non-nested models supported the use of a zero-inflated model over a standard negative binomial model, $z = 7.83, p < .001$. The LR test of overdispersion was also significant (LR, $X^2(1) = 173.65, p < .001$, which indicated that a zero-inflated Poisson model would not have been appropriate.

Logistic results—Results of the logistic portion of the model indicated that gender, typical drinks per week, and drinking PBS were not significantly associated with zero-inflation (i.e., zeroes in excess of what was predicted by the negative binomial regression). Condom PBS were negatively associated with zero-inflation, indicating that those reporting not using a condom in the last three months were less likely to use condom PBS. In contrast, there was a significant positive association between frequency of sex and zero-inflation, indicating that those reporting *not* using a condom during sex in the last three months reported having sex more frequently.

Count results—Results from the counts portion of the model indicated that frequency of sex and condom PBS were positively associated with condom use. Gender, typical drinks per week, and drinking PBS were not associated with condom use.

ZINB Regression Results Evaluating Condom Use when Drinking

Results of the ZINB regression evaluating condom use when drinking as the dependent variable are presented in Table 3. The likelihood ratio for the full ZINB model was $X^2(10) = 292.58, p < .001$; maximum likelihood $R^2 = .50$, which indicated that the overall model was significant. Findings indicated strong support for the ZINB model over other possible count models. The Vuong test for non-nested models supported the use of a zero-inflated model over a standard negative binomial model, $z = 6.17, p < .001$. The LR test of overdispersion was also significant (LR, $X^2(1) = 56.92, p < .001$), which indicated that a zero-inflated Poisson model would not have been appropriate.

Logistic results—Results of the logistic portion of the model indicated that gender and drinking PBS were not significantly associated with zero-inflation (i.e., zeroes in excess of what was predicted by the negative binomial regression). Condom PBS and typical drinks

per week were negatively associated with zero-inflation, indicating that those reporting not using a condom in the last three months when drinking were less likely to use condom PBS. In addition, those reporting not using a condom in the last three months when drinking were likely to report drinking a lower number of drinks per week compared to those reporting using a condom. As found with condom use, there was a significant positive association between frequency of sex and zero-inflation, indicating that those reporting not using a condom during sex in the last three months reported having sex more frequently.

Count results—Results from the counts portion of the model indicated that frequency of sex, typical drinks per week, and condom PBS were positively associated with condom use. Gender and drinking PBS were not associated with condom use.

ZINB Regression Results Evaluating Frequency of Drinking Prior to Sex

Results of the ZINB regression evaluating frequency of drinking prior to sex as the dependent variable are presented in Table 4. The likelihood ratio for the full ZINB model was $X^2(10) = 314.05$, $p < .001$; maximum likelihood $R^2 = .52$, which indicated that the overall model was significant. Findings indicated strong support for the ZINB model over other possible count models. The Vuong test for non-nested models supported the use of a zero-inflated model over a standard negative binomial model, $z = 2.94$, $p < .01$. The LR test of overdispersion was also significant (LR, $X^2(1) = 66.31$, $p < .001$), which indicated that a zero-inflated Poisson model would not have been appropriate.

Logistic results—Results of the logistic portion of the model indicated that gender, frequency of sex, drinking PBS, and condom PBS were not significantly associated with zero-inflation (i.e., zeroes in excess of what was predicted by the negative binomial regression). Typical drinks per week was negatively associated with zero-inflation, indicating that those reporting not drinking prior to sex in the last three months drank fewer drinks during a typical week.

Count results—Results from the counts portion of the model indicated that frequency of sex and typical drinks per week were positively associated with frequency of drinking prior to sex. Gender and drinking PBS ($p = .053$) were negatively associated with frequency of drinking prior to sex, indicating that men were more likely to drink prior to sex and individuals who drank less prior to sex were less likely to use drinking PBS. Condom-related PBS were not associated with frequency of drinking prior to sex.

ZINB Regression Results Evaluating Typical Number of Drinks prior to Sex

Results of the ZINB regression evaluating typical number of drinks prior to sex as the dependent variable are presented in Table 5. The likelihood ratio for the full ZINB model was $X^2(10) = 195.72$, $p < .001$; maximum likelihood $R^2 = .37$, which indicated that the overall model was significant. Findings indicated strong support for the ZINB model over other possible count models. The Vuong test for non-nested models supported the use of a zero-inflated model over a standard negative binomial model, $z = 15.03$, $p < .001$. The LR test of overdispersion was also significant (LR, $X^2(1) = 56.92$, $p < .001$), which indicated that a zero-inflated Poisson model would not have been appropriate.

Logistic results—Results of the logistic portion of the model indicated that drinking PBS were not significantly associated with zero-inflation (i.e., zeroes in excess of what was predicted by the negative binomial regression). Gender was positively associated with zero-inflation, indicating that men were more likely than women to report no drinks prior to sex in the last three months. Frequency of sex, typical drinks per week, and condom PBS ($p = .053$) were negatively associated with zero-inflation, indicating that those reporting no drinks

prior to sex in the last three months had sex less frequently, drank fewer drinks during a typical week, and used condom PBS less often.

Count results—Results from the counts portion of the model indicated that typical drinks per week was positively associated with the typical number of drinks prior to sex. Frequency of sex and drinking PBS were negatively associated with the typical number of drinks prior to sex. Gender and condom-related PBS were not associated with the typical number of drinks prior to sex.

Discussion

This study expanded on previous research by examining the relationships among drinking PBS, condom-related PBS, condom use, and alcohol-related sexual activity. It was hypothesized that drinking PBS and condom-related PBS would be related to less risky drinking and sexual behaviors, respectively, and also that drinking PBS would be related to greater condom use. We found partial support for our hypotheses. Specifically, we found that condom-related PBS were associated with greater condom use and greater condom use while drinking. This indicates that there are relationships between condom-related PBS and condom use in general and condom use while drinking, suggesting that it may be a useful strategy to target condom-related PBS to decrease sexual risk behaviors rather than using drinking PBS alone to decrease alcohol-related sexual risk behaviors.

Consistent with previous research, drinking PBS were related to actual drinking behavior, and this was true for sex-related drinking behavior (i.e. drinking prior to sex) as well. This suggests that drinking PBS are not only related to drinking behavior, as indicated by previous research (Dimeff et al., 1999; Kulesza et al., 2010; Larimer & Cronce, 2007), but they are also related to sex-related drinking behavior. Understanding this association is useful when developing prevention or intervention programs for sexual risk behaviors, as previous research has found that drinking prior to sexual activity was related to sexual assault, sexual dysfunction, and less condom use (for a review, see George & Stoner, 2000).

Contrary to our hypotheses, we did not find an association between drinking PBS and condom use or condom use while drinking. We hypothesized this relationship because drinking PBS has been found to be related to a decrease in overall negative drinking-related outcomes (Dimeff et al., 1999; Kulesza et al., 2010; Larimer & Cronce, 2007). In addition, Lewis et al. (2010) found that drinking PBS were related to negative sexual outcomes, including unprotected sex, regretting sex, and unwanted sex. Although more use of drinking PBS were associated with less drinking prior to sex, drinking PBS were not related to condom use while drinking. This suggests that for prevention and intervention programs interested in decreasing sexual risk behaviors, including both condom-related PBS and drinking PBS may be warranted.

The finding that drinking PBS are not related to condom use while drinking is interesting given that drinking PBS have been related to negative alcohol-related consequences in other studies (i.e. Lewis et al., 2010). More drinks consumed prior to sexual activity would likely contribute to riskier sexual behavior. However, findings from this study suggest that targeted PBS may be more effective for addressing condom use. Perhaps drinking PBS were not associated with condom use due to the additional aspect of condom negotiation. Although drinking PBS would theoretically help increase condom negotiation skills due to possible lower levels of intoxication, these strategies do not directly address issues related to discussion of STI risk and condom negotiation. On the other hand, condom PBS provide individuals with some preparatory condom negotiation knowledge that may help when individuals are in a potentially risky situation. In addition, drinking PBS do not encourage

individuals to actually carry condoms. This is problematic in sexual situations where condoms are not available. Future research could examine other sexual risk behaviors to determine if drinking PBS are related to any sexual risk behaviors.

Condom-related PBS were associated with increased condom use and increased condom use while drinking. These findings suggest that STI prevention programs should target condom use using condom-related PBS. Future research should examine if using condom-related PBS is a more effective strategy than targeting alcohol use to decrease sexual risk behavior in college populations.

Finally, findings from the count portion of the model indicated that a higher frequency of sexual activity was positively associated with a higher frequency of condom use, whereas findings from the logistic portion of the model indicated that a higher frequency of having sex was positively associated with not using a condom at least once.. These findings can be interpreted by considering that individuals often do not use condoms consistently. For example, while the more often one had sex was associated with using a condom more, these opportunities also present more times to have *not* used a condom at least once.

Limitations and Future Directions

We focused on general condom-related and drinking PBS as well as condom use and drinking prior to sexual activity in the past three months. Although this study provides insight into possible venues to decrease alcohol use prior to sex and increase condom use, it does not establish a causal relationship. In addition, the questions were not specific to each event and therefore it is not possible to conclude that using condom-related PBS in one situation increases condom use or drinking PBS decreases drinking prior to sex in each situation. Event-level studies do not always find a relationship between drinking and sexual risk behaviors (Leigh, Morrison, Hoppe, Beadnell, & Gillmore, 2008), suggesting that event-level analyses of drinking PBS, condom PBS, and condom use are imperative. However, the global associations found suggest that future research should focus on event-specific behavior in relation to condom-related and drinking PBS. This study suggests that both condom-related and drinking PBS would be helpful to include in interventions for college students targeting alcohol use and sexual risk behaviors. However, more specific prospective event-level studies should examine the utility of drinking and condom-related PBS for each sexual event to strengthen the understanding of PBS and actual behavior. Another limitation is that condom non-use reported in this study may have differed in riskiness depending on relationship status in the sexual situation. For example, some participants may have not used condoms in relatively safe sexual situations such as sex with a committed and monogamous partner. Although a strength of this study is that it used a random sample of college students, approximately half of those approached participated in the study suggesting that it is possible that individuals who participated may be different than those that did not.

Future research should also examine the relationship between other sexual risk behaviors and condom-related PBS. Previous research suggests that drinking PBS predicts not only actual drinking behavior, but also sexual risk behaviors during drinking (Lewis et al., 2010); however, it is unclear if this relationship is stronger than using sexual risk behaviors PBS. It is also possible that drinking PBS are not related to other negative alcohol-related consequences, such as decreased sexual assault risk perception and resistance and PBS specific to sexual assault may be more effective. However, this is speculative and future research should address this question. It is important to continue this research to increase the utility of PBS in intervention studies targeting high-risk alcohol use and sexual behaviors.

Conclusion

To our knowledge, the current study was the first to examine both direct relationships between outcome-specific PBS and cross-over relationships between drinking PBS and condom use. Findings from this study suggest that in a high-risk drinking sample of undergraduates, PBS are outcome specific i.e. condom-related PBS are associated with condom use and drinking PBS are associated with drinking behaviors. For intervention research, the current findings suggest that if an intervention is targeting related high-risk behaviors associated with drinking (i.e., risky sexual behavior) it may be necessary to target that specific outcome (i.e. condom use) in addition to targeting alcohol use.

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Table 1
Means, Standard Deviations, and Zero-order Correlations for Variables Assessed

Variable	M	SD	1	2	3	4	5	6	7	8
1. Frequency of Sex	14.59	9.03	-							
2. Typical Drinks per Week	13.21	11.04	-0.03	-						
3. Drinking PBS	1.94	0.64	-0.01	-0.36***	-					
4. Condom PBS	1.85	1.31	-0.24***	0.07	0.09	-				
5. Condom Use	6.50	7.60	0.39***	0.04	0.04	0.50***	-			
6. Condom Use when Drinking	1.83	2.94	0.20***	0.31***	-0.10*	0.39***	0.63***	-		
7. Drinking prior to Sex	4.11	4.21	0.52***	0.38***	-0.21***	-0.10*	0.22***	0.57***	-	
8. Number of Drinks prior to Sex	3.86	2.77	-0.03	0.56***	-0.29***	0.10*	0.00	0.24***	0.31***	-

Note. Ns ranged from 421 to 436 due to missing data.

* $p < .05$.

*** $p < .001$

Table 2

ZINB Regression Results Examining Condom Use

Predictor	B	SE B	Z	Ratio	(95% CI)
Logistic Portion of the Model					
Gender	-0.145	0.430	-0.340	0.865	(0.372, 2.010)
Frequency of Sex	0.055	0.026	2.140 *	1.057	(1.005, 1.111)
Typical Drinks per Week	-0.039	0.022	-1.730	0.962	(0.921, 1.005)
Drinking PBS	0.222	0.329	0.670	1.248	(0.654, 2.380)
Condom PBS	-2.459	0.327	-7.510 ***	0.086	(0.045, 0.162)
Counts Portion of the Model					
Gender	1.053	0.077	0.700	2.866	(2.490, 3.371)
Frequency of Sex	1.088	0.005	20.350 ***	2.970	(2.944, 2.996)
Typical Drinks per Week	1.001	0.003	0.320	2.721	(2.704, 2.738)
Drinking PBS	1.090	0.062	1.510	2.973	(2.651, 3.380)
Condom PBS	1.325	0.047	8.000 ***	3.763	(3.445, 4.137)

Note. *n* = 427.

* *p* < .05.

*** *p* < .001.

Ratio = zero-inflated odds ratios are presented for the logistic portion of the model and negative binomial incidence rate ratios are presented for the counts portion of the model.

Table 3

ZINB Regression Results Examining Condom Use when Drinking

Predictor	B	SE B	Z	Ratio	(95% CI)
Logistic Portion of the Model					
Gender	0.819	0.595	1.380	2.268	(0.707, 7.275)
Frequency of Sex	0.138	0.048	2.880**	1.148	(1.045, 1.261)
Typical Drinks per Week	-0.060	0.028	-2.120*	0.942	(0.891, 0.995)
Drinking PBS	0.345	0.568	0.610	1.412	(0.464, 4.300)
Condom PBS	-2.126	0.734	-2.900**	0.119	(0.028, 0.503)
Counts Portion of the Model					
Gender	0.969	0.119	-0.260	2.634	(2.141, 3.431)
Frequency of Sex	1.072	0.008	9.860***	2.922	(2.879, 2.966)
Typical Drinks per Week	1.028	0.005	5.290***	2.795	(2.766, 2.825)
Drinking PBS	0.982	0.106	-0.170	2.670	(2.213, 3.365)
Condom PBS	1.251	0.079	3.530***	3.493	(3.018, 4.122)

Note. *n* = 420.

* *p* < .05.

**

p < .01.

p < .001.

Ratio = zero-inflated odds ratios are presented for the logistic portion of the model and negative binomial incidence rate ratios are presented for the counts portion of the model.

Table 4

ZINB Regression Results Examining Frequency of Drinking prior to Sex

Predictor	B	SE B	Z	Ratio	(95% CI)
Logistic Portion of the Model					
Gender	0.983	0.665	1.48	2.674	(0.726, 9.853)
Frequency of Sex	-0.043	0.037	-1.18	0.958	(0.891, 1.029)
Typical Drinks per Week	-0.469	0.207	-2.26*	0.626	(0.417, 0.939)
Drinking PBS	-0.437	0.531	-0.82	0.646	(0.228, 1.830)
Condom PBS	-0.160	0.265	-0.60	0.852	(0.506, 1.433)
Counts Portion of the Model					
Gender	0.804	0.064	-2.740**	2.235	(1.991, 2.560)
Frequency of Sex	1.070	0.005	14.890***	2.915	(2.888, 2.943)
Typical Drinks per Week	1.028	0.004	7.690***	2.795	(2.775, 2.815)
Drinking PBS	0.880	0.058	-1.940 [†]	2.411	(2.166, 2.722)
Condom PBS	1.031	0.030	1.050	2.803	(2.649, 2.977)

Note. *n* = 427.

[†] *p* = .053.

* *p* < .05.

*** *p* < .001.

Ratio = zero-inflated odds ratios are presented for the logistic portion of the model and negative binomial incidence rate ratios are presented for the counts portion of the model.

Table 5

ZINB Regression Results Examining Typical Number of Drinks prior to Sex

Predictor	B	SE B	Z	Ratio	(95% CI)
Logistic Portion of the Model					
Gender	0.940	0.349	2.700**	2.561	(1.292, 5.075)
Frequency of Sex	-0.089	0.021	-4.230***	0.915	(0.878, 0.953)
Typical Drinks per Week	-0.157	0.038	-4.140***	0.854	(0.793, 0.921)
Drinking PBS	0.000	0.286	0.000	1.000	(0.571, 1.751)
Condom PBS	-0.268	0.138	-1.940 [†]	0.765	(0.584, 1.003)
Counts Portion of the Model					
Gender	1.025	0.061	0.420	2.788	(2.491, 3.164)
Frequency of Sex	0.990	0.003	-3.340***	2.692	(2.677, 2.707)
Typical Drinks per Week	1.017	0.002	7.840***	2.765	(2.753, 2.777)
Drinking PBS	0.856	0.042	-3.200***	2.354	(2.177, 2.564)
Condom PBS	1.005	0.022	0.240	2.733	(2.620, 2.855)

Note. $n = 427$.

[†] $p = .053$.

** $p < .01$.

*** $p < .001$.

Ratio = zero-inflated odds ratios are presented for the logistic portion of the model and negative binomial incidence rate ratios are presented for the counts portion of the model.