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The Influence of Marijuana and Alcohol Use on Condom Use Behavior: Findings from a Sample of Young Adult Female Bar Drinkers

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Abstract

Prevalence data indicate that alcohol and marijuana are frequently used intoxicants among young adults in the United States. In a number of studies, both alcohol use and marijuana use have been associated with failure to use condoms, a high risk sexual behavior. The purpose of the current study was to assess the individual and additive effects of alcohol and marijuana use on this risky sexual behavior among 251, young adult, female, bar drinkers. Multi-level modeling was used to assess the likelihood of condom use during sexual events that occurred as a function of substance use (none, only alcohol, only marijuana, or both) prior to and partner type during the event, as well as individual differences in sexual assertiveness. Initial model testing (level 1 and 2) revealed that there were significant main effects for partner type (known), substance use (alcohol and marijuana) and sexual assertiveness (refusal, pregnancy/STI prevention) on risky sex. Final model testing indicated that sexual assertiveness interacted with substance use to influence risky sex. Women who were low in sexual assertiveness refusal were more likely to engage in risky sex on days when they had consumed both alcohol and marijuana prior to the sexual activity. These findings highlight the complex nature of the relationship between substance use and risky sex.

Keywords

Alcohol Use; Marijuana; Risky Sexual Behavior; Young Adults; condom use

Alcohol and marijuana are two commonly used intoxicants among young adult women in the United States. According to the 2009 prevalence data from the Monitoring the Future study, 83.2% of female young adults (ages 19 to 30 years) consume alcohol annually, and 25.8% of female young adults smoke marijuana annually (Johnston et al., 2010). Less than 1 out of every 5 young women (16.3%) reported using illicit drugs other than marijuana during the past year. In addition, prevalence data indicate low rates of consistent condom use among young unmarried women (27.1–31.4%; 2002 National Survey of Household Growth Data, Centers for Disease Control, 2005). Failure to use condoms during heterosexual sex accounted for 89.3% of newly reported HIV infections among women in 2009 (HIV Surveillance Report; Centers for Disease Control, 2011). When used

consistently and correctly, latex condoms are effective in preventing most sexually transmitted infections (STIs) and HIV/AIDS (Centers for Disease Control, 2010).

Alcohol, Marijuana, and Risky Sexual Behavior

Both alcohol and marijuana use have been associated with risky sexual behavior among heterosexual individuals (i.e., failure to use condoms; Hittner & Kennington, 2008; Houck et al., 2006; Leigh et al., 1994; 2008). Global studies generally find an association between alcohol and marijuana use and risky sex, such that individuals who use either substance are more likely to engage in risky sex (Lauby et al., 2001; Houck et al., 2006). Two extensive reviews of event-level studies of alcohol and risky sex (i.e., studies that compare sexual events with and without condom use) have found limited support for alcohol's influence on condom use at the time of a sexual event (Cooper, 2006; Weinhardt & Carey, 2000). These reviews indicate that individuals who tend to use condoms when sober tend to use condoms when intoxicated. Unlike event-level studies of alcohol, these types of studies of marijuana suggest that marijuana use at the time of sexual activity reduces the likelihood of condom use (Bailey et al., 1998; Kingree & Betz, 2003; Kingree & Phan, 2002). While a number of studies have assessed the main effects of alcohol and marijuana on risky sex within the same global or event-level studies, we are aware of only one study, conducted with college students (18–25 years), that has attempted to assess the possible interaction between marijuana and alcohol use on risky sexual behavior – a composite variable of failure to use condoms and regretted sex (Simons et al., 2010). Simons et al. (2010) found that mean blood alcohol concentration (BAC) per drinking day and marijuana use intensity over the past 6 months were significantly associated with risky sex over the past 6 months. However, they did not find that the association between BAC and risky sex increased as a function of marijuana use (i.e., an alcohol x marijuana interaction).

In their review of alcohol's effects on risky sexual behavior, Weinhardt and Carey (2000) noted that the effects are complex and further suggested that these effects appear to be dependent upon individual characteristics, and situational or contextual factors. Using this theoretical framework, and a longitudinal, event-level design, Cooper (2010) modeled individual (within-person) personality effects across sexual situations and relationship contexts and found that the within-person effects accounted for greater variance in sexual risk-taking than did the between-person effects. Further suggesting that additional studies need to assess substance use influences on risky sexual behavior within the context of within-person variations in individual characteristics and situations (e.g., partner type) that impact condom use alone or interactively with substance use.

Daily diary studies allow for assessment of within-person effects, as well as the temporal relationship between substance use and risky sexual behavior. Several recent studies have assessed daily fluctuations in substance use (alcohol or marijuana) and condom use behavior (e.g., Leigh et al., 2008; Schroder, Johnson, & Wiebe, 2009; Anderson & Stein, 2010), thus allowing for modeling of individual (within-person) effects, as well as situational and contextual factors, such as partner type.

Impairing Effects of Alcohol and Marijuana

The cognitive, physical and behavioral effects of both alcohol and marijuana intoxication are well documented. Both substances can cause deficits in mood, cognition and perception, social behavior and motor coordination at moderate to high doses (e.g., Earleywine, 2002; Heishman, Arasteh, & Stitzer; Naranjo & Bremner, 1993; Ramaekers, Robbe, & O'Hanlon, 2000). Several studies have found that low to moderate doses of alcohol and marijuana have an additive effect on ratings of subjective intoxication (confusion, clear headedness; Liguori,

Gatto, & Jarrett, 2002), and impairment of driving performance (Bramness, Khiabani, Morland, 2010; Ramaekers et al., 2000).

Earleywine (2002) has noted that the intoxicating effects of a dose of marijuana are highly, individually variable. However, regular marijuana users report a common set of physiological and perceptual effects, several of which are likely to influence sexual decision making and perception. These include a sense of enhanced responsiveness to sexual touch, an increased focus on the present with little thought toward the future, and an increase in positive mood and relaxation, as well as an increase in strong emotions (Earleywine, 2002). These effects could create a situation in which a woman who is high on marijuana and faced with a sexual situation in which she needs to initiate/insist upon condom use will be more likely to have unprotected sex than when not high. This might occur because she will be more focused on the moment and the physical sensations (i.e., heightened sexual arousal/pleasure) and positive mood presented by the sexual situation, rather than the potential future negative consequences of not using condoms (i.e., STIs, HIV). Some evidence from experimental studies suggests that verbal communication is impaired after marijuana consumption (e.g., Haney et al., 1999); thus, marijuana may decrease women's ability to engage in effective communication about condom use (e.g., negotiation, sexual assertiveness).

The intoxicating effects of alcohol are somewhat more predictable than those of marijuana. At blood alcohol levels (BALs) as low as .02 an individual can begin to experience mild euphoria and dizziness, with impairment of perception and motor skills occurring between .05 and .08 BAL (Naranjo & Bremner, 1993). Individual differences in responsivity to alcohol are related to patterns of use and abuse and will influence cognitive, psychomotor, and social responses (Mundt, Perrine, & Searles, 1997). However, individuals who experience higher BALs (> .08), similar to individuals who experience greater intoxication from marijuana, will experience reduced perception and a greater focus on the most salient social cues during a social or sexual event (i.e., alcohol myopia). When this myopic effect occurs in a sexual situation in which a woman is simultaneously faced with the need to negotiate condom use and the possibility of having an enjoyable sexual encounter, it is likely to lead her to focus on the positive (enjoyable sex) rather than the negative (possibility of STIs/HIV without condom) cues in the situation.

Thus, findings that alcohol and marijuana independently and additively cause deficits in cognition, perception, and other behaviors, suggest that the combined use of alcohol and marijuana may increase risky sex (i.e., failure to use a latex condom) above the independent effect of either substance.

Alcohol, Marijuana, Risky Sex, and Partner Type

A limited number of studies have explored the differences in heterosexual risky sex as a function of partner type, with an even smaller number assessing this difference as a function of substance use. Some have found higher rates of condom use with casual partners (Cooper & Orcutt, 2000; Lescano, Vazquez, Brown, Litvin, & Pugatch, 2006). Macaluso, Demand, Artz, and Hook (2000) found that, with a regular partner, condom use decreased as the length of the relationship increased. In a study of college students (67% female; Brown & Vanable, 2007), alcohol use was associated with a decrease in condom use with non-steady or non-primary partners. However, in a study of women only, Cooper and Orcutt (2000) found that drinking and condom use were more common with casual partners. In a recent study using a 90-day time-line-follow-back (TLFB) to assess marijuana and risky sex (i.e., failure to use condoms), Anderson and Stein (2010) found that on days of sexual activity with casual partners, the likelihood of risky sex was 2.5 times higher when marijuana was

used compared to times when marijuana was not used. However, on days of sexual activity with regular partners, no difference in risky sex was found when marijuana was used compared with times when marijuana was not used.

Sexual Assertiveness and Risky Sex

Sexual assertiveness has been positively associated with condom use self-efficacy and stages of change for condom use (Morokoff, Quina, Harlow, Whitmire, Grimley, Gibson, & Burkholder, 1997). In addition, a positive association was found between sexual assertiveness and length of sexual relationship, suggesting that women may be more sexually assertive with known partners compared with new partners. Lower levels of sexual assertiveness have been associated with unprotected sex (frequency of condom use – Morokoff, et al., 2009; intentions to use condoms – Stoner, Norris, George, Morrison, Zawacki, Cue Davis, & Hessler, 2008). In an experimental study in which women were randomly assigned to a control, placebo, low or high dose (.04%, .08%) alcohol condition, Stoner et al. (2008) found that women who were lower in sexual assertiveness were less likely to indicate they would insist on condom use in response to a written vignette describing a sexual encounter with a new partner, regardless of alcohol condition. We are unaware of any studies that have specifically assessed the influence of marijuana on sexual assertiveness and condom use.

The Current Study

The purpose of the current study was to assess the differential influence of using only alcohol, only marijuana or alcohol and marijuana together, prior to a sexual event, on risky sex (i.e., condom use during vaginal or anal intercourse) among young, women bar drinkers. Our analyses are based on a subset of data from a larger study (Parks, Hsieh, Collins, Levonyan-Radloff, & King, 2009; Parks, Hsieh, Collins, & Levonyan-Radloff, 2011) that included a background survey and 12-weeks of daily data on substance use (alcohol and other drugs) and sexual activity from young, women bar drinkers. The subset of data – those days on which vaginal or anal penetrative sexual intercourse occurred – included 2712 sexual events from 251 women (original data: 19,990 person days, 287 women).

Prior findings from the full sample indicated that women reported higher rates of failure to use a condom with regular partners (Self-defined; Length of relationship: $M = 8.2$, $SD = 9.4$ weeks) compared with new partners (men just met, or not known well; Parks et al., 2009). Using a greater number of drugs other than alcohol was one of the significant predictors of failure to use condoms with regular partners. In addition, findings from analyses of the daily relationship between alcohol use and condom use behavior by partner type, indicated that alcohol did not influence condom use behavior (Parks et al., 2011). However, alcohol did increase sexual behavior (both condom and non-condom use *sex*) with casual partners (men just met, acquaintances). Given the complexity of these analyses and the relatively smaller number of days on which other drugs were used relative to alcohol, we did not analyze drug use independently from alcohol use.

The rationale for the current study, an assessment of the influence of alcohol and marijuana use independently and additively on condom use behavior comes from a number of sources. They include: our finding of an association between drug use and failure to use condoms with regular, but not casual partners (Parks et al., 2009); our findings that alcohol was not temporally associated with failure to use condoms, but did increase sexual activity with casual partners (Parks et al., 2011); recent findings by Anderson and Stein (2010) of a relationship between marijuana use and failure to use condoms on days of sex with regular

partners; and the literature on the additive effects of alcohol and marijuana on other behaviors.

Method

Participants

A total of 251 female, social drinkers were recruited through newspaper advertisements in local weekly and entertainment newspapers, as well as flyers posted in local coffee shops, restaurants and on college campuses, and by word of mouth. Advertisements stated: “Women bar drinkers needed for a study of alcohol use and social interactions. Must be 18–30 years old to participate”. The advertisements provided women with a telephone number to call if interested in learning more about the study. Upon calling, women were provided with a description of the project as a “confidential study of women who drink in bars, their alcohol and other substance use and sexual activity”. Women were eligible to participate in the study if they were: (1) between the ages of 18–30 years; (2) reported drinking in bars on a weekly basis; (3) not married or living with a romantic partner; (4) heterosexual; (5) not abstaining from alcohol; (6) not pregnant or trying to become pregnant; and (7) reported being in good physical and mental health. All study protocols were approved by the Institutional Review Board.

A total of 1256 women called the project. Of those women, 130 were not interested in participating in the study (10.4%). Among those women interested in participating in the study, 524 (46.5%) met all eligibility criteria. Women were most likely to be ineligible for the study because they did not frequent bars one or more times each week (20.2%). Of the 524 women eligible to participate in the study, 287 (54.8%) women participated in the study. Of those women, 251 (87.5%) women were included in the current analyses. These were women who completed the initial baseline interview and reported a minimum of one event of vaginal and/or anal sexual intercourse during the 12-week study and had sufficient data from the other variables of interest to be included in the analyses.

The average age of participants was 22.1 ($SD = 2.3$) years. The majority of participants (78%, $n = 195$) were Caucasian/European-American, 12% ($n = 30$) were African-American, 5% ($n = 12$) reported their ethnicity as Other, and small percentages were Hispanic, Asian, Indian or Alaskan.

Procedure

The current study focuses on the relations between alcohol and marijuana use on one specific type of risky sexual behavior: failure to use a latex condom during penetrative vaginal or anal intercourse. The data for sexual events were collected using an interactive voice response (IVR) system to collect daily data about women’s substance use (marijuana, alcohol, other drugs) and sexual activity during a larger 12-week prospective study (Parks et al., 2009; Parks et al., 2011). Given the focus of the current analyses only those days that involved consensual penetrative sexual activity (i.e., vaginal or anal intercourse) were included in the analyses. Participation in the larger study involved three forms of data collection: an initial comprehensive background interview, daily telephone reports provided through the computer-based IVR system, and monthly semi-qualitative, in-person interviews over 12 weeks. Informed consent was provided by participants prior to the initial background interview. Participants were remunerated for the initial interview, daily reports, and monthly interviews, and could receive up to a maximum of \$330 for full participation in the study. The measures utilized in the current analyses were drawn from the initial interview (i.e., sexual assertiveness, demographics) and the daily reports (presex alcohol and marijuana use, condom use, type of sexual activity, partner type).

Measures

Sexual Assertiveness—The 18-item Sexual Assertiveness Scale (SAS; Morokoff, Quina, Harlow, Whitmire, Grimley et al., 1997) was used to assess three factors of sexual assertiveness in women: initiation (e.g., ‘I begin sex with my partner if I want to.’), refusal (e.g., ‘I refuse to have sex if I don’t want to, even if my partner insists.’), and pregnancy/sexually transmitted infection (STI) prevention (e.g., ‘I make sure my partner and I use a condom or latex barrier when we have sex.’). Items are measured on a likert type scale from 1 ‘strongly disagree’ to 5 ‘strongly agree’. This scale has been shown to have good consistency and test-retest reliability. Internal consistency for each of the sub-scales was acceptable with the current sample (Cronbach’s $\alpha = 0.66, 0.67, 0.86$, respectively).

Overall Substance Use—Data on substance use was collected daily over the 12-week study period. In order to control for individual rates of alcohol and marijuana use, the percentage of days (0–100%) of study participation on which alcohol and marijuana were used was calculated for each participant and included as level 2 predictors in the analysis.

Daily Substance Use—For each day during the 12-week study period, women provided information on their substance use during the past 24 hours. For alcohol, they provided information on: 1) number of drinks (quantity) consumed; and 2) the time of their first and last drink. For illicit drug use, they provided information on: 1) the type of drug used (e.g., marijuana, cocaine, heroin, etc.); and 2) the time of their first and last use of the drug. This information allowed us to determine the type of substance used (alcohol and/or marijuana) and the temporal relationship between substance use and any sexual activity on a given day.

Daily Sexual Activity—For each day during the 12-week study period, women provided information on: 1) the time; 2) the type (e.g., oral, vaginal, and anal); and 3) the use of appropriate protection (i.e., latex condom) for each sexual event they had engaged in during the past 24 hours. They were asked to identify their relationship to the person with whom they had sex (i.e., someone just met, acquaintance, friend, ex-sexual partner/boyfriend, and current sexual partner/boyfriend). We recoded partner type as a dichotomous variable in which partners were either known (i.e., friend, ex-sexual partner/boyfriend – current sexual partner/boyfriend) or casual (i.e., someone just met, acquaintance). Each sexual event was categorized as either a risky (vaginal or anal sex without the use of a latex condom) or a nonrisky sexual event (vaginal or anal sex with the use of a latex condom).

Categorization of Substance use prior to Sex—At the beginning of the 12-week study period, we collected women’s body weight in order to calculate an estimated blood alcohol level (BAL) for each day on which drinking occurred. BAL, time that drinking and drug use began and ended and time of first sexual activity, were used to determine whether alcohol and marijuana use occurred prior to sexual activity on a given day. If marijuana use began within four hours of a sexual event or the woman had a BAL of .02 or higher at the time of a sexual event, marijuana or alcohol use, respectively, were considered to have occurred prior to the sexual event. Given that we did not have measures of quantity of substance used or intoxication for both alcohol and marijuana use, we dichotomized use of these substances (0/1; no use/use) prior to sex for each day of sexual activity. Therefore, each day of sexual activity received a mutually exclusive categorization as: no substance use, only alcohol, only marijuana, or alcohol and marijuana use prior to sex. Illicit drug use, other than marijuana occurred on less than 2% of days with sexual activity; thus, we did not include these days in our analyses.

Data Analyses

Given that sexual events were clustered within participants, we used hierarchical linear modeling (HLM) as our analytic technique. We assessed the effects of pre-sex substance use (no use, only alcohol, only marijuana, alcohol and marijuana), as well as women's relationship to their partners and the interactions between pre-sex substance use and partner type (level 1 variables) on likelihood of engaging in risky sex (i.e., not using a condom). We dummy-coded all variables such that the "no/low risk" category was used as the referent group. Thus, for the substance use dummy-codes, no use was the referent group, and for partner type, known (as opposed to casual) was the referent group. We controlled for individual differences in alcohol and marijuana use by including each person's overall percentage of days of use for both substances across the 12 weeks of the study (level 2 variables). We assessed the main effects of the three subscales of the SAS (level 2 variables) on likelihood of engaging in condom use as well as the interactions between the SAS subscales and pre-sex substance use. Dichotomous variables were uncentered, whereas the level-2 continuous variables (i.e., SAS subscales) were grand mean centered.

Results

Two hundred fifty-one women provided data for 2712 person days on which penetrative sexual intercourse (i.e., vaginal and/or anal) occurred. The majority (60%, $n = 1627$) of these sexual events involved sexual behavior without the use of a condom. On 65% ($n = 1763$) of the days that involved sexual intercourse, women did not consume alcohol and/or marijuana prior to the sexual event. Assessment of the temporal association between alcohol and/or marijuana consumption and sexual activity indicated that on 29% ($n = 787$) of days women consumed only alcohol before the sexual event and had a blood alcohol level of .02 or greater at the time of the sexual activity. On 4% ($n = 108$) of days women consumed only marijuana during the 4-hour period prior to the sexual event. On 2% ($n = 54$) of days women reported consuming both alcohol and marijuana prior to the sexual event. The majority (91%, $n = 2468$) of sexual events occurred with a known sexual partner (e.g., friend, current boyfriend), while the remaining 9% ($n = 244$) occurred with a casual sexual partner (e.g., someone just met, acquaintance).

The results for the level 1 HLM model are presented in Table 1. There was a significant main effect for sexual partner type, such that women were more likely to engage in risky sex (i.e., less likely to use a condom) with partners that were known (i.e., friend, ex, current boyfriend). There also was a significant main effect for alcohol and marijuana use, indicating that women were more likely to engage in risky sex when they had used both alcohol and marijuana compared with no substance use. We tested this model with interactions between partner type and substance use and found that the interactions were not significant ($ps > 0.80$), therefore we eliminated the interactions from further model testing.

The results for the level 2 model are provided in Table 2. We found significant main effects for refusal sexual assertiveness and pregnancy and STI prevention sexual assertiveness. Women who were higher in refusal assertiveness were more likely to engage in risky sexual behavior, while those who were lower in pregnancy and STI prevention sexual assertiveness were more likely to engage in risky sex (i.e., less likely to use condoms during sexual intercourse). The main effect for partner type remained, while the main effect for combined alcohol and marijuana use became marginally significant ($p < .07$). Model testing indicated that the main effects for the level 2 variables overall alcohol and marijuana use were not significant ($ps > 0.60$), therefore these two variables were eliminated from further model testing. The results for the final HLM model, including interactions between substance use and sexual assertiveness, are provided in Table 3. We found one significant interaction between sexual assertiveness refusal and the use of alcohol and marijuana prior to sex.

Figure 1 provides a graphical representation of this interaction. Women who were low (i.e., one standard deviation below the mean) in sexual assertiveness refusal were more likely to engage in risky sex on days when they used both alcohol and marijuana compared with no substance use days, $\beta = 1.82$, $se = 0.71$, $t = 2.55$, $OR = 6.16$, $CI_s = 1.519, 25.008$. Women who were high (i.e., one standard deviation above the mean) in sexual assertiveness refusal showed no difference in condom use on days of alcohol and marijuana use compared with no substance use days, $\beta = -0.18$, $se = 0.66$, $t = -0.27$, $OR = 0.84$, $CI_s = 0.231, 3.033$.

Discussion

Our findings are important for illustrating the influence of alcohol and marijuana on risky sexual behavior (i.e., failure to use a latex condom during penetrative intercourse) at the event level, among a sample of young, heterosexual women. Consistent with our previous analyses and findings from others we did not find that alcohol use prior to sex increased the likelihood of risky sex (Leigh et al., 1994; Parks et al., 2011). We did find an increase in risky sex when both alcohol and marijuana were used prior to sexual intercourse; however, this effect was attenuated with the inclusion of individual sexual assertiveness differences. This suggested that either we had limited power to detect this main effect with only 2% ($n = 54$) of events involving combined alcohol and marijuana use or sexual assertiveness is potentially an important moderator of the relationship between substance use and risky sexual behavior.

Therefore, we tested the interactions between sexual assertiveness and substance use in our final HLM model. In that model, we found a significant interaction between sexual assertiveness and substance use prior to sexual intercourse. Further examination of the interaction indicated that women who were low in sexual assertiveness refusal were more likely to engage in risky sex on days of alcohol and marijuana use compared to days of no substance use. Women who were high in refusal assertiveness did not show this increased risk on days of alcohol and marijuana use.

Our findings do not provide support for a simple additive or interactive effect of alcohol and marijuana on risky sexual behavior, but rather suggest that the use of these two substances interacts with existing individual vulnerabilities to further increase risk for engaging in risky sexual behavior. Lower assertiveness for sexual refusal has been associated with lower condom use efficacy and stages of change for condom use (Morokoff et al., 1997). In addition, recent findings suggest that sexual assertiveness effects on condom use are robust in the context of moderate to high doses of alcohol (Stoner et al., 2008). Perhaps it is that women who are high in sexual assertiveness refusal remain capable of refusing sex without the use of a condom when intoxicated, while women who are low in sexual assertiveness do not have the skill set necessary to refuse to engage in risky sex to begin with and thus, when intoxicated are even less likely to be able to refuse to engage in sex without the use of a condom. This hypothesis would need to be tested further in additional studies. However, it would suggest that prevention programs targeted at improving sexual assertiveness would not hurt, and could substantially improve safe sex outcomes, particularly among women who are low in sexual assertiveness and engage in regular alcohol and marijuana use.

In addition, to the findings related to substance use and sexual assertiveness, we found that women were more likely to use condoms with casual sexual partners (e.g., just met men, acquaintances) compared with known partners (e.g., boyfriends, ex-sexual partners). This finding is most likely due to the large number of sexual events that occurred with current boyfriends. However, women in our study indicated a regular sexual partner to be someone that she had known for an average of 8.2 weeks (Parks et al., 2009), an individual that is likely to represent a substantial unknown sexual history and thus, a sexual partner who poses

a considerable sexual risk. This would suggest that prevention efforts need to educate women about the risks of engaging in unprotected sex with repeat partners that are of relatively short duration, as well as the incubation period for many STIs and HIV.

Our findings, although intriguing, are not generalizable to all young women. Our sample consisted of young, predominantly White, sexually active, heterosexual women who reported regularly drinking in bars in Western New York state. We did not assess young women who report regular marijuana use (i.e., use greater than 3 times per week). Recent findings by Collins (unpublished data) suggest that individuals who report regular marijuana use are less likely to be heavy consumers of alcohol than the women in the current study. Thus, these findings should be replicated with women who report more frequent marijuana use. In addition, according to CDC surveillance data, Black and Hispanic women accounted for the majority (81%) of women who were living with HIV/AIDS in 2005, that had been acquired through high-risk heterosexual contact (CDC, 2008), therefore, additional research is needed to test these relationships among heterosexual, minority female populations.

Overall, our findings suggest that young women are not aware of the risks related to consuming substances other than alcohol that cause impairment in their ability to make decisions about risky sexual behavior. Public health messages that caution women to use condoms when intoxicated and engaging in sex seem to have had some positive influence, particularly with just met individuals. If our findings can be replicated, it may be useful to tailor and employ broader public health campaigns to increase sexual assertiveness and condom use to target young female substance users.

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Figure 1.

Predicted values for the cross-level Pre-Sex Alcohol + Marijuana X SAS – Refusal interaction. Values are graphed at one standard deviation below and above the mean for SAS-Refusal. Values were adjusted for SAS – Initiation, SAS – STI/Pregnancy Prevention, and Sexual Partner.

Table 1
Regression Model for Level 1 Main Effects of Pre-Sex Substance Use on Risky Sex

Fixed Effect	β	s.e.	t	OR	C. I.
Intercept	0.30	0.15	1.99		
Sexual Partner	-0.79	0.21	-3.81***	0.45	(0.303,0.682)
/ Pre-Sex Alcohol Only	0.18	0.13	1.34	1.20	(0.921,1.553)
Pre-Sex Marijuana Only	0.13	0.32	0.40	1.13	(0.607,2.137)
Pre-Sex Alcohol + Marijuana	0.89	0.45	1.96*	2.44	(1.002,5.933)

/ Comparison is to a day where no substance use occurred prior to the sexual event;

* $p < .05$,

*** $p < .001$

Table 2
Regression Model for Level 1 and Level 2 Main Effects of Pre-Sex Substance Use on Risky Sex

Fixed Effect	β	s.e.	t	OR	C.I.
Intercept	0.30	0.13	2.31		
Sexual Partner	-0.81	0.20	-3.98***	0.44	(0.296,0.661)
<i>I</i> Pre-Sex Alcohol Only	0.17	0.13	1.28	1.18	(0.913,1.538)
Pre-Sex Marijuana Only	0.08	0.33	0.25	1.08	(0.572, 2.055)
Pre-Sex Alcohol + Marijuana	0.88	0.46	1.91	2.41	(0.976,5.972)
SAS - Initiation	0.05	0.19	0.28	1.05	(0.724,1.535)
SAS - Refusal	0.42	0.17	2.48*	1.53	(1.092,2.138)
SAS – STI/Pregnancy Prevention	-1.34	0.13	-10.55***	0.26	(0.205,0.337)

I Comparison is to a day where no substance use occurred prior to the sexual event;

* $p < .05$,

*** $p < .001$

Table 3
Final Multilevel Regression Model for Effects of Pre-Sex Substance Use on Risky Sex

Fixed Effect	β	s.e.	t	OR	C.I.
Intercept	0.30	0.13	2.30		
SAS - Initiation	-0.04	0.21	-0.18	0.96	(0.643, 1.446)
SAS - Refusal	0.46	0.19	2.47*	1.58	(1.098, 2.282)
SAS - STI/Pregnancy Prevention	-1.41	0.14	-10.03***	0.24	(0.184, 0.321)
Sexual Partner	-0.81	0.21	-3.94***	0.44	(0.297, 0.665)
/ Pre-Sex Alcohol Only	0.15	0.13	1.15	1.16	(0.898, 1.512)
x SAS - Initiation	0.26	0.21	1.22	1.30	(0.852, 1.977)
SAS - Refusal	-0.06	0.18	-0.31	0.95	(0.661, 1.352)
SAS - STI/Pregnancy Prevention	0.22	0.15	1.50	1.25	(0.934, 1.670)
Pre-Sex Marijuana Only	-0.13	0.38	-0.35	0.88	(0.418, 1.842)
x SAS - Initiation	-0.37	0.60	-0.62	0.69	(0.211, 2.241)
SAS - Refusal	0.43	0.50	0.86	1.53	(0.580, 4.051)
SAS - STI/Pregnancy Prevention	-0.56	0.46	-1.22	0.57	(0.231, 1.403)
Pre-Sex Alcohol + Marijuana	0.83	0.48	1.74	2.30	(0.901, 5.865)
x SAS - Initiation	1.45	0.90	1.62	4.26	(0.735, 24.703)
SAS - Refusal	-1.34	0.66	-2.03*	0.26	(0.072, 0.958)
SAS - STI/Pregnancy Prevention	0.29	0.50	0.58	1.33	(0.505, 3.522)

/ Comparison is to a day where no substance use occurred prior to the sexual event;

* p < .05,

p < .001