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Negative substance use consequences associated with non-condom use among male, but not female, alternative high school students

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Abstract

BACKGROUND—Alternative (or continuation) high schools are institutions designed for students at risk for not graduating due to behavioral, educational, or medical problems. The present study explored the relationship between negative substance use consequences (eg, having trouble at school or work) and non-condom use in this at-risk population and whether these associations varied by sex.

METHODS—Participants ($N = 1101$; 62.9% Hispanic; $M_{age} = 16.85$) were sampled from 24 alternative high schools in California, and data were analyzed using cross-sectional multivariate logistic regression models.

RESULTS—We observed a relationship between the number of negative substance use consequences and probability of non-condom use at the last sexual encounter for boys ($p < .001$) but not girls ($p > .05$). There were significant associations between specific social consequences (missing school/work) and dependence symptoms (selling personal items to get alcohol or drugs) with non-condom use for boys only. There was a similar association between substance use frequency and non-condom use for boys.

CONCLUSIONS—These findings suggest that substance use consequences may be a useful and advantageous indicator of risky sexual behaviors such as non-condom use for boys, but not girls, in alternative high school settings. Future research and intervention programming recommendations are discussed.

Keywords

substance use; negative consequences; risky sex; non-condom use; gender differences; alternative high school

Alternative high schools, or continuation schools, are educational settings designed for high school students at risk for not graduating due to behavioral, educational or medical problems. Data from nationally representative alternative high school samples using measures from the YRBS (Youth Risk Behavior Survey) suggests that—compared to youth in regular high schools—alternative high school youth report significantly greater prevalence of violence-related injury (eg, weapon carrying, fighting), suicide attempts, HIV or other sexually transmitted disease (STD)-related risk behaviors (more frequent sex, more partners, non-condom use), pregnancy, and chronic diseases due to unhealthy eating, lack of exercise, and tobacco, alcohol, marijuana, and hard drug use.^{1–3} A recent review of health behaviors and mental health of students attending alternative high schools⁴ corroborate this trend of increased risk for negative health behaviors and outcomes among alternative high school youth.

Several studies show that negative health-related behaviors, such as those described above, influence each other in a clustered fashion instead of acting independently on one's health.^{5,6} Resulting synergistic effects have important implications for researchers and clinicians due to 1) increases in the likelihood of involvement in multiple risk behaviors, 2) underestimation of disease risk when considered independently, and 3) shared variance in the clustering behaviors. The onset of many negative health behaviors typically occurs in adolescence⁷ with several having long-term, adverse life course consequences. Due to the clustering of risk behaviors, preventive interventions must consider that when, for example, 2 behaviors co-occur, an intervention on one might indirectly affect the other. Conversely, when a related behavior is not considered in the intervention, designing an intervention to address one behavior might be less effective and cost-efficient when working with samples where multiple negative health behaviors co-occur. With the exception of addressing the use of multiple substances, multiple behavior change interventions are not proving as effective as other health promotion programs.⁸ Establishing empirical links between health behaviors will help to strengthen our understanding of behavior co-occurrence, improve our ability to detect shared risk factors, and guide screening efforts that identify at-risk populations that could benefit from multiple health behavior intervention settings.

Gender differences in negative alcohol use consequences have been observed in adolescent and young adult samples^{9,10} with boys typically reporting more frequency and consequences of use. Similarly, gender differences are found among sexual risk behaviors. Despite a similar prevalence in current sexual activity (males: 33.3%, females: 34.2%) and that boys have a higher prevalence of having 4 or more sexual partners (males: 17.8%, females:

12.6%), adolescent girls are less likely to report condom use (males: 67%, females: 53.6%).¹¹ Moreover, Jackson, Sweeting, and Haw¹² presented evidence that relationships between illicit drug use and risky sex practices were significantly stronger among girls than boys in older adolescents. These differences underscore the need to explore sex specific associations between substance use behaviors and non-condom use in adolescent samples.

Examining substance use consequences as a correlate of non-condom use at last sexual encounter instead of substance use frequency is advantageous for 2 reasons. First, it is difficult to ascertain a cumulative effect of substance use on other negative health behaviors when substance use data are collected using ordinal response options (eg, never, 1–10 times, 11–20 times, etc.) as is common in survey based substance use research, generally. Second, substance use consequences can make it easier to identify at risk groups. For example, it would be difficult to identify a universal “cutoff” of alcohol use frequency or quantity that would lead to an increase in other negative health behaviors due to differences in alcoholic concentration of the drink, user metabolism, tolerance, and related factors. Using substance use consequences, however, researchers may be able to identify a pattern of consequences that place individuals at a higher risk for engagement in other adverse health behaviors. This may be especially important in samples with a high prevalence of multiple substance use as is true in the present study and likely in others.^{13,14}

Current study

The objective of the present study is to further our understanding of how negative health behaviors cluster during adolescence by exploring the relationship between negative consequences of substance use and non-condom use in an at-risk population. Specifically, we were interested in addressing the following research questions:

- Is there a relationship between the cumulative number of substance use consequences and non-condom use at last sexual encounter?
- Are individual substance use consequences related to non-condom use?
- Do these associations vary by sex?
- Can the results to the above research questions be replicated when using substance use frequency as the predictor?

METHODS

Participants

A convenience sample of students (N = 1676) from 24 continuation high schools in 4 counties in Southern California was recruited for this study.^{15,16} Because we investigate the relationship between 2 risk behaviors, individuals reporting no past year substance use (N = 312) and no past year sexual intercourse (N = 270) were not included in the present analysis, resulting in a final analytic sample of 1101.

Instrumentation

Drug use consequences—The 11 items of the Problem Consequence Subscale (PCS) from the Personal Experience Inventory (PEI)¹⁷ were used to assess past 12-month substance use consequences in the present study. Sample items include, “In the last 12 months, how many times have you...” “...committed a crime while under the influence of alcohol or other drugs?” “...had an accident or been injured due to using alcohol or other drugs?” The PCS is advantageous given its brief length, good discriminant validity and prediction drug use treatment involvement.^{17–19} Items were coded dichotomously where 1=experienced and 0=not experienced.

Substance use frequency—A substance use frequency variable was created by summing past 30-day frequency of use for all substances reported by the sample including alcohol, marijuana, cocaine, hallucinogens, stimulants, inhalants, ecstasy, painkillers, or tranquilizers. The survey also included an “other” drug category, but we did not include this response, as it was not possible to discern what—or how many—drugs the participant used in that category. Independent tobacco use was also excluded from this analysis, as the negative consequences scale was not developed for smokers. This variable was used in a follow-up analysis to determine if substance use frequency had a similar association with non-condom use as substance use consequences. Responses were coded 0–6 (0=never, 1=1–10 times, 2=11–20 times, etc.) for each substance and added together across the 9 reported substances for a final measure of substance use frequency.

Non-condom use—Participants were asked, “Was a condom used the last time you had sexual intercourse?” Responses were coded 0=yes and 1=no.

Covariates—Sex was coded 0 = girls and 1 = boys. Age was measured continuously in years and ethnicity was coded as non-Hispanic = 0 and Hispanic = 1. Models also controlled for maternal education, past year number of sexual partners, and being high at last sexual intercourse.

Procedure

Sixty-one candidate schools were approached for inclusion in the Towards No Drug Abuse (Project TND) prevention program. To be included in the study, schools had to meet the following inclusion criteria: 1) location of the school had to be within 75 miles of project headquarters, 2) the school had to include only grades 9 through 12, 3) schools had to offer at least 2 classes with a minimum of 60 students total, and 4) at least 5% of enrolled students had to be Caucasian (to be consistent with the ethnic composition of previous TND trials). Thirty-seven schools were not recruited resulting in 24 schools participating the study. The present investigation uses data from the baseline survey prior to program implementation. Students completed self-report surveys in their classrooms. Additional study details are described elsewhere.^{15,16}

Analysis

To address the first research question, multivariate logistic regression was used to assess the association between the total number of negative consequences (range: 0–11) and non-

condom use. To address research question 2, individual multivariate logistic regression models were performed to examine associations between specific negative consequences and non-condom use. Models were stratified by sex, with Bonferroni corrections to account for multiple comparisons. Because respondents were nested in schools, clustered sandwich estimators were used to adjust the standard errors to adjust for intragroup clustering of data. Substance use frequency and substance use consequences could not be modeled simultaneously due to a strong correlation between the constructs ($r=0.53$, $p < .0001$) resulting in multicollinearity issues and non-convergence of models.

For ease of interpretation, we present the quantities of interest as predicted probabilities with 99% confidence intervals. In the present study, the quantity of interest is defined as a change in the probability of non-condom use. Probability estimates and confidence intervals from each multivariate model was derived by simulation using 1,000 randomly drawn sets of estimates from a sampling distribution with the mean equal to the maximum likelihood point estimates and variance equal to the variance covariance matrix of the model estimates holding covariates at their mean values.²⁰ There are multiple benefits of this simulation approach including 1) providing an assessment of uncertainty surrounding any quantity of interest (ie, confidence intervals) that account for (1.1) *estimation uncertainty* (that our knowledge is based on a finite sample of observations) and (1.2) *fundamental uncertainty* (often described as the stochastic component of statistical formulae—"random error"), and 2) the conversion of odds ratios into results more easily comprehended by audiences with varying expertise in statistical analysis. All statistical models controlled for age, maternal education, ethnicity (Hispanic vs. non-Hispanic), past year number of sexual partners, and being under the influence of alcohol or drugs at last sexual intercourse.

RESULTS

Descriptive Statistics

In the analytic sample, 62.9% were Hispanic and the average age was 16.85 years old ($SD=0.03$). The majority of youth reported their mothers had either some high school education (27.6%) or were high school graduates (24.8%). Most participants reported using either 2 (25.8%) or 3 (18.4%) substances within the past thirty days. Boys reported more total substance use consequences ($t=3.01$, $p < .01$), past year number of sexual partners ($t=7.54$, $p < .001$), and being high at last sexual intercourse ($\chi^2=14.3$, $p < .001$) than girls. However, a greater proportion of female participants (57.7%) reported non-condom use at the last sexual encounter than male participants (36.8%; $\chi^2=47.4$, $p < .001$). Table 1 summarizes the descriptive statistics for the sample.

Main Findings

Among substance using adolescents who are sexually active in alternative high schools, experiencing more substance use consequences is a significant correlate for non-condom use among boys ($p < .001$) but not girls ($p > .05$). As shown in Figure 1, girls reporting no substance use consequences had a 58% probability of non-condom use (95% CI: .374–.632) while boys had a 30.2% chance (95% CI: .251–.363). This significant difference diminished as substance use consequences increased for males and became non-significant once boys

reported experiencing 5 or more negative substance use consequences (Boys: .458, 95% CI: .369–.493; Girls: .584, 95% CI: .481–.664).

The relationship between specific substance use consequences and non-condom use among boys and girls is shown in Figure 2. There were no significant relationships between any individual substance use consequence and non-condom use among females. However, among boys, social problems and dependence symptoms were significantly associated with the probability of non-condom use. Specifically, the probability of non-condom use significantly increased by 10.2% (99% CI: 0.2%–19.8%) if boys reported taking or selling others property, and 9.8% (99% CI: 0.01%–18.4%) if they sold their own property for alcohol or drugs. Engaging in illegal activity to acquire drugs and/or alcohol or missing school or work due to alcohol and drugs were associated with a 17.8% (99% CI: 6.6%–28.3%) and 13.5% (99% CI: 4%–22.5%) increase in non-condom use among boys, respectively. There was a marginally significant increase of 10% (99% CI: –1%–21%) in non-condom use if boys reported doing personal favors for alcohol or drugs.

Reverse Associations and Replication Using Substance Use Frequency

Following the primary analysis, 2 follow-up analyses were performed. First, a negative binomial regression model was fit with an interaction term (sex*non-condom use) to examine if non-condom use at last sexual encounter was a meaningful correlate of the number of substance use consequences (range: 0–11) by sex. There was no significant interaction between non-condom use and sex ($p = .09$) in the prevalence of substance use consequences.

Second, we explored whether substance use frequency had a similar association with non-condom use as substance use consequences in the present sample. Results indicate that an increase in substance use frequency was associated with an increase in the odds of non-condom use for boys (OR: 1.02, 95% CI: 1.01–1.04) but not girls (OR: 1.01, 95% CI: .99, 1.03).

DISCUSSION

Among sexually active substance using adolescents in alternative high schools, experiencing more substance use consequences is a significant risk factor for non-condom use among males but not females. There was a similar pattern of association when substance use frequency was modeled instead of substance use consequences. However, substance use consequences are an advantageous measure, as previously mentioned, since it is difficult to ascertain a cumulative effect of substance use frequency on non-condom use behavior given that (1) most participants reported using more than one substance and (2) substance use frequency data were collected using ordinal response options. As a result, it becomes difficult for interventionists to establish a “cut-off” to identify at-risk subgroups for risky sexual behavior in substance using population.

By modeling substance use consequences, we are able to identify specific behaviors associated with increased risk for non-condom use. We observed that males were more likely to report non-condom use if they indicated that their substance use led to social

problems (missing school/work or doing something illegal under the influence) or dependence symptoms (selling their own or other's property to purchase more drugs or doing personal favors for drugs). This was not observed among females in the present sample. Motivations for non-condom use among females may not be tied to their substance use behavior and might instead reflect cognitive planning (ie, mental preparation for discussing condom use with one's partner) or motives for having sex.²¹ More work is needed to identify behavioral risk factors for non-condom use among females that can be identified and addressed in intervention programs to reduce risky sexual behaviors.

These results are in line with previous results suggesting that substance use behavior and risky sex practices cluster together²² but differ from findings suggesting that clustering of drug use behaviors and risky sexual practices tend to be more pronounced in females than in males.¹² In particular, we observed females as having a higher probability of non-condom use relative to males among those using alcohol or drugs, but not experiencing any consequences. However, this difference diminished as males experienced more substance use consequences. Moreover, findings of a recent meta-analysis²³ of universal substance use and risky sex interventions among young people in the United Kingdom did not find overall evidence of combined treatment effects for these negative health behaviors. We recommend that researchers screen for substance use consequences in order to identify male populations, specifically, for targeted risky sex and substance use interventions to improve efficiency of program delivery and reduce economic costs.

Limitations and Conclusion

There are several limitations to this study. First, the present data are cross sectional and do not support cause and effect conclusions. Second, we did not include an exhaustive list of negative consequences limiting our conclusions to the consequences that were surveyed; however, the findings do support the use of the PEI scale as a screening mechanism for substance use consequences. Third, data was collected from a convenience sample of students from alternative high schools in California and may not represent the population of alternative high school students. Moreover, drug use was self-reported and not corroborated with other reporting mechanisms, such as biochemical evidence. Fourth, we could not model substance use frequency and consequences simultaneously limiting our ability to tease out the variance explained by these indicators of substance use involvement. Finally, we did not examine the role of sexual orientation and it is possible that the risk for combined substance use and risky sex practices are different among sexual minority groups.²⁴

Extant research has established a link between substance use and engagement in other health compromising behaviors during adolescence.²⁵ This study adds to the existing literature showing that certain social problems or dependence symptoms are associated with non-condom use at the last sexual encounter for males and may serve as a useful indicator for prevention programming with high-risk adolescent male populations. Future research should continue to investigate whether the substance use consequences are a causal mechanism in risky sexual behaviors for males. It is conceivable that these behaviors operate as a function of shared risk factors (eg, impulsivity, sensation seeking) or that the relationship between these health behaviors are mediated by another construct, such as perception of risk or

sexual pleasure expectancies. Alternatively, males from at-risk populations such as alternative high schools may be more susceptible to cognitive impairments from substance use affecting their sexual decision making skills though evidence has suggested null gender differences²⁶ or an emphasis on outcomes among females.²⁷ It is important to note that such research has focused on the myopic effects of alcohol and has used alcohol frequency as opposed to negative consequences that may explain these differences. Teasing out the mechanisms that explain the observed associations in this study will improve our ability to prevent risky sexual behaviors in substance using populations.

IMPLICATIONS FOR SCHOOL HEALTH

This study supports previous findings that students in alternative high schools may be at a heightened risk for experiencing multiple behavioral health problems.^{1–3} Providing education, screening, and care to adolescents through School Based Health Centers (SBHCs) is one method for improving prevention outcomes²³ and treatment outcomes, including the reduction of substance use problems and co-occurring risky sexual practices that heighten the risk of long-term consequences such as contracting sexually transmitted infections (STIs) and teen pregnancy.

However, barriers to integrating SBHCs can impede their implementation and effectiveness. These include, for example, funding for trained staff and supplies, school and parental “buy-in” to screening, consent requirements, and parent or student resistance.²⁸ However, previous work^{29,30} has demonstrated the benefits of partnership between an on-site SBHC and the school administration to improve the behavioral and sexual health of high school students. Alternative high schools should consider the benefits and barriers to adopting SBHCs. The findings of this study suggest that developing resources that lead to improvement in the surveillance and early treatment of substance use behaviors and outcomes may have direct, and indirect, benefits to student’s sexual and other health outcomes. More research is needed to identify the mechanisms underlying correlated behavioral health problems and whether or not SBHCs can serve as an efficacious resource for addressing multiple behavioral health problems in adolescents from alternative high schools.

Human Subjects Approval Statement

The IRB at the University of Southern California approved all study procedures.

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Figure 1.
Association between the Cumulative Number of Negative Substance Use Consequences and Probability of Non-Condom Use at Last Sexual Encounter for Boys and Girls

Figure 2.
Sex-specific Change in the Probability of Non-condom Use at Last Sexual Encounter by
Individual Substance Use Consequences

Table 1

Descriptive Statistics by Sex and for the Total Analytic Sample

Variable	Boys (N = 631)	Girls (N = 470)	Difference	Total sample (N = 1101)
	M (SD)	M (SD)	t	M(SD)
Age	16.8 (0.9)	16.9 (0.9)	-1.31	16.85 (0.03)
Substance use frequency	3.86 (2.24)	3.63 (2.15)	-1.64	3.76 (2.20)
Total substance use consequences	2.5 (2.7)	2.1 (2.6)	3.01 **	2.33 (0.08)
Past year # of sexual partners	3.1 (2.7)	1.9 (1.6)	7.54 ***	2.59 (0.07)
	f (%)	f (%)	χ^2	f (%)
Hispanic	395 (62.5)	298 (63.4)	0.001	693 (62.9)
Non-condom use	232 (36.8)	271 (57.7)	47.4 ***	503 (45.7)
High at last sexual intercourse	308 (48.8)	176 (37.4)	14.3 ***	484 (43.9)
Maternal education				
<8 th grade	79 (12.5)	74 (15.7)		153 (13.9)
Some high school	162 (25.7)	142 (30.2)		304 (27.6)
High school graduate	167 (26.4)	106 (22.6)	6.8	273 (24.8)
Some college	113 (17.9)	83 (17.7)		196 (17.8)
Four-year college graduate	58 (9.2)	35 (7.4)		93 (8.4)
Advanced degree	15 (2.4)	9 (1.9)		24 (2.2)

Note: M=mean, SD = standard deviation, f = frequency, % = percent.

*
p < .05,**
p < .01,***
p < .001.

Non-condom use refers to condom use at last sexual encounter.