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Brief Intervention for Truant Youth Sexual Risk Behavior and Alcohol Use: A Parallel Process Growth Model Analysis

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Abstract

Truant youths represent a challenging, yet very promising group of at-risk youth to study. In addition to problems in school, they frequently experience troubled family situations, emotional/psychological problems, involvement in substance use, and delinquency. Given the problems often experienced by truant youth, it is likely they are engaging in alcohol use and sexual risk behavior at a higher rate, than the general youth population. Identification of these youths' problems and early placement into effective intervention services would benefit them, their families, and society. The current study presents interim findings from an ongoing, NIDA-funded experimental, Brief Intervention (BI) study involving truant youths and their parent/guardians. Baseline, 3-month, 6-month, and 12-month follow up data were analyzed to determine whether alcohol use and sexual risk behaviors were longitudinally related, examine the effects of the intervention on longitudinal alcohol use and sexual risk behaviors, identify latent subgroups of youths in the data for alcohol use and sexual risk behaviors, and determine whether the intervention influenced these subgroups.

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Results indicated alcohol use and sexual risk were longitudinally related. Subgroups of youth were also identified based on alcohol use and sexual risk behavior levels and trends. Further, limited treatment effects were observed for alcohol use. Implications of the results for future research and service delivery are considered.

Keywords

Truancy; alcohol use; sexual risk; growth model; latent class analysis

Introduction

Alcohol use and engagement in sexual risk behavior are common, co-occurring phenomena among adolescents (CDC, 2009; Cooper, 2002; Goldstein, Barnett, Pedlow, & Murphy, 2007; Elkington, Bauermeister, Brackis-Bott, Dolezal, & Mellins, 2009; Komro, Tobler, & Maldonado-Molina, 2010; Morris, Baker, Valentine, & Pennisi, 1998; Morris, Harrison, Knox, Tromanhauser, & Marquis, 1995; Murphy, Brecht, Herbeck, & Huang, 2009; Wetherill & Fromme, 2007). Although engaging in these behaviors can be accepted as part of normal adolescent development, they may place youth on a trajectory of serious, negative health related outcomes. For example, involvement in sexual risky behavior places adolescents at high risk for sexually transmitted diseases (STDs), including HIV (CDC, 2005; Whaley, 1999).

Adolescents having contact with the justice system have higher STD rates (Bryan, Ray, & Cooper, 2007; Dembo, Belenko, Childs, Wareham, & Schmeidler, 2009), in comparison to the general adolescent population (Morris et al., 1995). Likely reasons for this disparity may be due to justice-involved youth having sex at a younger age, having a greater number of sexual partners, reporting lower rates of condom use, and participating in more deviant behavior (cf. Schmiege, Levin, Broaddus, & Bryan, 2009; Teplin, Mericle, McClelland, & Abram, 2003). Importantly, an increasing number of recent studies has examined the relationship between alcohol use and sexual risk behavior among high-risk juveniles, with particular attention to those youth involved in the criminal justice system (Bryan et al., 2007; Schmiege et al., 2009).

Research indicates alcohol use is commonly cited as a reason for lack of condom use and other sexual risk behavior among adolescents (Cooper, 2002; Elkington et al., 2009; Goldstein et al., 2007; Komro et al., 2010; Morris et al., 1995; Morris et al., 1998; Murphy et al., 2009; Wetherill & Fromme, 2007). Further, alcohol use in the context of sexual encounters appears to be increasing among youth (CDC, 2006), placing them at greater risk for a variety of negative consequences (Bryan et al., 2007).

Very few longitudinal studies have examined on the relationship between alcohol use and engagement in sexual risk behavior, especially among high-risk youths. Two such studies have recently been completed. Murphy et al. (2009) completed a secondary analysis of data from the National Longitudinal Survey of Youth, and identified two major risk groups: (a) a high risk group, characterized by an early pattern of sexual risk behavior extending into early adulthood, and (b) a low risk group exhibiting low levels of alcohol use and sexual risk

behavior over time. Another recent study was completed by Bryan et al. (2007) among criminally involved adolescents, which included a 6-month follow-up period. Results indicated the quantity of alcohol consumed and the nature of the sexual partner relationship affected the probability of condom use. Further, higher impulsive sensation-seeking was associated with lower reported condom use. Additional longitudinal studies are needed, however, on alcohol use and sexual risk behavior among different groups of at-risk groups to develop a more complete understanding of the co-occurrence of these behaviors (see: Bryan et al., 2007; Halpern-Felsher, Millstein, & Ellen, 1996).

Explanations have been offered to account for the association between alcohol use and sexual risk behavior among youth (Bryan et al., 2007). Alcohol myopia theory asserts that persons under the influence of alcohol are likely to focus on highly salient, immediate cues (e.g., partner relationship), rather than on distal outcomes (e.g., contracting STDs) (Brown & Vanable, 2007; Steele & Josephs, 1990). Expectancy theory holds that beliefs about alcohol effects influence situations in which one uses alcohol and the behavioral and social reactions to substance use (Dermen & Cooper, 1994; Patrick & Maggs, 2009). Alcohol use and sexual risk behavior may also reflect an underlying “proneness to deviance,” or problem behavior syndrome (Jessor & Jessor, 1977). Youth who participate in one form of deviance (e.g., drug use) could be expected to engage in other forms of deviance (e.g., risky sexual behavior) (Winters, Botzet, Fahnhorst, Baumel, & Lee, 2009).

There is a need to develop and test interventions to reduce alcohol use and sexual risk behavior among at-risk youth. Interventions targeted to different at-risk groups of youths can be especially beneficial in reducing their long-term participation in these behaviors, in addition to their associated, adverse outcomes, such as contracting STDs and HIV/AIDS. Identification of youths who engage in these problem behaviors and early placement of them into effective intervention services would benefit them, their families, and society (Hawkins et al., 2000). Further, there is a need to follow these youths over time to better understand any long-term relationships between alcohol use and sexual risk behaviors, and to assess the impact of risk reduction interventions on them. In this vein, there is some evidence to indicate that drug prevention interventions can have “spillover” effects in reducing sexual risk behavior among youths (Ellickson, McCaffrey, & Klein, 2009).

We have not been able to identify any studies examining alcohol use and sexual risk behavior among truant youth. This is unfortunate, as truant youth often experience a number of serious problems. They represent a challenging, yet very promising group of at-risk youth to study. In addition to having problems in school, truant youth frequently experience troubled family situations, failing grades, and psychosocial difficulties, including drug use (Dembo & Turner, 1994). The limited number of available studies involving selected samples of truant youths indicate they often experience serious interrelated problems in regard to a stressed family life (Baker et al., 2001; Kearney & Silverman, 1995), alcohol and other drug use (Baker et al., 2001; Dembo & Turner, 1994; Diebolt & Herlache, 1991; Pritchard, Cotton & Cox, 1992), emotional/ psychological functioning (Dembo, Briones-Robinson, Ungaro, Gulledge, Karas, Winters, Belenko & Greenbaum, in press a; Diebolt & Herlache, 1991; Egger, Costello, & Angold, 2003; Kearney & Silverman, 1995), and poor educational functioning (e.g., low grades, grade retention, placement in remedial or special

programs) (Dembo & Turner, 1994; Garry, 1996; Ingersoll & LeBoeuf, 1997). Given these problem behaviors found among truant youth, it is likely they are also engaging in alcohol use and sexual risk behaviors at a higher rate than the general youth population (Eaton, Brener & Kann, 2008). Research also suggests that truant youths are at considerable risk of continuing their troubled behavior in school and entering the juvenile justice system (Garry, 1996; Ingersoll & LeBoeuf, 1997; Loeber & Farrington, 2000; Puzzanchera, Stahl, Finnegan, Tierney & Snyder, 2003; also see: Henry, Thornberry, & Huizinga, 2009).

The current study presents interim findings from an ongoing, NIDA-funded, experimental, prospective intervention study involving truant youths and their parents/guardians. Drawing on the literature reviewed above, we examined three main hypotheses. First, the youths' alcohol use and sexual risk behavior will be related to each other over time. Second, compared to youths not receiving Brief Intervention (BI) services that targeted substance use, youths receiving the BI will show reduced involvement in alcohol use and sexual risk behavior over time. Finally, alcohol use and sexual risk behavior subgroups of youths will be identified, and these subgroups will respond differently to BI services.

Method

Subjects

Eligible youths met the following criteria: (1) age 11 to 17, (2) no official record of delinquency or up to two misdemeanor arrests, (3) some indication of alcohol or other drug use, as determined, for example, by a screening instrument (PESQ [Winters, 1992]) or as reported by a Hillsborough County School District (HCSD) social worker located at the Truancy Intake Center (TIC), and (4) lived within a 25 mile radius of the TIC. The main place of recruitment into the BI project occurred at the Hillsborough County Juvenile Assessment Center, TIC. In addition, eligible participants were recruited from a community diversion program, and any HCSD social worker or guidance counselor could make referrals to the BI project. Free project services were provided in-home, and participation was voluntary. A discussion of the enrollment process appears in Dembo et al. (in press b).

Following the completion of the consent and assent processes, and separate baseline interviews with the youth and his/her parent/guardian, the youth and parent/guardian were randomly assigned to one of three project service conditions: (1) the Standard Truancy Services (STS), plus a referral service overlay involving three in-home visits by a project staff member, (2) the youth BI where two BI sessions were administered to the youth, or (3) the youth-parent BI where two BI sessions were administered to the youth and an additional session to the parent. All study procedures were approved and monitored by a local IRB.

Overview of the Brief Intervention

Following is a description of the BI, to give the reader an understanding of the conceptual foundation and content of the intervention. The primary goal of the BI therapist sessions is to promote abstinence and prevent relapse among drug using adolescents through the development of adaptive beliefs and problem-solving skills. The BI incorporates elements of Rational-Emotive Therapy (RET) and Problem-Solving Therapy (PST) to develop adaptive

beliefs and coping skills. Drug involvement is viewed as learned behavior that develops within a context of personal, environmental, and social factors (Catalano, Hawkins, Wells, & Miller, 1991; Clark & Winters, 2002) that shape and define drug use attitudes and behaviors. Developed over the course of an adolescent's learning history and prior experience with drugs, maladaptive beliefs and coping skill deficits are viewed as primary determinants of drug use. The goal of the BI therapist session is to diminish factors contributing to drug use (e.g., maladaptive beliefs) and promote factors that protect against relapse (e.g., problem solving skills) (Winters & Leitten, 2007).

BI counselors receive training on the treatment manual and personal training from a skilled trainer on all intervention components. The counselors, then, provide BI services to several practice cases. Following a review and approval of these sessions by the BI skilled trainer, with a focus on developing therapist adherence (aided by a rating checklist) and competence (e.g., perceived warmth and interest in the client, presentation clarity, ability to elicit client feedback), the interventionist begins to receive project families. Each BI session lasts for 1-1/4 hours, and the sessions occur about a week apart. With youth and parent/guardian permission, the BI sessions are tape recorded for ongoing fidelity/adherence assessment.

The first BI session with the youth focuses on discussing information about the youth's substance use and related consequences, the level of willingness to change, examining the causes and benefits of change, and discussing what goals for change the youth would like to select and pursue. The youth is allowed to pursue goals of drug abstinence or reduction in drug use. In the second session with the youth, the counselor reviews the youth's progress with the agreed upon goals, identifies risk situations associated with difficulty in achieving goals, discusses strategies to overcome barriers toward goal achievement, reviews where the youth is in the state of change process, and negotiates either continuation or advancement of goals. Informed by an integrated behavioral and family therapy approach, the parent BI session addresses the youth's substance use issues, parent attitudes and behaviors regarding this use, parent monitoring and supervision to promote progress towards their child's intervention goals, and parent communication skills to enhance youth-parent connectedness.

Standard Truancy Services

In addition to the normal truancy services provided by the HCSD, truant youths and their parents/guardians have access to a Hillsborough County agency and service resource file to assist them in connecting with needed services/programs. Developed over a period of several years, this resource guide contains hundreds of agency listings. Reflecting the concept of equipoise (Freedman, 1987), this referral assistance provides truant youth and their families with an additional resource that is not routinely available to them.

To control for service exposure, STS youths/families received three weekly hour-long visits by a project staff member. On each contact occasion, the staff member carried a copy of a Hillsborough County government-developed agency and service resource file. In addition to a general inquiry on events since the last session, the staff member asked the youth and his/her parents/guardians: (1) if they used any services and (2) if there were any additional service needs–and, if so, provided an appropriate referral.

Initial and Follow-up Interviews

The main data collection instruments used in the study were the Adolescent Diagnostic Interview (ADI, Winters & Henly, 1993), and the Parent/Guardian ADI (Winters & Stinchfield, 2003). Baseline interviews were completed with the 200 youths and their parents/guardians between March 6, 2007 and December 3, 2010. Each youth and parent/guardian was paid $15 for completing each baseline and follow-up interview. The baseline interviews for parents/guardians averaged 30 minutes; the youth interviews averaged one hour. Depending on the month/year youths entered the project, 3-month (90 days), 6-month (180 days), and 12-month follow-up interviews were completed. The follow-up interviews followed the date of the youth's last participation in project services (i.e., the last intervention or STS session). The majority of youths were interviewed in their homes at each follow-up time point, while a very small number of youths were interviewed in secure program settings, such as residential commitment programs, county jails, or a juvenile detention center. For 3-month, 6-month, and 12-month follow-up interviews, respectively, 1.8%, 2.7%, and 1.7% of youth were interviewed in a secure program setting. Overall completion rates of 92.2%, 92.6% and 90.8% were achieved for the 3-month, 6-month, and 12-month follow-up interviews, respectively. Importantly, there was a low refusal rate for each follow-up (<8%). Of the completed follow-up interviews, 97% of the 3-month, 95% of the 6-month, and 97% of the 12-month interviews were completed within 60 days following the anniversary of their preceding interview. Similarly, high percentages of follow-up interviews were completed within 30 days of the date of last participation: 84% of the 3-month, 84% of the 6-month, and 85% of the 12-month follow-up interviews. (A table reporting these results is available from the corresponding author upon request.)

Sample Characteristics

Most youths in the study were male (65%), and averaged 14.79 years in age (SD = 1.31). Thirty-eight percent of the youths were Caucasian, 26% were African American, 28% were Hispanic, 2% were Asian, and 7% were from other, mainly multi-ethnic, backgrounds. Relatively few youths (14%) lived with both their biological parents. In contrast, a majority of the youths were living either with their biological mother alone (34%) or with their mother and another adult (34%). Many of the youths tended to live in modest socioeconomic circumstances. For example, 10% of the caretakers reported an annual income of more than $75,000, while 38% reported annual incomes of $25,000 or less. Median family income was $25,000 to $40,000.

Psychosocial Description

The youths reported they and their families experienced significant problems. Specifically, 56% reported a family member ever had a substance abuse problem, and 34% indicated a family history of mental health problems. The youths also reported they had experienced significant psychosocial problems. Nineteen percent of the youths claimed ever having had a substance abuse problem, and 9% reported they had received substance abuse treatment. In addition, 46% of the youths claimed they had received treatment for emotional or behavioral problems; and, 19% reported they were sent to live away from home due to behavior problems at some point in their lives.

Measures

Youth alcohol use—The ADI alcohol questions probed youths use of alcohol to the point of experiencing its effects, such as feeling a buzz or getting drunk (Winters & Henly, 1993). From the alcohol use data at each time point, we created a measure reflecting the reported use of this substance as "never," "1 to 4 times," or "5 or more times." The baseline alcohol use questions probed lifetime use up until the time of the baseline interview, while the follow-up interviews probed the use of alcohol since the date of the previous interview.

Table 1 presents the youths' responses to the alcohol use questions at each time point. As can be seen, following baseline there is an increase in the percent of youths reporting alcohol use from 3-month to 12-month follow-up interview, especially use 5 or more times. There is a corresponding, general decrease in the percent of youths indicating the use of alcohol as "never" or "1 to 4 times."

Sexual risk behavior—We probed youths' involvement in sexual risk behavior at baseline and at each follow-up interview using the POSIT HIV/STD Risk Behavior instrument. The POSIT 11-item HIV/STD risk scale was developed by the NOVA Research Company (Young & Rahdert, 2000). The instrument has been pilot tested and found to have very good psychometric properties (e.g., internal consistency = 0.80, one-week test-retest reliability = 0.90; concurrent validity with the Sexual Risk Questionnaire scores: r = 0.80). In the current study, the internal consistency (Cronbach's Alpha) of the 11 items was 0.76.

Table 2 presents the baseline (lifetime) data for the sexual risk items. As can be seen, large percentages of youths reported close friends having had sex, and 66% of the youths reported they had sexual intercourse. Importantly, sizable percentages of youths indicated they had sexual intercourse without using a condom (34%) and having 2 or more sexual partners (32%). Comparison of these results with findings reported in the Centers of Disease Control, 2009 Youth Risk Behavior Surveillance (YRBS, CDC, 2009), indicates a higher rate of ever having had sexual intercourse among youths in our study, than that reported by youths in the YRBS (46%). This result is consistent with the expectation, noted earlier, that truant youth engage in sexual risk behavior at a higher rate than the general youth population.

Lack of condom use and number of sexual partners are widely used sexual risk behavior measures in related research (Brook, Balka, Abernathy, & Hamburg, 1994; Bryan et al., 2007; Cooper, 2002; Elkington et al., 2009; Goldstein et al., 2007; Komro et al., 2010; Morris et al., 1995; Morris et al., 1998; Murphy et al., 2009; Wetherill & Fromme, 2007). Hence, we developed a summary measure to focus on engaging in these two prominent indicators of sexual risky behaviors at each time point from the youths' replies to these items, which consisted of three ordinal categories: 0 = engaged in none of the two sexual risk behaviors (i.e., sexual intercourse without using a condom and having 2 or more sexual partners), 1 = engaged in one of the two sexual risk behaviors, 2 = engaged in both sexual risk behaviors.

Table 3 shows the percent of youths replying affirmatively to each sexual risk behavior item at each time point and the results for the summary index we developed from the youths' replies to these questions across the four time points. As can be seen in Table 3, there is a

gradual increase in the percent of youths reporting engagement in both sexual risk behaviors from 3-month to 12-month follow-up, and a corresponding, general decrease in the percent of youths reporting not engaging in any of these behaviors or in one of them. (Although from 45% to 55% of youths did not report engaging in one or another of the two sexual risk behaviors in Table 3, it is important to note that the vast majority of youths reported having some sexual experience [e.g., sexual contact with another person] at each time point [baseline, 82%; 3-month follow-up, 72%; 6-month follow-up, 76%; 12-month follow-up, 81%]).

Treatment effect and other covariates—Measures for treatment effects and covariates were also included in analyses. Treatment was measured as receiving overall BI services (youth and youth-parent interventions combined) versus STS. Covariates for sociodemographic measures were included for gender, age, African-American race, and Hispanic ethnicity. Following the work of Bryan et al. (2007), a covariate for Attention Deficit-Hyperactivity Disorder (ADHD) was also included in analyses. Four questions keyed to DSM-IV criteria for ADHD were included in the youth ADI interviews (Winters & Henly, 1993). Large percentages of youths (noted in parentheses) reported ever experiencing one or more of these issues: (1) *Do you often get complaints from parents/teachers that you don't listen to instructions or directions?* (57%), (2) *Do you frequently tend to act before thinking?* (70%), (3) *Do you often have difficulty waiting for your turn during games or when doing things with other people your age?* (33%), (4) *Do you often fidget and find it difficult to sit still?* (54%). Confirmatory factor analysis using Bayesian estimation indicated the four items provided a good fit for a single factor (Potential Scale Reduction = 1.07; Posterior Predictive *p*-value = 0.42). Factor scores were saved and used in subsequent analyses. (A table reporting these results is available from the corresponding author upon request.)

Comparison of Intervention Groups Demographics and Baseline Alcohol Use and Sex Risk Behavior Measures

Comparisons were made across the three intervention groups (BI Youth, BI Youth-Parent, and STS) in regard to: (a) gender, age, African American race, and Hispanic ethnicity, (b) alcohol use and lifetime involvement in sexual risk behavior (measured at baseline), and (c) ADHD. Results indicated the three groups were similar on all of these comparison variables.

Results

Strategy of Analysis

Latent growth modeling (see Duncan, Duncan, Strycker, Li, & Alpert, 1999) was used to examine growth in two constructs, alcohol use and sexual risk behavior, over four time points across one year. In latent growth models, longitudinal data are modeled as resulting from latent variables of a mean trend for the population while allowing for differences among individuals. The growth model analyses were completed using Mplus Version 6.1 (Muthèn & Muthèn, 2010), a multivariate statistical modeling program that estimates a variety of models for continuous and categorical observed and latent variables.

The growth models were estimated using Bayesian estimation procedures. Maximum likelihood (ML) estimation procedures are currently widely used in statistical analyses. In recent years, however, Bayesian analysis has become increasingly popular. Bayesian estimation is a preferred approach for analyzing relatively complex models, when data are sparse or samples are small—where asymptotic distributions, underlying ML/other frequentist estimation procedures, are unlikely to hold (Gelman, Carlin, Stern, & Rubin, 2004; Lynch, 2010; Rupp, Dey & Zumbo, 2004; Scheines, Hoijtink, & Boomsma, 1999). When samples are large, the results of maximum likelihood and Bayesian analyses tend to be similar. Bayesian analysis is firmly established in mainstream statistics.

Two estimates of model adequacy are important in Bayesian analysis: (a) convergence and mixing and (b) model fit. In Bayesian analysis, Markov Chain Monte Carlo (MCMC) estimation algorithms are used to make random draws of parameter values, resulting in an approximation of the joint distribution of all parameters in the analysis. Usually, several MCMC chains are used, involving different starting values and different random seeds in making the random draws (Muthèn & Asparouhov, 2010; also see: Lynch, 2010). The Gelman-Rubin diagnostic (Gelman & Rubin, 1992; also see: Gelman et al., 2004), referred to as the potential scale reduction (PSR) factor, is often used to assess convergence-mixing. A PSR value close to 1, and below 1.1, is considered as evidence that convergence and adequate mixing has been achieved. Model fit refers to assessing whether the model fits the data well enough to permit the drawing of inferences about the parameters (Lynch, 2010). A widely used approach for examining model fit is posterior predictive distribution checking (Gelman et al., 2004; Gelman, Meng, Stern, & Rubin, 1996). As implemented in Mplus (Muthèn & Muthèn, 2010), a posterior predictive p-value (PPP) fit statistic is based on the commonly used likelihood-ratio chi-square test of an H0 model against an unrestricted H1 model (Muthèn & Asparouhov, 2010). A low PPP value (e.g., .05 or .01 [see: Asparouhov & Muthèn, 2010]) indicates a poor fit, whereas values around 0.5 reflect an excellent fit.

Because the time of entry into the study determined the number of follow-up interviews each youth and parent/guardian received, the data that are missing are a consequence of study design. Accordingly, in the Bayesian analyses missing data were replaced in Mplus by a simulated value using a regression-prediction algorithm (Muthèn & Muthèn, 2010).[1] Since there is scant literature on the topic of this paper, the Bayesian analyses were performed without informed priors.

We began our analyses by estimating separate latent growth models to examine whether there were linear or quadratic trends in (1) alcohol use or (2) sexual risk behavior over time, and whether there was individual variability in each behavior. For these constructs, the intercept (i.e., level) and linear and quadratic trend factors were estimated across four time points (baseline, 3-month, 6-month, and 12-month follow-ups). Finally, we combined the separate models to examine a growth model for parallel processes in these two types of behavior.

[1]The proportion of data present for each model can be obtained from the corresponding author upon request.

The Parallel Growth Model

Figure 1 presents the parallel growth model we tested. The sexual risk and alcohol use portions of the model were each estimated with linear and quadratic growth trends across the four time points. The time specification of the model accommodated to the unequal measurement points (3-month, 6-month, and 12-month follow-ups). Covariances were specified between each pair of growth model latent variables reflecting sex risk level, sex risk linear trend, and sex risk quadratic trend, and alcohol use level, alcohol use linear trend, and alcohol use quadratic trend.

Adjusting for Time at Risk

Time in a secure setting reduces the likelihood of engaging in risk behavior. Hence, for each youth, we determined in each follow-up period, the number of days he/she spent in a secure facility (e.g., detention center, jail, residential commitment program, detoxification facility, treatment program). Study of the data indicated there was no need to adjust for time at risk in our analyses for four main reasons. First, relatively few youths were placed in a secure facility during the 3-month, 6-month, and 12-month follow-up periods: 5%, 7% and 11%, respectively. Second, the average number of days placed in a secure facility during each of these follow-up periods were relatively few (1.4, 3.2, and 4.2, respectively). Third, the correlations between the number of the days spent in a secure facility during each follow-up period and the youths' reported alcohol use during that period were low and non-significant (correlation range: −.102 to −.053). Finally, the correlations between the number of the days spent in a secure facility during each follow-up period and the youths' reported involvement in sexual risk behavior during that period were also low and non-significant (correlation range: −.121 to .145).

Alcohol Use Growth Model

A linear growth model estimation of the alcohol use data found acceptable convergence-mixing (PSR = 1.07), but a poor fit of the model to the data (PPP = 0.01). On the other hand, a quadratic growth model analysis of the hypothesized model indicated acceptable convergence-mixing and fit of the model to the data (PSR = 1.04; PPP = 0.28).[2]

Sexual Risk Behavior Growth Model

A linear growth model estimation of the sex risk behavior data found acceptable convergence-mixing (PSR = 1.06), and an acceptable fit of the model to the data (PPP = 0.56). A quadratic growth model analysis of the sexual risk behavior summary measures also indicated a good fit of the model to the data (PSR = 1.05; PPP = 0.43).[3]

Parallel Alcohol Use-Sexual Risk Processes Growth Model

We first estimated a linear parallel growth model involving the alcohol use and sexual risk behavior measures. Results indicated good convergence-mixing (PSR = 1.06), but a poor fit of the model to the data (PPP = 0.04). A sizable number of cases with valid data were

[2–6]Due to space concerns, tables reporting these results has been omitted. Copies are available from the corresponding author upon request.

available for these analyses. Covariance coverage for the sexual risk data indicated the proportion of data available at 3-month, 6-month, and 12-month follow-ups were 0.815 to 0.820, 0.720 to 0.735, and 0.525 to 0.535, respectively. The proportion of alcohol use data available at 3-month, 6-month, and 12-month follow-ups were 0.830, 0.730 to 0.735, and 0.530 to 0.535, respectively.

On the other hand, as Table 4 shows, a quadratic parallel process growth model analysis of alcohol use and sexual risk behavior indicated good model convergence-mixing and fit (PSR = 1.08; PPP = 0.26). As can be seen, five of the fifteen latent variable covariances (33%) were statistically significant, including three of the nine quadratic trend covariances. The significant covariances were: (1) sexual risk behavior linear trend and sexual risk quadratic trend (estimate = −0.064, $p = 0.006$), (2) sexual risk behavior level and alcohol use quadratic trend (estimate = 0.292, $p = 0.010$), (3) sexual risk behavior level and alcohol use level (estimate = 1.118, $p = 0.002$), (4) alcohol use level and alcohol use quadratic trend (estimate = 0.412, $p < 0.001$), and (5) alcohol use linear trend and alcohol use quadratic trend (estimate = −0.190, $p = 0.020$). Compared to youths with no or little involvement with alcohol at baseline, youths who engaged in more alcohol use were significantly more likely to report a greater level of involvement in sexual risk behavior. A positive quadratic trend exists between baseline sexual risk behavior and alcohol use over time, indicating a higher rate of alcohol use among youths more involved in sexual risk behavior at baseline. These results provide partial support for Hypothesis 1 that alcohol use and sexual risk are related over time. Significant variances were also obtained for sex risk level, linear trend, and quadratic trend, as well as alcohol use level, linear trend, and quadratic trend, indicating significant variation in these behaviors at baseline and over time.

Demographic and Intervention Condition Predictors of Growth Model Latent Variables

We also examined the effects of youths sociodemographic characteristics (age, gender, African-American race, and Hispanic ethnicity), ADHD factor scores, and BI treatment on alcohol use and sexual risk behavior level, linear trend, and quadratic trend latent variables. Since there were a relatively small number of cases in each of the intervention conditions (youth BI: n = 65; youth-parent BI: n = 68; STS: n = 67), limiting statistically meaningful three group comparisons, an overall intervention effect was studied involving a comparison between BI for combined youth and youth-parent intervention vs STS youths.

The following significant effects were found: (a) girls reported more involvement in alcohol use at baseline than male youths; (b) African-American youths reported less alcohol use at baseline than non-African-American youths, (c) girls had lower rates of increase in alcohol use over time (linear trend) than male youths; (d) African-American youths had a higher rate of linear increase in alcohol use over time than non-African-American youths, and (e) the quadratic trend for alcohol use over time was positive for gender, indicating a higher rate of alcohol use over time for girls than boys in the study. In contrast to the work of Bryan et al. (2007), we found no significant impulsivity effect (measured by our ADHD variable) on sexual risk linear or quadratic trends. Further, no overall, significant intervention effects were found on the sexual risk behavior or alcohol use linear trend or quadratic trend latent variables.[4] The lack of an overall BI effect on the youths' alcohol use and sexual risk

behavior over time did not support Hypothesis 2, which predicted BI reduces alcohol and sexual risk behavior over time.

Growth Mixture Modeling with Sexual Risk Behavior and Alcohol Use Latent Trajectory Classes

We examined the possibility that the data across the four time points contained youth subgroups differing in their sexual risk behavior (Murphy et al., 2009) and alcohol use over time. Growth mixture modeling was used in this effort (Muthèn & Muthèn, 2010). Figure 2 presents the growth mixture model we estimated for alcohol use over time. A similar model was estimated for involvement in sexual risk behavior. Latent class analysis models were estimated for a series of models including one, two, three, and four classes. Maximum likelihood estimation, involving standard errors and chi-square test statistics that are robust to non-normality, was used in these analyses.

For the sexual risk data, likelihood ratio chi-square results indicated a poor fit for 1-class and 2-class solutions (1 class: chi-square = 250.20, df = 72, $p < .001$; 2 classes: chi-square = 88.65, df = 63, $p < .05$). Comparison of the 3 latent class and 4 latent class solutions indicated the 3-class solution best fit the data. It had the lowest Bayesian information criterion (BIC) value (3 class = 1193.93 vs 4 class = 1221.51). Further, Parametric Bootstrapped Likelihood Ratio Test (bLRT) (Nylund, Asparouhov, & Muthen, 2007) results indicated significant improvement of the 3-class model over the 2-class model ($p = 0.000$). This was not the case for the 4 latent class model ($p = 0.040$).

The three subgroups identified in the sexual risk behavior data over time were: (1) a low sexual risk behavior group (n = 89, 44.4% of the 200 youths), (2) a moderate level sexual risk behavior group (n = 78, 38.9%), and (3) a high level sexual risk behavior group (n = 33, 16.7%).[5] Growth mixture model analyses, with the intercepts and slopes permitted to vary within each class, found no significant, overall BI intervention effect (combined youth and youth-parent) for any of these three sexual risk behavior subgroups.

For the alcohol use data, likelihood ratio chi-square test results indicated a poor fit for a 1-class solution (chi-square = 187.64, df = 72, $p < .001$). Likelihood radio chi-square statistics indicated an overall fit of the 2 latent class, 3 latent class, and 4 latent class solutions to the data. However, the 3 latent class solution seemed to be the best choice. It had the lowest Akaike information criterion (AIC, Akaike, 1987) value, second lowest BIC value, and lowest sample size adjusted BIC value. Further, the bLRT result indicated the 3 latent class solution was a significant improvement over a 2-class solution (p = 0.000), whereas the bLRT for the 4-class solution did not indicate a significant improvement over a 3-class solution (p = 0.600).

The three subgroups identified in the alcohol use data over time were: (1) a lower level alcohol use group (n = 116, 58.0% of the 200 youths), (2) a continuing, high level alcohol use group (n = 27, 13.7%), and (3) an escalating, linear trend alcohol use group (n = 57, 28.3%) characterized by an increasing involvement in alcohol use from 3-month follow-up to 12-month follow-up.[6] Growth mixture model analyses, with the intercepts and slopes permitted to vary within each class, indicated a significant BI intervention effect on linear

trend for subgroup (3), escalating alcohol use (estimate = −1.841, S.E.: 0.843, Critical ratio = −2.184, $p = 0.029$ [.014 for a one-tailed test]), with an effect size of 0.29. In partial support of Hypothesis 3, there is preliminary, promising indication that the linear rate of increase in alcohol use for youths in the escalating alcohol use group was lower among those receiving BI services.

We also regressed the latent class variable on the overall BI treatment effect. Results indicated that, in comparison to the high alcohol use group, youths in the escalating alcohol use group (estimate = −1.971, S.E. = 0.808, Critical Ratio = −2.441, $p = 0.015$ [.008 for a one-tailed test]) and low level alcohol use group (estimate = −1.805, S.E. = 0.781, Critical Ratio = −2.310, $p = 0.021$ [.010 for a one-tailed test]) were significantly more likely to be influenced by the intervention to reduce their alcohol use. These findings provide further indication of the promise of BI services for youths not heavily involved in alcohol use.

We appreciate the power of the comparisons for the sexual risk behavior and alcohol use subgroups is rather low, due to the small sample sizes. At the same time, the significant intervention effect for escalating alcohol use youths provides a promising suggestion of a potential beneficial effect of Brief Intervention services. We plan to study these relationships in planned, future analyses, at which time we expect more youths/families will be involved in our project.

Conclusion

Surprisingly little is known about the behaviors of truant youth, particularly about alcohol use and sexual risk behaviors. The present study addressed this gap in the research by examining the link between alcohol and sexual risk using a sample of truant youth who are participating in an ongoing NIDA-funded project. The general purpose of this study was to examine longitudinal trends in alcohol use and sexual risk behaviors and their associations with one another among truant youth. In addition, this study investigated the impact of a Brief Intervention (BI) for drug use on alcohol use and sex risk. Three hypotheses were articulated to examine the link between alcohol use and sexual risk.

First, it was hypothesized that alcohol use and sexual risk behaviors would be significantly related to one another over time. Partial support for Hypothesis 1 was found. Youths who were more involved in alcohol use at baseline were significantly more likely to report a greater level of involvement in sexual risk behavior. Further, a positive curvilinear (quadratic) trend was found between baseline sexual risk behavior and alcohol use, indicating a higher rate of alcohol use over the four waves of data collection during the year of observation among youths who were more involved in sexual risk behavior at baseline. These results suggest that involvement in sexual risk behavior increases the likelihood of longer term alcohol use. One explanation for this relationships asserts that involvement in alcohol use and engaging in sexual risk behavior are indicators of an underlying “proneness to deviance,” wherein engaging in one risk behavior is associated with engaging in others (Jessor & Jessor, 1977; Winters, Botzet, Fahnhorst, Baumel, & Lee, 2009). It would be important for future research to include assessments of multiple risk behaviors in their

modeling frameworks, in order to gain a more comprehensive understanding of this phenomenon.

The truant youth were participating in a project designed to evaluate the impact of a Brief Intervention protocol for drug use. It was hoped that the BI would affect alcohol use and sexual risk behaviors for treated youth over the course of a one-year follow-up period. There was no support for the second hypothesis that the BI treatment would reduce alcohol use and sexual risk behaviors over the follow-up year among the truant youth. As noted in the results section, no overall, significant intervention effects were found on the sexual risk behavior or alcohol use linear trend or quadratic trend latent variables. Although no treatment effects were found for alcohol and sexual risk levels and trends, there were some sociodemographic effects.

Girls reported more involvement in alcohol use at baseline than males. Girls also demonstrated lower rates of increases in alcohol use over time (linear trend) and increasing curvilinear (quadratic trend) use over time compared to boys. African American youths reported less alcohol use at baseline but a higher rate of increase over time than non-African American youths. There were no significant effects for gender, race (African American), age, and ethnicity (Hispanic) on sexual risk behavior trends or levels. Moreover, impulsivity (measured by an ADHD variable) did not affect sexual risk or alcohol use behaviors.

The third hypothesis was that there would be heterogeneity in the sample of truants with respect to sexual risk and alcohol use, and that the BI treatment would differentially affect identified subgroups of the truants. Growth mixture model analyses confirmed the existence of three sexual risk and three alcohol use youth subgroups. For sexual behavior, there was a low sexual risk behavior group, a moderate level sexual risk behavior group, and a high level sexual risk behavior group. For alcohol use, the analyses indicated a lower level alcohol use group, a continuing, high level alcohol use group, and an escalating, linear trend alcohol use group. Contrary to Hypothesis 3, no significant, overall BI treatment effect was found for any of the three sexual risk behavior subgroups. However, in partial support of Hypothesis 3, a significant, overall BI effect was found on the linear trend for the escalating alcohol use subgroup (effect size = .29). These findings provide promising, preliminary indication that the linear rate of increase in alcohol use for youths in the escalating subgroup was lower among youths receiving BI services. In other words, among truant youth who increased their use of alcohol over the course of the follow-up year, those assigned to BI treatment (youth or youth-parent) demonstrated significantly *lower* slopes of increase than those who received standard truancy services. Since this study utilizes data from an ongoing intervention, we appreciate that the findings we report will require further study as our data set increases in size.

The results of our study suggest several implications for research and intervention services. There is a need to complete more longitudinal studies on the relationship between alcohol use and engagement in sexual risk behavior, especially among high-risk youths, involving longer follow-up periods. Such studies would permit the identification of turning points in these behaviors over time (Hussong, Curran, Moffitt & Caspi, 2008). It is especially important to pursue such studies among truant youth, on whom few scientifically informed

investigations have been completed. As our results highlight, these studies should involve growth model analyses to study these and other risk behaviors in concert, as they are likely to be intertwined. Further, such analyses should allow for the identification of linear and non-linear trends in these relationships.

In regard to interventions for truant, and other at risk, youth, there is a need to develop and test interventions to reduce both alcohol use and sexual risk behavior. Such interventions targeted to different at-risk groups of youths can be especially beneficial in reducing their long-term participation in these behaviors, in addition to their associated adverse outcomes, such as contracting STDs and HIV/AIDS. These interventions should reflect a nuanced understanding of different alcohol use-sexual risk behavior subgroups, who may differ in their risk potential, as well as their response to intervention efforts. Targeting interventions to subgroups of at-risk youths might well be preceded by an inquiry into their identification. We are not aware of interventions targeting both these risk behaviors among truant and other at-risk youth. In this vein, there is a need to allow for the assessment of drug prevention intervention “spillover” effects in reducing sexual risk behavior among youths (Ellickson, McCaffrey, & Klein 2009).

There were several limitations to this study. First, there were limitations due to the nature of the sample, which consisted of truant youths picked up by law enforcement or placed in a diversion program. The results of the study may not be generalizable to truant youths who do not have such agency contact/involvement. Second, the sample size was relatively small, precluding an examination of the fit of the models across various sociodemographic groups (e.g., gender). Third, we were not able to assess the influence of such moderating factors as the nature of intimate partner relationship and event factors on our results. Examination of these factors in future longitudinal research is important. Fourth, the global association level of the analyses precludes deeper understanding of the situational, relationship, and event factors contributing to the findings we obtained regarding the alcohol use-sexual risk behavior nexus. We were also unable to assess the relative insight different explanations of the alcohol use-sexual risk behavior relationship (e.g., alcohol myopia theory, expectancy theory, and “proneness to deviance”) provide about the relationships we identified. Further, longitudinal research is needed on these issues, including that involving more comprehensive information on alcohol use. The present study should be regarded as a beginning effort in illuminating the dynamics of this important public health issue.

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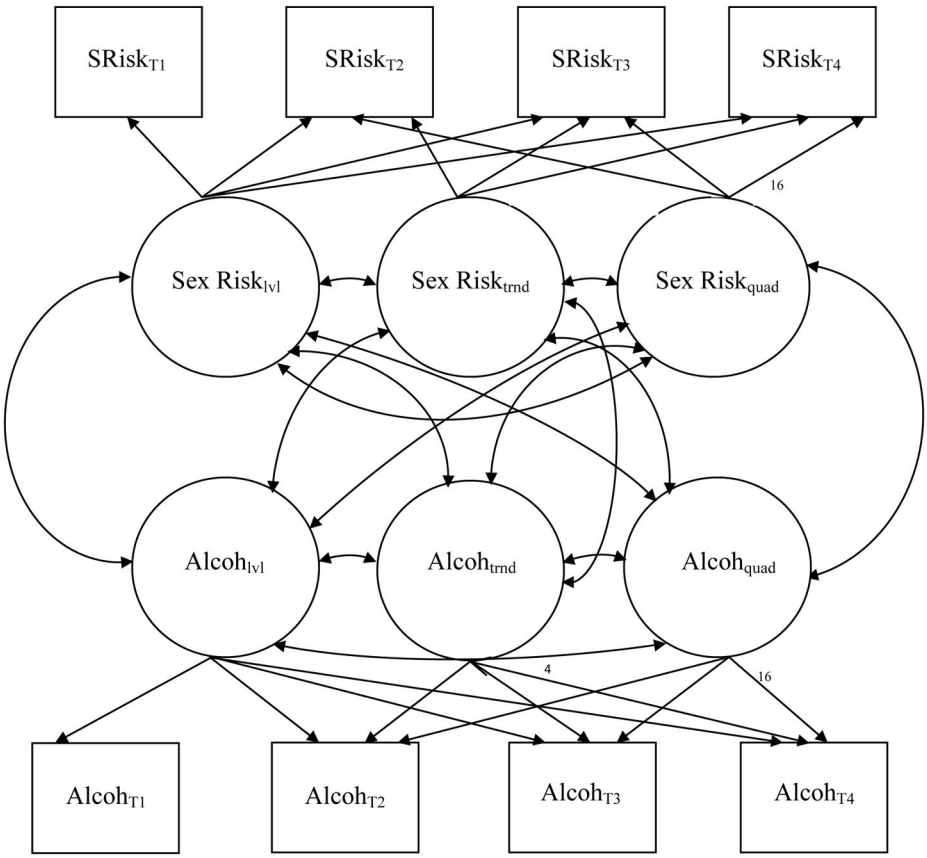

Figure 1. Parallel Process Model for Sexual Risk Behavior and Alcohol Use

Note: SRisk$_{T1}$, SRisk$_{T2}$, SRisk$_{T3}$, SRisk$_{T4}$=Sexual Risk Behavior; T1–T4, respectively. Alcoh$_{T1}$, Alcoh$_{T2}$, Alcoh$_{T3}$, Alcoh$_{T4}$=Alcohol Use; T1–T4, respectively. Lvl=Level; Linear Trnd=Trend; Quad=Quadratic Trend.

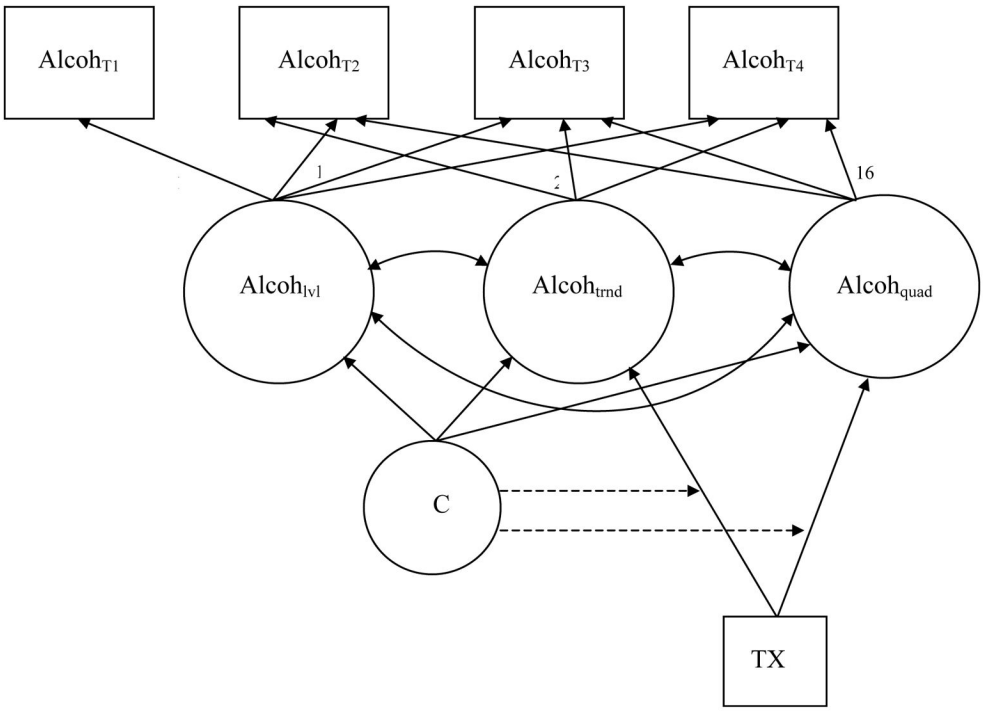

Figure 2. Growth Mixture Model of Intervention Effect on Alcohol Use Among Alcohol Use Subgroups

Note: Alcoh$_{T1}$, Alcoh$_{T2}$, Alcoh$_{T3}$, Alcoh$_{T4}$=Alcohol Use; T1-T4, respectively; lvl=level, trnd=trend, quad=quadratic effect.

Table 1

Self-reported Use of Alcohol to the Point of Experiencing its Effects (e.g. drunk, intoxicated) at Various Time Points

	Lifetime Reported at Baseline (n=200)	3 month follow up (n=166)	6 month follow up (n=147)	12 month follow up (n=107)
Alcohol Use				
Never	39%	70%	76%	64%
1 to 4 times	26%	22%	17%	22%
5 or more times	34%	7%	8%	14%
Total	99%	99%	101%	100%

Note. Percents may not total 100% due to rounding.

Table 2

Self-Reported Sexual Risk Behaviors: Baseline

	Ever (%) (n=198 or 200)
1. Have any of your close friends had sex?	80
2. Have you had any kind of sexual contact with another person?	82
3. Have you had sexual intercourse?	66
4. Have you had sexual intercourse without using a condom?	34
5. Do you find it difficult to use condoms every time you have sex?	13
6. Have you thought you or your partner might be pregnant?	28
7. Have you been or gotten someone pregnant?	4
8. Have you been tested for HIV?	16
9. Have you had sex with two or more people?	32
10. Have you had anal intercourse (sex in the butt)?	6
11. Have you had a sexually transmitted disease (STD)?	2

Table 3

Prevalence of Sexual Risk Behaviors and Summary Measure at Various Time Points

	Lifetime at Baseline (n=199)	3-month follow up (n=164 or 165)	6-month follow up (n=147)	12-month follow up (n=107)
Sexual Risky Behavior				
Had sexual intercourse without using a condom	34%	29%	31%	36%
Had sex with two or more people	32%	33%	36%	41%
Sexual Risk Summary Measure				
None	53%	55%	50%	45%
1 sexual risk behavior	29%	29%	32%	34%
Both sexual risk behaviors	18%	16%	18%	22%
Total	100%	100%	100%	101%

Note. Percents may not total 100% due to rounding.

Table 4

Parallel Process Linear Growth Model of Youths' Sex Risk Behavior and Alcohol Use

				95% C. I.	
Bayesian Estimation	**Estimate**	**Posterior S.D.**	**One-Tailed P-Value**	**Lower 2.5%**	**Upper 2.5%**
Sexual Risk Linear Trend WITH					
Sexual Risk Level	−0.272	0.497	0.226	−1.535	0.515
Sexual Risk Quadratic Trend WITH					
Sexual Risk Level	0.123	0.131	0.130	−0.105	0.423
Sexual Risk Linear Trend	−0.064	0.054	0.006*	−0.215	−0.008
Alcohol Use Level WITH					
Sexual Risk Level	1.118	0.468	0.002*	0.383	2.217
Sexual Risk Linear Trend	0.152	0.362	0.325	−0.579	0.880
Sexual Risk Quadratic Trend	0.009	0.105	0.459	−0.215	0.209
Alcohol Use Linear Trend WITH					
Sexual Risk Level	−0.370	0.419	0.161	−1.254	0.421
Sexual Risk Linear Trend	−0.044	0.233	0.420	−0.517	0.402
Sexual Risk Quadratic Trend	0.017	0.070	0.372	−0.109	0.182
Alcohol Use Level	−1.006	1.052	0.058	−3.872	0.122
Alcohol Use Quadratic Trend WITH					
Sexual Risk Level	0.292	0.138	0.010*	0.042	0.589
Sexual Risk Linear Trend	0.011	0.078	0.433	−0.135	0.171
Sexual Risk Quadratic Trend	0.011	0.023	0.308	−0.036	0.060
Alcohol Use Level	0.412	0.252	0.000*	0.142	1.103
Alcohol Use Linear Trend	−0.190	0.206	0.020*	−0.801	−0.002
Means					
Sexual Risk Level	0.000	0.000	1.000	0.000	0.000
Sexual Risk Linear Trend	0.001	0.172	0.498	−0.290	0.389
Sexual Risk Quadratic Trend	−0.027	0.051	0.305	−0.139	0.064
Alcohol Use Level	0.000	0.000	1.000	0.000	0.000
Alcohol Use Linear Trend	−1.603	0.233	0.000*	−2.154	−1.207

				95% C. I.	
Bayesian Estimation	**Estimate**	**Posterior S.D.**	**One-Tailed P-Value**	**Lower 2.5%**	**Upper 2.5%**
Alcohol Use Quadratic Trend	0.166	0.079	0.012*	0.033	0.339
Variances					
Sexual Risk Level	2.892	0.849	0.000*	1.682	5.068
Sexual Risk Linear Trend	0.273	0.196	0.000*	0.095	0.853
Sexual Risk Quadratic Trend	0.058	0.020	0.000*	0.032	0.108
Alcohol Use Level	3.247	1.397	0.000*	1.522	6.924
Alcohol Use Linear Trend	0.690	0.851	0.000*	0.108	3.320
Alcohol Use Quadratic Trend	0.139	0.060	0.000*	0.070	0.292

Note. As indicated in Figure 1, the intercept (level) coefficients were fixed at 1 and the slope (trend) coefficients were fixed at 0, 1, 2, and 4 for baseline, 3-month follow-up, 6-month follow-up, and 12-month follow-up, respectively, linear trends and 0, 1, 4, and 16 for quadratic trends, respectively. This information is not reported in the table, but is available from the corresponding author. Threshold estimates are also excluded and available upon request.

* $p < .05$.