

Truancy and Escalation of Substance Use During Adolescence*

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ABSTRACT. Objective: The aim of this study was to examine the relationship between truancy and escalation of substance use during adolescence and to explore potential mechanisms of this relationship. **Method:** Using data from the Rochester Youth Development Study, a longitudinal sample of predominantly minority youth, growth models with time-varying covariates were utilized to assess the relationship between truancy and substance use. Mediated growth models were used to examine potential mechanisms of the relationship. The analyses used five waves of panel data collected from 971 youth and their primary caregivers. Data were collected every 6 months from 1988 to 1990, spanning ages 14-16. Twenty-seven percent of the sample was female. **Results:** Findings indicate that truant youth engaged in more substance use, both when comparing one adolescent with another (i.e., a truant

adolescent used more substances than an adolescent who was not truant) and when comparing periods of change within an adolescent (i.e., during periods when an adolescent's truancy escalated, his or her involvement in substance use escalated). Moreover, the effect of escalation of truancy on escalation of substance use was, in part, mediated by escalation of risky, unsupervised time spent with peers. **Conclusions:** Truancy appears to be a robust predictor of substance use. The effect is likely to be, in part, a result of the deleterious effects of reduced school bonding and, in part, a result of the unsupervised, risky time afforded by truancy. Gaining a better understanding of how truancy may affect substance use is important for the development of prevention and intervention initiatives. (*J. Stud. Alcohol Drugs*, 71, 115-124, 2010)

TWO RECENT STUDIES, Henry et al. (2009) and Henry and Huizinga (2007a), considered a relatively understudied school-related behavior, truancy, and demonstrated that truancy was a robust predictor of the *onset* of substance use. Specifically, truancy (i.e., skipping school without a valid excuse) predicted the onset of substance use over and above many other salient risk factors, including other school-based risk factors such as school performance and commitment to school. These findings are congruent with other studies that have found a positive relationship between truancy and substance use (Bryant and Zimmerman, 2002; Chou et al., 2006; Vucina and Becirevic, 2007; White et al., 2007). In this study, we extended this work to consider the relationship between truancy and the *escalation* of substance use. We

examine how both level of truancy and change in truancy are related to substance use among urban adolescents. We also explore a probable mediator of the relationship between truancy and escalation of substance use: risky time spent with friends.

Theoretical framework and past empirical work

The idea that various school-related problems, including truancy, are related to substance use has been incorporated into most of the theories that explain substance use and other problem behaviors (Hawkins and Weis, 1985; Jessor and Jessor, 1977; Patterson et al., 1992; Thornberry and Krohn, 2001). For example, Hawkins and Weis (1985) stress the importance of school bonding as an important component of their social development model; students who demonstrate strong school bonds are more likely to remain academically engaged and less likely to become involved in antisocial behaviors. In part, this occurs because bonding to pro-social primary socialization units, like the school, attenuates delinquent behavior as adolescents conform to the norms, expectations, and values of the school.

Several developmental theories extend this framework to emphasize that *change* in school engagement variables (including constructs such as school bonding, school performance, truancy, and so forth) may be particularly important in accounting for adolescent substance use and related problem behaviors (e.g., Patterson et al., 1992; Thornberry and Krohn, 2001). School is one of the primary social institutions of adolescence and plays a vital role in constraining prob-

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lem behaviors. Yet adolescence is also a time of increasing independence and searching for autonomy (Moffitt, 1993), a search which often leads to an attenuation of school engagement. School engagement is likely to be more volatile during adolescence than at other developmental stages, and developmental theories (Hawkins and Weis, 1985; Thornberry, 1997) hypothesize that when school engagement weakens it is likely to be followed by increases in problem behaviors such as substance use. This effect of change should be evident over and above the average level of school engagement exhibited by the individual.

Indeed, truancy is a classic indicator of poor school engagement, and chronic truancy and/or escalation of truancy is considered an important marker of a student's disengagement from school. Although the process of school disengagement, marked in part by truancy, has been theoretically and empirically linked to substance use and other problem behaviors, we assert that truancy is also likely to affect substance use through another mechanism. Several models rooted in routine activities theory propose that problem behaviors, including substance use, are most likely to occur during periods of unstructured and unsupervised socializing with peers. Osgood et al. (1996) indicate that lack of adult authority figures limits the likelihood that adolescents will respond to social control pressures to behave in a prosocial manner, and exposure to delinquent peers in these types of settings may instigate delinquent behavior as well as make delinquent acts easier to carry out and more rewarding. It is logical to believe that for some students and in some instances truancy provides exactly this type of setting. When students are truant from school they are much more likely to be unsupervised as well as unoccupied with prosocial activities. Data from the sample used in this study indicate that truant youth tend to skip school in pairs or groups; across assessments 62%-70% of truants said that they skipped school with other students. Therefore, we hypothesize that truant students are more likely to escalate their involvement in substance use at least in part because of the unstructured, unsupervised, and risky environment afforded by skipping school. In other words, as truancy escalates, access to unstructured, unsupervised time spent with friends in risky settings escalates, and ultimately substance use escalates.

Aims of the current study

In this article, we use individual growth models to capture developmental trajectories of substance use and assess the extent to which truancy affects whether students demonstrate a level of substance use that is above or below what would be expected at a certain time given their own developmental trajectory. We assess these relationships using data collected every 6 months for a period of 2.5 years to examine the relationship between contemporaneous, lagged, and changing levels of truancy and level and change in substance use. We

consider truancy as a time-varying covariate that predicts substance use across the measurement occasions. Specifically, we first assess the *contemporaneous* effect of truancy on substance use (i.e., Is an adolescent's concurrently reported truancy associated with his or her level of substance use during the same 6-month period?). We then examine the *lagged* effect of truancy on substance use (i.e., Is an adolescent's truancy reported during the previous 6 months associated with his or her level of substance use?). Finally, we examine the effect of *change* in truancy on substance use (i.e., Is an adolescent's degree of change in truancy during the course of the study associated with his or her level of substance use?). This latter research question assesses the extent to which a student's level of substance use increases during times when he or she exhibits elevated involvement in truancy (relative to his or her own norm).

We assess these relationships after adjusting for common antecedents of truancy and substance use. This is crucial because the well-identified risk and protective factors of adolescent substance use are also salient predictors of poor school engagement. For example, demographic factors such as low socioeconomic status, sex, ethnic minority status, and low parental education are critical risk factors for poor school engagement (Cairns et al., 1989; Ensminger et al., 1996); adolescent tolerance for delinquent behavior and involvement with delinquent peers also impair positive school engagement (Cairns and Cairns, 1994; Ensminger and Slusarcick, 1992; Garnier et al., 1997); and poor family functioning in such areas as low parental involvement in school, poor parental monitoring, poor quality of parent-child interactions, and poor family values (Baker and Stevenson, 1986; Brooks-Gunn et al., 1993; Epstein, 1983; Rumberger, 1995) put an adolescent at risk for poor school engagement. Much less work has looked at the risk factors for truancy in particular, but recent studies by Henry and Huizinga (2007b) and Henry (2007) indicate that truancy is predicted by factors such as socioeconomic status, family structure, involvement with delinquent peers, and poor academic performance. Of course, these are many of the same risk factors for adolescent substance use (Hawkins et al., 1992). Therefore, in all models, we adjusted for shared risk and promotive factors that pertain to personal delinquency (i.e., prior involvement in delinquency, delinquent values), peer delinquency (association with peers who condone delinquency), family (parental level of education, family poverty, affective ties to child, positive parenting, parental monitoring), and school (grade-point average [GPA], commitment to school).

In combination, these three design features—(a) the assessment of truancy in the context of other important personal, peer, family, and school-related variables; (b) the longitudinal examination of these processes; and (c) the consideration of contemporaneous, lagged, and changing effects of truancy—provide a strong assessment of how truancy

might be associated with adolescent substance use. Our central hypothesis (Hypothesis 1) is that truancy is significantly associated with the escalation of substance use during adolescence, and that this relationship exists contemporaneously, prospectively, and dynamically (i.e., within person change in truancy).

In addition to examining the direct relationship between truancy and substance use, we also examine a possible mediating pathway. Using the mediated growth modeling framework described by MacKinnon (2008), we model truancy, risky time with friends, and substance use as growth models in a structural equation modeling framework and assess the extent to which the effect of change in truancy on change in substance use is mediated by change in risky time with friends. We hypothesize that truancy's effect on substance use is in part mediated (i.e., explained) by an increase in unstructured, unmonitored time spent with friends in risky settings (Hypothesis 2); that is, escalation of truancy is associated with escalation of risky time with friends, which in turn is associated with escalation of substance use.

Method

Data

The data for this study are from the Rochester Youth Development Study (RYDS), a panel study of child, adolescent, and young adult development. The initial purpose of the study was to investigate serious, chronic delinquency. During the 1987-1988 school year, 1,000 students in seventh and eighth grades of the public school system in Rochester, NY, were selected so that (a) youth at risk for serious delinquency are overrepresented and (b) the sample can be weighted to represent the initial population. To ensure a large enough number of serious, chronic delinquents, males were oversampled (3 to 1) given the higher prevalence of these behaviors among males (Moffitt et al., 2001); youth from high-crime areas of the city were also oversampled. All eligible students were assigned to their census tract of residence and the sample was selected to proportionately reflect each tract's contribution to the overall level of crime in the city of Rochester. (Sampling details are presented in Krohn and Thornberry, 1999.) The sample was 68% African American, 17% Hispanic, and 15% White.

During adolescence the students were interviewed nine times at 6-month intervals, from 1988 (average age = 14 years) to 1992 (average age = 18 years); their primary caregivers were also interviewed separately at the first eight assessments. Procedures to protect human subjects were approved by the University at Albany's Institutional Review Board and included written informed parental consent, student assent for those younger than age 18, and written informed consent thereafter. Students were typically interviewed in private rooms at school (unless they had dropped

out or moved, in which case they were interviewed in alternative but private locations) and the primary caregivers were typically interviewed at home. Data from the first five waves (approximate ages = 14-16 years) of the study were used in the current analyses. As such, we consider change in substance use over a period of 2 years during junior high school and early high school, a period that represents a crucial time for both escalation of substance use and truancy. Participation at each wave was very high and attrition was very low: 956 youths provided complete data at Wave 1, 947 at Wave 2, 931 at Wave 3, 928 at Wave 4, and 920 at Wave 5. In total, 971 youths provided data on at least one of the measurement occasions, and these students represent the sample for the current study. As described later, multiple imputation was used to account for missing data across the five waves.

Measures

The dependent variable of interest, substance use, was measured at each interview. We focused here on polysubstance use because we sought to assess the relationship between truancy and the general escalation of substance use. Students reported the number of times they had used alcohol (without their parent's permission) and other drugs (including marijuana and a comprehensive set of other illicit drugs) since their previous interview. The variable used in all analyses represented the sum of all instances of substance use. This variable was natural log transformed. Table 1 presents the means and standard deviations of all study variables, as well as the Cronbach's alpha for scales.

The primary predictor of interest was truancy. Self-reported truancy was assessed at each wave. Students reported the number of times since the previous interview (or during the last 6 months for the first interview) they skipped school without an excuse. Because of the timing of the interviews, the period of time that elapsed between each interview varied across students. For example, one student's Wave 3 interview took place in March 1989, and the Wave 4 interview took place in September 1989; another student's Wave 3 interview took place in June 1989, and the Wave 4 interview took place in December of 1989. Although 6 months elapsed between interviews for each student, the amount of time that they were in school (because of summer break) differed. Also, although every effort was made to interview students with a 6-month interval, longer or shorter periods of time elapsed between measurement occasions for some students at some waves. Therefore, we calculated the number of school days that elapsed between the two interview dates for each set of dates for each student. We then divided the number of times the student reported skipping school by his or her number of possible school days. To arrive at a number that approximated a percentage (although it should be noted that the students reported the number of "times" they skipped school, not the number of "days" they skipped school), we multiplied this

TABLE 1. Means (*M*), standard deviations (*SD*), and Cronbach's alpha (α) for study variables

Variable	Wave 1 Age \approx 14			Wave 2 Age \approx 14.5			Wave 3 Age \approx 15			Wave 4 Age \approx 15.5			Wave 5 Age \approx 16		
	<i>M</i>	<i>SD</i>	α	<i>M</i>	<i>SD</i>	α	<i>M</i>	<i>SD</i>	α	<i>M</i>	<i>SD</i>	α	<i>M</i>	<i>SD</i>	α
Age at baseline	13.96	0.78													
Parent's years of education	11.37	2.14													
Family poverty	0.49	0.50													
Involvement in delinquency at baseline (natural log)	0.61	1.01													
Substance use (natural log)	0.34	0.85		0.50	1.01		0.50	1.05		0.63	1.21		0.65	1.15	
Truancy (natural log)	0.36	0.71		0.60	1.00		0.67	1.08		0.87	1.24		0.82	1.13	
Peer reactions to delinquency	1.14	0.25	.80	1.20	0.30	.85	1.23	0.34	.85	1.23	0.33	.86	1.26	0.34	.86
Delinquent values	1.20	0.28	.80	1.21	0.33	.84	1.25	0.37	.89	1.26	0.36	.88	1.30	0.39	.89
Parental monitoring	3.88	0.20	.68	3.87	0.22	.72	3.86	0.22	.72	3.84	0.26	.77	3.82	0.27	.76
Positive parenting	3.35	0.47	.62	3.33	0.48	.66	3.30	0.49	.69	3.26	0.50	.67	3.26	0.50	.69
Affective ties to child	3.42	0.42	.80	3.47	0.42	.81	3.50	0.44	.83	3.54	0.43	.84	3.53	0.43	.84
Grade-point average	1.61	1.03		1.57	0.99		1.49	1.05		1.43	1.01		1.35	1.01	
Commitment to school	3.08	0.35	.75	3.08	0.36	.81	3.09	0.39	.84	3.11	0.38	.85	3.08	0.38	.85
Risky time with friends ^a				1.99	0.62	.77	2.02	0.66	.80	1.99	0.69	.82	2.03	0.71	.81

^aScale not collected at Wave 1.

number by 100 [i.e., (no. of times the student skipped school / no. of school days) \times 100]. A natural log transformation was applied to account for the positive skew.

To assess the unique effect of truancy after adjusting for potential confounders, several additional variables were assessed. First, dummy variables for both sex (coded as 1 for male, 0 for female) and race/ethnicity (comparing African American and Hispanic students with White students using two dummy-coded variables) were included in all models.

Prior involvement in delinquency was measured using self-reports of involvement in twenty property and violent crimes collected at the first interview. We used the self-reported delinquency index developed for the Program of Research on the Causes and Correlates of Delinquency (Huizinga et al., 1993). A natural log transformation was applied to account for the heavily skewed nature of this variable. Prior involvement in delinquency was included as a time-independent predictor (measured at Wave 1) rather than a time-varying measure because truancy is likely to influence subsequent involvement in delinquency in the same way that we hypothesize it to influence substance use. This has been demonstrated empirically (Huizinga and Jakob-Chien, 1998; Loeber and Farrington, 2000). Therefore, we included just the Wave 1 measure of prior delinquency.

Measures of delinquent values and the student's perception of peer reactions to their delinquency—scales developed for the Rochester Youth Development Study—were included as time-varying potential confounders. The scale for delinquent values had 10 items (e.g., how wrong is it to use drugs, to steal, to get into fights), and the scale for peer reactions to delinquency had nine items (e.g., what would the student's friends say if he or she used drugs, stole, got into fights). For these, and all other scales described below, the scale score was obtained by taking the average of all items.

The scale for delinquent values ranged from 1 to 4, and the scale for peer reactions to delinquency ranged from 1 to 3, where higher scores equaled more delinquent values and more prodelinquency reactions from peers.

Five family-related potential confounding variables, all reported by the primary caregiver, were included. The number of years of education of the parent/caregiver and a dichotomous measure of whether the family ever reported living below the poverty level in Waves 1 to 4 were both included as time-independent covariates. Three other family-related potential confounders were measured as time-varying covariates. Parent/caregiver monitoring was composed of seven items indicating the extent to which the primary caregiver was aware of the student's whereabouts, friendships, and activities and also the extent to which they personally thought that monitoring their child was important (scale ranged from 1 to 4, where a higher score equaled more monitoring/more importance placed on monitoring). These are commonly employed measures of parental monitoring, and this scale has been used consistently in many of the RYDS published manuscripts (including one published last year in this journal; Henry et al., 2009). However, it should be noted that work by Stattin and Kerr (2000) indicates that parental monitoring measures commonly used in the literature assess parental knowledge of behavior rather than actual parental supervision of behavior and that this knowledge is largely based on the child's willingness to divulge information. Based on Stattin and Kerr's work (2000) we assume that the parental knowledge items in the scale were influenced by the level of parent-child communication, which is one source of information that can enhance parental monitoring. In interpreting the findings, it is important to recognize that parental monitoring may be conceptualized and measured in a variety of ways; the measures available in RYDS are

just one formulation of this construct. Positive parenting was measured as a five-item scale that assessed the parent's rewarding of prosocial behavior of the child through praise, hugs, and the like (scale ranged from 1 to 4, where a higher score equaled more positive parenting). Affective ties to child was measured as an 11-item scale adapted from the Index of Parental Attitudes (Hudson, 1996) that assesses the extent to which the parent/caregiver had a strong bond with the student. The scale ranged from 1 to 4, where a higher score equaled stronger ties.

Finally, two school-related variables were included in all models: GPA and commitment to school. GPA was collected through official school records reported quarterly, thereby allowing a student's GPA at a particular point in time to be matched with his or her biannual interview responses. Commitment to school was assessed as a nine-item RYDS scale at each wave. The scale included such items as the extent to which the student tried hard in school and thought that getting good grades was important. The scale ranged from 1 to 4, where higher scores indicated more commitment to school.

For the second hypothesis, we considered an additional variable that we called "risky time with friends." This variable assessed the extent to which the student spent unsupervised and/or risky time with his or her three closest friends: How often do you get together where no adults are present? How often do you drive around with no special place to go? How often do you get together where someone is using or selling drugs or alcohol? The average of these items (each measured on a 5-point scale ranging from *never* [1] to *every day* [5]) was used as the measure. Although the outcome variable of interest in this study is substance use, we included the item that captured time spent with friends where drugs and alcohol are being sold or used in the scale. Our conceptual model, as well as others (e.g., Osgood et al., 1996), hypothesizes that students who skip school have more access to risky environments—environments that are unsupervised, where drugs and alcohol are available, and where others may be using them. Therefore, from this perspective, a measure of risky time with friends should have an item assessing time spent with friends where drugs and alcohol are being sold or used.

Analysis

To examine the first hypothesis (i.e., that truancy is related to substance use), we employed growth modeling carried out as a series of multilevel models using SAS statistical software, Version 9.2 (SAS Institute Inc., Cary, NC). A growth model is a specific type of multilevel model in which Level 1 represents measurement occasions and Level 2 represents individuals. To test these models, we began with an unconditional latent growth model of adolescent substance use. The following equation represents the Level 1 model:

$$SubUse_{ij} = \pi_{0i} + \pi_{1i}Age_{ij} + \epsilon_{ij}.$$

This model asserts that an adolescent's substance use measured over time can be described by an intercept (π_{0i}) and a slope (π_{1i}). The i subscript denotes that each individual (i) has his or her own trajectory that is described by his or her own intercept (level of substance use when age = 0, which in this analysis is defined at the midpoint age between Waves 2 and 5) and slope (rate of change over time). The residual term in the Level 1 equation (ϵ_{ij}) captures the scatter of the within-person residuals around each student's trajectory (Singer and Willett, 2003).

A growth model is not complete until the Level 2 or between-persons model is considered. The Level 2 model reveals the average trajectory in the population and how individuals differ on their growth parameters (e.g., substance use at the midpoint of the study and rate of change during adolescence). The unconditional, Level 2 model is written as follows:

$$\pi_{0i} = \gamma_{00} + \zeta_{0i}$$

$$\pi_{1i} = \gamma_{10} + \zeta_{1i}$$

The Level 2 model in the baseline model is represented by two equations: The first equation indicates that the Level 1 intercept (π_{0i}) is described by a fixed effect (γ_{00} —the average level of substance use at the midpoint of the study) and a random effect (ζ_{0i} —the extent to which individuals varied in their substance use at the midpoint of the study). Similarly, the second equation indicates that the Level 1 slope (π_{1i}) is described by a fixed effect (γ_{10} —the average rate of change in substance use) and a random effect (ζ_{1i} —the extent to which individuals varied in their rate of change). In all models, the intercept and linear trend were specified as correlated random effects.

In addition to time specified as a linear trend (i.e., age across the measurement occasions), truancy, as well as the time-varying potential confounders (i.e., peer reactions to delinquency, delinquent values, parental monitoring, positive parenting, affective ties to child, GPA, and commitment to school) were included as time-varying covariates and were specified to have a direct effect on substance use at each respective measurement occasion. Several time-independent covariates were also assessed, including age at baseline, sex, race/ethnicity, parent's level of education, family poverty, and involvement in delinquency at baseline. These time-independent covariates were specified to have an effect on the intercept and the rate of change in substance use over time. A series of additional models to adjust for time since last interview were tested. None were found to impact the effects of truancy reported in Table 2 and Figure 1.

As described in the introduction, the time-dependent variables (including truancy and the potential confounders) were assessed contemporaneously (covariates measured during the same period of time as the substance use) and prospectively

(covariates measured during the 6 months before the assessment of substance use). In addition, the effect of change in truancy on escalation of substance use was also assessed. In this application, the primary concern was the effect of within-person change in truancy on substance use; that is, the extent to which change in truancy (e.g., demonstrating relatively more truancy at a particular wave than usual for a particular adolescent) was related to substance use. Raudenbush and Bryk (2002) recommend adding the aggregated mean of the time-varying covariate to the Level 2 (between-persons) equation to disentangle the within-person effect from the between-persons effect. In this decomposed model, the Level 1 time-varying covariate represents only within-person change in truancy, allowing for a unique and interesting interpretation compared with the contemporaneous model. That is, the Level 1 effect represents the extent to which within-individual change in truancy (i.e., being above or below one's own norm at a particular measurement occasion) is associated with substance use. The Level 2 or between-persons effect is the contextual effect (because the Level 1 version of truancy is grand mean centered) and is defined as the effect that occurs when the average of a Level 1 time-varying covariate across time affects the dependent variable after adjusting for the effect of the time-varying covariate. For example, given two students who, at a certain point in time, demonstrated the same level of truancy, the student with the higher average level of truancy across all measurement occasions would have used more substances if a contextual effect was present. To disentangle the within-person effect from the contextual effect, the aggregated mean of truancy was included as a Level 2 predictor in the change model.

To test the second hypothesis (i.e., that unstructured, unsupervised time spent with friends in risky settings in part mediates the relationship between truancy and substance use), we employed mediated growth models as described by MacKinnon (2008). These models were estimated in Mplus, Version 5.21 (Muthén and Muthén, 1998-2008), applying a full information maximum likelihood estimator with robust standard errors. We began by assessing the growth structure for each process (i.e., truancy, risky time with friends, and substance use) from Waves 2 to 5. A linear model (with the intercept centered at Wave 2 and equidistant slope factor loadings ranging from 0 at Wave 2 to 1 at Wave 5) fit the data well for the substance-use and risky-time-with-friends trajectories, but a nonlinear model provided better fit to the data for the truancy trajectory. A latent basis model was estimated (McArdle, 2005), the first and last factor loadings for the slope factor for truancy were fixed at 0 and 1 respectively, and the middle loadings were estimated (resulting in factor loadings of 0, .294, .921, and 1 for Waves 2-5, respectively). This model fit significantly better than the strict linear model, $\Delta\chi^2(2) = 9.078, p < .05$. Finally, we tested the mediational hypotheses. First we assessed the direct effect of the growth process of truancy on the growth process of sub-

stance use. Then we introduced the growth process for risky time with friends to the model, assessing the extent to which (a) change in truancy was associated with change in risky time with friends, (b) change in risky time with friends was associated with change in substance use, and (c) the effect of change in truancy on change in substance use was mediated (i.e., explained) by change in risky time with friends. Baseline (Wave 1) measures of all covariates described for Hypothesis 1 were controlled for in all mediation models by regressing the growth parameters for each process on these covariate measures.

Although retention in the study was and remains high, there are some missing data. To appropriately handle missing data, we employed multiple imputation for testing the models in the first hypothesis. The imputation was carried out using SAS, Version 9.12 (SAS Institute Inc., Cary, NC). In total, 10 imputed datasets were created. All analyses were performed on each of the imputed datasets, and the parameter estimates were then combined using the procedures outlined by Rubin (1987). Missing data for the mediation models for Hypothesis 2 were handled using full information maximum likelihood in Mplus, Version 5.21 (Muthén and Muthén, 1998-2008).

Results

Hypothesis 1

Table 2 presents the results of the latent growth models estimated to address the first hypothesis. Model 1 represents a reduced model of the contemporaneous effects, reduced in the sense that it does not include the primary predictor of interest, contemporaneous truancy. Significant predictors in Model 1 include age at baseline and sex, indicating that, holding all other variables constant, younger students and males tended to report less substance use at the midpoint of the observation period for this study. A higher level of substance use was also reported by students who were more involved in delinquency at baseline, students who perceived that their peers condoned delinquent behavior, and students who held favorable attitudes toward delinquency. In the family domain, high parental monitoring and high affective ties to child were related to lower levels of substance use. A higher GPA and commitment to school were also related to lower levels of substance use. Model 2 added truancy to the baseline model. The unstandardized parameter estimate ($b = .20, SE = .01, p < .01$) indicates that, holding all other variables in the model constant and accounting for the students' developmental trajectories, greater involvement in truancy was associated with greater involvement in substance use.

Models 3 and 4 present the same information as in Models 1 and 2, except in these models the lagged [$t - (6 \text{ months})$] effect of all time-varying covariates (including the potential confounders and truancy) were considered. Similar conclusions may be drawn from these models; truancy was

TABLE 2. Effects of truancy on substance use

Variable	Model 1 Reduced Contemp.		Model 2 Full Contemp.		Model 3 Reduced Lagged		Model 4 Full Lagged		Model 5 Full Change	
	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE
Fixed effects										
Intercept	0.61	0.02**	0.62	0.02**	0.60	0.02**	0.60	0.02**	0.61	0.02**
Age (linear growth trend)	0.05	0.02	0.02	0.02	0.07	0.03**	0.04	0.03	0.03	0.02
Age at baseline	0.16	0.03**	0.13	0.03**	0.19	0.03**	0.18	0.03**	0.10	0.03**
Age at Baseline × Linear Growth	0.02	0.03	0.02	0.03	0.01	0.03	-0.01	0.03	0.02	0.03
Male	-0.11	0.05*	-0.05	0.05	-0.08	0.06	-0.05	0.05	-0.03	0.05
Male × Linear Growth	0.07	0.05	0.07	0.05	0.12	0.06*	0.12	0.06*	0.08	0.05
African American	-0.13	0.07	-0.10	0.06	-0.17	0.07*	-0.15	0.07*	-0.08	0.06
African American × Linear Growth	-0.04	0.07	-0.04	0.07	-0.01	0.08	-0.01	0.07	-0.04	0.07
Hispanic	-0.04	0.08	-0.04	0.08	-0.05	0.09	-0.05	0.09	-0.05	0.08
Hispanic × Linear Growth	0.12	0.09	0.09	0.09	0.13	0.09	0.11	0.09	0.09	0.09
Parent's years of education	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01
Parent's Years of Education × Linear Growth	-0.01	0.01	-0.01	0.01	-0.01	0.01	-0.01	0.01	-0.01	0.01
Family poverty	-0.05	0.05	-0.02	0.05	-0.05	0.05	-0.04	0.05	0.00	0.05
Family Poverty × Linear Growth	-0.02	0.05	-0.01	0.05	-0.04	0.05	-0.02	0.05	-0.01	0.05
Involvement in delinquency at baseline	0.21	0.02**	0.18	0.02**	0.28	0.03**	0.26	0.03**	0.15	0.02**
Involvement in Delinquency at Baseline × Linear Growth	-0.02	0.02	-0.01	0.02	-0.04	0.03	-0.04	0.03	-0.01	0.02
Peer reactions to delinquency	0.61	0.05**	0.54	0.05**	0.21	0.06**	0.18	0.06**	0.53	0.05**
Delinquent values	0.61	0.05**	0.57	0.05**	0.31	0.06**	0.29	0.06**	0.55	0.05**
Parental monitoring	-0.21	0.07**	-0.21	0.06**	0.02	0.07	0.02	0.07	-0.21	0.06**
Positive parenting	0.05	0.03	0.06	0.03	-0.07	0.04	-0.06	0.04	0.06	0.03
Affective ties to child	-0.11	0.04*	-0.08	0.04*	-0.04	0.04	-0.04	0.04	-0.07	0.04
Grade-point average	-0.07	0.02**	-0.03	0.02	-0.08	0.02**	-0.06	0.03*	-0.02	0.02
Commitment to school	-0.20	0.05**	-0.12	0.05*	-0.12	0.05*	-0.09	0.05	-0.10	0.05*
Truancy			0.20	0.01**			0.12	0.02**	0.16	0.02**
Average truancy									0.16	0.03**
Variance explained										
R ² Level 1		.33		.38		.24		.27		.39
R ² Level 2		.44		.50		.36		.41		.51

Notes: R² values were calculated using the formulas offered by Snijders & Bosker (1999). Contemp. = contemporaneous; est. = estimate (unstandardized regression coefficient); SE = standard error.

* $p < .05$; ** $p < .01$.

associated with a higher level of substance use at the proceeding wave after accounting for linear growth in years and all potential confounding variables.

Finally, Model 5 estimates the effect of within-person change in truancy on substance use. The results indicate that the average level of truancy across all measurement occasions was a significant predictor of higher overall involvement in substance use ($b = 0.16$, $SE = 0.03$, $p < .01$) and that during times when a student's involvement in truancy was elevated, his or her involvement in substance use was also elevated ($b = 0.16$, $SE = .02$, $p < .01$). These results indicate that truancy has both an interindividual effect (i.e., students who engaged in more truancy reported higher levels of substance use) and an intraindividual effect (i.e., within-person increases in truancy were associated with within-person increases in substance use).

Hypothesis 2

The second hypothesis tested our assertion that risky time spent with friends is a mediator of the relationship between escalation of truancy and escalation of substance

use. We estimated three growth models, one for truancy, one for risky time with friends, and one for substance use. The unconditional, three-process growth model provided good fit to the data, Robust $\chi^2(51) = 120.665$, $p < .001$; comparative fit index (CFI) = .973; Tucker-Lewis index (TLI) = .965; root mean square error of approximation (RMSEA) = .038. The intercept of each growth model represents the predicted level of the construct at Wave 2, and the change factor describes the change from Waves 2 to 5. The means (M) of the intercept (i) and change (c) factors for each process and the corresponding variances (V , representing interindividual variability) were estimated as follows (with standard errors in brackets): substance use ($M_i = .50$ [.03], $V_i = .76$ [.10], $M_c = .16$ [.04], $V_c = .71$ [.14]); risky time with friends ($M_i = 2.00$ [.02], $V_i = .22$ [.02], $M_c = .03$ [.02], $V_c = .13$ [.04]); and truancy ($M_i = .62$ [.03], $V_i = .72$ [.07], $M_c = .25$ [.04], $V_c = .55$ [.10]). Next, all potential confounders described for Hypothesis 1 were added to the model, along with regressions for testing mediation. Figure 1 presents the results of the model. The practical fit indices indicate that the model fits well, Robust $\chi^2(137) = 233.691$, $p < .001$; CFI = .975; TLI = .957; RMSEA = .027.

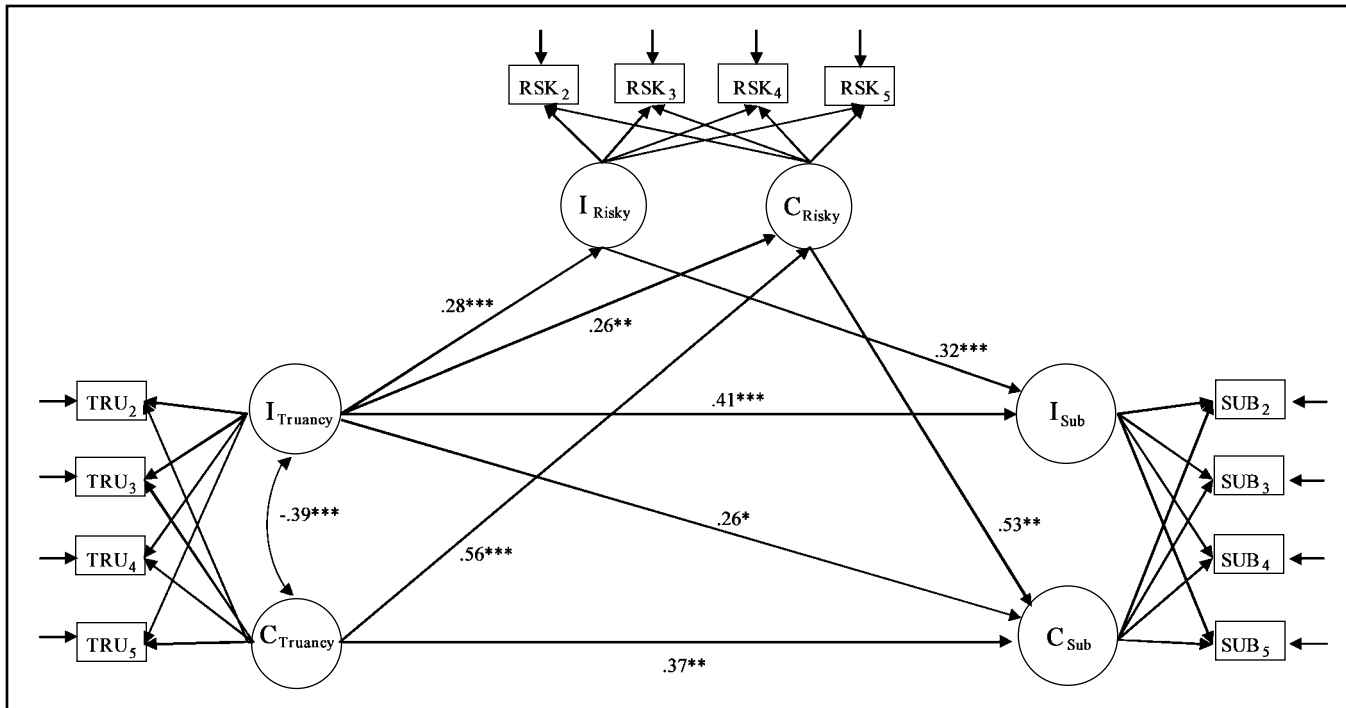


FIGURE 1. Risky time with friends as a mediator of the relationship between truancy and substance use. TRU_{2-5} = truancy at Waves 2 through 5; RSK_{2-5} = risky time with friends at Waves 2-5; SUB_{2-5} = substance use at Waves 2-5; $I_{Truancy}$ = initial status of truancy; $C_{Truancy}$ = change in truancy; I_{Risky} = initial status of risky time with friends; C_{Risky} = change in risky time with friends; I_{Sub} = initial status of substance use; C_{Sub} = change in substance use. Indirect effect of $C_{Truancy}$ on C_{Sub} via C_{Risky} is statistically significant ($\beta = .30, p < .05$). All growth parameters were regressed on age at baseline; parent's level of education; family poverty status; and baseline measures of delinquency, delinquent values, peer reactions to delinquency, parental monitoring, positive parenting, affective ties to child, grade-point average, and commitment to school. All reported coefficients are standardized estimates. * $p < .10$; ** $p < .05$; *** $p < .01$. Nonsignificant paths that were estimated but not included in the figure include $I_{Sub} \rightarrow C_{Sub}$, $I_{Sub} \rightarrow C_{Risky}$, $I_{Risky} \rightarrow C_{Risky}$, and $I_{Risky} \rightarrow C_{Sub}$.

As expected, a positive relationship between change in truancy and change in risky time with friends was observed ($\beta = .56, p < .01$), indicating that students who demonstrated an increase in their involvement in truancy over the course of these 2 years tended to also demonstrate an increase in risky time spent with friends. Likewise, a positive relationship between change in risky time with friends and change in substance use was observed ($\beta = .53, p < .05$). This is also consistent with our hypothesis and indicates that students who demonstrated increases in unstructured, unmonitored time with friends in risky settings tended to also demonstrate increased use of substances. The indirect effect of change in truancy on change in substance use via change in risky time with friends was statistically significant ($\beta = .30, p < .05$), indicating that, as hypothesized, risky time with friends is a significant mediator of the relationship between truancy and substance use. Without the consideration of the mediator, the effect of change in truancy on change in substance use was estimated at $\beta = .67 (p < .01)$; therefore, about 44% of the effect of change in truancy on change in substance use was mediated (i.e., explained) by change in unstructured, unmonitored time with friends in risky settings. Although this is indeed a substantial proportion of the effect, it is

important to note that it does not completely account for the relationship; that is, a significant direct effect of truancy on substance use remains.

Discussion

The purpose of this study was to examine the relationship between truancy and the *escalation* of substance use. In particular, we examined how both interindividual differences and intraindividual change in truancy was related to the escalation of adolescent substance use. By focusing on change, we moved beyond between-persons analysis to examine how escalation of truancy is associated with concomitant escalation of substance use.

Through a series of models, we demonstrated a robust association between truancy and substance use. This relationship exists contemporaneously (i.e., truancy is associated with higher levels of substance use within the same 6-month time frame), it exists prospectively (i.e., truancy during the previous 6 months is associated with a higher level of substance use), and it exists from a framework of change (i.e., during times when an adolescent's involvement in truancy is elevated [compared with his or her own norm], his or

her involvement in substance use is also likely to be elevated).

The robust relationship between truancy and escalation of substance use presented here extends previous work by Henry and Huizinga (2007b) and Henry et al. (2009), which demonstrated that truancy increases the odds of *initiation* of substance use among urban adolescents. Taken together, these results suggest that truancy is a particularly salient predictor of adolescent substance use. Not only is truancy associated with an increased odds of initiation of substance use, but once an adolescent initiates substance use, truancy is also related to a substantial escalation of use.

These results are quite consistent with theoretical expectations. As adolescents become disengaged from the conventional venue of the school, one would expect that involvement in a variety of problem behaviors, such as substance use, would increase. This may be the result of (a) the direct effect of reduced social control as involvement in the prosocial setting of school diminishes and/or to (b) increased exposure to deviant peer influences. These results are also consistent with developmental and life-course models of delinquency (Thornberry, 1997) which emphasize that changes in life-course trajectories (such as disengagement from school) are likely to be followed by behavioral consequences (such as escalation in substance use). It is important to note that the effect of truancy persists after adjusting for a comprehensive set of potential confounders, including other school-related variables.

We extended this line of questioning by considering one probable mediator of the relationship between truancy and substance use—unstructured, unmonitored time spent with friends in risky settings. We hypothesized that truancy, especially because it is typically a group activity, increases an adolescent's access to this type of risky time with friends, which in turn provides a setting for substance use and ultimately results in increased substance use by the adolescent. The results lend support to this hypothesis; 44% of the effect of change in truancy on the change in substance use over a period of 2 years was explained by change in risky time spent with friends. These findings conform to the models of Osgood and colleagues (Osgood and Anderson, 2004; Osgood et al., 1996) and Stoolmiller (1994) that suggest that involvement in problem behavior such as substance use is especially likely to occur in situations of unsupervised, unstructured time with peers. By its very nature, truancy is likely to provide such a context.

Implications for prevention

Overall, these findings have important implications for prevention because a thorough understanding of how school behaviors, including truancy, are related to involvement in substance use is crucial to the development of effective prevention and intervention initiatives. Continued research

aimed at developing an improved understanding of the patterns of academic disengagement that are most likely to predict substance use will better inform school personnel and prevention specialists as to which students are most in need of intervention and when that intervention should occur.

Although truancy is a robust predictor of substance use after controlling for GPA and school commitment, there are few evidence-based programs that effectively prevent truancy. Given the results presented in this article along with previous studies that have demonstrated the harmful consequences of truancy on substance use (Best et al., 2006; Chou et al., 2006; Vucina and Becirevic, 2007; White et al., 2007), more research into the etiology and prevention of truancy is necessary. Programs aimed at reducing truancy may have ripple effects, deterring delinquency, substance use, and other problem behaviors. In one study, Garry (1996) reported that shoplifting arrests declined by 60% and purse snatching dropped by nearly 50% when intensive truancy sweeps were conducted by the police. Several other recent studies have reported the effectiveness of school- and community-based truancy prevention programs (Fantuzzo et al., 2005; McCluskey et al., 2004), demonstrating encouraging results.

In summary, this study illuminates the relationship between truancy and escalation of substance use using a sophisticated methodology that assesses both between-persons and within-person effects. Results indicate that adolescents who are truant use substances more frequently; this finding exists when comparing one adolescent with another, that is, an adolescent who is truant uses more substances than an adolescent who is not truant, and when comparing periods of change within an adolescent, that is, during periods when an adolescent's truancy escalates, his or her involvement in substance use escalates. Moreover, mediated growth models indicate that escalation of access to unstructured, unmonitored time spent with peers in risky settings explains part of the relationship between truancy and substance use.

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