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Predicting High Risk Adolescents' Substance Use Over Time: The Role of Parental Monitoring

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Abstract We examined whether parental monitoring at baseline predicted subsequent substance use in a high-risk youth population. Students in 14 alternative high schools in Washington State completed self-report surveys at three time points over the course of 2 years. Primary analyses included 1,423 students aged 14–20 who lived with at least one parent or step-parent at baseline. Using hierarchical linear modeling, we found that high parental monitoring at baseline predicted significantly less use of alcohol, marijuana, downers, cocaine, PCP, LSD, and prescription drugs and drinking to intoxication at the first posttest. Approximately 1 year later, high parental monitoring at baseline predicted significantly less use of alcohol, cocaine, prescription drugs, uppers, and ecstasy and drinking to intoxication. Study results suggest that parental monitoring serves as a protective factor, even for high-risk alternative high school students. Including a parental monitoring component may increase the effectiveness of traditional drug prevention programs.

Keywords Parental monitoring · Alternative school · Substance use · Adolescent

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Introduction

Students who attend alternative schools are often at high risk of dropping out, have a history of behavioral or disciplinary problems, or are failing academically (Lehr & Lange, 2003). When compared to their peers who are attending regular high schools, alternative high school students have a higher prevalence of risk behaviors, including substance use (Grunbaum et al., 2000a; Grunbaum, Lowry, & Kann, 2001). Indeed, a large percentage of students in alternative schools use alcohol and other drugs. Various researchers have reported 30-day substance use ranging from 57–70% for alcohol, 47–52% for drinking to intoxication, 47–64% for marijuana, and 15–26% for cocaine (Grunbaum et al., 2000a, 2001; Grunbaum, Tortolero, Weller, & Gingiss, 2000b; Sussman, Dent, Stacy, & Craig, 1998; Weller et al., 1999). Although the effects of parental monitoring have not been examined with alternative high school students, this construct has shown promise in preventing and reducing substance use as children age (Beck, Boyle, & Boekeloo, 2003; Shillington et al., 2005) and has been targeted by

multiple prevention programs (e.g., Dishion, Nelson, & Kavanagh, 2003; Wu et al., 2003).

Parents who know where their children are and with whom they are associating, and who communicate to their children that they are aware of and concerned about their activities, are said to engage in parental monitoring (Dishion & McMahon, 1998). Researchers have reported significant inverse associations between substance use and parental monitoring within a variety of samples, such as a national cross-section of 12–18 year olds (Martins, Storr, Alexandre, & Chilcoat, 2008); 13–16 year olds in Buffalo, New York (Barnes & Farrell, 1992); urban, low-income African American adolescents (Rai et al., 2003); and 14–24 year olds attending neighborhood drop-in centers for at-risk youth (Shillington et al., 2005). A meta-analysis of 25 studies of respondents averaging 10–19 years old found a strong inverse association between parental monitoring and marijuana use (Lac & Crano, 2009).

Utilizing longitudinal studies, another line of research has focused on the predictive power of parental monitoring. Many studies have reported that parental monitoring significantly affects substance use after 1 year. For example, Chilcoat and Anthony (1996) found that third and fourth graders who had not used drugs were more likely to initiate drug use 1 year later if they experienced relatively low levels of parental monitoring. Even among older adolescents aged 13–16 years at baseline, Reifman, Barnes, Dintcheff, Farrell, & Uhteg, (1998) found that low parental monitoring was a strong predictor of weekly and heavy episodic drinking up to 1 year later. Similarly, compared to their less-closely monitored peers, highly monitored adolescents seen at medical practices were less likely to engage in risky alcohol-related behaviors, such as associating with peers who were drinking (Beck et al., 2003), and were less likely to report drinking 1 year later (Beck, Boyle, & Boekeloo, 2004). In addition, at a 1-year follow-up with students from nine high schools, compared to those with low parental monitoring, highly monitored nonusers at baseline were less likely to initiate use, highly monitored boys who were heavy users at baseline were more likely to decrease their use, and highly monitored girls who had experimented with substances at baseline were more likely to stop using them (Steinberg, Fletcher, & Darling, 1994).

Researchers who have examined the effects of parental monitoring within the context of longer time periods have reported more mixed results. For example, in a study examining trajectories of parental monitoring from the sixth to eighth grade, Tobler and Komro (2010) found that decreasing or inconsistent monitoring styles, compared to high monitoring, were associated with a greater risk for past year and month use of alcohol and marijuana and lifetime (but not past month) use of cigarettes. In a two-year study of incoming college freshmen, Walls, Fairlie, and Wood (2009) found that students who perceived a higher level of parental monitoring before they started college were less likely to report increases in binge drinking over time but were no more or less likely to become binge drinkers. Among adolescents who were 13–16 years old at baseline, higher parental monitoring predicted increases in alcohol misuse, illicit drug use, and initial alcohol misuse but not initial illicit drug use, over a 6 year period (Barnes, Hoffman, Welte, Farrell, & Dintcheff, 2006). Similarly, among 14 year olds followed for 18 months, Duncan, Duncan, and Stoolmiller (1994) found that low parental monitoring predicted higher rates of alcohol use but not the age at which the adolescents initiated use. Further, in a 4-year study of low-income, urban African American youth, low parental monitoring at baseline predicted higher drug use 1 year later but not in subsequent years (Li, Stanton, & Feigelman, 2000).

Although the majority of parental monitoring research has focused on alcohol, some studies have examined other drugs. For example, several studies summed respondents' use of various substances or created an index (e.g., Steinberg et al., 1994), whereas others focused on use of particular drugs. The results of these studies have been mixed. In the only one we identified that reported the effects of parental monitoring on a broad array of individual substances, including cigarettes, alcohol, marijuana, methamphetamines, ecstasy, inhalants, and binge drinking, favorable results were found for some, but not all, substances (Shillington et al., 2005). Martins et al. (2008) failed to find effects of parental monitoring on ecstasy use, but Lac and Crano (2009) found an inverse relationship between parental monitoring and marijuana use in their meta-analysis. Sooraksa (2009) found that family involvement had a negative effect on amphetamine use in Thailand.

Overall, research suggests that parental monitoring may be a factor that protects adolescents even as they progress beyond elementary and middle school

(Barnes et al., 2006). However, mixed results may be a function of the length of follow-up, the age or background of the respondents, the specific substances examined, and/or the respondents' current and past substance use. Indeed, monitoring may be insufficient to reduce substance use among more frequent users (Beck et al., 2003). When adolescents initiate early problem behavior, parents may give up on their attempts to monitor their activities (Barnes & Farrell, 1992). Indeed, Dishion et al. (2003) found that parents of high-risk adolescents decreased monitoring from grades 7–9, which is potentially problematic because reductions in parental monitoring have been associated with an increased risk of substance use (Chilcoat, Dishion, & Anthony, 1995). On the other hand, Li et al. (2000) found considerable stability in the construct over time.

We sought to examine whether parental monitoring at baseline would predict substance use among alternative high school students over the course of 2 years. Our study adds to the considerable literature on parental monitoring by means of a longitudinal examination of high-risk adolescents attending alternative high schools, many of whom already use substances. We also include a comprehensive list of substance use outcomes, which gives us the opportunity to examine the effects of monitoring upon each.

Method

Research Design

Study data came from an evaluation of Project SUCCESS, a school based substance abuse prevention that was developed for alternative high school students (Morehouse, Fallick, & Pierce, 2002). We randomly assigned participating alternative high schools to either an intervention or control condition. Students' 30-day use of alcohol, cigarettes, marijuana, and other drugs were assessed three times: prior to the program, immediately following program implementation, and 1 year later. Because we failed to find any lasting effects of the program (Clark et al., 2010), we combined students across conditions for the present paper and included as predictors in our models both intervention group and the interaction between parental monitoring and intervention group.

Respondents

We enrolled 14 alternative high schools from Washington state in two cohorts spaced 1 year apart. An alternative school can be defined as one that "addresses the needs of students that typically cannot be met in a regular school; provides nontraditional education; serves as an adjunct to a regular school, and falls outside of the categories of regular, special education, or vocational education" (Tang & Sable, 2009, p. A-23). School eligibility criteria included a (a) self-contained building, or a self-contained area within another school building; (b) total population of about 100–200 students in the ninth through twelfth grades; (c) great majority of students likely to stay in the school for at least one semester; and (d) focus on youth with behavioral problems, including delinquency. Some students enrolled in these schools by choice; others, by placement.

As we developed relationships with the schools, we came to understand that they served multiple subgroups of students who attended school for varying periods of time, both during the school day and over the course of the week. We included some and excluded others based on our best (and evolving) understanding of how each group functioned and the likelihood that each would attend a sufficient amount of any given school day to make it likely that they would be exposed to the program. For instance, we included students who were mandated by juvenile court to attend school under Washington State's Compulsory School Attendance and Admission Law, and we excluded all night school students because they did not have an opportunity to receive Project SUCCESS. We also excluded students in Running Start, a state funded program that allows students to earn college credit while completing a high school program, because these students spend at least part of the day—and many the entire day—at local community colleges. After we collected baseline data, we learned that one of the schools in our first cohort exclusively comprised contract-based and independent study students who attended school only long enough to turn in their assignments and secure the next set or to complete homework on the Web. We included this school in the study because we used an intent-to-treat approach to analyses, but we excluded these students in our second cohort a priori because we

believed their exposure to Project SUCCESS was likely to be negligible.

Given the nature of our schools, rosters were very fluid; we found that many administrators were often uncertain as to whether students were actually attending classes. Further, there were no clear or consistent rules that governed when a student who had not attended was dropped from the roster. This issue was complicated further by the contract and independent study students who attended school only sporadically.

According to the information we received, 2,871 students appeared to be enrolled at the time we distributed consents. Of the 709 students who received opt-out letters, 647 (91%) were allowed to participate in the study. Each wave of surveys was completed by 604, 573, and 539 students enrolled through the opt-out procedure, respectively. Of the 1,818 students were involved in the active parental consent process, 1,258 (69%) received parental permission to participate in the study, and 936, 885, and 864 students completed each wave of surveys, respectively. Of the 344 students who were at least 18 years old, 202, 192, and 179 students completed each wave of surveys, respectively.

Overall, the three waves of surveys were completed by 1,742, 1,650, and 1,582 participants, respectively. Of those who completed pretests, 89% provided all three waves of survey data, and 97% provided two waves. Students aged 14–20 ($M = 16.6$ years old; $SD = 1.3$) who lived with at least one parent or stepparent at baseline were included in the present analyses ($n = 1{,}423$). At baseline, 51.8% of the analytic sample were male, 77.2% were Caucasian, 14.6% were Hispanic, and 5.8% were African American.

Measures

Respondents completed a 77-item self-report questionnaire. The primary outcomes examined were 30-day substance use and parental monitoring.

Substance Use

We examined 30-day use of alcohol, marijuana, cigarettes, and drinking to intoxication with items secured from the Monitoring the Future survey (Johnston, O'Malley, Bachman, & Schulenberg, 2007). In two separate items, we asked the respondents to indicate on how many occasions they had used alcohol and marijuana in the previous 30 days. To assess drinking to intoxication, we asked them to indicate on how many occasions they had been drunk or very high from consuming alcoholic beverages in the previous 30 days. Response options for these three questions ranged from "0 occasions" to "40 or more occasions." We examined 30-day use of cigarettes by asking respondents how many cigarettes they smoked per day during the last 30 days. Response options ranged from "none" to "38 or more."

We used dichotomous (yes/no) items that had been used previously (Ellickson, McCaffrey, Ghosh-Dastidar, & Longshore, 2003) to assess 30-day use of "uppers" (amphetamines, speed, whites, etc.), "downers" (barbiturates, reds, etc), cocaine (coke), PCP (angel dust), and LSD (acid, trips). As specified by the National Survey on Drug Use and Health (Research Triangle Institute, 2003), we added similar items for methamphetamines, ecstasy, and prescription drugs not prescribed to the respondent and used only for the experience or feeling they caused.

Parental Monitoring

We combined the 6-item Poor Family Management Scale and the 3-item Poor Discipline Scale, both from the Student Survey of Risk and Protective Factors (Arthur, Hawkins, Pollard, Catalano, & Baglioni, Jr., 2002), to create our 9-item measure of parental monitoring ($\alpha = 0.86$ at baseline). Using a four-point scale, respondents rated the likelihood of being caught by their parents engaging in antisocial behavior (i.e., drinking alcohol, skipping school, and carrying a gun), parental monitoring of their activities, and rule setting. High scores reflected high parental monitoring.

Living Arrangement

Students selected the adult(s) with which they currently lived from a list including mother, father, stepmother, stepfather, other adult female, and other adult male. "I do not live with any adults" was also included as a response option.

Contextual Factors and Intervention Implementation

Students reported their age, gender, and race/ethnicity using items developed for the United States Census Bureau (US Census Bureau, 2003). Contextual factors, group status (intervention vs. control), cohort, and the

lag in days between when students participated at baseline and completed each of the posttests were included in our models to address potential rival explanations for relationships between early parental monitoring and later substance use.

Procedure

Local data collectors who were unknown to the students facilitated the consent form process and survey administration. In our first round of surveying, five of our six schools used a parental opt-out letter both sent in the mail and distributed to the students, whereas the sixth school chose to use active parental consent. However, we became concerned about the high numbers of letters returned as undeliverable and used active parental consent for the remainder of the survey administrations in both cohorts. To assist us with collecting active parental consent forms from minors, schools were given $200 for each classroom, which was divided evenly between teachers (in the form of a gift card) and their students (in the form of a pizza party or something similar) when 90% of the parental consent forms were signed and returned, regardless of whether parents provided or withheld consent. In addition, in return for their participation, each school received $500 for each of four semesters of data collection, for a total of $2,000. We also offered schools not selected for the intervention an additional unrestricted grant of $2,000 over the course of the study.

Data collectors made numerous trips to each school to secure as many completed surveys as possible. Pretests were administered prior to program exposure during 2 or 3 time periods in each school. We administered an initial posttest to all participants at the end of the program ($M = 373.3$ days after pretest, $SD = 139.0$; range = 81–849) and again about 2 years after the pretest ($M = 705.4$ days after pretest, $SD = 150.5$; range = 383–1,333). Respondents who were unavailable to us in their schools at posttest were followed into the community and returned their surveys either by mail or directly to a data collector who met them at home, at work, or at another mutually acceptable location. Thirty-two percent of posttests were completed in school, 48% were returned in postage-paid envelopes, and 20% were collected outside of school by a data collector.

For survey administrations in the school, we enclosed each student's assent form, request for contact information form, and survey in an envelope, on the outside of which was a removable label with the student's name. Data collectors distributed each survey to the appropriate student and instructed the student to remove the name label. At that point, each survey was identified only by a unique code number that had been previously assigned by the research team, which maintained exclusive possession of the link to their names. Students were assured of confidentiality both in writing on their assent forms and verbally by the data collectors. Students enclosed their completed surveys in their envelopes before returning them to the data collectors. Following survey completion, respondents received a list of substance use and mental health resources in the area. Respondents received $10 incentives for completing surveys in school and $20 incentives for returning surveys elsewhere. Some respondents (4%) who were particularly hard to locate at follow-up or were unresponsive to initial requests received $25 to $50 incentives.

Analysis Plan

We set four cases with out of range values to "missing." Missing covariate data were imputed using the Expectation Maximization (EM) algorithm implemented in the Missing Value Analysis module in SPSS 13.0. This algorithm employs maximum-likelihood estimation to ensure consistency between the variance-covariance matrix from the observed and the imputed data (Dempster, Laird, & Rubin, 1977). The proportion of missing values was minimal for covariates related to gender (0.3%) and Hispanic ethnicity (2.7%). There were no missing data for the remaining covariates.

The study's primary analyses were performed using hierarchical linear modeling (HLM). HLM was used to deal conservatively with variability that arises among groups (Raudenbush & Bryk, 2002) due to multiple students (Level 1) being nested within schools (Level 2). All models assumed a random intercept, which presumes variability arises among schools due to nesting. Our models regressed each of the substance use outcomes examined at each posttest separately on (a) age, (b) male gender, (c) Caucasian race, (d) African-American race, (e) Hispanic ethnicity, (f) parental monitoring, (g) baseline standing, and

(h) lag on the dependent measure. Models took the following general form at Level 1:

$$\begin{aligned}\text{Substance Use} = {} & \pi_0 + \pi_1(\text{Age}) + \pi_2(\text{Male}) \\ & + \pi_3(\text{White}) + \pi_4(\text{Black}) \\ & + \pi_5(\text{Hispanic}) \\ & + \pi_6(\text{Parental Monitoring}) \\ & + \pi_7(\text{Baseline Standing}) + \pi_8(\text{Lag})\end{aligned}$$

The Level 2 model assumed that cohorts of participation in the study and intervention status were predictors of the outcomes (or the Level 1 intercept):

$$\pi_0 = \beta_{00} + \beta_{01}(\text{Cohort}) + \beta_{02}(\text{Intervention}) + r_0$$

The Level 2 model also examined whether the cross level interaction between intervention status and parental monitoring at level one (or more formally, their product) predicted the outcomes:

$$\pi_6 = \beta_{10} + \beta_{11}(\text{Cohort}).$$

All models were run using HLM 6.06. Models examining dichotomous measures of drug use assumed that outcomes were Bernoulli-distributed; therefore, hierarchical non-linear modeling was used to model these outcomes employing a binomial distribution family with a logit link function. We derived all results from two-tailed tests of significance, given that a number of authorities have recently stated categorically that more liberal one-tailed tests should never be employed (Hurlbert & Lombardi, 2009; Ringwalt, Paschal, Gorman, Derzon, & Kinlaw, 2011).

Results

We first looked at the proportion of students who reported substance use at each of the study's three waves of data. As can be seen in Table 1, nearly half of the students reported at baseline that they had used cigarettes, alcohol, and marijuana and had drunk to intoxication in the past 30 days. At baseline, about one quarter of respondents reported 30-day use of illegal prescription drugs; about 7–10% of respondents reported 30-day use of cocaine, ecstasy, uppers, and downers; and about 2–5% reported 30-day use of PCP, LSD, and methamphetamines.

We also examined the distribution of the continuous parental monitoring scale. Parental monitoring was relatively normally distributed with a slight negative skew indicating that very few respondents (2.2%) reported low levels of monitoring. The majority of students reported a moderate level of parental monitoring ($M = 3.00$, $SD = .64$, range = 1–4). As can be seen in Tables 2 and 3, high parental monitoring at baseline predicted significantly less use of alcohol, marijuana, downers, cocaine, PCP, LSD, and prescription drugs and drinking to intoxication at the first posttest (all ps $< .05$), and there was a trend in the same direction for methamphetamine use ($p = .06$). Approximately 1 year later, high parental monitoring at baseline still predicted significantly less use of alcohol, cocaine, and prescription drugs and drinking to intoxication (all ps $< .05$), and there was a trend in the same direction related to use of downers ($p = .06$). There were two significant effects suggesting that

Table 1 Percentage of participants indicating 30-day substance use at each wave with 95% confidence interval

Substance	Wave 1 (N = 1,400–1,423)	Wave 2 (N = 1,325–1,347)	Wave 3 (N = 1,287–1,302)
Cigarettes	50.88(±2.60)	52.64(±2.67)	56.22(±2.69)
Alcohol	59.54(±2.55)	61.46(±2.60)	59.03(±2.67)
Drinking to intoxication	47.92(±2.60)	46.05(±2.67)	43.70(±2.69)
Marijuana	45.99(±2.59)	41.18(±2.63)	40.28(±2.67)
Uppers	9.16(±1.50)	7.74(±1.43)	6.32(±1.32)
Downers	7.33(±1.36)	8.14(±1.46)	4.86(±1.17)
Cocaine	8.98(±1.49)	8.37(±1.48)	6.39(±1.33)
PCP	1.56(±0.65)	1.65(±0.68)	1.23(±0.60)
LSD	3.61(±0.97)	4.26(±1.08)	2.85(±0.90)
Methamphetamines	5.38(±1.18)	4.72(±1.14)	3.70(±1.03)
Ecstasy	10.07(±1.58)	8.75(±1.52)	7.46(±1.44)
Prescription drugs	27.52(±2.33)	21.64(± 2.20)	18.78(±2.12)

Table 2 Effect sizes (r) and statistical significance for the relationships between parental monitoring and later substance use (continuous variables)

Substance	Fixed effect					Random effect		
	t	df	p	r	95% CI for r	$\chi^2(13)$	p	ICC
Time two								
Cigarettes	−1.07	1,322	.29	−0.03	±0.05	18.29	.15	0.007
Alcohol	−2.55	1,329	.01	−0.07	±0.05	10.44	.66	0.001
Intoxication	−3.01	1,327	.00	−0.08	±0.05	13.19	.43	0.004
Marijuana	−2.28	1,327	.02	−0.06	±0.05	16.28	.23	0.006
Time three								
Cigarettes	−0.25	1,250	0.81	−.01	±0.06	16.39	.23	0.005
Alcohol	−2.50	1,255	0.01	−.07	±0.05	6.35	.93	0.000
Intoxication	−3.12	1,256	0.00	−.09	±0.05	6.20	.94	0.000
Marijuana	−1.13	1,256	0.26	−.03	±0.06	12.73	.47	0.003

Negative relationships between parental monitoring and substance use indicate that as parental monitoring increases, substance use decreases

Table 3 Effect sizes (OR) and statistical significance for the relationships between parental monitoring and later substance use (dichotomous variables)

Substance	Fixed effect					Random effect		
	t	df	p	OR	95% CI	$\chi^2(13)$	p	ICC
Time two								
Uppers	−1.20	1,326	.23	0.77	[0.50, 1.18]	39.85	.00	0.096
Downers	−2.05	1,322	.04	0.63	[0.40, 0.98]	16.95	.20	0.027
Cocaine	−2.34	1,317	.02	0.60	[0.39, 0.92]	37.28	.00	0.093
PCP	−2.32	1,312	.02	0.30	[0.11, 0.83]	40.58	.00	0.320
LSD	−2.89	1,315	.00	0.39	[0.20, 0.74]	18.29	.15	0.058
Meth.	−1.91	1,310	.06	0.61	[0.37, 1.01]	21.74	.06	0.068
Ecstasy	−0.51	1,290	.61	0.89	[0.56, 1.41]	36.24	.00	0.074
Pres. drugs	−4.09	1,321	.00	0.52	[0.39, 0.72]	20.46	.08	0.018
Time three								
Uppers	−2.53	1,250	.01	0.54	[0.34, 0.87]	23.32	.04	0.064
Downers	−1.86	1,249	.06	0.56	[0.31, 1.03]	8.80	.79	0.000
Cocaine	−2.86	1,246	.01	0.49	[0.30, 0.80]	16.10	.24	0.031
PCP	−1.21	1,246	.23	0.53	[0.19, 1.49]	17.92	.16	0.161
LSD	−1.08	1,246	.28	0.61	[0.25, 1.50]	15.40	.28	0.061
Meth.	−0.77	1,244	.44	0.78	[0.41, 1.48]	3.77	.99	0.000
Ecstasy	−2.38	1,222	.02	0.56	[0.35, 0.90]	11.28	.59	0.006
Pres. drugs	−2.23	1,250	.03	0.67	[0.48, 0.95]	26.39	.02	0.036

Odds ratios less than one between parental monitoring and substance use indicate that as parental monitoring increases, substance use decreases

higher parental monitoring at baseline predicted less use of uppers and ecstasy at the second posttest (both ps $< .05$); however, these effects were not observed at the first posttest.

Discussion

In general, the 30-day rates of substance use in our sample of alternative high school students from Washington State are slightly lower than those reported among other alternative high school students (e.g., Grunbaum et al., 2000a; Weller et al., 1999). As we anticipated, however, our rates are considerably higher than those reported in a sample of students attending "regular" high schools, consistent with the findings of a study designed to compare the two school types (Grunbaum et al., 2001). The moderately high level of parental monitoring reported by our sample is consistent with the levels reported among a national sample of 12–17 year olds (National Center on Addiction and Substance Abuse at Columbia

University, 2008), ninth and eleventh graders from South Dakota (Tucker, Ellickson, & Klein, 2008), and high-risk 14–24 year olds from California (Shillington et al., 2005). Although research suggests that older adolescents receive significantly less monitoring than their younger peers (Beck et al., 2003), our study found that parents still closely monitor the behavior of high-risk adolescents attending alternative high schools.

Like Shillington et al. 2005, we found significant effects of parental monitoring on the use of some, but not all, substances. Indeed, our findings are consistent with the parental monitoring literature in that we found a significant relationship with alcohol use (e.g., Beck et al., 2004; Reifman et al., 1998). In a study in Thailand, Sooraksa (2009) found inverse relationships between parental monitoring and uppers (i.e., amphetamines), which we also found, albeit at the second, but not first, posttest.

Our lack of results for cigarettes and methamphetamines differs from studies that have found significant relationships between parental monitoring and these substances (e.g., Shillington et al., 2005). In addition, we were somewhat surprised that our significant finding for marijuana did not persist at the second posttest, given that a meta-analysis (i.e., Lac & Crano, 2009) and other studies (e.g., Rai et al., 2003) have consistently reported an inverse relationship between parental monitoring and marijuana use. However, Shillington et al. (2005) did not find any protective effects of parental monitoring on recent use of marijuana. We were also surprised that we found an effect, albeit a delayed one, on the use of ecstasy, given that other studies have failed to do so (e.g., Martins et al., 2008; Shillington et al., 2005).

Our sample included students who lived in many different environments, such as with parents, on their own, with other relatives, and in foster care. For this study, we examined only respondents who lived with a parent or step-parent at baseline in order to provide the most straightforward interpretation of results. That is, we would not expect for students living on their own to be monitored by their parents. Further, when students lived with other adults, we were unable to determine if they were considering their biological parents or their adult caregivers when responding to the parental monitoring items. We conducted ex post facto analyses to compare respondents who did and did not live with parents or step-parents at baseline as well as to examine effects of parental monitoring on substance use for the entire sample. Students who did not live with parents or step-parents were significantly older (17.3 vs. 16.6; $p < .001$), were less likely to be male (44% vs. 52%; $p < .001$), and reported lower parental monitoring (2.8 vs. 3.0; $p < .01$) than those who lived with parents. We found that the magnitude of effects of parental monitoring on substance use was slightly attenuated using the entire sample; however, the direction and pattern of results were similar. Examining the entire sample after 1 year, we found significant inverse effects of parental monitoring on alcohol, PCP, prescription drugs, and drinking to intoxication, with trends for marijuana, cocaine, and LSD. After 2 years, we found significant effects on alcohol, ecstasy, and drinking to intoxication, with trends for cocaine and prescription drugs.

This study has several limitations that may affect the interpretability of its results. First, there are a variety of definitions of parental monitoring and associated measures. The adolescent self-report measure we selected tapped adolescents' perceptions of whether or not they would be caught by their parents if they engaged in antisocial behavior, their parents knew their whereabouts, and their family rules were clear. Other researchers have relied on parent self-report measures (e.g., Chassin, Curran, Hussong, & Colder, 1996), or have included items related to parent–child communication (e.g., Dishion & Loeber, 1985). Further, Kerr, Stattin, and Burk (2010) found that what youth were willing to disclose to their parents constituted a better predictor of delinquency over time than traditional measures of parental monitoring. Second, we did not ask our respondents to report the monitoring of each parent individually, so those who lived with more than one parent may have had difficulty answering survey items. Third, we included all students in the study regardless of their baseline substance use. It is therefore possible that some parents may have changed their monitoring practices in response to their children's substance use prior to the initiation of this study. If so, it would not be possible to determine whether earlier substance use influenced parenting practices or if monitoring preceded to use. However, Chen, Storr, and Anthony (2005) found no relationship between cannabis involvement and prior monitoring among children who had the opportunity to try cannabis before participating in their study. Fourth, although parental

monitoring practices are hardly static and could well be inconsistent or otherwise change over time, we assessed adolescents' perceptions of their parents only once, at baseline. In that regard, it is particularly noteworthy that we found effects on substance use up to 2 years later. Fifth, we were unable to include in our model a number of variables that could have confounded the relationship between parental monitoring and substance use, such as peer influences, socioeconomic status, parental substance use, or parental approval of substance use. Finally, we employed a convenience sample of schools from one geographic area of the country, and we were unable to determine the representativeness of our sample.

In conclusion, our study found a substantial amount of substance use among alternative high school students. Although our study found that high parental monitoring predicted the decreased use of many, but not all, of the substances we examined, the correlational nature of our analyses does not allow us to assume causality. Our study focused on students who lived with at least one parent; however, these students inevitably spend time with their peers who do not have a parent at home. Therefore, even with high levels of parent monitoring, these adolescents are likely to be exposed to more peer interactions in which parents are uninvolved than students in regular education settings. The finding that parental monitoring continues to serve as a protective factor is remarkable. In the future, it would be useful for parental monitoring theory to be further developed in order to offer some possible explanations for parental monitoring's differential effects on various drugs. It would be interesting to explore the reasons that parental monitoring appears to be effective against some substances but not others. For example, researchers may wish to consider each individual caregiver's knowledge about various substances as well as his or her own use of substances and attitudes towards substance use. Future research also could examine how changes in parental monitoring over time predict use of various substances among different populations, as well as how monitoring changes in relation to adolescents' use of specific substances. In addition, potential mediators such as peer or sibling substance use could be fruitful avenues to explore.

Our findings lend further credence and support to earlier studies that suggest the importance of the effects of parental monitoring on a variety of risk behaviors (Embry, Hankins, Biglan, & Boles, 2009). These findings have given rise to a multitude of prevention strategies that have targeted parental monitoring, such as the Office of National Drug Control Policy's campaign titled Parents: The Anti-Drug (National Youth Anti-Drug Media Campaign, n.d.). While parent exposure to the campaign did not produce positive changes in youth behavior or beliefs (Orwin et al., 2006), other approaches that include strategies designed to enhance parental monitoring have demonstrated greater success (Dishion et al., 2003; Wu et al., 2003). One such program, Informed Parents and Children Together, employs a 1 hour home-based intervention that includes a video that emphasizes the importance of parental supervision and is followed by structured discussion and role play (Stanton et al., 2000). There are many others, including Strengthening Families (Kumpfer, Alvarado, & Whiteside, 2003) and Family Matters (Bauman, Foshee, Ennett, Hicks, & Pemberton, 2001), which generally teach parents a variety of skills, including how to monitor effectively and set rules, how to provide praise for appropriate behavior, and how to apply appropriate levels of discipline with consistency (Kosterman, Hawkins, Haggerty, Spoth, & Redmond, 2001). Fortunately, prevention practitioners interested in increasing parental monitoring are not faced with the daunting task of developing a new program, but instead can choose the program with the strongest evidentiary base that best meets the needs of the populations they serve.

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