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Joan S. Tucker
Phyllis L. Ellickson
David J. Klein

Reprinted from
Journal of Applied Social Psychology

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Published 2003 by RAND
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Five-Year Prospective Study of Risk Factors for Daily Smoking in Adolescence Among Early Nonsmokers and Experimenters¹

JOAN S. TUCKER,² PHYLLIS L. ELLICKSON, AND DAVID J. KLEIN

RAND
Santa Monica, California

Grade 7 nonsmokers and experimenters ($N = 4,165$) were compared on a wide range of risk factors for future smoking derived from four prominent theories and whether these factors predicted daily smoking at Grade 12. Early experimenters scored consistently higher than did early nonsmokers on risk factors for future smoking. Common predictors of Grade 12 daily smoking for both groups included early exposure to an important adult who smokes, being young for one's cohort, and weak academic bonds. For Grade 7 nonsmokers, unique predictors of daily smoking included exposure to pro-smoking social influences (cigarette offers, sibling who smokes), early binge drinking, and being female. Unique predictors for early experimenters were less sharply delineated, although certain family factors appeared to be more important for this group. African Americans and Hispanics were also less likely to progress from experimental to daily smoking. Results point to the importance of adapting prevention efforts to the special needs of early nonsmokers and experimenters.

Although considerable work has focused on smoking patterns among younger and older adolescents, less attention has been given to the patterns and antecedents of tobacco use among youth at high risk for smoking (Lynch & Bonnie, 1994; U.S. Department of Health and Human Services [USDHHS], 1994). Research has consistently shown that an important risk factor for future smoking is age at initiation. Smoking at an early age substantially increases the risk of subsequent heavy smoking and decreases the likelihood of successful quitting (Breslau & Peterson, 1996; Escobedo, Marcus, Holtzman, & Giovino, 1993; Taioli & Wynder, 1991). A better understanding is needed of the ways in which early smokers differ from their peers in other respects (Bertrand & Abernathy, 1993; Conrad, Flay, & Hill, 1992; Giovino, Henningfield, Tomar, Escobedo, & Slade, 1995). The goal of the present study is to investigate the antecedents of daily smoking in late adolescence among those who were either nonsmokers or experimenters in early adolescence. Such information should help guide the

¹This research was supported by National Cancer Institute Grant #R01CA80287.

²Correspondence concerning this article should be addressed to Joan S. Tucker, RAND, 1700 Main Street, P.O. Box 2138, Santa Monica, CA 90407-2138. E-mail: joan_tucker@rand.org

development and timing of anti-smoking programs, which tend to be less effective for early smokers (Best et al., 1984; Biglan et al., 1987; Ellickson & Bell, 1990; Murray, Davis-Hearn, Goldman, Pirie, & Luepker, 1988).

Research on risk and protective factors for adolescent smoking has been dominated by four major theoretical approaches, which guided the selection of variables for this study. According to social learning theory (Akers & Lee, 1996; Bandura, 1977), engagement in a behavior is more likely if one is exposed to models of the behavior. In the case of smoking, adolescents might be at higher risk for this behavior if they interact with family and friends who smoke. The theory of planned behavior (Ajzen, 1985; Ajzen & Fishbein, 1980) posits that three factors affect one's intention to engage in a specific health-related behavior: attitudes toward the behavior, normative beliefs, and perceived behavioral control. Problem behavior theory (Jessor & Jessor, 1977) proposes that many problem behaviors in adolescence have similar etiologies and serve common purposes. As a result, substance use, academic problems, deviancy, and other problem behaviors might co-occur for certain individuals. Some of these behaviors, such as school problems and alcohol use, might not only precede smoking initiation, but also contribute to its onset. According to social bonding theory (Burkett & Jensen, 1975; Hirschi, 1969), weak bonds with social institutions (e.g., family and school) contribute to a variety of deviant behaviors. Thus, future smoking might be predicted from such factors as being raised in a non-intact home, experiencing family friction, or having academic difficulties or discontinuity in one's education. These theories are not necessarily mutually exclusive; there is some overlap in the predictor variables encompassed within these theories and each might have some predictive utility. Together, they encompass the wide range of risk and protective factors that have been identified for adolescent smoking (Petraitis, Flay, & Miller, 1995).

Chassin and her colleagues (Chassin, Presson, Sherman, Corty, & Olshavsky, 1984) investigated whether predictors of smoking over a 1-year period differed for early triers versus nonsmokers. They compared variables from three of these theoretical approaches: social learning theory, theory of planned behavior, and problem behavior theory. Although all three classes of variables predicted future smoking for both groups, the results indicated that smoking attitudes and intentions were more predictive for triers, whereas deviant behavior and smoking environment were more predictive for early nonsmokers. In interpreting their findings, they argued that direct experience with smoking among early triers might lead to the formation of relatively strong pro-smoking attitudes, which, in turn, are the primary predictors of future smoking behavior. Since early nonsmokers have not yet formed these attitudes, their immediate social environment and inclinations toward deviant behavior might be stronger predictors of the transition to smoking. Although at least one other study has found that peer smoking is more predictive of smoking initiation than escalation (Flay et al., 1994), other

research has not shown differential effects of peer smoking and intentions on subsequent smoking for initial nonsmokers and smokers (Ary & Biglan, 1988). This study will further test whether social influences and early deviance are more important for early nonsmokers, and smoking intentions and attitudes are more important for early experimenters.

Previous studies in this area have tended to overlook variables relevant to social bonding theory. However, there are several lines of evidence from which predictions can be generated. Early smokers are more likely to have a rebellious self-image than are nonsmokers (Aloise-Young, Hennigan, & Graham, 1996; Leary, Tchividjian, & Kraxberger, 1994) and to reinforce that image by seeking out deviant peers and developing more positive attitudes toward deviant behavior (Akers & Lee, 1996; Fisher & Bauman, 1988). In addition, adolescent smokers are more likely to experience academic difficulties, including dropping out of school (Ellickson, Bui, Bell, & McGuigan, 1998; Mensch & Kandel, 1988). In light of these findings, early smokers might be expected to have weaker bonds with family and school than nonsmokers. Longitudinal analysis has indicated that having weak social bonds in early adolescence predicts increased smoking by late adolescence (Krohn, Massey, Skinner, & Lauer, 1983), although differences between early nonsmokers and smokers were not investigated. Previous work on the present sample found that social bonds were poorer predictors of hard drug use than were social influences and prior deviance (Ellickson, Collins, & Bell, 1999). However, weak social bonds are more strongly associated with cigarette use than hard drug use (Taub & Skinner, 1990) and, as a result, might not necessarily be poorer predictors of future smoking compared to other types of risk factors. The present study will investigate the extent to which weak social bonds predict future daily smoking for early nonsmokers and experimenters, taking other risk factors for smoking into account.

The present study significantly extends previous research in this area in several respects. First, it examines a wide range of risk factors for future smoking derived from four prominent theories that have guided research on adolescent smoking behavior. This comprehensive approach allows us to determine the independent associations of these risk factors and their relative importance. Second, we are aware of no other studies that have investigated predictors of daily smoking among early nonsmokers and experimenters; however, it is an important outcome in that it might signal current or future risk of tobacco dependence. Previous research has indicated that the risk factors for smoking might differ depending on the stage of smoking (Robinson, Klesges, Zbikoski, & Glaser, 1997). As a result, what is known about the risk factors for experimentation or monthly use might be of limited usefulness in understanding the precursors of daily smoking. Third, research on the predictors of adolescent smoking has tended to be cross-sectional or has used relatively short-term follow-ups (Conrad et al., 1992). The present 5-year prospective study, following a large cohort from

early adolescence (Grade 7) to late adolescence (Grade 12), allows us to identify early risk factors for the transition to daily smoking during the period when the prevalence of daily smoking increases dramatically (Johnston, O'Malley, & Bachman, 2002).

We hypothesize that early experimenters will exhibit consistently higher levels of Grade 7 risk factors compared to early nonsmokers. Further, we anticipate that nonsmokers and experimenters will differ somewhat in their vulnerability to these risk factors. Based on the results of Chassin et al. (1984), we expect that exposure to a pro-smoking social environment and engagement in deviance will be stronger predictors of daily smoking 5 years later for initial nonsmokers, whereas holding pro-smoking attitudes and intentions will be stronger predictors of future smoking for early experimenters. We also will explore the vulnerability of early nonsmokers and experimenters to weak academic and family bonds.

Method

Participants

The present study uses longitudinal data from 6,527 students recruited from 30 California and Oregon schools at Grade 7 who were reassessed at Grade 12 (1985 and 1990, respectively). These adolescents participated in the RAND Adolescent Panel Study, conducted to evaluate the effectiveness of the Project ALERT drug use prevention program for middle school children (Ellickson & Bell, 1990). The schools were chosen to represent a wide range of community types (urban, suburban, and rural), socioeconomic status (18 schools drew from neighborhoods with household incomes below the median for their state), and racial and ethnic composition (nine schools had minority populations of 50% or more). The prevention program was implemented after the Grade 7 assessment and had no lasting effects at Grade 12. Thus, there was no need to include treatment effects in the analyses.

Participants were excluded if they dropped out of the study, were lost to follow-up, or otherwise failed to complete the Grade 12 survey ($n = 2,137$), if they were missing smoking information at either assessment ($n = 221$), or if they were missing information on ethnicity ($n = 4$). These exclusions resulted in a final sample size of 4,165. Thirty-two percent of the weighted sample (unweighted $n = 1,178$) self-classified as a minority (African American, 10.1%; Hispanic, 9.6%; Asian, 8.3%; Other, 4.2%), 48% were female (unweighted $n = 2,258$), and 13% had dropped out of school (unweighted $n = 428$). Extensive tracking methods allowed us to retain 67% of the original baseline sample at Grade 12. However, the 33% of participants who could not be located or who dropped out of the study were more likely to have exhibited early behavioral problems compared to those who were retained. To further reduce bias associated with sample attrition, we

weighted the sample that was retained at Grade 12 using logistic regression to create predicted probabilities of responding to the Grade 12 survey that were derived from Grade 7 information about each 7th-grade respondent (including race, gender, family structure, deviance, substance use, and grades). These weights remove 90% or more of the bias exhibited in the unweighted sample (Ellickson, Saner, & McGuigan, 1997). The use of sample weights, as well as the clustering of observations within schools, was accounted for by computing Huber (1967) standard errors (Stata Corp, 1999).

Although the students who participated in the study at Grade 7 and Grade 12 generally completed the entire survey, there is a small amount of missing data for most variables. For multivariate analyses that require complete information for all included variables, this small amount of missing data can result in a sizable reduction in sample size. We used missing-value imputation on all variables to circumvent this problem. This procedure involves using regression analysis to generate a predicted value (the criterion) from other variables that are strongly empirically correlated with the criterion value. The predicted value is then substituted for the missing value.

Measures

Smoking status. At Grade 7, we classified participants as having ever used cigarettes or never used cigarettes. The dependent variable was smoking behavior at Grade 12, assessed as whether or not participants engaged in daily smoking (used cigarettes 20 or more days in past month: 0 = *no*, 1 = *yes*).

Demographics. Demographic information includes age at baseline, gender (0 = *male*, 1 = *female*), race/ethnicity (Caucasian vs. African American, Hispanic, Asian, or Other), and average parental education (0 = *no high school degree* to 3 = *college graduate*).

Beliefs about smoking. The prevalence of peer smoking was obtained by asking participants to estimate the percentage of 8th grade students in their school who had smoked in the last month. We used a six-item scale to assess positive beliefs about smoking, with higher scores indicating more positive beliefs ($\alpha = .63$). Participants rated how much they believe that smoking relaxes you, makes you do poorly in sports, gets you into trouble at school, helps you get away from your problems, and is addictive if done every weekend. The questions were rated on a 4-point scale ranging from 1 (*strongly agree*) to 4 (*strongly disagree*). They also answered a question about how much kids their age might harm themselves if they smoke occasionally, which was rated on a 4-point scale ranging from 1 (*a lot*) to 4 (*not at all*). Intention to smoke in the next 6 months was rated on a 4-point scale ranging from 1 (*definitely no*) to 4 (*definitely yes*).

Social influences. Participants rated how often the adult who is most important to them smokes (0 = *never* to 3 = *4-7 days a week*), whether any older

siblings smoke (0 = *no*, 1 = *yes*), and their perceptions of peer smoking (“How often are you with kids who are smoking”: 1 = *never* to 4 = *often*; and “Do you think your best friend smokes sometimes?”: 0 = *no*, 1 = *yes*; $\alpha = .67$). To assess social approval of smoking, participants rated how their parents and friends would feel if they found out that the participants smoked (parent rating: 1 = *very upset* to 4 = *not at all upset or wouldn't care*; friend rating: 1 = *they would disapprove and stop being my friends* to 4 = *they would approve*). Cigarette offers were assessed by how many times they had been offered a cigarette (0 = *never* to 4 = *5 or more times*).

School and family bonds. Measures of school bonding included academic success, stability, and intentions. Participants reported on their grades (1 = *mostly As* to 5 = *mostly Fs*), the number of grades that they had repeated, the number of elementary schools that they had attended, and the highest level of schooling that they anticipated completing (1 = *plan to attend graduate or professional school* to 5 = *may not finish high school*). We assessed family bonds in two ways: whether or not the adolescent would be likely to talk to his or her parents about a personal problem (0 = *no*, 1 = *yes*) and whether or not the adolescent had an intact nuclear family (was living with both biological parents: 0 = *no*, 1 = *yes*). Not having an intact nuclear family would provide evidence that family bonds with one or both biological parents were weakened by diminished contact.

Problem behavior and rebelliousness. Four variables assessed substance use other than smoking. Participants indicated their use of alcohol and marijuana (1 = *never used* to 11 = *used 20 or more days in past month*), whether or not they had ever used hard drugs (0 = *no*, 1 = *yes*), and whether or not they ever binge drank (3 or more drinks in one day: 1 = *nondrinker*, 2 = *drinker*, 3 = *binge drinker*). Deviance was assessed by asking participants how often they did the following things over the past year: skipped school, cheated on a test, stole, and were sent out of the classroom for causing trouble (0 = *never* to 3 = *more than three times*; $\alpha = .64$).

Results

Of the 4,165 participants in these analyses, 47% had never smoked and 53% had smoked at Grade 7 (weighted estimates). Given that 81% of those who had ever smoked reported smoking less than monthly (weighted estimate), we heretofore refer to this group as *early experimenters*. A higher percentage of early experimenters than nonsmokers progressed to daily smoking by Grade 12 (26.5% vs. 6.1%, respectively), $\chi^2(1, N = 4,165) = 405.6, p < .001$. Table 1 provides descriptive information on the Grade 7 predictor variables.

Early nonsmokers and experimenters were compared on each of the variables in Table 1, supporting the hypothesis that experimenters would exhibit higher levels of risk factors for future smoking. Results indicate that Grade 7 experimenters tended to report higher prevalence estimates for peer smoking, more

Table 1

Comparing Grade 7 Nonsmokers and Experimenters on Grade 7 Variables

Variable	Nonsmokers		Experimenters		<i>t</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Perceived prevalence	29.68	23.90	43.95	27.39	16.41***
Positive beliefs	1.45	0.49	1.79	0.62	17.42***
Intention to smoke	1.14	0.37	1.90	0.96	20.68***
Parent approval of smoking	1.14	0.42	1.50	0.78	13.69***
Friend approval of smoking	1.81	0.70	2.41	0.76	23.13***
Important adult smokes	0.95	1.31	1.64	1.42	16.06***
Best friend smokes	-0.48	0.53	0.38	0.89	26.26***
Cigarette offers	0.52	1.02	2.17	1.57	37.20***
Low grades	1.86	0.75	2.38	0.83	21.19***
Grades repeated	0.12	0.33	0.21	0.42	8.69***
Schools attended	1.97	1.09	2.24	1.23	6.36***
Low academic intentions	1.99	0.82	2.23	0.98	7.69***
Alcohol use	1.60	2.14	3.63	2.92	19.76***
Binge drinking	1.45	0.58	1.94	0.69	22.23***
Marijuana use	0.06	0.59	1.42	2.74	9.55***
Any hard drug use	0.01	0.07	0.09	0.28	9.31***
Deviance	0.30	0.44	0.75	0.69	17.17***
Age	12.70	0.54	12.90	0.59	10.18***
Parents' education	2.13	0.97	1.80	1.06	-7.82***
	%		%		<i>F</i>
Female	51.0		46.3		8.0**
Caucasian	71.2		64.9		6.8*
African American	8.1		11.8		7.3*
Hispanic	6.1		12.6		49.1***
Asian	11.7		5.4		21.8***
Other race	3.0		5.3		8.1**
Sibling smokes	20.1		49.9		312.8***
Intact nuclear family	69.8		49.1		254.6***
Talks to parents	70.4		52.5		81.7***

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

positive attitudes about smoking, and stronger intentions to smoke in the future. Experimenters also experienced greater exposure to and social approval of smoking than nonsmokers; had weaker academic and family bonds; reported more engagement in deviant behavior; and tended to be more involved in alcohol, marijuana, and hard drug use (all $ps < .001$). In terms of demographic variables, experimenters tended to be older and to have parents with less education; were more likely to be African American and Hispanic; and were less likely to be female, Asian, and White compared to nonsmokers (all $ps < .05$).

Huberized (Huber, 1967) logistic regression techniques were used to determine the independent associations of the Grade 7 predictor variables with Grade 12 daily smoking for Grade 7 nonsmokers and experimenters. Being African American was not included in the model for Grade 7 nonsmokers because of the lack of individuals in this group who became daily smokers by Grade 12, which reduced the sample size for this analysis by 132 individuals. We also tested an interaction model by adding Grade 7 smoking status interaction terms for each of the predictor variables to the main effects model shown in Table 2³ in order to determine whether there were significant differences between initial nonsmokers and experimenters in the associations of the Grade 7 predictor variables with Grade 12 smoking status (Table 2).

Comparing results for Grade 7 nonsmokers and experimenters, we found both similarities and differences in the predictors of Grade 12 daily smoking. Variables that predicted daily smoking at Grade 12 for both Grade 7 nonsmokers and experimenters included smoking by the adult most important to them, earning lower grades, attending more elementary schools, and being younger for one's grade cohort. Unique predictors of daily smoking 5 years later for Grade 7 nonsmokers included having siblings who smoked, receiving cigarette offers, binge drinking, and being female. Each of these differences between Grade 7 nonsmokers and experimenters was found to be at least marginally significant ($p \leq .10$) in the interaction model. Finally, the following variables were found to be significant predictors of Grade 12 daily smoking among Grade 7 experimenters only: intending to smoke in the future, parental approval of smoking, not having an intact nuclear family, not talking to parents about personal problems, and not being African American or Hispanic. However, results from the interaction model indicate that the associations between each of these Grade 7 predictor variables and Grade 12 daily smoking did not differ significantly for Grade 7 nonsmokers and experimenters.

Notable are the variables not predictive of Grade 12 smoking for either group: perceived prevalence of peer smoking, general pro-smoking beliefs, friend

³African American (vs. Caucasian) was only included as a main effect in the fully crossed interaction model because of lack of Grade 7 African American nonsmokers who became daily smokers by Grade 12.

Table 2

Predicting Grade 12 Frequent Smoking From Grade 7 Variables

Grade 7 variable	Grade 7 smoking status				Difference <i>p</i> ^a
	Nonsmokers		Experimenters		
	OR	(95% CI)	OR	(95% CI)	
Perceived prevalence	1.00	(1.00-1.01)	1.00	(0.99-1.00)	
Positive beliefs	0.93	(0.57-1.51)	0.93	(0.75-1.16)	
Intention to smoke	1.48†	(0.97-2.25)	1.40**	(1.19-1.65)	
Parent approval of smoking	0.95	(0.65-1.40)	1.28**	(1.13-1.46)	
Friend approval of smoking	1.25†	(0.97-1.61)	0.86	(0.69-1.07)	.04
Important adult smokes	1.16*	(1.01-1.34)	1.15***	(1.08-1.23)	
Best friend smokes	0.74†	(0.53-1.02)	1.12	(0.94-1.33)	.02
Siblings smoke	1.66*	(1.00-2.74)	0.94	(0.70-1.26)	.08
Has no sibling	0.83	(0.53-1.29)	0.92	(0.65-1.32)	
Cigarette offers	1.25*	(1.06-1.49)	1.08	(0.97-1.21)	.10
Low grades	1.55**	(1.21-2.00)	1.32**	(1.11-1.56)	
Grades repeated	1.23	(0.62-2.44)	1.29	(0.88-1.88)	
Schools attended	1.17*	(1.01-1.35)	1.14*	(1.01-1.28)	
Low academic intentions	1.12	(0.89-1.40)	0.99	(0.85-1.16)	
Intact nuclear family	0.65†	(0.39-1.08)	0.73*	(0.57-0.93)	
Talks to parents	0.93	(0.60-1.44)	0.75*	(0.60-0.95)	
Alcohol use	0.96	(0.84-1.09)	1.02	(0.96-1.08)	
Binge drinking	1.68*	(1.13-2.50)	1.07	(0.82-1.39)	.07
Marijuana use	0.66	(0.24-1.81)	1.02	(0.96-1.07)	
Any hard drug use	1.37	(0.24-7.95)	1.30	(0.87-1.94)	
Deviance	0.97	(0.64-1.47)	0.90	(0.74-1.09)	
Age	0.56*	(0.34-0.91)	0.61***	(0.48-0.77)	
Female	1.96**	(1.22-3.15)	0.99	(0.74-1.33)	.01
African American	—	—	0.12***	(0.05-0.30)	
Hispanic	0.40	(0.13-1.23)	0.50**	(0.34-0.72)	
Asian	0.65	(0.30-1.41)	0.96	(0.52-1.75)	
Other race	0.51	(0.16-1.66)	0.84	(0.44-1.62)	
Parents' education	1.01	(0.78-1.30)	0.94	(0.84-1.05)	

Note. OR = odds ratio; CI = confidence interval.

^aResults of fully crossed model; *p* value for test of difference between Grade 7 nonsmokers and experimenters on association of Grade 7 predictor variable with Grade 12 daily smoking.

†*p* < .10. **p* < .05. ***p* < .01. ****p* < .001.

smoking and approval of smoking, repeating grades and low academic intentions, frequency of alcohol and marijuana use, hard drug use, deviance, being Asian or Other race, and parents' education.

Discussion

Only 6% of the Grade 7 nonsmokers had become daily smokers by the end of high school, whereas over 4 times as many of the experimenters had done so. Because daily smoking often signals tobacco dependence, this difference in smoking trajectories is important. It suggests that efforts to prevent or delay early initiation into tobacco use could have a substantial impact on future rates of tobacco addiction among adolescents.

Consistent with previous research (e.g., Sussman et al., 1993), early nonsmokers experienced less exposure to role models who smoked and received fewer cigarette offers compared to early experimenters. Further, our hypothesis that exposure to a pro-smoking social environment would be a stronger predictor of subsequent smoking for initial nonsmokers than experimenters received some support. Early nonsmokers who reported that the adult who was most important to them smoked, an older sibling smoked, or they received more cigarette offers were more likely to be daily smokers 5 years later. In contrast, only exposure to an important adult who smoked was a risk factor for early experimenters.

The different results for early experimenters and nonsmokers might be a result of these social influences operating through different mechanisms that are not necessarily relevant for both groups. For example, having an older sibling who smokes and receiving cigarette offers might provide easy access to tobacco and strong social pressures to smoke. These factors might be expected to have more of an influence on future smoking behavior among adolescents who have not yet begun smoking than among those who have already started. Important adults who smoke (presumably parents in most cases) might exert their influence less through providing access to cigarettes or explicit pressure to smoke, but more through conveying a powerful message to young adolescents that smoking is a desirable and acceptable behavior. If this is the case, such a message is likely to contribute to smoking initiation among nonsmokers, as well as continued and escalated smoking among those who are already engaging in the behavior.

Early experimenters were more likely than were nonsmokers to report engaging in various types of deviant behavior (e.g., delinquency and other substance use), which is consistent with previous research (DuRant, Smith, Kreiter, & Krowchuk, 1999; Escobedo, Reddy, & DuRant, 1997). Although it was predicted that deviant behaviors would be stronger predictors of subsequent smoking for early nonsmokers than experimenters, these variables tended to not be associated with subsequent smoking for either group. An exception involved binge drinking, which was a strong and significant risk factor for daily smoking in Grade 12 for

early nonsmokers only. Previous research on the sequencing of substance use in adolescence has found that experimentation with alcohol tends to precede smoking (e.g., Kandel & Faust, 1975), which might explain why binge drinking was a significant predictor of Grade 12 smoking behavior only for those who had not yet begun smoking at Grade 7.

We expected that early experimenters would hold stronger pro-smoking attitudes than would nonsmokers, presumably because of their direct experience with smoking; and that pro-smoking attitudes would be better predictors of daily smoking 5 years later for early experimenters than for nonsmokers. Although pro-smoking attitudes were stronger among early experimenters, a pattern also reported by Chassin et al. (1984), we did not find strong support for the notion that these attitudes function as unique predictors for experimenters. Believing that smoking has few negative consequences did not put either group at greater risk for future smoking. Intention to smoke was a significant predictor for the early experimenters, a result consistent with social psychological research on attitude-behavior consistency indicating that engagement in a specific behavior is better predicted by specific attitudes toward the behavior than more general attitudes (Krause, 1995). However, the odds ratios for this risk factor were nearly equal and did not significantly differ between the two groups. That fact, plus the marginally significant status of smoking intentions for the early nonsmokers, points to the importance of certain pro-smoking attitudes as risk factors for future daily smoking among early experimenters, but does not support the idea that they are more important risk factors for this group compared to nonsmokers. The experimenters did appear to be more susceptible to parental approval of smoking than the nonsmokers, for whom this risk factor was not a significant predictor. Although the odds ratios were not significantly different between the two groups, the lack of difference might be a result of insufficient statistical power (e.g., few parents indicated approval of their children's smoking).

To the best of our knowledge, previous research has not investigated whether having weak social bonds presages the transition to daily smoking among early nonsmokers and experimenters. Consistent with research indicating that adolescent smokers are more likely than are nonsmokers to experience academic difficulties (Escobedo, Anda, Smith, Remington, & Mast, 1990; Pirie, Murray, & Luepker, 1988), we found that early experimenters were more likely than were nonsmokers to have weaker academic bonds in terms of poorer performance in school, attending a greater number of elementary schools, and repeating grades by early adolescence. With the exception of repeating grades, having weak academic bonds at Grade 7 predicted the transition to daily smoking by late adolescence for both groups. In terms of bonds with family, early experimenters were more likely than were nonsmokers to not live with both parents and to not talk to parents about their problems. Further, our results indicate that weak family bonds are significant risk factors for the transition to daily smoking for early

experimenters, again demonstrating the importance of early parental influences on the subsequent smoking behavior of this group. Although the odds ratios for these variables did not significantly differ for early experimenters and nonsmokers, there was some suggestion that poor communication with parents might pose a greater risk for future daily smoking among those who have already begun experimenting. Given the limited research comparing social bonding variables to other types of risk factors for substance use, further work is needed to better understand their role in the initiation and maintenance of substance use. This is especially the case in light of evidence that the influence of weak social bonds on substance use might vary as a function of the type (Taub & Skinner, 1990) and stage (Ellickson et al., 1999) of use.

This study has several important strengths, such as its prospective design with relatively long-term follow-up, large sample size, and the inclusion of a wide range of predictor variables that theory and previous research have suggested are relevant to adolescent smoking behavior. Limitations of the study include basing the results on a single sample of California and Oregon students. Although the schools were selected to represent a broad spectrum of communities, socioeconomic status, and racial and ethnic composition, the extent to which these results would generalize to adolescents in other parts of the country is unknown. However, previous work with this cohort has indicated that prevalence rates for violence, drug use, dropping out of school, and multiple problem behaviors are within the range typically found in other studies (Ellickson et al., 1997, 1998). It is also a limitation of this study that information on smoking and other problem behaviors came exclusively from self-reports. Although it was not feasible to validate all reports of problem behaviors in this sample, self-reported tobacco use was shown to be highly accurate when externally validated, and self-reported alcohol and marijuana use were highly consistent over time (Reinisch, Bell, & Ellickson, 1991). We have no reason to believe that incentives to misreport other behaviors are stronger than those for drug use.

Results from this study indicate that there are common predictors of Grade 12 daily smoking for early experimenters and nonsmokers, such as early exposure to an important adult who smokes, being young for one's age cohort, and weak academic bonds. However, there are also important differences in risk factors for these groups. Whereas certain pro-smoking social influences, early binge drinking, and being female are stronger risk factors for subsequent daily smoking among early nonsmokers, early experimenters might be more vulnerable to certain family factors. These results suggest that it is important to take into account the special needs of early nonsmokers and experimenters in designing prevention programs for implementation in early adolescence: What is effective for one group might not be optimally effective for the other. Further, early experimenters are more likely than are nonsmokers to be facing a myriad of problems by Grade 7 other than smoking (e.g., academic difficulties, strained family relations,

deviance, other substance use). Prevention programs need to address these other problems (as they might adversely affect recruitment and retention into such programs), as well as their ultimate effectiveness in curbing cigarette use among adolescents who have already begun smoking.

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