

Peer and Parental Influences on Adolescent Tobacco Use

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Longitudinal models of the development of adolescent smoking and smokeless tobacco (ST) use were tested for a sample of 643 adolescents, age 14 to 17. The sample was assessed at three time points. Smoking, smokeless tobacco, and other problem behaviors formed a single problem behavior factor. Structural equation modeling indicated that inadequate parental monitoring and association with deviant peers at Time 2 predicted tobacco use at Time 3. When parental and peer smoking at Time 2 were added to the model, each accounted for significant variance in predicting Time 3 smoking, but inadequate parental monitoring and association with deviant peers still accounted for some of the variance in Time 3 smoking. In predicting boys' smokeless tobacco use, monitoring at Time 2 predicted smokeless tobacco use, but only when parental approval of ST use was not included. Fathers approval of ST use at Time 2 predicted ST use at Time 3, while maternal disapproval predicted its use.

KEY WORDS: tobacco use; adolescence; social context; structural equation methodology.

INTRODUCTION

This paper tests a model of the influence of general and specific parental and peer influences on adolescent tobacco use. Studies of social influences on adolescent tobacco use have typically focused on how peer and

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parent tobacco use increases the likelihood of adolescent tobacco use (U.S. Department of Health and Human Services, 1994). It is possible, however, that more general features of parent and peer relations influence tobacco use. Recent studies have shown that high levels of parent-child conflict and inadequate parental monitoring of children's behavior contribute to the development of antisocial behavior (Patterson *et al.*, 1992), drug abuse (Dishion *et al.*, 1991; Dishion and Loeber, 1985; Dishion and Ray, 1991; Hawkins *et al.*, 1992), and high-risk sexual behavior (Biglan *et al.*, 1990; Metzler *et al.*, 1994). High levels of family conflict and poor parental monitoring also could contribute to tobacco use. For example, adolescents from such families might be less likely to comply with parent requests that they not smoke or chew, and their initial use of tobacco might go undetected and unpunished.

Similarly, there is extensive evidence that young people's associations with deviant peers contribute to antisocial behavior (Patterson *et al.*, 1992), drug use (Brook *et al.*, 1992; Dishion and Ray, 1991), and high-risk sexual behavior (Biglan *et al.*, 1990; Metzler *et al.*, 1994). The role of such general peer deviance in tobacco use should also be examined.

Given the growing evidence that adolescent engagement in different problem behaviors is intercorrelated (e.g., Donovan and Jessor, 1985), Ary *et al.* (1994) tested the influence of parenting practices and associations with deviant peers on the development of general engagement in problem behavior. The problem behavior construct was composed of indices of antisocial behavior, high-risk sexual behavior, academic failure, and an index of tobacco, alcohol, and marijuana use. At the first assessment, the level of coercive family interactions predicted low levels of family involvement. Family involvement predicted inadequate parental monitoring a year later, which was, in turn, correlated with young people's associations with deviant peers at the 1-year assessment. Poor parental monitoring and associations with deviant peers at 1 year accounted for 52% of the variance in the problem behavior construct at 18 months. It thus appears that parenting practices influence the development of association with deviant peers, and these associations, together with inadequate parental monitoring, make it more likely that young people will engage in the entire range of high risk behaviors.

The present paper extends the analyses of Ary *et al.* (1994) in several ways. First, it examines the covariance between smoking and other problem behaviors in greater detail. The Ary *et al.* (1994) analysis of the relationships among problem behaviors lumped different types of substance use (cigarette, alcohol, and marijuana use) together in one indicant. It is possible that smoking would not load on a problem behavior factor if it were

included as a separate indicant. In the present paper this possibility is examined.

Second, the Ary *et al.* (1994) analysis did not examine whether smokeless tobacco is related to other problem behaviors. This issue deserves attention, since there is some suggestive evidence that ST use may not be as counternormative as other problem behaviors. We therefore analyzed its relation to other problem behaviors.

Third, although Ary *et al.* (1994) found that parenting practices and associations with deviant peers influenced engagement in problem behavior, it is possible that such a model would not hold if smoking and smokeless tobacco were examined in isolation. We therefore examined the influences of general peer deviance and parenting practices on adolescent smoking and boys' smokeless tobacco (ST) use. Specifically, we replicated the model that Ary *et al.* (1994) tested using smoking and smokeless tobacco as the dependent variables.

Finally, the paper examines whether peer and parent influences, which would be expected to be specific to tobacco, contribute to the prediction of tobacco use over and above the contribution of these general parent and peer influences. In the case of smoking we examined whether including parent and peer smoking in the model increased our ability to predict smoking and reduced the variance accounted for by parental monitoring and association with deviant peers. Similarly, with respect to ST use among boys, we examined whether including young people's perceptions of their mothers' and fathers' approval of tobacco use in the model would alter the predictive validity of the parental monitoring and deviant peer constructs.

METHODS

Subjects

Study participants were 608 adolescents from a large metropolitan area in the Pacific Northwest. Subjects were members of the Kaiser Permanente health maintenance organization (HMO) who were recruited to participate in a clinical trial to evaluate the efficacy of an adolescent smoking cessation program. A screening questionnaire of adolescent members of the HMO was used to identify adolescent smokers. Recruitment procedures maintained an 8:1 ratio of current "smokers" (i.e., smoked one or more cigarettes in last month) to nonsmokers. Subjects ranged in age from 14 to 17 years at the outset of the study. There were 91% Caucasian, 3%

African-American, 2% American Indian, 2% Asian, and less than 2% Latino. There were 225 males and 383 females.

The parents of 89% of these adolescents also participated in the study. Neither the adolescent nor the parent was paid for participation.

Procedures

Adolescent subjects and their parents completed a questionnaire in their homes during a visit by a research staff member. The initial assessment was followed with additional assessments at 12 and 18 months. In addition to the questionnaire assessments, adolescent subjects also provided an expired air sample for carbon monoxide analysis to detect smoking (Biglan *et al.*, 1985) and a saliva sample for cotinine analysis to detect smoking (Benowitz, 1986). There is evidence that collecting such physiological samples increases the accuracy of self-reports of tobacco use (Murray and Perry, 1987; Murray *et al.*, 1987).

Measures

The 45-min adolescent questionnaire assessed adolescent problem behavior, the social context in the family environment, and the peer social context. As summarized in Table I, multiple items assessed each of the following constructs: (a) target adolescent's problem behavior, (b) peer deviant behavior (i.e., antisocial behavior and substance use), (c) parental monitoring, (d) family involvement, and (f) parent/child coerciveness. Most measures were based on previously validated items. The problem behavior items included measures of substance use (Ary and Biglan, 1988), high-risk sexual behavior (Metzler *et al.*, 1992), antisocial behavior (Donovan and Jessor, 1985; Elliot *et al.*, 1983; Jessor and Jessor, 1977), and academic failure (i.e., GPA, homework time, future academic plans, and truancy). The measures of peer deviance and parental monitoring were based on prior work by Capaldi and Patterson (1989). Family involvement and parent/child coerciveness measures were adapted from the Family Environment Scale (Moos and Moos, 1986) and the Conflict Behavior Questionnaire (Prinz *et al.*, 1979).

To summarize, the variables retained for the structural equation models and presented in Fig. 1 included (a) three indicants of family coercion (V_1 to V_3), (b) three indicants of Family Involvement (V_4 to V_6), (c) three indicants of Inadequate Monitoring (V_7 to V_9), (d) two indicants of peer deviance (V_{10} and V_{11}), (e) four indicants of adolescent Cigarette Use (V_{12}

Table 1. Summary of Construct Items Utilized in the Structural Equation Models

Construct	Indicator	Questionnaire item	Scaling ^b
Family involvement	V1	Family members support one another	TF
	V2	There are feelings of togetherness in our home	TF
	V3	Family members get along well	TF
Parent-children coercion	V4	Mother—big arguments over little things	TF
		Father—big arguments over little things	TF
	V5	Mother—get angry with daily	TF
		Father—get angry with daily	TF
	V6	Mother—3 times a week get angry	TF
	Father—3 times a week get angry	TF	
Monitoring	V7	How often child goes where you told not to ^a	1-5
	V8	How difficult to know where child goes ^a	1-3
	V9	Adults supervise child's parties ^a	1-5
Peer deviance	V10	Child's friend have had influence ^a	1-5
		How often child associates with misbehaved ^a	1-5
		How often child hangs out with those who steal ^a	1-5
		How often child hangs out with those who smoke ^a	1-5
		How often child hangs out with those who drink ^a	1-5
		How often child hangs out with those who use pot ^a	1-5
		Times friends ruined others' property on purpose	1-5
		Times friends stole item >\$50	1-5
		How many friends could get in lots of trouble	1-5
		Times friends go drunk once in while	1-5
Friends would dare to try drugs (at school)	V11	Times friends sold or gave alcohol to other kids	1-5
		Friends would dare to try drugs (at school)	TF
		Friends would dare to try drugs (not at school)	TF

Table I. Continued

Construct	Indicator	Questionnaire item	Scaling ^b
Adolescent smoking behavior	V12	Average number smoked per day all life	Frequency
	V13	Number of years smoked	Frequency
	V14	Number of cigarettes in last 6 months	Frequency
	V15	Smokes in last 24 hr.	Frequency
Parental smoking behavior	V16	Have ever smoked? ^a	TF
		Smoked in last week ^a	TF
		Mother approves of smoking	TF
		Father approves of smoking	TF
Peer smoking	V17	How often child hangs out with those who smoke ^a	1-5
		Does you best friend smoke?	TF
Smokeless tobacco use	V12	Are you a current user of chewing tobacco?	TF
	V13	Times last week used chewing tobacco	Frequency
	V14	Times last month used chewing tobacco	Frequency
Parental approval of smokeless tobacco	V15	Mother approves of chew use	1-5
	V16	Father approves of chew use	1-5
Risky sexual behavior		Number of opposite sex partners	Frequency
		How often used condom during sex	1-5
		How often alcohol part of sex	1-5
		How often pot or drugs part of sex	1-5
Substance use		Monthly alc. rate, computed with full range of variables	Frequency
		Monthly cig. rate, computed with full range of variables	Frequency
		Monthly pot rate, computed with full range of variables	Frequency
Academic failure		GPA in school	1-5 ^b
		Time spent on homework each night	# minutes

Antisocial behavior		
Last 6 months: damaged school property		1-4
Last 6 months: damaged others' property		1-4
Last 6 months: vandalized		1-4
Last 6 months: hit/threat parent		1-4
Last 6 months: hit/threat others		1-4
Last 6 months: stole \$5-\$50 items		1-4
Last 6 months: stole <\$5 item		1-4
Last 6 months: stole >\$50 item		1-4
Last 6 months: skipped school		1-4
Last 6 months: times late after school		1-4

^aParent questionnaire items.

^bFor true/false items, T = 2 and F = 1. For Likert items 1-5, 1 = never, 5 = always; 1-4, 1 = never, 4 = often; 1-3, 1 = not at all difficult, 3 = very difficult. GPA was recoded to a 5-point scale: A = 4, F = 0.

to V_{15}), and (f) two single-item measures pertaining to parent (V_{16}) and peer (V_{17}) smoking behavior.

RESULTS

Analysis Strategy

The models were tested using EQS, Bentler's (1989) structural equation modeling program. A two-step process, recommended by Anderson and Gerbing (1988), was followed in which confirmatory factor analysis was used to test the measurement portion of the model, followed by the test of the more substantive and restrictive hypothesized model. This two-step procedure is fundamental in identifying misspecification in the relationships that exist among the latent constructs. In addition, the structural equation (SEM) methodology was applied to a situation where data were missing on specific variables. Although standard analyses of incomplete data, generally involving the use of listwise deletion, take advantage of the complete nature of the resulting data set to simplify computations, these procedures provide estimates that are generally inefficient, discarding a substantial amount of potentially useful data (Muthén *et al.*, 1987). Muthén *et al.* (1987) have demonstrated that in many applications, model estimation with distinct missing data patterns can be carried out utilizing existing structural equation modeling software that allows for the simultaneous analysis of multiple groups.

Briefly, the strategy for handling missing data consists of expanding the usual structural equation model to include means, or regression intercepts, and partitioning the sample into subgroups with distinct patterns of missing data. Equality constraints across the various groups representing distinct patterns of missingness are used in a multisample analysis to obtain unbiased and consistent estimates. It should be emphasized that these equality constraints across the missing data subsamples are not of substantive interest but, because of the assumption that the hypothesized model is invariant across groups, function solely to ensure correct estimation of model parameters. A complete exposition of the missing data approach to structural equation modeling as applied in the present investigation is beyond the scope of this manuscript. Readers are referred to Duncan and Duncan (1995), Duncan *et al.* (1994), and Muthén *et al.* (1987) for a complete discussion and references on the issues surrounding the model-based approach to the analysis of missing data.

Relationships Between Adolescent Smoking and Other Problem Behaviors

Empirical research has demonstrated relationships among alcohol, cigarette, marijuana, other illicit drug use and abuse, delinquency, antisocial behavior, precocious and unsafe sexual practice, and academic failure or low expectations for achievement in academics (Biglan *et al.*, 1990; Newcomb and Bentler, 1988).

An examination of the relationships among smoking and five other adolescent problem behaviors (high-risk sexual behavior, marijuana use, alcohol consumption, antisocial behavior, and academic failure) indicated that a one-factor solution fit the data, suggesting that smoking is part of a problem behavior syndrome that includes a variety of adolescent problematic behaviors. Fit indices for this model were $\chi^2(9, N = 593) = 16.347$, $p = .059$, NNFI = .939, and CFI = .964. Factor loadings for each of the individual problem behaviors with the common factor were significant. Thus, it appears that cigarette use, at least among this sample of adolescents, is closely related to engagement in these other behaviors.

Models of the Social Influences on Adolescent Smoking

We were interested in whether measures of specific parental and peer influences on tobacco use predicted later smoking or smokeless tobacco use even after more general peer and parental influences had been accounted for. Therefore, we first tested two substantive models (one for smoking and one for ST use) that contained only the general parenting and peer factors and then added specific influences to those models. We examined whether the addition of variables involving specific influences produced a significant increment in R^2 over the more general model for predicting smoking or smokeless tobacco use.

Figure 1 presents a model of the peer and parental influences on adolescent smoking. The first model included only the general parent and peer influence constructs (shaded in the figure): Coercive Interactions and Family Involvement at Time 1, Inadequate Monitoring and Association with Deviant Peers at Time 2, and Cigarette Smoking at Time 3.

The model depicted in Fig. 1 used data from five subsets of cases that represent various stages of "completeness." The first group represents those individuals for whom complete data are available across the 18-month developmental period of interest. Each successive group represents a case where either attrition or other forms of missingness eliminates some data. Compared with the sample of 643, the data in group 1 ($n = 188$) represent

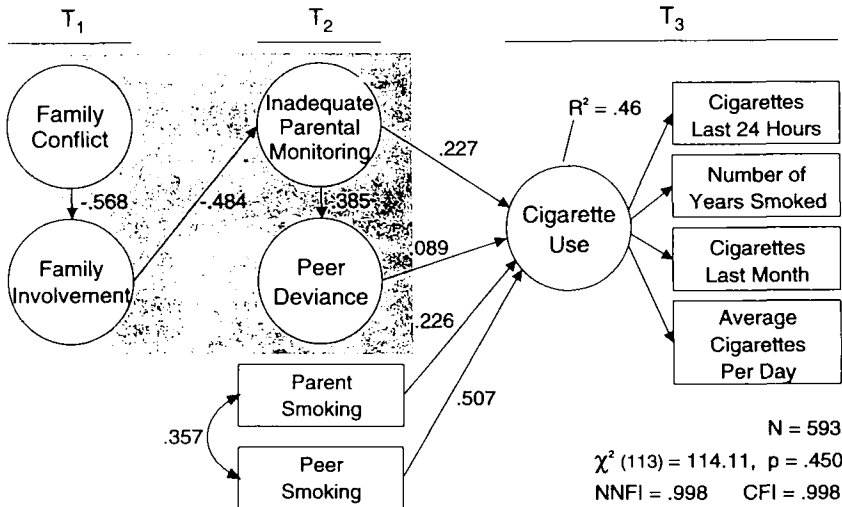


Fig. 1. Social context model of adolescent cigarette use.

the “complete” or nonmissing listwise data available for analysis. The data available for subsequent groups ($n = 162, 172, 43,$ and 28) increase the total number of subjects with complete data to 593 cases, which represents approximately 98% of the original sample. The limited nature of the two latter data sets are typical of the samplings generally obtained in repeated-measures longitudinal research.

Normalized estimates of multivariate kurtosis for the five subgroups and univariate values of skewness and kurtosis were, in most cases, minimal. Thus, the assumption of approximate normality of the observed variables appears tenable. Approximate normality justifies the use of normal theory maximum-likelihood estimation techniques found in structural equation programs such as EQS (Bentler, 1989).

Fitting the tobacco use model to our multiple-sample data results in an overall model fit of $\chi^2(85, N = 593) = 79.78, p = .63,$ and fit indices NNFI = 1.01 and CFI = 1.00. The model accounted for 16% of the variance in cigarette smoking. Inadequate Monitoring had a significant effect ($\beta = .354, t = 2.669, p < .01$) on adolescent smoking, whereas associations with deviant peers did not ($\beta = .099, t = .968, p = ns$). Inadequate Monitoring at Time 2 significantly predicted associations with deviant peers at Time 2 ($\beta = .385, t = 3.68, p < .01$). Inadequate Monitoring at Time 2

was predicted by low Family Involvement at Time 1 ($\beta = -.518, t = 4.32, p < .01$). Low Family Involvement was, in turn, predicted by high levels of family conflict ($\beta = -.551, t = 4.828, p < .01$).

In the second model, peer and parental smoking were added. The fit indices for this expanded model were $\chi^2(113, N = 593) = 114.11, p = .45$, NNFI = .998, and CFI = .998. The model accounted for 46% of the variance in adolescent smoking. In this model, both general and specific factors at Time 2 predicted smoking at Time 3: Inadequate Monitoring ($\beta = .227, t = 2.117, p < .05$), Parental Smoking ($\beta = .226, t = 2.850, p < .05$), and Peer Smoking ($\beta = .507, t = 5.047, p < .01$). Association with Deviant Peers at Time 2 did not predict smoking at Time 3 ($\beta = .089, t = 1.025, p = ns$). As in the previous model, Coercive Interactions predicted low Family Involvement at Time 1, low Family Involvement at Time 1 predicted Inadequate Monitoring at Time 2, and Monitoring at Time 2 predicted Associations with Deviant Peers at Time 2.

We examined whether the model differed according to gender. This was done via a multisample analysis that tests whether the same model fits equally well for males and females by placing cross-group constraints on common model parameters. Model-fitting procedures resulted in the following fit indices: $\chi^2(266, N = 593) = 267.26, p = .46$, NNFI = .998, and CFI = .998. Moreover, none of the Lagrange multipliers, which identify specific constraints which if relaxed, would result in a significant improvement in model fit, were significant. Therefore, the same model fits for both males and females.

Relationships Between Boys' Smokeless Tobacco Use and Other Problem Behaviors

An examination of the relationships between boys' smokeless tobacco use and six other adolescent problem behaviors (high-risk sexual behavior, marijuana use, alcohol consumption, smoking, antisocial behavior, and academic failure) indicated that a one-factor solution could adequately explain the covariation among these varied problem behaviors. Fit indices for this model were $\chi^2(14, N = 212) = 8.836, p = .84$, NNFI = 1.093, and CFI = 1.000. Factor loadings for each of the individual problem behaviors with the common factor were significant. Although smokeless tobacco use may be considered more of a normative behavior among adolescent boys, at least in this sample it is closely related to engagement in these other problem behaviors.

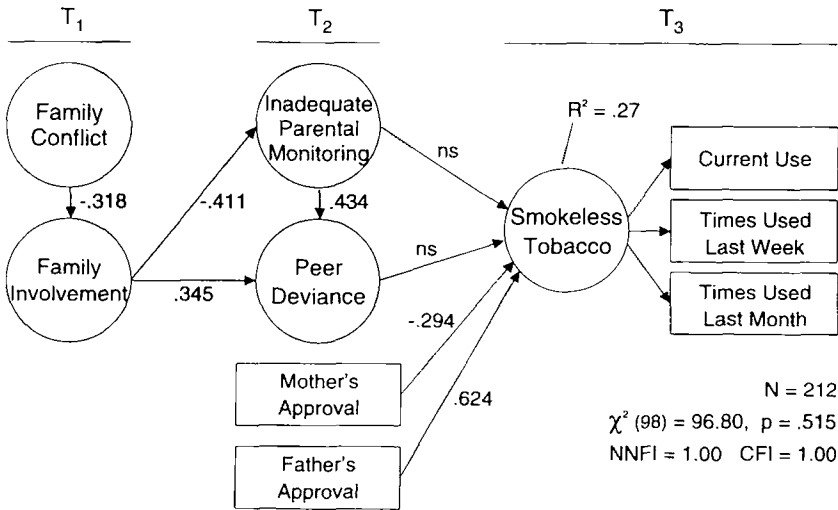


Fig. 2. Social context model of adolescent smokeless tobacco use.

Models of Boys' Smokeless Tobacco Use

Figure 2 presents two models of the influences on smokeless tobacco use. The predictors used in the first model (shaded in the figure) were the same as for the first model of cigarette smoking. The fit of this model was $\chi^2(98, N = 212) = 70.029, p = .54, NNFI = 1.007,$ and $CFI = 1.000$. The model accounted for only 10% of the variance in boys' use of smokeless tobacco. As with the smoking model, Inadequate Parental Monitoring at Time 2 predicted Smokeless Tobacco Use at Time 3 ($\beta = .358, t = 1.926, p < .06$), but Association with Deviant Peers did not predict Smokeless use.

In the second model, we added young people's ratings of Perceived Mother's and Father's Approval of Smokeless Tobacco Use. The fit of this model was $\chi^2(98, N = 212) = 96.796, p = .515, NNFI = 1.003,$ and $CFI = 1.000$. The model accounted for 27% of the variance in Smokeless Tobacco Use, with Perceived Father's Approval ($\beta = .624, t = 4.096, p < .01$) and Perceived Mother's Approval ($\beta = -.294, t = -1.984, p < .05$) being the only significant predictors. Note that father's approval was *positively* associated with later ST use, but the mother's approval was *negatively* related.

DISCUSSION

The results confirm previous studies showing that smoking is associated with engagement in numerous other problem behaviors. Moreover, they suggest the relevance of general parenting practices and associations with deviant peers for the development of smoking. Even when specific parental and peer smoking practices are included in the model, inadequate parental monitoring and association with deviant peers account for significant variance in adolescent smoking 6 months later. The findings are consistent with models of the role of parenting and peer influences on general problem behavior (Ary *et al.*, 1994), antisocial behavior (Patterson *et al.*, 1992), drug abuse (Dishion *et al.*, 1991; Dishion and Loeber, 1985; Dishion and Ray, 1991; Hawkins *et al.*, 1992), and high-risk sexual behavior (Biglan *et al.*, 1990; Metzler *et al.*, 1994). Taken together, the evidence indicates that the prevention of diverse problems of youth would be facilitated by altering problematic family relationships and preventing the formation of deviant peer groups.

The present model indicates that family conflict and lack of parental involvement with their children are risk factors for inadequate parental monitoring. If monitoring is inadequate, young people are more likely to associate with deviant peers and are more likely to smoke. The model implies that preventing family conflict, fostering family involvement, and encouraging parental monitoring could contribute to the prevention of smoking. Given that poor monitoring was still a predictor of smoking when parents' own smoking was included in the model, the results suggest that parental monitoring will influence adolescent smoking development, even if the influence of parental smoking is in some way eliminated.

At the same time, it should be noted that the single best predictor of smoking was peers' smoking 6 months earlier. Parental smoking was also a significant predictor. Even families with optimal relationships that prevented their children from associating with generally deviant peers would encourage their children to smoke if the parents smoke and the children are allowed to associate with friends who smoke. Interestingly the Lagrange Multiplier test (which indicates the likelihood that effects not included in the model would significantly improve its fit) suggested that no significant covariation existed between the specific peer measure of smoking and the general peer deviance construct.

The study provides evidence that smokeless tobacco use is associated with engagement in other problem behaviors. However, unlike other problem behaviors, poor parenting practices do not appear to be risk factors for the development of smokeless tobacco use among boys, once more specific influences are considered. A model including only general influences showed

that parental monitoring predicted smokeless use 6 months later. However, when mothers' and fathers' approval of smokeless tobacco use were included in the model, parental monitoring did not predict smokeless use. In neither model did associations with deviant peers predict smokeless use.

Perceptions of father's approval of ST use was a strong predictor of young men's later use. Unfortunately, data on father's actual use of ST were not available. It may be that the relationship involves fathers who use ST approving of their son's use. Reasons for the negative relationship between perceived maternal approval and young men's later ST use are unclear. It may reflect the oppositional tendency of some boys. That is, some boys may be more inclined to take up ST use precisely because it is disapproved by their mothers.

Models that establish the ability of key theoretical variables to predict, with relative accuracy, the likelihood of subsequent tobacco use are important as the first step in understanding developmental processes. Such models are not, however, without limitations. The dependent variables in these analyses were current smoking and smokeless tobacco use at Time 3. This maximized the amount of variance that could be accounted for by the Time 2 constructs. Had measure of change in these behaviors from Time 2 to Time 3 been used, the amount of variance accounted for by the Time 2 variables would likely be reduced. The next step would be to assess longitudinal outcomes to determine how the social context contributes to the long-term developmental trajectories of adolescent tobacco use as such use unfolds over time.

It should also be noted that the sample had disproportionately high numbers of smokers, reducing the generalizability of the findings. Despite these limitations, the findings appear consistent with the notion that familial conflict and inept monitoring are likely contributors to a plethora of poor behavioral outcomes in adolescence. There is, however, an obvious need for additional research which integrates our basic knowledge of how the social context exerts its influence on the ongoing development of tobacco use. It is likely that an increased understanding of the roles these mediators play in the etiology of tobacco use will ultimately lead to distinct interventions aimed at interrupting the development of various problem behaviors in youth.

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