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Adolescent Academic Adjustment Factors and the Trajectories of Cigarette Smoking from Adolescence to the Mid-thirties

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Abstract

Knowledge of early predictors which differentiate between various longitudinal smoking patterns might facilitate designing more effective interventions. Using data from 806 participants, we examined the association of three adolescent academic adjustment factors, Educational Aspirations and Expectations; Perception of School Achievement; and Trouble at School, to five trajectories of cigarette use covering 23 years from adolescence to adulthood. The five trajectory groups were: heavy/continuous smokers, late starters, quitter/decreasers, occasional smokers, and nonsmokers. Each academic factor predicted smoking trajectory group membership. Each academic factor was significantly associated with being a heavy/continuous smoker rather than a member of other trajectory groups. Behavioral academic factors also differentiated quitter/decreasers from late starters, occasional smokers, and nonsmokers. Adolescents manifesting academic maladjustment risk becoming early, chronic smokers. Prevention and intervention efforts targeting educational maladjustment may decrease cigarette smoking.

Keywords

academic adjustment; cigarette smoking trajectories

INTRODUCTION

Smoking poses significant health risks including, but not limited to, damage to the lungs, and puts individuals at risk for cancer of the head and neck (Chassin, Presson, Sherman, & Edwards, 1992; Samet, 2001; U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office of Smoking and Health, 2004). It has been reported that adolescent smokers are more likely than nonsmokers to engage in problem behaviors such as being incapacitated at school or work due to substance use and engaging in delinquent behavior (Brook, Balka, Rosen, Brook, & Adams, 2005). Adolescent smokers are at an increased risk for using other illegal drugs such as cocaine (Ellickson, Tucker, & Klein, 2001). From a public health perspective, given the adverse psychobiological effects of smoking, it is important to comprehend how to prevent tobacco use. Knowledge of the early predictors of longitudinal smoking patterns might contribute to the design of more effective prevention programs. Consequently, the present study was designed to examine the relationship of three components of adolescent educational adjustment related to patterns of tobacco use over

time, namely, a) educational orientation; b) educational achievement; and c) troublesome school behavior.

Several studies have shown that components of educational adjustment problems, such as poor educational achievement, educational orientation, and school behavior problems, are associated with substance use including tobacco use (Bachman, O'Malley, Schulenberg, Johnston, Freedman-Doan, & Messersmith, 2008; Bryant & Zimmerman, 2002; Tucker, Ellickson, & Klein, 2003; van den Bree, Whitmer, & Pickworth, 2004). While these three components of educational adjustment problems are related, they can be considered separate dimensions: 1) educational orientation reflects school-related attitudes or goals; 2) achievement reflects grades and specific academic skills; and 3) school behavior problems assess general behaviors that interfere with learning in a school setting. Considering them as separate dimensions might add to our knowledge regarding differences between smoking trajectories, as adolescents may express educational difficulties in different ways. Some adolescents may express their problems through poor achievement whereas others may exhibit troublesome behavior at school. Some may achieve and behave adequately, but have low aspirations (Bryant & Zimmerman, 2002).

Several teams of investigators have found it informative to use trajectory analysis to analyze multiple waves of data for distinctive smoking patterns or trajectory groups and to assess the differential associations of these patterns with predictors and consequences (Chassin, Presson Pitts, & Sherman, 2000; Ellickson, Tucker, & Klein, 2008; Brook, Balka, Ning, & Brook, 2007). The trajectory groups vary in terms of their quantity of smoking, as well as in terms of the growth, stability, or decline in smoking over time. Our research with two different samples has found four or five trajectory groups covering the period from adolescence to adulthood (Brook, Pahl, & Ning, 2006; Brook, Brook, Zhang, Whiteman, Cohen, & Finch, 2008). Other investigators have found six or nine distinctive smoking patterns (Chassin et al., 2000; Chassin, Presson, Sea, Sherman, Macy, Wirth, et al., 2008). Based on the results in a similar, but more time-limited, trajectory analysis of cigarette use than the one in the present study, we expect that the present analysis will yield five trajectory groups (Brook, Zhang, Brook, & Finch 2010).

With one exception, studies have usually included one or two of the three educational adjustment dimensions as predictors of smoking and assessed samples only through the early twenties. Ellickson and her associates (Ellickson et al., 2008) found that higher grades in 7th and 10th grades protected against becoming a smoker by the 12th grade, while exhibiting behavior problems in school in those grades each heightened the risk of becoming a 12th grade smoker. This study assessed a limited age range, but the results suggest that comparable variables might differentiate groups that start smoking early from those that start later or do not smoke. Orlando and her colleagues (Orlando, Tucker, Ellickson, & Klein, 2004) found that earning poor grades at age 13, and again at age 15, differentiated each of five smoking trajectory groups, including late increasers and triers from nonsmokers. The trajectories covered ages 13–23. Chassin and her colleagues (Chassin et al., 2000) did not find that adolescents' attitudes towards education, valuing achievement and expecting to achieve educational success, predicted differences between smoking trajectories covering the period from ages 11–31. However, the proportion in college did differentiate the nonsmokers from all of the other trajectory groups except the quitters and did differentiate the early stable smokers from all of the trajectory groups except the erratic smokers (Chassin et al., 2000). These findings suggest that behavioral indicators of educational adjustment may be better long-term predictors of smoking than attitudinal predictors. Bryant and her colleagues (2003) found that multiple measures of school performance and school attitudes, albeit not factor analyzed, were associated with tobacco use cross-sectionally in early adolescence, but only early grades, not misbehavior or attitudes, predicted change in

cigarette smoking through age 20. This study will extend the literature by assessing whether three educational adjustment factors, educational aspirations and expectations, educational achievement, and trouble at school, determined by factor analysis, predict differences in tobacco use trajectories covering the period from 14 to 37 years of age.

Aside from the empirical literature, there are several theories that specify a link between educational adjustment problems and substance use. Family Interactional Theory [FIT (Brook et al., 1990)] predicts that the parent-child relationship contributes to shaping behaviors and attitudes such as academic achievement, aspirations, and school behavior which, in turn, predict the characteristics of the adolescents' friends and adolescent problem behaviors such as substance use. Problem behavior theory (Jessor & Jessor, 1977) suggests that various problem behaviors have a common underlying dimension and thus co-exist or predict others over time. The presence of one increases the likelihood of the presence of others. Thus, maladaptive school functioning might be a risk for cigarette smoking. According to Social Control Theory (Hirschi, 1969), the school serves as a setting for developing and maintaining pro-social norms. Thus, adolescents who are attached to pro-social institutions (e.g., schools) are more likely to identify with conventional norms, which include achievement as well as avoidance of school problems and substance use.

Despite the fact that empirical data support a relationship between educational adjustment problems and smoking, further research is needed. The overwhelming majority of studies of the association of educational adjustment problems have not examined the relationship of a range of early adolescent educational adjustment problems to trajectories of smoking beginning in adolescence and extending into the fourth decade of life. The present longitudinal study thus fills an important gap in the literature. We examine three educational adjustment problems and relate them to trajectories of smoking. Assessing the relationship of each of the educational adjustment problems separately permits us to determine not only if each is associated with the trajectories, but also to determine if they differentiate among the trajectories similarly or not. Since some studies have found demographic differences in smoking trajectories, we will control for: a) gender; b) age at T2 and; c) parents' education, a proxy for socioeconomic status (Orlando et al., 2004; Brook et al., 2006).

We hypothesize that all three:

1. Educational adjustment problems are associated with an increased likelihood of being in the heavy continuous trajectory group, as compared with: a) quitters/decreasers; b) late starters; c) occasional smokers; and d) nonsmokers.
2. Educational adjustment problems are associated with an increased likelihood of being in the quitter/decreaser trajectory group as compared with: a) late starters; b) occasional smokers; and c) nonsmokers.

We will explore whether educational adjustment problems are associated with an increased likelihood of being in the late or occasional trajectory groups as compared with the nonuser trajectory group.

METHOD

Participants

Data on the participants in this study came from a community-based, random sample residing in one of two upstate New York counties and first assessed in 1983. The participants' mothers were interviewed in 1975 about their children's problem behaviors. The sampled families were generally representative of the population of families in Albany and Saratoga, two upstate New York counties, with respect to gender, family intactness,

family income, and education. There was a close match of the participants on family income, maternal education, and family structure with the 1980 survey conducted by the U.S. Bureau of Census. Interviews of the youths were conducted in 1983, Time 2 (T2, N=756), 1985–1986, Time 3 (T3, N=739), 1992, Time 4 (T4, N=750), 1997, Time 5 (T5, N=749), 2002, Time 6 (T6, N=673), and 2005–2006, Time 7 (T7, N=607). The mean ages (SDs) of the participants at the follow-up interviews were 14.1 (2.8) at T2, 16.3 (2.8) at T3, 22.3 (2.8) at T4, 27.0 (2.8) at T5, 31.9 (2.8) at T6, and 36.6 (2.8) at T7. We included 806 youths, who participated in the study at least twice from 1983 onwards, in the current trajectory analysis. Sixty percent of these youths participated in all six waves of the data collection, 21% in five waves, 11% in four waves, 5% in three waves, and 3% in two waves.

Extensively trained and supervised lay interviewers administered interviews in private. Written informed consent was obtained from participants and their mothers in 1983, 1985–1986, and 1992, and from participants only in 1997, 2002, and 2005–2006. The Institutional Review Boards of the Mount Sinai School of Medicine, New York Medical College, and New York University School of Medicine authorized the procedures used in this research study. Additional information regarding the study methodology is available in prior publications (Brook, Whiteman, Gordon, & Cohen, 1986).

Measures

Cigarette Smoking—The data were obtained from interviewer-administered questionnaires. At each follow-up wave (T2–T7), questions about tobacco use (adapted from the Monitoring the Future study, Johnston, Bachman, & O'Malley, 2006) were included. In order to measure the lifetime quantities and frequencies of using tobacco from childhood to the mid-thirties, at each time wave, the questions asked about the frequencies of using tobacco during the period from the last time wave through the current time wave. Specifically, the questions used were the lifetime frequencies and quantities of tobacco use in childhood and early adolescence for T2 (1983; for the period prior to T2), frequencies and quantities of tobacco use during the past two years in adolescence for T3 (1985–1986; T2–T3), frequencies and quantities of tobacco use during the past five years in the early twenties for T4 (1992; T3–T4), frequencies and quantities of tobacco use during the past five years in the late twenties for T5 (1997; T4–T5), frequencies and quantities of tobacco use during the past five years in the late twenties and early thirties for T6 (2002; T5–T6), and frequencies and quantities of tobacco use during the past five years in the mid-thirties for T7 (2005–2006; T6–T7). The tobacco measure at each point in time had a scale coded as none (0), less than daily (1), 1–5 cigarettes a day (2), about half a pack a day (3), about a pack a day (4), and about 1.5 packs a day or more (5). This smoking measure has been found to predict young adult psychiatric disorders (Brook, Brook, Zhang, Cohen, & Whiteman, 2002) and health problems (Brook, Brook, Zhang, & Cohen, 2004).

Early Educational Factors—We included the following educational variables as independent variables: a) Educational Aspirations and Expectations [2 items, $r = 0.82$; e.g., “Thinking about the future, how far do you hope you will go in school?” and “How far do you expect you will go in school?” (Original)]; b) Perception of School Achievement [3 items; Cronbach's $\alpha = 0.59$; e.g., “For your age how good are you in math?” (Original)]; and c) Trouble at School [3 items; Cronbach's $\alpha = 0.52$; e.g., “How often do you get into a serious fight at school?” (Smith & Fogg, 1979; Gold, 1966)].

Demographic Characteristics—We also included demographic characteristics as control variables. These demographic factors are: gender (0 = female, 1 = male), age at T2, and the level of education for the parent with the most years of education.

Analysis

We conducted a factor analysis of the eight educational items assessed at T2 in early adolescence.

We used the Mplus software (Muthén & Muthén, 1998–2007) to identify the developmental trajectories of cigarette use (N=806). We treated the dependent variables (i.e., cigarette use at each time point) as censored normal variables. For missing data, primarily due to individuals missing from some waves of data collection, we applied the full information maximum likelihood (FIML) approach (Schaefer & Graham, 2002). We set each of the trajectory polynomials to be cubic. The GMM analyses used a multinomial logistic regression model for unordered polytomous responses (Muthén & Shedden, 1999) to predict trajectory group membership. To assure finding the maximum of the likelihood function, we used 50 random sets of starting values. We used the minimum Bayesian Information Criterion (BIC) to determine the number of trajectory groups (G). After extracting latent classes, we assigned each participant to the trajectory group with the largest Bayesian Posterior Probability (BPP). For each of the trajectory groups, we created an indicator variable, which had a value of 1 if the participant had the largest BPP for that group and 0 otherwise. The observed trajectory for a group was the average of tobacco use at each time point for participants assigned to the group.

We then performed multivariate logistic regression analyses to examine separately the associations between each of three educational factors and the participants' trajectory group memberships. For example, in the three logistic regressions of G_1 versus G_2 , we set the G_2 group as the reference group. The dependent variable was an indicator variable of being G_1 users. The independent variable was one of the three T2 educational factors (i.e., educational aspirations and expectations, perception of school achievement, or trouble at school) and the control variables consisted of gender, age at T2, and parental educational level at T2. To facilitate interpretation of the adjusted odds ratios (A.O.R.), the independent variables (e.g., trouble at school) were converted to standardized scores. Thus, the odds ratios associated with these variables were computed for one standard deviation of change.

RESULTS

The principal components analysis with varimax rotation yielded three independent factors (Dunteman, 1989). Factor 1 consisted of the two aspiration and expectation items. Their loadings on this factor were .93 and .91, respectively. Factor 2 consisted of the three perception of achievement items whose loadings ranged from .47 to .84. Factor 3 consisted of the three school behavior items; the loadings ranged from .60 to .79.

Trajectories of Cigarette Use

The mean (SD) tobacco use scores at each point in time were 0.61 (1.11), 0.82 (1.33), 1.38 (1.62), 1.36 (1.62), 1.24 (1.65), and 1.22 (1.73) for T2–T7 respectively. Table 1 presents the proportion of the sample in each of the cigarette use categories. As shown in Table 1, the proportion of the cigarette users peaked at T4, when the participants were in their early twenties.

We calculated solutions for three trajectory groups (BIC = 10275), four trajectory groups (BIC = 10153), and five trajectory groups (BIC = 10052). We were unable to obtain convergence for a six-group solution. Based on the BIC criterion, a five-group model was selected as the best fitting model, as the five-group model had the lowest BIC value. Figure 1 presents the observed trajectories for each of five trajectory groups. For each group, the mean BPP of the participants who were assigned to that group ranged from 84% to 97%, which indicates a good classification.

The trajectory smoking groups were named: heavy/continuous smokers (19.5%), late starters (10.7%), quitter/decreasers (8.2%), occasional smokers (18.1%), and non-smokers (43.5%). As cited above, using the posterior probability of group membership, we assigned each individual to the class for which he or she had the highest probability of belonging. As shown in the figure, the heavy/continuous smokers started smoking early, increased to their maximum level (i.e., on average, about half pack a day or more) in their early twenties, and then stayed at that level throughout their thirties. In contrast, the late starters started smoking in late adolescence, and rose to the same level of smoking (i.e., on average, about half pack a day) as the heavy/continuous smokers, but only in their early thirties. These late starters then stayed at that level throughout adulthood. The occasional smokers increased their smoking from adolescence to their late twenties and then stayed at a level of less than daily smoking through their mid-thirties. The quitter/decreasers started smoking as early as the heavy/continuous smokers and achieved the maximum level of smoking (i.e., on average, daily smoking) in their early twenties. These participants then tapered off gradually from that level to less than daily smoking or nonsmoking.

Logistic Regression Analyses

Table 2 presents the results from the separate multivariate logistic regression analyses for the smoking trajectory groups. The regression analyses focused on identifying the early educational adjustment factors that differentiated the participants' membership in the 10 comparisons of the smoking trajectory groups: 1) the heavy/continuous group versus each of the other four groups (4 comparisons); 2) the quitters/decreasers versus the late starters, the occasional smokers, and the non-smokers (3 comparisons); 3) the late starters versus the occasional smokers and the non-smokers (2 comparisons); and 4) the occasional smokers versus the nonsmokers (1 comparison).

As shown in Table 2, the early academic adjustment factors predicted smoking trajectory group membership on all the three measures; namely, Educational Aspirations and Expectations, Perception of School Achievement, and Trouble at School. With two exceptions, there were significant associations between a low level of educational aspirations and expectations, low educational achievement, and a high level of trouble at school and an increased likelihood of being a heavy/continuous smoker as opposed to being a nonsmoker, an occasional smoker, a late starter, and a quitter/decreaser. In addition, two of the academic adjustment characteristics, having a low level of perceived educational achievement and a high level of trouble at school, were associated with a greater likelihood of membership in the quitter/decreaser group as opposed to being a nonsmoker, an occasional smoker, and a late starter. Educational Aspirations and Expectations did not differentiate the quitters from any of these trajectory groups. There were no academic adjustment factors that significantly differentiated among late starters, occasional smokers, and nonsmokers.

Overall, of the 10 group comparisons, Educational Aspirations and Expectations, Perception of School Achievement, and Trouble at School differentiated the participants' membership in 4, 6, and 6 comparisons, respectively. Thus, the number of significant results was greater than the number expected by chance.

DISCUSSION

The findings substantially supported the hypotheses regarding the differentiation between the trajectories of tobacco use covering the period from early adolescence through the mid-thirties by three T2 academic adjustment predictors. Thus, in contrast to the findings of Chassin et al. (2000), the present study found that early adolescent academic indicators predicted differences in smoking patterns into the thirties. In addition, the present study was

consistent with the conclusion of Bachman and colleagues (Bachman, Wadsworth, O'Malley, Johnston, & Schulenberg, 1997) that educational adjustment far in advance of college influenced smoking patterns from adolescence to adulthood. The educational predictors differentiated between the trajectories despite controlling for age at T2, their gender, and their parents' level of education.

Educational Aspirations and Expectations was the only predictor that differentiated the heavy/continuous trajectory from each of the others, but it did not differentiate between any of the other trajectories. Those with low aspirations and expectations were more likely to be among those who started smoking early, reached their maximum level in their early twenties, and maintained this level into their mid-thirties than they were to be in any of the other trajectory groups. In contrast, the remaining two educational measures, Perception of School Achievement and Trouble at School, did not differentiate between the heavy continuous and quitter trajectories, but they did differentiate both the heavy continuous and quitter groups from the late starters, the occasional smokers, and the nonsmokers. Thus, those who reported low levels of academic achievement and/or more troublesome school behavior were more likely to be heavy/continuous smokers or quitters than late starters, occasional smokers, or nonsmokers. The present study was consistent with the literature that finds that none of the educational predictors differentiated among the late starter, occasional smoker, and the nonsmoker trajectory groups (Chassin et al., 2000).

These findings show that two of the three early adolescent educational predictors (Perception of School Achievement and Trouble at School) are more likely to differentiate trajectories reflecting early-starting, daily smoking (heavy/continuous and quitter) from the other trajectories than to differentiate between the other trajectories. The other trajectories show later daily smoking or only less than daily smoking. Moreover, the behavioral predictors differentiate between more of the trajectories than did the attitudinal predictor, Educational Aspirations and Expectations. Still, the attitudinal predictor did differentiate the heavy/continuous trajectory from each of the others in contrast to the findings of Bryant et al. (2003). In the latter study, adolescent school attitudes only predicted smoking cross sectionally while adolescent educational behavior predicted smoking at age 20.

It is noteworthy that quitters can be distinguished from the heavy/continuous smokers by their higher educational goals, despite comparable levels of academic achievement and troublesome school behavior. This suggests that encouraging the educational aspirations and expectations of adolescent smokers might support their eventual quitting. Consistent with FIT, this intervention might facilitate their associating with nonsmoking peers rather than peers who are smokers which, in turn, might contribute to quitting (Brook, et al., 2006).

The ability of two of the educational adjustment characteristics to differentiate the heavy/continuous and quitter trajectories, those manifesting earlier, heavier use, from the remaining trajectories is consistent with theories regarding the development of problem behavior over time. The fact that early low achievement and troublesome school behavior were associated most significantly with potentially the most consequential, long-term smoking patterns was compatible with FIT (Brook et al., 1990) and problem behavior theory (Jessor & Jessor, 1977; Jessor, Donovan, & Costa, 1991). Both of these theories predict that problematic behaviors in one area of experience can coexist with or antecede difficulties in other areas. In addition, social control theory (Hirschi, 1969) suggests that schools are one of the settings in which society encourages identifying with conventional norms such as having high aspirations, achieving, and cooperating. A failure to identify with these social expectations heightens the risk for other unconventionality (Bachman et al., 2008).

A few issues limit generalizing from these results. First, the sample was disproportionately Caucasian. Until this research is repeated with an ethnically and racially mixed sample, we cannot generalize these findings beyond Caucasian adolescents and adults. Second, the educational predictors seemed to distinguish between trajectories involving early smoking and those which did not. To plan interventions to reduce the likelihood of harm from sustained smoking, one needs predictors also to single out late starting trajectories. Either modifying the educational predictors and/or adding a predictor that is related to both education and tobacco use might improve this analysis.

In sum, the current study examined the longitudinal effects of educational aspirations and expectations, perceived school achievement, and troublesome school behavior on growth trajectories of smoking using a person-centered approach. Findings from this study suggest that these three academic adjustment factors may be related to self-regulation, and hence important in identifying distinct patterns of smoking. Adolescents with maladaptive patterns of academic adjustment, as shown by low aspirations and expectations, low achievement, and high trouble at school, may be particularly at risk for developing early and chronic smoking. Prevention and intervention efforts directed at these three academic adjustment factors are important and have the added benefit of decreasing cigarette smoking, particularly early heavy/continuous use. Additional research with younger children on these three academic adjustment factors that are associated with subsequent nicotine use might facilitate identifying adolescents at risk for heavy/continuous use at earlier ages.

Further prospective, longitudinal studies on the association of these academic factors are essential to the accumulation of empirical etiological evidence. Our findings offer insights toward developmentally informed models by highlighting some of the difficulties that may place adolescents at risk for the development of early and continuous cigarette use as well as early frequent use, even among those who quit. Moreover, the findings call for elucidating the mechanisms that translate these vulnerabilities into the frequent and chronic use of cigarettes.

Biographies

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Figure 1.
Developmental Trajectories of Cigarette Smoking Extending From Adolescence to Age 37

Table 1

Proportion of Sample in each Cigarette Use Category at each Time Point.

Categories	T2	T3	T4	T5	T6	T7
None	69.9%	63.8%	47.2%	50.5%	59.6%	61.1%
Less Than Daily	16.8%	17.0%	17.2%	17.0%	11.2%	9.3%
1–5 Cigarettes a Day	3.9%	4.7%	6.4%	5.6%	6.6%	4.3%
About Half a Pack a Day	6.6%	8.7%	13.1%	9.5%	7.5%	8.7%
About One Pack a Day	2.9%	4.3%	12.0%	15.3%	11.6%	10.8%
About 1.5 Packs a Day or More	0.9%	1.5%	4.1%	2.1%	3.5%	5.8%

Note: The mean ages of the sample at each time point were: 14.1 at Time (T) 2; 16.3 at T3; 22.3 at T4; 27.0 at T5; 31.9 at T6; and 36.6 at T7.

Table 2

Separate Logistical Regressions: Adolescent Educational Factors as Predictors of the Trajectories of Cigarette Smoking Extending from Adolescence to the Mid-thirties.

	H vs. Q A.O.R. (95% C.I.)	H vs. L A.O.R. (95% C.I.)	H vs. O A.O.R. (95% C.I.)	H vs. N A.O.R. (95% C.I.)	Q vs. L A.O.R. (95% C.I.)	Q vs. O A.O.R. (95% C.I.)	Q vs. N A.O.R. (95% C.I.)	L vs. O A.O.R. (95% C.I.)	L vs. N A.O.R. (95% C.I.)	O vs. N A.O.R. (95% C.I.)
Educational Aspirations & Expectations	.73* (.54-.99)	.58** (.39-.84)	.59*** (.44-.78)	.57*** (.45-.71)	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Perception of School Achievement	N.S.	.49*** (.34-.71)	.58*** (.44-.76)	.49*** (.40-.62)	.53*** (.34-.81)	.64** (.47-.87)	.51*** (.37-.69)	N.S.	N.S.	N.S.
Trouble at School	N.S.	2.43*** (1.62-3.66)	2.33*** (1.72-3.16)	2.16*** (1.73-2.69)	1.87* (1.20-2.92)	1.78*** (1.27-2.51)	1.81*** (1.35-2.43)	N.S.	N.S.	N.S.

¹ H=heavy/continuous smoker; Q=quitters/decreasers; L=late starter; O=occasional smoker; N=nonsmoker;

² *p<0.05; **p<0.01; ***p<0.001;

³ A.O.R. refers to adjusted odds ratio; C.I. refers to confidence interval;

⁴ Age, gender, and parental educational level were statistically controlled.