

Hostility, depressive symptoms, and smoking in early adolescence

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Abstract

Using logistic and multiple regression, we examined the association between hostility, level of depressive symptoms, and smoking in a sample of 1699 ethnically diverse students in California. Self-reports were collected twice from each student, at the beginning of the 6th and 7th grade years. Among 6th graders who had not smoked, depressive symptoms and hostility were associated with smoking initiation by the 7th grade. Among those students who had already tried smoking, increases in depressive symptoms and hostility were associated with more frequent smoking. The association between hostility and smoking was stronger for students reporting higher levels of depressive symptoms.

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Introduction

Adolescence is a crucial period for smoking initiation (Flay, 1993; USDHHS, 1994, 2001; Chen, Unger, Cruz, & Johnson, 1999). Extensive research has demonstrated the potent roles of some psychological factors, among them stress, anxiety, and depressive mood, on smoking initiation (Khantzian, 1985; Sussman et al., 1993; Koval, Pederson, Mills, Mcgrady, & Carvajal, 2000).

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However, little attention has been paid to the effects of hostility on smoking initiation. Increasing evidence has suggested a relationship between hostility and negative health behaviours (Shapiro, Goldstein, & Jamner, 1996; Calhoun, Bosworth, Siegler, & Bastian, 2001; van Loon, Marja, Surtees, & Ormel, 2001), but few studies have investigated the causal link between hostility and adolescent smoking. There is a paucity of information on the interaction between hostility and depressive symptoms on smoking behaviour (Jamner, Shapiro, & Murray, 1999; Curran, White, & Hansell, 2000). Therefore, there is a need to examine whether hostility leads to adolescent smoking and whether the risk of smoking initiation increases when hostility and depressive symptoms co-occur.

Hostility and depression

Hostility has been defined as either a mood state or personality trait. In either case, it is characterized by temporary or stable negative affect toward others (Spielberger, 1988; Robinson, Brower, & Gomberg, 2001). Hostility is one of the components of the “AHA syndrome”: anger, hostility, and aggression (Johnson, 1990). The experience of anger is identified as neurotic hostility, which is characterized by frequent feelings of anger associated with suspicion, resentment, and the belief that one is often mistreated. The expression of anger is identified as expressive hostility, which is characterized by verbal or physical aggression (Bushman, Cooper & Lemke, 1991; Simourd & Mamuza, 2000). Previous studies have suggested that neurotic hostility is positively associated with stress vulnerability, poor coping, and depression (Schubiner, Scott, & Tzelepis, 1993; Costa & McCrae, 1992; Felsten & Hill, 1999). Psychodynamic theory suggests that anger turned inward is at the core of depression (Felsten, 1996; McWilliams, 1994). There is evidence that depressed adolescents are at heightened risk for hostility and aggressive behaviour because depressed adolescents tend to attend selectively to the most negative features of events. Thus, they tend to feel intense, irritated, and hostile (Felsten, 1996; Knox, King, & Hanna, 2000). There is also evidence to support a physiological substrate, dysregulation of serotonin, for hostility, aggression, and depression (Birmaher, Kaufman, & Brent, 1997; Kaufman, Birmaher, & Perel, 1998). Hostility and depression are often correlated; however, they reflect different constructs and may be independently associated with unhealthy behaviours, including smoking (Whiteman, Fowkes, & Deary, 1997; Calhoun et al., 2001).

Hostility, depressive symptoms, and adolescent smoking

Hostility has recently emerged as a critical component of the Type A behaviour pattern and, as such, has been linked to a variety of negative health outcomes, including cancer, hypertension, and cardiovascular diseases (Calhoun et al., 2001; Shapiro et al. (1995); van Loon et al., 2001). Some studies have suggested a positive correlation between hostility and negative affect, which may lead to cigarette smoking as a means to reduce the tension, irritation, and distress (Lee, Mendes de Leon, & Markides, 1988; White, Johnson, & Buyske, 2000; Whalen, Jamner, Henker, & Delfino, 2001). The frequent experience of intense anger reactions—particularly in situations involving criticism and evaluation—has been associated with adolescent smoking, in that adolescents who have difficulty controlling anger and regulating mood tend to use smoking as a coping mechanism (Johnson, 1990; Whiteman et al., 1997).

Numerous studies have identified major depression and depressive symptoms as important determinants of adolescent smoking (Anda et al., 1990; Fergusson, Lynskey, & Horwood, 1996; USDHHS, 2001). However, previous research has not confirmed the causal link between depression and adolescent smoking (Patton et al., 1996; Wu & Anthony, 1999; Koval et al., 2000), and the effects of interaction between depression and other psychological factors on adolescent smoking is unclear (Schifano, Forza, & Gallimberti, 1994; Jamner et al., 1999). Hostility and depression, which often share some common symptoms, such as irritability and negative affect, may co-occur and increase the risk of unhealthy behaviours, including substance use and smoking, among adolescents when they are overwhelmed with pressures and conflicts from family, school, and peers (Hughes, 1986; Kendler et al., 1993; Felsten, 1996). Therefore, information on whether smoking serves as a mechanism to ventilate anger and decrease feelings of depression and related distress would be very important for tobacco prevention programmes.

The aim of this study is to determine the longitudinal effects of hostility and depressive symptoms on smoking initiation among adolescents who had no reported history of smoking (“never-smokers”) and increases in smoking among those who report they had already begun to smoke (“ever-smokers”). Survey data were collected during the 6th and 7th grades. We hypothesized that hostility and depressive symptoms during the 6th grade, as well as increases in hostility and depressive symptoms by the 7th grade, would be associated with smoking initiation among never-smokers and increases in 30-day smoking among ever-smokers. Secondly, since the co-occurrence of hostility and depression may place students at increased risk of smoking, we predicted that the interaction of hostility and depressive symptoms would be significant.

Methods

Sample

The data described in this article are from a two time point survey of a longitudinal school-based experimental trial of smoking prevention strategies in a multicultural, urban population of adolescents in California. We conducted a baseline survey of 6th grade students in 2000, and then surveyed those of the participants who progressed to 7th grade 1 year later.

School selection: Because the study focuses on the two largest ethnic groups in California (Hispanics and Asians), the sample selection procedure was designed to select schools with large proportions of Hispanic and Asian students. Data from the California Board of Education and the Roman Catholic Archdiocese of Los Angeles and Orange Counties identified and classified schools as Asian, Latino, or ethnically diverse. Schools were predominantly Asian or Latino if: (1) at least 50% of the students were the ethnicity of interest, *or* (2) at least 35% of the students were the ethnicity of interest, and less than 25% of the students were the other ethnicity. For example, one school qualified as predominantly Asian because the population was 48% Asian and 21% Latino. Schools were classified as ethnically diverse for not meeting the above criteria (e.g. one school was 38% Asian and 44% Latino, and another was 25% Asian and 29% Latino).

Student recruitment: All 6th grade students in the 24 participating schools were invited to participate in the study. The study includes two components with different informed consent requirements according to California law and the university’s Institutional Review Board. The

curriculum evaluation portion of the study required only implied parental consent and active student assent (i.e. students could choose to participate if their parents did *not* provide a written refusal). The more extensive survey of cultural and psychosocial variables, which contained more personal questions not directly related to the content of the curriculum, required active written parental consent (i.e. students could choose to participate only if their parents provided active written informed consent). The data for the current analyses are from the more extensive survey requiring active written parental consent.

Procedure

Students completed a 160-item paper-and-pencil survey in their classrooms during a single class period (45–50 min). Trained data collectors, who were not previously acquainted with the students, distributed the surveys. The surveys were identified only by a code number, not with the students' names or any other identifying information. Because the students were all attending English-language schools in which their classes were conducted only in English, a basic level of English-language proficiency was assumed and the surveys were provided only in English. However, students were encouraged to ask the data collectors to clarify the meanings of any unfamiliar words.

Measures

Lifetime smoking prevalence: Respondents were asked, "Have you ever tried cigarette smoking, even a few puffs"? Respondents answered "yes" or "no".

30-day smoking prevalence: Respondents were asked, "Think about the last 30 days. On how many of these days did you smoke cigarettes"? Responses were coded on a seven-point scale ranging from "0 days" to "all 30 days".

Depressive symptoms: Five questions adapted from the Center for Epidemiological Studies Depression Scale, CES-D (Radloff, 1991). CES-D is a 20-item self-report measure that uses four-point scales to tap depressed mood over the past week. Numerous studies have indicated that it is a valid and reliable measure in assessing depressive symptoms rather than the broader construct of negative affectivity among adolescents (Schoenbach, Kaplan, Grimson, & Wagner, 1982; Galaif, Chou, Sussman, & Dent, 1998). We used factor analysis, the initial factor method of principal components, to determine which five items to use in the abridged version of the survey. Consistent with suggestions from previous research using shorter forms of the CES-D scale, we chose the five items that loaded the highest on the first factor, called "*depression*". The factor loadings for these items ranged from 0.72 to 0.81. The alpha for these five items was 0.87. To assess the depressive symptoms, students in this study were asked: "Think about how you felt during the past 7 days. On how many of these days did you have trouble shaking off sad feelings?" "On how many of these days did you feel depressed?" "On how many of these days did you think your life had been a failure?" "On how many of these days did you feel lonely?" and "On how many of these days did you feel sad?" Response options ranged from: 1 = "0–1 day", 2 = "2–3 days", 3 = "4–5 days", and 4 = "6–7 days". Each student's score was the sum of the four responses, with a possible range of 5–20.

Hostility: In this study, we chose items that measure hostility as a relatively stable trait as opposed to a changing mood. To assess self-reported hostility, the following four questions adapted from the Buss–Durkee Hostility Inventory (Buss & Durkee, 1957) were asked: “I lose my temper easily”; “Sometimes people bother me just by being around”; “I can’t help being a little rude to people I don’t like”; and “Lately, I have been kind of grouchy”. Responses were rated on a four-point scale: 1 = “definitely no,” to 4 = “definitely yes”. Each student’s score was the sum of the four responses, with a possible range of 4–16. Cronbach’s alpha for this hostility scale was 0.69.

Covariates: To control for confounding, the demographic variables of age, gender, SES, and generation status were treated as covariates.

Socioeconomic status: Because responses to traditional measures about parental occupation, education, and income are difficult for adolescents this age to recall, the following more tangible questions were adapted from the American Household Survey as proxy measures: “How many people live in the home where you spend most of your time (including you)?” (students chose from six response options ranging from “2 people” to “7 or more people”) and “How many rooms does your house or apartment have? (Don’t count the kitchen or bathroom)?” (students choose seven response options ranging from “1 room” to “7 or more rooms”). For each student, a proxy SES score was calculated by dividing the number of rooms by the number of people living in the household.

Generation status: Three questions were used to assess students’ generation status in the United States: “In what country were you born?”; “In what country was your father born?”; and “In what country was your mother born?” For all questions, response options were: “United States” and “Other”. The “Other” option included a line for writing in the country name. Responses were coded with definitions by Portes and Rumbault (2001): (1) “Immigrant-second generation” if at least one parent was born outside of the United States; and (2) “third generation” if the child and both parents were born in the United States.

As part of this longitudinal study, the schools were randomly assigned to participate in a programme evaluation of two newly created smoking prevention curricula. Schools received either their school’s standard smoking prevention curriculum or one of the two new curricula. The exposure to smoking prevention programmes might confound the results of this study, thus, we included it in the analysis as a covariate. The effects of our prevention programmes are reported elsewhere (Unger et al., 2004).

Data analysis

Characteristics of baseline (6th grade reports) ever-smokers and never-smokers: χ^2 analyses were performed to determine whether baseline ever-smokers and never-smokers differed in gender and ethnicity. We refer to “baseline” as the time of our first observations, when the students were in 6th grade; 8.2% of the students reported smoking at that time. ANOVAs were calculated to compare ever-smokers and never-smokers on mean hostility and depressive symptom scores for the 6th graders, hostility and depressive symptoms change scores from the 6th grade to the 7th grade, and socioeconomic status. Bivariate correlations for all independent variables revealed no multicollinearity problems. All the independent variables were retained for the all analyses in the present study because their univariate effects on the smoking variables were significant at the 0.05

level. Baseline hostility and depressive symptoms scores were moderately correlated ($r = 0.32$), but were independent enough to be entered as separate variables in subsequent analyses.

Logistic regression among baseline never-smokers. Among the 1558 6th grade never-smokers, a logistic regression model was estimated to determine whether baseline and change scores on hostility and depressive symptoms, as well as interactions of baseline hostility and depression, were associated with smoking initiation by the 7th grade. The model controlled for the covariates described above.

Multiple regression among baseline ever-smokers. Among the 141 students who already had tried smoking before the 6th grade survey, a multiple regression model was estimated to determine whether baseline and change scores on hostility and depression, as well as interactions of baseline hostility and depression, were associated with increases in past 30-day smoking in the 7th grade. The model controlled for covariates and baseline levels of past 30-day smoking.

Results

Sample attrition

Of the 4427 students invited to participate, 3358 (85%) provided active parental consent and were eligible for the study. Of those students, 168 (5%) did not complete the survey because they were absent from school on the day of data collection or chose not to participate. Of the 3190 students who turned in the 6th grade survey, 2701 (84.7%) also turned in the 7th grade survey. Out of those 2701 students who turned in both surveys, 1699 of them (62.9%) provided data on all variables of interest and comprised the analytic sample. The analytic sample was ethnically diverse (43.6% Latino, 28.2% Asian, 12.1% White, and 16.2% Multiethnic) with slightly more females than males (55.0% female).

Attrition rates were lower among Asians relative to other ethnic groups ($p < 0.05$) and higher for those who reported ever-smoking in the 6th grade relative to those who reported never-smoking in the 6th grade ($p < 0.01$). Furthermore, those students who did not complete a survey in the 7th grade scored lower on socioeconomic status measures ($p < 0.05$), had more depressive symptoms ($p < 0.01$), and scored higher on hostility ($p < 0.0001$) during the 6th grade. Compared to the students with missing data, students in the analytic sample were more likely to be female ($p < 0.01$), Asian ($p < 0.0001$). The analytic sample did not differ from those with incomplete data on socioeconomic status, hostility, depressive symptoms, and smoking behaviors.

Characteristics of the analytic sample

Table 1 compares baseline ever-smokers and never-smokers on the variables of interest. One hundred forty one respondents (8.3%) were self-reported ever-smokers at year 1, while they were in the 6th grade, whereas 1558 (91.7%) were self-reported never-smokers. Relative to never-smokers, ever-smokers were more likely to be male ($p < 0.01$), Latino ($p < 0.0001$), and less likely to be Asian ($p < 0.0001$). Ever smokers also scored higher than never-smokers in the 6th grade on baseline depressive symptoms ($p < 0.0001$), hostility ($p < 0.0001$), and socioeconomic status ($p < 0.05$).

Table 1
Characteristics of 6th grade ever-smokers and never-smokers

	Ever-smokers (<i>N</i> = 141)		Never-smokers (<i>N</i> = 1558)		χ^2
	<i>n</i>	%	<i>n</i>	%	
Gender					9.68**
Male	81	10.6	683	89.4	
Female	60	6.4	875	93.6	
Ethnicity					31.2***
Latino	91	12.3	649	87.7	
Asian	17	3.6	462	96.4	
White	13	6.3	192	93.7	
Multiethnic	20	7.3	255	92.7	
	Mean	S.D.	Mean	S.D.	<i>T</i> -test
Depression 6th grade	9.07	4.33	7.29	3.33	4.65***
Hostility 6th grade	11.37	3.23	9.61	3.19	−6.25***
Socioeconomic status	1.03	0.63	1.17	0.72	−2.53*

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.0001$.

Prediction of 7th grade smoking initiation among baseline never-smokers

Table 2 presents the effects of predictors on the 7th grade smoking initiation among the baseline never-smokers. One hundred forty one (9.1%) of the 1558 original never-smokers reported smoking by the 7th grade. R^2 for the entire model was 0.0638. Males ($p < 0.05$) were more likely to begin smoking by the 7th grade, whereas Asians ($p < 0.0001$) and Whites ($p < 0.05$) were less likely than the other ethnic groups to begin smoking. Higher depression scores ($p < 0.0001$) and higher hostility scores ($p < 0.01$) at baseline were risk factors for smoking initiation. Similarly, increases in depression ($p < 0.0001$), and, to a lesser extent, increases in hostility ($p < 0.05$), were risk factors for smoking initiation. The baseline hostility $\times$ depression interaction term was not a significant predictor of smoking initiation.

Predictors of change in past 30-day smoking among baseline ever-smokers

Table 3 presents the effects of predictors on increases in past 30-day smoking among baseline ever smokers. R^2 for the entire model was 0.6632. Fifteen of the 141 baseline ever-smokers (10.6%) reported higher levels of past 30-day smoking in the 7th grade. Increases in hostility ($p < 0.05$), but not increases in depression were associated with increases in smoking. However, the significant baseline hostility $\times$ depression interaction term indicated that baseline hostility was associated with increases in smoking among those students with higher scores on depressive symptoms. Increases in past 30-day smoking was associated with decreases in baseline smoking

Table 2

Multivariate logistic regression of 7th grade smoking initiation among baseline never-smokers

	Lifetime smoking		
	OR	95% CI	ΔR^2
<i>Psychological variables</i>			
Depression 6th grade	1.76***	1.30, 2.38	0.0052
Increase in depression from 6th to 7th grade	1.76***	1.43, 2.18	0.0272
Hostility 6th grade	1.51**	1.10, 2.09	0.0022
Increase in hostility from 6th to 7th grade	1.34*	1.02, 1.78	0.0029
Hostility 6th grade $\times$ Depression 6th grade	0.99	0.71, 1.37	0
<i>Covariates</i>			
Gender	1.41	0.98, 2.03	0.0003
Socioeconomic status	0.90	0.67, 1.20	0.0038
<i>Ethnicity</i>			
Asian (vs. Latino)	0.22***	0.12, 0.40	0.0158
White (vs. Latino)	0.50*	0.27, 0.95	0.0021
Multiethnic (vs. Latino)	0.66	0.41, 1.09	0.0017
Total R^2 (Final model)			0.0638

Note: Predictor variables entered into model individually in the order presented. The final model also controlled for intervention effects ($\Delta R^2 = 0.0022$).

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.0001$.

($p < 0.0001$), which suggests that 6th grade smokers regress in their amount of smoking to that of their peers by the 7th grade.

Discussion

This study was designed to explore the association between adolescent smoking and the psychological variables, hostility, and depressive symptoms. The main findings of the 2-year prospective data indicated a unique pattern of association between psychological symptoms and smoking among never- and ever-smoking adolescents. Among those who had never tried smoking in the 6th grade, baseline hostility and depressive symptoms, as well as increases in these variables, were associated with smoking initiation. Among those who already had tried smoking in the 6th grade, only increases in hostility were associated with increased smoking in the 7th grade. Among ever-smokers, the levels of hostility and depressive symptoms decreased compared to never-smokers in the follow-up year; however, their psychological symptoms remained higher compared to never-smokers. Furthermore, the interaction of hostility and depressive symptoms among ever-smokers was significant, suggesting that hostility is a stronger risk factor for smoking among adolescents who are more depressed relative to those who are less depressed. In other words, the

Table 3

Multiple regression on increases in 30-day smoking between 6th and 7th grades among baseline ever-smokers

	Increase in past-30-day smoking		
	Regression coefficient	Standard error	ΔR^2
<i>Psychological variables</i>			
Depression 6th grade	0.00	0.01	0.0114
Increase in depression from 6th to 7th grade	0.00	0.01	0.0010
Hostility 6th grade	0.00	0.02	0.0039
Increase in hostility from 6th to 7th grade	0.03*	0.01	0.0082
Hostility 6th grade $\times$ depression 6th grade	0.03*	0.01	0.0022
<i>Covariates</i>			
Baseline frequency of smoking	−0.10***	0.01	0.5897
Gender	0.04*	0.02	0.0143
Socioeconomic status	0.02	0.01	0.0175
<i>Ethnicity</i>			
Asian (vs. Latino)	0.05	0.03	0.0091
White (vs. Latino)	0.00	0.03	0
Multiethnic (vs. Latino)	0.03	0.03	0.0039
Total R^2 (Final model)			0.6632

Note: Predictor variables entered into model individually in the order presented. The final model also controlled for intervention effects ($\Delta R^2 = 0.0020$).

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.0001$.

combination of hostility and depression places adolescents at an especially high risk for progression to more frequent smoking.

Although research on a causal link between hostility and adolescent smoking is virtually non-existent, the temporal precedence of hostility in smoking initiation and the role of hostility in the progression of smoking found in our study is in agreement with the stress-reduction theory of addictive behaviours, in that smoking may be perceived as an effective tension reducer. There is evidence suggesting that hostile or irritable individuals are more vulnerable to stress, negative affect, and mistrust. Thus, smoking initiation may occur as a means of reducing frustration, irritation, and anger at a time of substantial stress (Johnson, 1990; Jamner et al., 1999). The fact that hostility decreased among ever-smokers in the follow-up year seems to support this notion. Alternatively, this could also be interpreted as regression to the mean; perhaps, some of the ever-smokers reported unusually high levels of hostility in 6th grade and then provided more moderate reports of their hostility in 7th grade. However, compared to never-smokers, the level of hostility was still higher among ever-smokers. More longitudinal research is needed to gain a better understanding of the mechanism of hostility in adolescent smoking.

Extensive studies have demonstrated an association between major depression or depressive symptoms and smoking. However, there is still controversy about the causal link in this

relationship. Adolescent smoking is a dynamic process, and smoking acquisition may vary by stages of life or by stages of smoking involvement (Patton et al., 1996; Wu & Anthony, 1999). With a sample of early adolescents from the 6th and the 7th grades, we were able to assess mood prior at the beginning of their smoking careers and to obtain evidence consistent with a causal link between depression and smoking behaviour. A study with late adolescents and adults would be less informative, because the connection between tobacco and depressed mood might have alternative explanations. Nicotine may either directly or indirectly change neurobiological systems in a way that increases vulnerability to depression. In addition, smokers might feel alienated in an increasingly non-smoking society, as California has become. Thus, they may feel upset or depressed. The sequential connection between depressive mood and smoking initiation found in our study is consistent with self-medication hypothesis and motivational theory, which propose that smoking may develop in an attempt to cope with psychological distress and feelings of depression (Penny & Robinson, 1986; Glass, 1990; Cooper, 1994). The anticipated improvement in mood and psychosocial functioning may be a potentially powerful motivating factor for taking up smoking among adolescents (Patton et al., 1998; Koval & Pederson, 1999). Further research is needed to understand how adolescents with no prior smoking experience develop the expectancy that smoking will improve their mood, and how prevention curricula could help them to challenge that expectancy.

The effect of the hostility $\times$ depressive symptoms interaction on adolescent smoking initiation warrants further research. The results of this study indicated that, although hostility and depressive symptoms each had an independent effect on smoking after partialling out the effects of the other, the association between depressive symptoms and smoking is stronger among high-hostile adolescents relative to low-hostile adolescents. This finding is consistent with previous research. Irritability and negative affect, symptoms common to both hostility and depression, may explain the relationship between these two psychological states. Theoretical support for this notion comes from the frustration–aggression hypothesis (Berkowitz, 1989), which proposes that negative emotions can lead to anger, hostility, and aggression. On the other hand, individuals who have difficulty expressing their anger (neurotic hostility) tend to view others as distrustful, the world as threatening, and to feel depressed (Kashani, Dahlmaier, Burduin, Soltys, & Reid, 1995; Felsten, 1996; Knox et al., 2000). It is possible that high-hostile adolescents are more vulnerable to stress and negative affect. Thus, they are more likely to take up smoking as a means to regulate their mood and decrease distressed feelings.

Limitations

There are several limitations associated with the present study. First, our sample consisted of adolescents in a school-based setting rather than a clinical population. Therefore, we employed brief measures that serve as indicators of hostility and depressive symptoms, rather than more complex diagnostic instruments that might be used with a clinical sample in accord with DSM-IV criteria. While the results do reflect associations between smoking and the psychosocial variables tapped by our items, we are necessarily cautious in asserting that these variables correspond to the same terms as used by clinicians. Our usage is consistent with that of other researchers examining these associations with similar populations.

Second, our results are based on adolescents' self-reports of their smoking behaviour, hostility, and depressive symptoms. Although the respondents were assured of anonymity, self-presentation bias may have influenced their responses. Furthermore, self-report of depression and hostility may be affected by different interpretations of those ideas, depending on the cultural values, beliefs, and acculturation experience of immigrant children. Further research is needed to establish the validity and equivalence of the concepts and measures of depression and hostility across cultural groups in the United States and internationally.

Third, consistent with previous studies on ethnic differences in smoking among adolescents (USDHHS, 1998; Unger et al., 2001; Cachelin, Weiss, & Garbanati, 2003), we found Hispanics and Whites to be higher in smoking prevalence, while Asian-Americans were the lowest. However, our results did not show differences among ethnic groups with respect to the associations among hostility, depressive symptoms, and smoking. This may be due to the fact that the prevalence rates of lifetime smoking and past-30-day smoking are relatively low because of the young age of the participants. Therefore, we may not have had sufficient power to detect more subtle differences in psychological impact on smoking initiation among ethnic groups. In addition, the findings of this study may not generalize to adolescents who are non-Asians, males, and those with lower SES because these students were more often excluded from the analyses since they were less likely to provide complete data. Also, we selected our schools because they had large percentages of Hispanics and Asians. The patterns we observed might not appear in schools where the majority of students were White. Future studies are warranted to examine whether the association between hostility, depressive symptoms, and smoking vary across ethnic groups, and whether a group's status as an actual minority with the school matters.

In summary, our results provide compelling evidence for an association between smoking initiation, hostility, and depressive symptoms among early adolescents. We find that the association between hostility and smoking is stronger among those students with higher depressive symptoms. This research supports the hypotheses that hostility and depressive symptoms have an important role in smoking initiation, and that the co-occurrence of hostility and depressive symptoms places adolescents at increased risk of adolescent smoking.

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