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Longitudinal effects of hostility, depression, and bullying on adolescent smoking initiation

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Abstract

Purpose—This study examined the associations between smoking initiation and, hostility, depressive symptoms, and bullying (bullies and bully-victims) among a culturally diverse sample of 1771 adolescents who reported never having smoked at baseline.

Methods—Data were from a longitudinal school-based experimental trial of smoking prevention programs in Southern California. Students were surveyed annually while in the 6th, 7th, and 8th grades. All students in the 24 participating schools were invited to participate in the study during the 6th grade.

Results—The risk of smoking initiation was significantly higher among students who score higher on hostility and depressive symptoms, and were bully-victims.

Conclusions—The findings suggest that tobacco prevention programs should include strategies of managing hostile feelings and negative affect as part of the curriculum. In addition, it may be helpful to identify youth who score high on these psychosocial factors and teach them skills to handle interpersonal conflict and negative feelings to prevent their involvement in substance use.

Keywords

adolescents; smoking initiation; hostility; depressive symptoms; and bullying

Introduction

Numerous studies have identified risk factors associated with smoking onset, with the goal of developing effective tobacco control programs. Smoking is not randomly distributed across the population [1-2]. Psychological and behavioral factors along with intrapersonal elements including genetic makeup[3-5], contribute to the etiology. Adolescents with psychosocial characteristics such as hostility and depressive symptoms, as well as those who behave aggressively (e.g., bullying), are especially vulnerable to smoking[6-8]. However, there is limited research that examines how these factors correlate with smoking initiation among culturally diverse early adolescents, particularly among Asian American and

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Hispanic/Latino youth. These are the two largest and fastest growing ethnic groups in Southern California. To fill the research gap, we amassed a sample that included a high percentage of these two ethnic groups, and assessed psychosocial characteristics during the 6th grade, when smoking prevalence is generally low. We then examined smoking behavior during the 7th and the 8th grades, when successively more adolescents initiate smoking.

Hostility, depressive symptoms, and bullying

Hostility is defined as having negative beliefs and suspicion about others, such as cynicism and mistrust. It is characterized by negative affect toward others [9]. Hostility is associated with stress vulnerability, poor coping, and with externalizing behaviors such as bullying, arguing, and aggression [10-11]. In addition, hostility is related to internalizing behaviors such as withdrawal, anxiety, and depression [12]. Depressed adolescents are at heightened risk for hostility and aggressive behavior because they attend selectively to the most negative features of events [13-14]. While previous research has indicated that hostility, depression, and aggression are independently associated with unhealthy behaviors, including smoking, only a few studies have examined the impact of these psychosocial characteristics and their possible joint influence on adolescent smoking initiation.

Hostility and adolescent smoking

Hostility has been associated with higher smoking rates in both cross-sectional and longitudinal studies [11,15]. A longitudinal study of more than 4,700 individuals [16] found high-hostile were more likely than low-hostile students to take up smoking and still be smokers 20 years later. This suggests that tobacco may be used to reduce tension and distress. The frequent experience of intense anger, particularly when undergoing evaluation, has been associated with adolescent smoking, in that adolescents who have difficulty controlling negative affect tend to use smoking as a coping mechanism [17].

Depressive symptoms and adolescent smoking

Depression and depressive symptoms have been identified as important determinants of adolescent smoking [18-19]. Depressed adolescents are more likely to initiate smoking than their less depressed counterparts, but there is still controversy about the direction of causality in the depression-smoking relationship, because smoking is also associated with an increased risk of subsequent depression [20-21]. Some studies suggested that smoking may develop in an attempt to cope with psychological distress, and that depressive symptoms can leave adolescents more vulnerable to peer smoking influences [22-23]. Other research has shown that depressive symptoms get worse over time [24]. A study examining the relationship between cigarette smoking and depressive symptoms in a longitudinal sample of 688 adolescents over 13 years showed that a history of earlier cigarette smoking in adolescence predicts depressive symptoms and smoking in the late twenties [25].

According to a literature review that searched through six major databases, 47 of 57 studies showed significant associations between smoking and depression [26]. However, these significant relationships may either be spurious or unrelated to depression because a substantial number of the studies did not adjust for confounders or did not use validated instruments to measure depression. Additionally, even if the relationship is causal, its direction still remains controversial. Several possible relationships were suggested: (a) depression causes smoking, (b) smoking causes depression, (c) there is a bidirectional relationship between smoking and depression, and (d) smoking and depression co-occur due to confounders. Given the existing controversy, it is necessary to conduct longitudinal research to gain a better understanding of the relationships between adolescent depressive symptoms and smoking initiation.

Bullies, bully-victims and adolescent smoking

Smoking among adolescents has been associated with bullying [27-28]. High levels of bullying at baseline, as well as hyperactivity and somatic complaints, have been associated with smoking initiation among adolescents fifteen months later [29]. Bullies are students who act aggressively towards specific students on a regular basis. Bully-victims (a subset of bullies who have also been victimized), have higher rates of smoking than other students [30]. Bully-victims may be particularly at risk for smoking initiation because of their high rates of emotional reactivity, academic difficulties, peer rejection, learning difficulties, and negative mood [31-32]. They may initiate smoking in an attempt to gain peer acceptance and/or to alleviate stress and depression.

The present study

Hostility, depression, and bullying have been associated with cigarette smoking among adolescents, but few studies have investigated multiple psychosocial characteristics and smoking initiation among culturally diverse groups, particularly among Asian-American and Hispanic/Latino youth. Therefore, the goal of this study is to examine the longitudinal effects of hostility, depressive symptoms, and bullying on smoking initiation in a culturally diverse adolescent population. This study addresses research gaps in several ways. Our sample included a high percentage of Asian-American and Hispanic/Latino adolescents, who are relatively understudied. To identify predictors of initiation, we started examining smoking at a younger age when smoking prevalence is generally low. Investigation of longitudinal effects might provide useful information on whether the psychosocial characteristics increase risk for initiating tobacco use. Finally, many studies have focused on the influence of depression on smoking initiation, but have not looked at hostility and bullying effects. We hypothesized that these psychosocial characteristics in 6th grade would be associated with smoking initiation by the 8th grade.

Methods

Sample

The participants were students in a longitudinal school-based trial of two smoking prevention programs in a multicultural, urban population in Southern California. A description of the program and its outcomes is reported elsewhere [33]. Students were surveyed annually while in the 6th, 7th, and 8th grades. All 6th grade students in the 24 participating schools were invited to participate in the study. Of the 4,427 students invited to participate, 3,358 (75.85%) provided active parental consent. Of those who consented, a total of 3,190 students completed the 6th grade survey, 2,822 students completed the 7th grade survey, and 2,561 students completed the 8th grade survey. A total of 2,292 students completed surveys for all three waves. Attrition rates were lower among Asian-Americans compared to other ethnic groups in the sample ($p < 0.001$).

Since the primary outcome of this study was smoking initiation, we eliminated from the analyses any students who reported smoking at baseline ($n = 205$; 8.9% of the adolescents who completed all three assessments). There were 351 (15.31%) respondents with missing data on at least one variable in the final model, and we excluded those students from the analysis. Hence, the analytic sample utilized in this study consisted of 1771 adolescents. Of those, 675 (38%) reported as Hispanic/Latinos, 474 (27%) reported as Asian-Americans, 199 (11%) reported as Caucasian, 27 (1.5%) reported as African-Americans, 285 (16%) identified themselves as Multiethnic, and 111 (6%) reported as "others." The proportion initiating smoking during the observation period among those excluded was not significantly different from that of the analytic sample ($p = 0.63$).

Procedure

Students completed a 160-item paper-and-pencil survey in their classrooms during a single class period (45-50 minutes). Trained data collectors, who were not previously acquainted with the students, distributed the surveys. Surveys were identified only by code numbers. Because the students were attending classes conducted in English, proficiency was presumed and surveys were provided only in English. However, students were encouraged to ask the data collectors to clarify the meaning of any unfamiliar words. The study was conducted in accordance with APA policy, under ethical oversight by the University of Southern California Institutional Review Board.

Measures

Lifetime smoking—Each year respondents were asked, “Have you ever tried cigarette smoking, even a few puffs?” Response options were “yes” and “no.” Those students who reported not smoking in the 6th grade, but reported smoking in either the 7th or 8th grade were classified as “ever smokers.” Those students who reported not smoking in the 6th, 7th, and 8th grades were classified as “never smokers.”

Hostility—In this study, we chose items that measure hostility as a relatively stable trait as opposed to a changing mood. Four questions were adapted from the Buss-Durkee Hostility Inventory [34]. Sample questions are: “I lose my temper easily;” “I can't help being a little rude to people who I don't like.” Responses were rated on a 4-point scale: 0= “definitely no,” to 3= “definitely yes”. Scores on these items were summed, for a possible range of 0-12. Cronbach's alpha for this scale was .69

Depressive symptoms—Five items were adapted from the Center for Epidemiological Studies Depression Scale (CES-D) [35]; a 20-item self-report scale that assesses depression during the past week. The CES-D is a valid and reliable measure of depressive symptoms, but not of the broader construct of negative affect among adolescents. In a pilot study we factor analyzed the 20 CES-D items using the principal components method to determine five items to use in the main trial of the longitudinal study. Consistent with suggestions from previous research, we chose the five items that loaded the highest on the factor labeled “*depression*.” The factor loadings for these items ranged from 0.72 to 0.81, and Cronbach's alpha for this short scale was 0.87. The sample items were the following: “Think about how you felt during the past 7 days. On how many of these days did you...” (1) “Have trouble shaking off sad feelings?” (2) “Feel depressed?” (3) “Think your life had been a failure?” Response options were: 1=“0-1 day”, 2= “2-3 days”, 3= “4-5 days”, and 4= “6-7 days”. Scores on these items were summed, for a possible range of 0-20.

Bully and Bully-Victim Status—Four items were adopted from Olweus [36] to assess self-reported physical and verbal forms of bullying and victimization during the past three months. The bullying items were the following: “Did you push or hurt another kid?” “Did you threaten another kid or say something mean to him or her?” The victimization items were the following: “Did another kid hit you, push you, or hurt you in any way?” “Did another kid threaten you or say something mean to you?” The response options for all items were: 3 = A lot, 2 = Sometimes, 1 = Once in a while, and 0 = Never. A bullying score and a victimization score were calculated by summing responses on their two respective items. Hence, bullying and victimization scores ranged from 0 to 6. From these scores, the dichotomous variables, “bully” (yes/no), and “bully-victim” (yes/no) were created. Students were classified as “bullies” if they scored 4 or higher on bullying, and less than 4 on victimization, as “bully victims” if they scored 4 or higher on both bullying and victimization, and were placed in the “neither” group if they scored lower than 4 on both bullying and victimization (we used this category as a reference group). Using this

categorization, we identified students who are at least “sometimes” involved in bullying and in victimization. Bullying constitutes the repeated occurrence of aggressive behaviors over time; hence the utilization of cutoffs, rather than continuous scores, is warranted and follows what has been done in other studies.

Covariates

Demographic covariates assessed in 6th grade were age, gender, socioeconomic status, ethnicity, and immigration status. Other covariates included program exposure and acculturation status.

Immigration status—Was dichotomized as immigrants vs. non-immigrants. Students were designated as non-immigrants if they reported that they, as well as both of their parents, were born in the United States. Students were designated as immigrants if they and/or at least one of their parents were born outside of the United States.

Program exposure—The exposure to smoking prevention programs constitutes a potential confound for this study. Participating schools were randomized to receive either a program designed for multicultural classrooms (Project FLAVOR), or a standard prevention program (CHIPS), or the school's usual health curriculum. Therefore, we included program group assignment as a covariate.

Acculturation status—The eight-item Acculturation, Habits, and Interests Multicultural Scale for Adolescents [37] was used to assess acculturation. The questions, such as “I am most comfortable being with people from...” and “The holidays I celebrate are from...” all offered the same four response options: a = “The United States” (Assimilation orientation), b = “The country my family is from” (Separation orientation), c = “Both” (Integration orientation), and d = “Neither” (Marginalization orientation). Each student was assigned to an orientation category based on the most frequently selected response.

Socioeconomic status—The indicator for socioeconomic status (SES) was created from two questions: “How many people live in the home where you spend most of your time (including you)?” and “How many rooms does your house or apartment have (excluding kitchen and bathroom)?” SES was calculated by dividing the number of rooms in the home by the number of people living in the home.

Acculturative stress—Acculturative stress was measured with the Acculturation Strain Scale, which has been used in a number of studies [38] to quantify conflicts associated with the use of English, perceived discrimination, and acculturation.

Data analysis

Characteristics of baseline ever smokers and never smokers—T-tests assessed whether ever smokers and never smokers differed on hostility and depressive symptoms, age, and socioeconomic status in the 6th grade. Chi-square analyses assessed whether ever smokers and never smokers differed on bully status, bully-victim status, gender, ethnicity, immigration status, acculturative stress, and program exposure in the 6th grade. Bivariate correlations for all independent variables revealed no multicollinearity problems.

Since students were nested within schools and within classrooms, a hierarchical model was warranted. PROC GLIMMIX [39] was computed to predict smoking initiation by the 8th grade (a dichotomous, “yes/no” variable) from 6th grade (baseline) psychological characteristics. Smoking initiation in the 7th grade and in the 8th grade were combined into one outcome variable because the relatively low prevalence of smoking initiation within a

given year compromised the statistical power of this study. We specifically examined the statistical significance of those associations after controlling for the effects mentioned previously, plus the other independent variables and demographic covariates.

Results

Characteristics of sample

Table 1 compares baseline never smokers and ever smokers on predictor variables and demographic covariates. Compared to never smokers, ever smokers scored higher on hostility and depressive symptoms, and were more likely to be bully-victims. Ever smokers and never smokers also differed on demographic variables such as age, socioeconomic status, and ethnicity. Ever smokers and never smokers did not differ on gender, program exposure, and immigration status. Of the 1,771 participants constituting the analytic sample, 656 (37.0%) were in the control group, 522 (29.5%) were in the CHIPS program, and 593 (33.5%) were in the FLAVOR program.

Smoking initiation in the 7th and 8th grades

A total of 160 participants (9% of the analytic sample) who reported never smoking in the 6th grade initiated smoking by the 7th grade. By the 8th grade, an additional 156 participants reported ever smoking, bringing the total initiating smoking during the observation period to 316 (17.8%).

Association between psychosocial characteristics and smoking initiation

Prior to examining associations between psychological characteristics and lifetime smoking, we examined associations among the psychological characteristics to determine whether multicollinearity was an issue. Although we did not find evidence of multicollinearity, the variables were significantly associated with each other. Specifically, hostility was associated with depressive symptom scores (Spearman's rho = .367; $p < 0.001$). Although bullies and bully-victims did not differ from each other on hostility scores, we did find that bully-victims had higher scores on depressive symptoms ($M = 1.89$, $SD = 0.90$) compared to bullies ($M = 1.67$, $SD = 0.83$).

Table 2 presents the adjusted parameter estimates for smoking initiation by the 8th grade. The findings suggest that psychological characteristics have longitudinal associations with smoking initiation. In a full model that adjusted for all other predictor variables, covariates, and clustering of smoking initiation within schools and classrooms, 6th grade hostility ($p < 0.05$), depression ($p < 0.01$) and being a bully-victim ($p < 0.05$) were significant predictors of smoking initiation by the 8th grade. We tested the two-way interaction terms (hostility \times depression, hostility \times bully-victims, and depression \times bully-victims), as well as the three-way interaction term (hostility \times depression \times bully-victims). None was significantly associated with smoking initiation by the 8th grade. In addition, we tested the interactions of each predictor \times ethnicity before we ran the full model and found that the associations were similar across ethnic groups. Therefore, the rest of the analyses were conducted on the full sample.

Discussion

In this study, we examined the effects of hostility, depressive symptoms, and bullying on smoking initiation among culturally diverse early adolescents. Each of these psychosocial characteristics was independently and significantly associated with risk for smoking initiation. Adolescents who scored relatively high on hostility, depressive symptoms, and

were bully-victims in 6th grade were especially at increased risk for smoking initiation by the 8th grade.

Although research on a causal link between hostility and adolescent smoking is virtually nonexistent, the temporal precedence of hostility in smoking initiation found here is in agreement with previous studies, in that smoking is perceived as an effective tension reducer [7,11]. Smoking initiation may be seen as a way to reducing frustration, irritation, and anger [12,40].

The temporal association between depressive symptoms and smoking initiation found in the present study is also consistent with previous studies. Among the motives for adolescents to take up smoking are to cope with depression and to improve psychological functioning [21,24]. Controversy remains regarding the causal link in the depression-smoking relationship. Adolescent smoking is a dynamic process, and smoking acquisition may vary by stage of life or stage of smoking involvement [23,26]. With a sample of early adolescents starting from the 6th grade in the present study, we were able to assess psychological characteristics prior to the commencement of smoking, with the hopes of obtaining evidence consistent with a causal link between depression and smoking behavior. A study employing late adolescents and adults would be less informative, because the connection between tobacco and depressed mood might have alternative explanations. In fact, our results showed a strong link between depressive symptoms and smoking initiation, in that even after controlling for all other variables, the scores for depressive symptoms in the 6th grade were significantly associated with smoking initiation when the students reached the 8th grade. This may suggest that depressive symptoms predict adolescent smoking initiation.

Another important finding is that those students who were bully-victims at baseline were more likely to initiate smoking by the 8th grade. This finding is consistent with previous studies, in that individuals who identified themselves as victims of bullying were more likely to smoke compared to others [28-29].

Thus, each of the psychosocial characteristics is a significant risk factor for smoking initiation among adolescents. However, because we did not find a significant interaction effect, the results do not show that the comorbidity of being depressed, hostile and an aggressive victim implies a higher risk for smoking initiation. Further research is needed to understand the relationships among the three psychological characteristics and their impact on smoking.

Also worthy of note is that our measure of socioeconomic status was significantly associated with smoking initiation. Smoking initiation was more likely with a smaller number of rooms and a larger number of people in the dwelling. Previous studies have similarly suggested that adolescents who did not live in two-parent households, whose parents had lower levels of educational attainment and low income, and who attended lower SES schools, were more likely than their peers to smoke [38].

Limitations

One limitation of this study is that our results are based on adolescents' self-reports of their smoking behavior and psychological characteristics. Although previous research has demonstrated the accuracy of self-reports of smoking by adolescents, self-reports of depressive symptoms, hostility, and aggression may be affected by different understandings of those concepts.

Another limitation is that 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 the psychological characteristics of interest, 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 psychological characteristics tapped by our items, we are necessarily cautious in asserting that these variables correspond to the same terms as used by clinicians. However, an advantage of the non-clinical sample is that the findings are likely more generalizable to the general population.

Conclusion

We found a longitudinal association between smoking initiation and psychological characteristics (hostility, depressive symptoms, and bully-victim status) among culturally diverse early adolescents. The risk of smoking initiation is significantly increased among students who score higher on hostility, depressive symptoms, and are identified as bully-victims. The results suggest that tobacco prevention programs should include strategies of addressing how to teach adolescents skills in order to handle interpersonal conflicts and negative feelings, so as to prevent their involvement in substance use.

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Table 1
Baseline characteristics of non-smoking initiators and smoking initiators

Independent Variables	Never Smokers (n = 1455)		Smoking in 7th and 8th Grades (n = 316)		SD	p-value
	Mean	SD	Mean	SD		
<i>Hostility</i>	7.9	2.7	9.2	7.8		<0.0001
<i>Depressive Symptoms</i>	6.8	2.7	8.1	3.7		<0.0001
<i>Bullying</i>	n	%	n	%		
Controls	980	67.4	179	56.6		<0.01
Bullies	65	4.5	20	6.3		
Bully-Victims	111	7.6	47	14.9		
Covariates	n	%	n	%		p-value
<i>Gender</i>	819	56.3	161	50.9		ns
Girl	636	43.7	155	49.1		
Boy	512	35.2	163	51.2		<0.01
<i>Ethnicity</i>	432	29.7	42	13.3		
Hispanic/Latino	170	11.7	29	9.2		
Asian	21	1.4	6	1.9		
Caucasian	231	15.9	54	17.1		
African-American	89	6.1	22	7.0		
Multiethnic	204	14.0	46	14.6		ns
Other	1251	86.0	270	85.4		
<i>Immigration Status</i>	1002	68.9	197	62.3		<.01
Non-immigrant	249	17.1	73	23.1		
Immigrant	540	37.1	116	36.7		ns
<i>Acculturative Stress^a</i>	422	29.0	100	31.6		
No	493	33.9	100	31.6		
Yes	Mean	SD	Mean	SD		p-value
Control group	11.27	0.49	11.34	0.52		0.02
Standard program	0.19	0.72	-0.09	0.70		<0.001
FLAVOR program						

^aImmigrants only

Table 2
Generalized linear mixed models of smoking initiation

	F	p-value
Psychological characteristics		
Hostility	3.94	<0.05
Depression	8.40	<0.01
Bullies(vs. controls)	0.66	ns
Bully- victims (vs. controls)	5.85	<0.05
Covariates		
Hispanic/Latino (vs. non-Hispanic/Latino)	6.20	<0.01
Acculturative stress (yes vs. no)	1.23	ns
Age	2.34	ns
Socioeconomic status	8.18	<0.01

Note. The analytic sample consisted of those students who reported that they did not initiate smoking in the 6th grade.

Note. Parameter estimate were adjusted for clustering of students within schools/classrooms.