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Sensation-seeking predicts initiation of daily smoking behavior among American Indian high school students

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Abstract

Purpose—American Indian (AI) youth have a high risk of smoking initiation. Sensation-seeking, defined as the tendency to seek novel and thrilling experiences, has been associated with smoking initiation in other groups but has never been examined in AI youth.

Methods—Data were from the Voices of Indian Teens Project (VOICES), a longitudinal study of AI youth from seven high schools in four AI communities in the western United States. Participants completed annual surveys in school over a three-year period. Our sample comprised 764 students who were non-smokers at baseline. Smoking initiation was defined as endorsement of daily smoking after baseline. We used binary logistic regression to evaluate the association of baseline sensation-seeking with odds of daily smoking initiation, stratified by gender

Results—Participants were 353 males and 411 females aged 13 to 21 years at baseline. After adjusting for covariates, baseline sensation-seeking correlated with smoking initiation differently in males and females. Sensation-seeking did not predict daily smoking in males. Among females,

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however, higher sensation-seeking scores at baseline predicted daily smoking in both the unadjusted (odds ratio = 1.4; 95% CI = 1.1 – 1.8; $p = 0.005$) and covariate-adjusted (odds ratio = 1.3; 95% CI = 1.0 – 1.6; $p = 0.04$) models

Conclusion—Gender-specific prevention programs may be warranted in addressing different risk-factor profiles in this high-risk population

Keywords

American Indian; smoking initiation; sensation-seeking

1. Introduction

Smoking is the most preventable cause of death and disease in the United States (American Cancer Society, 2000) with an estimated 8.6 million people who suffer from smoking-related illnesses (Fiore et al., 2004; C. W. Lee & Kahende, 2007). Early cigarette smoking predicts both subsequent nicotine dependence (Van De Ven, Greenwood, Engels, Olsson, & Patton, 2010) and tobacco-related morbidity (Kessler, 1995; Pierce & Gilpin, 1996). One-third to one-half of teenagers who try smoking become regular smokers (Kessler, 1995). Therefore, it is important to consider older and younger adolescents separately when identifying predictors of smoking as high school students may exhibit different risk factors than do their younger non-smoking counterparts (Abroms, Simons-Morton, Haynie, & Chen, 2005).

American Indian (AI) adolescents are at high risk for cigarette smoking (Beauvais, Thurman, Burnside, & Plested, 2007; Federman, Costello, Angold, Farmer, & Erkanli, 1997; Forster, Brokenleg, Rhodes, Lamont, & Poupart, 2008; LeMaster, Connell, Mitchell, & Manson, 2002; Wallace et al., 2009). Although the prevalence of tobacco use among AI adolescents varies greatly by region and culture, almost half (42%) of AI adolescents aged 12-17 years endorse lifetime cigarette smoking; the next highest racial group was White adolescents (25%) (U.S. Department of Health & Human Services, 2009). AIs have higher rates of tobacco-related diseases such as cardiovascular disease (B. V. Howard et al., 1999) and cancer (Wiggins et al., 2008) compared to non-Hispanic Whites. Therefore, identifying factors associated with smoking initiation in AI youth is a public health priority, since at-risk individuals may be targeted with specific prevention programs.

Several factors are associated with smoking initiation among AI youth, including stressful life events (LeMaster, et al., 2002), having friends who smoke (Forster, et al., 2008), substance abuse/dependence (Yu, Stiffman, & Freedenthal, 2005), alcohol use (Yu, et al., 2005), familial mental health problems (Yu, et al., 2005), family stressful events (Epplein et al., 2009), peer misbehavior (Yu, et al., 2005), and single-parent homes (Lonczak, 2007). This body of research is limited, however, by cross-sectional study designs and failure to examine the influence of personality traits, such as sensation-seeking, on smoking in this vulnerable population.

Sensation-seeking is the tendency to seek novel and thrilling experiences (Zuckerman & Neeb, 1979). It has been associated with smoking initiation in non-Native populations (Clayton, Segress, & Caudill, 2007; Lipkus, Barefoot, Williams, & Siegler, 1994) presumably because the novelty of smoking is attractive to individuals with higher levels of sensation-seeking (Lipkus, et al., 1994). Among AI youth, sensation-seeking has predicted other risky behaviors, such as early sex initiation (Mitchell & Beals, 1997) and inhalant use (M. O. Howard, Walker, Walker, Cottler, & Compton, 1999); however, its relationship with smoking behavior has not been examined.

Given these considerations, we analyzed longitudinal data from a multi-school study of AI high school students collected over three years. Our goal was to determine whether baseline sensation-seeking correlated with daily smoking initiation among non-smoking students after controlling for depressive symptoms, alcohol use, and peer delinquent attitudes.

2. Methods

2.1 Participants and Data

We used data from the Voices of Indian Teens (VOICES) project, a three-year study of AI youth from seven, geographically dispersed and culturally distinct high schools in four AI communities in the western United States. A detailed description of the VOICES study has been published elsewhere (Mitchell & Beals, 1997). Briefly, baseline data were collected in 1993, with two annual follow-ups in 1994 and 1995. Each year data collection took place during a single school day. For students who were absent, research staff attempted to locate them in school one week later or in the community for up to three months. Youth were paid \$5.00 for their participation. The average participation rate at baseline across all schools was 74% (Spicer, Novins, Mitchell, & Beals, 2003).

Of the 2,357 students who participated in the VOICES study at baseline, 2,067 (88%) had valid data for baseline smoking status. Slightly more than half ($n=1,048$) were categorized as never or previous smokers, and the remaining 1,019 were current smokers and not included in the analyses. Among the 1,048 that were categorized as never or previous smokers at baseline, 214 (20%) students were excluded due to lack of follow-up at either time point and 70 (7%) students were excluded due to missing sensation-seeking or covariate information at baseline. Students lost due to attrition tended to be older, have higher sensation-seeking scores, and were more likely to be previous smokers at baseline and currently consume alcohol. Students excluded due to missing baseline variables were not significantly different from included students. Our final sample consisted of 764 non-smokers (607 never smokers, 157 previous smokers). The project was reviewed and approved by the Colorado Multiple Institutional Review Board and by the Institutional Review Boards at the University of Washington and Brown University.

2.2. Measures

2.2.1 Smoking Status—At baseline and each follow-up, smoking behavior was assessed by 2 questions: “Do you smoke cigarettes?” (not at all, once in a while but not every day, 1-5 per day, 6-10 per day, 11-20 per day, > 1 pack per day) and “How old were you when you first tried cigarettes?” (age in years).

We classified students as non-smokers at baseline if they endorsed smoking “not at all.” This included previous smokers who reported “not at all” and an age when they first tried cigarettes. The available data did not allow us to distinguish former regular smokers from students who merely experimented with cigarettes or smoked very occasionally for ceremonial purposes. We felt it was important to include this group since our focus was daily smoking initiation. Students who endorsed current smoking at baseline were excluded from analyses.

2.2.2 Smoking Initiation—We classified all students who were non-smokers at baseline as initiating daily smoking (classified as a daily smoker at least once during follow-up) or not (classified as non-smoker and/or infrequent smoker at all follow-ups).

2.2.3 Sensation-seeking—VOICES used a pre-existing instrument to measure sensation-seeking (Huba, 1981). Students rated their agreement to 6 items on a 5-point Likert scale (1

= Disagree, 5 = Agree) that assessed engaging in novel, thrilling activities. Responses were averaged to yield a mean score ranging from 1-5, with higher values indicating higher sensation-seeking.

2.2.4 Baseline Covariates—Baseline demographic factors included region (Southwest, Southeast, Northern Plains, Pueblo), gender, and age in years (range = 13-19). Alcohol consumption was categorized as current (drank alcohol 1 day in the past 30 days) or never/former (never tried alcohol/previously tried but not in the past 30 days). Depressive **symptomatology** was measured using the depressed affect subscale of the Centers for Epidemiologic Studies Depression Scale (Radloff, 1977). Seven questions asked **about the past week and feeling blue, depressed, like a failure, fearful, lonely, sad, and having crying spells**. Responses were averaged to yield a final value ranging from 1-4, with higher scores indicating greater symptomatology. Coefficient alpha using this scale with the full sample was 0.8 (<http://www.ucdenver.edu/academics/colleges/PublicHealth/research/centers/CAIANH/NCAIANMHR/ResearchProjects/Documents/vcmethod.pdf>). Delinquent peer values were measured via an existing scale (Allen, 1989). Answers to six questions were averaged to yield a final value ranging from 1-5. Coefficient alpha estimates based on the whole sample range was 0.54 (<http://www.ucdenver.edu/academics/colleges/PublicHealth/research/centers/CAIANH/NCAIANMHR/ResearchProjects/Documents/vcmethod.pdf>).

2.3 Data Analysis

Sensation-seeking may vary by gender (Roth & Hammelstein, 2007); therefore, we performed separate analyses for males and females. We used binary logistic regression to model the association between baseline sensation-seeking and odds of daily smoking during follow-up. All models used generalized estimating equations, which accounts for clustering of students within school. We ran one model with baseline sensation-seeking as the sole independent variable and another model adjusting for all covariates. We tested for interactions between baseline sensation-seeking and gender or covariates. Results are presented as odds ratios with 95% confidence intervals. All analyses were performed using Stata v10.1 (StataCorp, 2007).

3. Results

Baseline descriptive statistics are presented in Table 1. Sixteen percent of males and 24% of females were classified as previous smokers at baseline. Thirteen percent of males, and 8% of females, were classified as daily smokers at 1 follow-up wave.

Higher sensation-seeking scores at baseline predicted daily smoking in both the unadjusted (odds ratio = 1.4; 95% CI = 1.1 – 1.8; $p = 0.005$) and covariate-adjusted (odds ratio = 1.3; 95% CI = 1.0 – 1.6; $p = 0.04$) models for females, but not for males. The interaction between sensation-seeking and gender approached significance ($p = 0.07$). Among the baseline covariates, for males only depressive symptoms and for females previous smoker at baseline were associated with higher odds of daily smoking. The interaction between sensation-seeking and current alcohol use was significant in females ($p = 0.01$); no other covariate interaction terms were significant.

4. Discussion

Consistent with previous findings, sensation-seeking predicted daily smoking initiation over the next two years in females, but not in males (Sargent, Tanski, Stoolmiller, & Hanewinkel, 2010). We offer two possible explanations: 1) sensation-seeking might exert influence on males at earlier ages than on females, resulting in a stronger association among younger

students that we were not able to detect in this analysis; and 2) smoking may be more normative in males and may not require personality traits such as sensation-seeking to trigger conversion to daily smoking. However, while there was a trend toward statistical significance, the interaction between sensation-seeking and gender was not significant. We believe this finding was due to low statistical power to detect the interaction.

Our results also revealed that girls who are high in sensation seeking and girls who drink alcohol are more likely to initiate daily smoking. This finding is consistent with previous research indicating alcohol use and cigarette smoking are related (Mrug, Gaines, Su, & Windle, 2010). Further, our results indicate the association of smoking initiation with depressive symptomatology and previous smoking at baseline may differ in males and females. Because smoking may be more normative in males, conversion to daily smoking may require pathology to be present such as depressive symptomatology. Conversely, previous smoking was significantly associated with future initiation in females but not males. Our data do not permit consideration of previous smoking regularity, and males may have been lighter smokers than females. Our results underscore the need to consider potential gender differences in future studies.

This study has several limitations. First, baseline data collection occurred in 1993. Although there has been a general trend in the U.S. for AI and non-AI adolescents to smoke less (Beauvais, et al., 2007; Wallace, et al., 2009), AI youth continue to smoke at alarming rates. Second, the smoking measures included in the surveys were brief and limited in their ability. The data did not allow us to identify individuals who smoked for ceremonial purposes only, and limited our ability to determine precisely when an individual initiated regular daily smoking. Third, we cannot rule out the possibility of selection or response bias in our results. The schools were not selected randomly for the project; however they represent diverse regions and tribes in the western United States. Fourth, sensation-seeking is a complex construct. Although our measure of sensation-seeking performed well, it is possible that the construct was not fully represented in this measure.

Despite these limitations our results improve our understanding of personality traits associated with smoking initiation among these high-risk individuals. Prevention programs have been developed specifically for high sensation-seeking youth (Sargent, et al., 2010). Our results indicate that using such preventive interventions would reach many of the youth who will initiate to daily smoking. Because high sensation seekers may be more sensitive to the reinforcing properties of nicotine, it may be prudent to introduce alternative reinforcers that may take the place of smoking (D. C. Lee, Perkins, Zimmerman, Robbins, & Kelly, 2011). Similarly, programs may want to emphasize other ways for youth to act in accordance with their personalities. The results of this study, although preliminary in nature, may provide important insights that can inform effective interventions to curb the alarming smoking rates seen in AI youth.

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Highlights

- American Indians (AIs) smoke more than do members of other races and ethnicities and experience greater health disparities.
- In this study, sensation-seeking was associated with incident smoking.
- These results provide one personality variable that may distinguish those AI adolescents who might start smoking in high school, helping to target these individuals for intervention.

Table 1

Descriptive statistics for demographic variables, covariates, sensation-seeking, and incident smoking.

	<i>Males (n = 353)</i>		<i>Females (n = 411)</i>	
	%	Mean (SD)	%	Mean (SD)
Covariates				
Region:				
Southwest	47		50	
Southeast	9		7	
Northern Plains	26		17	
Pueblo	19		26	
Age (years):		15.7 (1.3)		15.7 (1.2)
Grade:				
9	38		27	
10	27		29	
11	23		29	
12	12		16	
Current alcohol drinking	28		26	
CES-D (average item score)		1.3 (0.5)		1.6 (0.7)
Peer values (average item score)		3.3 (0.7)		3.5 (0.7)
Smoking status at baseline:				
Never	84		76	
Previous	16		24	
Sensation-seeking				
Average item score		2.6 (1.0)		2.0 (0.9)
Smoking Initiation				
None	66		72	
Infrequent only	20		20	
Daily (outcome of interest)	13		8	

Table 2

Generalized Estimating Equation results for odds of daily smoking, sensation seeking, and covariates; separately by gender.

	Males (<i>n</i> = 353)		Females (<i>n</i> = 411)	
	<i>OR</i> (95% <i>CI</i>)	<i>p</i>	<i>OR</i> (95% <i>CI</i>)	<i>p</i>
Unadjusted				
Sensation seeking	1.1 (0.9 – 1.4)	0.40	1.4 (1.1 – 1.8)	0.005
Adjusted				
Sensation seeking	1.1 (0.9 – 1.5)	0.35	1.3 (1.0 – 1.6)	0.04
Covariates:				
Age	0.7 (0.6 – 0.9)	0.01	1.0 (0.7 – 1.4)	0.95
Current alcohol drinking	1.5 (0.9 – 2.5)	0.15	1.4 (0.4 – 4.4)	0.58
Depression symptoms	2.1 (1.3 – 3.2)	0.002	0.9 (0.6 – 1.3)	0.63
Previous smoking at baseline	1.2 (0.6 – 2.7)	0.59	2.6 (1.0 – 6.5)	0.05
Delinquent peer values	1.5 (0.8 – 2.8)	0.22	0.9 (0.7 – 1.1)	0.33

Note: Adjusted models covaried for baseline age, alcohol consumption, depressed mood, and delinquent peer values.