

Improving Measurement of Normative Beliefs Involving Smoking Among Adolescents

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Objectives: To identify different components of smoking normative beliefs and determine if each component is independently associated with 2 clinically relevant measures of smoking in adolescents.

Design: Cross-sectional survey.

Setting: One large suburban high school.

Participants: A total of 1211 high school students aged 14 to 18 years.

Outcome Measures: Current smoking and susceptibility to smoking.

Results: Of the 1138 students with data on current smoking, 216 (19.0%) reported current smoking, and 342 (38.3%) of the 893 nonsmoking students with susceptibility data were susceptible to future smoking. Factor analysis identified 3 normative belief constructs, labeled “perceived prevalence of smoking,” “perceived popularity of smoking among elite/successful elements of society,” and “disapproval of smoking by parents/

peers.” On average, students believed that 56% of people in the United States smoke cigarettes; 27.7% believed that wealthy people smoke more than poor people. Multiple logistic regression showed that each of the 3 constructs was independently associated with current smoking (adjusted odds ratios, 1.05 [95% confidence interval {CI}, 1.02-1.08], 1.12 [95% CI, 1.02-1.23], and 0.66 [95% CI, 0.59-0.75], respectively), even after controlling for covariates. Students’ perceptions of smoking among the successful/elite and disapproval by parents/peers were independently associated with susceptibility to future smoking (adjusted odds ratios, 1.20 [95% CI, 1.11-1.29] and 0.87 [95% CI, 0.79-0.96], respectively).

Conclusions: Adolescents’ normative beliefs about smoking are multidimensional and include at least 3 distinct components, each of which was independently related to smoking outcomes. These distinct components should be considered in the design and evaluation of programs related to prevention and cessation of adolescent smoking.

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SEVERAL THEORETICAL MODELS that have been used to successfully predict smoking behavior rely on the concept of normative beliefs as precursors to behavior change. According to the Theory of Planned Behavior,^{1,2} positive attitudes and subjective normative beliefs involving smoking lead to intention to smoke, which in turn leads to smoking. In this model, subjective normative beliefs are specifically defined as the subject’s impression of the acceptance of the behavior by those close to the subject (such as parents, close friends, and significant others).^{1,2} Similarly conceived normative beliefs are also considered important precursors to smoking behavior by the Jessor and Jessor Problem Behavior Theory³ and by Social Learning and Social Cognitive Theories.⁴ Accordingly, the acceptance of smoking by significant others has been shown to predict smoking among various groups of adolescents.⁵⁻⁹

Others have shown that normative beliefs regarding the “perceived prevalence” of smoking are also useful in predicting smoking. In 2005, Olds et al⁸ showed that among 6594 adolescents perceived prevalence and perceived approval by peers and siblings independently predicted smoking. Perceived prevalence has also been shown to predict smoking among a large group of Chinese adolescents,¹⁰ military recruits,¹¹ and multiple groups of US adolescents.^{6,12-17}

Despite the fact that these 2 different components of normative beliefs—perceived approval and perceived prevalence—can be useful, some have found that normative beliefs do not predict behaviors as strongly as would be expected. Grube et al,¹⁴ for instance, found in their study of grade school and college students that subjective smoking normative beliefs were not strong predictors of smoking outcomes, and that normative beliefs could perhaps be measured more completely. Tickle et al¹⁸ similarly found in 2006 that, among the various psychosocial mediators of media effects on smoking behavior, normative beliefs

were weak predictors of smoking. Others¹⁹⁻²¹ have also found that normative beliefs were not as strong predictors of smoking as they were hypothesized to be.

One way of improving measurement of subjective normative beliefs involving smoking may be by further expanding their scope. The Social Cognitive Theory²² suggests that individuals are affected not only by how common they believe smoking to be among the general population but also by how relatively common it is among more desirable (eg, successful or elite) societal elements. A young person who believes that smoking is more common among the wealthy, successful, and privileged may be likely to smoke, even if the person does not believe it is common in the general population.

However, to our knowledge, no such scale has been published in the literature, and it is not known if such an additional construct of normative beliefs is independently associated with smoking-related outcomes, even when controlling for accepted measurements of normative beliefs, demographic information, and other predictors of smoking, such as parent, sibling, and peer smoking.

The purpose of this study was to determine if each of 3 measures of smoking normative beliefs—perceived prevalence among the general population, perceived popularity among successful/elite elements of society, and perceived disapproval by friends and family—is independently associated with 2 clinically relevant measures of smoking in adolescents: current smoking and susceptibility to smoking. Our a priori hypothesis was that each measure of smoking normative beliefs would be independently associated with smoking, even when controlling for covariates.

METHODS

PARTICIPANTS AND SETTING

The study population for our cross-sectional questionnaire consisted of all students attending a suburban public high school outside of Pittsburgh, with total enrollment of 1690. Male and female students were eligible to participate if they were aged 14 to 18 years and were available to complete the questionnaire on the regular school day in January 2005 when it was administered. On this date, 79 students were absent and 86 were unavailable because of in-school suspensions, field trips, or appointments with the nurse or guidance counselor; 1525 students were, therefore, eligible to participate.

PROCEDURES

Approval to administer the study questionnaire was granted by the superintendent of the school district and the institutional review board of the University of Pittsburgh. The superintendent and the institutional review board agreed to a waiver of parental informed consent, because students would not be asked to place their names or any other unique personal identifiers on the questionnaire. The students were invited to complete the questionnaire during their social studies classes, and those who did so were given a packet of trail mix to show appreciation for their time.

MEASURES

The questionnaire assessed 2 clinically relevant dependent variables: current smoking, defined as having smoked at least once

in the past 30 days; and susceptibility to smoking, assessed with the reliable and valid 3-item scale of Pierce et al.²³ According to this scale, a person is considered “nonsusceptible” (and does not intend to smoke) only if the person answers “definitely no” to the following 3 items: (1) Do you think that you will smoke a cigarette soon? (2) Do you think you will smoke a cigarette in the next year? (3) If one of your best friends were to offer you a cigarette, would you smoke it?

Eleven items were used to measure smoking normative beliefs. Three of the items were “perceived disapproval” items based on items from the Fishbein-Ajzen-Hansen Questionnaire, developed by the authors of the Theory of Planned Behavior.^{1,2} These items, each measured on a 4-point Likert scale (strongly agree, agree, disagree, and strongly disagree), included the following: (1) according to my parents, it is very important for me to not smoke cigarettes; (2) according to my friends, it is very important for me to not smoke cigarettes; and (3) according to most people my age, it is very important for me to not smoke cigarettes. Four of the items measured perceived prevalence. These items, based on prior work in this area,^{10,12,15,17} asked students to estimate what percentage of different groups of people (8th- and 12th-grade students, college students, and adults in the United States) had smoked at least 1 complete cigarette in the past 30 days. Students responded on an 11-point scale, from 0 through 100, in 10-point increments. The final 4 normative belief items asked students to judge on a 4-point Likert scale (strongly agree, agree, disagree, and strongly disagree) whether they believed that specific successful or elite elements of society were likely to be smokers. These items included the following: (1) most successful businesspeople smoke cigarettes at least once a month; (2) in general, more “cool” people smoke cigarettes than “uncool” people; (3) wealthy people are more likely to smoke cigarettes than poor people; and (4) my favorite celebrities probably smoke cigarettes at least once a month. All normative belief measures were developed after a comprehensive literature review; honing of the scales based on the input of experts in tobacco control, public health, and adolescent medicine; and focus groups with adolescents. This process has been described previously in more depth.²⁴

Finally, we assessed multiple covariates previously shown to be associated with smoking, including age, race/ethnicity, sex, parental education (as a surrogate for socioeconomic status), parent smoking, sibling smoking, and peer smoking.

ANALYSIS

First, we performed a descriptive data analysis of the questionnaire responses, computing means and standard deviations. We then used iterative principal components analysis with varimax rotation to determine the underlying factor structure of the smoking normative belief items. The primary goal of this analysis was to determine if the items representing normative beliefs about smoking seemed to be part of 1, or more than 1, underlying concept(s). If the analysis revealed several concepts, or factors, this would indicate that “normative beliefs” is not a 1-dimensional variable, but a variable with empirically discernable subcategories. Principal components analysis did indicate 3 subgroups of items, and items belonging to each particular scale were evaluated for internal reliability using the Cronbach α .

Finally, we performed 2 multivariate logistic regression analyses. For each of the analyses, the independent (predictor) variables consisted of age, sex, race, socioeconomic status, parental smoking, sibling smoking, peer smoking, and each of the 3 normative belief constructs. In the first analysis, we used current smoking as the dependent variable. For the second analysis, we used susceptibility to smoking as the dependent variable. In this second analysis, we only included nonsmokers,

Table 1. Respondent Characteristics*

Characteristic	Total Sample (N = 1211)	Current Smoker (n = 216)†	Susceptibility to Smoking (n = 379)‡
Age, y			
14	186 (15.7)	18 (8.4)§	56 (15.3)
15	277 (23.3)	36 (16.8)	94 (25.7)
16	328 (27.6)	66 (30.8)	106 (29.0)
17	301 (25.4)	75 (35.0)	84 (23.0)
18	95 (8.0)	19 (8.9)	26 (7.1)
Sex			
Male	572 (47.6)	100 (46.7)	184 (48.9)
Female	630 (52.4)	114 (53.3)	192 (51.1)
Race			
White	1092 (91.7)	203 (94.4)	341 (90.9)
Black	49 (4.1)	4 (1.9)	17 (4.5)
Other	50 (4.2)	8 (3.7)	17 (4.5)
Ethnicity			
Non-Hispanic	1199 (99.1)	214 (99.1)	378 (99.7)
Hispanic	11 (0.9)	2 (0.9)	1 (0.3)
Parental education			
≤1 Parent completed high school	64 (5.4)	19 (9.3)§	13 (3.8)
1 Parent completed college or both parents completed high school	369 (31.0)	74 (36.1)	107 (31.1)
1 Parent completed college and 1 completed high school	328 (27.5)	64 (31.2)	101 (29.4)
Both parents completed college	430 (36.1)	48 (23.4)	123 (35.8)
Smoking			
Parental	430 (38.2)	127 (58.8)§	142 (38.1)
Sibling	244 (22.4)	90 (42.7)§	89 (24.5)§
Peer	678 (60.0)	209 (96.8)§	271 (71.5)§

*Data are given as number (percentage) of each group. Data do not always sum to total sample sizes because of missing data. Percentages are based on the total for each category and may not total 100 because of rounding.

†Defined as having smoked at least once in the past 30 days.

‡These analyses were conducted on only nonsmoking students (n = 995).

§P < .001.

||Because of the small sample size, Hispanic ethnicity was not included in multivariate analyses.

¶P < .05.

because the construct of “susceptibility to smoking” of Pierce et al²³ (our measure of intention to smoke) was developed and validated in this population.

In each model, we included the smoking normative belief scales and all covariates to determine if the scales were independent predictors of the outcomes. Because of the small sample size, Hispanic ethnicity was not included as a covariate. We considered any independent variable or covariate to be statistically significant if it had a relationship with the outcome variable at P < .05. We conducted model diagnostics to ensure that the assumptions of logistic regression were satisfied and that adequate model fit was achieved.

FINAL SAMPLE

Of the 1525 students who were eligible for the study, 1402 (91.9%) completed the questionnaire. Using specific criteria established before administering the survey, we eliminated any questionnaire if 3 or more responses were deemed to be impossible or extremely improbable (n = 44) or if the students admitted to providing dishonest answers (n = 147). The final sample size was, therefore, 1211 (86.4% of the surveys completed). The mean age of the 1211 respondents was 15.9 years, about half (572 [47.2%]) were male, and 1092 (90.2%) were white.

RESULTS

Of the 1138 respondents on whom current smoking data were available, 216 (19.0%) reported current smoking. Of

the 893 nonsmokers on whom susceptibility data were available, 342 (38.3%) were susceptible to future smoking. Participants were more likely to be current smokers if they were older, had a lower socioeconomic status, or had parents, siblings, or friends who smoke. Nonsmokers were more likely to be susceptible to future smoking if they had parents, siblings, or friends who were smokers (**Table 1**).

Principal components analysis on the 11 normative belief items revealed a clear 3-factor solution, with eigenvalues of 2.9, 1.9, and 1.7, explaining 27%, 17%, and 15% of the variance, respectively (**Table 2**). Thus, we defined 3 factors as the following: (1) perceived prevalence of smoking (4 items), (2) popularity of smoking among successful/elite elements of society (4 items), and (3) approval of smoking by parents/peers (3 items). The 3 scales were internally consistent, with Cronbach α scores of 0.67, 0.67, and 0.82, respectively.

Summary data for the independent variables (responses to the smoking normative belief items) are located in Table 2. With regard to perceived prevalence, students believed that, on average, 56% of people in the United States smoke cigarettes at least once each month, along with 53% of college students, 48% of high school seniors, and 30% of eighth graders. As shown in **Figure 1** and **Figure 2**, most respondents believed that more people smoke than actually do (22.3% for the US population²⁵ and 21.9% for high school seniors²⁶). Specific-

Table 2. Smoking Normative Belief Items: Responses and Factor Loadings*

Item	Mean (SD)	Factor Loading		
		1	2	3
Perceived prevalence†				
What percentage of all people in the United States smoke cigarettes at least once a month?	56 (21)	0.72‡	0.09	0.06
What percentage of 12th graders smoke cigarettes at least once a month?	48 (21)	0.89‡	0.06	-0.10
What percentage of 8th graders smoke cigarettes at least once a month?	30 (20)	0.77‡	0.00	-0.03
What percentage of college students smoke cigarettes at least once a month?	53 (21)	0.84‡	0.07	-0.06
Popularity among the successful/elite§				
Most successful businesspeople smoke cigarettes at least once a month	2.0 (0.8)	0.11	0.70‡	-0.06
In general, more “cool” people smoke cigarettes than “uncool” people	1.9 (0.8)	0.07	0.72‡	-0.04
Wealthy people are more likely to smoke cigarettes than poor people	2.1 (0.8)	-0.01	0.77‡	0.04
My favorite celebrities probably smoke cigarettes at least once a month	2.2 (0.8)	0.14	0.61‡	-0.14
Approval by parents/peers§				
According to my parents, it is very important for me to not smoke cigarettes	3.4 (0.7)	-0.04	-0.12	0.73‡
According to my friends, it is very important for me to not smoke cigarettes	2.8 (0.9)	-0.06	-0.05	0.83‡
According to most people my age, it is very important for me to not smoke cigarettes	2.5 (0.8)	-0.08	0.06	0.76‡

*This was the second iteration of principal components analysis. After the initial analysis suggested a 3-factor solution, the number of factors was set at 3 and varimax rotation was implemented to determine the final factor loadings.

†Students responded on an 11-point scale (0%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, and 100%) for mean (SD) values.

‡Strong loadings (>0.5).

§Scores ranged from 1 to 4 (1 indicates strongly disagree; 2, disagree; 3, agree; and 4, strongly agree) for mean (SD) values.

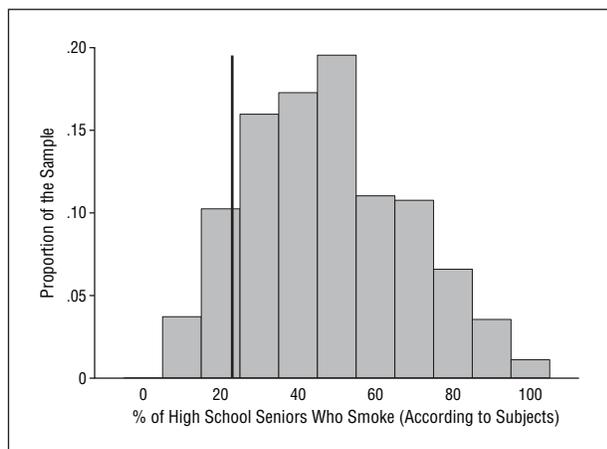


Figure 1. Histogram of subjects' impression of the percentage of high school seniors who smoke. The vertical line indicates the actual percentage of seniors (21.9%) who are current smokers at the high school where the study was conducted.

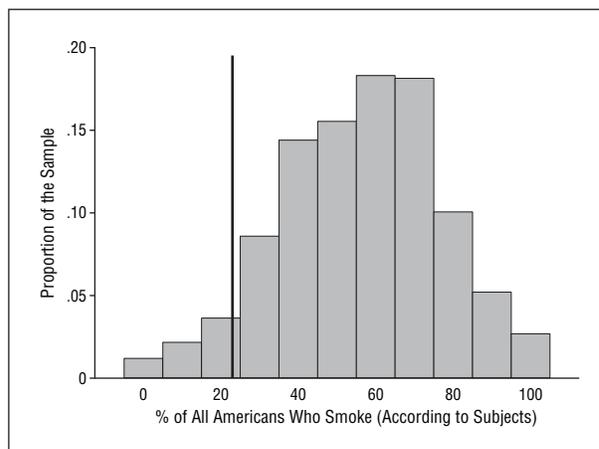


Figure 2. Histogram of subjects' impression of the percentage of all Americans who smoke. The vertical line indicates the actual percentage of adult Americans (22.3%) who are current smokers.

cally, 93.0% believed that 30% or more of the US population smokes once each month and 85.9% believed that 30% or more of high school seniors smoke once each month (Figure 1 and Figure 2).

With regard to the popularity of smoking among successful/elite elements of society, 24.2% indicated they believed that most successful businesspeople smoke at least once a month, 23.2% believed that cool people smoke more than uncool people, 27.7% believed that wealthy people smoke more than poor people, and 35.4% believed that their favorite celebrities probably smoke at least once a month.

With regard to disapproval of smoking by parents and peers, most students (90.1%) agreed or strongly agreed that it was important to their parents that they not smoke. Fewer (62.5%) agreed or strongly agreed it was important to their friends that they not smoke, and fewer still (45.3%) believed it would be important to most people their age.

In the fully adjusted logistic regression model, perceived prevalence of smoking was independently associated with a higher risk of current smoking, but not with susceptibility to smoking (Table 3). Each 10% increase in response to the perceived prevalence scale was associated with a 5% increase (odds ratio, 1.05) in the odds of smoking.

“Popularity among successful/elite elements of society” was independently associated with an increased likelihood of current smoking and susceptibility to smoking among the never smokers. Even after controlling for all covariates and the other components of normative beliefs, each 1-point increase in response to this scale was associated with a 12% increase in the odds of being a current smoker. In addition, each 1-point increase in response to this scale was associated with a 20% increase in the odds of being susceptible to future smoking.

In the fully adjusted model, “disapproval of friends and family” was also significantly associated with cur-

Table 3. Logistic Regression Analyses*

Predictor	Current Smoking†		Susceptibility to Smoking‡	
	Crude	Adjusted§	Crude	Adjusted§
Perceived prevalence of smoking	1.08 (1.05-1.11)¶	1.05 (1.02-1.08)#	1.04 (1.02-1.06)¶	1.01 (0.98-1.04)
Perceived prevalence among successful/elite**	1.20 (1.12-1.29)¶	1.12 (1.02-1.23)#	1.29 (1.21-1.39)¶	1.20 (1.11-1.29)¶
Parent/peer disapproval**	0.55 (0.49-0.61)¶	0.66 (0.59-0.75)¶	0.78 (0.72-0.85)¶	0.87 (0.79-0.96)#
Age (in years)	1.33 (1.17-1.51)¶	1.21 (1.01-1.44)#	1.00 (0.90-1.11)	0.93 (0.81-1.07)
Male (vs female)	1.02 (0.76-1.38)	0.87 (0.57-1.32)	0.90 (0.70-1.17)	1.03 (0.74-1.43)
Race				
White	1 [Reference]	1 [Reference]	1 [Reference]	1 [Reference]
Black	0.43 (0.15-1.23)	0.32 (0.08-1.31)	1.11 (0.58-2.11)	0.82 (0.36-1.85)
Other	0.97 (0.44-2.13)	1.08 (0.36-3.24)	1.41 (0.70-2.84)	1.01 (0.40-2.51)
Parental education**	0.73 (0.62-0.86)¶	0.85 (0.68-1.06)	1.02 (0.88-1.19)	1.13 (0.94-1.35)
Smoking (yes vs no)				
Parental	2.86 (2.11-3.88)¶	1.45 (0.96-2.20)	1.36 (1.03-1.79)#	1.02 (0.71-1.46)
Sibling	3.58 (2.59-4.95)¶	1.66 (1.06-2.58)#	1.94 (1.39-2.72)¶	1.09 (0.70-1.71)
Peer	28.80 (13.40-61.90)¶	9.98 (4.49-22.20)¶	3.88 (2.93-5.14)¶	2.93 (2.07-4.16)¶

*Data are given as odds ratio (95% confidence interval).

†Defined as having smoked at least once in the past 30 days.

‡These analyses were conducted on only nonsmoking students (n = 995).

§Adjusted for all variables in the table.

||Each point on this scale corresponds with a 10-point increment in percentage (0 indicates 0%; 10, 100%).

¶P < .001.

#P < .05.

**The score range was from 1 to 4.

rent smoking and susceptibility to smoking. A 1-point increase in response to the disapproval of friends and family scale was associated with a 34% decrease in the odds of being a current smoker and a 13% decrease in the odds of being susceptible to future smoking.

COMMENT

This study identifies 3 separate scales measuring different aspects of smoking normative beliefs. Each of the 3 normative belief measures was independently associated with current smoking, and 2 of the measures—including our new measure of perceived prevalence of smoking among successful/elite—were independently associated with susceptibility to smoking among nonsmoking adolescents.

Even after adjusting for peer and family smoking, adolescents were less likely to be current smokers or susceptible to future smoking if they perceived a higher prevalence of parent and/or peer disapproval of smoking. This result is consistent with those who have shown the importance of peer and parental approval in the development of smoking behaviors.^{6-8,14,27} Adolescents' perception of the particular type of person who is a smoker (eg, successful vs unsuccessful or wealthy vs unwealthy) was also significantly associated with current smoking and susceptibility to smoking among nonsmokers. The perceived prevalence of smoking, which is a more common measure of normative views, was positively associated with being a current smoker. This is also consistent with previous research.^{8,10-12,15-17} However, in this sample of adolescents, perceived prevalence of smoking was not independently associated with increased susceptibility to future smoking among nonsmokers. This suggests that the early stages of smoking initiation may be more likely to be influenced by normative views that include some level of value judg-

ment and/or assessment (eg, how others will feel about my smoking and whether people I admire smoke) than simply by the notion that many people smoke.

This finding may have important implications for future research and educational interventions. With regard to research, it will be particularly important to determine how, when, and where young people glean their understanding of the prevalence of smoking, especially among specific subgroups. It is likely, for instance, that media portrayals of smoking, which often show smoking in a glamorous and positive light, contribute to false impressions of high smoking prevalence among the elite.^{23,28-30} Future research may be able to improve our understanding of what specific types of media messages and images are more likely to affect normative beliefs.

With regard to intervention, this finding suggests that we can improve smoking normative beliefs education not only by emphasizing the true prevalence of smoking but also by emphasizing more accurate information regarding the types of individuals who are smokers. In this study, 24.2% of students incorrectly agreed that most successful businesspeople smoke at least once a month and 27.7% incorrectly believed that wealthy people smoke more than poor people. It may, therefore, be valuable to educate young people that the groups who most commonly smoke are not necessarily the ones they view as successful. It may also be valuable to implement media restrictions and/or media literacy programming, because smoking in media is common among elite and successful media characters.³⁰⁻³²

Our study population was drawn from a single large high school and was fairly homogeneous in terms of racial and ethnic makeup, which could limit the generalizability of our findings. However, the baseline values for current smoking are similar to values previously reported from a representative sample of US adoles-

cents.²⁶ Because this was a cross-sectional study, we can determine only association and not causation. Although the Theory of Planned Behavior would suggest that conception of normative beliefs precedes smoking intention and behavior, it is certainly possible that adolescents who begin to smoke subsequently develop different subjective normative beliefs. Longitudinal studies and randomized intervention trials are needed to elucidate the directionality and causal nature of the associations. Although we relied on self-report rather than biochemical verification of smoking behavior, several studies³³⁻³⁵ have demonstrated that self-reported smoking status has acceptable validity.

In summary, this study reports the development of a new measure of adolescents' perception of the popularity of smoking among the successful/elite. It also shows that this new construct of normative beliefs and 2 established measures of normative beliefs are all independently associated with current smoking. The constructs that measure peer and family disapproval of smoking and popularity of smoking among elite subgroups were significantly associated with susceptibility to smoking among nonsmokers, which suggests that these normative beliefs may be more instrumental during the early stages of smoking uptake. These findings illustrate that there are distinct components of smoking normative beliefs that should be considered in the design and evaluation of programs related to prevention and cessation of adolescent smoking.

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