NIH Public Access

Improving measurement of normative beliefs involving smoking among adolescents

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Abstract

Objective—To identify different components of smoking normative beliefs and determine if each component is independently associated with two clinically relevant measures of smoking in adolescents.

Design—Cross-sectional survey.

Setting—One large suburban high school.

Participants—1211 high school students aged 14–18.

Main outcome measures—Current smoking and susceptibility to smoking.

Results—Nineteen percent (N=216) of students reported current smoking, and 40% (N=379) of the non-smokers were susceptible to smoking. Factor analysis identified three normative beliefs 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 felt that 56% of people in the US smoke cigarettes. Twenty-four percent (24%) believed that wealthy people smoke more than poor people. Multiple logistic regression showed that each of the three constructs was independently associated with current smoking (Adjusted OR = 1.05, 95% CI: 1.02, 1.08; Adjusted OR = 1.12, 95% CI: 1.02, 1.23; Adjusted OR = 0.66, 95% CI: 0.59, 0.75; respectively) even after controlling for covariates. Students' perceptions of smoking among successful/elite and disapproval by parents/peers were independently associated with susceptibility to future smoking (Adjusted OR = 1.20, 95% CI: 1.11, 1.29; Adjusted OR = 0.87, 95% CI = 0.79, 0.96; respectively).

Conclusions—Adolescents' normative beliefs about smoking are multidimensional and include at least three 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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Keywords

smoking; tobacco; adolescent; norms; normative beliefs; subjective norms; theory of reasoned action; ecological model; youth; factor analysis; principal components analysis; logistic regression; risk behavior; scale development

INTRODUCTION

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] positive attitudes and subjective normative beliefs involving smoking lead to intention to smoke, which in turn leads to smoking. According to this theory, subjective normative beliefs are specifically defined as the subject's impression of the acceptance of the behavior by those close to him/her (such as parents, close friends, and significant others).[1, 2] Similarly conceived normative beliefs are also considered important precursors to smoking behavior by Jessor & Jessor's Problem Behavior Theory[3] as well as social learning and social cognitive models.[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 al.* showed that among 6594 adolescents both 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 American adolescents.[6, 12–17]

Despite the fact that these two 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.*, for instance, found in their study of both 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.[14] Tickle *et al.* similarly found in 2006 that, among the various psychosocial mediators of media effects on smoking behavior, normative beliefs were weak predictors of smoking.[18] Others have also found that normative beliefs were not as strong predictors of smoking as they were hypothesized to be.[19–21]

One way of improving measurement of subjective normative beliefs involving smoking may be by further expanding their scope. The social learning approach[22] would suggest that individuals would be likely to be 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 (e.g., 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 himself, even if he does not believe it is very common in the general population.

However, to our knowledge no such scale has been published in the literature, and it is not currently known if such an additional construct of normative beliefs is independently associated with smoking-related outcomes, even when controlling for currently 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 three 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 two 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, Pennsylvania with a total enrollment of 1690. Male and female students were eligible to participate if they were 14–18 years old and were available to take 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 (IRB) of the University of Pittsburgh. Both the superintendent and IRB agreed to a waiver of parental informed consent, since 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 two clinically relevant dependent variables: current smoking, defined as having smoked at least once in the past 30 days, and susceptibility to smoking, assessed with Pierce's reliable and valid 3-item scale [23]. According to this scale, a person is considered "non-susceptible" (and does not intend to smoke) only if he or she 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 / strongly disagree), included (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 percent of different groups of people (8th grade students, 12th grade students, college students, and adults in the US) had smoked at least one complete cigarette in the past 30 days. Students responded on an 11-point scale, from 0 through 100 in 10-point increments. The final four normative belief items asked students to judge on a 4-point Likert scale (strongly agree / agree / disagree / strongly disagree) whether they believed that specific successful or elite elements of society were likely to be smokers. These items included (1) Most successful business people 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, gender, 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 one, or more than one, underlying concept(s). If the analysis revealed several concepts, or factors, this would indicate that "normative beliefs" is not a one-dimensional variable, but one with empirically discernable subcategories. Principal components analysis did indicate three subgroups of items, and items belonging to each particular scale were evaluated for internal reliability using Cronbach's alpha.

Finally, we performed two multivariate multiple 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 three 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, since Pierce's construct of "susceptibility to smoking" (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 a level of $p<.05$. We conducted model diagnostics to ensure that the assumptions of logistic regression were satisfied and that adequate model fit was achieved.

Subjects

Of the 1525 students who were eligible for the study, 1402 (92%) 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% of the surveys completed). The mean age of the 1211 respondents was 15.9 years, about half (48%; N=572) were male, and 92% (N=1092) were white.

RESULTS

Nineteen percent (N=216) reported current smoking and 40% (N=379) of the non-smokers (N=995) were classified as susceptible to future smoking. Participants were more likely to

be current smokers if they were older, had lower socioeconomic status, or had parents, siblings, or friends who smoke. Non-smokers 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 three 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 three 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 three scales were found to be internally consistent with Cronbach alpha 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 felt that on average 56% of people in the US smoke cigarettes at least once each month, along with 53% of college students, 48% of high school seniors, and 30% of eighth graders. As is shown in Figures 1 and 2, most respondents felt that more people smoke than actually do (22% for the US population25 and 25% for high school seniors26). Specifically, 93% felt that 30% or more of the US population smokes once each month, and 86% felt that 30% or more of high school seniors smoke once each month (Figures 1 and 2).

With regard to the popularity of smoking among successful/elite elements of society, 24% indicated they felt that most successful business people smoke at least once a month, 23% felt that "cool" people smoke more than "uncool" people, 24% believed that wealthy people smoke more than poor people, and 35% felt that their favorite celebrities probably smoke at least once a month.

With regard to disapproval of smoking by parents and peers, the vast majority of students (90%) agreed or strongly agreed that it was important to their parents that they not smoke. Fewer (70%) agreed or strongly agreed it was important to their friend that they not smoke, and fewer still (55%) felt 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 (OR=1.05, 95% CI: 1.02, 1.08) but not with susceptibility to smoking (Table 3). Each 10% increase in response to the "perceived prevalence" scale was associated with a 5% increase (OR=1.05) in the odds of smoking.

"Popularity among successful/elite elements of society," was independently associated with an increased likelihood of both 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 (OR=1.12, 95% CI: 1.02, 1.23) in the odds of being a current smoker. Additionally, each 1-point increase in response to this scale was associated with a 20% increase (OR=1.20, 95% CI: 1.11, 1.29) in the odds of being susceptible to future smoking.

In the fully adjusted model, "disapproval of friends and family" was also significantly associated with current 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 (OR=0.66, 95% CI: 0.59, 0.75) in the odds of being a current smoker, and a 13% decrease (OR=0.87, 95% CI: 0.79, 0.96) in the odds of being susceptible to future smoking.

DISCUSSION

This study identifies three separate scales measuring different aspects of smoking normative beliefs. Each of the three normative belief measures was independently associated with current smoking, and two of the measures—including our new measure of "perceived prevalence of smoking among successful/elite"—were independently associated with susceptibility to smoking among non-smoking 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, 28] Adolescents' perception of the of the particular type of person who is a smoker (e.g., successful vs. nonsuccessful, wealthy vs. nonwealthy) was also significantly associated with both 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 inititiation may be more likely to be influenced by normative views that include some level of value judgement and/or assessment (e.g. how others will feel about my smoking; whether people I admire smoke, etc.) 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, 29–31] 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% of students incorrectly agreed that most successful business people smoke at least once a month, and 24% incorrectly felt 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, since smoking in media is common among elite and successful media characters.[31–33]

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 U.S. adolescents.[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 both the directionality and causal nature of the associations. Although we relied on self-report rather than biochemical

verification of smoking behavior, several studies have demonstrated that self-reported smoking status has acceptable validity.[34–36]

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, as well as two 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, which should be considered in both the design and evaluation of programs related to prevention and cessation of adolescent smoking.

Acknowledgments

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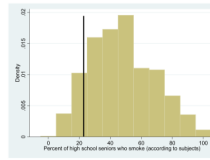
Figure 1. Histogram of subjects' impression of the percent of high school seniors who smoke
The black line indicates the actual percentage of seniors who are current smokers at the high school where the study was conducted (21.9%).
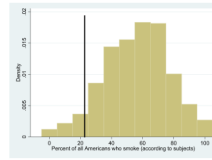
Figure 2. Histogram of subjects' impression of the percent of all Americans who smoke
The black line indicates the actual percentage of adult Americans who are current smokers
(22.3%).

Table 1

Respondent Characteristics

Characteristic	Total Sample (N=1211)	Current Smoker* (N=216)	Susceptibility to Smoking† (N=379)
	N (%)	N (%)	N (%)
Age			
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 (25.3)	75 (35.0)	84 (23.0)
18	95 (8.0)	19 (8.9)	26 (7.1)
Gender			
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 (91.2)
Black	49 (4.1)	4 (1.9)	17 (4.6)
Other	50 (4.2)	8 (3.7)	17 (4.3)
Ethnicity §			
Non-Hispanic	1199 (99.1)	214 (99.1)	378 (99.7)
Hispanic	11 (0.9)	2 (0.9)	1 (0.3)
Parental Education			
No more than one parent completed high school	64 (5.4)	19 (9.3)‡	13 (3.8)
One parent completed college or both parents completed high school	369 (31.0)	74 (36.1)	107 (31.1)
One parent completed college and one completed high school	328 (27.6)	64 (31.2)	101 (29.3)
Both parents completed college	430 (36.1)	48 (23.4)	123 (35.8)
Parental Smoking (Yes)	430 (38.2)	127 (58.8)‡	142 (38.1)‖
Sibling Smoking (Yes)	244 (22.4)	90 (42.7)‡	89 (24.5)‡
Peer Smoking (Yes)	678 (60.0)	209 (96.8)‡	271 (71.5)‡

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

†
These analyses were conducted on only nonsmoking students (N=995).

‡
P<0.001

§Because of the small sample size, Hispanic ethnicity was not included in multivariate analyses shown in Table 3.

//$P<0.05$

Table 2

Smoking Normative Belief Items—Responses and factor loadings[*]

Items	Mean (SD)	Factor 1 loading	Factor 2 loading	Factor 3 loading
Perceived Prevalence				
What percent of all people in the USA smoke cigarettes at least once a month? (0–100)[†]	56 (21)	*0.72*	0.09	0.06
What percent of 12th graders smoke cigarettes at least once a month?(0–100)	48 (21)	*0.89*	0.06	−0.10
What percent of 8th graders smoke cigarettes at least once a month?(0–100)	30 (20)	*0.77*	0.00	−0.03
What percent of college students smoke cigarettes at least once a month? (0–100)	53 (21)	*0.84*	0.07	−0.06
Popularity Among Successful/Elite				
Most successful business people smoke cigarettes at least once a month (1–4)[‡]	2.0 (0.8)	0.11	*0.70*	−0.06
In general, more "cool" people smoke cigarettes than "uncool" people (1–4)	1.9 (0.8)	0.07	*0.72*	−0.04
Wealthy people are more likely to smoke cigarettes than poor people (1–4)	2.1 (0.8)	−0.01	*0.77*	0.04
My favorite celebrities probably smoke cigarettes at least once a month (1–4)	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 (1–4)	3.4 (0.7)	−0.04	−0.12	*0.73*
According to my friends, it is very important for me to not smoke cigarettes (1–4)	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 (1–4)	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 in order to determine the final factor loadings. **Bold italic** values were strong loadings (>0.5).

[†] Students responded on an 11-point scale (0%, 10%, 20% … 100%)

[‡] 1=Strongly Disagree, 2=Disagree, 3=Agree, 4=Strongly Agree

Table 3

Logistic Regression Analyses

Predictor	Current Smoking[*]		Susceptibility to Smoking[†]	
	Crude OR (95% CI)	Adjusted OR[‡] (95% CI)	Crude OR (95% CI)	Adjusted OR[‡] (95% CI)
Perceived prevalence of smoking, 1–11[¶]	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, 1–4	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, 1–4	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 Black Other	1 (reference) 0.43 (0.15, 1.23) 0.97 (0.44, 2.13)	1 (reference) 0.32 (0.08, 1.31) 1.08 (0.36, 3.24)	1 (reference) 1.11 (0.58, 2.11) 1.41 (0.70, 2.84)	1 (reference) 0.82 (0.36, 1.85) 1.01 (0.40, 2.51)
Parental Education, 1–4	0.73 (0.62, 0.86)[//]	0.85 (0.68, 1.06)	1.02 (0.88, 1.19)	1.13 (0.94, 1.35)
Parental Smoking (yes vs. no)	2.86 (2.11, 3.88)[//]	1.45 (.96, 2.20)	1.36 (1.03, 1.79)[¶]	1.02 (0.71, 1.46)
Sibling Smoking (yes vs. no)	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 Smoking (yes vs. no)	28.8 (13.4, 61.9)[//]	9.98 (4.49, 22.20)[//]	3.88 (2.93, 5.14)[//]	2.93 (2.07, 4.16)[//]

[*] 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. For example, 0=0%, 1=10%, 2=20%, etc.

[//] $P<0.001$

[¶] $P<0.05$