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Cognitive Attributions for Smoking Among Adolescents in China

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Abstract

To design more effective health communication messages for smoking cessation and prevention, it is important to understand people's own perceptions of the factors that influence their decisions to smoke. Studies have examined cognitive attributions for smoking in Western countries but not in the Chinese cultural context. In a study of 14,434 Chinese adolescents, exploratory factor analysis grouped 17 cognitive attributions into 8 factors: curiosity, coping, social image, social belonging, engagement, autonomy, mental enhancement, and weight control. The factors were ranked based on the participants' self-reports of importance and by the strength of their associations with smoking behavior. Among all smokers, curiosity was the most frequently-ranked attribution factor at the early stages of smoking but not for daily smoking. Coping was highly-ranked across smoking stages. Social image and social belonging were more highly-ranked at earlier stages, whereas engagement and mental enhancement were ranked more highly at later stages of smoking. More attributions were associated with smoking among males than among females. This information could be useful for the development of evidence-based anti-smoking programs in China.

Keywords

Attributions; Smoking; Attribution Theory; Adolescents; China

1. Introduction

Despite ubiquitous information about the adverse health consequences of smoking, many current smokers continue to smoke and many adolescents begin to experiment with smoking each day (Edwards, 2004). Empirical studies have identified numerous personal, social, and environmental factors associated with smoking (Moolchan, Ernst, & Henningfield, 2000;

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Schepis & Rao, 2005; Turner, Mermelstein, & Flay, 2004; Tyas & Pederson, 1998). However, it remains unclear how individuals actually perceive the causes of their smoking behaviors. To develop effective smoking cessation and prevention programs, it is important to understand individuals' perceptions of the factors that motivate them to smoke and prevent them from quitting, so that these issues can be addressed explicitly in curricula and self-help materials.

Attribution theories describe how people explain the causes of their behaviors and the behaviors of others. Attribution theorists posit that people are motivated to explain the causes of personal behaviors to make the social environment seem more manageable (Heider, 1958; Jones & Davis, 1965; Kelley, 1967). People's explanations of behaviors, or attributions, can be classified as either personal or situational. Personal attributions imply volitional intention on the part of the actor, whereas situational attributions imply that contextual or environmental factors influence the behavior. Similar to other cognitive perceptions, attributions can be inaccurate or biased. For example, people tend to attribute the behavior of others to personal factors and attribute their own behaviors to situational factors (Jones & Nisbett, 1971; Monson & Snyder, 1977). However, attribution theorists argue that the task is not to determine the true causes of events, but to discern people's perceptions of the causes because these perceptions influence people's subsequent actions regardless of their accuracy. In other words, it might be more effective to design health communication messages that counter-argue the reasons why smokers *perceive* that they smoke, in addition to altering the personal, social, and environmental variables that are empirically associated with their smoking behaviors.

Several studies have identified cognitive attributions for smoking by asking people directly why they and other people initiate, maintain, or become addicted to smoking (Allbutt, Amos, & Cunningham-Burley, 1995; Rugkasa et al., 2001; Sarason, Mankowski, Peterson, & Dinh, 1992; Treacy et al., 2007). However, most of these studies have not assessed the relative importance of attributions to the individual, and most have not linked cognitive attributions with actual smoking behaviors to determine which are most influential (Kleinke, Staneski, & Meeker, 1983). A comprehensive investigation about cognitive attributions, their relative importance, and their associations with actual smoking behaviors could provide a better understanding about how people rationalize their decisions about smoking, which could be helpful in the design of more effective health communications for smoking cessation and prevention.

Most previous studies of attributions for smoking have been conducted in Western cultures including European countries (Allbutt et al., 1995; Berlin et al., 2003; Eiser, Sutton, & Wober, 1977, 1978; Palmqvist & Martikainen, 2005; Rugkasa et al., 2001; Treacy et al., 2007), the United States (Cronan, Conway, & Kaszas, 1991; Jenks, 1994a, 1994b; Kleinke et al., 1983; Sarason et al., 1992), and a few other countries (McGee & Stanton, 1993; Zoller & Maymon, 1983). Little is known about the attributions for smoking in China, where one-third of the world's smokers reside (Yang et al., 1999; Yang et al., 2004). Attributions for smoking found in previous studies might not generalize to China, where social and cultural norms about smoking are quite different from those in Western countries. For example, smoking is often portrayed in U.S. culture as a way of expressing one's individuality and autonomy (Davis, Gilpin, Loken, Viswanath, & Wakefield, 2008). It is not clear whether these individualistic motivations would operate similarly in a collectivistic culture such as China. Another difference between most Western cultures and China is that in China smoking is primarily a male behavior (Yang et al., 1999; Yang et al., 2004), whereas most Western countries have small gender gaps in smoking prevalence. Previous studies have shown that attributions for smoking vary across cultures. In one study, although the smoking behaviors among high school students in Israel and the United States were quite similar, the reasons for smoking and not smoking perceived by the students themselves were qualitatively and quantitatively different in the two countries (Zoller & Maymon, 1983).

Most studies of cognitive attributions for smoking have focused on adults. More research is needed among adolescents, because adolescence is a critical period for smoking initiation and formation of attitudes and beliefs about the consequences and functional meanings of one's behavioral choices. Most previous studies also have focused on current smokers, with the goal of understanding why they continue to smoke. However, information about which factors might convince nonsmokers to smoke in the future is equally important, and information about how reasons for smoking may vary at different points on smoking trajectories also could be informative. Health communication messages about smoking cessation and prevention might be more effective if they address and counter the most common self-reported reasons for different points on smoking trajectories, as well as nonsmokers' perceptions of possible future risk factors for smoking.

Therefore, the present study was conducted to investigate cognitive attributions for smoking, their relative importance, and their associations with actual smoking behaviors among Chinese adolescents. It differentiated the total sample into four subgroups: never smokers, lifetime smokers, past 30-day smokers, and daily smokers, which are equivalent to never smokers, tried/experimental smokers, regular smokers, and established smokers classified by Mayhew et al (Mayhew, Flay, & Mott, 2000).

2. Methods

Data for this analysis were obtained from a larger study being conducted in China to assess the effects of changing economic and social factors on health behaviors (Johnson et al., 2006). The project included seven large cities located in the northeastern, central, southwestern, and coastal regions of China.

2.1. Participants

Participants were recruited from schools in each of the seven cities. All schools in the metropolitan area of each city were stratified by median income in the district (high, medium, low) and by school academic performance (high, medium, low), resulting in nine clusters of schools. One middle school and one high school were randomly selected from each of the nine clusters. One classroom from the 7^{th} and 8^{th} grades in the selected middle schools and one classroom from the 10^{th} and 11^{th} grades in the selected high schools were recruited. In addition, one professional high school was selected from each district, major courses of study within each professional school were randomly selected, and students in these majors were recruited from the 10^{th} and 11^{th} grades. As a result, 147 schools were selected across the seven cities, 15,516 students were invited, and 14,434 students (93.0%) participated.

2.2. Procedures

The students completed the surveys in their schools. Students were eligible to participate if they provided parental informed consent. The informed consent and data collection procedures were reviewed and approved by both the University of Southern California and Chinese Institutional Review Boards. More details about the methodology of this study were reported elsewhere (Grenard et al., 2006; Guo et al., 2007; Johnson et al., 2006).

2.3. Measures

Demographic characteristics included age, gender, ethnicity, and geographic region. Cognitive attributions for smoking were assessed by the question, "I smoke, (or might smoke), because: (circle all that apply)", with seventeen possible reasons for smoking listed as response options. The list of 17 possible attributions was generated based on previous qualitative and quantitative research on attributions for smoking among Chinese American and Taiwanese American college students (Hsia & Spruijt-Metz, 2003) and U.S. adolescents (Spruijt-Metz et al.,

2005), along with consultation with educational and medical experts in China. Smoking behaviors were assessed at three levels: lifetime smoking, past 30-day smoking, and daily smoking.

2.4. Statistical Analyses

Frequencies were calculated to describe the demographic characteristics and smoking status of the sample, and gender differences were evaluated with chi-square tests. Exploratory factor analysis (EFA) was used to group the 17 attributions into common factors. Because these variables were dichotomous, a tetrachoric correlation matrix of these variables was generated for the EFA. The principal components method was used to extract factors. An oblique rotation was used to allow correlations among the factors. The number of factors was determined based on the theoretical knowledge and the statistical rule of "eigenvalue greater than 1". Based on the EFA, variables that loaded on the same factors were summed to create new variables representing the themes of attributions for smoking. Each of the new variables was dichotomously recoded as "0" if the value of the sum was 0, and as "1" if the value of the sum was equal to or greater than 1.

The relative importance of each attribution for smoking was ranked in two ways. First, the rankings were determined by the magnitudes of frequencies of attributions, first in the entire sample and then stratified by stages of smoking and gender. Second, the rankings were determined by the strength of their associations with smoking behavior, obtained from polychotomous logistic regression models. The polychotomous logistic regression models were computed first in the full sample and then separately by gender, adjusting for age, geographic region, district economy rank, and school academic rank. The outcome was a new variable created to represent four stages of smoking and coded as "0" if a student had never smoked, "1" if he/she had ever smoked but didn't smoke during the past 30 days, "2" if he/she had smoked during the past 30 days but didn't smoke daily, and "3" if he/she had smoked daily during the past 30 days. This analysis identified the attribution factors that were most strongly associated with each smoking status.

3. Results

3.1. Demographic characteristics and smoking status of the sample

As shown in Table 1, the sample contained slightly more females (51.4%) than males (48.6%). The distribution of ethnicity was not significantly different among males and females ($p=0.30$), but the distributions of age groups ($p<0.001$) and geographic regions ($p=0.03$) were significantly different. The prevalence of smoking was higher among males than among females at all stages of smoking ($p<0.001$).

3.2. Themes of cognitive attributions for smoking

As shown in Table 2, the EFA suggested that the 17 attributions could be grouped into 8 factors. We labeled these 8 factors as curiosity, coping, social image, social belonging, engagement, autonomy, mental enhancement, and weight control. These themes were similar to, but not exactly the same as, the factors obtained in a previous study that used a similar measure among a multiethnic sample of 8th graders in great Los Angeles (Spruijt-Metz, Gallaher, Unger, & Johnson, 2005). That study identified 4 factors from 19 attributions: personal (including mental enhancement, engagement, and social belonging in this study), functional (equivalent to coping in this study), social image, and weight control. In this study, curiosity and autonomy did not load on any factors and were therefore retained as single items. The decision was made to retain these items because even though they did not load on factors with other attributions, curiosity was endorsed quite frequently by the respondents and therefore represents an important attribution for smoking.

3.3. Relative importance of cognitive attributions, ranked by self-reports

Table 3 shows that, based on self-reports of ever smokers, curiosity was ranked 1st and 2nd for lifetime smoking and past 30-day smoking respectively, but only 4th for daily smoking. Other than curiosity, coping was ranked 1st across all stages, including lifetime smoking, past 30-day smoking, and daily smoking. Social image and social belonging were ranked as more important at earlier stages of smoking, whereas engagement and mental enhancement were ranked as more important at later stages of smoking. Autonomy and weight control were ranked as the least important among all ever smokers.

Based on self-reports of never smokers, coping was ranked 1st and curiosity was ranked 2nd, which is similar to that of past 30-day smokers. Mental enhancement, social belonging, and social image were ranked 4th, 5th and 6th, which is similar to that of daily smokers. Weight control was ranked as the least important, which is similar to that of all ever smokers. However, autonomy was ranked as the 3rd most important and engagement was ranked as the 2nd least important, which is different from that of all ever smokers.

3.4. Relative importance of cognitive attributions, ranked by strength of associations

Table 4 shows that, based on strength of association with smoking, curiosity remained ranked 1st and 2nd for lifetime smoking and past 30-day smoking respectively, but only 4th for daily smoking. Other than curiosity, coping was consistently ranked 1st across all stages of smoking, followed by engagement, social belonging, and social image which were about equally important across all stages of smoking. Autonomy and mental enhancement were significantly associated with smoking, but less important compared with the others. Weight control was not significantly associated with adolescent smoking.

As shown in Table 4, among both males and females, curiosity was ranked 1st for lifetime smoking and coping was ranked 1st for past 30-day smoking. However, the relative importance of most other attributions differed between genders. More attributions were significantly associated with male smoking than female smoking. The numbers of significant attributions among males and females were 7 versus 5 for lifetime smoking, 6 versus 5 for past 30-day smoking, and 7 versus 3 for daily smoking. Among attributions that were associated with both male smoking and female smoking, the associations were almost all stronger among males than among females.

4. Discussion

4.1. Cognitive attributions for smoking and their relative importance

This study indicates that Chinese adolescents attributed their smoking behavior to curiosity about smoking, coping, social image, social belonging, engagement, autonomy, mental enhancement, and weight control. These findings are consistent with some previous studies and inconsistent with others, as described in detail below.

Curiosity was found to be the most important reason for lifetime smoking, which is consistent with previous findings (Sarason et al., 1992). Cronan et al found that, even in late adolescence, curiosity was still an important reason for starting to smoke, reported by more than half of the adolescents who have smoked (Cronan et al., 1991). The present study indicates that curiosity became less important at more advanced stages of smoking.

Previous studies have shown that social image factors such as appearing cool, tough, mature, and attractive to the opposite sex can motivate adolescents to smoke (Allbutt et al., 1995; Rugkasa et al., 2001; Treacy et al., 2007). One study demonstrated that many of the reasons given by Navy recruits about why they started smoking during their first year in the service

were related to social image: “to show I wasn’t afraid,” “to want to be cool,” and “to look like an adult” (Cronan et al., 1991). Other studies have found that image-related attributions were consistently important for smoking across ages (Stanton & Silva, 1993), were more important among females than among males (Barton, Chassin, Presson, & Sherman, 1982), and predicted future cigarette smoking (Aloise-Young, Hennigan, & Graham, 1996). Consistent with previous findings in Western cultural contexts, this study indicates that Chinese adolescents perceived social image as an important reason for their smoking as well. It was ranked as more important by males than by females and was more important at earlier stages of ever smoking. The positive images that adolescents associate with smoking might be derived from western media, where cigarette smoking has been presented as fashionable, elegant, cool, and sophisticated (Davis et al., 2008). Chinese adolescents have numerous opportunities to be exposed to such images because Western media and tobacco advertising are becoming increasingly popular in China. However, the rankings derived by strength of association with smoking indicated that social image was equally important across all stages of smoking, especially among males. In this study, the attribution about projecting a social image of autonomy did not load with the other social image attributions and was not strongly associated with smoking behavior. Autonomy is not necessarily perceived as a positive trait in a collectivist cultural context such as China; therefore it is not surprising that smokers did not report smoking to project a social image of autonomy. However, never smokers reported they might smoke in the future to project a social image of autonomy. Smoking prevention messages for never-smokers might be more effective if they address and counter this expectation.

Adolescents in previous studies have reported that they smoke to facilitate social interactions and strengthen social relationships (Allbutt et al., 1995; Cronan et al., 1991; Rugkasa et al., 2001; Sarason et al., 1992; Stanton & Silva, 1993; Treacy et al., 2007). Adolescents were motivated to smoke to make friends, maintain friendship, and achieve group membership and identity. One study reported this motivation as “social pressure” (Sarason et al., 1992). However, another study found that adolescents were not passively victimized by peer pressure to smoke, but actively sought out friendships with smokers and experimented with smoking as a way of gaining entry into peer groups of smokers (Rugkasa et al., 2001). “Friendship” as a reason for smoking has been found to be relatively consistent across age (Stanton, Mahalski, McGee, & Silva, 1993). Our study indicates that Chinese adolescents also perceived social belonging as an important reason for smoking across all smoking stages.

The role of coping in adolescent smoking has been inconsistent across studies. In some studies, adolescents did express that smoking helped them to calm down when they were stressed (Cronan et al., 1991). However, in another study, adolescents felt that coping with life was a reason for adult smoking and was not relevant to adolescents (Rugkasa et al., 2001). In their views, depression, anxiety, and stress were all adult issues that were irrelevant to them. Those adolescents disagreed that they were motivated to smoke by personal reasons; instead, they explained that they were motivated to smoke for social reasons to gain social status image and group membership. In the present study, coping was almost the most important reason for all stages of smoking. The reasons why Chinese adolescents should report this are not clear but could be explored in future research.

Engagement was found to be a reason for smokers’ smoking in this study, which is consistent with previous findings (Cronan et al., 1991). Engagement was more important at later stages of smoking among males, according to both self-reports and strength of associations with smoking. However, never smokers did not perceive that they might smoke to engage. Because they had never smoked, they might not have formed opinions about whether smoking is useful for engagement.

Mental enhancement was less important statistically as a predictor of smoking status. However, male daily smokers reported mental enhancement as an important reason for smoking, which is worrisome. Based on attribution theory, if people perceive mental enhancement as a reason for smoking, they might smoke when they need to refresh mind or increase concentration. Therefore, among Chinese male smokers, smoking cessation programs might be more effective if they teach adolescents more effective methods of mental enhancement such as good study habits, good sleep hygiene, and other related behaviors such as diet and physical activity.

Weight control was reported as a reason for smoking infrequently in this study, which is consistent with previous findings. Although in a qualitative focus group interview, several individual adolescents expressed weight concern as a motive for both their own smoking and their parent smoking (Allbutt et al., 1995), another quantitative study found that the percentage of adolescents who smoked for the purpose of losing weight was not high, compared with percentages of adolescents who smoked due to other reasons, such as the curiosity, friend smoking, images, and boredom (Cronan et al., 1991).

4.2. Relative importance of cognitive attributions for smoking, ranked by self-reports and by strength of associations with smoking

One of the few studies that examined associations between cognitive attributions and smoking behaviors found that, while smokers gave significantly more agreement to relaxation as a smoking motive, the most important motives associated with cigarette consumption were actually addiction and affective Smoking (Kleinke et al., 1983). In this study, curiosity and coping were consistently ranked by both self-reports and strength of associations with smoking as the most important attributions, and weight control were consistently ranked by the two means as the least important attributions of smoking. This implies that the most obvious reasons that Chinese adolescents give for their smoking are reliable and should not be overlooked. However, the relative importance of other reasons is less consistent. For example, compared with social image and social belonging, engagement was detected as more important by strength of associations but ranked as less important by self-reports. This implies that there is some discrepancy between Chinese adolescents' self-reported reasons for smoking and the factors that are actually correlated with their smoking behavior. To be most effective, smoking prevention and cessation programs could address both types of attributions – those that are actually associated with smoking behavior and those that adolescents believe are influencing their smoking behavior.

4.3. Cognitive attributions for different stages of smoking

Several studies have demonstrated that reasons for smoking vary across stages of smoking trajectory (Baade & Stanton, 2006; Mayhew et al., 2000). For example, one study found that adolescents frequently attributed curiosity, social norms, and social pressure as reasons for beginning smoking, and pleasure and addiction as reasons for current smoking (Sarason et al., 1992). Findings of the present study are consistent with this finding; curiosity was important at the earlier stages, engagement was important at later stages, and coping was important across all stages of smoking. This suggests that health communications for smoking prevention and cessation should be stage-matched.

4.4. Cognitive attributions for male smoking and female smoking

Smoking is much more prevalent among Chinese male adolescents than among female adolescents. Some Western studies have found that male and female adolescents make similar attributions for smoking (Grube, Rokeach, & Getzlaf, 1990; Jenks, 1994b; Palmqvist & Martikainen, 2005; Stanton et al., 1993), but others have found gender differences in attributions (Anderson & Anderson, 1990; Sarason et al., 1992). In this study, attributions for male smoking and female smoking were not exactly the same. In addition, more attributions

were significantly associated with male smoking than with female smoking. This might make smoking prevention interventions difficult to implement in the classroom setting, where boys and girls sit together and receive the same information. More intensive health communications via personal counseling, internet, phone calls or mail might be needed to prevent smoking or encourage cessation among Chinese boys.

4.5. Summary

This study extends the results of previous attribution studies in that it not only identified cognitive attributions for smoking, but also examined the relative importance of each cognitive attribution at different smoking stages and between genders. Therefore, the findings provide more complete information about the causes of adolescent smoking and are instructive for development of evidence-based anti-smoking programs.

4.6. Limitations and future directions

We should acknowledge several limitations in this study. First, data used were from an ongoing study and not specifically collected for the present study. Therefore, the measures for cognitive attributions for smoking were less than ideal. Previous studies have indicated that peer smoking (Chen, Fang, Li, Stanton, & Lin, 2006; Hesketh, Ding, & Tomkins, 2001; Zhang, Wang, & Zhou, 2005) and familial smoking (Chen, Stanton et al., 2006; Xiang et al., 1999; Yang et al., 2004; Zhang et al., 2005) influence Chinese adolescents to smoke. Unfortunately, these important reasons for smoking were not included in present investigation. Future studies should investigate broader attributions for smoking at the intrapersonal, interpersonal, institutional, community, and policy levels. Qualitative approach (such as focus groups) conducted among Chinese adolescents could help to generate more attributions for smoking that are unique to Chinese adolescent culture. Guided by attribution theory, future studies could also better categorize attributions in terms of their locus (personal and situational), stability (stable and unstable), and controllability (controllable and uncontrollable), which may have different implications for self-esteem, expectations, and social emotions (Weiner, 1986). Second, we were unable to account for the potential intraclass correlations among participants within each school due to limited capability of the statistical program we used. However, because the main purpose of the EFA was to estimate the factor loadings rather than to make statistical inferences, the impact of using conventional EFA on our results is likely minimal. Third, although this retrospective study has successfully identified cognitive attributions for Chinese adolescent smoking, their relative importance, and their associations with actual smoking behaviors, longitudinal studies are needed to reveal the roles of these cognitive attributions in subsequent smoking behaviors.

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Table 1

Demographic Characteristics and Smoking Status of the Sample (*N*=14,434)

	All *n* (%)	Male *n* (%)	Female *n* (%)	Gender Difference
		6993 (48.6)	7388 (51.4)	
Age				
12 years or younger	1265 (8.8)	549 (7.8)	696 (9.4)	$\chi^2(5)=46.8$
13	2695 (18.6)	1360 (19.5)	1332 (18.0)	$p<0.0001$
14	1902 (13.2)	1009 (14.4)	890 (12.1)	
15	1505 (10.4)	660 (9.4)	842 (11.4)	
16	3720 (25.8)	1759 (25.2)	1955 (26.5)	
17 years or older	3347 (23.2)	1656 (23.7)	1673 (22.6)	
Ethnicity				
Han	13766 (95.8)	6665 (95.7)	7071 (96.0)	$\chi^2(1)=1.1$
Others	600 (4.2)	302 (4.3)	294 (4.0)	$p=0.30$
City				
Chengdu	2198 (15.2)	1047 (15.0)	1141 (15.4)	$\chi^2(6)=14.2$
Hangzhou	1902 (13.2)	929 (13.2)	970 (13.1)	$p=0.03$
Shenyang	2327 (16.1)	1117 (16.0)	1188 (16.1)	
Wuhan	2106 (14.6)	995 (14.2)	1111 (15.0)	
Harbin	1852 (12.8)	893 (12.8)	950 (12.9)	
Kunming	1992 (13.8)	1040 (14.9)	949 (12.9)	
Qingdao	2057 (14.3)	972 (13.9)	1079 (14.6)	
Smoking Status				
Never smoker	8760 (61.2)	3517 (50.8)	5215 (71.1)	$\chi^2(3)=811.4$
Lifetime smoker	3524 (24.6)	1947 (28.0)	1562 (21.3)	$p<0.0001$
Past 30-day smoker	1544 (10.8)	1053 (15.2)	489 (6.6)	
Daily smoker	484 (3.4)	413 (6.0)	70 (1.0)	

Table 2

Cognitive Attributions for Smoking - Factor Pattern Matrix

	Factor							
I smoke (or might smoke), because:	**Coping**	**Weight Control**	**Mental Enhancement**	**Social Image**	**Engagement**	**Social Belonging**	**Autonomy**	**Curiosity**
It helps me forget my problems	**0.93**	0.07	−0.10	−0.03	−0.06	0.12	0.05	−0.04
It helps me deal with anger	**0.88**	0.01	−0.06	0.03	0.07	0.04	0.00	0.07
It helps me deal with stress	**0.84**	0.04	0.23	−0.05	0.00	−0.05	−0.02	−0.03
It helps me to relax	**0.66**	−0.05	0.25	0.10	0.13	−0.08	0.00	−0.05
It helps me keep my weight down	0.08	**0.92**	0.08	0.07	−0.09	−0.05	−0.10	0.08
It keeps me from eating too much	−0.01	**0.85**	0.04	−0.04	0.12	−0.03	0.07	0.05
It helps me concentrate	0.12	0.10	**0.79**	−0.07	0.04	0.03	0.02	0.02
It gives me more energy	0.16	−0.08	**0.77**	0.07	−0.01	0.03	0.12	0.00
It helps me study	−0.02	0.39	**0.64**	0.01	−0.01	0.08	−0.03	−0.07
It makes me look good	0.05	0.02	−0.02	**0.92**	0.00	−0.08	0.00	0.11
I would have more friends	−0.03	0.05	0.06	**0.66**	0.04	0.30	0.00	−0.07
It keeps me from being bored	0.16	−0.02	−0.05	0.02	**0.89**	0.01	−0.06	0.05
It gives me something to do	0.02	0.06	0.15	0.00	**0.75**	0.04	0.04	−0.01
I don’t like to refuse when someone gives me a cigarette	0.06	−0.10	0.14	−0.01	−0.01	**0.91**	−0.12	0.18
I don’t want to make another person smoke alone	−0.01	0.26	−0.13	0.05	0.11	**0.51**	0.32	−0.17

	Factor							
I smoke (or might smoke), because:	**Coping**	**Weight Control**	**Mental Enhancement**	**Social Image**	**Engagement**	**Social Belonging**	**Autonomy**	**Curiosity**
I feel like I'm making my own decisions	0.04	−0.05	0.10	0.00	−0.03	−0.06	**0.95**	0.10
I'm curious what it's like	−0.03	0.08	−0.04	0.05	0.03	0.08	0.08	**0.90**

Factor loadings greater than 0.50 are shown in bold

Table 3

Relative Importance of Cognitive Attributions for Smoking, Ranked by Self-reports

	Never Smoker		Lifetime Smoker		Past 30-day Smoker		Daily Smoker	
	n (%)	Rank	*n (%)*	Rank	*n (%)*	Rank	*n (%)*	Rank
				All				
Curiosity	462 (5.3)	2	1212 (34.6)	1	510 (33.3)	2	134 (27.9)	4
Coping	494 (5.7)	1	695 (19.9)	2	639 (41.8)	1	331 (68.8)	1
Social Image	117 (1.3)	6	288 (8.2)	3	246 (16.1)	5	127 (26.4)	6
Social Belonging	125 (1.4)	5	264 (7.5)	4	272 (17.8)	4	133 (27.7)	5
Engagement	107 (1.2)	7	250 (7.1)	5	332 (21.7)	3	192 (39.9)	2
Autonomy	176 (2.0)	3	202 (5.8)	6	187 (12.2)	6	81 (16.8)	7
Mental Enhancement	152 (1.7)	4	131 (3.7)	7	173 (11.3)	7	160 (33.3)	3
Weight Control	64 (0.7)	8	62 (1.8)	8	64 (4.2)	8	34 (7.1)	8
				Male				
Curiosity	137 (3.9)	2	626 (32.4)	1	370 (35.5)	2	120 (29.3)	5
Coping	156 (4.5)	1	344 (17.8)	2	462 (44.3)	1	298 (72.7)	1
Social Image	53 (1.5)	6	201 (10.4)	3	205 (19.7)	5	121 (29.5)	4
Social Belonging	54 (1.5)	5	174 (9.0)	4	215 (20.6)	4	118 (28.8)	6
Engagement	50 (1.4)	7	160 (8.3)	5	259 (24.9)	3	178 (43.4)	2
Autonomy	81 (2.3)	3	128 (6.6)	6	143 (13.7)	7	76 (18.5)	7
Mental Enhancement	69 (2.0)	4	85 (4.4)	7	146 (14.0)	6	148 (36.1)	3
Weight Control	13 (0.4)	8	29 (1.5)	8	48 (4.6)	8	29 (7.1)	8
				Female				
Curiosity	322 (6.2)	2	583 (37.5)	1	140 (28.8)	2	14 (20.0)	3
Coping	337 (6.5)	1	349 (22.5)	2	176 (36.2)	1	32 (45.7)	1
Social Image	63 (1.2)	6	86 (5.5)	5	41 (8.4)	6	5 (7.1)	6
Social Belonging	70 (1.4)	5	89 (5.7)	4	57 (11.7)	4	15 (21.4)	2
Engagement	57 (1.1)	7	90 (5.8)	3	72 (14.8)	3	13 (18.6)	4
Autonomy	93 (1.8)	3	73 (4.7)	6	44 (9.1)	5	5 (7.1)	6
Mental Enhancement	81 (1.6)	4	45 (2.9)	7	27 (5.6)	7	12 (17.1)	5
Weight Control	51 (1.0)	8	33 (2.1)	8	16 (3.3)	8	5 (7.1)	6

Table 4

Relative Importance of Cognitive Attributions for Smoking, Ranked by Strength of Associations with Smoking

	All					Male					Female				
	***β*(*se*)**	***OR*(95% *CI*)**	**LS**	**PS**	**DS**	***β*(*se*)**	***OR*(95% *CI*)**	**LS**	**PS**	**DS**	***β*(*se*)**	***OR*(95% *CI*)**	**LS**	**PS**	**DS**
Curiosity[a]															
Lifetime smoking	2.05(0.06)	7.78(6.86,8.82)*	1			2.23(0.10)	9.31(7.59,11.43)*	1			1.99(0.08)	7.34(6.22,8.65)*	1		
Past 30-day smoking	1.64(0.08)	5.13(4.36,6.05)*		2		2.00(0.12)	7.41(5.84,9.40)*		2		1.30(0.13)	3.67(2.84,4.73)*		3	
Daily smoking	1.24(0.13)	3.46(2.66,4.50)*			4	1.64(0.17)	5.16(3.72,7.15)*			3	0.60(0.33)	1.82(0.95,3.47)			--
Coping[a]															
Lifetime smoking	0.87(0.08)	2.38(2.05,2.76)*	2			0.98(0.12)	2.67(2.12,3.36)*	2			0.86(0.10)	2.37(1.94,2.90)*	2		
Past 30-day smoking	1.73(0.09)	5.61(4.73, 6.67)*		1		2.01(0.13)	7.48(5.85,9.57)*		1		1.50(0.14)	4.47(3.43,5.83)*		1	
Daily smoking	2.30(0.13)	10.00(7.70,12.99)*			1	2.64(0.16)	14.07(10.19,19.43)*			1	1.70(0.32)	5.48(2.95,10.16)*			2
Social Image[a]															
Lifetime smoking	0.49(0.13)	1.64(1.27,2.12)*	5			0.81(0.18)	2.24(1.58,3.18)*	4			0.06(0.20)	1.06(0.71,1.57)	--		
Past 30-day smoking	0.65(0.14)	1.91(1.44,2.52)*		6		0.93(0.19)	2.53(1.75,3.67)*		5		0.15(0.25)	1.16(0.71,1.90)		--	
Daily smoking	0.84(0.18)	2.31(1.63,3.29)*			5	1.20(0.22)	3.32(2.15,5.11)*			5	−0.54 (0.57)	0.58(0.19,1.78)			--
Social Belonging[a]															
Lifetime smoking	0.67(0.13)	1.96(1.52,2.51)*	4			0.88(0.18)	2.41(1.70,3.42)*	3			0.39(0.19)	1.47(1.01,2.14)&	4		
Past 30-day smoking	1.21(0.14)	3.35(2.57,4.38)*		4		1.37(0.18)	3.95(2.75,5.67)*		4		0.96(0.22)	2.61(1.69,4.04)*		4	
Daily smoking	1.30(0.17)	3.66(2.61,5.15)*			3	1.41(0.22)	4.10(2.67,6.29)*			4	1.74(0.38)	5.67(2.70,11.92)*			1
Engagement[a]															
Lifetime smoking	0.77(0.13)	2.16(1.66,2.81)*	3			0.80(0.18)	2.24(1.56,3.21)*	5			0.79(0.20)	2.21(1.49,3.28)*	3		
Past 30-day smoking	1.47(0.14)	4.33(3.31,5.66)*		3		1.53(0.19)	4.62(3.21,6.65)*		3		1.42(0.22)	4.14(2.69,6.36)*		2	
Daily smoking	1.69(0.17)	5.40(3.91,7.47)*			2	1.81(0.21)	6.13(4.07,9.21)*			2	1.27(0.41)	3.57(1.61,7.92)#			3
Autonomy[a]															
Lifetime smoking	0.41(0.12)	1.51(1.19,1.92)*	6			0.55(0.17)	1.73(1.25,2.40)*	6			0.28(0.19)	1.33(0.92,1.91)	--		
Past 30-day smoking	0.73(0.14)	2.07(1.59,2.70)*		5		0.87(0.18)	2.38(1.68,3.38)*		6		0.65(0.22)	1.91(1.24,2.95)#		5	

	All					Male					Female				
	***β*(*se*)**	***OR*(95% *CI*)**	**LS**	**PS**	**DS**	***β*(*se*)**	***OR*(95% *CI*)**	**LS**	**PS**	**DS**	***β*(*se*)**	***OR*(95% *CI*)**	**LS**	**PS**	**DS**
Daily smoking	0.60(0.19)	1.83(1.27,2.64)#			7	0.85(0.22)	2.33(1.50,3.62)*			6	0.08(0.53)	1.09(0.39,3.06)			--
Mental Enhancement[a]															
Lifetime smoking	−0.54(0.15)	0.58(0.44,0.77)*	7			−0.51(0.20)	0.60(0.41,0.89)&	7			−0.72(0.22)	0.49(0.31,0.76)#	5		
Past 30-day smoking	−0.12(0.15)	0.88(0.66,1.19)		--		−0.06(0.20)	0.94(0.64,1.39)		--		−0.51(0.28)	0.60(0.35,1.03)		--	
Daily smoking	0.75(0.17)	2.12(1.51,2.97)*			6	0.79(0.22)	2.20(1.44,3.36)*			7	0.74(0.41)	2.09(0.93,4.69)			--
Weight Control[a]															
Lifetime smoking	−0.30(0.21)	0.74(0.49,1.12)	--			0.33(0.39)	1.39(0.64,3.01)	--			−0.53(0.26)	0.59(0.35,1.00)	--		
Past 30-day smoking	−0.36(0.24)	0.70(0.44,1.12)		--		0.31(0.41)	1.36(0.61,3.01)		--		−0.60(0.35)	0.55(0.28,1.08)		--	
Daily smoking	−0.48(0.30)	0.62(0.34,1.12)			--	0.07(0.46)	1.08(0.44,2.64)			--	0.00(0.57)	1.00(0.33,3.07)			--

[a] reference group is non-smoking.

* $p<0.001$;

# $p<0.01$;

& $p<0.05$.

LS: lifetime smoking; PS: past 30-day smoking; DS: daily smoking.