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Predicting Tobacco Smoking Among Male Adolescents in Hamadan City, West of Iran in 2014: An Application of the Prototype Willingness Model

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ABSTRACT

Background: As adolescent tobacco smoking has become a widespread problem in developing countries, it is time to understand the cognitive determinants of adolescents' decisions to engage in tobacco smoking. This study aimed to investigate the predicting factors associated with tobacco smoking among male adolescents based on Prototype Willingness Model (PWM) as a theoretical framework.

Methods: This descriptive-analytical study was carried out on 810 male adolescents of Hamadan City western Iran, recruited with a multistage sampling method. The data-gathering tool consisted of a questionnaire based on the PWM constructs. Data analysis was performed using SPSS-19 software, by bivariate correlations, liner and logistic regression tests.

Results: The prevalence of current tobacco smoking was 17.2%. Behavioral willingness and subjective norms were the most important predictors of behavioral intentions, whereas subjective norms, attitude and prototype were the most important predictors for behavioral willingness. The result obtained from logistic regression analysis revealed that both pathways of PWM constructs [behavioral intention (OR=1.207; 95% CI: 1.13, 1.28) and behavioral willingness (OR=1.334; 95% CI: 1.25, 1.41)] were significant predicting factors for tobacco smoking among male adolescents.

Conclusions: The framework of the PWM is applicable and useful in understanding tobacco smoking among male adolescents. In addition, the results revealed the importance of social reaction path when examining adolescents' smoking status.

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Introduction

Tobacco smoking is one of the major health related problem among adolescents and young adults¹. Tobacco smoking is a widely prevalent condition accompanied by high morbidity and mortality, so that more than 5 million deaths per year occur due to tobacco smoking worldwide². Studies of substance abuse among Iranian society showed that adolescents' interest to smoking and consequently initiation of tobacco smoke is greater than the general population. For example, 25.6% of high school students as well as employed and unemployed youth reported using tobacco smoking and in these subjects, the consumption rate was 12.3% in daily smoking³. 24.8% of high school students had tried tobacco smoking, and the figures for having tried the other drugs were 53% for hookah smoking and 13.6% for alcohol⁴. These percentages are considerably higher than those reported for the 14-20-year-old sample by Moeini et al.⁵ and Bashirian et al.⁶ which found that 10.2% and 11.1% had tobacco smoking, respectively.

Tobacco smoking among adolescents may lead to serious social consequences as substance abuse, physical health problems, sleep disturbances, academic, and emotional problems⁷. The rate of reported substance abuse has increased

in the recent years among young people between 15 and 25 years in Iran⁸. For example, among Iranian male adolescents and young adults aged 16 to 24 years, the prevalence of psychoactive drugs was 9%⁹. A similar increase among young people has been found in other developing countries as well, for example, in the India¹⁰ and the Turkey¹¹.

The worldwide magnitude of tobacco smoking as well as Iran indicate necessity of designing comprehensive and effective interventions to prevent tobacco smoking among adolescents¹². To design more effective educational programs to reduce the prevalence of tobacco smoking, it is important to understand the determinants (e.g., social norms, specific beliefs) of adolescents' decisions to engage in this risky behavior¹³. To test the relationship between beliefs and behavior more explicitly, dual-processing models of the behavior-attitude relationship, such as the Prototype Willingness Model (PWM) was developed to better predict behavior and explain the decision-making process behind it¹⁴ (Figure 1).

The PWM relies on a dual-processing approach developed to examine cognitive factors on health behavior. The basic assumption of the model is that initial adolescent

risk behavior, although volitional, is not intended or planned; rather, is a response to conditions that are risk conducive¹⁴. It does this by incorporating two pathways to risk behavior. The first path, called the *reasoned path*, reflects the fact that some risk behavior is intentional even among young adolescents which attitudes and subjective norms are antecedents of behavioral intention, as outlined in the Theory of Reasoned Action (TRA) and the Theory of Planned Behavior (TPB). According to this path, adolescent risk behavior is as the result of a reasoned and thoughtful process. The second path to risk behavior, called the *social reaction path*, consisting of prototype favorability predicting behavioral willingness. In general, this path is much less deliberative, it acknowledges that much risk behavior is not intended, and that adolescents often find themselves in situations that facilitate (but do not demand) risky behaviors (e.g., an unsupervised party where alcohol and drugs are available)¹⁴. In these situations, decision-making process is often unintentionally and behavioral willingness determines risky behavior¹⁵. According to the PWM, behavioral willingness is associated with individuals' social images (prototypes) of the typical smokers. Prototypes are images of people who engage in risk behaviors, e.g., the type of person who smokes cigarettes¹⁶. The more positive the image, the more willing they will be to smoke when given the opportunity^{17,18}.

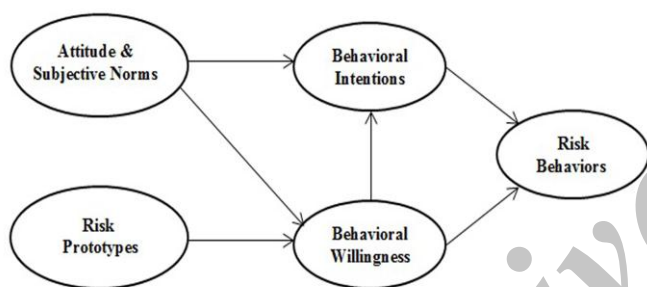


Figure 1: Prototype Willingness Model

This study was conducted to determine predictors of tobacco smoking among male adolescents in Hamadan based on PWM to registering and discussing these assumptions: (a) attitude, subjective norms and behavioral willingness would predict behavioral intention; (b) attitude, subjective norms and smoker prototype evaluations would predict behavioral willingness; and (c) behavioral intention and behavioral willingness would predict behavior.

Methods

Participants

This cross-sectional study was conducted among high school male students in Hamadan City, west of Iran, in 2014. A multi-stage (random) probability sample was used to obtain participants. For this purpose, each region of the city was considered as a section (2 regions). Then, seven male high schools were randomly selected from each section using random numbers table (7 out of 15 in section 1 and 7 out of 13 in section 2). The high school had three grades from 10th, 11th and 12th grades and 15 to 18 years of age in Iran. After schools had been recruited, one class was randomly selected from each grade of one to three. Finally, 20 students were selected through simple sampling method from each class.

This included a total sample of 840 of which 810 male students participated voluntarily (Response rate about 96%).

The study was conducted with approval from Tarbiat Modares University' institutional review board and ethical committee. Informed assent and consent were obtained from participants.

Measures

Prior to conducting the main project, a pilot study was carried out. Initially the relevant questionnaires were administered to 30 students who were similar to participants in the main study to obtain feedback about the clarity, length comprehensiveness, time of completion, and internal reliability of the measures. In addition, content validity of questionnaire was confirmed by 10 health education and promotion experts through calculating the content validity index (CVI) and content validity ratio (CVR).

The self-administered questionnaire included closed questions and required approximately 35 min to complete. The questionnaire comprised two sections: (1) demographic and background factors: including age, grade, major, father's job, mother's job, living status, smoker father, smoker friend and smoking initiation age; (2) PWM theoretical constructs: PWM scales were measured in relation to tobacco smoking that were modified from scales of Hukkelberg¹⁹ and Gerard²⁰ and 29 items were composed under six major constructs: a) attitude positive toward tobacco smoking; b) subjective norms about tobacco smoking; c) prototype images; d) Tobacco smoking willingness; e) behavioral intention to tobacco smoking; f) Tobacco smoking behavior.

Positive Attitude toward Tobacco Smoking: Six items were designed to measure attitude toward tobacco smoking (e.g., "If I tobacco smoke it would help me to forget problems"). The items were rated on a 5-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Higher scores indicate more positive attitude to tobacco smoking. An estimated reliability coefficient for attitude toward tobacco smoking was 0.79 that this result demonstrate internal consistency of this questionnaire.

Subjective Norms about Tobacco Smoking: These were measured in relation to best friend, other friends, parent, and teachers. A sample item is "My best friend thinks I should not or should tobacco smoking." The items were rated on a 5-point scale ranging from 1 (*should not*) to 5 (*should*). Motivation to comply with each of the referent groups was measured with items for each group. A sample item is "With regards to tobacco smoking, I want to do what my best friend thinks I should." The items were rated on a 5-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). These items were multiplicatively combined and averaged. An estimated reliability coefficient for subjective norms was 0.75 that this result reveals internal consistency of this questionnaire.

Prototype images about Tobacco Smokers: Images of adolescent smoker were introduced with this lead-in statement: "Take a moment to think about 16, 17, or 18-year-old [boys] who tobacco smoking". Following were seven items with the adjective descriptor stem "How [descriptor] are they?" Each item had a 5-point response scale keyed to the descriptor, ranging from 1 (not at all) to 5 (very). The

descriptors were popular, selfish, smart, cool, immature, unattractive, and dull. Items were scored, with a higher score indicating a more favorable perception of peers who tobacco smoking, and then the average of the 7 items was computed. Reliability analyses showed satisfactory reliability ($\alpha=0.76$).

Behavioral Willingness: This section began with a description of a hypothetical scenario: “Suppose you were with a group of kids and there was some drug that you could have if you wanted. How willing would you be to do the following things?” four items that assessed willingness to tobacco smoking followed this statement—“take a cigarette and smoke a some pack” “take a cigarette and smoke a cigarette end” “tanks to them, answer no will,” and “I will leave the position or location”—each rated on a 5-point Likert-type scale ranging from 1 (not at all) to 5 (very). An estimated reliability coefficient for behavioral willingness was 0.74.

Intention to Tobacco Smoking: Intention to use was measured using three items. For example, it was asked “At any time during the next 3 month do you think you will smoke a cigarette? The items were rated on a 5-point scale ranging from 1 (*very likely*) to 5 (*very unlikely*). Higher scores indicate intention to use more frequently.

Tobacco Smoking behavior: Male students were asked when, if ever, they had used tobacco smoking. Participants were placed into one of the following tobacco smoking categories: never used, used, but some time and use every day. The participant who had used tobacco smoking in the past was then classified as a user of tobacco smoking.

All statistical analyses were performed using version 18.0 of the statistical software package SPSS (SPSS Inc., Chicago, IL, USA). The *P* value was set 0.05. Correlations, logistic regression and linear regression analyses were used to determine the predictors of tobacco smoking.

Results

The results were obtained from 810 questionnaires completed by male students. Age of respondents ranged from 14 to 18 years, with a mean age of 16.42 years ($SD=0.89$). Regarding frequency of tobacco smoking, a number of 22 persons (2.7%) were always smoker, 117 (14.4%) subjects were occasionally smoker. More details of demographic characteristics of the participants are shown in Table 1.

Descriptive statistics (means and standard deviation) along with the bivariate correlations among the variables of the PWM are given in Table 2. All PWM variables had significant positive correlation with each other.

As can be seen in Table 3, multiple regression analysis was performed to explain the variation in tobacco smoking intention based on *reasoned path* in PWM. The PWM components accounted for 27% of the variance in intentions among male adolescents, whereas behavioral willingness was the only significant predictor ($\beta=.492$, $P<.001$). The inclusion of subjective norms in the second step increased the explained variance significantly ($R^2=0.27$, $P<.001$), whereas inclusion of the attitude in this step did not. Thus, behavioral willingness and subjective norms were the significant predictors of intentions to tobacco smoking in the final step

($\beta=0.395$, $P<0.001$ and $\beta=0.193$, $P<0.001$) among male adolescents.

Table 1: Summary statistics for characteristics of study participants (n=810)

Variables	Frequency	Percent
Grade		
Tenth	95	11.7
Eleventh	365	45.1
Twelfth	350	43.2
Major		
Natural Sciences	279	34.4
Mathematics	230	28.4
Human Sciences	148	18.3
Technical & Occupational	153	18.9
Father's job		
Worker	126	15.6
Employee	238	29.4
Free Job	376	46.4
Retired	40	4.9
Unemployed	30	3.7
Mother's job		
Housewife	726	89.6
Employed	84	10.4
Living status		
Both parents	774	95.6
Father	6	0.7
Mother	16	2
Other	14	1.7
Smoker father		
Always	120	14.8
Occasionally	222	27.4
Never	468	57.8
Smoker friend		
Always	89	11
Occasionally	251	31
Never	470	58
Tobacco smoking		
Always	22	2.7
Occasionally	117	14.5
Never	671	82.8
Age, mean (SD)	16.42	0.89
Smoking initiation age, mean (SD)	13.73	2.22

Table 2: Descriptive statistics and inter correlations between the Prototype Willingness Model variables (n=810)

Variables	1	2	3	4	5	Mean (SD)
1. Attitude	1.000	0.472	0.383	0.281	0.423	13.26 (4.6)
2. Subjective Norms		1.000	0.387	0.390	0.500	12.89 (5.1)
3. Prototypes			1.000	0.202	0.348	16.50 (5.2)
4. Behavioral Intention				1.000	0.492	5.61 (3.5)
5. Behavioral willingness					1.000	7.35 (3.8)

Table 3: Multiple regression analyses predicting behavioral intention to tobacco smoking (n=810)

Steps	β	B	SE	<i>P</i> value	Adjusted R^2
Step 1					
Attitude	0.032	0.025	0.027	0.368	0.26
Subjective norms	0.182	0.128	0.026	0.001	
Behavioral willingness	0.387	0.363	0.034	0.001	
Step 2					
Subjective norms	0.193	0.136	0.024	0.001	0.27
Behavioral willingness	0.395	0.371	0.033	0.001	

B: unstandardized regression coefficient, SE: standard error

Table 4 shows that the PWM components accounted for 31% of the variance in willingness to tobacco smoking based on *social reaction path*, whereas subjective norms, attitude and prototype were the significant predictors. The inclusion of attitude in the second step increased the explained variance significantly ($R^2=0.290$, $P<0.001$), also inclusion of prototype in the third step increased the explained variance significantly ($R^2=0.310$, $P<0.001$). Thus, whereas subjective norms, attitude and prototype were the significant predictors of willingness to tobacco smoking in the final step ($\beta=0.351$, $P<0.001$, $\beta=0.206$, $P<0.001$ and $\beta=0.134$, $P<0.001$) among male adolescents.

Table 4: Multiple regression analyses predicting behavioral willingness to tobacco smoking (n=810)

Steps	β	B	SE	P value	Adjusted R ²
Step 1					0.24
Subjective norms	0.500	0.376	0.023	0.001	
Step 2					0.29
Subjective norms	0.386	0.290	0.025	0.001	
Attitude	0.241	0.199	0.028	0.001	
Step 3					0.31
Subjective norms	0.351	0.264	0.026	0.001	
Attitude	0.206	0.170	0.028	0.001	
Prototype	0.134	0.098	0.024	0.001	

B: unstandardized regression coefficient, SE: standard error

Besides, multiple logistic regression was used to predict whether participants engaged tobacco smoking from (a) behavioral willingness (*reasoned path*), and (b) behavioral intention (*social reaction path*). Behavioral willingness and behavioral intention significantly predicted whether participants engaged in tobacco smoking, and accounted for 42% of the variance (based on the Nagelkerke R²). Behavioral willingness was a better predictor of behavior ($R^2=0.359$, $P<0.001$) compared to behavioral intention ($R^2=0.244$, $P<0.001$) (Table 5).

Table 5: Logistic regression: predicting tobacco smoking with Prototype Willingness Model variable (n=810)

Variables (Step 1)	B	SE	OR	P value	R ²
Behavioral Intention	0.188	0.030	1.207	0.001	0.244
Behavioral willingness	0.288	0.031	1.334	0.001	0.359

B: unstandardized regression coefficient, SE: standard error, OR: odds ratio, R²: nagelkerke R²

Discussion

The current study was conducted to examine the sociocognitive processes contributing to tobacco smoking decision-making, using PWM among male adolescents. The present study has effective results that can play an important role in preventing tobacco smoking. Regarding the prevalence of tobacco smoking, 17.2% of participants reported that they had history of tobacco smoking within their lifetime, which is consistent with the findings of similar studies^{21,22}. Nonetheless, the rate of tobacco smoking among adolescents was higher than other studies^{5,6}. This might be due to different in sample size, easy access to cigarette, and demographic and geographic differences in target population.

The current study showed that subjective norms and behavioral willingness, in the reasoned path of the PWM, were significantly associated with intention of tobacco smoking. This finding is consistent with the results of similar studies in the field of high-risk behaviors^{12,19,23,24}. It seems that peer pressure and motivation to comply (as important

concepts of subjective norms) have determinant role in the onset of substance use²⁵. Consequently, developing connection and friendship with deviant peers (in 60% of cases, first-time drug users are introduced to this behavior by friends) on the one hand, and sense of belonging to a certain group (as one of the most important needs of adolescents) on the other hand are the reasons for the highlighted role of subjective norms²⁵. Thus, training assertiveness skills such as skills of substances rejection to urging peers will have significant role in reducing subjective norms. This matter has also been emphasized in some studies.

The lack of association between attitude and intention of smoking is an important finding of this research. Yet, based on the reasoned path hypothesis, it was expected that attitude could predict behavioral intention²⁶. This discrepancy might be due to the participants' responses to attitudinal research questions were mostly based on the acceptability and acknowledgement of a behavior, which is per se affected by extensive educational activities in these areas. This also prohibits people from expressing their actual attitudes towards tobacco smoking.

Analysis of social reaction path in the PWM revealed that attitude, subjective norms, and participants' positive prototype about the tobacco smokers were associated with willingness to engage in tobacco smoking. The results in this section are consistent with the findings of similar studies²⁷⁻²⁹. Because, positive prototypes about tobacco smokers had considerable impact on willingness to engage in tobacco smoking among adolescents¹⁹, it seems that paying attention to the antecedents of the adolescents' images is essential in explaining recent finding of the study. Recent biobehavioral models of smoking have suggested that four such antecedents of the adolescents' images including; level of academic orientation, ineffective parenting style, risk-taking tendency, and social context²⁰. Therefore, paying attention to this issue in the future studies in form of community-based research is recommended.

Results from this study showed that both "reasoned path" and "social reaction path" are capable of predicting tobacco-smoking behavior; additionally, according to the findings, the behavioral willingness can predict the tobacco smoking better than the behavioral intention. These findings are consistent with the results of earlier studies in terms of risky behaviors among adolescents^{19,23,30}. It seem that adolescents frequently find themselves in situations that facilitate or encourage risky behavior, therefore, the decision-making process is often irrational. This decision-making might be due to the accessibility to cigarette in the society. The more it is accessible, the more it is used, the more adolescents are unintentionally confronted with it, and probably the more wrongful decisions are made¹⁴. Moreover, paying attention to the role of age and experiences is essential in explaining recent findings. Usually, aging and the broadened experiences it brings make people to arrive at decisions that are more reasonable²⁶. It seems that adolescents are more prone to make irrational decisions in their life, especially with respect to high-risk behaviors, not only for their age and little experience they have, but also for tending to display more risk-taking behaviors.

Although the present study has several strengths, it has certain limitations. First, data collection was based on self-reporting questionnaire and it may raise the possibility of

recall and response bias, but as with any risky behavior study, potential bias may occurred in the results by adolescents who had not correct respond. Second, the study participants were recruited from high schools who might not be representative of all adolescents in our country. Because, adolescents who have dropped out of school are more likely to smoke than those who are in school. The future studies are needed to overcome these problems.

Conclusions

The results indicated the effectiveness of PWM to predict male adolescents' behavior towards tobacco smoking. Attitude, subjective norms, prototypes, behavioral willingness and intention were all significantly associated with tobacco smoking; however, results revealed the importance of social reaction path rather than reasoned path when examining adolescents' smoking status. Therefore, it is recommended to implement educational programs using the PWM with emphasis on behavioral willingness and prototype images about tobacco smokers to facilitate the prevention and control of tobacco smoking.

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Conflict of interest statement

The authors report no conflict of interest in the undertaking of this research.

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