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## THE EFFECT OF WEB-BASED INTERVENTION ON PREVENTING TOBACCO SMOKING AMONG MALE ADOLESCENTS: AN APPLICATION OF THE THEORY OF PLANNED BEHAVIOR

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### ABSTRACT

**Aim:** Tobacco smoking is one of the most common problems in the developing countries. Therefore employing effective strategies for prevention of tobacco smoking seem to be necessary. This study aimed to determine the effectiveness of web-based intervention to prevent tobacco smoking among male adolescents based on the Theory of Planned Behavior as a theoretical framework. **Methods:** In this quasi-experimental study, 114 male adolescents were randomly divided into two experimental and control groups in Hamadan, west of Iran. Data was collected using a questionnaire including the Theory of Planned Behavior constructs and demographic variables. Intervention was twelve web-based sessions applied in the experimental group. Both groups were followed for six months after the intervention. Finally, data analysis was performed using SPSS-18 by Chi-square, Independent T-test, Paired T-test and McNemar. **Finding:** The mean scores for the constructs of Theory of Planned Behavior, and tobacco smoking behavior showed no significant differences between the two groups before the intervention. The result showed that educational manipulation had significant effect on experimental group's average response for attitude toward tobacco smoking, subjective norms, perceived behavior control and behavioral intention ( $P < 0.001$ ). After the educational intervention, significant differences were observed in experimental group compared to control group. **Conclusion:** The results show that applying web-based intervention would be an efficient strategy for preventing tobacco smoking among adolescents.

**Keywords:** Adolescents, e-Learning, Smoking, Student, Theory of Planned Behavior

### INTRODUCTION

Tobacco smoking is one of the major risk factors of cardiovascular diseases, respiratory diseases, cancer and stroke (Carter *et al.*, 2015; Sharma *et al.*, 2015). In addition to physical damage, smoking jeopardizes mental health and addiction to opiates as well (Allen, 2015). Currently, there are about one billion smokers in the world and it is estimated that by 2030 one billion people of younger adults will start smoking (Bilano *et al.*, 2015). Prevalence of tobacco smoking in the Iranian society was 11.9% for individuals above the age of 15 that every one of them uses 13.2 cigarettes averagely on a daily basis (Moeini *et al.*, 2012). Ramazankhani's study showed that 25.5% of Iranian adolescents have reported a history of smoking (Ramezankhani *et al.*, 2010). Also in studies by Bashirian *et al.*, and Barati *et al.*, prevalence of tobacco smoking among Iranian adolescents were reported 11.1% and 17.2%, respectively (Bashirian *et al.*, 2012; Barati *et al.*, 2015). Patterns and trends of tobacco smoking are also very thinkable in Iran, since it is reported that the age of onset is adolescence and between 13 and 18 years (Barati *et al.*, 2014).

Adolescence is a period during which the person on one hand faces sudden and rapid physical changes, and on the other hand, psychological changes also occur by which a wave of mental turbulence and disturbing occurs, as well (Berenbaum *et al.*, 2015). Large numbers of vulnerable adolescents think they can use tobacco just to have fun or to gain experience, but they soon realize that smoking becomes an emotional support for them (Jafarabadi *et al.*, 2012).

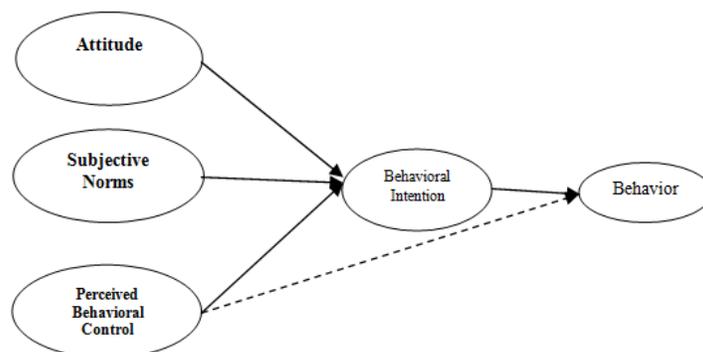
Given the demographic structure of developing countries, designing and implementing tobacco smoking prevention programs among adolescents seems necessary (Andersen *et al.*, 2014). In this regard, the World Health Organization has announced health education as one of the basic and important strategies of

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prevention programs (Glanz *et al.*, 2008). Health education makes a sustainable change in the attitudes and behaviors of people and ultimately changes their lifestyles (Gallagher and Updegraff, 2012). The point to be noted in terms of educational strategies is that, nowadays, knowledge, social behaviors, interests and thinking of adolescents differ noticeably with those of earlier generations (Hamel *et al.*, 2011). Fundamental changes have been shaped in behaviors and attitudes of today's adolescents that much of them are driven by the arrival and the spread of new communication technologies such as the Internet. It seems that the Internet and other information and communications technologies not only have increased the information of younger generation, but they also have influenced their trends and tendencies (Hunley *et al.*, 2005).

Results of studies suggest that the application of web-based educational interventions to prevent risk behaviors has new features and capabilities including added extensive contacts and covering a lot of people, lack of time and place constrictions on access to information, ability to be adjusted and updated to meet the changing needs of the audience and attractiveness of the message content (Wutoh *et al.*, 2004). A few similar studies have reported the higher effectiveness of web-based educational interventions on prevention of drug abuse compared with traditional methods such as lectures and educational booklets (Bewick *et al.*, 2008; Cremers *et al.*, 2015).

In addition, some experts believe that one reason for failure of educational programs is the lack of attention to etiological studies and founding them regardless of psychosocial models as a defined conceptual framework in educational program (Bashirian *et al.*, 2014). Theory of Planned Behavior (TPB) was introduced by Fishbein and Ajzen (1988) (Ajzen, 1991) (Figure 1).



**Figure 1: Theory of Planned Behavior**

Due to being belief-oriented, the TPB compared with other theories, is more efficient to explain the factors associated with risky behaviors. In this theory, individuals gather and regularly evaluate the information available on target behavior; they also consider the consequences of behaviors, and then decide based on their reasoning to do or not to do a specific behavior (Glanz *et al.*, 2008).

According to the TPB, behavioral intention is predicted by three factors: (a) Attitude, which is positive or negative evaluation of an individual to perform a behavior; (b) Subjective norms that points out the social pressure perceived by the individual to do or not to do the target behavior, and (c) Perceived behavioral control, which is defined as a degree of one's voluntary control sense for doing or not doing a behavior (Glanz *et al.*, 2008). In this regard, the results of similar studies on high-risk behaviors also suggest the effectiveness of TPB in predicting tobacco smoking and drug abuse among adolescents (Barati *et al.*, 2011a; Bashirian *et al.*, 2013; Moeini *et al.*, 2014).

Although acceptable evidence has been presented on the effectiveness of new educational strategies such as e-learning, determining the effectiveness of these techniques in the prevention of risky behaviors in developing countries requires further studies. Therefore, the present study aimed to evaluate the effectiveness of web-based intervention to prevent tobacco smoking among adolescents based on the TPB.

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### **MATERIALS AND METHODS**

#### **Participants**

This quasi-experimental study was conducted among high school male students in Hamadan during 2014. Of the 190 students enrolled in the statement at the high schools, 114 students were recruited from four high schools, through Random sampling method. Fifty seven participants as experimental and 57 as control groups were enrolled at the baseline survey, of who all were followed up after 6-month intervention. This study was conducted with approval from Tarbiat Modares University' institutional review board and ethical committee. Informed consent was obtained from all students before the project began. Researchers educated participants to ensure that they can reach a truly informed decision about whether or not to participate in the research.

#### **Procedure**

This was a longitudinal randomized pretest-posttest series control group design panel study to implement a health education based intervention to prevent and reduce tobacco smoking among a sample of high school students in Hamadan, west of Iran. After obtaining informed consent participants were enrolled in the study, questionnaire was distributed to the students to complete. Pretest and posttest data were collected by students in classrooms that lasted about 30 minute. Pretest data were collected 1 week prior to the intervention, posttest measures were collected 6 months after the end of the intervention.

Students in the experimental group were given a web address (URL) and an identification code for entering a personalized website. After logging in, participants were invited to watch the usability guidelines of the Learning Management System (LMS). The intervention aimed to provide participants with refusal skills against tobacco smoking. This manipulation was provided the smoking-prevention contents in a single large set of educational materials. Participants received the twelve web-based sessions applying the TPB constructs either all at one time or distributed over a 6-week period with e-mail reminders to revisit the site when new content was made available. Each web session consisted of two to five screens of smoking prevention information and was available for 2 weeks. Web-based sessions included awareness of the consequences of tobacco smoking and training resistance skills against tobacco smoking (e.g., problem solving, assertiveness, and stress management) using Video-clip, Photo-clip, PowerPoint, Chat-room, and text. Furthermore, prior to intervention six participants who were commitment to mediate tobacco smoking prevention program's message to students in the experimental group, were selected as the mediator. Consequently, six subgroups were formed as experimental group that were coordinated by one responsible mediator.

#### **Instrument**

Prior to conducting the intervention, a pilot study was performed to assess the content validity of the study questionnaires as well as reliability. In the first step, we carried out an expert panel of 10 specialists in health education, and psychologists to calculate content validity. The purpose of this step was to ensure that the instrument was clear and culturally relevant. In the second step, to determine the reliability of the instrument, the internal consistency was tested using the Chronbach's alpha coefficient among 30 students who were similar to participants in the main study.

The self-administered questionnaire comprised two sections:(a) demographic and background factors: including age, grade, major, father's job, mother's job, living status, smoker father, smoker friend and smoking initiation age; (b) TPB theoretical constructs: TPB scales were measured in relation to tobacco smoking that were modified from scales of Karimy (Karimy *et al.*, 2013b), Bashirian (Bashirian *et al.*, 2012) and Barati (Barati *et al.*, 2011a) and 28 items were composed under five major constructs: a) attitude positive toward tobacco smoking; b) subjective norms about tobacco smoking; c) perceived behavioral control; d) behavioral intention to tobacco smoking; f) Tobacco smoking behavior.

Attitude toward tobacco smoking was measured consisted of six items using 5-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Higher scores indicate more positive attitude to use a tobacco. The 6-items scale had Cronbach's alphas of 0.79. Subjective norms (the social pressure perceived by a person to engage in risky behavior) were measured in relation to whether significant others would approve adolescent's smoking behaviors using 8 items rated on a 5-point scale ranging from 1 (*strongly*

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*disagree*) to 5 (*strongly agree*). The 8-item scale had Cronbach's alphas of 0.81. Also, 10 items were designed to measure perceived behavioral control toward adolescent's confidence in their ability to refuse a cigarette when one was offered. The items were rated on a 5-point scale ranging from 1 (less likely) to 5 (more likely). Cronbach's alpha for PBC was 0.75. Behavioral intention was measured consisted of three items using 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). Higher scores indicate more behavioral intention to tobacco smoking. The 3-items scale had Cronbach's alphas of 0.89. Finally, adolescents were asked about tobacco smoking in the past. Participants were placed into one of the following tobacco smoking categories: never used, used, but sometimes, and use every day. The participant who had used cigarette in the past was then classified as a tobacco smoker.

### Statistics

Analyses were conducted by using SPSS-18 and a probability level of 0.05 was used throughout. Cross-tabulation and *t*-test were employed to determine comparability of the intervention in compare with control group.

## RESULTS AND DISCUSSION

### Results

The participants' ages ranged from 15 to 17 years, with the mean (SD) age of participants being 16.26( $\pm$ SD:0.64) yr in experimental group and 16.14( $\pm$ SD:0.66) yr in control group. All students were in grade11. Table 1 is a comparison of background variables in experimental and control groups.

**Table 1: Comparison of background variables in experimental and control groups**

Variables	Experimental group n (%)	Control group n (%)	P <sub>value</sub> *
<b>Age (yr)</b>			0.595
15	9 (15.8)	6 (10.5)	
16	31 (54.4)	30 (52.6)	
17	17 (29.8)	21 (36.8)	
<b>Major</b>			0.722
Natural Sciences	15 (26.3)	12 (21.1)	
Mathematics	26 (45.6)	30 (52.6)	
Human Sciences	16 (28.1)	15 (26.3)	
<b>Father's Education</b>			0.673
Primary	13 (22.8)	9 (15.8)	
High school	21 (36.8)	19 (33.3)	
BSc	13 (22.8)	17 (29.8)	
MSc	10 (17.6)	12 (21.1)	
<b>Mother's Education</b>			0.772
Primary	18 (31.6)	14 (24.6)	
High school	23 (40.4)	22 (38.6)	
BSc	13 (22.8)	18 (31.6)	
MSc	3 (5.3)	3 (5.3)	
<b>Internet Usage</b>			0.509
Moderate (3-7 h/day)	42 (73.7)	45 (78.9)	
High (>7 h/day)	15 (26.3)	12 (21.1)	
<b>Game usage</b>	38 (66.7)	42 (73.7)	0.413
<b>Having a separate room</b>	43 (75.4)	39 (68.4)	0.404
<b>Having a smoking father</b>	22 (38.6)	21 (36.8)	0.847
<b>Having a smoking friends</b>	20 (35.1)	23 (40.4)	0.562

*Note.* Experimental group (n=57), Control group (n=57); \*Chi-square

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Cross tabulation analysis revealed that there were not significant differences regarding demographic variables between two experimental and control groups before implementation of web-based intervention program ( $P>0.05$ ). These results revealed homogeneity of participants. Table 2 presents the comparison of TPB constructs regarding tobacco smoking before and after educational program in experimental and control groups. According to the result, no statistically significant differences were found in the mean scores of TPB constructs between experimental and control groups before the intervention ( $P>0.05$ ). Results indicates that there are significant improvements in average response for independent variables among students who were in the experimental group compared to the controls after intervention ( $P<0.05$ ). As it shown in table average response for perceived behavioral control was  $39.89\pm 5.08$  that it was increased to  $41.79\pm 6.01$  after intervention. Also, Average response for positive attitude toward tobacco smoking and persuasive subjective norms were  $19.23\pm 4.31$  and  $18.09\pm 3.75$  that those were decreased to  $13.21\pm 4.27$  and  $12.61\pm 3.76$  after implementing educational program, respectively. Additionally averages response to behavioral intention to tobacco smoking was  $5.81\pm 3.96$  that it was decreased to  $4.42\pm 2.55$  after intervention. For control group, no significant changes were found between testing times ( $P>0.05$ ).

**Table 2: Average responses for TPB constructs about tobacco smoking before and after educational program**

Independent Variables	Before Intervention Mean ( $\pm$ SD)	After Intervention Mean ( $\pm$ SD)	P <sub>value</sub> *
<b>Attitude</b>			
Experimental group	19.23 ( $\pm$ 4.31)	13.21 ( $\pm$ 4.27)	<0.001
Control group	20.79 ( $\pm$ 3.87)	21.02 ( $\pm$ 4.51)	0.696
P <sub>value</sub> **	0.076	<0.001	
<b>Subjective Norms</b>			
Experimental group	18.09 ( $\pm$ 3.75)	12.61 ( $\pm$ 3.76)	<0.001
Control group	19.11 ( $\pm$ 5.75)	18.14 ( $\pm$ 5.99)	0.201
P <sub>value</sub> **	0.266	<0.001	
<b>Perceived Behavioral Control</b>			
Experimental group	39.89 ( $\pm$ 5.08)	41.79 ( $\pm$ 6.01)	0.013
Control group	39.67 ( $\pm$ 5.86)	38.26 ( $\pm$ 6.71)	0.059
P <sub>value</sub> **	0.825	0.004	
<b>Behavioral Intention</b>			
Experimental group	5.81 ( $\pm$ 3.96)	4.42 ( $\pm$ 2.55)	0.004
Control group	6.01 ( $\pm$ 3.79)	7.04 ( $\pm$ 3.37)	0.081
P <sub>value</sub> **	0.791	<0.001	

*Note.* Experimental group (n=57), Control group (n=57); \* Paired t-tests, \*\* Independent sample t-test

To assess efficiency of web-based intervention program in preventing tobacco smoking, cross-tabulation analysis was performed (Table 3). The results showed no significant difference regarding tobacco smoking between two groups before and 6 months after intervention. According to the results, the prevalence of tobacco smoking in both control and experimental groups were increased after 6 months,

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but, the rate of increase was higher in the control group compared to the experimental group. The percent of tobacco smoking in the experimental group was 15.8% that it was increased to 17.2% after intervention. However, the percent of tobacco smoking was increased from 19.3% to 26.3% in the control group.

**Table 3: Tobacco smoking before and after intervention in two groups**

Variables	Before Intervention n (%)	After Intervention n (%)	P <sub>value</sub> <sup>*</sup>
<b>Experimental group</b>			0.392
Daily Smoker	2 (3.5)	1 (1.8)	
Occasionally Smoker	7 (12.3)	9 (15.8)	
Non-smoker	48 (84.2)	47 (82.5)	
<b>Control group</b>			0.264
Daily Smoker	5 (8.8)	6 (10.5)	
Occasionally Smoker	6 (10.5)	9 (15.8)	
Non-smoker	46 (80.7)	42 (73.7)	
P <sub>value</sub> <sup>**</sup>	0.495	0.146	

*Note.* Experimental group (n=57), Control group (n=57); \*McNemar test, \*\*Chi-square

**Discussion**

The current study was performed to evaluate the effectiveness of web-based intervention on preventing tobacco smoking among male adolescents based on the TPB as a theoretical framework. The results showed that significant changes in attitudes, subjective norms, perceived behavioral control, and behavioral intention in experimental group compare to the control group after intervention.

The results of the effectiveness of educational programs in reducing positive attitudes toward smoking indicate the effective role of web-based educational intervention in reinforcing negative beliefs toward tobacco smoking in the experimental group; these results are consistent with findings of similar studies (Shegog *et al.*, 2005; Hopfer *et al.*, 2010; Cremers *et al.*, 2015). It seems that smoking is a behavior learned socially, in other words, the smoking behavior on one hand is learned by process of modeling, imitation and reinforcement, and on the other hand, the behavior is affected by knowledge and beliefs of the individual (Barati *et al.*, 2011a).

The results of numerous studies in the field of prevention of drug abuse imply that life skills training helps people resolve their conflicts with peers in a constructive way, the ability to inhibit impulses and excitements increases, and the skills reduce tendency to perform risky behaviors by changing the individual's beliefs (Barati *et al.*, 2011a).

Therefore, the educational program of constructing healthy behaviors with the aim of preventing smoking may lead to negative attitudes of participants.

Results associated with subjective norms persuasion encouraging tobacco smoking also showed the effectiveness of educational interventions in reducing subjective norms encouraging tobacco smoking in the experimental group after the educational intervention.

These results are consistent with findings of similar studies (Patrick *et al.*, 2014; Bashirian *et al.*, 2013). Peer pressure and motivation to comply plays a determining role in subjective norms encouraging tobacco smoking (Glanz *et al.*, 2008). It seems that, relationship and friendship with peers smoking tobacco on one hand and belonging to a group as one of the important needs of teenagers on the other hand are why the factors are important. The strength or weakness of the effect of these factors is closely associated with the life of individuals, for example, for students who spend most of their time with their friends at school the peer pressure will be the highest (Barati *et al.*, 2011c). It reveals the fact that adolescents are more likely influenced by peer pressure than other age groups (Gardner and Steinberg, 2005). In this regard, like the educational strategies of the present study, training skills of drug rejection, especially the skill of "saying no" against the insisting of peers has important role in the prevention of smoking. Several studies

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in the field of substance abuse prevention have also emphasized on dealing with peer pressure (Bashirian *et al.*, 2013; Karimy *et al.*, 2013b).

Other finding of the present study has been the success of web-based educational program to increase the perceived behavioral control of adolescents of the experimental group against smoking. This result is consistent with findings of similar studies (Barati *et al.*, 2011b; Guo *et al.*, 2015, Hagger *et al.*, 2015). In this regard, social psychological studies have demonstrated that people react to social influence in different ways and personality characteristics have decisive role in these situations. For example, individuals with low self-confidence and poor behavioral control are more affected by their environment. The impact of the environment will increase the likelihood of risky behaviors (Barati *et al.*, 2011a). So if the skills to increase the individuals' capacity to firmly respond to social influence are created, the susceptibility of social influence is reduced and the probability of performing high-risk behaviors is reduced. This issue was addressed in the educational intervention of the present study.

The results of the present study suggest the effectiveness of web-based educational intervention on reducing the intention for smoking among adolescents of the experimental group. These results are consistent with findings of similar studies (Guo *et al.*, 2015; Bashirian *et al.*, 2013). Increased behavioral intention in adolescents of the control group as a pre-behavioral phase can be a serious risk factor for smoking experience on which the results of similar studies have also emphasized (Karimy *et al.*, 2012). In the TPB, intention is the most important determinant of behavior and involves thinking to perform a behavior that is the immediate determinant of a certain behavior (Glanz *et al.*, 2008). The results of similar studies suggest that educational interventions based on the TPB through attitude change, subjective norms, and perceived behavioral control influence behavioral intention and finally the program is effective in reducing smoking (Karimy *et al.*, 2012).

In fact, the implementation of smoking prevention program in this study has increased the ability to recognize risky situations in adolescents through building skills, and this has led to an increased resistance against peer pressure. Adolescents learn to solve their own conflicts in constructive ways and to achieve better social relationships. Thus, the education led to reduced intention to smoking among adolescents of the experimental group by creating negative attitude towards smoking, reducing subjective norms and increasing behavioral control.

Smoking behavior was the variable that researchers examined to confirm the effectiveness of the intervention. The results of the current study showed that web-based educational program, despite the improvement in attitudes, subjective norms, perceived behavioral control and behavioral intention change was not effective in reducing smoking among adolescents. So that regular or occasional smoking of tobacco in the experimental group was increased from 15.8% before the study to 17.2% after the intervention while that, the rate was also increased from 19.3% to 26.3% in the control group. These changes were not statistically significant in either of the groups. These results are consistent with the findings of some similar studies (Eslami *et al.*, 2011), however they are inconsistent with the results of studies by Enggasser *et al.*, (2015), Karimi *et al.*, (2013a), McGahee and Tingen (2000), which reported the effectiveness of educational interventions based on the TPB to reduce smoking and drug use.

For the explanation of this contradiction between the findings, the results of a longitudinal study over a one-year period showed that 17% of non-smoking adolescents have experienced smoking after a year or become regular smokers (Mohammadpoorasl *et al.*, 2012). It seems that the difference in smoking rates between the two groups after intervention suggests the role of the present study in the prevention of smoking among adolescents. This illustrates the fact that preventing the onset and the increase of smoking can also be a valuable success for interventional studies. Therefore, lack of a significant increase in smoking among adolescents in the experimental group is a positive outcome of the present study.

Despite positive points of the present study, it has a certain limitations. First, only male adolescents engaged in the study and it is not clear if we included females in the study we would obtain the same results. Second, the study participants were recruited from high schools who might not be representative of all adolescents in our country. We recommended that study be conducted in a similar sample of girl adolescents and employed young age.

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### Conclusion

The results show that applying web-based intervention would be an efficient strategy for preventing tobacco smoking among adolescents. For designing and implementing educational programs, more attention to decrease of positive attitudes of students toward tobacco smoking and persuasive subjective norms is essential. Interventions also could heighten perceived behavioral control to reduce tobacco smoking by adolescents. In addition, formative and process evaluation of web-based interventions should be performed to learn how the components of the program work and are received by the intended participants.

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