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The effects of an education program on hookah smoking cessation in university students: an application of the Health Action Process Approach (HAPA)

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ABSTRACT

Background: Hookah smoking is a harmful practice which has become increasingly popular among university students.

Methods: This quasi-experimental study was conducted on 150 male undergraduate students, who were regular hookah smokers, from Jan 2014 to Sept 2016. The participants were randomly selected and assigned to intervention ($n = 75$) and control groups ($n = 75$). A self-administered questionnaire was utilized to measure baseline demographic information and HAPA constructs. The primary outcome was an improvement in behavioral intention for quitting hookah, and the secondary outcome was successful abstinence from tobacco use.

Results: The motivational phase constructs (one month after the intervention) and the volitional phase constructs (six months after the intervention) except for recovery self-efficacy were significantly higher in the intervention group compared to the control group. Six months after the intervention, 26 (44.1%) intenders (participants who intended to quit hookah) in the intervention group quitted hookah while only three (9.4%) intenders in the control group did the same. Twelve months after the intervention, the number of students who successfully quitted hookah was significantly higher in the intervention group (19 out of 71) compared to the control group (6 out of 67).

Conclusion: HAPA is a useful model that can be applied in education programs to increase the rate of hookah smoking cessation in university students.

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Introduction

Tobacco consumption contributes to the high mortality rates in consumers (the World Health Organization -WHO), which is about six million annual deaths across the globe (*WHO global report on trends in prevalence of tobacco smoking 2015, 2015*). Hookah smoking, which is a four-century-old practice is common in Asian and African cultures as a traditional mode of tobacco consumption (Goodman, 2005). This form of tobacco consumption is now an emerging trend, particularly in developing countries (Kadhun, Sweidan, Jaffery, Al-Saadi, & Madden, 2015), and it has gained a remarkable popularity due to the appeal of the flavored and aromatic tobacco (Rastam, Ward, Eissenberg, & Maziak, 2004), the social acceptability, the increased availability in traditional restaurant and dedicated cafes (Association, 2007; Martinasek, McDermott, & Martini, 2011; Maziak et al., 2014), the proliferation through mass media and internet publicity (Carroll, Shensa, & Primack, 2012; Primack et al., 2012), the absence of definitive policies toward hookah (Maziak et al., 2013; Salloum, Nakkash, Myers, Wood, & Ribisl, 2013), and an underestimation of the health risks of hookah smoking compared to other tobacco products (Maziak, Eissenberg, & Ward, 2005).

Findings of the global youth tobacco survey indicate a growing prevalence of all forms of tobacco consumption, particularly hookah smoking, among the youth (Warren et al., 2009). Hookah smoking is the second prevalent form of tobacco consumption among students in the United States (Primack et al., 2012), and it has become a widespread practice among the students in the Eastern Mediterranean, Middle Eastern, and western countries (Jackson & Aveyard, 2008; Rice et al., 2007; Weglicki et al., 2007). Studies in Iran have demonstrated a high prevalence of hookah smoking among university students (Ghafouri et al., 2011; Joveini et al., 2016). A study on health science students in Tehran showed that 44.7% of the students were regular hookah smokers (Ghafouri et al., 2011).

Available researches have mentioned multiple health problems caused by hookah smoking including high blood pressure, cardiovascular diseases, pulmonary function impairment, increased lung inflammation, syncope, and carbon monoxide poisoning (Alomari, Khabour, Alzoubi, Shqair, & Eissenberg, 2014; Al-Kubati, Al-Kubati, Al'Absi, & Fišer, 2006; El-Zaatari, Chami, & Zaatari, 2015; Hawari et al., 2013). A very recent study in the northeast of Iran has also shown a strong association between hookah smoking and metabolic syndrome, diabetes, obesity, and dyslipidemia (Soflaei et al., 2018).

Hookah smoking is currently a significant challenge for public health advocates and policymakers, as there are no definitive directions on how to create effective education and intervention strategies to curtail consumption. Most countries have not yet implemented the comprehensive tobacco control legislation set out by the WHO to curb the tobacco epidemic (Warren et al., 2009). Moreover, most tobacco control programs include preventive measures rather than cessation measures (Grimshaw & Stanton, 2006). Based on the literature review, a very few studies have introduced effective educational strategies for hookah smoking cessation, and there is no study on the effectiveness of a theory-based education program on hookah smoking cessation in students.

Theoretical framework

Health-compromising behaviors, such as tobacco and alcohol consumption are difficult to change. Most social-cognitive theories assume that the intention of behavior change can well predict the actual change; however, intention alone does not guarantee behavior change. Some hookah smokers make cessation attempts; however, they encounter unforeseen barriers such as smoking temptation, and inability to say “no” to friends’ pressure (Joveyni, Dehdari, Gohari, & Gharibnavaz, 2012). Therefore, the translation of intentions into action should be facilitated by more proximal predictors. For instance, perceived self-efficacy, as a self-regulatory mediator, may help an individual to bridge the intention-behavior gap (Schwarzer & Luszczynska, 2008). Understanding the factors that affect human behaviors can help health educators to plan for effective education programs.

The Health Action Process Approach (HAPA) is a health behavior change theory which explains health behavior engagement (Schwarzer, 1992). According to HAPA assumptions, replacement of health-compromising behaviors by health-enhancing behaviors occurs in two phases, motivation and volition. In the motivational phase, individuals form an intention to engage in a healthy behavior (Schwarzer et al., 2003). Motivational factors, in this process, including risk perception, outcome expectancy, and task self-efficacy are the significant determinants which contribute to the formation of intention (Schwarzer, 2008). For example, HAPA predicts that those with higher risk perception are more inclined to quit smoking (Williams, Herzog, & Simmons, 2011). The volitional phase facilitates the adoption and maintenance of healthy behaviors. Volitional factors including action planning, coping planning, coping self-efficacy, and recovery self-efficacy help individuals to translate the intention into actual behavior change (Gollwitzer, 1999; Sheeran, 2002; Sniehotta, Schwarzer, Scholz, & Schüz, 2005).

Materials and methods

Participants and setting

This quasi-intervention study was conducted between January 2014 and September 2016. The participants were selected through convenience sampling ($n = 150$). They were male undergraduate university students in the Islamic

Azad University of Sabzevar, Iran. The inclusion criteria were as follows; a male undergraduate student with at least one year left until graduation, regular hookah smoker (at least once a month), no tobacco-related illness such as heart and lung diseases, and willing to participate in the study. To ensure minimal contamination of groups, the participants in each group were selected from different colleges. The intervention group participants were randomly selected from the college of health sciences, and the control group participants were selected from the college of engineering. Among the 306 male students surveyed, 75 participants from the college of health sciences and 68 participants from the college of engineering met the inclusion criteria. In addition, seven more participants were identified through snowball sampling so that 150 students entered the study. The exclusion criteria were as follows; absence in more than two education sessions, and reluctance to continue participation at whatever stage of the study. The authors tried to keep the attrition rate as low as possible by taking appropriate steps. Nevertheless, 13 students (nine from the control group, four from the intervention group) were excluded from the study at different stages.

Measures

The data gathering tool was a questionnaire consisting of two parts. The first part included questions to measure the baseline demographic characteristics of the participants. The second part included a self-administered questionnaire with 51 items to measure HAPA constructs related to hookah smoking. The first draft of the questionnaire included 56 items, and it was developed based on the literature review (Schwarzer et al., 2003), and the viewpoints of 10 male students about hookah smoking. The face validity was examined using a sample group of 22 students who fulfilled the first draft of the questionnaire. According to the students’ suggestions, seven items were not clear, relevant, or understandable, and hence, they were omitted from the questionnaire. The necessity and relevance of the items were assessed by a panel of ten experts in health education and addiction. Content validity ratio and content validity index were calculated in order to perform quantitative content validity. Items with $CVR < 0.62$ and $CVI < 0.80$ were omitted (Lawshe, 1975). Four items, including two items related to outcome expectancy construct, one related to coping self-efficacy construct, and one related to coping planning construct, were removed from the questionnaire at this stage. The reliability of the subscales was assessed using Cronbach’s α coefficient ($\alpha \geq .70$) (Cronbach, 1951). The final questionnaire included 51 items, 48 of which measured seven constructs of HAPA, and three items measured behavioral intention in students (Table 1).

Hookah smoking, the primary behavioral outcome, was determined by asking the question: “Do you smoke hookah?”. The participants who answered “YES” were then asked about the frequency of hookah smoking. Both groups filled out the questionnaire at baseline and 1, 6, and 12 months after the education program.

Table 1. 51-Item of the instrument to assess HAPA constructs relevant to the hookah smoking.

Construct	Question	Coding used for data analysis	Cronbach's α
Risk perception	<ol style="list-style-type: none"> (1) What are the chances of getting lung cancer due to hookah smoking? (2) What are the chances of getting mouth cancer due to hookah smoking? (3) What are the chances of getting bladder cancer due to hookah smoking? (4) What are the chances of getting cardiovascular diseases due to hookah smoking? (5) What are the chances of getting respiratory diseases due to hookah smoking? (6) What are the chances of getting infectious diseases (like tuberculosis and hepatitis) due to hookah smoking? (7) What is the risk of using other smoking and narcotic materials (like cigarette and opium) following hookah smoking? 	A seven-point Likert scale ranging from (0) very low to (6) very high	.79
Outcome expectancy	<p>If I quit hookah smoking:</p> <ol style="list-style-type: none"> (1) People will respect me more, since my clothes do not smell of tobacco smoke. (2) People will respect me more, since my skin become clearer and my teeth become whiter. (3) My inclination to switch to other substances (like cigarette, opium, etc.) will increase. (4) My relationship with family and friends will be ruined. (5) I will have trouble spending my leisure time. (6) I will become nervous and anxious. (7) Cardiovascular and respiratory diseases will be prevented. (8) My expenses will be reduced. (9) I will have a normal weight. (10) My physical condition will be improved. (11) I will have more strong volition. 	A four-point Likert scale ranging from (0) not at all true to (3) exactly true	.70
Task self-efficacy	<p>I can take steps to quit hookah smoking, even if:</p> <ol style="list-style-type: none"> (1) My friends will continue to smoke hookah. (2) I feel tense and nervous. (3) I lose some of my friends. (4) I have a strong temptation to smoke hookah. (5) I have stress. (6) My significant others would not help me to quit hookah. (7) My significant others blame me for quitting hookah. 	A four-point Likert scale ranging from (0) not at all true to (3) exactly true	.85
Coping self-efficacy	<p>I will continue not to smoke hookah, even if:</p> <ol style="list-style-type: none"> (1) My stress does not decrease. (2) I feel tired. (3) I feel that I am not able to quit hookah. (4) My significant others do not support me for quitting hookah. (5) I feel that my physical condition has not improved in short-term. (6) Obsessive thoughts arise regarding the resumption of hookah. (7) My friends offer me hookah at a party or in a friendly environment. (8) I cannot find any other entertainment. (9) I have many problems following cessation. (10) I need to concentrate. 	A four-point Likert scale ranging from (0) not at all true to (3) exactly true	.76
Recovery self-efficacy	<p>After a short period of cessation, I am sure that I will stay abstinent from hookah smoking, even if:</p> <ol style="list-style-type: none"> (1) I have postponed my cessation program several times. (2) Sometimes, I am not able to refrain from hookah smoking. (3) During the cessation program, I smoked hookah for a few weeks and abandoned the cessation program. 	A four-point Likert scale ranging from (0) not at all true to (3) exactly true	.70
Action planning	<p>I have a precise plan of action concerning:</p> <ol style="list-style-type: none"> (1) The time of initiating hookah smoking cessation. (2) The process of initiating hookah smoking cessation. 	A four-point Likert scale ranging from (0) not at all true to (3) exactly true	.73
Coping planning	<p>After quitting hookah smoking, I have a clear plan on:</p> <ol style="list-style-type: none"> (1) How to overcome the situation which makes me more likely to start hookah smoking again. (2) How to fill my leisure time to avoid hookah smoking urge. (3) How to avoid hookah parlors. (4) How to deal with interruptions during the cessation program. (5) What to do with the issues interfering with the cessation program. (6) How to decline friends' invitation for hookah. (7) How to be careful not to smoke a hookah again. (8) What to choose as a substitute for hookah smoking. 	A four-point Likert scale ranging from (0) not at all true to (3) exactly true	.71
Behavioral intention	<ol style="list-style-type: none"> (1) I am going to quit hookah smoking within the next month. (2) I have planned to quit hookah smoking within a month. (3) I want to quit hookah smoking within the next month. 	A seven-point Likert scale ranging from (0) strongly disagree to (7) strongly agree	.93

Education program

The education program was divided into two stages: motivation and volition. The intervention group received seven sessions of education during these two stages, while the control group did not receive any education. Initially, a briefing session was held in the university, wherein the main objectives and process of educations were explained. After the briefing session, the students expressed that they were more comfortable if the educations were held in a place outside the university. To respect the students' request and to gain their trust, the authors implemented the educations at one of the student' houses. The education sessions were conducted in groups of 25 students and were supervised by a trained instructor.

The education program at the motivation stage was developed based on the results of the pre-test analysis and constructs of the motivational phase of the HAPA model (risk perception, outcome expectancy, and task self-efficacy). The primary objective of the motivation stage was to develop an intention for quitting hookah smoking in intervention group participants. The education program included three education sessions of 45–60 min over four weeks, with one week break between the sessions. During the first and second sessions, using lecture and question-and-answer methods, the students were informed about the health risks and harms associated with hookah smoking and the benefits of hookah smoking cessation. Additionally, an educational booklet entitled “the consequences of hookah smoking” was given to all participants. During the third session, students were divided into small groups to discuss the barriers to quitting hookah, and to propose possible ways to overcome these barriers. Therefore, they had an opportunity to share their own positive or negative experiences in this regard. At this session, the students were also provided with the step-by-step and practical instructions which helped them to plan for quitting hookah more easily. In addition, they were persuaded that they were capable enough to quit hookah smoking. One month later, the intervention and control groups were assessed regarding their intentions toward quitting hookah.

At the volition stage, the authors implemented four education sessions of 45–60 min for hookah smokers intending to quit, in order to promote coping self-efficacy, recovery self-efficacy, coping planning, and action planning among them. During the first session, the students were provided with information about the importance and role of self-planning for quitting hookah (action planning). They were asked to write down every step they had taken for quitting hookah. At the beginning of the second session, the notes made by the students were reviewed, and the problems were discussed while planning for quitting hookah. For the rest of the session, the necessity of having a personal plan to overcome perceived obstacles during the process of cessation (coping planning) was emphasized. At the end of the second session, students were asked to write down the obstacles they might face during the process of cessation, and the ways to overcome these obstacles. At the beginning of the third session, the notes made by the students were reviewed, and the obstacles they encountered and the unique methods proposed by every

student for overcoming the obstacles were discussed. For the rest of the session, the students shared their personal experiences with others. At the end of the session, the students were persuaded that they are capable enough to plan for quitting hookah successfully. The final session was devoted to recovery self-efficacy enhancement, and the students were informed about the necessity of having a personal plan to prevent relapse. They were persuaded that they were capable enough to quit hookah smoking in case of a relapse.

Data analysis

The collected data were analyzed using SPSS 15 statistical software package (SPSS Inc., Chicago, IL, USA). Descriptive statistics were conducted to compare demographic characteristics between the groups. The Kolmogorov-Smirnov test was used to check the normal distribution of the data. Independent samples t-test or an equivalent nonparametric test (Mann-Whitney U test) was used to compare baseline smoking status of the participants and HAPA constructs between the groups at different time points of the study. Student's paired t-test was used to compare differences in HAPA constructs in each group at different time points of the study. Logistic regression was used to determine if there was a significant difference in the rate of hookah smoking cessation between the groups at baseline, and 1, 6, and 12 months after the education program. Chi-square test was used to determine whether there was a significant relationship in the rates of hookah smoking cessation between intenders (participants who intended to stop smoking) and non-intenders in both groups. *P* values < .05 were considered significant.

Ethical considerations

The study was approved by the Ethics Committee of Tehran University of Medical Sciences (IR.TUMS.REC.1395.2607). In addition, a written consent form was obtained from all students in advance after explaining the nature and purpose of the study.

Results

The mean (SD) age of the participants in the intervention and control groups was 21.8 (2.4) and 22.6 (2.7) years, respectively. A larger majority of the participants (*n* = 144, 96%) expressed that they consumed flavored hookah tobacco. Participants expressed that they had experienced hookah for the first time in traditional restaurants (*n* = 40), cafes (*n* = 39), home (*n* = 35), and entertainment venues (*n* = 27). They also had their first experience of hookah smoking with their friends (*n* = 114), relatives (23), family members (*n* = 6), and alone (*n* = 7). Thirty-four (45%) participants in the control group and 30 (40%) participants in the intervention group reported having at least one family member who smoked hookah. Table 2 presents the baseline self-reported smoking status of the participants. In addition to hookah smoking, 6 (8%) participants in the control group, and 9 (12%) participants in the intervention group were cigarette smokers.

Table 2. Self-reported smoking status of the participants (n = 150).

	Control group	Intervention group	P value
	$\bar{x} \pm (SD)$	$\bar{x} \pm (SD)$	
Age at first hookah smoking	16.5 ± (2.4)	17.4 ± (3.6)	.08
Age at first cigarette smoking	18.5 ± (2)	19.8 ± (1.9)	.08
Hookah smoking frequency (number/month)	8.4 ± (9.3)	7.5 ± (9.1)	.50

Table 3. The rates of hookah smoking cessation six months after the intervention according to the students' behavioral intention (n = 137).

Cessation	Control group (n = 66)		P. value	Intervention group (n = 71)		P. value
	Intenders	Non-intenders		Intenders	Non-intenders	
	N (%)	N (%)		N (%)	N (%)	
Yes	3 (9.4)	4 (11.8)	.70	26 (44.1)	1 (8.3)	.02
No	29 (90.6)	30 (88.2)		33 (55.9)	11 (91.7)	
Total	32 (100)	34 (100)		59 (100)	12 (100)	

One month after the intervention, the number of intenders in the intervention group was significantly higher than those in the control group. Six months after the intervention, 26 (44.1%) intenders in the intervention group, and 3 (9.4%) intenders in the control group successfully quit hookah (Table 3). Chi-square test showed that there was a significant relationship between behavioral intention and hookah smoking cessation in the intervention group.

Table 4 lists the mean and standard deviation of HAPA constructs at the baseline and 1, 6, and 12 months after the intervention. Clearly, one month after the intervention, participants in the intervention group had a significantly higher intention for quitting hookah smoking. There was no significant difference in any of the HAPA constructs of the two groups at the baseline; however, the motivational phase constructs and volitional phase constructs (except recovery self-efficacy construct) significantly increased in the intervention group one and six months after the education program.

Six and twelve months after the intervention, the number of students who quit hookah was significantly higher in the intervention group compared to the control group. Twelve months after the intervention, 19 participants in the intervention group and six participants in the control group successfully quit hookah (Table 5).

Table 4. Group differences on HAPA constructs at baseline and 1, 6, and 12 months after the intervention (n = 137). Data are expressed as the mean ± standard deviation.

Construct	Baseline		One month after the intervention		Six months after the intervention		Twelve months after the intervention	
	Control group	Intervention group	Control group	Intervention group	Control group	Intervention group	Control group	Intervention group
Behavioral intention	51.7 ± 30.7	56.29 ± 23.3	51.03 ± 27.9	74.7 ± 17.3 ^{*B}	-	-	-	-
Task self-efficacy	53.3 ± 26.5	55.7 ± 21.6	53.2 ± 22.4	67.2 ± 13.5 ^{*B}	-	-	-	-
Outcome expectancy	56.8 ± 16.7	58.18 ± 14.6	55.6 ± 15.8	69.7 ± 11.7 ^{*B}	-	-	-	-
Risk perception	61.5 ± 20.3	62.4 ± 15.2	59.6 ± 18.1	79.2 ± 10.57 ^{*B}	-	-	-	-
Action planning	46.01 ± 28.3	43.8 ± 24.9	-	-	51.9 ± 23.1	65.7 ± 20.87 ^{*B}	-	-
Coping planning	46.9 ± 16.4	50.9 ± 13.8	-	-	48.7 ± 14.6	60.8 ± 11.3 ^{*B}	-	-
Coping self-efficacy	52.2 ± 11.4	50.6 ± 13.6	-	-	53.5 ± 14.4	61.8 ± 8.8 ^{*B}	-	-
Recovery self-efficacy	42.78 ± 21.1	37.55 ± 22.01	-	-	-	-	45.1 ± 19.1	52.11 ± 17.7

^{*}Paired t-test, *p* < .05.

^BIndependent-samples t-test, *p* < .05.

Table 5. The rates of hookah smoking cessation six months and twelve months after the intervention (n = 138).

Cessation	Control group (n = 67)		Intervention group (n = 71)	
	Six months after the intervention	Twelve months after the intervention	Six months after the intervention	Twelve months after the intervention
No	60 (89.6%)	61 (91%)	44 (62%)	52 (73.2%)
Yes	7 (10.4%)	6 (9%)	27 (38%)	19 (26.8%)

Discussion

Hookah smoking is considered as a gateway to cigarette smoking in the young (Regulation, 2005). We observed that the mean age of the first hookah smoking experience in the participants was about two years lower than the mean age of first cigarette smoking experience; so that, the more the occasion of hookah smoking, the higher the risk of trying cigarette (Soneji, Sargent, Tanski, & Primack, 2015). After the education program, the mean score of behavioral intention was significantly higher in the intervention group than that of the control group. This finding is consistent with previous studies (Barati, Allahverdi-pour, Moinei, Farhadinasab, & Mahjub, 2011; Hyde & White, 2009; Joveyni, Dehdari, & Gohari, 2013). One month after the intervention, all motivational phase constructs (risk-perception, outcome expectancy, and task self-efficacy) were significantly higher in the intervention group. Williams et al. suggested that those with high-risk perception have more tendency to quit cigarette compared to those with low-risk perception (Williams et al., 2011). Studies based on the theory of planned behavior have suggested that perceptions of susceptibility and control can increase smokers' motivation to quit (Norman, Conner, & Bell, 1999). Students may mistakenly hold the belief that hookah smoking is less harmful than cigarette smoking (Jackson & Aveyard, 2008). Evidences show that this misconception is a strong motive for hookah smoking (Cobb, Shihadeh, Weaver, & Eissenberg, 2010; Labib et al., 2007; Ward et al., 2005). For instance, in a study on female university students in Egypt, 74% of hookah users stated that the lower health risks of hookah were one of the main reasons that tempted them to turn to hookah smoking (Labib et al., 2007). Therefore, it is of paramount importance to improve risk perception of adolescents and youths about the harms associated with hookah smoking. In addition to risk perception, the

higher positive outcome expectancy and the lower negative outcome expectancy are known to affect individual's intentions for engaging in a behavior (Perrier, Sweet, Strachan, & Latimer-Cheung, 2012; Schwarzer et al., 2003).

Hookah smokers are more likely to have a lower negative outcome expectancy since they may hold the view that hookah smoking is safer than cigarette smoking because the smoke passes through water and becomes purified before inhalation (Ward et al., 2005). It seems that the targeted education programs with an emphasis on the harms caused by the long-term use of hookah increase the negative outcome expectancy among consumers.

Participants in the intervention group achieved a significantly higher score in task self-efficacy after the intervention. Available researches have indicated that interventions were very effective in improving self-efficacy (Arbour-Nicitopoulos, Ginis, & Latimer, 2009; Perrier, Shirazipour, & Latimer-Cheung, 2015). People with high self-efficacy possess a high perception of success and are more likely to engage in new behaviors and less likely to be influenced by peer pressure to try smoking (Chang et al., 2006; Hiemstra, Otten, de Leeuw, van Schayck, & Engels, 2011; Schwarzer et al., 2003). Self-efficacy significantly contributes to the formation and maintenance of health behaviors in people (McAuley & Blissmer, 2000; McAuley, Courneya, Rudolph, & Lox, 1994). A study on individuals with acquired physical disabilities pointed out that interventions were necessary to build self-efficacy for those interested in participating in health-enhancing behaviors (Perrier et al., 2015).

Six months after the intervention, three out of four volitional phase constructs (action planning, coping planning, and coping self-efficacy) were significantly higher in the intervention group. Consistent with our finding, several studies on health behaviors have shown the significant effects of action planning on behavior change (Arbour & Martin Ginis, 2009; Armitage, 2007; Luszczynska, Sobczyk, & Abraham, 2007). Given that there is a gap between intention and behavior, it is apparent that the intention of performing a behavior does not necessarily lead to the actual behavior (Sniehotta, Scholz, & Schwarzer, 2005; Sutton, 2008). When coupled with effective coping strategies, action planning can effectively help behavior change maintenance (Arbour-Nicitopoulos et al., 2009). Action planning correlates with high self-confidence for overcoming the barriers of performing a particular behavior (Latimer, Ginis, & Arbour, 2006). As we observed in this study, the education program on when and how to perform a behavior helps students to bridge the intention-behavior gap.

Several studies have reported that coping planning can well predict performing healthy behaviors (Araújo-Soares, McIntyre, & Sniehotta, 2008; Pakpour et al., 2011; Scholz, Schüz, Ziegelmann, Lippke, & Schwarzer, 2008). Intervention programs are promising approaches to encourage individuals to develop coping strategies to deal with specific circumstances and difficulties while planning for cessation. Since hookah is usually served at public areas such as traditional restaurants, tea houses, cafes, and outdoor entertainment venues, the intenders should avoid such places in which the smoking urges are triggered. It seems that students with better coping strategies are more likely to resist the urge to smoke hookah. Evidence shows that identifying barriers and developing coping strategies protect individuals from returning to unhealthy behaviors (Larimer & Palmer, 1999).

Six and twelve months after the intervention, the number of students who quitted hookah smoking was significantly higher in the intervention group (38% and 26.8% respectively) compared to the control group (10.4% and 9% respectively). This finding is in line with our previous study on students living in dormitories of Tehran University of Medical Sciences that showed a substantial reduction in the frequency of hookah smoking after the intervention (Joveyni et al., 2013). It seems that the reduction in recovery self-efficacy and coping self-efficacy of individuals when dealing with the barriers and difficulties of hookah smoking cessation can explain the lower rate of cessation twelve months after the education program.

Limitation

Only male students all from the Sabzevar city were investigated. That is, the participants were from a small geographical area in Iran. Therefore, the participants were not a good representative of students in Iran and other countries. Future interventions are needed to determine whether education programs reduce the rate and prevalence of hookah smoking in women and students from other parts of Iran and the world.

Conclusion

The results highlighted the effectiveness of an education program based on the constructs of the HAPA on hookah smoking cessation and behavioral change persistence in students. Education programs are very effective strategies that help intenders to more easily deal with difficulties and barriers encountered during the cessation process. In addition to the education programs, further steps should be taken to decrease smoking urges among students. Filling students' leisure time with recreational and sporting activities, a ban on hookah advertising, a ban on hookah smoking in traditional restaurants and tea houses are recommended in this regard.

Disclosure of potential conflicts of interest

Authors declare no conflict of interests.

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