

Effects of a theory-driven educational package and social support on durability of cigarette smoking cessation behavior: A community-based programMohammad Ali Orouji¹, Davoud Shojaeizadeh², Roya Sadeghi³, Mohammad Rafiei⁴

¹ Ph.D. Student of Health Education and Promotion, Department of Health Promotion and Education, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran

² Ph.D. of Health Education and Promotion, Professor, Department of Health Promotion and Education, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran

³ Ph.D. of Health Education and Promotion, Associate Professor, Department of Health Promotion and Education, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran

⁴ Ph.D. of Biostatistics, Professor, Department of Biostatistics and epidemiology, School of medicine, Arak University of Medical Sciences, Arak, Iran

Type of article: Original**Abstract**

Background: According to a World Health Organization (WHO) report, the prevalence of smoking in Iranian individuals aged 15-64 is up to 12%.

Objective: The aim of the current study was to determine the durability of smoking cessation behavior based on a trans-theoretical model.

Methods: This educational experimental study was conducted on smokers in Khomein City, Iran, in 2015. Sampling was done through a public announcement and then a random allocation of participants into two study group (50 persons) and control group (60 persons). Tools to gather data were as follows: an individual characteristics form and DiClemente's stages of change, Velicer's self-efficacy, Prochaska's processes of change, Velicer's decisional balance, and Fagerstrom's nicotine dependency questionnaires. The study group received five sessions of 45-minute individual counseling each and were followed-up three and six months later. Data were analyzed by SPSS version 16, using paired-samples t-test, independent-samples t-test, and chi-square.

Results: Within six months of follow-up, 20 persons (40%) of the intervention group reached the maintenance stage of smoking cessation, while no one from controls managed to do that. Except for the perceived barriers and benefits of smoking cessation, all other constructs of the trans-theoretical model (cognitive and behavioral processes and smoking temptation) showed significant changes among the intervention group during six months' follow-up ($p < 0.05$). There was no significant relationship between variables of having smoker friends, occupation, marital status, education status, and success or failure in cigarette smoking cessation ($p > 0.05$).

Conclusion: According to our study, selection of cigarette smokers who are willing to quit, delivery of individual counseling according to specific personal characteristics, and also provision of free nicotine replacement therapies should be taken into account in cigarette smoking cessation programs.

Keywords: Trans-theoretical model, Cigarette smoking cessation, Decisional balance, Stages of change

1. Introduction

Cigarette smoking has been on the rise among both sexes especially the young generation worldwide. Epidemiologic studies across the world have shown that there are strong relationships between cigarette smoking and incidence of non-communicable and chronic maladies such as cardiovascular diseases (CVDs), pulmonary problems, cancers, and stroke (1, 2). In North America, smoking is identified as the most important preventable cause of CVDs and as the third leading cause of all mortalities, imposing millions of dollars to the health system (3, 4). According to a US Department of Public Health (USDPH) report, 82% of adult smokers picked up their smoking habit before reaching

Corresponding author:

Professor Dr. Davoud Shojaeizadeh, Department of Health Promotion and Education, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran. Tel: +98.2142933000, Email: Shojaei@tums.ac.ir

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18 years old, and almost half of smoking adolescents will be continuing it until a smoking-induced death (2). Therefore, smoking cessation obviously can prevent millions of premature deaths (4), but, seemingly, the chance of such a cessation is not so high (5) in a way that only 2.7% of people were able to give up smoking in some studies (6). Smoking behavior is a complex phenomenon, and without help of behavioral interventions very few people manage to break such a habit—a matter that is also emphasized by studies. In the present study, intervention was composed of a trans-theoretical model (TTM), motivational counseling, and nicotine replacement therapy (NRT). The main staple of TTM is that people are not to make white or black decisions while trying to change their behavior, but behavior change is a gradual phenomenon divided into different parts and stages through which people pass in order to change (7). TTM consists of four constructs, including change stages, change processes, self-efficacy, and decisional balance (8). Change stages construct is composed of five stages: pre-contemplation, contemplation, preparation, action, and maintenance. In the pre-contemplation stage, one has no intention to change his or her behavior within the next six months, which can be due to lack of knowledge about behavior of interest, negative experience of cessation failure, or lack of motivation. In the contemplation stage, one has the intention to take up the behavior in the next six months and is mulling on advantages and disadvantages of it. In the preparation stage, one intends to adopt the behavior within next month and is planning and preparing for needed requirements. In the action stage, one has already taken up the behavior of interest, but it is only a few months (less than six months) that he or she is on this line of action. In the maintenance stage, as a last stage, it is more than six months that one has adopted the behavior and has reached an appropriate level of self-efficacy against tempting situations (8, 9). As a short literature review, John and colleagues' study in 2003 in Germany showed that, in terms of smoking cessation, 76.4% of people were in pre-contemplation stage, 17% in contemplation stage, and 6.6% in preparation stage (10). Carlson and colleagues' interventional study in 2003 on 1800 Canadian people showed that, after three months of educational intervention, 39.5% of people managed to quit smoking successfully (11). In a quasi-experimental study in the United States, Anderson assessed the effect of NRT on 109 smokers using TTM. The study proved a higher rate of successful cessation among interventions compared with controls that did not enjoy such an intervention (12). Social support of persons has a crucial role in adoption of health behaviors. "Cobb" defined the social support as the enjoyment of love, support, and care from family members, friends, and others (13). Informational, emotional, and instrumental supports are the common types of social support introduced by a several researches. Emotional support includes loving, compassion, acceptance, and respect for the individuals. Instrumental support means material, real, and objective assistance from others (14). According to the World Health Organization (WHO), in 2010 the prevalence of smoking in Iranian individuals aged 15-64 is increased to 12% (15). Additionally, WHO predicts whether tobacco control efforts will continue at the same levels; in 2025, around 9% of the Iranian population (approximately 6,355,400 persons) will be smokers (15). Furthermore, the result of a study revealed that only 2.7% of Iranian smokers have quit their smoking spontaneously (6). Based on the TTM, smokers in the preparation stage of smoking tend to quit smoking. On the other hand, this tendency will be less successful if they not use quit smoking aids such as nicotine replacement therapy and other support. Thus, the present study aimed to assess the effects of educational interventions, based on TTM, on smoking cessation behavior.

2. Material and Methods

2.1. Study design and sampling

We conducted an experimental study on smokers in Khomein City, Iran, in 2015. To choose the samples and according to Orwell and Erdogan (16), the rate of success in smoking cessation after intervention was set to be 33.3%. Also, globally speaking, the rate of success in cigarettes smoking without intervention is shown to be 2.7% (6), but to prevent bias, the rate in our study was set to be 10%. However, taking all these into account and also the probability of loss of samples, the number of samples as interventions and controls was calculated to be 50 and 60 people, respectively.

2.2. Inclusion and exclusion criteria

Inclusion criteria were as follows: daily smoking of at least one cigarette, being in the preparation stage of cigarette cessation process, and willingness to take part in the study. Exclusion criteria were as follows: nicotine smoking other than cigarettes, history of recent participation in other smoking cessation programs, being under prescriptions of a psychiatrist, and addiction to other drugs.

2.3. Randomization and groups

Through a public announcement, it was attempted to invite the highest number of smoking people as possible into the study. Then, by using inclusion and exclusion criteria, the proper subjects were chosen into the study. This process of subject selection went on until a predetermined required number of samples was chosen.

2.4. Experiment and data collection

To gather the required data, the following tools were applied: 1) an individual characteristics form; 2) stages of change questionnaire developed by Di Clemente and colleagues (17) and Velicer and colleagues, which includes five questions regarding smoking and intention to quit it; 3) self-efficacy questionnaire developed by Velicer and colleagues (18), which contains nine questions on tempting situations. Answer options to each question are on a Likert scale (five options) ranging from “not at all” to “very high.” Score of options correspondingly ranges from 1 to 5; 4) processes of change questionnaire developed by Prochaska and colleagues (19), which is composed of 20 Likert-styled five-option questions, options ranging from “never” (score=1) to “always” (score=5). The first 10 questions of the questionnaire covered cognitive processes of smoking (for example: I would tell to myself that I am able to cease smoking whenever I intend to) and the next 10 questions cover behavioral processes of smoking (for example: whenever I am in need of peace and tranquility, I would resort to other activities rather than smoking); 5) decisional balance questionnaire developed by Velicer and colleagues (20) which includes six Likert-styled five-option questions, options ranging from “not important” (score=1) to “very important” (score=5). Decisional balance is a stage in which one weighs the benefits and barriers of a behavior change (7); 6) Fagerstrom’s nicotine dependency questionnaire (21). According to this questionnaire, if one smokes his or her first daily cigarette within the first 5 minutes after morning wake-up, that person would get a score of 3, and if within 6 to 30 minutes a score of 2, within 31 to 60 minutes a score of 1, and after 60 minutes a score of 0. Reliability and validity of this questionnaire has been tested and proved in many previous studies in Iran (22, 23). Specificity and sensitivity of Fagerstrom’s test are 67.5% and 76.2%, respectively; 7) the final tool was a questionnaire to measure one’s motivation to quit smoking (24). The Banville method was used to study the validity of the questionnaire (23), which included three phases of translation-back translation, expert panel, and a pilot study. Its reliability also was proved through a preliminary study on 30 smokers (Cronbach’s $\alpha > 0.7$).

2.5. Statistical analysis

Gathered data were entered into SPSS (version 16) and analyzed. Paired and independent t-tests and chi-square test were used to analyze the data. To investigate the changes among interventions and controls, repetitive tests were used. Also, to control for demographic data, covariance tests were applied.

2.6. Ethics

The protocol for this study was approved ethics committee of Tehran University of Medical Sciences (grant number: 9121108009). Written informed consent was obtained from all participants before the study commenced.

2.7. Educational intervention

As the educational intervention, each case received five sessions of 45-minute counseling. Issues covered and educated in the counseling sessions were as follows: exact time of smoking cessation within, at most, the next two weeks, requirements for day of cessation, tempting situations, and likelihood of error and slide into smoking, nicotine dependency and signs of nicotine deprivation, measurement of nicotine dependency level using Fagerstrom’s test and determination of exact dosage of nicotine gum, smoking cessation induced stress and ways to cope with it, and importance of physical exercise during smoking cessation period. Then, in order to keep interventions persuasive and make the cessation durable, smoking cessation was followed up for six months. During that period, interventions were counseled in three different times (in pre-test, three and six months later), and questionnaires of changes in smoking behavior were completed. NRT was used within the first eight weeks of intervention. There also was a phone-based follow-up program for six months: two follow-up calls at first week, one call each week from second week until the end of first three months, and then one call every other week until the end of the follow-up period. Based on Fagerstrom’s test, scores on nicotine dependency level interventions were grouped into three cohorts of: a) those with low dependency (0-3 test scores); b) those with mediocre dependency (4-6 test scores); c) and those with high dependency (7-10 test scores). Dosage of prescribed 2 gm nicotine gum was determined based on that grouping: at most six chewing gums daily for the first cohort, at most nine daily for the second group, and at most 12 daily for the third group. All interventions were receiving the gum for eight weeks, and its dosage was being gradually reduced every other week. To be exact, for those with low dependency one chewing gum; for those with mediocre and high dependency two chewing gums were being reduced every other week. Also, according to motivation to cessation scores, interventions were grouped into three cohorts of: a) those with low motivation (4-9 score values); b) those with mediocre motivation (10-15 score values); and c) those with high motivation (16-20 score values). There was also a pack of smoking cessation related pamphlets and booklets distributed among interventions. Against this, controls received no intervention. However, due to ethical

considerations, there were two educational sessions for controls after data gathering; they also received a same pack of educational materials.

3. Results

As mentioned in the methodology section, there were in total 110 smokers participating in our study: 98.2% (108 persons) of participants were men, and each case and control group contained only one participating female. The majority of participants were married. Other demographic characteristics of participants are illustrated in Table 1. Mean of nicotine dependency score based on Fagerstrom's test among all participants and among controls and interventions separately was 5.30 ± 2.15 , 5.12 ± 2.12 , and 5.49 ± 2.76 (out of 10) respectively ($t=1.032$; $p=0.305$). Over half the interventions and over 30% of controls were highly nicotine dependent; according to chi-square test, such a distribution was statistically significant. As presented in Table 2, and in terms of success in cessation of smoking, 40% (20 persons) of interventions managed to reach the maintenance stage after six months of follow-up, whereas not one of controls could do that, and only three persons managed to reach the action stage. Also, according to repetitive tests, the trend of temptation to smoke scores among interventions was significantly declining ($F=30.215$, $p=0.001$, $SE=0.38$). Also, the magnitude of such a temptation effect was 0.38; according to Cohen's criterion (1994) such an effect is mediocre (25). Table 3 also illustrates results of analyses on TTM constructs of perceived benefits and barriers and cognitive and behavioral processes. According to those analyses, there was no significant change in scores of cognitive processes among controls during six months' follow-up, but interventions showed significant changes. Analyses on constructs of TTM among interventions during three months' follow-up showed that, except for constructs of perceived barriers of smoking (t independent=0.155; $p=0.877$), cognitive processes (t independent=0.765; $p=0.765$), and environment assessment (t independent=0.254; $p=0.801$), all other constructs were significantly different among interventions who managed to quit and those who did not. Such analyses for changes of constructs during six months' follow-up showed that, except for constructs of perceived barriers and benefits, all other constructs of TTM were different among interventions who quit and those who did not (Table 4).

Table 1. Frequency of demographic features of sample

Demographic variables		No. of controls (%)	No. of interventions (%)
Education	Primary school	9 (15)	11 (22)
	Guidance school	17 (28.2)	9 (18)
	High school	23 (38.4)	19 (38)
	Bachelor and higher	11 (18.4)	11 (22)
Marital status	Single	6 (10)	8 (16)
	Married	54 (90)	42 (84)
Occupation	Self-employed	54 (90)	40 (80)
	Cleric	6 (10)	10 (20)

Table 2. Frequency of progress and regress through stages of smoking cessation among interventions and controls during six months of follow-up

Time of follow-up	Change stages	No. of interventions (%)	No. of controls (%)
Pre-test	Pre-contemplation	0 (0)	0 (0)
	Contemplation	0 (0)	0 (0)
	Preparation	50 (100)	60 (100)
	Action	0 (0)	0 (0)
	Maintenance	0 (0)	0 (0)
Three months after intervention	Pre-contemplation	4 (8)	4 (6.7)
	Contemplation	4 (8)	14 (23.3)
	Preparation	12 (24)	40 (66.7)
	Action	30 (60)	2 (3.3)
	Maintenance	0 (0)	0 (0)
Six months after intervention	Pre-contemplation	6 (12)	7 (11.7)
	Contemplation	6 (12)	22 (36.7)
	Preparation	12 (24)	28 (44.66)
	Action	6 (12)	3 (5)
	Maintenance		0 (0)

Table 3. Mean of scores for TTM constructs among interventions and controls after six months of follow-up

Constructs		Pre-test	Three months after intervention	Six months after intervention	P-value
Temptation to smoke	Controls	3.65±0.64	3.72 ± 0.60	3.77 ± 0.71	0.04
	Interventions	3.91 ± 0.78	3.27 ± 0.92	3.02 ± 1.10	0.003
ANCOVA test		<i>P</i> = 0.405	<i>P</i> = 0.001	<i>P</i> = 0.001	-
Benefits of smoking	Controls	2.41 ± 1.06	2.42 ± 1.03	2.44 ± 1.01	0.147
	Interventions	2.31 ± 0.99	2.33 ± 0.88	2.35 ± 0.5	0.898
ANCOVA test		<i>P</i> = 0.42	<i>P</i> = 0.73	<i>P</i> = 0.88	-
Barriers of smoking	Controls	3.86 ± 0.7	3.81 ± 0.75	3.73 ± 0.7	<i>P</i> = 0.136
	Interventions	3.73 ± 0.8	3.72 ± 0.7	3.75 ± 0.68	<i>P</i> = 0.97
ANCOVA test		<i>P</i> = 0.43	<i>P</i> = 0.56	<i>P</i> = 0.61	-
Cognitive processes	Controls	3.41 ± 0.76	3.44 ± 0.5	3.36 ± 0.54	<i>P</i> = 0.746
	Interventions	3.78 ± 0.6	3.76 ± 0.44	3.48 ± 0.43	<i>P</i> = 0.006
ANCOVA test		<i>P</i> = 0.627	<i>P</i> = 0.25	<i>P</i> = 0.26	-
Behavioral test	Controls	2.90 ± 0.72	2.75 ± 0.62	2.81 ± 0.71	<i>P</i> = 0.244
	Interventions	2.75 ± 0.7	3.34 ± 0.88	3.29 ± 1.04	<i>P</i> = 0.001
ANCOVA test		<i>P</i> = 0.927	<i>P</i> = 0.07	<i>P</i> = 0.01	-

Table 4. Mean of scores for constructs of TTM among those who quit and those who did not after three and six months of follow-up

Constructs of TTM	Three months follow-up			Six months follow-up		
	Quitted	Not quitted	P-value	Quitted	Not quitted	P-value
	Mean & SE	Mean & SE		Mean & SE	Mean & SE	
Consciousness raising	4.18 ± 0.53	3.22 ± 0.78	0.001	4.10 ± 0.47	2.68 ± 0.73	0.001
Dramatic relief	2.86 ± 0.7	3.47 ± 0.95	0.013	2.41 ± 0.68	3.94 ± 0.83	0.019
Self-reevaluation	2.93 ± 0.72	3.62 ± 0.93	0.005	2.56 ± 0.89	3.03 ± 0.71	0.044
Environmental reevaluation	3.51 ± 0.67	3.57 ± 0.94	0.801	4.15 ± 0.77	3.46 ± 0.66	0.001
Social liberation	4.41 ± 0.5	3.8 ± 0.67	0.001	4.02 ± 0.69	3.59 ± 0.69	0.035
Self-liberation	4.05 ± 0.71	3.85 ± 0.85	0.375	4.69 ± 0.39	3.57 ± 0.91	0.001
Helping relationships	3.8 ± 0.61	2.62 ± 0.75	0.001	4.00 ± 0.391	2.61 ± 0.8	0.001
Counter conditioning	4.21 ± 0.77	2.02 ± 0.83	0.001	4.32 ± 0.35	2.18 ± 0.92	0.001
Stimulus control	4.63 ± 0.89	2.02 ± 0.83	0.001	4.93 ± 0.2	2.14 ± 1.05	0.001
Reinforcement	3.96 ± 0.61	3.2 ± 0.95	0.001	4.39 ± 0.29	3.14 ± 0.8	0.001
Cognitive processes	3.58 ± 0.37	3.54 ± 0.64	0.765	3.45 ± 0.33	3.14 ± 0.55	0.024
Behavioral processes	4.13 ± 0.53	2.75 ± 0.62	0.001	4.48 ± 0.18	2.73 ± 0.74	0.024
Perceived benefits	1.55 ± 0.46	1.57 ± 0.66	0.855	1.37 ± 0.33	1.39 ± 0.96	0.554
Perceived barriers	3.93 ± 0.72	3.96 ± 0.76	0.877	4.01 ± 0.72	3.92 ± 0.71	0.665
Decisional balance	-2.37±0.74	-1.36±1.38	0.002	-2.63±0.8	-1.97±1.22	0.002
Positive social situations	2.58±0.57	3.9±0.91	0.001	1.91±0.59	3.64±0.94	0.001
Negative social situations	3.2±0.67	4.55±0.53	0.001	2.56±0.46	4.35±0.69	0.001
Habitual circumstances	2.11±0.69	3.53±0.88	0.001	1.33±0.34	3.29±0.93	0.001
Smoking temptation	2.63±0.58	3.99±0.7	0.001	1.93±0.534	3.76±0.77	0.001

4. Discussion

The present study findings showed that success in cigarette smoking cessation and reaching the maintenance stage were significantly higher among interventions than in controls. Such success can be due to the type of interventions delivered and/or selection of highly willing and ready-to quit people. Dino and colleagues' study showed that people who were only through a session of 10-minute smoking cessation counseling had 25 times more intention to quit after three months (26). Jonsditer and colleagues' study showed that, six months after intervention, the constant and one-week long cessation starts were 33% and 44%, respectively (27), which was slightly lower than those figures in our study. Such a difference, however, can be due to the reason that, against our study, their subjects were suffering

from pulmonary diseases. Delivery of nicotine gums and related education and also determination of proper nicotine dosage based on level of dependency were, frankly speaking, one of the bold features of our study that could play a role in higher cessation success rate and movement toward the maintenance stage. A slew of studies have shown that NRT plays a notable role in smoking cessation (28, 29). Alberg and colleagues' study showed that providing NRT for no charge raised the cessation success rate from 38% to 56% (30). On the other hand, phone-based follow-ups, especially during the first weeks, provide a kind of social support for smokers who are attempting to quit. McAlister and colleagues' study showed that cessation success rate among those who had access to phone-based counseling was 8% times higher than the rate among those who did not. In terms of cessation economy, the counseling also was one year cost-effective (31). Due to selection of highly intended people, delivery of individual counseling, NRT, and phone-based follow-ups, the cessation success rate in the present study was high among interventions compared with the controls. Different studies have shown that concurrent use of mentioned strategies can lead to such higher rates of success in smoking cessation. Park and colleagues study (2006) showed that short-term counseling, phone-based follow-ups, and NRT can significantly increase the cessation success rate among cancer survivors (32). Our study also showed that there was no significant change in mean of scores for perceived barriers of smoking among interventions and controls in six months of follow-up. According to TTM, as one goes closer to the maintenance stage, they can expect to observe increased perceived barriers of smoking and perceived benefits of quitting and/or less and less perceived benefits of smoking and perceived barriers of quitting. Carlson and colleagues' study (2006) showed that perceived barriers of smoking along with the process of "reinforcement management" are strong predictors of smoking cessation (11). Kim's study (2006) in South Korea showed that adolescents who are in action and maintenance stages of smoking cessation use more behavioral processes, but, generally speaking, when moving from first to last stages of cessation, people enjoy the cognitive processes as well. This way, Kim concluded, people who are in cessation stages search repeatedly for related information and then assess their environment and take action accordingly (33).

5. Conclusions

According to the present study findings, one can suggest that delivery of individual counseling, according to specific personal characteristics, should be considered in smoking cessation programs. Also, as people who are in the preparation stage of cessation are more willing and intend to quit, they should be of higher priority in cessation programs. Delivery of free-of-charge NRT, which lifts its economic barrier, also can increase the rate of adoption of smoking cessation interventions among smokers. Moreover, use of Fagerstrom's test of nicotine dependency that determines dosage of NRT (nicotine gums) is effective. Noteworthy is that a limitation of the present study is its reliance on self-reported smoking cessation, which was not rectified by biochemical variables such as tests of exhaled carbon monoxide, plasma, and urine level of cotinine and other metabolites of nicotine.

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Conflict of Interest:

There is no conflict of interest to be declared.

Authors' contributions:

All authors contributed to this project and article equally. All authors read and approved the final manuscript.

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