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The effect of educational intervention based on theory of planned behavior on the improvement of colorectal cancer screening intention among average-risk individuals referring to Asadabad city clinics

Mina Maheri, Fatemeh Darabi¹, Saeede Khalili², Marziyeh Hesari¹

Abstract:

BACKGROUND: Colorectal cancer (CRC) is the third most common cancer in men and the fourth most common cancer in women in Iran. Therefore, the aim of this study was to determine the effect of educational intervention based on the theory of planned behavior (TPB) on the improvement of CRC screening intention among average-risk individuals.

MATERIALS AND METHODS: This quasi-experimental study was performed on the 50–69-year-old individuals referred to Asadabad city clinics in 2020. The individuals were randomly assigned to multistage cluster sampling in each intervention and control group. The instrument used in this research was a researcher-made questionnaire based on TPB. Educational intervention was conducted for the intervention group, one of their family members, and staff of clinic under intervention. Finally, the data were entered into SPSS and analyzed utilizing descriptive and analytical statistics. Results were considered significantly <0.05 .

RESULTS: There were no significant differences between two intervention and control groups in the preintervention phase in terms of the mean scores of attitude ($P = 0.58$), subjective norms ($P = 0.59$), and behavioral intention ($P = 0.66$). However, in the postintervention phase, these differences were significant. Furthermore, regarding the mean score of perceived behavioral control, there was a significant difference between the two groups in the preintervention phase ($P < 0.02$), while in the postintervention phase, this difference was not significant ($P = 0.29$).

CONCLUSION: Educational intervention based on the TPB has been effective in improving the CRC screening intention among average-risk individuals. Therefore, using the results of this research and developing appropriate educational programs at the community level can be increased the participation of community members in CRC screening programs.

Keywords:

Colorectal cancer, education, intention, screening

Introduction

Colorectal cancer (CRC) occurs in the colon or rectum, which is called colon or rectum cancer, considering the place of the lesion. Still, because of their common

features, they are classified in the same group.^[1] Most cases of CRC occur in industrialized countries. However, it is increasing rapidly in less developed countries which have taken Western

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Department of Public Health, School of Health, Reproductive Health Research Center, Urmia University of Medical Sciences, Urmia, Iran,
¹Department of Public Health, Asadabad School of Medical Sciences, Asadabad, Iran,
²Department of Health Services and Health Promotion, School of Health, Iran University of Medical Sciences, Tehran, Iran

Address for correspondence:

Dr. Fatemeh Darabi,
Department of Public Health, Asadabad School of Medical Sciences, Asadabad, Iran.
E-mail: fatemedarabi43@yahoo.com

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lifestyle.^[2-5] CRC is the third common cancer among men and the second common cancer among women around the world, and the number of new cases of this disease is 1.2 million cases in the year.^[4,6,7] Cancers are the third reason for death in Iran after heart diseases and accidents.^[8] CRC is one of the most common cancers in Iran. This cancer is the third common cancer among Iranian men and the fourth common cancer among Iranian women. Changes in lifestyle, including unhealthy diet and physical activity decrease, as well as low participation of people in screening programs have increased incidence and mortality rate due to CRC in Iran.^[6,9-11]

Considering the shocking statistics of prevalence and mortality rate due to CRC, secondary prevention from this disease is as important as primary prevention, like having a healthy lifestyle.^[6,10,11] Therefore, it is possible to take necessary measures about this cancer by secondary prevention, which is, in fact, early diagnosis utilizing screening tests to cure it rapidly and prevent its spreading.^[4,10,11] Fecal occult blood test (FOBT) through fecal immunochemical test, which is called iFOBT or FIT preferred to other CRC screening methods due to ease to doing and also its low cost.^[4,10,11] Therefore, CRC is screened through this method in Iran for average-risk individuals. Hence, these individuals have to do FIT per year. If the test is positive, the individuals have to be referred to do complementary tests, including colonoscopy.^[12,13] Average-risk individuals are asymptomatic individuals 50 years old or older without CRC or cancerous polyp personal experience, without inflammatory bowel disease personal experience, without CRC family experience in a first-class relative who has been diagnosed before 60 years old or in two first-degree relatives who are diagnosed at any age, and without adenomatous polyp family which is diagnosed in a first-degree relative before 60 years old.^[4,12,13] It is worth mentioning that the target of screening program in Iran is individuals between 50 and 69 years old. Despite the effect of screening programs on the diagnosis of primary and curable stages of cancer, unfortunately so many endangered individuals do not take part in screening programs^[10,11] so that considering the capacity of treatment in more than 90% of individuals suffering from CRC in primary stages, only 40% of such individuals are diagnosed in primary stages and cured.^[10,11] Based on the findings of studies conducted in Iran, the level of knowledge, attitude, practice, and participation of average-risk individuals in CRC screening programs is poor. These findings showed that routine training on CRC screening provided by health-care workers is inadequate because it is not theory based. Therefore, the use of theories and models existing in the health education can increase the effectiveness of these educational programs.^[11,14,15]

So for due to growing trend of CRC in Iran,^[9] referring to so many individuals suffering from CRC in the advanced stages of the disease,^[10,11] the importance of screening programs in the early detection of CRC and reducing its prevalence, incidence, and mortality,^[6] low participation of Iranian average-risk individuals in the routine CRC screening program,^[10,11] and inadequate routine training on CRC screening,^[14,15] it is necessary to design and implement the theory-based educational interventions among people at risk of CRC to increase their participation in the screening programs.

As mentioned, the effectiveness of educational interventions depends on the correct use of models and theories existing in the health education.^[16] Existing theories and models in the health education science are considered as a basis and foundation for designing and implementing educational interventions, which through them, it is possible to measure educational intervention effect and predict behaviors.^[17] These theories and models are an overall plan that increases the effectiveness of educational interventions and integrates the individual and environmental factors affecting the behavior and behavioral intention into the health education interventions.^[16,17] Thus, theory-based educational interventions can increase the individual's intention to participate in the CRC screening programs. Moreover, the findings of the study conducted by Baghianimoghadam *et al.* indicated that education based on the theory of planned behavior (TPB) can increase the individual's behavioral intention to participate in the CRC screening programs and the use of this theory is recommended in the educational interventions which are conducted to increase the behavioral intention to participate in the CRC screening programs.^[18] Regarding what mentioned above, the present study aims to "investigate the effect of educational intervention based on the TPB on the improvement of CRC screening intention among average-risk individuals referring to Asadabad city clinics," to be a basis and guideline to implement the educational interventions among people at risk of CRC to increase their participation in the screening programs.

Conceptual framework

The present study has used the TPB as the conceptual framework. TPB is one of the common theories in behavior change. According to this theory, behavioral intention is the most important determinant of human behavior; behavioral intention is the decision and demand of individuals to do a specific behavior. Behavioral intention is the index of individual readiness to do a specific behavior and is considered as immediate behavior overture.^[19] According to this theory, behavioral intention determinants are three factors of attitude (individual's belief in the results of behavior and his/her evaluation of

these results lead to forming his/her attitude toward this behavior), subjective norms (individual's beliefs about other's expectations and also individual's motivation in satisfying these expectations lead to forming subjective norms), and perceived behavioral control (individual's beliefs in interior and exterior factors which may hinder or facilitate behavior and also individual's belief in how doing this behavior is simple or difficult to him/her regarding these obstacles and facilitators lead to forming perceived behavioral control).^[19]

Materials and Methods

This is a quasi-experimental study aiming at investigating the effect of educational intervention based on TPB to improve CRC screening intention among average-risk individuals referred to clinics in Asadabad, Hamedan, Iran, in 2020. The study population is 50–69-year-old individuals referred to Asadabad city clinics. Inclusion criteria are 50–69-year-old individuals without symptom and personal or family experience suffering from colorectal polyp or cancer, physical and mental readiness to participate in the study, and satisfying to take part in study consciously. Exclusion criteria are filling in questionnaires incompletely, unwillingness to participate in the study, the incidence of unpleasant events (illness, etc.), absence of more than two sessions in educational sessions, and migration during the study. According to a similar study conducted by Abuadas *et al.*,^[20] 95% confidence interval, power of 90%, with probability of loss of 20% of samples, and using the following formula, the samples were determined 50 for each group.

$$n = \frac{(z_{1-\alpha} + z_{1-\beta})^2 \times (s_1^2 + s_2^2)}{(x_1 - x_2)^2}$$

$$= \frac{(1.960 + 1.282)^2 \times (1.43^2 + 1.52^2)}{(7.77 - 6.74)^2} = 43$$

In this study, multistage cluster sampling was used. First, each of the four clinics affiliated with Asadabad School of Medical Sciences was considered as a cluster (the clinic refers to comprehensive health service centers). Then, two clinics were selected by simple random sampling among clusters. Next, one of the selected clinics was considered as an intervention group and another one as the control group by simple random sampling. Then, by referring to selected clinics and coordinating with clinic supervisors, the required samples were selected from the referred individuals who met the inclusion criteria, using convenience sampling method.

The ethical considerations of the present study are as follows: receiving ethical code license (IR.ASAUMS.REC.1399.003) from Asadabad School of Medical

Sciences, receiving recommendation letter from Asadabad School of Medical Sciences to submit it to research environments, presence of researcher at selected clinics and expressing study goals, obtaining conscious satisfaction from intervention and control group individuals to take part in the study, and making sure them that participating in the survey is entirely voluntary. In the case of unwillingness, they can exist from research, and their information will remain confidential by researcher and study results will be expressed as a whole.

Data collecting instruments include two parts; the first part was demographic information and research units' medical experiences. The second part was a researcher-made questionnaire based on TPB constructs; the primary questions of this questionnaire were designed based on health education experts, and then, the following stages were conducted to determine questionnaire validity and reliability: qualitative face validity was used to determine the difficulty in understanding the phrases and words and the degree of appropriateness and relationship between phrases and words with the questionnaire dimensions and ambiguities and misunderstanding the phrases and words in the questionnaire, so that 20 individuals with characteristics like individuals in the study answered questionnaire questions and expressed their corrective opinions, and the ambiguous phrases and words reported by them have corrected or omitted.^[21] In the following, to determine qualitative content validity, the questionnaire was provided with experts' panel (including ten experts of health education and designing instrument). They were asked to investigate questionnaire based on grammar criteria, using proper words, placing item suitably, proper scoring, appropriateness between selected dimensions with questions related to constructs, and to represent their opinions. Cronbach's alpha was used to measure instrument reliability, which was 0.85 for attitude questions, 0.80 for subjective norms questions, 0.94 for perceived behavioral control, and 0.82 for behavioral intention. Therefore, the instrument used in the study was desirably reliable.^[21] Answering questions related to TPB constructs were scored as a five-point Likert scale from strongly agree (score 5) to strongly disagree (score 1). The final questionnaire includes 12 questions related to attitude construct (obtainable score range from 12 to 60), 6 subjective norms questions (6–30), 8 perceived behavioral control questions (8–40), and 2 behavioral intention questions (2–10). Questionnaires were coded and recognizable, and the participants' address and telephone number were registered in list names by the researcher.

In the preeducational intervention phase, pretest was conducted and the two groups (intervention and control)

completed questionnaires. In the case of inability to read or understating questions, the questionnaire would be read by researcher or clinic personnel or sometimes by some natives who were more familiar with region language to remove ambiguities. Educational intervention based on TPB constructs and considering results from pre-test stage was designed and conducted on the intervention group. Control group individuals only received routine training on CRC screening provided by health-care workers.

Educational intervention was held in three 60-min sessions for the intervention group, one 60-min session for one of their family members, and one 30-min session for staff of clinic under intervention, during 2 months. In the first session after the introduction, through lecture and question-answer, some information was represented about CRC and its status in Iran and the world and the film of pain due to CRC and its treatment was played. In the end, a designed educational pamphlet about CRC was distributed among the intervention group (improving knowledge and attitude constructs). During the second session, some information was represented through lecture and question-answer about the importance of preventing CRC and different ways of primary and secondary prevention including existing screening tests in Iran to early diagnose this cancer like FIT. In the following, a group discussion on the benefits of CRC screening was held with the aim of creating a positive attitude toward screening tests, especially FIT, and the prepared educational poster entitled "take part in preventing and controlling CRC by doing FIT" was installed on board and clinic entrance gate. In the end, the family members' invitation cards to participate in the CRC workshop were distributed among them (improving attitude construct). The third session was held in the form of an educational CRC workshop with the presence of one family member of the intervention group (spouse or one of his/her children) aiming at changing attitude and positively influencing them rather than screening tests, especially FIT, in the early diagnosis of CRC. In this session, after the introduction, through lecture and question-answer, some information was represented about CRC, the importance of preventing it, different ways of primary and secondary prevention, and the benefits of CRC screening. In the end, they were asked to encourage and support intervention group individuals to do screening tests regularly, especially FIT (improving subjective norm construct). The fourth session was held aiming at influencing positively on clinic staff to support intervention group individuals and to encourage them to do CRC screening tests regularly, especially FIT. This session was held in a group discussion form on the role of health-care workers in promoting and supporting from CRC average-risk individuals to participate in CRC screening programs

and the benefits due to increasing participation in these programs (improving subjective norm construct). The fifth session was held in a group discussion on facilitators and barriers to CRC screening, and also, an individual's belief in how doing these tests may be difficult or simple for him/her despite such facilitators and barriers. In the following, some approaches were mentioned to overcome the existing barriers. Furthermore, individuals who have done FIT before were asked to share their experiences with others (improving perceived behavioral control construct) [Table 1]. It is worth mentioning that to increase educational sessions' effectiveness, these sessions were held in 10-person groups. Hence, educational intervention took 2 months. Three months after the end of educational intervention, questionnaires were completed in again by the intervention and control groups (posttest).

At last, data were entered into SPSS 23 (SPSS Inc., Chicago, IL, USA) and analyzed utilizing descriptive statistics (frequency, percentage, mean, and standard deviation) and analytical statistics (Kolmogorov-Smirnov test, Chi-square test, Fisher's exact test, independent *t*-test, paired sample *t*-test, and ANCOVA). Results were considered significantly < 0.05 .

Results

The findings of this study include frequency, percentage, mean, and standard deviation of study variables, comparing demographic characteristics and medical experiences in the two intervention and control groups in the preintervention phase, measuring changes in the mean scores of TPB constructs following operating educational intervention in both the control and intervention groups, and comparing the mean scores of TPB constructs between the two control and intervention groups before and after the educational intervention.

Based on findings from this study, in the preintervention phase, there was no significant difference between the two intervention and control groups regarding gender, age, marital status, educational status, family income status, using special drugs experience, covered by medical insurance, history of specific physical illness, history of examinations and tests for CRC, history of iFOBT, and general health status, while there was a significant difference regarding suffering from especial physical disease between the two groups [Table 2]. Hence, the mean scores of TPB constructs were compared between the two intervention and control groups in the postintervention phase, using ANCOVA and with adjusted for "suffering from especial physical disease variable" to omit the potential effect of this variable on the observed difference in the mean scores of TPB constructs between the two groups.

Table 1: Summary of interventions

Session	Target group for intervention	Target construct for intervention	Topics raised	Educational methods	Educational aids	Time
First	Intervention group	Knowledge, attitude	Introduction of persons to each other Basic information about CRC CRC status in Iran and world Complications of CRC and its treatment	Lecture, question-answer	Audio-video clip, pictures, pamphlet, PowerPoint file, laptop	60 min
Second	Intervention group	Attitude	Importance of preventing CRC Different ways of primary and secondary prevention including existing screening tests in Iran to early diagnose of CRC like FIT Benefits of CRC screening Distribution of the family members' invitation cards	Lecture, question-answer, group discussion	Poster, PowerPoint file, laptop	60 min
Third	Family member of the intervention group	Subjective norms	Introduction of persons to each other Basic information about CRC Importance of preventing CRC Primary and secondary prevention of CRC Benefits of CRC screening Importance of supporting and encouraging family members to do CRC screening	Lecture, question-answer	Audio-video clip, pictures, poster, pamphlet, PowerPoint file, laptop	60-min
Fourth	Clinic staff	Subjective norms	Role of health care workers in supporting from CRC average-risk individuals to do CRC screening	Group discussion	Poster, Pamphlet, PowerPoint file, laptop	30-min
Fifth	Intervention group	Perceived behavioral control	Facilitators and barriers to CRC screening Approaches overcoming the barriers to CRC screening Experiences of individuals who have done the FIT before	Group discussion	PowerPoint file, laptop	60-min

FIT=Fecal immunochemical test, CRC=Colorectal cancer

The findings of the present study showed that there were no significant differences between the two intervention and control groups in terms of the mean scores of attitude ($P = 0.58$), subjective norms ($P = 0.59$), and behavioral intention ($P = 0.66$) in the preintervention phase. However, these differences were significant between the two groups at the postintervention phase. Furthermore, regarding the mean score of perceived behavioral control, there was a significant difference between the two groups in the preintervention phase ($P < 0.02$), while in the postintervention phase, this difference was not significant ($P = 0.29$). Moreover, the results of the paired *t*-test showed that, in the intervention group, there was a significant difference in terms of the mean scores of TPB constructs at the pre- and postintervention phase. In contrast, these differences were not significant in the control group [Table 3].

Discussion

The present study aims at investigating the effect of educational intervention based on TPB to improve CRC screening intention among average-risk individuals referred to clinics of Asadabad. The results showed the positive effect of theory-based educational intervention on taking behavioral intention related to CRC screening

among the average-risk individuals and significant increasing of behavior change prerequisites from TPB construct perspective that is the attitude, subjective norm, and behavioral intention after the educational intervention in the intervention group; also, the results demonstrate that to create change in the preventive behaviors, interventions based on individuals' belief and intention may be influential.

Based on the findings of the present study, after the educational intervention, the mean score of behavioral intention significantly increased in the intervention group compared with the control group. The effectiveness of educational interventions based on the TPB in promoting cancer screening intention has also been observed in other studies. For example, in the studies conducted by Khani Jeihooni *et al.* entitled "the effect of educational intervention based on the TPB on mammography screening in Iranian women in 2018" and Sargazi *et al.* entitled "effect of an educational intervention based on the TPB on behaviors leading to early diagnosis of breast cancer among women referred to health care centers in Zahedan city in 2013," after the educational intervention, the mean score of breast cancer screening intention significantly increased in the intervention group compared with the control group.^[22,23]

Table 2: Comparison of demographic information and medical history in two groups at the preintervention phase

Variables	Subvariables	Group, n (%)		P
		Intervention	Control	
Gender	Male	25 (50)	25 (50)	1 ^a
	Female	25 (50)	25 (50)	
Marital status	Single	1 (2)	3 (6)	0.58 ^b
	Married	44 (88)	43 (86)	
	Divorced	0	1 (2)	
	Widow	5 (10)	3 (6)	
Educational status	Illiterate	15 (30)	13 (26)	0.83 ^a
	Elementary	10 (20)	12 (24)	
	Junior high school	9 (18)	9 (18)	
	High school and diploma	6 (12)	9 (18)	
Family income sufficiency	Yes	26 (52)	27 (54)	0.84 ^a
	No	24 (48)	23 (46)	
History of specific physical illness	Yes	23 (46)	10 (20)	0.006 ^{a*}
	No	27 (54)	40 (80)	
Using special drug experience	Yes	19 (38)	14 (28)	0.29 ^a
	No	31 (62)	36 (72)	
Covered by medical insurance	Yes	40 (80)	39 (78)	0.80 ^a
	No	10 (20)	11 (22)	
History examinations and tests for CRC such as colonoscopy and sigmoidoscopy	Yes	5 (10)	12 (24)	0.07 ^a
	No	45 (90)	38 (76)	
History of iFOBT (FIT)	Yes	19 (38)	21 (42)	0.68 ^a
	No	31 (62)	29 (58)	
General health status	Excellent	0	3 (6)	0.53 ^b
	Very good	9 (18)	10 (20)	
	Good	26 (52)	21 (42)	
	Fair	11 (22)	11 (22)	
	Poor	4 (8)	5 (10)	
Age (year), mean±SD		57.62±5.93	58.34±5.44	0.53 ^c

^aChi-square test, ^bFisher's exact test, ^cIndependent t-test, *P value significant at P<0.05; SD=Standard deviation, FIT=Fecal immunochemical test, CRC=Colorectal cancer, iFOBT=Immunochemical fecal occult blood test

Table 3: Mean scores of theory of planned behavior constructs in two groups at the pre- and postintervention phases

Construct	Research phase	Mean±SD			P
		Intervention	Control	Mean difference	
Attitude	Preintervention	42.42±5.67	42.10±4.94	0.32	0.58 ^c
	Postintervention	45.04±5.10	42.34±4.58	2.70	0.018 ^{a*}
	Mean difference	2.62±7.29	0.24±5.64	2.38	0.02 ^c
	P	0.006a	0.76b		
Subjective norms	Preintervention	23.80±3.31	24.42±7.52	-0.62	0.59 ^d
	Postintervention	26.42±2.41	24.46±3.72	1.96	0.004 ^{a*}
	Mean difference	2.62±2.94	0.04±8.29	2.58	0.04 ^d
	P	<0.001b	0.97b		
Perceived behavioral control	Preintervention	30.74±4.06	28.72±4.11	2.02	0.02 ^d
	Postintervention	31.70±3.14	29.56±5.62	2.14	0.29 ^{e*}
	Mean difference	0.96±2.83	0.84±5.41	0.12	0.94 ^c
	P	0.02b	0.28b		
Behavioral intention	Preintervention	7.36±1.50	7.38±1.85	0.02	0.66 ^c
	Postintervention	8.96±1.66	7.86±2.08	1.10	0.02 ^{e*}
	Mean difference	1.60±1.72	0.48±2.26	1.12	0.013 ^c
	P	<0.001a	0.14a		

^aWilcoxon; ^bPaired t-test, ^cMann-Whitney U-test, ^dIndependent t-test, ^eANCOVA, *P value significant at P<0.05. SD=Standard deviation

Baghianimoghadam *et al.*, showed that behavioral intention is the most important predictor of CRC screening behavior by first-degree relatives of patients.^[24] Fernández *et al.* also revealed that intention is the most important predictor of breast and cervical cancer screening behavior among women with low income.^[25] Researchers maintain that the more an individual is intended to do a behavior, the more probable it will be to do that behavior.^[17,26]

Based on TPB when individuals obtain positive attitude toward cancer screening behaviors (attitude) and controllability of these behaviors (perceived behavioral control), and on the other hand, they receive social supports from important individuals, relatives, etc., to encourage him/her to do cancer screening behaviors (subjective norms), the individual feels that these behaviors are available regarding environmental factors (facilities and obstacles) and will have high intention to do these behaviors, and when the intention is explained correctly, doing the cancer screening behaviors will increase in them.^[22,23] Therefore, it is recommended designing and implementing the educational interventions to improve behavioral intentions and, consequently, CRC screening behavior among average-risk individuals by focusing on attitude, subjective norms, and perceived behavioral control constructs.

The findings of the present study showed that the educational intervention based on the TPB has been effective in improving attitudes toward CRC cancer screening in the intervention group. The effectiveness of educational interventions based on the TPB in improving attitudes toward cancer screening has been confirmed in other studies, including in studies conducted by Khani Jeihooni *et al.*, and Sargazi *et al.*, which is consistent with the findings of the present study.^[22,23] Different studies show that a positive attitude to behaviors is one of the influential factors of individuals participating in cancer screening plans.^[24,25] Hence, improving individuals' positive attitudes toward CRC screening will increase their performance in protecting oneself concerning different dimensions of the digestive system. Therefore, it is essential using specific educational approaches for attitude changes, such as group discussion and role-playing during the implementation of educational interventions to improve the attitude toward CRC cancer screening among average-risk individuals.^[27,28]

Concerning the effectiveness of educational intervention in increasing subjective norms for adopting cancer screening behaviors significantly in the intervention group, the present study showed a similar result with previous studies.^[22,29] Friends' and family

members' recommendations increased CRC screening intention,^[30] Therefore, in addition to implementing educational interventions for the average-risk individuals, it is suggested that influential people on them are involved in educational intervention including friends and family members, to improve the CRC screening intention and behavior among average-risk individuals.

The findings of this study did not show a significant change in the mean score of perceived behavioral control after the educational intervention than before intervention in the intervention group. In a study conducted by Baghianimoghadam *et al.* entitled "effect of education on knowledge, attitude and behavioral intention in family relative with CRC patients based on TPB in Yazd city in 2012," the mean score of perceived behavioral control significantly increased after the educational intervention than before intervention in the intervention group.^[18] However, this finding is inconsistent with the findings of our study. Hence, we can conclude that the intervention implemented in the present study was not effective in increasing perceived behavioral control. This finding can be explained by the fact that perceived behavioral control is affected by barriers,^[19,31] and on the other hand, there are many barriers in front of CRC cancer screening intention and behavior including traffic problems, lack of time, fatigue and boredom, feeling ashamed of doing these tests, and feelings of fear and anxiety until the test results are known.^[11] In the present study, there was not enough time and facilities to influence all of these barriers, so change in the perceived behavioral control was not significant.

This study has strong points and limitations. One strong point of the current study is that we designed a questionnaire about CRC screening based on the constructs of TPB and assessed its validity and reliability. Furthermore, there was a high rate of answering to questions, which one of the reasons for it is the study population, who referred to clinics to receive their routine care and were available. Furthermore, distributing questionnaires by the researcher and persuading the samples about the importance of the study, following up questionnaires periodically, and above all, this rate of answering demonstrates that this study has been among individuals' concerns.

One potential limitation of the current study is that we did not spend enough time to influence on the perceived behavioral control. Therefore, it is suggested to focus more on this construct in future studies. Another potential limitation is that the data collection instrument in this study was a self-report questionnaire which allowed the participants not to answer the questions honestly.^[16]

Conclusion

The findings of the present study suggest that educational interventions based on the TPB can effectively improve the CRC cancer screening among average-risk individuals. Hence, it is suggested that the educational intervention introduced in the present study as an effective and low-cost method was used in all health-care centers to encourage people to do the CRC screening. The expertise and experiences of health education and health promotion experts working in these centers can significantly contribute to realization of this objective.

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Conflicts of interest

There are no conflicts of interest.

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