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Effect of Education by Multimedia Tools on Pre-colonoscopy Anxiety in Female Patients

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Abstract

Background: Colonoscopy is the most accurate tool for the diagnosis of large intestine diseases, allowing one to observe the inner wall of the large intestine; nonetheless, the invasiveness of colonoscopy causes anxiety in patients.
Objectives: The present study aimed to assess the effect of education using multimedia tools on pre-colonoscopy anxiety in female patients.
Methods: The study tools were Spielberger State-Trait Anxiety Inventory (STAI) and a Knowledge questionnaire which were completed on the visit day. The patients completed the STAI and Knowledge questionnaire again before receiving the colonoscopy. The data were analyzed in SPSS software (version 24) using the analysis of variance (ANOVA) test.
Results: Based on the results, patients in the booklet group had lower anxiety scores on the day of the colonoscopy, as compared to their counterparts in the multimedia group. There was no significant difference between the control and multimedia groups in terms of anxiety scores on the day of the colonoscopy. Nevertheless, there was a significant difference in the knowledge scores of the three groups on the colonoscopy day, and this difference was quite evident in the multimedia group. Moreover, the results of the two-way ANOVA test indicated that an increase in patients' knowledge on the days of visit and colonoscopy increased their anxiety on the colonoscopy day.
Conclusion: As evidenced by the results of the present study, although multimedia tools increased patients' understanding and knowledge of the colonoscopy procedure, they were not useful in the reduction of patients' anxiety. Therefore, the use of multimedia tools for the reduction of pre-colonoscopy anxiety was not effective in patients with high levels of anxiety.

Keywords: Anxiety, Anxiety prevention and control, Colonoscopy, Health education, Spielberger state-trait anxiety inventory (STAI)

1. Background

Cancer is the second leading cause of death in Iran which ranks second in the Eastern Mediterranean region in terms of cancer deaths. More than 38% of cancers in Iran are gastrointestinal, and colon cancer is the third most common type of cancer in men and the fourth one in women (1). Recent studies have reported that the incidence rate of colorectal cancer in patients under 50 years in Iran is 25%. More than 39% of cases were diagnosed with colorectal cancer when still under 50 years. The mean age for early-onset colorectal cancer was 40 years and the majority of cases were in the range of 40-50 years. This pattern is more pronounced in Asia than in Western countries. Early-onset colorectal cancer is predominant in women (2).

Cancer mortality has declined in many developed countries (3) and it is believed that screening has played a major role in this process (4, 5). Fecal occult blood test (FOBT) and colonoscopy are often used in the early stages of screening. Colonoscopy is the best and the most accurate diagnostic screening tool for colon diseases, including inflammatory diseases and structural lesions of the colon (6). This method is invasive and associated with discomfort and pain in patients (6-12). Anxiety is a common problem with invasive medical procedures (10, 13, 14) and is significantly higher in women than men (14, 15); therefore, female patients may need additional education and support (16).

Preoperative anxiety, the pre-surgery phase from the time of the decision to start the intervention to the implementation of the action that demands specific nursing care, reduces tolerance, has some adverse effects on physiological status, increases recovery time, reduces adherence to treatment plans and follow-up of subsequent medical procedures (9, 17), and can affect patients' pain (13). The most common behavioral disorder caused by anxiety is avoiding or escaping treatment. Consequently, the reduction of anxiety can improve adherence to screening programs (10) Since healthcare environments are usually crowded, the communication between medical staff and patients is limited. This creates a gap between health care providers and patients, thereby increasing patients' anxiety (18). Therefore, it seems necessary to ease patients' anxiety during invasive procedures (14, 19).

In this regard, educational interventions seem to

be effective in the enhancement of knowledge, reduction of anxiety, as well as the improvement of the quality of intestinal preparation, and adherence to physicians' instructions (19,16). The most common method for the provision of information is oral training, which is affected by the time and place of providing the education to patients (20). Nonetheless, since patients often do not remember oral explanations (15), another alternative is the provision of written information, such as brochures and pamphlets. The interpretation of information provided in the brochures can be affected by the patient's culture, level of education, and his/her language (20).

Multimedia tools are suitable methods for better communication between medical staff and patients, raising patients' awareness of the treatment processes. However, the clinical results of these interventions on anxiety and pain are still unclear (7). In some previous studies, the patients were included in the study, regardless of gender and level of anxiety. Therefore, to identify appropriate methods for the reduction of anxiety, it is necessary to investigate small groups of patients with severe anxiety before treatment (21).

2. Objectives

The present study aimed to investigate the effect of education using multimedia tools on pre-colonoscopy anxiety in female patients.

3. Methods

This clinical trial was registered in the Iran Clinical Trial Registration Center (www.irct.ir; Code: IRCT20180904040943N1). Based on previous studies, the sample size was determined as 16 individuals in each group with alpha 0.05 and beta 0.2 (80% strength) $(Z_{1-\alpha/2} + Z_{1-\beta}) = (S_1^2 - S_2^2) / (\mu_2 - \mu_1)^2$ (7). The patients were randomly assigned to three groups of 'control', 'booklet', and 'multimedia' using a randomization website (www.randomization.com). The statistical population of the study included women aged 30-70 years referred to the gastrointestinal clinic of Ghaem Hospital in Mashhad, Iran, from November 2018 to June 2019. All patients received a colonoscopy.

The inclusion criteria were as follows: 1) ability to read and write, 2) having at least one of the symptoms of lower gastrointestinal bleeding, abdominal pain, defecation disorders, or iron deficiency anemia, 3) no history of colonoscopy and abdominal surgery, and 4) a trait anxiety score above the relatively weak level. On the other hand, the exclusion criteria entailed not performing the colonoscopy procedure 12 days after the visit day and performing the colonoscopy in a medical center other than the Endoscopy Department of Ghaem Hospital in Mashhad.

The booklet had two parts and its contents were extracted from some authentic and reputable medical websites according to the opinion of gastroenterologists. While the first part had two sections ('an introduction to the gastrointestinal tract' and 'intestinal diseases'), the second part had three sections ('an introduction to colonoscopy', 'before the colonoscopy', and 'the day of colonoscopy'). The content validity of the booklet was evaluated by five gastroenterologists using a researcher-made questionnaire including 67 items. Due to the important effect of color on emotions, blue and green colors were used in the text and images. According to a previous study, these colors cause less anxiety in patients (22). The training video was produced based on the content of the booklet.

To measure patients' anxiety, we used the Spielberger State-Trait Anxiety Inventory (STAI), which is widely used to assess anxiety in medical studies with a small sample size (23). The standardization of this test was performed by Mahram in 1993, and its reliability was calculated and confirmed using Cronbach's alpha coefficient (a=0.89)(24). The questionnaire has two parts (20 items in each part), assessing state anxiety and trait anxiety. State anxiety arises at the moment and evaluates one's feelings about stress, fear of the future, restlessness, selfishness, arousal, and activation of the autonomic nervous system at a moment in time. Trait anxiety refers to relatively constant individual differences in a person's susceptibility to anxiety, thereby distinguishing individuals in their readiness to perceive anxious situations, such as experiencing danger or threatening situations, and responding to such situations with high-intensity accompanying anxiety. In the present study, anxiety refers to the score obtained from answering the STAI tool.

To measure the patients' knowledge, a 15-item researcher-made questionnaire with 'True & False' answers was designed based on the contents of the booklet. To evaluate the validity of the Knowledge Questionnaire, five gastroenterologists commented on the relevance and transparency of the questions on a five-point Likert scale. After the patient's visit by a gastroenterologist and upon receiving a colonoscopy referral, the patients were randomly assigned to three groups. After obtaining an informed consent form, all patients completed the two scales of state and trait anxiety, the STAI, the Knowledge Questionnaire, and the demographic information form. The booklet was provided to the patients in the booklet group. Patients in the multimedia group, in addition to receiving the booklet, watched a 15-min video in the office. On the day of colonoscopy and upon the patient's admission to the endoscopy ward, the STAI and the Knowledge

Questionnaire were completed again by the patients, and the duration of the colonoscopy was recorded after the procedure. To increase validity and control the confounding factors, the treating physician2 was unaware of the patients' groups.

To analyze descriptive and inferential statistics and compare the means of the three groups, the analysis of variance (ANOVA) parametric test was used. Tukey's post-hoc test was also used in the follow-up phase, and the two-way ANOVA was utilized to examine the interaction between booklet and video. Moreover, the chi-square test was used to compare the frequencies observed in the three groups.

4. Results

Out of a total of 62 patients who met the inclusion criteria, 16 cases were excluded from the study due to non-referral for the procedure. Thereafter, 17 subjects were assigned to the control group, 15 to the booklet group, and 14 to the multimedia group. Statistical analysis was performed using descriptive and inferential statistics, including the ANOVA test. As illustrated in Table 1, the demographic information of patients in the three groups was not statistically significant (P<0.05). More than 66% of participants had a high school diploma or high school education, about 65% were employed, and about 82% were married. About 75%, 70%, and 24% of the patients had symptoms of abdominal pain, defecation disorders, and lower gastrointestinal bleeding, respectively. There was no statistically significant difference between the groups in terms of symptoms.

The participants' state anxiety scores using the STAI on the day of the visit ranged from 26-75. The results of the ANOVA test (Table 2) indicated that there was no significant difference between the three groups in terms of anxiety score and knowledge on the visit day.

Table 1. Frequency and percentage of patients' symptoms and demographic information

Profile of the patients			Control (n=17)	Booklet (n=15)	Multimedia (n=14)	p-value
Marital status		Single	1 (5.9%)	2 (13.3%)	5 (35.7%)	0.082
		Married	16(94.1%)	13 (86.7%)	9 (64.3 %)	
Educational status		Below diploma / Diploma	12 (70.6%)	10 (66.7 %)	10 (71.4%)	0.956
		University degree	5 (29.4 %)	5 (33.3 %)	4 (28.6 %)	
Occupational status		Employed	11 (64.7 %)	10 (66.7 %)	11 (78.6 %)	0.675
		Unemployed	6 (35.3 %)	5 (33.3 %)	3 (21.4 %)	
Age			40.6 ± 6.84	39.5 ± 7.43	40.6 ± 6.84	0.08
Patients' symptoms	Lower gastrointestinal bleeding	Yes	2 (11.8 %)	5 (33.3 %)	4 (28.6 %)	0.32
		No	15 (88.2%)	10 (66.7 %)	10 (71.4 %)	
	Abdominal pain	Yes	13 (76.5 %)	12 (80 %)	11 (78.6 %)	0.971
		No	4 (23.5 %)	3 (20 %)	3 (21.4 %)	
	Defecation disorders	Yes	12 (70.6 %)	10 (66.7 %)	11 (78.6 %)	0.77
		No	5 (29.4 %)	5 (33.3 %)	3 (21.4 %)	
	Iron deficiency anemia	Yes	2 (11.8 %)	0 (0 %)	1 (7.1 %)	0.402
		No	15 (88.2 %)	15 (100 %)	13 (92.9 %)	

Table 2. The mean and standard deviation of state anxiety score and knowledge

Profile of the patients		Control n=17	Booklet n=15	Multimedia n=14	p-value
On the day of the visit	State anxiety	51.53±10.74	46.3 14.2	49.5±9.9	0.462
	Knowledge score	3.85±2.48	5.67± 2.22	5.14±2.42	0.266
On the day of the colonoscopy	State anxiety	53.7 11.26	45.1± 8.03	55±9.29	0.016
	Knowledge score	6.14±2.7	6.9±3.99	9.7±2.84	0.038

As displayed in Table 2, there was a significant difference between patients' anxiety scores on the day of the colonoscopy. The results of Tukey's post-hoc test (Table 3) showed that state anxiety on the day of colonoscopy in the booklet group was significantly different from that in the other two groups, and this difference was more significant in the multimedia group. As depicted in Figure 1, the mean score of state anxiety on the day of colonoscopy in the booklet group was significantly lower than that in other groups, and it significantly differed from that in the control group (P=0.04). Moreover, there was no significant difference between the patients' state anxiety scores on the day of colonoscopy in the control and multimedia groups (P<0.05). There was a significant difference between the three groups in terms of the knowledge score on the day of colonoscopy using a one-way ANOVA test (P=0.038), with the multimedia group being the cause of this difference with an average of 9.7 (Table 2).

Out of the 62 participants in this study, 16 individuals did not refer for the procedure. Non-referral was 26% in the control group and about 7% in the multimedia group. There was no significant difference between the groups in terms of following the physician's instructions, which might be due to the insufficient sample size (Table

4).The results of two-way ANOVA (Table 5) indicated that intervention and state anxiety on the day of the visit did not affect state anxiety on the day of the colonoscopy. Furthermore, knowledge on the day of the visit and colonoscopy day affected anxiety on the day of the colonoscopy. The results showed that anxiety elevated with an increase in knowledge. Therefore, the educational programs were not effective in the reduction of anxiety in this group.

Table 3. Results of Tukey's post-hoc test

Intervention 1	Intervention 2	Mean difference (Intervention 1 - Intervention 2)	p-value
Control group	Booklet	8.63	0.04
	Multimedia	-1.23	0.93
Booklet group	Control	-8.6	0.04
	Multimedia	-9.8	0.02
Multimedia group	Control	1.23	0.93
	Booklet	9.8	0.02

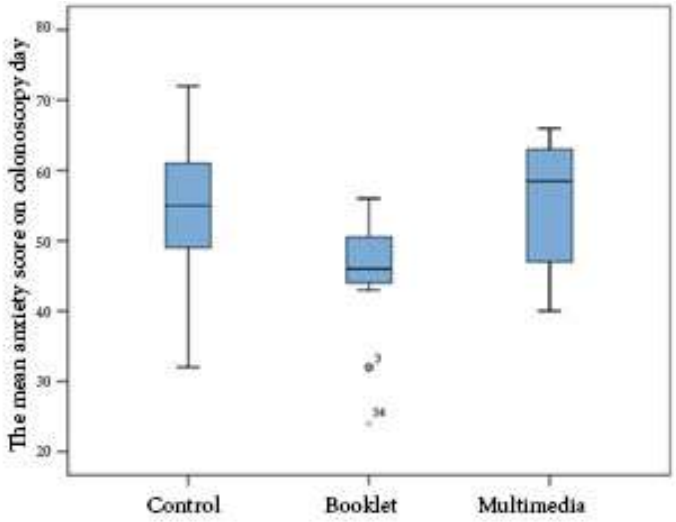

Figure 1. Mean anxiety score on colonoscopy day in three groups

Table 4. Number and percentage of patients in terms of following the physician's instructions

	Referral and completion of the colonoscopy procedure	No referral	Total	P-value*
Control	17 (73.9 %)	6 (26.1 %)	23	
Booklet	15 (62.5 %)	9 (37.5 %)	24	0.101
Multimedia	14 (93.3 %)	1 (6.7 %)	15	
Total	46 (74.2 %)	16 (25.8 %)	62	

* Chi-square test

Table 5. Results of two-way analysis of variance

	The sum of the squares	Degree of freedom	The square of the average	F	p-value
State anxiety on the visit day	221.27	1	221.27	3.5	0.07
Knowledge of the day of the visit	360.9	1	360.9	5.7	0.02
Knowledge of the colonoscopy day	428.7	1	428.7	6.8	0.01
Intervention	105.43	2	52.7	0.84	0.44

5. Discussion

The results of the present study pointed to the positive effects of a colonoscopy training manual on the reduction of patients' anxiety. The anxiety score of patients in the booklet group was lower than that in the multimedia group. In agreement with the studies by Van, Sheikh, and Tehrani, the present research pointed out that education using brochures and written training materials had a positive effect on patient anxiety (25-27). Nevertheless, in the study by Lanius, Luo, and Abuksis, no positive effect was observed on patients' anxiety using training brochures (28-30). The results of the mentioned studies demonstrated that providing information about the risks and details of the procedure can increase anxiety in patients with high levels of trait anxiety, and the time interval between providing information and performing the procedure was controversial (30).

However, in the studies conducted by Hsoueh,

Veldhuijzen , Murgesan, Luck, Power, Shamakhi, and Parker, the effect of multimedia tools on patients' anxiety was evaluated positively (7, 19, 31-35). Nonetheless, in the present study, no significant difference was observed between the anxiety scores of patients in the multimedia group and the control group, and multimedia tools could not reduce the patients' anxiety. In the studies by Callaghan, Bytzer, and Shaw, the effect of educational videos and written training materials (brochures) was reported to be the same (36-38). While in the stated studies, the cause of colonoscopy had not been mentioned, we expressed four symptoms for performing the procedure.

In the studies by Hsoueh, Luck, Power, Shamakhi, Arabul, Sheng, and Esen, the effect of training videos on patients' anxiety was evaluated positively (7, 32-34, 39-41). Nonetheless, patients' previous colonoscopy experiences were not evaluated at the time of enrollment, and patients with previous colonoscopy experience were also included in the study (7, 32-34, 39). Previous studies have shown that the past experience of a colonoscopy can affect patients' anxiety. Considering the inclusion criteria in the current study, it can be stated that multimedia tools did not have a positive effect on controlling anxiety in patients with high levels of anxiety.

A study by Hsoueh revealed that the level of anxiety in individuals with a university degree or higher was significantly lower than that in those with a high school education and lower (7). The subjects in the present study were selected from one of the largest public hospitals in Mashhad. However, due to the low cost of visits and difficult reception conditions, most people from lower-income families refer to the clinic, which seems to have an effect on the level of education. Therefore, in the present study, most participants had a diploma degree or high school education.

Video tutorials and multimedia tools make it possible to use the visual and auditory senses at the same time and create a fuller, easier, and better understanding of the material by drawing personal attention. The results of the present study showed that the knowledge scores of patients receiving a training video increased significantly, as compared to those in the booklet group. This finding is consistent with a study carried out by Hsoueh, Kumar, and Drokow who reported that multimedia tools increased patients' understanding and knowledge of the procedure (7, 42, 43). However, the video alone cannot increase knowledge (7). This might be attributed to the fact that about 70% of participants in this study had a diploma degree or high school education.

The patients stated that they were able to read and complete the questionnaire alone. It is possible that they had lower reading comprehension than verbal and auditory comprehension. Therefore, it was not easy for them to comprehend the material in writing (i.e., in the form of a booklet). Adherence to the physician's instructions in the multimedia group reached 93%, indicating an 18% increase compared to the control group; however, this difference was not significant. The study by Shamim emphasized the positive effect of providing information to increase adherence to physicians' instructions (12).

The results of two-way ANOVA demonstrated that knowledge at the time of visit and colonoscopy could affect anxiety on the day of the colonoscopy. Therefore, anxiety scores increased with an increase in knowledge. More than 25% of patients in the control group did not follow the physician's instructions. Due to increased non-adherence in the booklet group, it can be claimed that providing information in the form of a booklet did not give the patient a full understanding of the importance of performing colonoscopy and early diagnosis of colon diseases.

Among the notable limitations of this study, we can refer to patients' illiteracy, physician's time limit for visiting and performing colonoscopy, as well as difficulty receiving appointments in Ghaem Hospital Clinic, which prolonged the sampling phase. Furthermore, collecting data about the behaviors through self-report may cause errors in evaluating the results. The strengths of the present study include conducting research in a university medical center and performing colonoscopy under the same conditions for all patients and by the same physician. Furthermore, the single gender of patients, the treating physician, and the researchers who were in direct contact with the patient led to an appropriate acceptance of the research.

6. Conclusion

Following the physician's prescription is of paramount importance for the early diagnosis of colon diseases; moreover, providing information to patients is a part of patients' rights and medical staff's duties. In this study, although educational videos increased patients' anxiety, they could have a positive effect on increasing compliance with the physician's instructions. To control patients' anxiety, other strategies, such as aromatherapy, massage therapy, counseling, and hypnosis can be used. Therefore, in this group of patients, the mere use of training intervention to reduce anxiety does not seem appropriate.

It is suggested that future studies, focusing on patients with high trait anxiety, evaluate the effect of mobile phone applications and educational content customized for each patient based on their

level of education, symptoms, and illness, as well as the availability of education during their visit and colonoscopy, on patients' knowledge and anxiety.

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