Shiraz E-Med J. 2023 July; 24(7):e136829. https://doi.org/10.5812/semj-136829.

Published online 2023 August 14. **Research Article**

Effect of Three Educational Methods on Anxiety and Hemodynamics of Candidates for Exercise Stress Test: A Double-blinded Randomized Controlled Trial

Maani Beizaei [1], Camellia Torabizadeh [1], Sara Shojaei-Zarghani [2], Ali Reza Safarpour [3], Manoosh Mehrabi [4,*] and Mohammad Vahid Jorat [5]

[1] School of Nursing and Midwifery, Shiraz University of Medical Sciences, Shiraz, Iran
[2] Colorectal Research Center, Shiraz University of Medical Sciences, Shiraz, Iran
[3] Gastroenterohepatology Research center, Shiraz University of Medical Sciences, Shiraz, Iran
[4] Department of e-Learning Planning in Medical Sciences, Shiraz University of Medical Sciences, Shiraz, Iran
[5] Shiraz University of Medical Sciences, Shiraz, Iran

[*] *Corresponding author*: Department of e-Learning Planning in Medical Sciences, Virtual School, Shiraz University of Medical Sciences, Neshat Street, P. O. Box: 7134814336, Shiraz, Iran. Tel: +98-7132361618, Fax: +98-7132303061, Email: mehrabi.manoosh@gmail.com

Received 2023 April 13; **Revised** 2023 June 25; **Accepted** 2023 July 02.

Abstract

Background: Exercise stress test (EST) is commonly performed to diagnose cardiovascular diseases. Patients undergoing EST usually experience anxiety and stress mainly because they lack knowledge about the test.
Objectives: The present double-blinded randomized controlled trial aimed to compare the effects of education via face-to-face, interactive multimedia, and short messaging service (SMS) methods on anxiety level (main outcome) and vital signs (secondary outcomes) in candidates for EST.
Methods: Candidates of EST with moderate to severe anxiety were allocated randomly (block size of 6) to receive education via the face-to-face routine method (control, n = 47), multimedia (n = 48), or SMS (n = 49). The educational content was similar in the groups and focused on EST methods, preparations, and potential adverse effects. Anxiety was assessed at baseline and one week after education. The patients' blood pressure and pulse rate were measured at baseline, before, and after the EST.
Results: One-hundred-forty-four patients completed the study. The post-intervention anxiety reduced significantly in the SMS group compared to the control group ($P < 0.001$, Cohen's d = -1.09) and in the SMS group compared to the multimedia group ($P < 0.001$, Cohen's d = -0.83). The anxiety score was not significantly different between the multimedia and control groups ($P = 0.454$, Cohen's d = -0.26), although within-group comparison showed a significant decrease in the multimedia and SMS groups. Patients who received education via SMS also experienced lower pulse rates than those in the control group.
Conclusions: Because of the effectiveness of education via SMS in decreasing patients' anxiety scores, we recommend using this method to prevent anxiety before EST, especially in developing and low-income countries.

Keywords: Anxiety, Exercise Test, Health Education, Multimedia, Text Messaging, Cell Phone

1. Background

Cardiovascular diseases (CVDs) are a leading cause of death worldwide. One popular diagnostic tool for heart conditions is the non-invasive cardiac stress test (NCST), specifically the exercise stress test (EST) (1). The EST diagnoses obstruction or narrowing of coronary arteries when chest pain and changes in pulse rate (PR), blood pressure (BP), and electrocardiogram (EKG) have occurred (2). Despite being low-cost and offering immediate results, the EST has some limitations, including lower diagnostic accuracy in women, those with left ventricular hypertrophy, and digoxin users (1, 3). Moreover, it may cause anxiety and distort results in patients who are unfamiliar with testing procedures or have had unpleasant experiences with other cardiac tests (4, 5). Since anxiety disorders are common among CVD patients, reducing anxiety and preparing patients before the test is crucial (6).

Educating patients through face-to-face interviews effectively reduces anxiety before cardiac surgery or

hospital discharge (7). However, its drawbacks, such as being time-consuming and requiring specific time and place, have resulted in a growing trend towards virtual and online alternatives (8). Multimedia education makes learning easier and more attractive (9). This method has shown promise in reducing anxiety levels among patients undergoing cardiac catheterization (10). Furthermore, with the advance of technology and the availability of cell phones for almost everyone, educating patients through SMS has been suggested for increasing awareness and disease control in patients with coronary heart disorders (11). The effectiveness of various educational interventions in reducing patients' anxiety before cardiac surgery has been confirmed previously (12). Nonetheless, the effect of different educational methods on the anxiety levels of EST candidates has not been evaluated so far.

2. Objectives

We aimed to compare the impact of education via routine face-to-face, interactive multimedia, and SMS on anxiety as a primary objective and BP and PR as secondary objectives in EST candidates.

3. Methods

3.1. Study Design

This study was a double-blinded paralleled randomized controlled trial conducted between August 2017 and May 2018 in the heart clinics affiliated with Larestan University of Medical Sciences, Larestan County, south of Iran. Among 150 patients scheduled for the EST, 144 eligible patients voluntarily filled out and signed the informed consent form after informing them about the objectives. This study is approved under the ethical approval code of IR.SUMS.REC.1396.18. The protocol was registered as IRCT2017042933689N1 in the Iranian Registry of Clinical Trials.

3.2. Sample Size Calculation

Based on a similar study (13), the sample size was estimated using the mean and standard deviation of the total anxiety score (primary outcome) in the intervention (89.4 ± 19.5) and control (107 ± 24.2) groups, considering the power of 95% and α of 0.05. Using STATA software and the following command, sampsi 89.4 107, sd1(19.5) sd2(24.2) a (.05) p (.95), a minimum sample size of 41 in each group was determined for the study. We enrolled 4 - 5 additional patients in each group for compensating probable attrition.

3.3. Inclusion and Exclusion Criteria

The inclusion criteria were being literate, having the age of 20 - 60 years, being a candidate for the EST for the first time, owning a cell phone or a personal computer and having the ability to use them, and having an anxiety score of $\geq$ 16 (moderate to severe). Any patient who used tranquilizers or other anxiety medications or had an experience of previous EST was not enrolled in the study.

3.4. Randomization and Intervention Blindness

Patients were randomly allocated to three groups using random allocation software and permuted block randomization (block size of 6): One control group (face-to-face education, n = 47) and two intervention groups: Multimedia (n = 48) and SMS (n = 49). All study participants and outcome assessors were blind to the group allocations. The patients were assessed on different days to have no contact with each other and avoid data contamination.

3.5. Interventions, Follow-up, and Data Collection

The study enrolled 144 patients eligible for the EST. One week before EST, the control group received a 30-minute routine face-to-face education by a hospital researcher covering CST definition, test methods, preparation, and adverse effects. Intervention group 1 received an interactive multimedia CD containing 30-minute materials, such as text, audio, video, and animation, with similar content one week before the EST to be watched at home multiple times. Intervention group 2 received the same content via 14 text messages sent to their cell phones for one week, with one SMS in the morning and one in the evening. The educational content was prepared by researchers based on the literature and underwent e-content development at the virtual school of Shiraz University of Medical Sciences - the center of excellence for e-learning in medical sciences (14).

The participants were asked to complete the Beck's Anxiety Inventory (BAI), a 21-item self-report measure on clinical anxiety (15). In this questionnaire, the subjects chose one of the four options for each question about the most common anxiety symptoms (mental, physical, and panic). Each question scored from 0 to 3, and the sum scores showed the severity of anxiety (0 - 7: minimal, 8 - 15: mild, 16 - 25: moderate, and 26 - 63: severe). The Persian version of the BAI has been validated by Kaviani and Mousavi (16). The intra-class correlation between the BAI scores and clinical evaluation of anxiety showed an acceptable validity (r = 0.72), appropriate test-retest reliability (r = 0.83), and acceptable internal consistency (Cronbach's alpha = 0.92).

At the baseline (before providing education), the researcher recorded demographic features, patient's symptoms (including angina pectoralis, dyspnea, and shoulder pain), history of hospital admission due to cardiac symptoms, and the BAI questionnaire for all the included patients. The BAI was also completed for each participant immediately before the EST. A co-researcher examined the patients' PR and right-arm BP a week before, immediately before, and at the end of the first stage of the EST. If a patient had unstable vital signs before the test, the EST was not performed, and the patient was excluded from the study. If the vital signs were within the normal range and the EKG had no abnormal features, the EST was performed with a gradually increasing speed. At the end of each stage of the EST, the patients' PR, BP, and EKG were checked. If the patient had changes in EKG, chest pain, and/or shortness of breath during the test, the test ceased, and the patient was excluded from the study.

3.6. Statistical Analyses

The statistical analyses were conducted by IBM SPSS version 21.0. The data were described by frequency (percentage) or mean ± standard deviation (SD) based on the variable's type. The normal distribution of the quantitative data was checked by the Shapiro-Wilks test. The numeric variables were compared among the three groups using one-way ANOVA, and the significant differences were compared pairwise using Tukey's post hoc test. The categorical variables among the groups were compared using the chi-square or Fisher's exact test based on the number of participants in the subgroups. The measured intervals were compared using a paired *t*-test or repeated-measures ANOVA, depending on the number of intervals measured. The level of significance for all tests was set at 0.05.

4. Results

The CONSORT flow diagram of our study is shown in Figure 1. The three groups had no significant differences concerning the distribution of basic variables (Table 1).

The baseline BAI scores showed no significant difference between the three study groups ($P > 0.05$; Table 2). Comparing the baseline and post-intervention BAI scores in each group indicated no difference in the control group, while both intervention groups showed a decreased post-intervention anxiety score ($P < 0.001$). Post-intervention BAI was significantly lower in the SMS group than in control ($P < 0.001$, Cohen's d = -1.09, 95% CI; -1.52 to -0.66) and multimedia ($P < 0.001$, Cohen's d = -0.83, 95% CI; -1.25 to -0.42; Table 2) groups. There was no significant difference between the face-to-face and multimedia groups ($P = 0.454$).

In terms of secondary outcomes, the results of the repeated-measures ANOVA indicated a significant group-time interaction effect for systolic BP ($P = 0.030$) and PR ($P < 0.001$). Subsequently, a one-way ANOVA was conducted, revealing that patients who received SMS-based education had lower PR before ($P = 0.017$) and at the end of the first stage of EST ($P = 0.022$) than those who received face-to-face education. Additionally, there were significant differences in systolic BP and pulse rate across all groups between different time points ($P < 0.001$). The effect of time on diastolic BP was also found to be significant in the multimedia and SMS groups. Regarding specific time points, systolic and diastolic BP levels were significantly higher at the end of the first stage of EST than other measurements in the face-to-face and multimedia groups. However, in the SMS group, the levels of systolic and diastolic BP and pulse rate were significantly lower immediately before EST compared to other times (Table 3). The trend of the changes in PR in the three study groups is depicted in Figure 2.

5. Discussion

We found a significant reduction in anxiety scores in the SMS group compared to the control and multimedia groups. A very strong effect of the intervention was observed in comparing SMS and control groups. Nevertheless, multimedia education failed to affect anxiety compared to the control group significantly.

Research suggests that anxiety and stress, particularly before cardiac tests or surgery, are important conditions in cardiac patients (17). The sources of anxiety among these patients include the fear of death, discomfort from previous tests, and apprehension about the upcoming interventions (18). Educating patients about the procedure is an effective method for reducing anxiety. This can be done through various strategies, such as providing booklets or face-to-face explanations (12).

Multimedia education has been suggested as an appropriate measure to reduce patients' anxiety/pain in various settings, including patients admitted to the coronary intensive care unit (19, 20) and candidates for cerebral angiography (21). This educational method has several advantages, such as time efficiency, ease of use, cost-effectiveness, and the opportunity to repeat the educational content based on the learner's desire (19). However, we detected no effect of multimedia education on patients' anxiety. The observed inconsistencies could be due to the differences in the selected cardiac procedure, the prepared contents, the control group,

Table 1. Demographic Characteristics [a]

Variables	Face-to-Face (n = 47)	Multimedia (n = 48)	Text Messaging (n = 49)	Total (n = 144)	P Value
Age (y)	44.96 ± 9.04	43.96 ± 9.37	44.59 ± 9.26	44.50 ± 9.17	0.867 [b]
Sex					0.838 [c]
Female	36 (76.6)	36 (75.0)	35 (71.4)	107 (74.3)	
Male	11 (23.4)	12 (25.0)	14 (28.6)	37 (25.7)	
Marital status					0.630 [d]
Single	10 (21.3)	11 (22.9)	13 (26.5)	34 (23.6)	
Married	32 (68.1)	32 (66.7)	27 (55.1)	91 (63.2)	
Divorced/widowed	5 (10.6)	5 (10.4)	9 (18.4)	19 (13.2)	
Education level					0.846 [c]
Elementary school	19 (40.4)	22 (45.8)	23 (46.9)	64 (44.4)	
High-school graduate	14 (29.8)	13 (27.1)	16 (32.7)	43 (29.9)	
Academic degree	14 (29.8)	13 (27.1)	10 (20.4)	37 (25.7)	
Occupation					0.887 [d]
Unemployed	9 (19.1)	12 (25.0)	10 (20.4)	31 (21.5)	
Employed	14 (29.8)	12 (25.0)	11 (22.4)	37 (25.7)	
Retired/housewife	24 (51.1)	24 (50.0)	28 (57.1)	76 (52.8)	
Symptoms					0.682 [c]
Angina pectoralis	25 (53.2)	31 (64.6)	25 (51.0)	81 (56.3)	
Dyspnea	12 (25.5)	8 (16.7)	12 (24.5)	32 (22.2)	
Shoulder pain	10 (21.3)	9 (18.8)	12 (24.5)	31 (21.5)	
History of admission					0.811 [c]
Yes	14 (29.8)	12 (25.0)	12 (24.5)	38 (26.4)	
No	33 (70.2)	36 (75.0)	37 (75.5)	106 (73.6)	

[a] Values are expressed as mean ± standard deviation or No. (%).
[b] The results of one-way ANOVA
[c] The result of chi-square test
[d] The results of Fisher's exact test

Table 2. Comparison of Pre- and Post-test Anxiety Scores Among the Three Study Groups [a]

Groups	Face-to-Face (n = 47)	Multimedia (n = 48)	Text Messaging (n = 49)	P Value [b]
Baseline	25.00 ± 6.66	24.73 ± 6.86	26.59 ± 7.64	0.37
Post-intervention	25.11 ± 6.34 [c]	23.46 ± 6.55 [d]	17.84 ± 6.95	< 0.001
P value [e]	0.805	< 0.001	< 0.001	

[a] Values are expressed as mean ± standard deviation.
[b] The results of paired *t*-test
[c] Significant difference was observed between face-to-face and text messaging groups based on Tukey's Post-hoc test (P < 0.001)
[d] Significant difference was observed between multimedia and text messaging groups based on Tukey's Post-hoc test (P < 0.001)
[e] The result of one-way ANOVA

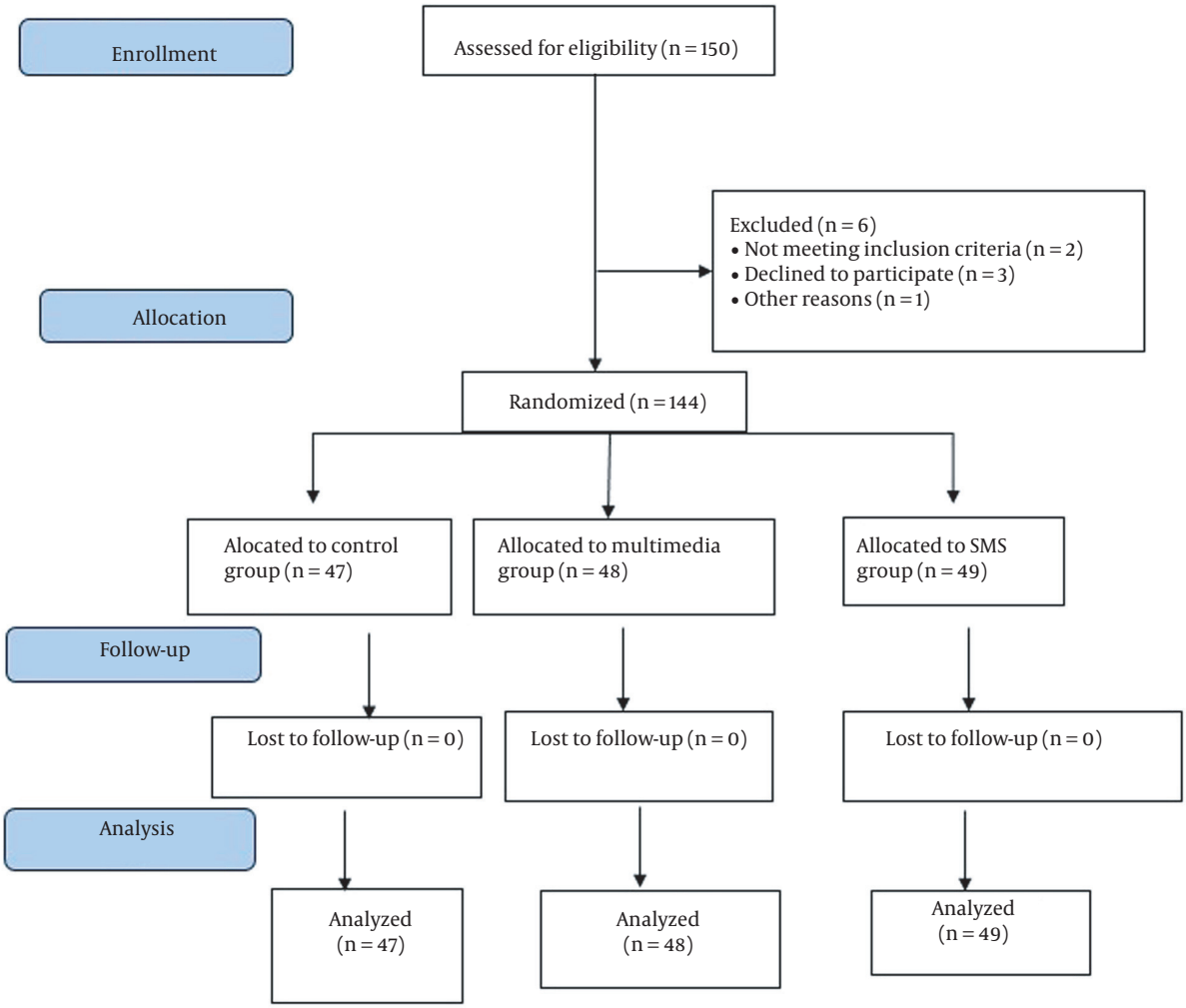

Figure 1. The flow diagram for patient enrollment into the study

and the assessment tool for evaluating anxiety. The effectiveness of SMS education on patients' anxiety, proposed by the present study, is consistent with other studies, suggesting the favorable effect of this method on improved patient care (22, 23).

We also found that traditional face-to-face intervention did not adequately reduce patient anxiety. This could be attributed to the inherent shortcomings of in-person education, as learners may have difficulty comprehending and retaining information presented during a single verbal session (24). However, providing multimedia and SMS education before the CST allowed patients to review the material repeatedly, leading to better outcomes. Other studies have also confirmed the inefficacy of face-to-face education for percutaneous intervention (PCI) candidates in reducing anxiety (25), which supports our findings.

We also found no significant differences in the BP among the three groups. One week after the education, the SMS method led to a lower PR than the face-to-face group, which can be attributed to the passive education in the face-to-face group. Previous studies also have shown a reducing effect of video education on the hemodynamic fluctuation of PCI candidates (26, 27). The educational interventions can reduce anxiety's impact on the hemodynamic fluctuation in the patient and enable a more accurate diagnosis of the cardiac disease by the EST.

Our study had several limitations. Our SMS platform was one-way, and we could not verify message receipt. Furthermore, the results of this study cannot be generalized to the whole population, especially those

Table 3. Comparison Between Pre-test and Post-test Means of Pulse, Systolic, and Diastolic Blood Pressure Across the Three Groups and in Each Group at Various Times [a, b]

Variables	Face-to-Face	Multimedia	Text Messaging	P-Value [c]	P Value [d]		
					Time	Group	Time [d] Group
Systolic blood pressure					< 0.001	0.439	0.030
One week before the intervention	131.40 ± 19.27 [A]	127.25 ± 17.87 [A]	130.31 ± 14.67 [A]	0.481			
Immediately before EST	130.28 ± 16.52 [A]	126.02 ± 16.35 [A]	126.41 ± 14.16 [B]	0.347			
At the end of the first stage of EST	134.19 ± 15.64 [B]	130.42 ± 15.50 [B]	130.71 ± 13.26 [A]	0.389			
P-value (within) [d]	< 0.001	< 0.001	< 0.001				
Diastolic blood pressure					< 0.001	0.513	0.086
One week before the intervention	80.04 ± 9.99	79.23 ± 9.89 [A]	78.69 ± 9.40 [A]	0.794			
Immediately before EST	78.85 ± 8.51	78.69 ± 9.33 [A]	76.06 ± 9.40 [B]	0.241			
At the end of the first stage of EST	80.62 ± 13.63	82.08 ± 8.84 [B]	79.26 ± 8.98 [A]	0.432			
P-value (within) [d]	0.298	< 0.001	< 0.001				
Pulse rate					< 0.001	0.123	< 0.001
One week before the intervention	82.91 ± 10.84 [A]	81.94 ± 9.70 [A]	81.92 ± 7.66 [A]	0.842			
Immediately before EST	82.98 ± 9.99 [A]	80.33 ± 8.52 [A]	78.10 ± 7.15 [B]	0.024 [e]			
At the end of the first stage of EST	93.19 ± 10.61 [B]	90.81 ± 9.46 [B]	87.90 ± 8.79 [C]	0.039 [e]			
P-value (within) [d]	< 0.001	< 0.001	< 0.001				

Abbreviation: EST, exercise stress test.
[a] Data are expressed as mean ± standard deviation.
[b] Different capital letters show significant differences between different times in each group using Bonferroni correction.
[c] Differences between groups according to the ANOVA test
[d] Repeated-measures ANOVA test
[e] Significant differences were found between face-to-face and text messaging groups using Tukey's post hoc test.

with lower socioeconomic status, as we only considered patients with access to cell phones or computers and literacy skills. Furthermore, our study had a small sample size in each group, mainly because of the several inclusion criteria considered for reducing the effect of confounders and higher accuracy of the results.

5.1. Conclusions

Given the probable effectiveness of education via text messages and multimedia in decreasing patients' anxiety scores, we recommend using these methods to prevent anxiety before the EST.

Acknowledgments

The present article was extracted from the M.S. thesis of Maani Beizaei. The thesis has been approved by the ethics committee at Shiraz University of Medical Sciences, Shiraz, Iran (grant No. 95-01-08-13441). The authors thank all patients who voluntarily participated in this study.

Footnotes

Authors' Contribution: Study concept and design: C. T., M. B., M. M., and A. R. S.; acquisition of data: C. T., M.

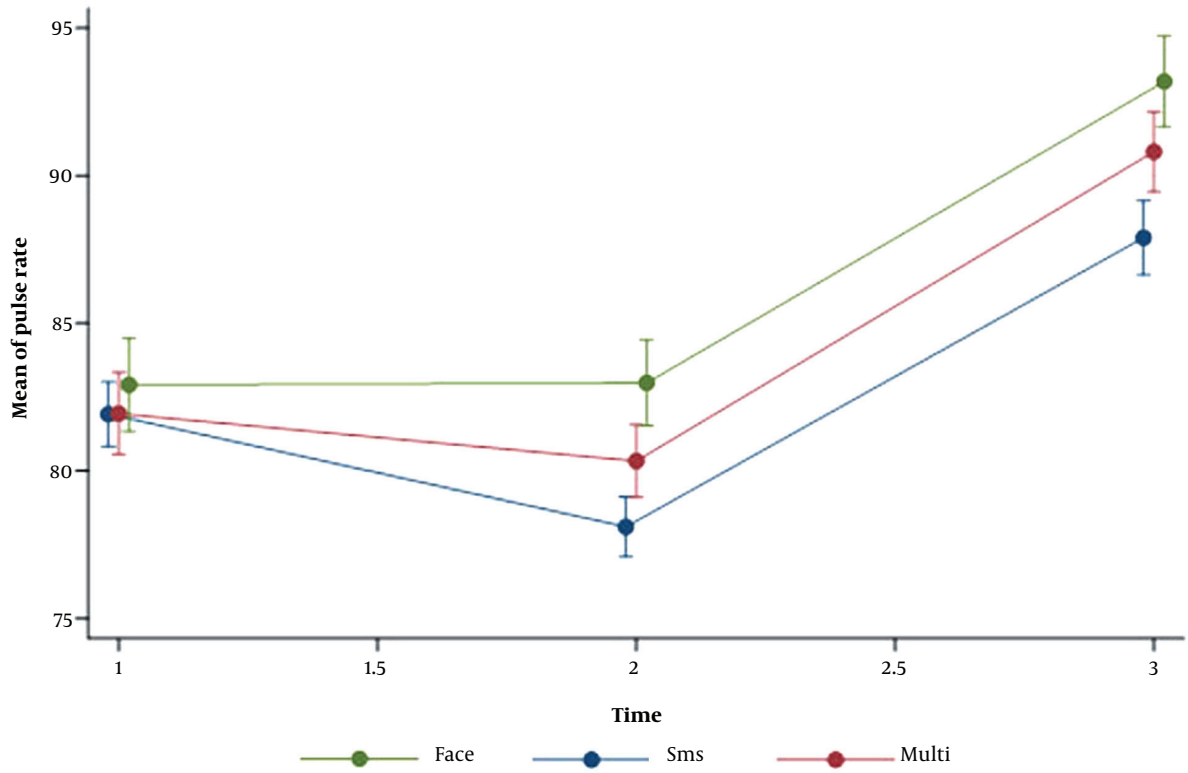

Figure 2. The trend of the changes in pulse rate in three study groups in baseline, one week after education, and after the first step of the exercise stress test

B., and S. S. Z.; data analysis: M. B. and A. R. S.; drafting of the manuscript: C. T., M. B., A. R. S., M. M., and S. S. Z.; critical revision of the manuscript: C. T., M. B., A. R. S., and M. M.; study supervision: C. T. and M. M. All authors read and approved the final manuscript.

Clinical Trial Registration Code: IRCT2017042933689N1.

Conflict of Interests: The authors are employees of Shiraz University of Medical Sciences.

Data Reproducibility: The data that support the findings of this study are available from the corresponding author (M. M.) upon reasonable request.

Ethical Approval: This study is approved under the ethical approval code of IR.SUMS.REC.1396.18.

Funding/Support: This study was supported by the Vice-Chancellor for Research and Technology of Shiraz University of Medical Sciences (grant No. 95-01-08-13441).

Informed Consent: We uploaded the "Informed consent" during the submission.

References

1. Anderson KM, Murphy DL, Balaji M. Essentials of noninvasive cardiac stress testing. *J Am Assoc Nurse Pract*. 2014;**26**(2):59–69. [PubMed ID: 24420707]. https://doi.org/10.1002/2327-6924.12096.
2. Sharma K, Kohli P, Gulati M. An update on exercise stress testing. *Curr Probl Cardiol*. 2012;**37**(5):177–202. [PubMed ID: 22469057]. https://doi.org/10.1016/j.cpcardiol.2011.11.004.
3. Bourque JM, Beller GA. Value of Exercise ECG for Risk Stratification in Suspected or Known CAD in the Era of Advanced Imaging Technologies. *JACC Cardiovasc Imaging*. 2015;**8**(11):1309–21. [PubMed ID: 26563861]. [PubMed Central ID: PMC4646721]. https://doi.org/10.1016/j.jcmg.2015.09.006.
4. Pelletier R, Bacon SL, Laurin C, Arsenault A, Fleet RP, Lavoie KL. The impact of anxiety disorders on assessment of myocardial ischemia and exercise stress test performance. *J Cardiopulm Rehabil Prev*. 2011;**31**(1):60–6. [PubMed ID: 20724935]. https://doi.org/10.1097/HCR.0b013e3181ebf2c0.
5. Paine NJ, Bacon SL, Pelletier R, Arsenault A, Diodati JG, Lavoie KL. Do Women With Anxiety or Depression Have Higher Rates of Myocardial Ischemia During Exercise Testing Than Men? *Circ Cardiovasc Qual Outcomes*. 2016;**9**(2 Suppl 1):S53–61. [PubMed ID: 26908861]. https://doi.org/10.1161/CIRCOUTCOMES.115.002491.
6. Chen YY, Xu P, Wang Y, Song TJ, Luo N, Zhao LJ. Prevalence of and risk factors for anxiety after coronary heart disease: Systematic review and meta-analysis. *Medicine (Baltimore)*. 2019;**98**(38). e16973. [PubMed ID: 31567932]. [PubMed Central ID: PMC6756742]. https://doi.org/10.1097/MD.0000000000016973.
7. Yildiz T, Gurkan S, Gur O, Unsal C, Goktas SB, Ozen Y. Effect of standard versus patient-targeted in-patient education on patients' anxiety about self-care after discharge from cardiovascular surgery clinics.

Cardiovasc J Afr. 2014;**25**(6):259–64. [PubMed ID: 25363789]. [PubMed Central ID: PMC4336912]. https://doi.org/10.5830/CVJA-2014-048.
8. Saki A, Hooshmand Bahabadi A, Asadi Noghabi AA, Mehran A. [Comparison of Face-to-Face and Electronic Education Methods on Anxiety in Patients with Acute Myocardial Infarction]. *Hayat*. 2014;**20**(1). Persian.
9. Tipotsch-Maca SM, Varsits RM, Ginzel C, Vecsei-Marlovits PV. Effect of a multimedia-assisted informed consent procedure on the information gain, satisfaction, and anxiety of cataract surgery patients. *J Cataract Refract Surg*. 2016;**42**(1):110–6. [PubMed ID: 26948785]. https://doi.org/10.1016/j.jcrs.2015.08.019.
10. Wu KL, Chen SR, Ko WC, Kuo SY, Chen PL, Su HF, et al. The effectiveness of an accessibility-enhanced multimedia informational educational programme in reducing anxiety and increasing satisfaction of patients undergoing cardiac catheterisation. *J Clin Nurs*. 2014;**23**(13-14):2063–73. [PubMed ID: 24372795]. https://doi.org/10.1111/jocn.12469.
11. Park LG, Howie-Esquivel J, Chung ML, Dracup K. A text messaging intervention to promote medication adherence for patients with coronary heart disease: a randomized controlled trial. *Patient Educ Couns*. 2014;**94**(2):261–8. [PubMed ID: 24321403]. https://doi.org/10.1016/j.pec.2013.10.027.
12. Ramesh C, Nayak BS, Pai VB, Patil NT, George A, George LS, et al. Effect of Preoperative Education on Postoperative Outcomes Among Patients Undergoing Cardiac Surgery: A Systematic Review and Meta-Analysis. *J Perianesth Nurs*. 2017;**32**(6):518–529 e2. [PubMed ID: 29157759]. https://doi.org/10.1016/j.jopan.2016.11.011.
13. Murphy B, Le Grande M, Alvarenga M, Worcester M, Jackson A. Anxiety and Depression After a Cardiac Event: Prevalence and Predictors. *Front Psychol*. 2019;**10**:3010. [PubMed ID: 32063868]. [PubMed Central ID: PMC7000459]. https://doi.org/10.3389/fpsyg.2019.03010.
14. Mehrabi M. Setting up the structure and process for e-content development. *Interdiscip J Virtual Learn Med Sci*. 2019;**10**(4):78–80. https://doi.org/10.30476/IJVLMS.2019.84733.1016.
15. Beck AT, Epstein N, Brown G, Steer RA. An inventory for measuring clinical anxiety: psychometric properties. *J Consult Clin Psychol*. 1988;**56**(6):893–7. [PubMed ID: 3204199]. https://doi.org/10.1037//0022-006x.56.6.893.
16. Kaviani H, Mousavi AS. [Psychometric properties of the Persian version of Beck Anxiety Inventory (BAI)]. *Tehran University Medical Journal*. 2008. Persian.
17. Hernandez-Palazon J, Fuentes-Garcia D, Falcon-Arana L, Roca-Calvo MJ, Burguillos-Lopez S, Domenech-Asensi P, et al. Assessment of Preoperative Anxiety in Cardiac Surgery Patients Lacking a History of Anxiety: Contributing Factors and Postoperative Morbidity. *J Cardiothorac Vasc Anesth*. 2018;**32**(1):236–44. [PubMed ID: 28803768]. https://doi.org/10.1053/j.jvca.2017.04.044.
18. Celano CM, Daunis DJ, Lokko HN, Campbell KA, Huffman JC. Anxiety Disorders and Cardiovascular Disease. *Curr Psychiatry Rep*. 2016;**18**(11):101. [PubMed ID: 27671918]. [PubMed Central ID: PMC5149447]. https://doi.org/10.1007/s11920-016-0739-5.
19. Demircelik MB, Cakmak M, Nazli Y, Sentepe E, Yigit D, Keklik M, et al. Effects of multimedia nursing education on disease-related depression and anxiety in patients staying in a coronary intensive care unit. *Appl Nurs Res*. 2016;**29**:5–8. [PubMed ID: 26856480]. https://doi.org/10.1016/j.apnr.2015.03.014.
20. Demirçelik MB, Yigit D, Sentepe E, Keklık M, Cetın M, Cetın Z, et al. The Effectiveness of Multimedia Nursing Education on Reducing Illness-Related Anxiety and Depression in Coronary Care Unit's Patients. *J Am Coll Cardiol*. 2013;**62**(18). https://doi.org/10.1016/j.jacc.2013.08.145.
21. Sayadi L, Varaei S, Faghihzadeh E, Ahmadkhani Z. The effects of multimedia education on anxiety and physiological status among patients with cerebral angiography: A randomized controlled clinical trial. *Nurs Pract Today*. 2018. https://doi.org/10.18502/npt.v5i4.116.
22. Amani A, Abbaspoor Z, Afshari P, Jafari Rad S. [The effect of education through short massage system on blood glucose control of prediabetic pregnant women]. *Iran J Obstet Gynecol Infertil*. 2017;**20**(5):76–83. Persian. https://doi.org/10.22038/IJOGI.2017.9083.
23. Akhu-Zaheya LM, Shiyab WY. The effect of short message system (SMS) reminder on adherence to a healthy diet, medication, and cessation of smoking among adult patients with cardiovascular diseases. *Int J Med Inform*. 2017;**98**:65–75. [PubMed ID: 28034414]. https://doi.org/10.1016/j.ijmedinf.2016.12.003.
24. Masoudi R, Soleimani MA, Yaghoobzadeh A, Baraz S, Hakim A, Chan YH. Effect of Face-to-face Education, Problem-based Learning, and Goldstein Systematic Training Model on Quality of Life and Fatigue among Caregivers of Patients with Diabetes. *Iran J Nurs Midwifery Res*. 2017;**22**(3):208–14. [PubMed ID: 28706545]. [PubMed Central ID: PMC5494950]. https://doi.org/10.4103/1735-9066.208169.
25. Sharif F, Moshkelgosha F, Molazem Z, Najafi Kalyani M, Vossughi M. The effects of discharge plan on stress, anxiety and depression in patients undergoing percutaneous transluminal coronary angioplasty: a randomized controlled trial. *Int J Community Based Nurs Midwifery*. 2014;**2**(2):60–8. [PubMed ID: 25349846]. [PubMed Central ID: PMC4201194].
26. Habibzadeh H, Rasouli D. [Effect of video information on anxiety level and hemodynamic parameters of patients undergoing coronary angiography]. *Nursing and Midwifery Journal*. 2018;**16**(4):295–302. Persian.
27. Jamshidi N, Abbaszadeh A, Kalyani MN, Sharif F. Effectiveness of video information on coronary angiography patients' outcomes. *Collegian*. 2013;**20**(3):153–9. [PubMed ID: 24151693]. https://doi.org/10.1016/j.colegn.2012.06.001.