

## ■ Original article

## Effect of Benson's relaxation technique on the anxiety of patients undergoing coronary angiography: A randomized control trial

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(Received: 14 Sep 2015; Accepted: 20 Jan 2016)

### Abstract

**Background and Purpose:** Anxiety is a common problem associated with invasive medical procedures, especially in patients undergoing coronary angiography. As an intensifier at cardiovascular reactions, anxiety poses significant risk to the health of patients undergoing angiography. Researchers believe that use of Benson's relaxation technique could reduce anxiety in different patients. This study aimed to evaluate the effect of Benson's relaxation technique on the anxiety of patients undergoing coronary angiography.

**Methods:** This randomized clinical trial was conducted on 70 patients who were candidates for coronary angiography in Mazandaran Heart Center in Sari, Iran in 2014. Patients were selected via randomized sampling and divided into two groups of intervention (n=35) and control (n=35). Data collection tools included demographic questionnaire, Spielberger's State-Trait Anxiety Inventory (STAI), and hemodynamic variables recording sheet. Data analysis was performed in SPSS V.16 using Chi-square, dependent and paired T-test, and Mann-Whitney U test.

**Results:** Both study groups were homogenous in terms of age, gender, marital status, education level, disease history, and health insurance status. Use of Benson's relaxation technique significantly decreased anxiety in the intervention group (P=0.0001). However, no significant difference was observed in the systolic blood pressure, respiratory rate and heartbeat parameters between the study groups (P=0.0001).

**Conclusion:** According to the results of this study, use of Benson's relaxation technique before coronary angiography reduced the level of anxiety in the patients. Therefore, this complementary approach could be used as an effective healthcare measure without any side effects to provide mental support for patients before invasive procedures, such as angiography.

**Keywords:** Angiography, Anxiety, Benson relaxation technique

### Introduction

Cardiovascular diseases are considered as one of the leading causes of mortality in the men and women of all ages and races (1). Coronary angiography is an invasive medical procedure used for the diagnosis of coronary artery disease (2). According to statistics, approximately two million cardiac patients in the United States and 18,000 cases in Iran undergo angiography (3, 4). In general, invasive diagnostic tests are known to cause stress

and anxiety in the patients (5).

As an intensifier at cardiovascular reactions, anxiety largely affects physiological responses, including the respiratory rate, heart rate, blood pressure, myocardial oxygen consumption, and plasma epinephrine and norepinephrine concentrations, posing significant risk to the health of patients undergoing angiography (5, 6). Furthermore, sympathetic activity is likely to increase the heart rate, which may lead to hypoxia

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and dysrhythmia. Increased heart rate and high blood pressure could bring about other complications, such as inter-tissue damage and platelet aggregation (7).

According to the literature, over 80% of cardiac patients experience anxiety before coronary angiography (8). For instance, the findings of Uzun et al. indicated that 74% of the studied cardiac patients experienced anxiety before angiography (9).

Current approaches used to reduce anxiety are categorized into two types of pharmacological and non-pharmacological (10). Among the most notable non-pharmacological methods in this regard are complementary therapies, such as muscle relaxation, aromatherapy, meditation, massage therapy, music therapy, and guided visual imagery (9).

Complementary methods for reducing anxiety are cost-efficient, easy to implement, non-invasive, non-pharmacological, and without any side effects. Relaxation is one of the main techniques adopted in non-pharmacological interventions to alleviate the stress and anxiety of patients (11, 12). In relaxation, principles of psychoneuroimmunology are applied in order to regulate physiological activities in different systems of the body (13).

Relaxation techniques could be used effectively in many clinical conditions, including childbirth, severe pain, anxiety, insomnia, and aggression. These techniques are able to decrease heart rate, respiratory rate, blood pressure, and oxygen consumption (11).

Relaxation could be performed variably, while the method proposed by Herbert Benson (1970) is considered to be particularly effective (12). Benson's relaxation technique is rapid and easy to learn, and its implementation requires no expertise or advanced equipment. Moreover, this technique is applicable for patients of all age groups (14).

According to previous studies, Benson's muscle relaxation considerably reduces somatic contractions (physiological reactions against tension) eliminating the physical and psychological consequences of stress (15). As such, the findings of Singh et al. (5) and Dehghan-Nayeri et al. (16) have confirmed the pivotal role of relaxation techniques in decreasing the anxiety of different patients.

Anxiety is frequently experienced by patients before invasive surgical operations, and this has been

reported to impede these procedures in many cases. On the other hand, non-pharmacological methods are not commonly used to reduce this type of anxiety. Anxiety is highly prevalent among cardiac patients, especially those undergoing coronary angiography. Considering the adverse effects of anxiety on different body organs, particularly the cardiovascular system, as well as the side effects of anti-anxiety medications, non-pharmacological approaches should be prioritized for the reduction of stress and anxiety in cardiac patients.

Interventions for the reduction of stress and anxiety are an inherent part of nursing care. This study aimed to evaluate the effect of Benson's relaxation technique on the level of anxiety in cardiac patients before coronary angiography. It is hoped that our findings lay the ground for further practice of non-pharmacological approaches in order to inhibit sympathetic activity and prevent the complications associated with overactive sympathetic nervous system in different patients.

## Materials and Methods

This randomized control trial was conducted on all the cardiac patients who were exclusive candidates for coronary angiography in Mazandaran Heart Center in Sari, Iran in 2014. Study protocol was approved by the Ethics Committee and Institutional Review Board of Islamic Azad University of Sari, Iran. Objectives of the study were explained to the participants, and written informed consent was obtained from all the patients prior to the study. In addition, the participants were assured of confidentiality terms and were allowed to withdraw from the study at any time.

Inclusion criteria were as follows: 1) age of 30-90 years; 2) undergoing coronary angiography for the first time; 3) exclusive candidates for coronary angiography; 4) full consciousness and awareness; 5) absence of critical conditions and 6) ability to communicate.

Exclusion criteria of the study were as follows: 1) lack of patient consent for participation; 2) sedation within the past eight hours before intervention; 3) history of non-pharmacological treatments (e.g.,

muscle relaxation) and 4) muscle paralysis. Patients were selected via randomized sampling during four months (June-September 2014) based on the inclusion and exclusion criteria.

In total, 70 patients who were exclusive candidates for coronary angiography were enrolled in this study, and 3 patients were excluded. Selected patients were randomly divided into two groups of intervention (Benson's relaxation technique) and control (35 patients in each group) (Figure 1).

We selected Mazandaran Heart Center affiliated to Mazandaran University of Medical Sciences as the study setting. This specialized center offers angiography and other invasive medical procedures for cardiovascular patients in Mazandaran province.

Data collection tools included demographic questionnaire, hemodynamic variables recording sheet, and Spielberger's State-Trait Anxiety Inventory (STAI). Validity and reliability of the Persian version of STAI has been confirmed, and

this scale has been used to evaluate anxiety in previous studies (16, 17).

There are 20 items in the first and second section of STAI to measure the level of overt and covert anxiety, respectively; for this study, we assessed the level of overt anxiety among the patients undergoing coronary angiography.

STAI questionnaire was completed by a nurse for each patient. After summing up the obtained scores, the patients were classified into two groups of anxious (scores above 43) and normal (scores below 43) (18).

For the intervention, an audio file with recorded instructions on relaxation exercises was prepared, and the exercises were performed by the patients in the presence of the researcher one day before angiography. Level of anxiety and status of vital signs were recorded one hour before angiography.

To perform Benson's relaxation technique, patients in the intervention group received routine

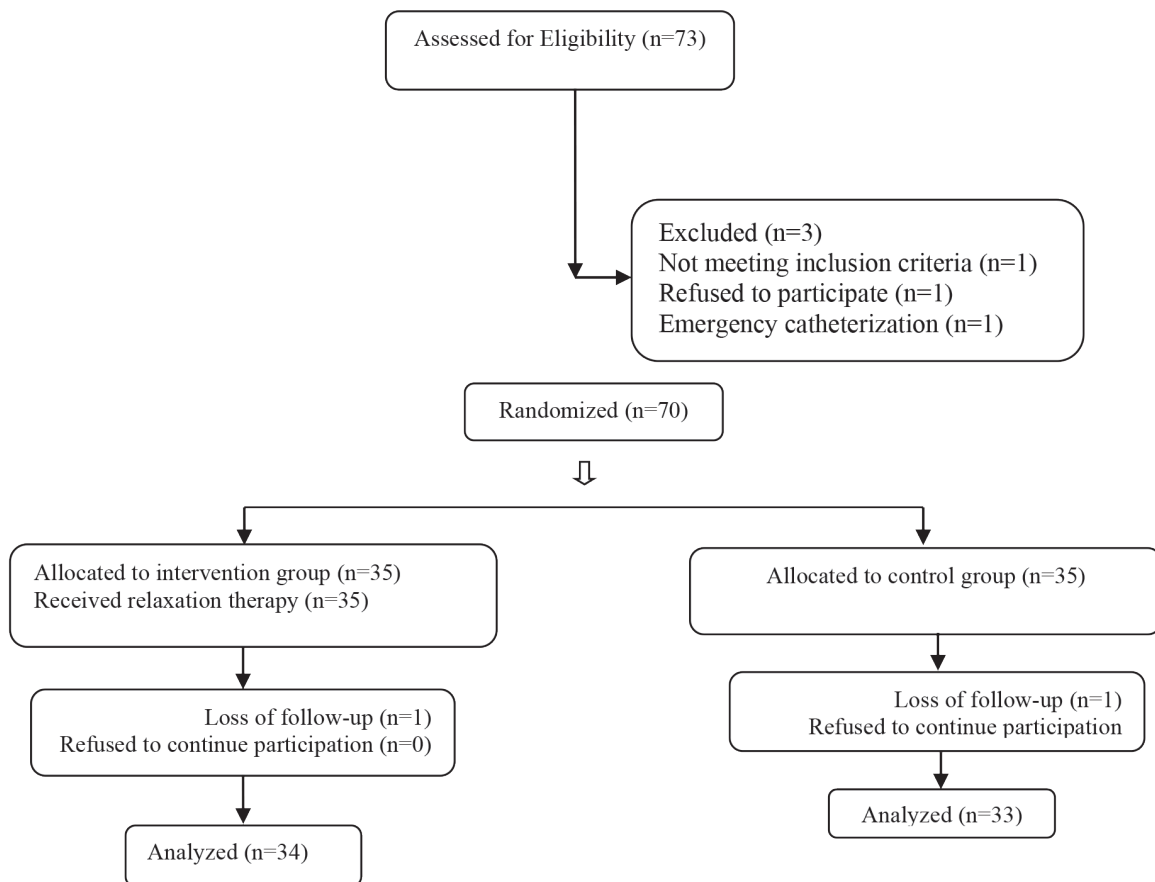


Figure 1. CONSORT Diagram of Randomization, Intervention, and Analysis of Patients

care in a calm, quiet place in order to minimize the effect of environmental provocations. The patients listened to the audio file using headphones. In accordance with the given instructions, the patients calmly lay on the bed with closed eyes and started to say relaxing words based on their preference (e.g., God or love). Meanwhile, they would deeply inhale through the nose, exhale through the mouth, and repeat the desired word in their mind. Simultaneously, they would relax their muscles from the fingertips upward until the complete relaxation of all the muscles in the body. This state was maintained for 20 minutes. The relaxation technique was performed before angiography, and level of anxiety and vital signs of the patients were recorded 30 minutes after the intervention (19).

Patients in the control group only received routine care without relaxation. Anxiety level and vital signs of control subjects were recorded 30 minutes and one hour before angiography. No intervention and placebo were used for patients of the control group. As a project partner, a cardiologist, who was blinded to the study, controlled and supervised all the procedures during the research.

Data analysis was performed in SPSS V.16 using Kolmogorov-Smirnov test to assess the normal distribution of quantitative variables. In addition, Chi-square test was used to match the demographic characteristics of study groups, and paired T-test was used for the comparison of study groups separately. To compare the anxiety levels of intervention and control groups, we used the pre-post data and Mann-Whitney U test. Mann-Whitney U test was used for the comparison of anxiety in study groups before and after the intervention.

Physiological variables of the study groups were compared using the Wilcoxon test, and P value of less than 0.05 was considered significant.

## Results

The results of Chi-square and Mann-Whitney U test were indicative of no significant difference in the demographic data of the patients, including age, gender, marital status, education level, insurance status, and disease history. Therefore, patients in the

**Table 1.** Demographic and baseline characteristics of patients in intervention and control groups

Variables	Group		P-value	
	Relaxation (n=34)	Control (n=33)		
Gender	Male	12 (35.3)	14 (42.4)	*0.812
	Female	22 (64.7)	19 (57.6)	
Age (years)		59.29±10.576	58.48±2.442	<sup>b</sup> 0.372
Marital Status	Single	0 (0)	2 (6.1)	*0.465
	Married	25 (73.5)	25 (75.8)	
	Other	9 (26.5)	6 (18.2)	
Education Status	Illiterate	19 (55.9)	17 (51.5)	*0.419
	Primary Education	12 (35.3)	7 (21.2)	
	Secondary Education	3 (8.8)	5 (15.2)	
	Academic Education	0 (0)	4 (12.1)	
History of Other Diseases	Yes	29 (85.3)	30 (90.9)	*0.783
	No	5 (14.7)	3 (9.1)	
Health Insurance	Yes	34 (100)	32 (97.0)	*0.660
	No	0 (0)	1 (3.0)	

<sup>a</sup> Chi-Square test

<sup>b</sup> T-test

\*Data presented as number (%) or Mean ± Standard Deviation.

intervention and control groups were homogenous in terms of the aforementioned variables (Table 1).

Evaluation of the anxiety level based on the STAI questionnaire indicated that the mean score of anxiety reduced from 46.09±2.442 before the intervention to 43.56±4.896 after the intervention in the relaxation group. However, mean score of anxiety had no significant difference in patients of the control group (Table 2).

The results of paired T-test were indicative of a significant difference in the anxiety level of the patients in the relaxation group before and after intervention ( $P < 0.0001$ ). However, no significant difference was observed in the anxiety level of the patients in the control group before and after

**Table 2.** Comparison of anxiety levels between intervention and control groups

Groups	Time		P-value
	Before Intervention (Mean±SD)	After Intervention (Mean±SD)	
Relaxation (n=34)	46.09± 2.442	43.56± 4.894	<sup>a</sup> <0.0001
Control (n=33)	47.79± 4.428	47.91± 4.537	0.716

P-value = 0.126 , <sup>b</sup> <0.0001

<sup>a</sup> Significant difference based on paired T-test

<sup>b</sup> Significant difference based on dependent T-test

**Table 3.** Comparison of vital signs between intervention and control groups

Variables		Groups				P-value
		Relaxation (n=34)		Control (n=33)		
		Mean±SD		Mean±SD		
Pulse Rate	Before Intervention	74.71	2.929	74.55	3.717	0.681
	After Intervention	71.32	3.169	74.97	4.419	<0.0001
	P-value	<0.0001		0.5		
Respiratory Rate	Before Intervention	18.47	1.54	18.42	1.58	0.923
	After Intervention	16.71	1.467	18.85	1.584	<0.0001
	P-value	<0.0001		0.103		
Systolic Blood Pressure	Before Intervention	123.97	10.898	123.33	9.623	0.893
	After Intervention	114.97	8.163	124.39	9.219	<0.0001
	P-value	<0.0001		0.295		
Diastolic Blood Pressure	Before Intervention	77.12	8.981	77.03	8.967	0.780
	After Intervention	78.03	10.443	77.39	8.753	0.739
	P-value	0.1		0.3		

Significant difference based on Wilcoxon test

Significant difference based on Mann-Whitney U test

intervention (P=0.716) (Table 2). Comparison of the level of anxiety between the study groups after the intervention was performed using dependent T-test, and the results were indicative of a significant difference in this regard (P=0.0001) (Table 2).

Comparison of the physiological parameters (heart rate, respiratory rate, systolic and diastolic blood pressure) before and after the intervention was indicative of significant differences in patients of the relaxation group (P<0.0001) (Table 3). Moreover, the results of Mann-Whitney U test revealed a significant difference between the physiological parameters of the study groups before and after the intervention (P=0.0001) (Table 3).

## Discussion

According to the results of the present study, Benson's relaxation technique reduced the level of anxiety in patients of the intervention group before coronary angiography. Furthermore, this complementary technique had a positive impact on the vital signs of these patients, while it decreased the physiological parameters of the vital signs.

Based on this finding, it could be concluded that use of non-pharmacological nursing care procedures could be remarkably effective in the reduction of anxiety.

Considering the willingness of patients to receive assisted interventions to alleviate anxiety and stress, non-pharmacological approaches, such as Benson's relaxation technique, are recommended during patient waiting times for invasive surgical operations. These methods are cost-efficient and have no side effects; therefore, they could successfully reduce the stress of patients before invasive procedures. Moreover, these techniques are known to have a positive effect on the prognosis and outcome of patients while decreasing physiological parameters, such as pulse rate and blood pressure, before and during invasive operations.

The results of the current study were indicative of no significant difference between the study groups in terms of the mean score of anxiety before the intervention (P=0.126).

Moreover, the difference in the mean of anxiety level was significant after the intervention with Benson's relaxation technique (P<0.0001), which confirms the efficacy of this approach in the reduction of stress and anxiety.

According to the findings of Singh et al., muscle relaxation could potentially increase the relaxation rate in patients with chronic obstructive pulmonary disease (5). Results of the present study confirmed the beneficial effects of relaxation techniques on the

anxiety level of cardiac patients, which is consistent with the findings of Bagheri-Nesami et al. In their research, use of Benson's relaxation technique led to a significant reduction in the anxiety level of patients with rheumatoid arthritis (19).

Our findings are in line with the results obtained by Van Dixhoorn and White; correspondingly, use of relaxation therapy decreased heart rate, improved exercise tolerance, alleviated depression, and reduced anxiety in patients with ischemic heart disease (18).

With regard to hemodynamic variables of patients, our findings were indicative of a statistically significant difference in the pulse rate, respiratory rate, and systolic blood pressure of the patients after the intervention with Benson's relaxation technique. This is consistent with the results obtained by Singh et al. (5). Another study by Hamidizadeh et al. (2005) reported that mean of blood pressure significantly reduced in patients of the intervention group after progressive muscle relaxation (20).

It seems that Benson's muscle relaxation technique maintains the activity of parasympathetic nerves and decreases the activity of sympathetic nerves. This will preserve the balance of the body through psychoneuroimmunology, which regulates the physiological activity of different body systems (21).

One of the limitations of the current study was the effect of environmental factors on the anxiety of the patients. Moreover, the outcomes might have been influenced by the non-blinded design of the research. Also, no significant results were obtained with regard to the diastolic blood pressure of patients. Therefore, it is recommended that future studies be performed with longer treatment durations in order to achieve results with higher accuracy.

## Conclusion

Pre-procedure care aims to maximize the physical and mental health of patients. Today, there is a growing tendency toward receiving complementary therapies and non-pharmacological interventions to reduce stress and anxiety. Credible sources have confirmed the efficacy of methods such as Benson's relaxation technique and aromatherapy in relieving anxiety in different patients. Therefore, it is

recommended that medical authorities include non-pharmacological and complementary approaches (e.g., muscle relaxation) in the curriculum of nursing care as simple, safe, and cost-efficient procedures. Furthermore, it is suggested that nurses receive comprehensive training on the effects of non-pharmacological interventions for the reduction of anxiety and stress through theoretical and practical courses. Findings of the current research may lay the ground for the extensive review of the studied variables in order to diminish stress and anxiety in patients before invasive procedures.

## Conflicts of interest

None declared.

## Author's contributions

All authors contributed equally to the preparation of the scientific proposal, data collection, and drafting of the manuscript. The final manuscript was reviewed and approved by all the authors.

## Acknowledgements

Hereby, we extend our gratitude to the Research Deputy of Islamic Azad University of Sari branch for the financial support of this study. We would also like to thank the personnel of Fatimah-Zahra Hospital of Sari for assisting us in this research project.

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