Impact of White Noise and Benson's Relaxation Technique on Death Anxiety in Patients Undergoing Coronary Artery Bypass Graft Surgery: A Randomized Clinical Trial

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Abstract

Background: Patients undergoing coronary artery bypass graft (CABG) surgery face a serious psychological problem called death anxiety, which can harm the patient physically, socially, and emotionally. White noise and Benson's relaxation technique are among the complementary and effective treatments which help mitigate death anxiety in these patients.

Aim: This study aimed to investigate the impact of white noise and Benson's relaxation technique on death anxiety among patients undergoing CABG.

Method: This randomized clinical trial study was performed on 60 hospitalized patients in Iran in 2020. The permutated block method was used to randomly divide the eligible participants into intervention and control groups. In the intervention group, participants accomplished Benson's technique with white noise music on three consecutive occasions in the morning, afternoon, and before night sleep. The control group did not receive any intervention. The demographic and clinical characteristics form and Templer scale were used to collect data. Data were analyzed using SPSS software (Version 25).

Results: The mean±SD age of the participants was 61.97±8.80 and 64.81±6.53 years in the intervention and control groups, respectively. The results showed a significant decrease in the mean score of death anxiety in the intervention group (P<0.05), while this score increased in the control group compared to the pre-training scores (P<0.05).

Implications for Practice: Nurses are recommended to use white noise and Benson's relaxation techniques as an effective intervention to reduce death anxiety in patients undergoing CABG surgery, and include them in the patient care and education programs.

Keywords: Benson relaxation, Coronary artery bypass graft surgery death anxiety, White noise

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Introduction
Cardiovascular diseases as the leading cause of death (1) affect 26 million people worldwide, and countless new cases are identified every year (2). Coronary artery bypass graft (CABG) surgery is the most common treatment for advanced coronary artery disease. Other than physical problems, cardiovascular patients face psychological issues, such as anxiety and depression that can affect many aspects of their life (3). Anxiety is one of the most common and important reactions to cardiovascular diseases. Death anxiety is one of the most important specific types of anxiety that are known and named according to their sources and is caused by predicting one's own death and the fear of imagining one's or the loved ones' dying process (4). Cardiovascular patients often have energetic lives before developing this condition. However, they suddenly find themselves sick and wrongly believe that they may never return to normal life. Therefore, they experience depression and anxiety, especially death anxiety. Furthermore, evidence shows that in addition to the negative effects of heart disease, the stressful nature of the CABG surgery exacerbates anxiety in these patients (5). In the study conducted by Gallagher, the patients undergoing CABG who had been anxious before the surgery experienced higher levels of anxiety after the surgery (3).

Pharmacological interventions help reduce postoperative anxiety; however, they may not apply to all patients due to their age, the complications, drug interactions, or hemodynamic instability, and are often associated with such life-threatening complications as low heart rate, hypotension, drowsiness, respiratory depression, nausea, vomiting, drug tolerance and dependence, and prolonged recovery time and treatment course (6). Therefore, the use of non-pharmacological methods, such as listening to soothing music and holy Quran, prayer therapy, spiritual intelligence training, guided mental visualization, massaging, hypnosis, placebos, and touching are recommended as effective and safe methods (7-11). One of the effective non-pharmacological methods is relaxation which has a positive and long-term effect and is easy to learn and use (11, 12). It can also be considered a complementary treatment. The reason is that these techniques greatly help reduce sympathetic reactions (13), stabilize vital signs, and reduce the negative effects of anxiety on the physical and mental health levels of patients undergoing CABG. In fact, the mechanism of action in this approach is based on the fact that two separate simultaneous stimuli in the nervous system can neutralize each other's impacts. Therefore, other stimuli, such as anxiety, especially death anxiety may be neutralized in an individual who has concentrated on listening to music and experiencing relaxation (12, 14-16). White noise therapy is a complementary medicine approach that uses natural sounds that are not in conflict with religious beliefs, such as the sound of rain and ocean waves. With its soothing resonance, white noise can reduce the activity of the sympathetic system and regulate and control blood pressure and heart rate (17). The effectiveness of white noise increases if it is used in combination with Benson's technique. In fact, Benson's technique is a kind of mental visualization through which a person succeeds to relax his/her respiratory and muscular system (18) through the involvement of all the senses, creative visualization, and the muscle relaxation that follows (19). Benson's relaxation technique has been found to have effects on the psychological symptoms of the women with multiple sclerosis (20), the self-esteem of myocardial infarction patients (21), the level of anxiety in high-risk pregnant women (22), reduction of cesarean section (C-section) pain (23), and anxiety and depression in patients with pulmonary arterial hypertension (24). No research was found in the literature regarding the combined use of Benson's technique and white noise on death anxiety in patients undergoing CABG while addressing this important issue can help improve both the physical and mental condition of these patients. Therefore, this study was performed to determine the effect of white noise and Benson's relaxation technique on death anxiety in patients undergoing CABG in Farshchian Hospital in the city of Hamadan, Iran.

Methods
This clinical trial included two groups of control and intervention and was conducted in Farshchian Cardiovascular Hospital in Hamadan, Iran, from April to June 2021. The study population included the hospitalized patients undergoing CABG surgery.
The mean±standard deviation (SD) of anxiety scores were reported to be 53.33±9.45 and 61.5±7.81 for the intervention and control groups in a similar study, respectively (25). Considering a confidence coefficient of 95% and a test power of 90%, the sample size for each group was

calculated to be 24, which was increased to 30 patients in each group after taking the dropout rate into account.

The participants were selected according to the inclusion criteria and randomly assigned to intervention and control groups by permutation blocks method using Excel software (Version 2017) after being selected randomly from a list of patients. In this method, "A" stands for the person receiving the intervention, and "B" stands for the person in the control group, and the assignments included "AABB" code 1, "ABAB" code 2, "ABBA" code 3, "BAAB" code 4, "BBAA" code 5, and "BABA" code 6 in the quadruple block. The starting point was then chosen randomly using a table of random numbers, and 10 numbers were considered as rows or columns. The permutation corresponding to each encountered number was placed, taking into account the order of the numbers in the table.

The inclusion criteria included being a candidate for CABG surgery, being in the age range of 40-75 years; awareness of time, space, and people; being hemodynamically stable (not needing anti-hypotensive drugs and tachycardia, having the hearing ability, and willingness to take part in the study. The patients with a previous history of cardiac surgery and known mental illnesses, and those taking any anti-anxiety or psychedelic drugs were excluded from the study.

Data collection was performed using a two-part questionnaire. The first part included demographic data (i.e., gender, age, marital status, education, occupation, income level, history of smoking, and drug abuse), and the second part of the questionnaire included Templer's death anxiety scale (DAS). This 15-item yes/no questionnaire consisted of the 5 subscales of fear of death, fear of pain and disease, thoughts of death, transient and short life, and fear of the future, with YES and NO answers indicating the presence and absence of anxiety, respectively. Every NO answer has 1 and YES answers had no score. Therefore, the minimum and maximum score of the scale is 0 (no death anxiety) and 15 (very high death anxiety), respectively, with a score between 7 to 15 indicating high death anxiety. A score of 6 to 7 indicates moderate and a score of 0 to 6 indicates low death anxiety (26).

In the study conducted by Saggino and Kline, the Cronbach's alpha of the whole scale was reported to be 0.63 (27). In Iran, this questionnaire has been used based on cultural and social context to assess death anxiety in various areas (12). For example, it was validated and used by Dadfar et al. on 106 nurses from two hospitals in the city of Tehran. The reliability coefficient of the scale has been reported to be 0.6 by measuring Cronbach's alpha coefficient. The validity of DAS was evaluated using two scales of Death Concern and Fear of Death, the correlations of which for DAS were calculated to be 0.04 and 0.34, respectively (28).

In the current study, the qualitative content validity was assessed by 10 nursing faculty members and experts in the field of instrument development. The reliability was examined using the internal consistency measurement (Cronbach's alpha). For this purpose, the questionnaire was distributed among 10 patients who met the inclusion criteria, and Cronbach's alpha was calculated for the whole scale ($\alpha=0.93$).

Initially, the necessary permits were obtained from the university and the hospital authorities. To use the technique correctly, the researcher participated in related workshops and received a competency certificate for teaching the technique. The researcher then visited the ICUs and CCUs of the hospital, offered introductions, and provided the patients with explanations about research objectives, methodology, and the duration of the training. Afterward, written informed consent was obtained from those willing to participate in the study.

The research protocol was approved by the Ethics Committee of Hamadan University of Medical Sciences, Hamadan, Iran. The respiratory rate of participants was counted using the hour counter one minute before training. The pulse rate and the level of SpO2 were measured using a calibrated pulse oximeter (Beurer, Germany). Blood pressure measurement was performed for all participants using a calibrated mercury sphygmomanometer (ALPK2, Japan). All the readings were within the normal range. The measurements were performed twice to ensure accuracy. First, the researcher in charge of measuring vital signs measured these symptoms. Another nurse re-measured the symptoms five minutes after the first measurement in the same location.

Benson's relaxation technique was taught during individual oral sessions. Given the pandemic conditions, the sessions were held in ICUs and CCUs with the observation of distancing protocols, and there was at least a distance of 1.5-meter between the patient and the researcher. All health

guidelines were observed by wearing face masks and the frequent disinfection of all surfaces. Benson's relaxation technique was performed and the patients were in a relaxed position. While they took deep and regular breaths (inhaling through the nose and exhaling through the mouth) with closed eyes, they were aware of breathing and with each exhalation repeated a word in their mind that reminded them of peace. In the same position, they released the muscles from the toes to the upper body parts, until all the muscles were fully expanded and relaxed.

After the training, the patients were asked to listen to music while performing Benson's relaxation technique. The participant selected one sound from among three options (i.e., the sound of sea waves, the sound of river, and the sound of falling rain) and listened to it for 30 min using a headphone on three consecutive occasions (9 am, 4 pm, and 8 pm) (15, 29, 30). The volume was set by the participant. After the musical intervention and the performance of Benson's relaxation technique, the patients were given a glass of water and asked not to leave the bed for 3 to 4 min. The intervention was performed on two consecutive days. The DAS scale was provided to the participants of both groups once before the intervention and once after the intervention. In the control group, only routine care was offered and no intervention was performed (Fig 1). The obtained data were analyzed in SPSS software (Version 25) using descriptive statistics, Kolmogorov-Smirnov test, chi-square, independent t-test, and non-parametric (Fisher's exact) statistical test, and Wilcoxon and Mann-Whitney tests. P-values less than 0.05 were considered statistically significant.
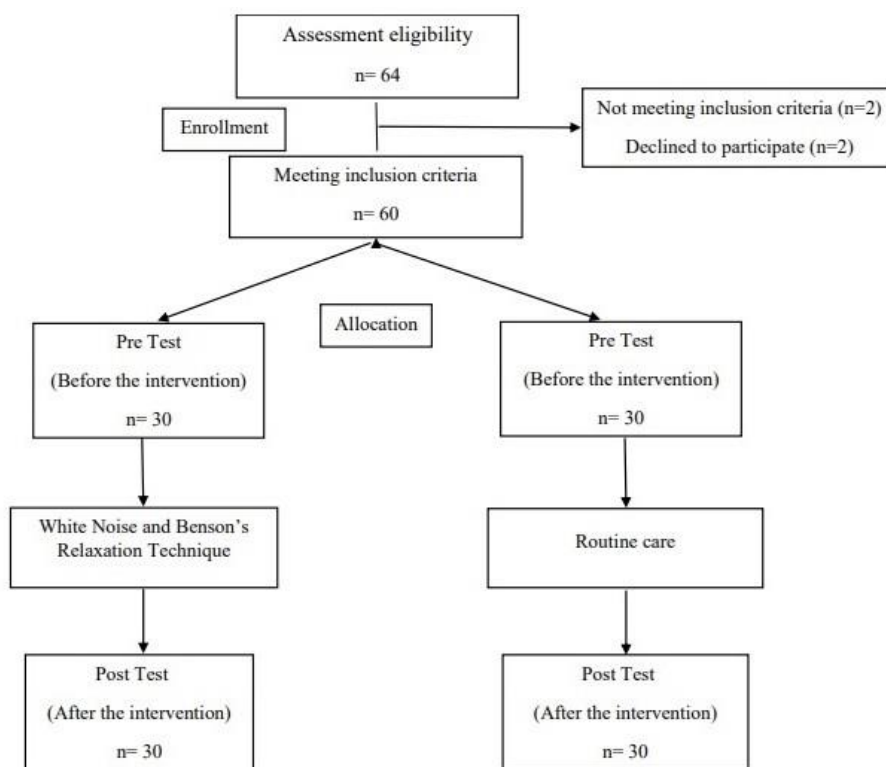
Figure1. Diagram of CONSORT

Results
Based on the results, the two study groups were not significantly different in terms of demographic variables. In total, 38.3% of the study participants were females. The mean±SD age of the participants was 61.97±8.80 and 64.81±6.53 years in the intervention and control groups, respectively. All the participants were in the age range of 45-75 years. Other demographic and clinical data are presented in Table 1.
The mean score of death anxiety in the intervention and the control groups (Table 2) were significantly different before performing Benson's relaxation technique (P<0.05), while after performing the technique and listening to white noise, the mean score of death anxiety was found

Table 1. A comparison of demographic and clinical variables of participants in the control and the intervention groups

Variables		Control (30)	Intervention (n=30)	Pearson's chi-squared test	
		Frequency (percentage)	Frequency (percentage)	Value	P-value
Gender	Female	11 (36.7)	12 (40)	0.07	P>0.999
	Male	19 (63.3)	18 (60)		
Marital status	Single	1 (3.3)	0 (0)	1.02	P>0.999
	Married	29 (96.7)	30 (100)		
Education	Undergraduate	11 (36.7)	19 (63.3)	6.8	0.207
	Diploma	10 (33.3)	7 (23.3)		
	College education	9 (30)	4 (13.3)		
Occupation	Employee/ Self-employed	2 (6.7)	6 (20)	5.31	0.208
	Unemployed/ Retired	21 (70)	0 (0)		
	Housewife	14 (46.7)	21 (70)		
Income adequacy	Adequate	18 (60)	8 (26.7)	6.79	0.009
	Inadequate	12 (20)	22 (73.3)		
Smoking	Yes	21 (70)	17 (56.7)	1.15	0.284
	No	9 (30)	13 (43.3)		
Drug abuse	Yes	10 (33.3)	11 (56.7)	0.07	0.787
	No	20 (66.7)	19 (63.3)		

to be lower in the intervention group, compared to the control group ($P<0.05$). Moreover, in the intervention group, the mean scores were statistically different before and after the intervention, and the mean score of death anxiety in the participants decreased after practicing relaxation techniques ($P<0.05$). However, the mean score of death anxiety significantly increased in the control group, compared to the pre-training scores ($P<0.05$). In addition, there was no significant difference in the demographic variables including gender, marital status, income adequacy, smoking, and drug abuse, according to the result of the independent t-test ($P=0.45$). Moreover, no significant difference was observed in these two groups regarding variables of education and occupation ($F=0.27$), according to the results of ANOVA ($P<0.05$).

Table 2. A comparison of the mean scores of death anxiety before and after the intervention in the control and intervention groups

Groups		Mean score of death anxiety Mean±standard deviation		Analysis of change	Wilcoxon Test	
		Pre-intervention	Post-intervention		Value	P-value
Control		14.86± 0.44	14.65±0.55	0.21±0.56	- 1.90	0.58
Intervention		14.77 ± 0.57	12.20 ± 0.96	2.57±1.10	- 4.70	< 0.001
Mann-Whitney	Value	407	31.5		-	
U Test	P-value	0.475	<0.001			

Discussion

This study aimed to determine the impact of white noise and Benson's relaxation technique on death anxiety in patients undergoing CABG surgery in Farshchian Cardiovascular Hospital, in Hamadan, Iran, in 2020.

In this study, there was no significant difference between the study groups in terms of demographic variables, which increased the generalizability of the obtained results. The mean score of death anxiety before intervention was not significantly different in the control and the intervention groups, which confirmed the results of the study conducted by Dai WS et al., who investigated the impact of music on pain, anxiety, and depression in patients after coronary artery transplant (14). This lack of difference in the mean score of participants in both study groups before intervention indicated the accuracy of the results and the changes in the death anxiety score related to the effect of the intervention.

The results showed that after performing Benson's technique and white noise, the mean score of death anxiety in the participants was significantly reduced compared to the pre-intervention scores

and also compared to scores of the patients in the control group. This result indicates the effectiveness of relaxation intervention in patients with death anxiety and confirms the results obtained in a clinical trial study conducted in 2020 on the impact of muscle relaxation and music therapy on anxiety in patients undergoing coronary artery angiography. The results showed lower levels of anxiety in the intervention group after learning the relaxation technique compared to the patients in the control group (16). The impact of music therapy on the reduction of anxiety and pain in patients undergoing cardiac surgery has also been investigated (15, 31, 32). A noteworthy point in the findings of these studies is that other than a decrease in the level of anxiety and pain, positive changes were observed in the patients' vital signs, such as reduced systolic blood pressure and heart rate. The stability of the physiological and hemodynamic status of the patients undergoing surgery is of special importance in the recovery of the patients and returning to the normal condition in individual and social life. The findings of these studies emphasize the positive and significant effect of this complementary treatment method on the physical condition of patients with death anxiety.

The results of other studies showed that other than reducing the scores of anxiety and pain (14), music therapy intervention and muscle relaxation led to a significant decrease in analgesic use among patients undergoing coronary artery heart surgery (33) and C-section (23), which in turn reduced the possible complications of drug consumption. Not only this method causes no harm to the patient, but it also helps improve the level and the quality of health and comfort in these patients. Pain, as an integral part of surgical procedures, always overshadows the quality of sleep and comfort in patients and imposes more stress on patients by activating the sympathetic system. Furthermore, pain restricts patients' movement which in turn disrupts self-care and has a devastating effect on patients' physical and mental well-being. However, death anxiety and change in one's living conditions have a negative consequence in heart patients and lead to poor prognosis, disability, disease recurrence, and readmission. The combination of music therapy and relaxation can improve the prognosis of patients' complex conditions after surgery and increases their hope of returning to normal life by reducing anxiety.

In the present study, the mean score of death anxiety was measured on two occasions and the results were statistically significant and notable among the patients in the control group. The level of death anxiety increased in patients in the control group who did not experience any relaxation interventions, which was in line with the results of the study conducted by Malmir et al. (34). This can be explained by the fact that performing relaxation techniques somehow distracts patients from thinking about the nature of the disease, the growing fear, and the subsequent anxiety. In fact, following the relaxation and the reduction of sympathetic dominance, the person feels comfortable. Engagement in physical activity and hearing white noise distracts the patient from external issues and turns attention to these relaxing activities which give the person peace. However, the participants in the control group were deprived of this technique and were more strongly affected by the stressful condition of their disease and the outcome of the surgery (35).

One of the most important limitations of this study is the lack of a clear and integrated conceptual structure for playing white noise and performing Benson's relaxation technique, which overshadows the results. Therefore, the generalization of the results must be done with caution. In addition, there is a dearth of research on the impact of combined use of Benson's relaxation technique and white noise, which limits results' comparison. Other limitations of this study include the impact of patients' mental and psychological conditions on responding to the questionnaire items and the obtained results, which was beyond the researcher's control.

In general, the combined use of white noise and Benson's relaxation technique has been effective in reducing death anxiety in patients undergoing CABG surgery. According to the results of this study, the use of these relaxation techniques can be considered as part of the treatment protocol for patients undergoing CABG surgery. Therefore, plans should be made to implement this type of care to minimize the mental burden and improve the quality of life in these patients. This requires support from managers in health care departments.

Implications for Practice
The performance of Benson's relaxation technique and white noise is a fully practical and easy approach for patients which should be taught by nurses to cardiac patients and their families.

Therefore, it is necessary to hold nursing education classes in this field to teach this concept to nurses. Furthermore, it is suggested that this type of relaxation technique be used for acute and chronic patients hospitalized in other health care departments who suffer from additional anxiety in stressful situations.

Acknowledgments

Conflicts of Interest
The authors have no conflicts of interest regarding the publication of this study.

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