Original Article

The Effect of Traditional Iranian Music on Anxiety and Physiological Parameters of Patients before Coronary Artery Bypass Graft (CABG): A Randomized Controlled Trial

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Abstract

Background: Coronary artery bypass graft (CABG) surgery is a primary treatment for coronary artery occlusion. Anxiety is a common preoperative concern among patients undergoing this procedure. This study aimed to investigate the effect of listening to traditional Iranian music on anxiety in patients before CABG surgery.

Methods: This randomized controlled trial involved 66 patients scheduled for CABG surgery. Patients were randomly assigned to either the control or intervention group, with 33 patients in each group. The intervention group listened to traditional music on an MP3 player for 20 minutes, while the control group received an MP3 player without music. Anxiety levels were measured using the Spielberger Anxiety Questionnaire before and after the intervention. Data were analyzed using the Student's t-test, the paired t-test, and the Mann-Whitney U-test with SPSS software version 21.

Results: There was no significant difference in anxiety severity between the 2 groups before the intervention (music group: 106.45 ± 10.67 and control group: 116.36 ± 9.78; $P=0.798$). However, after the intervention, there was a significant difference between the groups (music group: 65.82 ± 7.54 vs control group: 113.72 ± 13.04; $P=0.001$). There were no significant differences in physiological parameters (blood pressure, heart rate, and respiration rate) between the groups before the intervention ($P<0.078$). Following the intervention, systolic ($P<0.013$) and diastolic ($P<0.003$) blood pressure significantly decreased in the intervention group compared with the control group.

Conclusion: Traditional Iranian music therapy can be a noninvasive, low-cost, and accessible tool to reduce anxiety in patients undergoing CABG surgery.

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Introduction

Cardiovascular disease (CVD) has the highest mortality rate among other diseases and will remain the leading cause of death worldwide.[1] Globally, CVD is now the primary cause of death, and its mortality rate continues to increase.[2] There is a pressing need to prioritize prevention and management to improve outcomes. Coronary artery bypass graft (CABG) surgery is a common treatment for coronary artery disease.[3] The prevalence of CABG varies, with a rate of 26.8% in North America, 17.94% in Western Europe, and 18.1% in other countries.[3] In Iran, CABG constitutes 60% of all open-heart surgeries.[4] CVD accounts for 46% of all-cause mortality in Iran.[5] Recent data showed that of the 54,418 heart surgeries performed in Iran, 74.1% were related to CABG.[6,7]

Anxiety is a common issue among patients undergoing elective surgery, with 47% of patients experiencing it before surgery and an even higher prevalence among CABG patients.[8,9] Preoperative cardiac anxiety can lead to numerous complications, such as changes in blood pressure, heart rate, dysrhythmia, prolonged recovery, and increased hospitalization.[9-13] It may also adversely impact the post-anesthesia care process, increase the need for sedatives and anesthetics during surgery, and elevate the risk of mortality.[9,11-13] Therefore, effective management of preoperative anxiety in CABG patients is crucial.

Evidence suggests that traditional physicians in Iranian medicine utilized music and melody with various instruments to calm and soothe the mind and body.[14] Currently, pharmacologic agents, complementary medicine, and non-pharmacologic approaches are used to manage anxiety in patients undergoing CABG surgery.[15,16] Nonetheless, previous studies have reported numerous complications associated with these methods, such as respiratory depression, apnea, nausea and vomiting, communication problems, bradycardia, and hypotension.[14,16,17] Complementary and alternative methods like aromatherapy, relaxation, acupressure, acupuncture, and music therapy have been employed to control anxiety.[16,18,19]

Music has a significant role in our daily lives and can help alleviate anxiety and pain by distracting and reducing the patient's focus on anxious stimuli.[3,5,20] Previous studies have demonstrated that music is an affordable and simple noninvasive tool to decrease anxiety and pain after surgery.[3,21] Nevertheless, some investigators have found no significant changes in hemodynamic variables following music therapy.[22,23]

Research has indicated that patients who listen to their favorite music before surgery experience significantly reduced anxiety, heart rate, and blood pressure compared with those who do not listen to music.[24] This effect may be attributed to the release of morphine-like substances in the body when listening to preferred music.[6] However, other studies examining the effect of music on patient anxiety have yielded conflicting results. Investigations involving patients undergoing cardiac surgery, cataract procedures, and other surgeries have found no significant impact of music therapy on patient anxiety.[25-27]

Given the hitherto inconsistent findings; cultural, socio-economic, and musical differences; and a notable lack of research on this topic in Iran (particularly in northern Guilan and Mazandaran provinces) compared with other countries, this study aimed to investigate the effect of traditional Iranian music on anxiety and physiological parameters, including blood pressure, heart rate, and respiratory rate, before CABG surgery.

Methods

The present randomized controlled trial involved patients scheduled for CABG surgery. The sample size was determined based on a previous study by Heidari et al,[19] investigating the effect of music on anxiety and cardiovascular indices in patients undergoing CABG surgery. In their research, thirty minutes after the intervention, the mean anxiety levels in the control and intervention groups were 1.07±0.69 and 0.53±0.57, respectively. Using these values and calculating β=0.2, α=0.05, μ1=1.07, μ2=0.53, S1=0.69, and S2=0.57, we estimated that 30 subjects were needed in each group. However, considering the potential loss to follow-up, 33 patients were enrolled in each group.

Furthermore, the sample size was calculated using data from various studies, including research by Saeedi et al.[17] Therefore, based on the 2 primary variables in this study, we enrolled 33 patients in each group.

Figure 1 presents the CONSORT flowchart. A total of 66 patients were consecutively recruited and randomly assigned to either the control group (Group C) or the experimental group (Group M) using a block randomization method. Each block contained CCMM characters in varying positions. The principal investigator prepared a numbered list from 1 to 66, and the samples were divided into 2 equal groups.

Sixty-six sealed opaque envelopes were consecutively numbered, each containing a card labeled with the letter M for the experimental group or C for the control group in a random sequence. A secretary, not part of the research team, opened the envelopes for each new patient. The control group (n=33) received usual care with an MP3 player without music, whereas the experimental group (n=33)
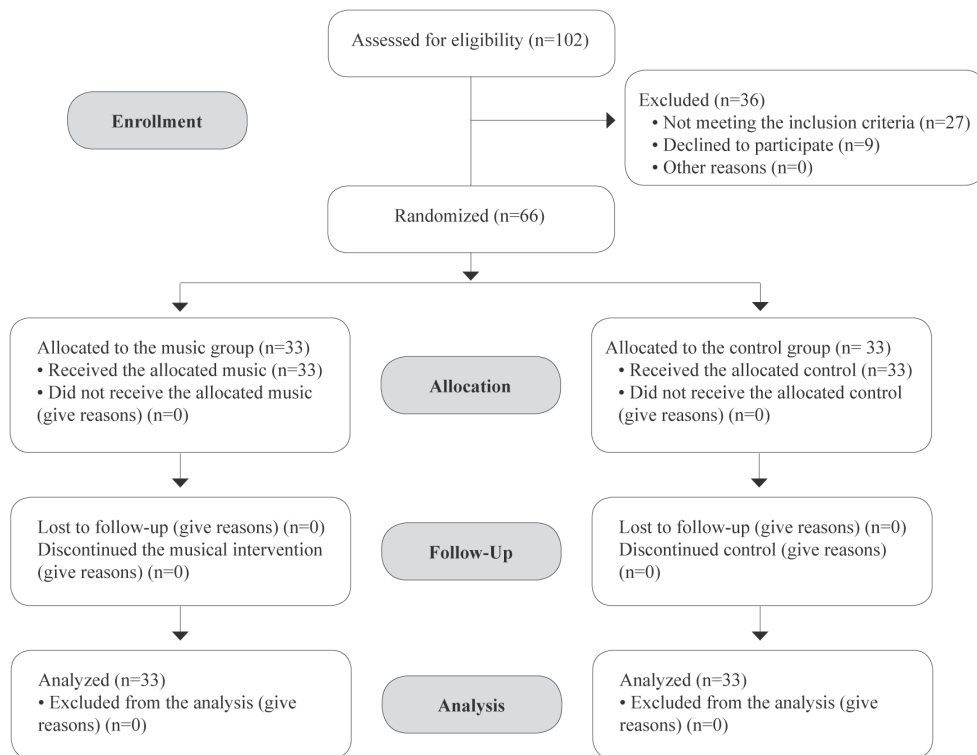
Figure 1. The image presents the study's CONSORT flow diagram.

listened to 20 minutes of traditional Iranian music via an MP3 player. The Spielberger Anxiety Questionnaire was used to measure anxiety levels in both groups before and after the intervention.

The inclusion criteria included full consciousness; awareness of time, place, and person; candidacy for CABG surgery; ability to read and write; absence of known psychological or anxiety disorders; no history of CABG or cardiac surgery; no hearing problems; and an anxiety score above 20 on the questionnaire. Patients were excluded if they demonstrated unwillingness to participate, presence of mental illness, no interest in music, and use of non-routine sedative and hypnotic drugs.

Data collection was conducted using a 3-part instrument consisting of demographic information (age, sex, history of surgery, education level, and marital status), a checklist for recording hemodynamic parameters (systolic and diastolic blood pressure, heart rate, and respiratory rate), and anxiety measurement using the Spielberger Anxiety Questionnaire.

Using a pre-planned and coordinated protocol, 2 trained nurses with at least 5 years of experience evaluated cardiovascular and respiratory parameters and recorded their averages.

The third component of the data collection instrument was the Spielberger State-Trait Anxiety Inventory, which measures anxiety. This 40-item questionnaire consists of 2 parts: the state (obvious) scale assessing the current level of anxiety and the trait (hidden) scale evaluating the general

situation of reactive anxiety.[14,28] Items are rated on a 4-point Likert scale (1=not at all; 2=moderately; 3=often; and 4=almost always).

According to previous studies, anxiety levels are categorized as follows: scores ranging from 40 to 80 indicate mild anxiety, 81 to 120 represent moderate anxiety, and 121 to 160 signify severe anxiety.[14,17] This study reported anxiety at 5 distinct levels: a score of 20 to 31 denotes mild anxiety, 32 to 42 represents anxiety below moderate levels, 43 to 53 indicates anxiety above moderate levels, 54 to 64 signifies relatively severe anxiety, and 65 to 75 denotes severe anxiety. The scores can range from a minimum of 20 to a maximum of 80.[14,17]

According to mathematical logic, anxiety levels were classified into 3 categories based on the scores: 20 to 40 (low anxiety), 41 to 59 (moderate anxiety), and 60 to 80 (severe anxiety).

To ensure the content and face validity of the 3-part instrument, 5 expert members from the School of Allied Medical Sciences at Mazandaran University of Medical Sciences and 4 expert members from the Faculty of Nursing at Mazandaran and Guilan Universities of Medical Sciences provided their expert opinions and confirmation.

The reliability of the Spielberger Anxiety Questionnaire was assessed in 2 stages using Cronbach's α, yielding values of 0.80 before the intervention and 0.97 after listening to traditional music. Patients who scored above 30 on the questionnaire were included in the study as participants.

Patients scheduled for CABG surgery were escorted to the research room an hour before the surgery by the researcher. The room was calm and in good condition before anesthesia. The music group listened to wordless traditional Iranian music from the "Golden Dreams" album by Maroufi, which has been endorsed by the psychiatric community for its positive effects on human health and wellbeing.

After the procurement of approval and ethical permission from the Research Ethics Committee of Mazandaran University of Medical Sciences (ethical code: IR.MAZUMS. REC.1397.172) and registration of the study with the Iranian Clinical Trials Registry (code: IRCT20181126041762N1), the sampling process commenced.

The study consisted of 2 patient groups. Patients were blinded to their group assignments to ensure unbiased results. Headphones were placed on the ears of all participants in both groups. Before surgery, the experimental group listened to 20 minutes of traditional Iranian music, while no music was played for the control group. All other conditions in the room remained the same for both groups. After the 20 minutes, anxiety levels were re-measured using the Spielberger Anxiety Questionnaire. Simultaneously, physiological parameters, including systolic and diastolic blood pressure, heart rate, and respiratory rate, were recorded using calibrated equipment. Patients in both groups maintained a semi-sitting or supine position and received standard routine care in a calm environment under the supervision of a nurse and the researcher. The outcome assessor was also blinded to the group assignments.

Data analysis was performed using SPSS software version 16 (SPSS Inc, Chicago, IL, USA). The Kolmogorov-Smirnov test was used to evaluate the normal distribution of anxiety data. Between-group comparisons of normally distributed quantitative data were conducted using the independent samples t-test, while non-normally distributed data were analyzed using the Mann-Whitney U-test. Qualitative variables were compared using the χ^2 or Fisher exact tests, as appropriate. A P-value below 0.05 was considered statistically significant.

Results

The study maintained equal numbers of patients in both groups at the beginning and end of the study period. A total of 33 patients in each group were included in the final analysis, as depicted in the CONSORT flowchart (Figure 1). Baseline characteristics were comparable between the 2 groups (Table 1).

Our statistical analysis revealed no significant difference in heart rate between the 2 groups before the intervention. The mean heart rate before the intervention was 85.82±5.84 in the control group and 85.30±5.65 in the intervention group (P=0.717). After the intervention, the mean heart rate was 81.70±4.93 in the control group and 83.42±6.51 in the intervention group. The difference between the groups was not statistically significant (P=0.229).

Prior to the intervention, there was no significant difference in respiratory rate between the control and intervention groups (14.97±0.73 vs 15.21±1.24; P=0.338). After the intervention, the mean respiratory rate was 14.60±2.09 in the control group and 14.33±2.04 in the intervention group. The difference between the 2 groups was neither statistically significant (P=0.594) nor clinically meaningful.

The statistical analysis also revealed a significant difference in blood pressure between the 2 groups following the intervention. The mean systolic blood pressure (P=0.013) and the mean diastolic blood pressure (P=0.003) were significantly lower in the intervention group than in the control group (Figure 2).

The musical intervention led to a reduction in systolic blood pressure by approximately 12 mm Hg and diastolic blood pressure by 7 mm Hg in the music group, while no significant changes were observed in the control group (Figure 2).

The mean anxiety scores of the music and control groups were measured before and after the intervention using the Spielberger Anxiety Questionnaire. In the music group, the mean scores were 52.15±5.44 before the intervention and 36±3.65 afterward. In the control group, the mean scores were 59.24±4.87 and 61.67±7.44, respectively. The difference in anxiety scores between the 2 groups post-

Table 1. A comparison of the demographic characteristics between the music and control groups

Characteristics	Music	Control	P
Age	6076±8.36	59.88±7.93	0.663[*]
Sex			0.428[**]
male	21 (63.6)	24 (72.4)	
female	12 (36.4)	9 (27.6)	
Marital Status			0.601[**]
single	5 (15.2)	6 (18.2)	
married	28 (84.8)	27 (81.8)	
Education Status			0.073[**]
Below a bachelor's degree	31 (93.9)	26 (78.8)	
Bachelor's degree and higher	2 (6.1)	7 (21.2)	

[*]Data were analyzed using the t-test.
[**]Data were analyzed using the χ^2 test.

intervention was statistically significant (*P*=0.001). The music group experienced a decrease of 26.66 points in anxiety scores compared with their pre-intervention scores, while the control group only showed a drop of 7 points.

The results further indicated a significant difference in the mean hidden anxiety scores between the music and control groups. Before and after the intervention, the music group's mean hidden anxiety scores were 50.49±5.98 and 29.82±4.78, respectively, while the control group's scores were 53.15±5.74 and 52.06±6.30, respectively. The difference between the groups was statistically significant (*P*=0.001). The music group experienced a 21-point decrease in hidden anxiety scores compared with their pre-intervention scores, whereas the control group only showed a 1-point drop.

The average total scores of obvious and hidden anxieties in the 2 groups were significantly different post-intervention (*P*=0.001). The control group had an average total anxiety score of 116.36±9.78 before the intervention, which changed to 113.73±13.04 after the intervention. On the other hand, the music group had an average total anxiety score of 106.45±10.67 before the intervention and 65.82±7.54 after the intervention. The change in the average total anxiety

score before and after the intervention was 6.4 points in the control group, whereas the music group showed a difference of 41 points. These results suggested that the music intervention had a significant effect on reducing the total anxiety scores of the music group compared with the control group (*P*=0.001). Data normal distribution was confirmed using the Kolmogorov-Smirnov test (*P*>0.161), as shown in Table 2.

Following the intervention, the χ^2 test showed a statistically significant difference between the 2 groups concerning total anxiety severity (*P*=0.001). Notably, 60.6% of the control group displayed moderate anxiety levels post-intervention, whereas only 6.1% of the experimental group showed moderate anxiety levels. The χ^2 indicated no significant differences between the groups in total anxiety severity (*P*=0.55) and hidden anxiety (*P*=0.33). Table 2 presents the severity of obvious and hidden anxiety levels in both groups.

The mean difference in anxiety scores between the 2 groups during the study is presented in Table 3. The mean total anxiety score difference between the pre-and post-intervention phases in the experimental group was 47.9, with a 95% confidence interval of 42.7 to 53.2 (*P*=0.001).
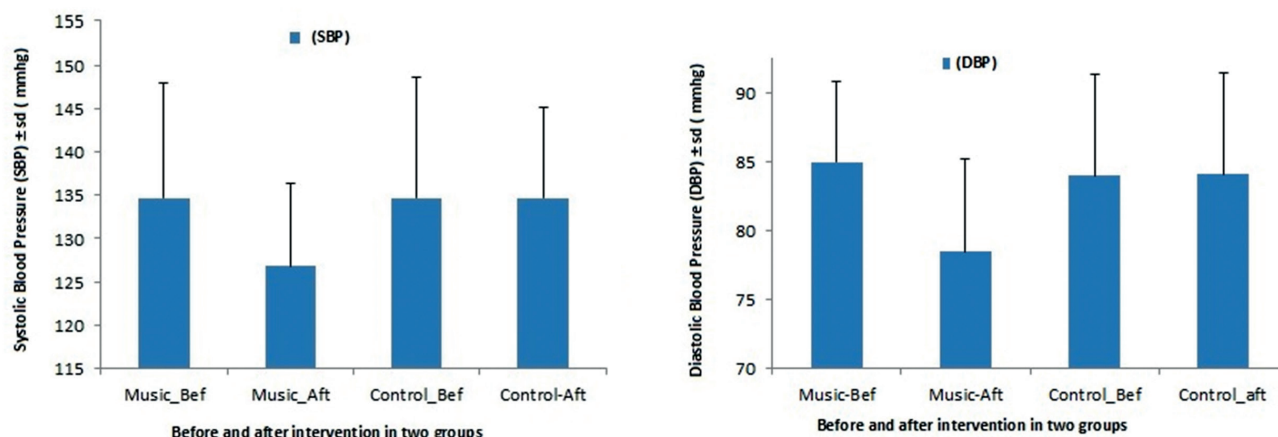

Figure 2. The image depicts comparisons of systolic and diastolic blood pressure between the music and control groups.

Table 2. A comparison of the severity of obvious and hidden anxiety levels between the music and control groups

Groups	Level of Anxiety, Frequency (%)					
	Before Intervention			After Intervention		
	Low	Moderate	High	Low	Moderate	High
Control (n=33)						
Obvious anxiety	0	11 (33.3)	22 (66.7)	2 (6.1)	10 (30.0)	21 (63.6)
Hidden anxiety	0	29 (87.9)	4 (12.1)	1 (3)	29 (87.9)	3 (9.1)
Music (n=33)						
Obvious anxiety	0	9 (27.3)	24 (73.7)	32 (97)	1 (3)	0
Hidden anxiety	0	25 (75.8)	8 (24.2)	31 (93.9)	2 (6.1)	0
P Obvious/hidden		0.592 / 0.339			0.001 / 0.001*	
Total Anxiety Level						
Control	0	20 (60.6)	13 (36.4)	1 (3)	20 (60.6)	12 (36.4)
Music	0	22 (66.7)	11 (33.3)	31 (93.9)	2 (6.1)	0
P		0.798			0.001*	

* The χ^2 test

Table 3. A comparison of the mean differences between obvious and hidden anxiety scores during post-and pre-intervention between the music and control groups

Groups	Pre- and Post-Intervention Mean Differences in Anxiety Scores (Standard Errors)	95% CI, Mean Difference		P
		Lower	Upper	
Obvious				
Control	7.09±1.27	4.55	9.63	0.001[*]
Music	25.67±1.44	22.79	28.55	0.001[*]
Hidden				
Control	2.67±1.44	0.22	5.55	0..49
Music	22.24±1.38	19.49	24.99	0.001[*]
Total Anxiety				
Control	9.90	4.88	14.94	0.001[*]
Music	47.90	42.66	53.15	0.001[*]

[*]The Student's t-test,
[**]The paired t-test,

Conversely, the total anxiety score difference in the control group was 2.3, with a 95% confidence interval of -4.3 to 5.5 (*P*=0.806). Table 3 also displays the differences in obvious and hidden anxiety scores between the groups. No side effects or complications from listening to music or using the MP3 player were reported in either of the groups.

Discussion

The study findings demonstrated that music therapy significantly decreased the mean obvious, hidden, and total anxiety scores in patients undergoing CABG surgery. Moreover, music therapy led to a significant reduction in anxiety severity levels among patients awaiting CABG surgery, as well as a meaningful decrease in their systolic and diastolic blood pressure and heart rate, compared with the control group.

Various clinical trials and review studies have examined the impact of music on different surgical procedures, such as cardiac surgery,[3,4,29-30] coronary angiography,[4] general surgery,[28] port-catheter placement procedures,[22] and shockwave lithotripsy.[32] These studies have reported that music therapy is effective in ameliorating patient anxiety during these procedures.

Some trial studies have reported contrasting results, indicating that listening to music either increases anxiety or has no effect on anxiety during procedures.[27,28] Drzymalski et al[26] found that using music during epidural catheter placement in laboring parturients was associated with higher post-procedure anxiety. The discrepancies in these findings might be attributed to the short duration of surgery. In contrast, the current study suggests that music is effective in longer and more extensive procedures.

The findings of this study are in line with the work of Ashok et al,[29] who demonstrated that among 40 CABG patients, those exposed to music had lower anxiety levels than those in the control group.

In another study, Heidari et al[19] investigated the efficacy of music therapy on anxiety and cardiovascular indices in patients undergoing CABG surgery. Their findings also supported the effectiveness of music in soothing anxiety among CABG patients. Nonetheless, music therapy failed to impact cardiovascular indices significantly. Similarly, Sendelbach et al[30] observed that music therapy decreased anxiety in patients during cardiac surgery. Their study also found that music therapy had no significant effect on systolic and diastolic blood pressure or heart rate.

The discrepancies between the findings of this study and those of other studies might be attributed to various factors that can influence physiological parameters, such as the surgical environment, patient characteristics, administered medications, and surgery duration. These factors can potentially impact hemodynamic variables in different ways.

A review study conducted by Ulrike Nilsson[29] found that approximately 50% of studies demonstrated the effectiveness of music therapy in alleviating patient anxiety. Given the diverse stressful conditions associated with various surgeries, it is recommended that further research be conducted to assess the effectiveness of music therapy on patient anxiety and pain.

Karalar et al[31] found that music therapy effectively reduced anxiety among patients undergoing shockwave lithotripsy, although the surgical procedure differed from the one examined in the current study. On the other hand, Kongsawatvorakul et al[11] reported contradictory findings, as music did not decrease anxiety levels in patients undergoing the Large Loop Excision of Transformation Zone. Several other studies have also yielded results that differ from those in the present study.[10,28]

The discrepancies in results across various studies may be attributed to factors such as the specific type of music utilized, patient expectations, cultural characteristics of patients, the specific surgical procedure performed, surgery duration, and unique environmental conditions experienced by patients.[31] Despite these variations, most studies have reported findings that align with those of the current study, indicating that music therapy has a beneficial effect on

anxiety during surgeries.

Music therapy can be advantageous due to several factors, including its ability to distract patients from pain and fear, create a familiar environment in unusual conditions, provide comfort during discomforting situations, and aid in muscle relaxation. Furthermore, it is a convenient, practical, and cost-effective option for use during surgery. Music may help patients manage anxiety related to various surgical procedures.[27]

This study has 2 principal limitations. Firstly, the evaluation period was restricted to 4 hours before surgery, preventing assessments over a longer duration. Future studies might benefit from expanding the evaluation period to encompass not only the day before surgery but also several days post-surgery. Secondly, the patients were exposed to only a single type of music, chosen for its popularity in northern Iran, to maintain consistency. While this approach ensured uniformity, it did not allow for personal preferences, as the patients had no choice in the type of music they listened to.

Conclusion

The findings of this study indicate that listening to traditional Iranian music is a simple, cost-effective, efficient, and safe complementary method for managing anxiety in patients undergoing CABG surgery. Nurses can integrate traditional music into standard care practices to help alleviate anxiety in patients before CABG procedures. Notably, the intervention led to significant reductions in cardiovascular indices such as systolic and diastolic blood pressure and heart rate, although no significant impact was observed on respiratory rate. While these reductions were statistically significant, further research is needed to determine their clinical significance. Additional studies should explore the potential effects of music on various physiological parameters in CABG patients.

Acknowledgments

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