Received: 3 April 2023 | Revised: 29 June 2023 | Accepted: 17 September 2023

DOI: 10.1002/nop2.2024

SYSTEMATIC REVIEW

NursingOpen Open Access WILEY

Exploring the effect of music therapy as intervention to reduce anxiety pre- and post-operatively in CABG surgery: A quantitative systematic review

Lan Wu[1] | Yongbo Yao[2]

[1]Cardiac Care Unit, The First Affiliated Hospital of Shantou University Medical College, Shantou, Guangdong, China

[2]Oncology Department, Guangdong Clifford Hospital, Guangzhou, Guangdong, China

Correspondence
Lan Wu, Cardiac Care Unit, The First Affiliated Hospital of Shantou University Medical College, No. 57 Changping Road, Jinping District, Shantou, Guangdong, China.
Email: 745933904@qq.com

Abstract

Aim: Patients undergoing coronary artery bypass graft (CABG) surgery may experience psychological complications, which can increase mortality. This review aims to explore the efficacy of music therapy as an intervention to reduce anxiety pre- and post-operatively in CABG surgery.

Design: This was a quantitative systematic review registered in PROSPERO (REDACTED).

Methods: This review used the PECOD framework to identify quantitative questions. We systematically searched seven electronic databases (Cochrane Central Register of Controlled Trials, CINAHL, MEDLINE, PubMed, Embase, PsycArticles, and PsycInfo) for articles published between 1 January 1992 and 13 July 2022. Studies were critically appraised, and the results of this systematic review yielded a narrative summary of the findings.

Results: Four randomized control trials and one quasi-experimental study published in English were included in the review. Narrative analysis indicated that patients undergoing CABG who were assigned to the group receiving music therapy reported significantly reduced anxiety levels compared with controls who did not listen to music. In addition, music therapy can effectively be used as a non-pharmacological intervention to manage anxiety pre- and post-operatively in CABG surgery.

No members of the public or patients were involved in the design or conduct of the study.

KEYWORDS
anxiety, cardiac rehabilitation, coronary artery bypass graft surgery, music therapy, quantitative systematic review

1 | INTRODUCTION

Globally, cardiovascular disease (CVD) is the leading cause of mortality and morbidity, resulting in a large global economic burden (Ruel et al., 2022). Coronary artery disease (CAD) is the most common cause of CVD-related mortality, responsible for approximately 375,476 people in 2021 (Tsao et al., 2023). Coronary artery bypass graft (CABG) surgery is a common treatment for stable CAD, which

can prolong the life expectancy of patients by preventing myocardial infarction (Doenst et al., 2019). Despite its benefits, CABG surgery can cause serious psychological complications, particularly anxiety, which place patients who undergo CABG surgery at a higher risk of death (Can & Abay, 2023). Anxiety and fear are common amongst patients undergoing CABG surgery in association with stressors such as fear of death, waiting time before surgery, pain, discomfort, and environmental changes (Zaini et al., 2022). Complications during hospitalization owing to CABG surgery substantially increase the cost of surgery, prolong the length of stay in the hospital, and require more human resources (Barbosa et al., 2019). Systematic screening for mental health problems before and after CABG surgery is essential to identify patients at risk of developing anxiety and depression. Proper care provided by health care professionals can reduce the impact of psychological complications.

2 | BACKGROUND

Pre-operative apprehension is a prevalent phenomenon observed amongst adult individuals across a wide range of surgical procedures, which can obstruct both the initiation and culmination of surgery, augmenting the likelihood of post-operative complications (Guo et al., 2020). In particular, patients submitted to cardiac surgical procedures often experience perioperative anxiety and subsequent admittance to an intensive care unit (ICU) presents them with various stress-inducing factors, such as ambient noise, sleep deprivation, the imposition of mechanical ventilation, and limited mobility (Kakar et al., 2021). It is paramount to identify and ameliorate this perioperative anxiety as it has been correlated with amplified post-operative pain severity, diminished life quality, and increased consumption of benzodiazepine and opioids, along with elevated morbidity and mortality rates (Spence et al., 2018). Cognitive behavioural therapy is the most common type of psychotherapy, but it must be administered by trained mental health professionals (MHA, 2020). Numerous studies have endeavoured to explore various methods to alleviate anxiety, and beyond pharmacological solutions, non-pharmacological interventions have demonstrated substantial potential (Kühlmann et al., 2018).

The study indicates that patient preparation for surgical procedures via non-pharmacological methodologies effectively mitigates their anxiety (Agüero-Millan et al., 2023). Amongst these methods, music therapy emerges as a non-invasive, secure, and cost-effective non-pharmacological nursing intervention that demands no specialized skills for administration, whilst exerting a positive influence on anxiety (Patiyal et al., 2021). Research by Ciğerci et al. (2019) indicates that nurses employ music intervention across various health care sectors, and anxiety is typically the primary variable examined in relation to the impact of such musical interventions. Furthermore, academic literature substantiates that music therapy can be competently executed by health professionals within clinical settings and this treatment modality may serve to enhance the patient-oriented focus of nursing practices (Ciğerci et al., 2019).

A non-blind, randomized controlled trial (RCT) found that music therapy was effective in decreasing anxiety amongst patients undergoing CABG surgery (Heidari et al., 2015). However, that study had limitations; patients in the intervention group received the same 30 min of light music, which may not be preferred by all patients. Individual responses to music are influenced by environmental, educational, and cultural factors and personal preferences (Bradshaw et al., 2011). The research did not assess cardiovascular indices beyond a 30-min duration. Moreover, the study was a non-blind RCT, which may have resulted in observer preference bias (Manheimer, 2011). Given the enormous economic and social burden of CABG surgery and its resulting psychological complications, finding effective management methods is essential to reduce anxiety and depression related to CABG surgery. Further investigation is required to provide sufficient evidence in this field. The present review of the effects of music therapy amongst patients undergoing CABG surgery can help to fill gaps in primary findings and provide more definitive conclusions about the effects of intervention.

As the effects of music therapy on reducing anxiety amongst CABG patients remain uncertain, the aim of this study is to conduct a quantitative systematic review to explore the effectiveness of music intervention amongst patients undergoing CABG surgery to control or prevent detrimental or adverse psychological outcomes, such as anxiety disorders. Additionally, the review is to assess the relative effectiveness of music as an intervention for anxiety when delivered at different stages of the operative journey (pre-operative, intra-operative, and post-operative stages) amongst patients undergoing CABG surgery.

3 | METHODS

The review protocol is registered in PROSPERO (CRD42022354154).

3.1 | Search strategy

Seven electronic databases, namely CINAHL, MEDLINE, PubMed, EMBASE, PsycArticles, PsycInfo, and Cochrane Central Register of Controlled Trials for relevant studies from 1 January 1992 to 13 July 2022. To reduce publication bias and provide diverse evidence resources, the reviewer searched grey literature such as Clinical Trials, EU Clinical Trials Register, Web of Science, OpenGrey, Chinese Clinical Trial Register, Scopus, and ISI Conference Proceedings. Reference lists were also reviewed. Adhering to the PICOD framework, the relevant keywords identified and their synonyms are presented in Table 1. The search strategy was structured using relevant keywords and their synonyms, which were linked via a Boolean operator to form different combinations of keywords. Search terms in different columns will be linked with "AND," whilst search terms in the same column will be connected with "OR." Detailed information about the search terms and databases is presented in Appendix 1.

TABLE 1 Review question in the PICOD framework.

PICOD	Descriptors of the PICOD	Keywords
Population (P)	Coronary artery bypass grafting (CABG) patient	"Coronary artery bypass grafting" OR "Coronary bypass surgery" OR "Coronary artery bypass grafting surgeries" OR "Coronary artery bypass graft surgery" OR "Heart bypass surgery" OR "Heart surgery" OR "Heart bypass surgery" OR "Off-pump coronary artery bypass grafting" OR "CABG" OR "Thoracic surgery" OR "Coronary artery bypasses" OR "Coronary artery bypass, off-pump" OR "Coronary artery bypass, on-pump"
Intervention (I)	Any combination of pre-operative, intra-operative, and post-operative music	"Music intervention or" Music therapy or "Receptive music therapy" OR "Active music therapy" OR "Expressive music therapy" OR "Taped music" OR "Music" OR "Using music as a therapy tool" OR "Nature sounds" OR "Music*"
Counter intervention (C)	No music	–
Outcome (O)	Measurable outcomes of anxiety, stress, and depression	"Anxiety" or "Anxiety order" or "Anticipatory Anxiety" or "Social Anxiety Disorders" or "Stress" or "Stress Disorders, Post- Traumatic" or "Stress, Psychological" or "depression" or "Depression, Reactive"
Design (D)	Experimental studies	–

3.2 | Inclusion and exclusion criteria

3.2.1 | Inclusion criteria

The inclusion criteria were (1) adult patients undergoing CABG surgery who had no underlying mental disease; (2) an experimental group that received a music intervention including any combination of music administered pre-, intra-, and post-operatively (music therapy includes categories of classical music, soothing music, light music, relaxing music, and nature sounds); (3) a control group that received standard care (or no treatment); (4) the primary outcome of the included articles was adverse psychological consequences such as anxiety, stress, fear, and depression; (5) RCTs and quasi-experimental studies; (6) articles with the full text available; and (7) articles published in English only.

3.2.2 | Exclusion criteria

The following exclusion criteria were excluded: (1) patients were put on a ventilator for prolonged periods; (2) patients with other complications; (3) patients with severe mental disorders; (4) patients with hearing problems/aids; (5) hip-hop, pop, R&B, rock, electronic music, dance, party, chill music, punk music, metal music, or other exciting styles of music were excluded; and (6) the observational studies such as cohort studies and case report were excluded.

3.3 | Quality assessment

To assess the risk of bias, two reviewers (REDACTED) independently evaluated the methodological quality of RCTs using the Cochrane Collaboration tool. The evaluation of bias risk involves examining seven domains: allocation concealment (selection bias), random sequence generation (selection bias), blinding of participants and personnel (performance bias), incomplete outcome data (attrition bias), blinding of outcome assessment (detection bias), selective reporting (reporting bias), and other bias (Cumpston et al., 2019). The quality of each domain is divided into three categories: low risk of bias, high risk of bias, and unclear risk (Cumpston et al., 2019). Moreover, the Joanna Briggs Institute (JBI) critical appraisal tools were used for quality assessment of quasi-experimental studies. Any disagreements or doubts amongst reviewers were addressed and settled by the lead author (REDACTED).

3.4 | Data extraction

Based on a pre-specified dataset, two researchers (REDACTED) independently gathered and verified the data from the included studies. The characteristics of following studies were extracted: title, author name, country, study design, setting, population, sample size, participant sex, mean age, sponsor, setting, length of study, randomization method, inclusion criteria, exclusion criteria, number of patients, dropout rate, the results of assessment regarding anxiety, and conclusions. Based on a pre-specified dataset, two researchers (REDACTED) independently gathered and verified the data from the included studies. The following intervention characteristics were extracted: types of music interventions, timing of the music intervention (before, during, or after CABG surgery), comparisons, and the length of the intervention in minutes The main outcomes measured were anxiety levels determined by validated subjective assessment tools following the music intervention.

3.5 | Data analysis

After extracting data from the included studies, synthesis without meta-analysis was performed to measure the effect of an exposure

or intervention. In this review, we could not conduct a meta-analysis for the following three reasons. First, data were collected using five different anxiety scales: a numeric rating scale (NRS; Barnason et al., 1995); a visual analogue scale for anxiety measurement (VAS-A; Heidari et al., 2015); the Spielberger State–Trait Anxiety Inventory (STAI; Amiri et al., 2017); the depression, anxiety, and stress scale (DAS; Devare Phadke et al., 2014); and the Hospital Anxiety and Depression Score (HADS; Ashok et al., 2019). Although four of the five included articles were RCTs, they used different measurement scales to evaluate anxiety levels. Second, the duration of listening to music and the time frame measured were different across the selected articles. As a result, the reviewer could not combine certain data. Therefore, this review yielded a synthesis without meta-analysis.

3.6 | Ethics

This was a systematic review of the literature, and thus, no Research Ethics Committee approval was needed.

4 | RESULTS

4.1 | Literature search

We retrieved 106 studies from different electronic databases, and an additional two records were found in an online search and via citation chaining. Consequently, 108 studies were retrieved in the initial search. All results were imported into Endnote X 9.2, and 90 studies remained after removing duplicates. After reviewing the title, abstract, and keywords, 90 articles were discarded without meeting the inclusion criteria, leaving 15 full-text articles for consideration. Ten articles were excluded for the following reasons: not an experimental study ($n=2$), included other (non-CABG) cardiac surgery ($n=5$), patients undergoing CABG surgery during weaning of mechanical ventilation ($n=2$), and patients underwent coronary artery surgery with open-heart surgery ($n=1$). Ultimately, five studies that met the inclusion and exclusion criteria were incorporated into the quantitative synthesis for this review. The assessment and selection processes for study selection are presented in Figure 1, according to PRISMA guidelines.

4.2 | Study characteristics

Four completed RCTs and one quasi-experimental study were included (Amiri et al., 2017; Ashok et al., 2019; Barnason et al., 1995; Devare et al., 2014; Heidari et al., 2015). The five included studies' characteristics are listed in Table 2, and more detailed characteristics are presented in Appendix 2.

A total sample of 346 patients undergoing CABG surgery participated in these five studies. The participants were recruited from hospitals and had similar mean ages. The types of music intervention included relaxing music, classical music, nature sounds, light music, and soothing music without lyrics. Music was mostly provided through headphones. The listening duration of music intervention is 20–30 min over a period ranging from 2 to 7 days. The primary outcome of this systematic review was to assess the level of anxiety in patients undergoing CABG surgery. All five studies used different measures of anxiety, including NRS (Barnason et al., 1995), VAS-A (Heidari et al., 2015), DASS (Devare et al., 2014), the STAI (Amiri et al., 2017), and HADS (Ashok et al., 2019).

4.3 | Methodological quality assessment of the included studies

4.3.1 | Quality of four RCT studies

According to recommendations of the Cochrane Handbook, the reviewer assessed the following elements for the four RCT studies: selection bias, detection bias, performance bias, attrition bias, reporting bias, and other sources of bias (Cumpston et al., 2019). The elements for the four RCT studies were classified as low, high, or unclear risk of bias. Detailed quality assessments for the included studies are presented in Appendix 3.

The statistical analysis results of the total bias risk of the four included studies are shown in Figure 2. Three studies (75%) showed a low risk of bias for random allocation sequences, attrition bias, reporting bias, and allocation concealment. Allocation was conducted using a sealed opaque envelope, the toss of a coin, or a random number table. One study (25%) was deemed to have a high risk of attrition bias, owing to the incomplete result data. One study (25%) showed a high risk of performance bias, whereas three studies (75%) had an unclear risk of performance bias. Two studies (50%) were rated as having a low risk of blinding of outcome assessment, and two studies (50%) showed an unclear risk of blinding of outcome assessment.

4.3.2 | Quality of the quasi-experimental study

We assessed the study by Barnason et al. (1995) using the JBI critical appraisal tools for quasi-experimental studies (see Appendix 4). The study used the NRS anxiety score for data collection. The NRS is a popular subjective measure used to assess pain intensity, and the verbal rating scale reveals excellent psychometric properties (Haefeli & Elfering, 2006). The analysis to explore the effect of intervention on the outcome variable of anxiety was evaluated with repeated measures analysis of covariance. However, the study had some limitations. It was unclear whether the baseline characteristics of participants in the intervention and control groups were similar because this was a before-and-after study. Further information is presented in Table 3.

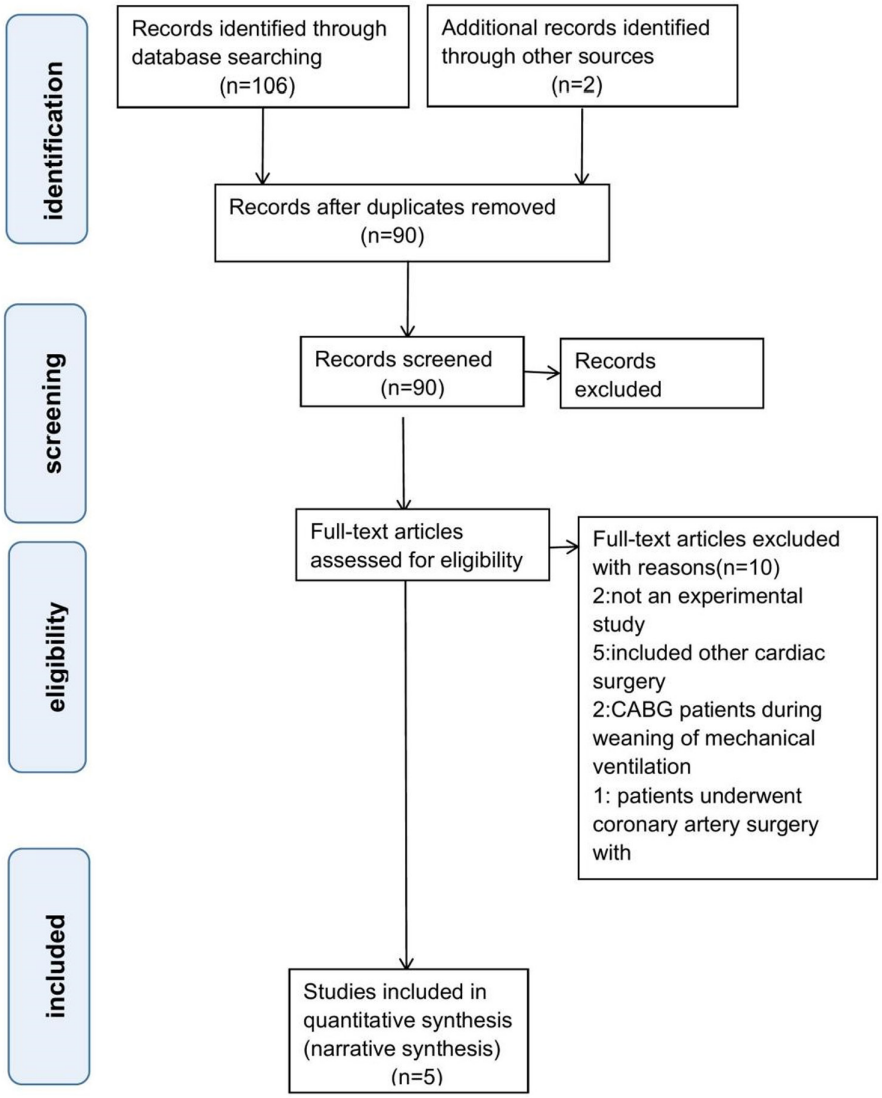


FIGURE 1 Study selection process presented as the PRISMA flow diagram.

4.4 | Effect of the intervention

All five studies included in this quantitative systematic review reported the effect of music therapy as an intervention to reduce patient anxiety, although the specific measurement tools were different. Overall, the studies showed that music therapy can be applied by nurses as a non-pharmacological method for reducing anxiety in patients undergoing CABG surgery.

4.4.1 | Assessment of music interventions

Each the five included studies investigated the effectiveness of music therapy. The five studies evaluated anxiety after music intervention using different calculation methods. The overall data for the intervention effects in each included study are presented in Table 4. Because of different anxiety assessment methods used in the studies, and because each study used different interventions, comparing confounding factors directly was impossible. We used the deviation standardization method to process the anxiety value, with the following equation:

$$\text{Value} = \frac{F_x - F_{\min}}{F_{\max} - F_{\min}} \times 100\%$$

where $F_{\max}$ and $F_{\min}$ are the upper and lower limits. Taking the STAI as an example, $F_{\max}=80$, $F_{\min}=20$. When $F_x=38.6$, the normalized fraction is 31%. On the basis of the data normalization results, the included studies can be compared horizontally. Normalization is a non-dimensional processing method that transforms the absolute value into a relative value. The normalization approach used in synthesizing the results was to map data changes to a fixed interval [0,1]. Although the evaluation methods are different, the basis for mapping is the score range of evaluation methods, which is a relatively basic statistical concept. Therefore, in this review, the normalization method for data comparison was used. The ratings for anxiety after intervention are presented in Table 5.

In the study by Barnason et al. (1995), patients were randomly divided to three groups: two intervention groups and one control

TABLE 2 The characteristics of studies.

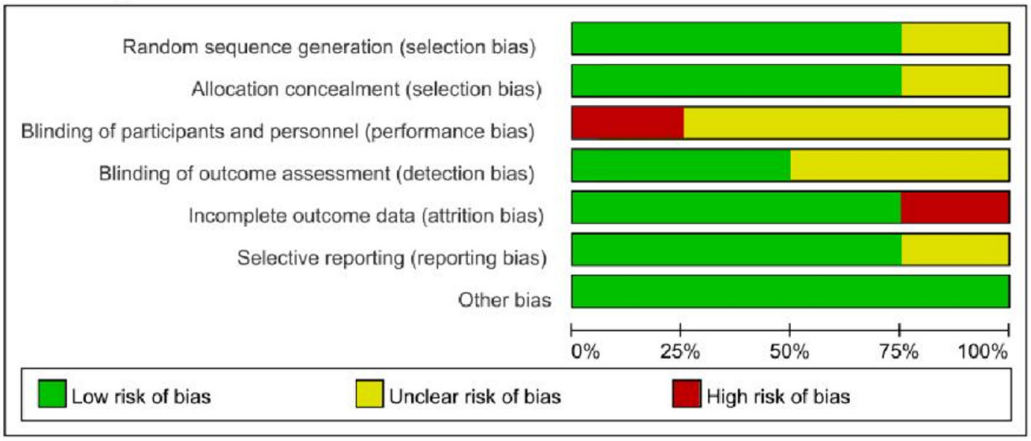
Study ID	Country	Study design	Setting	Population	Sample size		Mean age
					Male	Female	
Barnason et al. (1995)	USA	Quasi-experimental study	A Midwestern Community Hospital	Patients underwent elective CABG	65	31	67 ± 9.9
Devare Phadke et al. (2014)	India	RCT	Hospital	Immediate post-operative CABG patients	44	16	58.6 ± 9.55
Heidari et al. (2015)	Iran	RCT	Cardiovascular surgical ICU of Shahid Beheshti Hospital	Patients undergoing CABG	44	16	58.46 ± 7.89
Amiri et al. (2017)	Iran	RCT	ICU	Candidates for CABG	33	27	56.33 ± 13.52
Ashok et al. (2019)	India	RCT	Cardiovascular Surgery Department	Patients undergoing CABG	12	28	59.85 ± 7.92

group. Participants received 30-min music intervention during two periods on post-operative days 2 and 3. NRS anxiety score after intervention had no significant differences on post-operative day 2, with $F(2, 91) = 0.64$ ($p > 0.05$) or on day 3, with $F(2, 87; p > 0.05)$. The study findings demonstrated that the total group showed relatively low levels of anxiety overall as measured using the STAI and using the NRS anxiety score. Notably, in that study, the exclusion criteria prevented extremely critically ill patients from participating. Therefore, the results may be completely different for a group of highly anxious patients. It is worth mentioning that the above study was the only one amongst the five included studies that did not prove the effectiveness of music intervention.

In the study by Devare Phadke et al. (2014), 60 post-operative patients who underwent CABG were allotted into one of two groups ($n = 30$ each). The intervention group participated in music sessions and an exercise program; the control group only participated in the exercise program. The intervention group listened to 35 min of music via headphones for 7 days. Participants were re-evaluated using scores on the DAS scale after 1 week of intervention. However, missing data on the DAS scale led to a high risk of incomplete outcome data (attrition bias). The study reported that on the DAS scale, anxiety and stress reduction were very significant but p values were not provided in detail. Overall, the study concluded that music effectively reduces anxiety and improves mood in post-operative patients receiving CABG.

Heidari et al. (2015) played light music in the intervention group, using a digital MP3 player and headphones. Between 2:30 and 3:00 PM, participants assumed a semi-Fowler posture and listened to the music. This time frame was chosen as most patients were resting, undisturbed by visitors or medical staff. Meanwhile, individuals in the control group were instructed to rest in the same position without the musical element. The study reported that before treatment, VAS-A scores in the intervention group and control group were 1.53 ± 0.89 and 1.43 ± 0.77, respectively. Following the intervention, the anxiety scores for the intervention group were 0.77 ± 0.72, whilst the control group had scores of 1.27 ± 0.44. VAS-A scores in the experimental and control groups were 0.53 ± 0.57 and 1.07 ± 0.69, respectively, 30 min in the stages after the intervention. The results reported that the trend of changes in anxiety scores had significant difference during the periods immediately before, immediately after, and 30 min following the intervention ($F = 19.919$; $p < 0.001$). Additionally, there was a significant interaction between both groups and time ($F = 7.178$; $p = 0.004$). The study demonstrated that music therapy was an effective nursing intervention to reduce anxiety in patients undergoing CABG.

Amiri et al. (2017) aimed to evaluate the effect of nature sounds on reducing anxiety amongst patients before CABG surgery. In the intervention group, the natural sounds were played for 30 min through headphones worn by the participants, whilst in the control group, participants' headphones were connected to a device that did not emit any sound. The STAI in the two groups was used before the intervention, 30 min after the music intervention, and before surgery in the waiting room. The intervention group exhibited a significantly



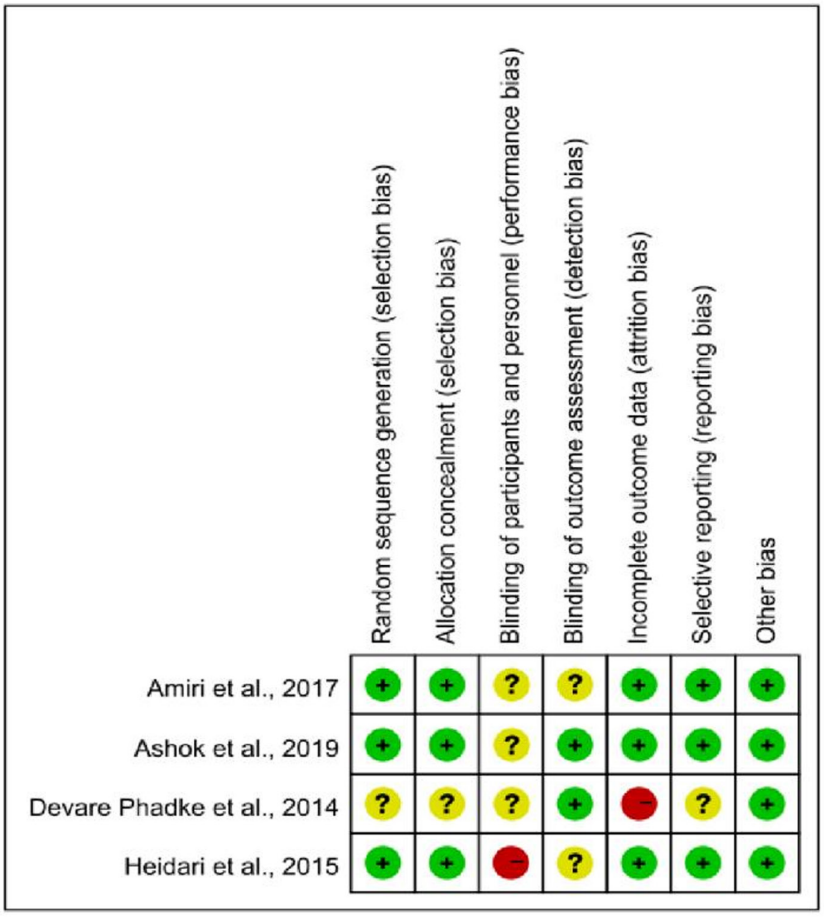


FIGURE 2 Risk of bias graph: review author's judgement about each risk of bias item presents as percentages across all included studies. Risk of bias summary: review author's judgement about each risk of bias item for each included study.

reduced mean anxiety level compared to the control group, both 30 min after the intervention and in the waiting room during the pre-operative period ($p = 0.001$). Additionally, there was a decrease in mean anxiety for the intervention group and an increase for the control group over time ($p < 0.001$). This research demonstrates that nature sounds can serve as a non-pharmacological approach to alleviate anxiety in patients undergoing CABG surgery.

Ashok et al. (2019) conducted intervention experiments in pre- and post-operative patients undergoing CABG. The intervention group was provided with music therapy in addition to cardiac rehabilitation, whilst the control group underwent cardiac rehabilitation only, both on a daily basis. Soothing music without lyrics (60–80 beats per minute) was administered for a 20-min period each day, starting on the first day after surgery and continuing until the seventh post-operative

TABLE 3 Detailed assessment information of the quasi-experimental study.

Evaluation of project	The evaluation results	Support for judgement
① Is it clear in the study what the "cause" and what the "effect" are?	Yes	Quote: "The pre-operative perceptions of the patient undergoing heart surgery that identify sources of anxiety are consistent with studies of other types of pre-operative patients. Numerous researchers have examined the usefulness of providing pre-operative teaching to allay patient fears and anxiety. Perceived anxiety also may be heightened for this patient group because of the critical care environment itself. The major finding of this study was that the use of music, music video, or rest periods did not significantly reduce the anxiety of patients after CABG"
② Were the participants included in any comparisons?	Yes	Quote: "subjects were randomly assigned by drawing lots to one of the following groups: (1) music therapy, (2) music video therapy, or (3) scheduled rest period group"
③ Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?	Yes	Quote: "Subjects in the groups received their assigned 30-min intervention at two episodes on post-operative days 2 and 3"
④ Was there a control group?	Yes	The subjects were randomly assigned. "They were assigned by drawing lots into one of the following groups: (1) music video therapy, (2) music therapy, or (3) scheduled rest period group"
⑤ Were there multiple measurements of the outcome, both pre- and post-intervention/exposure?	Yes	Quote: "A baseline measure of STAI was taken before surgery; patients also completed the "state" anxiety tool before the intervention session on post-operative day 2 and on completion of the session on post-operative day 3"
⑥ Was follow-up complete, and if not were differences between groups in terms of their follow-up adequately described and analysed?	Unclear	No special evidence
⑦ Were the outcomes of participants included in any comparisons measured in the same way?	Yes	Quote: "The subject's perception of anxiety was measured with Spielberger's 34 state trait anxiety instrument (STAI). The outcome (dependent) variables were anxiety, as measured by state anxiety and anxiety NRS"
⑧ Were outcomes measured reliably?	Yes	Quote: "The use of the NRS, although considered less sensitive than the VAS, allows ease of use in the critical care population and has been demonstrated to be clinically useful"
⑨ Was an appropriate statistical analysis used?	Yes	Quote: "To determine if there were any differences that needed to be statistically controlled for amongst the groups by demographic characteristic variables, chi-square and analysis of variance (ANOVA) statistics were done"

day. The primary outcome measure was HADS on the pre-operative day and on post-operative days 2 and 7. Anxiety scores showed a reduction in both groups, scores in the intervention group decreased from 5.53 ± 2.72 to 1.8 ± 1.373, an improvement of 18.65% ($p = 0.02$), and scores in the control group showed declined from 5.53 ± 2.47 to 3.39 ± 3.025, an improvement of 10.70% ($p = 0.303$). The authors found differences in anxiety levels within the intervention group between the pre-operative day and post-operative day 7 and between post-operative days 2 and 7, with p-values <0.05. The control group showed differences in anxiety between post-operative days 2 and 7 ($p < 0.05$). Owing to the small sample size (12 men and 28 women), randomization had a greater impact on the results. However, there was no type II error because the experimental results verified the hypothesis to a certain extent, although not completely.

These studies mainly explored the effect of music intervention after surgery. Together, the above studies demonstrated that music intervention therapy has the effect of relieving anxiety in most cases (the intervention time was between 10 and 30 min). Although the types of control group and the music in the intervention group were not consistent, this conclusion can still be considered correct.

4.4.2 | Assessments of post-operative and pre-operative intervention

Researchers divided participants into two groups: pre-operative intervention (Amiri et al., 2017; Ashok et al., 2019) and post-operative intervention (Ashok et al., 2019; Barnason et al., 1995; Devare et al., 2014; Heidari et al., 2015). In the study by Ashok et al. (2019), anxiety levels were the same (22.65%) in the intervention and control groups. Following the intervention, the anxiety level experienced by the intervention group was 4%, a figure lower than the 7.95%

TABLE 4 Characteristics and assessments of interventions.

	The effect of music intervention					
		Before intervention		After intervention		
		IG (mean ± SD)	CG (mean ± SD)	IG (mean ± SD)	CG (mean ± SD)	
Study ID	Anxiety measurement	(the normalized fraction of anxiety value, %)	(the normalized fraction of anxiety value, %)	(the normalized fraction of anxiety value, %)	(the normalized fraction of anxiety value, %)	Measure of difference
Barnason et al. (1995)	NRS anxiety scale	Music 35.3 ± 10.9 (25.5%) Music video 31.6 ± 9.9 (19.33%)	Scheduled rest 38.6 ± 13.8 (31%)	Music 31.8 ± 11.4 (19.67%) Music video 33.1 ± 12.9 (21.83%)	Scheduled rest 34.7 ± 16 (24.5%)	$p > 0.05$ (IG vs. CG) $p > 0.05$ (IG before the intervention vs. IG after the intervention)
Devare Phadke et al. (2014)	DAS	–	–	–	–	–
Heidari et al. (2015)	VAS-A	1.53 ± 0.89 (16.1%)	1.43 ± 0.77 (14.3%)	0.53 ± 0.57 (5.3%)	1.07 ± 0.69 (10.7%)	$p = 0.037$ (IG before the intervention VS IG after the intervention) $p = 0.004$ (IG vs. CG)
Amiri et al. (2017)	STAI	4.37 ± 47.66 (46.1%)	5.17 ± 48.44 (47.4%)	7.2 ± 43.68 (38.25%)	6.6 ± 50.57 (52.13%)	$p = 0.001$ (IG after the intervention vs. CG after the intervention) $p = 0.001$(IG vs. CG)
Ashok et al. (2019)	HADS	5.53 ± 2.72 (22.65%)	5.53 ± 2.47 (22.65%)	POD-2 4.87 ± 2.446 (19.35%) POD-7 1.80 ± 1.373 (4%)	POD-2 6.29 ± 3.099 (26.45%) POD-7 3.39 ± 3.025 (11.95%)	$p = 0.02$ (IG before intervention vs. IG after intervention) $p < 0.05$ (IG VS CG)

Abbreviations: CG, control group; IG, intervention group.

TABLE 5 Characteristic of post-operative and pre-operative intervention.

Study ID	Interventions	Comparisons	Outcomes (degree of anxiety decline)	Design
Barnason et al. (1995)	Music	Scheduled rest	5.83%	Post-operation
	Video music		−2.50%	
Devare Phadke et al. (2014)	Music sessions	Exercise program	–	Post-operation
Heidari et al. (2015)	Light music	Rest in bed	10%	Post-operation
Amiri et al. (2017)	Natural sounds	Silent	7.85%	Pre-operation
Ashok et al. (2019)	The sedative music	Cardiac rehabilitation	18.65%	Pre-operation and post-operation

observed in the control group. According to Heidari et al. (2015), the anxiety level in the control group increased to a certain extent after a short rest and was higher (13.88%) than the anxiety level in the intervention group (see Table 5). Looking at the research results, the effect of pre-operative intervention was worse than that of post-operative intervention, which may be owing to the fact that pre-operative anxiety resulting from the patient's fear of surgery is more difficult to address and could not be eliminated. On the whole, pre-operative music intervention reduced patients' anxiety to a certain extent, but the degree of relief was low. Amongst the included studies, the results reported by Barnason et al. (1995) were relatively early, and thus, there may be a large error caused by the experimental environment. In the experimental results, post-operative intervention alleviated patients' anxiety to a certain extent, but the authors could not rule out that the reduction in anxiety was caused by success of the operation. In general, because of the limited number of studies and the small sample sizes, the effect of post-operative intervention was better than that of pre-operative intervention. However, this finding remains unclear and warrants further investigation.

5 | DISCUSSION

5.1 | Summary of main results

Each included study reported on the primary outcome of this review, namely the effectiveness of music therapy on anxiety of patients undergoing CABG surgery; however, the specific measurement methods differed. This quantitative systematic review is the first to focus on exploring the effectiveness of music therapy for reducing anxiety in patients undergoing CABG. Four included studies (Amiri et al., 2017; Ashok et al., 2019; Devare et al., 2014; Heidari et al., 2015) reported the effectiveness of music intervention during surgery; one study (Barnason et al., 1995) reported unclear findings regarding music intervention. The results of this synthesis without meta-analysis showed that the anxiety level of CABG patients receiving music therapy was significantly lower than that of the control group without music ($p < 0.05$). The results of this review were in line with those of a previous systematic review by Chu et al. (2021), who stated that music intervention significantly reduced anxiety scores. Our findings align with previous research conducted by Lai and Good (2005) and Shum et al. (2014), which indicated that music listening can regulate bodily rhythms by slowing them down. This, in turn, leads to a decrease in sympathetic nervous system activity and a reduction in noradrenaline levels circulating in the body. Because of this physiological change, calmness and deep relaxation are promoted in the body, reducing anxiety. Music therapy as an intervention is relatively safe and inexpensive and can be easily performed by nurses. The result of the review provides evidence in support of music therapy as an intervention to reduce anxiety amongst patients undergoing CABG.

Despite the above study results, conflicting findings regarding the effects of music on patients' anxiety have been reported and disagreements with the above reviews have been identified. The aim of one study (Panteleeva et al., 2018) was to conduct a meta-analysis of RCTs on the impact of music therapy as an intervention on anxiety in healthy individuals. The primary results of that study revealed an overall reduction in self-reported anxiety ($d = -0.30$, 95% confidence interval [CI]: −0.55, −0.04); however, the reduction in anxiety was not significant on psychophysiological signals associated with anxiety. Hence, Panteleeva et al. (2018) revealed that incorporating music listening into a comprehensive music-based psychological intervention should be given substantial consideration for managing anxiety.

Different kinds of music can reduce anxiety in patients at different stages of their operative journey. In two studies, the intervention was pre-operative and reduced anxiety in patients prior to undergoing CABG (Amiri et al., 2017; Ashok et al., 2019). Four studies used post-operative musical intervention (Ashok et al., 2019; Barnason et al., 1995; Devare et al., 2014; Heidari et al., 2015). However, the authors of three studies (Ashok et al., 2019; Devare et al., 2014; Heidari et al., 2015) and Barnason et al. (1995) showed that music therapy as an intervention was effective to reducing anxiety in patients after CABG surgery. From the results, post-operative intervention appears to be more effective than pre-operative intervention. However, owing to the small sample size, rigorous conclusions cannot be drawn. Addressing and managing patients' anxiety during the perioperative period are crucial, as it has been linked to increased post-operative pain intensity, higher opioid usage, diminished quality of life, elevated benzodiazepine consumption, and a rise in morbidity and mortality rates (Hernández-Palazón et al., 2018). Hence, on the basis of these studies, administering music therapy before and after CABG surgery could be very beneficial in reducing patients' anxiety.

TABLE 6 GRADE evidence profile.

Certainty assessment									
No. of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Certainty	Importance
5	4 RCT 1 quasi-experiment study	Serious[a,b]	None	None	Serious[c]	None	⊕⊕⊕O Moderate	Importance

[a]The study did not show the score on DAS scale of the two groups (Devare Phadke et al. 2014).
[b]Heidari et al. (2015) failed to blind participants and research staff.
[c]The five included studies evaluated anxiety after music intervention by using different calculation methods.

In this review, each of the included studies used a different variety of music during intervention. Four studies use relatively soft music such as nature sounds, light music, relaxing music, and soothing music without lyrics (Amiri et al., 2017; Ashok et al., 2019; Barnason et al., 1995; Heidari et al., 2015). Nature sounds, light music, and soothing music significantly decreased anxiety in patients undergoing CABG (Amiri et al., 2017; Ashok et al., 2019; Heidari et al., 2015). However, the relaxing music and soft instrumental video used in the study by Barnason et al. (1995) did not reduce anxiety in these patients. The reason for this may be that patients have different preferences regarding types of music. In the study of Devare Phadke et al. (2014), classical music was used to reduce anxiety in patients undergoing CABG. Guétin et al. (2009) also reported that "relaxation" music therapy was often used in the treatment of anxiety and depression. Therefore, relaxing music can reduce anxiety in patients undergoing CABG; however, further research is explored to determine which types of music are most effective.

The duration of music intervention in the included studies was 20–35 min each day. Except for Devare Phadke et al. (2014), the intervention group listened to music through headphones over 7 days; in all other studies, the music was low frequency. Low-frequency and short-term music therapy showed an effect on anxiety levels (Amiri et al., 2017; Ashok et al., 2019; Devare et al., 2014; Heidari et al., 2015). Additionally, Ashok et al. (2019) clarified that music therapy could positively affect anxiety levels for up to 7 days after intervention. Hence, both short-term and long-term music therapy could reduce anxiety in patients undergoing CABG surgery. However, the effective duration of the period for music therapy as an intervention remains unclear. Therefore, to further clarify the long-term effects of music therapy in cardiac rehabilitation, follow-up measurements after discharge are needed, which were beyond the scope of the present study.

5.2 | Overall completeness and applicability of evidence

Evaluating the evidence associated with the review question provides a comprehensive assessment of the external effects of the review and how it relates to current practice. In terms of the effectiveness of music therapy to reduce anxiety amongst patients undergoing CABG surgery, sufficient evidence is available to answer the review question. The findings of this review indicated that music therapy is an effective method to reduce anxiety in patients undergoing CABG, even though it is unclear which types of music and the timing of interventions are most effective.

The themes of this review are appropriate for the current health care environment. Anxiety disorders are linked to increased heart rate and blood pressure (Sendelbach et al., 2006). Hence, alleviating anxiety is of great importance in patients undergoing CABG surgery. Comeaux and Comeaux (2013) showed that music therapy can improve anxiety in patients without serious side effects. Additionally, it is a useful approach with a low cost. Therefore, music therapy can be widely used in clinical practice.

Despite these positive results, several issues may affect the completeness and applicability of the evidence. First, although Devare Phadke et al. (2014) concluded that music therapy reduced anxiety levels in patients, the DASS table for measuring anxiety levels was missing in the published article; thus, there was no way to gauge the impact of music therapy on anxiety levels. Additionally, the article did not report the cost of headphones. Professional treatment approaches that will be widely adopted in the future will be those that are relatively cost-effective and that demonstrate clear benefits with respect to important objective indicators in the relatively short term (Baker et al., 2008). Therefore, establishing cost-effectiveness in standard care and music therapy interventions is essential.

5.3 | Quality of the evidence

Based on the GRADE system, the evidence quality of the five studies incorporated can be categorized into four distinct levels: high, moderate, low, and very low (Guyatt et al., 2008). The levels are classified according to their quality in the following domains: study design, risk of bias, heterogeneity of results, indirectness of evidence, and imprecision of results (Terracciano et al., 2010). We made use of the GRADE system to evaluate the quality of evidence and each result in the five included studies. Detailed information of the evaluation is shown in Table 6.

To sum up, owing to heterogeneity amongst studies in the types of music therapy, sample sizes, study designs, anxiety measurement tools, and participants, reaching a robust and transparent conclusion regarding which type of music therapy is most effective in the target patient population was difficult. Music therapy showed a positive impact on reducing anxiety amongst patients undergoing CABG, but the type and duration of music therapy that are most effective to reduce anxiety pre- or post-operatively in CABG surgery remain unclear.

6 | STRENGTHS AND LIMITATIONS

6.1 | Strengths

This review had several important advantages. First, four of the five studies were RCTs. Katona et al. (2021) reported that hierarchy of evidence is widely used to identify the quality of evidence; in systematic reviews of medical research, RCTs are considered the gold standard. The present review included a quasi-experimental study. However, because in specific research areas, RCTs cannot be nonrandomized, studies are still the primary source of evidence regarding the effect of interventions (Sterne et al., 2016). Second, although all five studies used different approaches to verify the reliability of the data, the authors used scaled assessment to ensure the reliability of the results. Moreover, the VAS-A and STAI for anxiety, facilitating clinical interpretation, are easy assessment tools and the most commonly used in the research. The overall findings of this review are reliable in terms of their moderate levels of evidence.

6.2 | Limitations

This systematic review faced certain limitations. Firstly, only English-language studies were included, potentially introducing language bias. Secondly, the music therapy approaches used were diverse, making it difficult to assess the precise impact of various music genres on anxiety reduction. In addition, one of the included studies was regarded as high risk in performance bias and one was considered to have a high risk of attrition bias, which leads to affect the internal authenticity of research conclusions. Lastly, the initial subjective anxiety levels of participants varied between studies, which could contribute to the heterogeneity of the results.

7 | CONCLUSIONS

Patients undergoing CABG surgery who have one or more existing psychological problems require greater attention. This was the first systematic review to quantify the effectiveness of music intervention on anxiety levels in patients undergoing CABG. In this review, we found sufficient evidence to support the effect of music therapy intervention. Hence, music therapy should be used in health care facilities to reduce anxiety levels in patients before and after CABG surgery. Music intervention as an intervention is an effective and inexpensive tool to decrease anxiety in this patient group. Moreover, different types of music for relaxation, such as nature sounds, classical music, light music, and soothing music without lyrics, have been shown to reduce anxiety. In conclusion, music therapy was found to be an effective method to alleviate anxiety amongst patients receiving CABG surgery.

According to the outcomes of the studies included in this review, several implications for research were identified. Initially, identifying the point at which (pre-operative, intra-operative, or post-operative) musical interventions are most effective in reducing patients' anxiety requires further study. The intra-operative benefits of music therapy for patients undergoing CABG surgery need to be further explored; we identified no such studies in this review. Furthermore, the effectiveness of combined pre-operative and post-operative music therapy to reduce anxiety amongst patients undergoing CABG surgery should be investigated in future.

Whether different types of music have different effects on anxiety in patients undergoing CABG surgery also requires further studies using different types of music that accurately reflect patients' preferences. Whether cultural factors have an impact on the role of music therapy also warrants further examination. Additionally, the association between the duration of music intervention and reduced patient anxiety requires further study. Nevertheless, this systematic review showed that music therapy is valuable as a low-technology

intervention and a very cost-effective way to reduce anxiety in patients undergoing CABG.

AUTHOR CONTRIBUTIONS

Lan Wu: Conceptualization (lead); data curation (lead); writing – original draft (lead); investigation (lead); methodology (lead); software (lead); formal analysis (lead); writing – review and editing (lead); visualization (lead). **Yongbo Yao:** writing – review and editing (equal); visualization (equal).

ACKNOWLEDGEMENTS

The authors would like to thank Dr.Ben of Birmingham City University for guiding the manuscript.

FUNDING INFORMATION

No financial support was received for this study.

CONFLICT OF INTEREST STATEMENT

The authors have no conflicts of interest to declare.

DATA AVAILABILITY STATEMENT

Data available on request from the authors.

ORCID

Lan Wu https://orcid.org/0000-0002-1202-1824
Yongbo Yao https://orcid.org/0000-0001-5578-8198

REFERENCES

Agüero-Millan, B., Abajas-Bustillo, R., & Ortego-Maté, C. (2023). Efficacy of nonpharmacologic interventions in preoperative anxiety: A systematic review of systematic reviews. *Journal of Clinical Nursing*, *32*, 6229–6242. https://doi.org/10.1111/jocn.16755

Amiri, M. J., Sadeghi, T., & Negahban Bonabi, T. (2017). The effect of natural sounds on the anxiety of patients undergoing coronary artery bypass graft surgery. *Perioperative medicine*, *6*, 17. https://doi.org/10.1186/s13741-017-0074-3

Ashok, A., Shanmugam, S., & Soman, A. (2019). Effect of music therapy on hospital induced anxiety and health related quality of life in coronary artery bypass graft patients: A randomised controlled trial. *Journal of Clinical and Diagnostic Research*, *13*(11), YC05–YC09. https://doi.org/10.7860/JCDR/2019/42725.13274

Baker, T. B., McFall, R. M., & Shoham, V. (2008). Current status and future prospects of clinical psychology: Toward a scientifically principled approach to mental and behavioral health care. *Psychological Science in the Public Interest*, *9*(2), 67–103. https://doi.org/10.1111/j.1539-6053.2009.01036.x

Barbosa, J. L., Thiers, C. A., Silva, A. F. R. D., Vianna, M. M., Gedeon, P. O. D. P. R., Martins Neto, L., & Tura, B. R. (2019). Impact of complications of myocardial revascularization surgery on expenses during hospital stay. *International Journal of Cardiovascular Sciences*, *32*(1), 28–34. https://doi.org/10.5935/2359-4802.20170098

Barnason, S., Zimmerman, L., & Nieveen, J. (1995). The effects of music interventions on anxiety in the patient after coronary artery bypass grafting. *Heart & Lung*, *24*(2), 124–132. https://doi.org/10.1016/s0147-9563(05)80007-x

Bradshaw, H., Donaldson, G. W., Jacobson, R. C., Nakamura, Y., & Chapman, C. R. (2011). Individual differences in the effects of music engagement on responses to painful stimulation. *The journal of pain*, *12*(12), 1262–1273. https://doi.org/10.1016/j.jpain.2011.08.010

Can, A., & Abay, G. (2023). Effect of emotional status on early morbidity after coronary artery bypass graft surgery. *Journal of Cardio-Vascular-Thoracic Anaesthesia and Intensive Care Society*, *29*(2), 74–79. https://doi.org/10.14744/GKDAD.2023.83723

Chu, S. W. F., Yeam, C. T., Low, L. L., Tay, W. Y., Foo, W. Y. M., & Seng, J. J. B. (2021). The role of mind–body interventions in pre-dialysis chronic kidney disease and dialysis patients – A systematic review of literature. *Complementary Therapies in Medicine*, *57*, 102652. https://doi.org/10.1016/j.ctim

Ciğerci, Y., Kısacık, Ö. G., Özyürek, P., & Çevik, C. (2019). Nursing music intervention: A systematic mapping study. *Complementary Therapies in Clinical Practice*, *35*, 109–120. https://doi.org/10.1016/j.ctcp.2019.02.007

Comeaux, T., & Comeaux, T. (2013). The effect of complementary music therapy on the patient's postoperative state anxiety, pain control, and environmental noise satisfaction. *Medsurg Nursing*, *22*(5), 313–318.

Cumpston, M., Li, T., Page, M. J., Chandler, J., Welch, V. A., Higgins, J. P., & Thomas, J. (2019). Updated guidance for trusted systematic reviews: A new edition of the Cochrane handbook for systematic reviews of interventions. *Cochrane Database of Systematic Reviews*, *10*(10), ED000142. https://doi.org/10.1002/14651858.ED000142

Devare Phadke, S., Hadiya, H., & Yardi, S. (2014). Effect of music intervention on immediate post operative coronary artery bypass graft surgery (CABG) patients. *Indian Journal of Physiotherapy & Occupational Therapy*, *8*(4), 107.

Doenst, T., Haverich, A., Serruys, P., Bonow, R. O., Kappetein, P., Falk, V., Velazquez, E., Diegeler, A., & Sigusch, H. (2019). PCI and CABG for treating stable coronary artery disease: JACC review topic of the week. *Journal of the American College of Cardiology*, *73*(8), 964–976. https://doi.org/10.1016/j.jacc

Guétin, S., Soua, B., Voiriot, G., Picot, M. C., & Hérisson, C. (2009). The effect of music therapy on mood and anxiety-depression: An observational study in institutionalised patients with traumatic brain injury. *Annals of Physical and Rehabilitation Medicine*, *52*(1), 30–40. https://doi.org/10.1016/j.annrmp.2008.08.009

Guo, P., Li, P., Zhang, X., Liu, N., Wang, J., Yang, S., Yu, L., & Zhang, W. (2020). The effectiveness of aromatherapy on preoperative anxiety in adults: A systematic review and meta-analysis of randomized controlled trials. *International Journal of Nursing Studies*, *111*, 103747. https://doi.org/10.1016/j.ijnurstu.2020.103747

Guyatt, G. H., Oxman, A. D., Vist, G. E., Kunz, R., Falck-Ytter, Y., Alonso-Coello, P., Schünemann, H. J., & GRADE Working Group. (2008). GRADE: An emerging consensus on rating quality of evidence and strength of recommendations. *BMJ*, *336*(7650), 924–926. https://doi.org/10.1136/bmj.39489.470347.AD

Haefeli, M., & Elfering, A. (2006). Pain assessment. *European Spine Journal*, *15*, S17–S24. https://doi.org/10.1007/s00586-005-1044-x

Heidari, S., Babaii, A., Abbasinia, M., Shamali, M., Abbasi, M., & Rezaei, M. (2015). The effect of music on anxiety and cardiovascular indices in patients undergoing coronary artery bypass graft: A randomized controlled trial. *Nursing and Midwifery Studies*, *4*(4), e31157. https://doi.org/10.17795/nmsjournal31157

Hernández-Palazón, J., Fuentes-García, D., Falcón-Araña, L., Roca-Calvo, M. J., Burguillos-López, S., Doménech-Asensi, P., & Jara-Rubio, R. (2018). Assessment of preoperative anxiety in cardiac surgery patients lacking a history of anxiety: Contributing factors and postoperative morbidity. *Journal of Cardiothoracic and Vascular Anesthesia*, *32*(1), 236–244. https://doi.org/10.1053/j.jvca.2017.04.044

Kakar, E., Billar, R. J., Van Rosmalen, J., Klimek, M., Takkenberg, J. J. M., & Jeekel, J. (2021). Music intervention to relieve anxiety and pain in

adults undergoing cardiac surgery: A systematic review and meta-analysis. *Open Heart*, *8*(1), e001474. https://doi.org/10.1136/openhrt-2020-001474

Katona, L., Bitter, I., & Czobor, P. (2021). A meta-analysis of effectiveness of real-world studies of antipsychotics in schizophrenia: Are the results consistent with the findings of randomized controlled trials? *Translational Psychiatry*, *11*(1), 510. https://doi.org/10.1038/s41398-021-01636-9

Kühlmann, A. Y. R., De Rooij, A., Kroese, L. F., Van Dijk, M., Hunink, M. G. M., & Jeekel, J. (2018). Meta-analysis evaluating music interventions for anxiety and pain in surgery. *The British Journal of Surgery*, *105*(7), 773–783. https://doi.org/10.1002/bjs.10853

Lai, H. L., & Good, M. (2005). Music improves sleep quality in older adults. *Journal of Advanced Nursing*, *49*(3), 234–244. https://doi.org/10.1111/j.1365-2648.2004.03281.x

Manheimer, E. (2011). Selecting a control for in vitro fertilization and acupuncture randomized controlled trials (RCTs): How sham controls may unnecessarily complicate the RCT evidence base. *Fertility and Sterility*, *95*(8), 2456–2461. https://doi.org/10.1016/j.fertnstert.2011.04.040

Mental Health America. (2020) . https://www.mhanational.org/mental-health-treatments

Panteleeva, Y., Ceschi, G., Glowinski, D., Courvoisier, D. S., & Grandjean, D. (2018). Music for anxiety? Meta-analysis of anxiety reduction in non-clinical samples. *Psychology of Music*, *46*(4), 473–487. https://doi.org/10.1177/0305735617712424

Patiyal, N., Kalyani, V., Mishra, R., Kataria, N., Sharma, S., Parashar, A., & Kumari, P. (2021). Effect of music therapy on pain, anxiety, and use of opioids among patients underwent orthopedic surgery: A systematic review and meta-analysis. *Cureus*, *13*(9), e18377. https://doi.org/10.7759/cureus

Ruel, M., Williams, A., Ouzounian, M., Sun, L., Légaré, J. F., Poirier, P., Malas, T., Farkouh, M. E., Chedrawy, E., Hassan, A., Higgins, J., Connelly, K., McClure, R. S., Bewick, D., Whitlock, R., Graham, M., & Arora, R. C. (2022). Missing the goal with the 2021 ACC/AHA/SCAI guideline for coronary artery revascularization. *Canadian Journal of Cardiology*, *38*(6), 705–708. https://doi.org/10.1016/j.cjca.2022.03.013

Sendelbach, S. E., Halm, M. A., Doran, K. A., Miller, E. H., & Gaillard, P. (2006). Effects of music therapy on physiological and psychological outcomes for patients undergoing cardiac surgery. *The Journal of Cardiovascular Nursing*, *21*(3), 194–200. https://doi.org/10.1097/00005082-200605000-00007

Shum, A., Taylor, B. J., Thayala, J., & Chan, M. F. (2014). The effects of sedative music on sleep quality of older community-dwelling adults in Singapore. *Complementary Therapies in Medicine*, *22*(1), 49–56. https://doi.org/10.1016/j.ctim.2013.11.003

Spence, J., Belley-Côté, E., Devereaux, P. J., Whitlock, R., Um, K., McClure, G., & Syed, S. (2018). Benzodiazepine administration during adult cardiac surgery: A survey of current practice among Canadian Anesthesiologists Working in Academic Centres. *Canadian Journal of Anesthesia*, *65*(3), 263–271. https://doi.org/10.1007/s12630-017-1047-1

Sterne, J. A., Hernán, M. A., Reeves, B. C., Savović, J., Berkman, N. D., Viswanathan, M., Henry, D., Altman, D. G., Ansari, M. T., Boutron, I., Carpenter, J. R., Chan, A. W., Churchill, R., Deeks, J. J., Hróbjartsson, A., Kirkham, J., Jüni, P., Loke, Y. K., Pigott, T. D., … Higgins, J. P. T. (2016). ROBINS-I: A tool for assessing risk of bias in non-randomised studies of interventions. *BMJ*, *355*, i4919. https://doi.org/10.1136/bmj.i4919

Terracciano, L., Brozek, J., Compalati, E., & Schünemann, H. (2010). GRADE system: new paradigm. *Current opinion in allergy and clinical immunology*, *10*(4), 377–383. https://doi.org/10.1097/ACI.0b013e32833c148b

Tsao, C. W., Aday, A. W., Almarzooq, Z. I., Anderson, C. A. M., Arora, P., Avery, C. L., Baker-Smith, C. M., Beaton, A. Z., Boehme, A. K., Buxton, A. E., Commodore-Mensah, Y., Elkind, M. S. V., Evenson, K. R., Eze-Nliam, C., Fugar, S., Generoso, G., Heard, D. G., Hiremath, S., Ho, J. E., … Stroke Statistics Subcommittee. (2023). Heart disease and stroke statistics-2023 update: A report from the. *American Heart Association*, *147*(8), e622. https://doi.org/10.1161/CIR.0000000000001123

Zaini, N. H., Abdullah, K. L., Raja Mokhtar, R. A., Chinna, K., & Kamaruzzaman, S. B. (2022). Relationship between psychological distress and demographic characteristics among patients undergoing coronary artery bypass graft (CABG) surgery. *Healthcare (Basel)*, *10*(9), 1763. https://doi.org/10.3390/healthcare10091763

How to cite this article: Wu, L., & Yao, Y. (2023). Exploring the effect of music therapy as intervention to reduce anxiety pre- and post-operatively in CABG surgery: A quantitative systematic review. *Nursing Open*, *10*, 7544–7565. https://doi.org/10.1002/nop2.2024

APPENDIX 1

SEARCH STRATEGY FOR EACH DATABASE

1. Cochrane Library (search date: 13 July 2022)

Search ID#	Search terms	Results
#1	MeSH descriptor: [Coronary artery bypass] explode all trees	5395
#2	MeSH descriptor: [Coronary artery bypass grafting] this term only	5095
#3	MeSH descriptor: [Thoracic Surgery, Video-Assisted] explode all trees	227
#4	#1 or #2 or #3	5625
#5	(Cardiac surgical procedures or Heart surgical procedures): ti,ab,kw	5376
#6	(cardiac* near3): ti,ab,kw	61,787
#7	#5 and #6	3612
#8	#4 or #7	8920
#9	MeSH descriptor: [Music therapy] explode all trees	804
#10	MeSH descriptor: [Music] explode all trees	593
#11	(music*): ti,ab,kw	4717
#12	#9 or #10 or #11	4717
#13	MeSH descriptor: [Anxiety] explode all trees	7624
#14	MeSH descriptor: [anxiety disorders] this term only	3633
#15	(anxi*): ti,ab,kw	51,101
#16	#13 or #14 or #15	51,101
#17	Stress	58,062
#18	MeSH descriptor: [Stress, Psychological] this term only	5679
#19	#17 or #18	58,062
#20	MeSH descriptor: [depression] explode all trees	11,757
#21	MeSH descriptor: [depressive disorder] this term only	7721
#22	(depres*): ti,ab,kw	83,702
#21	#20 or #21 or #22	152,555
#22	#8 and #12 and #21	30

2. CINAHL complete (search date: 13 July 2022)

Search ID#	Search terms	Results
S1	"Coronary artery bypass graft"	10,243
S2	"Coronary artery bypass surgery"	9433
S3	"Coronary artery bypass graft surgery"	9385
S4	(MH "Coronary Artery Bypass")	12,923
S5	"CABG"	10,336
S6	S1 OR S2 OR S3 OR S4 OR S5	15,239
S7	(MH "Music") OR "music"	18,575
S8	(MH "Music Therapy") OR "music therapy"	6208
S9	"Music intervention"	4466
S10	"Natural sounds"	26
S11	"Taped music"	7
S12	"Music*"	19,477
S13	S7 OR S8 OR S9 OR S10 OR S11 OR S12	19,497
S14	(MH "Anxiety")	43,335
S15	(MH "Anxiety Disorders") OR "Anxiety disorder "	13,838

APPENDIX 1 (Continued)

Search ID#	Search terms	Results
S16	""anxi*""	101,718
S17	S14 OR S15 OR S16	101,718
S18	(MH "Stress") OR "stress"	204,932
S19	(MH "Stress Disorders, Post-Traumatic") OR "stress disorder"	25,637
S20	S18 OR S19	204,932
S21	(MH "Depression") OR "depression"	168,999
S22	"Depressive disorder"	66,730
S23	"Depressi*" OR (MH "Depression") OR (MH "Depression, Reactive")	176,775
S24	S21 OR S22 OR S23	176,775
S25	S17 OR S20 OR S24	398,828
S26	S6 AND S13 AND S25	11

3. MEDLINE (date: 13 July 2022)

Search ID#	Search terms	Results
S1	(MH "Coronary Artery Bypass") OR "Coronary artery bypass graft"	52,529
S2	"Coronary artery bypass surgery" OR (MH "Coronary Artery Bypass, Off-Pump") OR (MH "Coronary Artery Bypass, on pump")	39,090
S3	"Coronary artery bypass graft surgery"	35,965
S4	(MH "Coronary Artery Bypass")	64,524
S5	"CABG"	41,242
S6	S1 OR S2 OR S3 OR S4 OR S5	66,077
S7	(MH "Music") OR "music"	25,825
S8	(MH "Music Therapy") OR "music therapy"	4331
S9	"Music intervention"	3080
S10	"Natural sounds"	401
S11	(MH "Tape Recording") OR "Taped music"	4285
S12	"Music*"	29,177
S13	S7 OR S8 OR S9 OR S10 OR S11 OR S12	33,700
S14	(MH "Anxiety")	235,900
S15	(MH "Anxiety Disorders") OR "Anxiety disorder"	41,128
S16	""anxi*""	248,545
S17	S14 OR S15 OR S16	248,545
S18	(MH "Stress, Physiological") OR "Stress"	920,452
S19	(MH "Stress Disorders, Post-Traumatic") OR "stress disorder"	42,768
S20	S18 OR S19	920,452
S21	(MH "Depression") OR "depression"	415,461
S22	(MH "Depressive Disorder") OR "Depressive disorder"	173,051
S23	""Depressi*""	458,077
S24	S21 OR S22 OR S23	458,077
S25	S17 OR S20 OR S24	1,433,834
S26	S6 AND S13 AND S25	16

4. PULMED (search date:13 July 2022)

Search terms	Results
((((((((((anxiety) OR (anxiety disorder)) OR (anxiety disorders)) OR ("anxi*")) OR (stress)) OR (stress disorders)) OR (Stress, Physiological)) OR (Stress Disorders, Post-Traumatic)) OR (Depression)) OR (depressive disorders)) OR ("Depressi*")) AND (((((((Coronary Artery Bypass Graft) OR (Coronary artery bypass)) OR (Coronary artery bypass surgery)) OR (Coronary Artery Bypass, Off-Pump)) OR (Coronary Artery Bypass)) OR (Coronary artery bypass graft surgery)) OR (CABG))) AND ((((((music) OR (music therapy)) OR (music intervention)) OR (natural sound)) OR (taped music)) OR ("music*"))	15

APPENDIX 1 (Continued)

5. PsycArticles and PsycInfo (search date: 13 July 2022)

No.	Search terms	Results
S1	Coronary artery bypass graft surgery OR Coronary artery bypass surgery OR Coronary artery bypass graft OR CABG	702
S2	Music OR Music therapy OR Music intervention OR Natural sounds OR Taped music OR "music*"	49,885
S3	Anxiety OR Anxiety disorders OR Anxiety disorder OR "Anxi*"	295,353
S4	Stress OR stress disorder OR stress, psychological	296,778
S5	Depression OR Depressive disorder OR Depressive symptoms OR "Depressi*"	369,917
S6	S3 OR S4 OR S5	734,790
S7	S1 OR S2 OR S6	3

6. Web of Science (search date: 13 July 2022)

No.	Search terms	Results
#1	(TS = (Coronary artery bypass surgery OR Coronary artery bypass graft surgery OR Coronary artery bypass graft OR CABG)) AND LANGUAGE: (English)	48,480
#2	(TS = (Music OR Music therapy OR Music intervention OR Natural sounds OR Taped music OR "music*")) AND LANGUAGE: (English)	150,497
#3	TS = (Anxiety OR Anxiety disorders OR Anxiety disorder OR "Anxi*")) AND LANGUAGE: (English)	274,759
#4	TS = (Stress OR stress disorder OR stress, psychological)) AND LANGUAGE: (English)	1,900,187
#5	TS = (Depression OR Depressive disorder OR Depressive symptoms OR "Depressi*")) AND LANGUAGE: (English)	524,584
#6	#3 OR #4 OR #5	2,454,293
#7	#1 AND #2 AND #6	15

APPENDIX 2

DATA EXTRACTION FORM

Exploring the effect of music therapy as intervention to reduce anxiety pre- and post-operatively in CABG surgery patient's data extraction form

People who complete this form — **Lan Wu/Yongbo Yao**

Title	First author; publication year	Country	Sponsor	Setting	Length of study	Randomization methods	Inclusion criteria
Effect of music intervention on immediate post-operative coronary artery bypass graft surgery (CABG) patients	Devare Phadke et al. (2014)	India	Study was self-funded	Hospital	35 min of music was played via headphones for the intervention group for 7 days	Unclear	1. Immediate post-operative stable CABG patients; 2. Patients with no hearing problem/aids
The effect of natural sounds on the anxiety of patients undergoing coronary artery bypass graft surgery	Amiri et al. (2017)	Iran	This study was financially sponsored by Rafsanjan University of Medical Sciences	In an intensive care unit	The sound was broadcast by a 25–30-dB Sony MP3 player for 30 min	The toss of a coin	1. The age of over 18; 2. Undertaking heart surgery for the first time; 3. Having no pain, and having no evidence of organic fever during collection of information; 4. Taking no sedative; 5. Having no hearing problem; 6. Having no problem with the use of headphones, ability to participate in research and collaboration

Revision date			30 July 2022					
Exclusion criteria	*N* = total number of patients included	*N* = the number of completed study participants	Intervention number	Control number	Dropout rate	Assessment tools of anxiety	Results	Conclusion
1. Patients on ventilator for prolonged period of time 2. Patients with complications 3. Patients with psychiatric disorder; 4. Patients with cognitive problems	60	60	30	30	None	VAS-A scale/DAS scale	For DAS scale, the depression score was not significant whereas anxiety and stress are extremely significant	1 week of regular music resulted in extreme statistically significant reduction in Pain, RPE score, Respiratory rate. For DAS scale, anxiety and stress reduction were extremely significant. In clinical practice, music intervention can be incorporated as cost-effective method
1. The unwillingness to participate in research; 2. Interrupting music whilst performing the experiment; 3. The need to use sedative and narcotic drugs during voice playback or before completion of the second turn of the questionnaire	90	45	45	45	None	The Spielberger State–Trait Anxiety Inventory (STAI)	Whilst the result was significant and showed a decrease in the mean anxiety of the intervention group, the mean anxiety of the control group increased ($p < 0.001$)	Natural sounds can be used as a way to reduce the anxiety of patients before surgery. Nurses can use this non-pharmacological approach along with other types of care to reduce the anxiety of patients before CABG

APPENDIX 2 (Continued)

Exploring the effect of music therapy as intervention to reduce anxiety pre- and post-operatively in CABG surgery patient's data extraction form							
People who complete this form				Lan Wu/Yongbo Yao			
Title	First author; publication year	Country	Sponsor	Setting	Length of study	Randomization methods	Inclusion criteria
The effect of music on anxiety and cardiovascular indices in patients undergoing coronary artery bypass graft: A randomized controlled Trial stress and mindfulness in Korean nursing students	Heidari et al. (2015)	Iran	This article is the report of a master's thesis funded by Qom University of Medical Sciences with the number P.12050.34	Shahid Beheshti Hospital	The light music was played using a digital MP3 player and a headphone with duration of 30 min	Using a random number table	The inclusion criteria were being oriented to time, place, and person, undergoing CABG a day before the study, having no hearing impairments, having no known anxiety disorder, having no history of cardiac surgery, having no known endocrine disorder, no need to a tracheal tube, temporary pacemaker or intra-aortic balloon pump after the surgery
Effect of music therapy on hospital-induced anxiety and health-related quality of life in coronary artery bypass graft patients: A randomized controlled trial	Ashok et al. (2019)	India	Unclear	Cardiovascular Surgery Department	The sedative music without lyrics (60–80 beats per minute) was delivered for 20 min, once daily from the post-operative day 1 to post-operative day 7	Computer-generated randomization and sequentially numbered opaque sealed envelope method	1. Subjects 30–80 years of age 2. Both male and female patients 3. CABG both on pump and off pump 4. Patients with LVEF <60% 5. Patients with 2 grafts
The effects of music interventions on anxiety in the patient after coronary artery bypass grafting	Barnason et al. (1995)	USA	Unclear	The cardiovascular intensive care unit of community hospital	30-min intervention during the afternoons of post-operative days 2 and 3	Drawing lots	(1) oriented to person, place, and time; (2) able to speak and read English; (3) 19 years of age or older; (4) not currently using any Of the intervention techniques; (5) free of a major hearing deficit.

APPENDIX 3

RISK OF BIAS TABLE OF EACH INCLUDED STUDY

Bias	Author's judgement (low/high/unclear)	Support for judgement
Study: Devare Phadke et al. (2014)		
Random sequence generation (selection bias)	Unclear risk	Quote: "After taking the consent, the subjects were accordingly allotted into 2 groups"
Allocation concealment (selection bias)	Unclear risk	Quote: "comprising of 30 subjects each ($n=30$ each) Group1i.e. the intervention group underwent the music sessions and exercise program whilst the other group was the control group which underwent just exercise program"

Revision date			30 July 2022					
Exclusion criteria	*N* = total number of patients included	*N* = the number of completed study participants	Intervention number	Control number	Dropout rate	Assessment tools of anxiety	Results	Conclusion
The exclusion criteria included a patient's reluctance to remain in the study, decreased consciousness, cardiac arrest and using tranquillizers or hypnotic-sedative agents during the study	60	60	30	30	None	A visual analogue scale for anxiety measurement (VAS-A)	The study showed that compared to the immediately before intervention, the mean anxiety scores immediately after and 30 min after the intervention, were significantly lower in the experimental group ($p < 0.037$)	In conclusion, the findings of the present study showed that music therapy is an effective nursing intervention in decreasing anxiety amongst patients undergoing CABG However, the intervention was not effective on cardiovascular indices. Accordingly, intensive care nurses can apply music therapy as a non-pharmacological and safe intervention to improve the patients' anxiety
1. Patients who are having hearing impairments 2. Patients after post-operative day 7, enter into phase II cardiac rehabilitation 3. Patients with multiple procedures (e.g., CABG+ valve replacement) 4. Patients who do not have interest in music 5. Patient contraindicated to 6-min walk test	40	40	20	20	None	Hospital Anxiety and Depression Score (HADS)	HADS anxiety score showed significant difference within the intervention and control group, with *p*-value <0.05	In conclusion, the present authors demonstrate that music therapy during Stage I cardiac rehabilitation is found to be effective to reduce post-operative anxiety and improve quality of life in CABG patients The present authors also suggest that it is an effective and harmless means for the management of hospital-induced anxiety
(1) extubated within 12 hours after surgery; (2) removal of the intra-aortic balloon pump within 12 h after surgery	96	96	Music therapy ($n = 33$) musicvideo therapy ($n = 29$)	Scheduled rest group ($n = 34$)	None	Patient verbal ratings of both mood and anxiety with use of a numeric rating scale (NRS)	There was no significant difference, $F(2, 91) = 0.77$, $p > 0.05$, for mood NRS on post-operative day 2. However, there was a significant group effect on mood NRS on post-operative day 3, $F(2, 87) = 4.33$, $p = 0.016$	Although none of the three interventions was overwhelmingly superior, the overall response by all intervention groups demonstrated a generalized relaxation response. It is also important to note that there was reduced anxiety and improved mood within all three groups

APPENDIX 3 (Continued)

Bias	Author's judgement (low/high/unclear)	Support for judgement
Blinding of participants and personnel (performance bias)	Unclear risk	No specific evidence
Blinding of outcome assessment (detection bias)	Low risk	Quote: "For outcome measures data were collected on standardized forms and encoded for computerized analysis using GraphPadInstat Version3.10, 32 for Windows"
Incomplete outcome data (attrition bias)	High risk	The paper did not show the score on DAS scale of the two groups
Selective reporting (reporting bias)	Unclear risk	No specific evidence

APPENDIX 3 (Continued)

Bias	Author's judgement (low/high/unclear)	Support for judgement
Other bias	Low risk	The overall methodology and reports were standardized and complete
Study: Heidari et al. (2015)		
Random sequence generation (selection bias)	Low risk	Quote: "Sixty patients were consecutively sampled and randomly allocated into the experimental and control groups"
Allocation concealment (selection bias)	Low risk	Quote: "To this end the researchers prepared a list of numbers from 1 to 60 and then using a random number table was divided into two equal parts"
Blinding of participants and personnel (performance bias)	High risk	Quote: "This non-blind, randomized, controlled trial was conducted on patients undergoing CABG in the CVSICU of Shahid Beheshti Hospital in Qom city, Iran"
Blinding of outcome assessment (detection bias)	Unclear risk	No specific evidence
Incomplete outcome data (attrition bias)	Low risk	All patients included in final assessment
Selective reporting (reporting bias)	Low risk	All relevant outcomes are reported in the results section
Other bias	Low risk	The overall methodology and reports were standardized and complete
Study: Amiri et al. (2017)		
Random sequence generation (selection bias)	Low risk	Quote: "As many as 90 candidates for CABG were selected based on inclusion and exclusion criteria by purposeful sampling. They were assigned to two intervention and control groups using the method of categorization through the minimization method. In this method, the patients were initially categorized based on key variables such as anxiety score and gender"
Allocation concealment (selection bias)	Low risk	Quote: "Afterward, the first participant was chosen from amongst those patients who met the inclusion criteria and then placed in the intervention or control group by the toss of a coin, whilst other participants were allocated to the study group with a lower number of variables"
Blinding of participants and personnel (performance bias)	Unclear risk	No specific evidence
Blinding of outcome assessment (detection bias)	Unclear risk	No specific evidence
Incomplete outcome data (attrition bias)	Low risk	All patients included in final assessment
Selective reporting (reporting bias)	Low risk	All relevant outcomes are reported in the results section
Other bias	Low risk	The overall methodology and reports were standardized and complete
Study: Ashok et al. (2019)		
Random sequence generation (selection bias)	Low risk	Quote: "A sample size of 40 was considered and 40 sealed envelopes were made. Patients who were willing to participate and who met the inclusion criteria were randomized"
Allocation concealment (selection bias)	Low risk	Quote: "Patients who were willing to participate and who met the inclusion criteria were randomized allocated into two groups based on computer-generated randomization and sequentially numbered opaque sealed envelope method"
Blinding of participants and personnel (performance bias)	Unclear	No specific evidence
Blinding of outcome assessment (detection bias)	Low risk	Quote: "All the outcome measures were taken by a trained therapist on post-operative day 7. Hospital anxiety and depression scores were assessed on the post-operative day 2 and day 7 by an independent physiotherapist who was blinded to group and intervention allocation"
Incomplete outcome data (attrition bias)	Low risk	All patients included in final assessment
Selective reporting (reporting bias)	Low risk	All relevant outcomes are reported in the results section
Other bias	Low risk	The overall methodology and reports were standardized and complete

APPENDIX 4

JBI CRITICAL APPRAISAL CHECKLISTS FOR QUASI-EXPERIMENTAL STUDIES

JBI Critical Appraisal Checklist for Quasi-Experimental Studies (non-randomized experimental studies)

Reviewer_____Date_____

Author _____Year_____Record Number_____

	Yes	No	Unclear	Not applicable
1. Is it clear in the study what is the 'cause' and what is the 'effect' (i.e. there is no confusion about which variable comes first)?	☐	☐	☐	☐
2. Were the participants included in any comparisons similar?	☐	☐	☐	☐
3. Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?	☐	☐	☐	☐
4. Was there a control group?	☐	☐	☐	☐
5. Were there multiple measurements of the outcome both pre and post the intervention/exposure?	☐	☐	☐	☐
6. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed?	☐	☐	☐	☐
7. Were the outcomes of participants included in any comparisons measured in the same way?	☐	☐	☐	☐
8. Were outcomes measured in a reliable way?	☐	☐	☐	☐
9. Was appropriate statistical analysis used?	☐	☐	☐	☐

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Comments (Including reason for exclusion)

_____

_____

_____