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Music for stress and anxiety reduction in coronary heart disease patients (Review)

Bradt J, Dileo C, Potvin N

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[Intervention Review]

Music for stress and anxiety reduction in coronary heart disease patients

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ABSTRACT

Background

Individuals with coronary heart disease (CHD) often suffer from severe distress due to diagnosis, hospitalization, surgical procedures, uncertainty of outcome, fear of dying, doubts about progress in recovery, helplessness and loss of control. Such adverse effects put the cardiac patient at greater risk for complications, including sudden cardiac death. It is therefore of crucial importance that the care of people with CHD focuses on psychological as well as physiological needs.

Music interventions have been used to reduce anxiety and distress and improve physiological functioning in medical patients; however its efficacy for people with CHD needs to be evaluated.

Objectives

To update the previously published review that examined the effects of music interventions with standard care versus standard care alone on psychological and physiological responses in persons with CHD.

Search methods

We searched the Cochrane Central Register of Controlled Trials (CENTRAL) on *The Cochrane Library* (2012, Issue 10), MEDLINE (OvidSP, 1950 to October week 4 2012), EMBASE (OvidSP, 1974 to October week 5 2012), CINAHL (EBSCOhost, 1982 to 9 November 2012), PsycINFO (OvidSP, 1806 to October week 5 2012), LILACS (Virtual Health Library, 1982 to 15 November 2012), Social Science Citation Index (ISI, 1974 to 9 November 2012), a number of other databases, and clinical trial registers. We also conducted handsearching of journals and reference lists. We applied no language restrictions.

Selection criteria

We included all randomized controlled trials and quasi-randomized trials that compared music interventions and standard care with standard care alone for persons with confirmed CHD.

Data collection and analysis

Two review authors independently extracted data and assessed methodological quality, seeking additional information from the trial researchers when necessary. We present results using weighted mean differences for outcomes measured by the same scale, and standardized mean differences for outcomes measured by different scales. We used post-intervention scores. In cases of significant baseline difference, we used change scores (changes from baseline).

Main results

We identified four new trials for this update. In total, the evidence for this review rests on 26 trials (1369 participants). Listening to music was the main intervention used, and 23 of the studies did not include a trained music therapist.

Results indicate that music interventions have a small beneficial effect on psychological distress in people with CHD and this effect is consistent across studies (MD = -1.26, 95% CI -2.30 to -0.22, P = 0.02, I^2 = 0%). Listening to music has a moderate effect on anxiety in people with CHD; however results were inconsistent across studies (SMD = -0.70, 95% CI -1.17 to -0.22, P = 0.004, I^2 = 77%). Studies that used music interventions in people with myocardial infarction found more consistent anxiety-reducing effects of music, with an average anxiety reduction of 5.87 units on a 20 to 80 point score range (95% CI -7.99 to -3.75, P < 0.00001, I^2 = 53%). Furthermore, studies that used patient-selected music resulted in greater anxiety-reducing effects that were consistent across studies (SMD = -0.89, 95% CI -1.42 to -0.36, P = 0.001, I^2 = 48%). Findings indicate that listening to music reduces heart rate (MD = -3.40, 95% CI -6.12 to -0.69, P = 0.01), respiratory rate (MD = -2.50, 95% CI -3.61 to -1.39, P < 0.00001) and systolic blood pressure (MD = -5.52 mmHg, 95% CI - 7.43 to -3.60, P < 0.00001). Studies that included two or more music sessions led to a small and consistent pain-reducing effect (SMD = -0.27, 95% CI -0.55 to -0.00, P = 0.05). The results also suggest that listening to music may improve patients' quality of sleep following a cardiac procedure or surgery (SMD = 0.91, 95% CI 0.03 to 1.79, P = 0.04).

We found no strong evidence for heart rate variability and depression. Only one study considered hormone levels and quality of life as an outcome variable. A small number of studies pointed to a possible beneficial effect of music on opioid intake after cardiac procedures or surgery, but more research is needed to strengthen this evidence.

Authors' conclusions

This systematic review indicates that listening to music may have a beneficial effect on anxiety in persons with CHD, especially those with a myocardial infarction. Anxiety-reducing effects appear to be greatest when people are given a choice of which music to listen to.

Furthermore, listening to music may have a beneficial effect on systolic blood pressure, heart rate, respiratory rate, quality of sleep and pain in persons with CHD. However, the clinical significance of these findings is unclear. Since many of the studies are at high risk of bias, these findings need to be interpreted with caution. More research is needed into the effects of music interventions offered by a trained music therapist.

PLAIN LANGUAGE SUMMARY

Music to reduce stress and anxiety for people with coronary heart disease

Individuals with coronary heart disease often suffer from severe distress, putting them at greater risk for complications, including sudden cardiac death. It is therefore important that the care of people with coronary heart disease focuses on psychological as well as physiological needs. Music interventions have been used for many years to reduce anxiety and distress and improve physiological responses such as heart rate and respiratory rate in medical patients.

This review is an update of a previous Cochrane review from 2009 which suggested that music interventions may have a beneficial effect on anxiety and physiological responses in people with coronary heart disease but the quality of the evidence was not strong and the clinical significance unclear.

For this review, we searched for additional trials on the effect of music interventions on stress and anxiety in people with coronary heart disease. We searched for studies published up until November 2012 as well as ongoing studies until November 2012. We considered all studies in which any form of participation in music (e.g. listening to music, singing, playing music) was compared with any form of standard treatment and included persons with confirmed coronary heart disease. We identified four new trials for this update.

This review includes 26 trials with a total of 1369 participants. The trials were small in size. The findings suggest that listening to music may have a beneficial effect on systolic blood pressure and heart rate in people with coronary heart disease. Listening to music also appears to be effective in reducing anxiety in people with myocardial infarction, especially when they are given a choice of which music to listen to. Listening to music may also reduce pain and respiratory rate. However the size of the effects on pain and respiratory rate is small. Therefore, its clinical importance is unclear. Finally, listening to music appears to improve patients' quality of sleep following a cardiac procedure or surgery. We found no evidence of effect for depression or heart rate variability, and inconsistent results for mood. No adverse effects of music interventions were reported. The majority of the studies examined the effects of listening to pre-recorded music. More research is needed on the effects of music interventions offered by a trained music therapist. Overall, the quality of the evidence is not strong thus the results should be interpreted with caution.

We did not identify any conflicts of interests in the included studies.

SUMMARY OF FINDINGS

Summary of findings 1. Music versus standard care for coronary heart disease

Music versus standard care for coronary heart disease

Patient or population: people with coronary heart disease
Settings:
Intervention: music versus standard care

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of Participants (studies)	Quality of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	Control	Music versus standard care				
Psychological Distress POMS		The mean psychological distress in the intervention groups was **1.26 lower** (2.30 to 0.22 lower)		228 (5 studies)	⊕⊕⊖⊖ **low** [1]	
Anxiety (all measures) NRS, VAS, HADS, STAI		The mean anxiety (all measures) in the intervention groups was **0.70 standard deviations lower** (1.17 to 0.22 lower)		353 (10 studies)	⊕⊖⊖⊖ **very low** [1,2,3]	
State anxiety (MI patients) STAI		The mean state anxiety (MI patients) in the intervention groups was **5.87 lower** (7.99 to 3.75 lower)		243 (6 studies)	⊕⊕⊖⊖ **low** [1]	
Heart rate bpm		The mean heart rate in the intervention groups was **3.62 lower** (6.28 to 0.95 lower)		828 (13 studies)	⊕⊖⊖⊖ **very low** [1,2,3]	
Respiratory rate breaths per minute		The mean respiratory rate in the intervention groups was **2.50 lower** (3.61 to 1.39 lower)		442 (7 studies)	⊕⊖⊖⊖ **very low** [1,4]	
Systolic blood pressure		The mean systolic blood pressure in the intervention groups was **5.52 lower** (7.43 to 3.60 lower)		775 (11 studies)	⊕⊕⊖⊖ **low** [1]	

Pain VAS, NRS	The mean pain in the intervention groups was **0.43 standard deviations lower** (0.80 to 0.05 lower)	562 (8 studies)	⊕⊖⊖⊖ **very low** [1,3,5]	

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).
CI: Confidence interval;

GRADE Working Group grades of evidence
High quality: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: We are very uncertain about the estimate.

[1]The majority of the trials were assessed as being at high risk of bias
[2]Results were inconsistent across studies as evidenced by I^2 = 77%.
[3]Wide confidence interval
[4]Results were inconsistent across studies as evidenced by I^2 = 79%.
[5]Results were inconsistent across studies as evidenced by I^2 = 81%.

BACKGROUND

Description of the condition

Coronary heart disease (CHD) is the leading cause of death worldwide. According to the World Health Organization (WHO), 17.3 million people worldwide die of cardiovascular diseases (CVD) each year. By 2030, the WHO predicts 25 million CVD deaths globally (WHO 2012). Heart disease has no geographical, gender, or socioeconomic boundaries (Chockalingam 1999). People with CHD often suffer from severe distress due to diagnosis, hospitalization, surgical procedures, uncertainty of outcome, fear of dying, doubts about progress in recovery, helplessness and loss of control (Barnason 1995; Bolwerk 1990; Guzzetta 1989; Malan 1992). This stress is likely to stimulate the release of epinephrine and norepinephrine, resulting in increased heart rate, respiratory rate, arterial blood pressure, myocardial oxygen demand and anxiety levels. Such adverse effects put the cardiac patient at greater risk for complications, including sudden cardiac death (White 1999). It is therefore of crucial importance that the care of people with CHD focuses on psychological as well as physiological needs.

Description of the intervention

There is a great deal of literature, both quantitative and qualitative, regarding the use of music to reduce stress and anxiety in non-medical patients, and this provides the context and rationale for its hypothesized effects in people with CHD. Moreover, with non-medical patients, music is used both alone and as an adjunct to traditional stress-reduction approaches in therapy and for self-help procedures. Effects of music for stress reduction have been documented in physiological (e.g. heart rate, blood pressure, hormonal levels), neurological (e.g. electroencephalographic (EEG) readings) and psychological domains (e.g. self report, the Spielberger State-Trait Anxiety Inventory (STAI)) (Dileo 2007). In addition, the effects of both music and music therapy interventions have been documented in a range of other medical patients, for example, pre-surgical, oncology, pediatric, and pre-procedural patients (Dileo 1999; Dileo 2005). Moreover, anxiety and stress reduction is one of the primary outcomes investigated in music medicine and music therapy research with medical patients. Effects similar to those reported in the current review have been observed, and meta-analyses of these effects have been conducted (Bradt 2010b; Bradt 2011; Dileo 2005; Standley 1986; Standley 2000).

Dileo 2007 makes a clear distinction between music interventions administered by medical or healthcare professionals (music medicine) and those implemented by trained music therapists (music therapy). Interventions are categorized as 'music medicine' when passive listening to pre-recorded music is offered by medical personnel. In contrast, music therapy requires the implementation of a music intervention by a trained music therapist, the presence of a therapeutic process, and the use of 'live' music experiences. These music experiences include: (1) listening to live, improvised or pre-recorded music; (2) performing music on an instrument; (3) improvising music spontaneously using voice or instruments or both; (4) composing music; and (5) music combined with other modalities (e.g. movement, imagery and art).

Several investigators have examined the effects of music on a variety of outcomes in people with CHD, including heart rate (Barnason 1995; Davis-Rollans 1987), respiratory rate, blood pressure (Barnason 1995), myocardial oxygen demand (White 1999), hormone levels (Vollert 2002), anxiety (Barnason 1995; Bolwerk 1990), and pain (Zimmerman 1996).

How the intervention might work

As discussed in a recently published Cochrane systematic review on the effects of music interventions on pre-operative anxiety (Bradt 2013), a common theory regarding the anxiety-reducing effects of music is that music can help people focus their attention away from stressful events to something pleasant and soothing (Mitchell 2003; Nilsson 2008). Even though this is an important mechanism in anxiety reduction, it is important to emphasize that music does more than refocusing people's attention. It provides an aesthetic experience that can offer comfort and peace while awaiting a cardiac procedure or surgery or the outcome of a myocardial infarction. In music interventions provided by a trained music therapist, the music therapist furthermore adapts the live music interactions to the in-the-moment needs of the participants. This often provides a deeply humanizing and validating experience for the patient. The act of making music together can provide a strong sense of support. Moreover, the active and creative engagement in music making (e.g. singing songs, improvising music) stands in stark contrast with passively submitting oneself to cardiac procedures or surgery. This may result in an increased sense of control and empowerment.

It has been postulated that music induces relaxation through its impact on automated and central nervous responses (Gillen 2008). More specifically, it is believed that the anxiolytic effect of music is achieved through its suppressive action on the sympathetic nervous system, leading to decreased adrenergic activity and decreased neuromuscular arousal (Chlan 1998; Gillen 2008). Music furthermore triggers the limbic system in the brain to release endorphins; these neurotransmitters play an important role in enhancing a sense of well-being (Arslan 2008; Lee 2005). However, Gillen 2008 has suggested that more research is needed to examine the physiological mechanisms that explain the anxiolytic effects of music.

Why it is important to do this review

Although there are no hypothesized responses to music unique to this population, the effects of music on heart rate, respiratory rate, blood pressure, and anxiety have been widely studied both in people with or without medical conditions. These outcomes have heightened significance when it comes to cardiac patients, and a systematic review of the existing data is therefore much needed.

The previous version of this review found that music listening may have a beneficial effect for people with CHD and may reduce blood pressure and heart rate. Listening to music also appeared to be effective in reducing anxiety in people with myocardial infarction (MI) upon hospitalization. It has therefore been recommended that music listening be offered as a stress management intervention to people with MI upon hospitalization.

OBJECTIVES

To update the previously published review that examined the effects of music interventions with standard care versus standard care alone on psychological and physiological responses in persons with CHD.

METHODS

Criteria for considering studies for this review

Types of studies

All randomized clinical trials and quasi-randomized trials (trials that allocate participants to a treatment by using a method that is not random such as alternate group assignment or date of birth) in any language, published and unpublished, were eligible for inclusion.

Types of participants

The review included studies of men, women, and children, inpatient or outpatient, with confirmed coronary heart disease (CHD). The original review included several studies with participants who did not have confirmed CHD (e.g., cardiac diagnostic procedures). For this update we limited the inclusion criteria to studies where all participants had confirmed CHD. Therefore, studies involving cardiac procedures for diagnostic purposes as well as studies with participants with suspected myocardial infarction were not included in this review. We imposed no restrictions as to age, gender, or ethnicity.

Types of interventions

The review included all studies in which any form of participation in music (e.g. listening to music, singing, playing music) was compared with any form of standard treatment. Studies using music therapy interventions, as defined by the authors, as well as music medicine interventions, as defined by the authors, were considered for inclusion. We did not use length or frequency of music sessions as inclusion criteria for this review.

Types of outcome measures

Primary outcomes

1. Psychological distress including anxiety, depression, and mood;
2. Quality of life.

Secondary outcomes

1. Heart rate;
2. Respiratory rate;
3. Systolic blood pressure;
4. Diastolic blood pressure;
5. Mean arterial pressure;
6. Myocardial oxygen demand;
7. Oxygen saturation;
8. Peripheral skin temperature;
9. Hormone levels;
10. Pain;
11. Opioid intake;
12. Quality of sleep;
13. Length of hospitalization;
14. Duration of cardiac procedure.

Where more than one measure per outcome was used for psychological distress, quality of life, and pain, we gave preference to measures taken using validated instruments. Primary outcomes and pain were rated by the participant. Physiological responses were recorded by an observer who may or may not have been blinded.

Search methods for identification of studies

Electronic searches

We updated the previously-run searches from 2008 (Appendix 1) and searched the following databases between 5 November and 15 November 2012:

- Cochrane Central Register of Controlled Trials (CENTRAL) on *The Cochrane Library* (2012, Issue 10);
- MEDLINE (OvidSP, 1950 to October week 4 2012);
- EMBASE (OvidSP, 1974 to October week 5 2012);
- CINAHL (EBSCOhost, 1982 to 9 November 2012);
- PsycINFO (OvidSP, 1806 to October week 5 2012);
- LILACS (Virtual Health Library, 1982 to 15 November 2012);
- Social Science Citation Index (ISI, 1974 to 9 November 2012);
- the specialist music therapy research database at www.musictherapyworld.net (on June 16 2007; database has not been maintained after this date);
- CAIRSS for Music (Webvoyage, to February 2005; database has not been maintained after this date);
- Proquest Digital Dissertations (1861 to 9 November 2012).

We also searched the following clinical trials registers:

- ClinicalTrials.gov (www.clinicaltrials.gov) (11 November 2012);
- Current Controlled Trials (www.controlled-trials.com) (11 November 2012);
- National Research Register (http://www.nihr.ac.uk/Pages/NRRArchiveSearch.aspx) (2000 to September 2007).

The search strategies are listed in Appendix 2. For this update, the search results for the databases were limited from 2008 until November 2012.

We also searched the Internet (www.google.com) to find scholars and research centers that have focused on the use of music for cardiac care.

Searching other resources

In addition, we handsearched relevant journals, see Appendix 3 for full details. For this update, the journals were handsearched from 2008 until November 2012.

We checked the bibliographies of relevant studies or reviews and contacted relevant experts for the identification of unpublished trials. There were no language restrictions for either searching or trial inclusion.

Data collection and analysis

Selection of studies

One review author (JB) scanned the titles and abstracts of each record retrieved from the searches for the original review, while another review author (NB) did this for the update. If information in the abstract clearly indicated that the trial did not meet the inclusion criteria, we rejected the trial. When a title or abstract could not be rejected with certainty, we obtained the full-text article, and two review authors (JB and CD for original review;

JB and NP for update) independently inspected it. The review authors used an inclusion criteria form to assess the trial's eligibility for inclusion. If we excluded a trial, we recorded both the article citation and the reason for exclusion.

Data extraction and management

Two review authors (JB and CD in original review; JB and NP for the update) independently extracted data from the selected trials using a standardized coding form. We discussed and collaboratively resolved any differences in data extraction. We extracted the following data (where applicable):

General information

Author;
Year of publication;
Title;
Journal (title, volume, pages);
If unpublished, source;
Duplicate publications;
Country;
Language of publication.

Trial information

Study design (parallel group, cross-over);
Randomization;
Randomization method;
Allocation concealment;
Allocation concealment method;
Level of blinding.

Intervention information

Type of intervention (e.g. listening, singing, playing music).
Music selection (music style, detailed information on music selection, live music, recorded music);
Music preference (patient-preferred, researcher-selected);
Administrator of music intervention (music therapist, medical personnel);
Length of intervention;
Intensity of intervention;
Comparison intervention.

Participants information

Total sample size;
N of experimental group;
N of control group;
Gender;
Age;
Ethnicity;
Diagnosis;
Setting;
Inclusion criteria.

Outcomes

Heart rate;
Respiratory rate;
Systolic blood pressure;
Diastolic blood pressure;
Myocardial oxygen demand;
Hormone levels;
Anxiety;
Depression;
Mood (e.g. Profile of Mood States (POMS));
Pain;
Other.

Assessment of risk of bias in included studies

At least two review authors (JB and CD in original review; JB, CD, and NP for update) assessed all included trials, blinded to each other's assessment for trial quality. In case of disagreements, JB was the arbiter. We used the following criteria for quality assessment, following Cochrane Collaboration guidance in the *Cochrane Handbook for Systematic Reviews of Interventions* (*Cochrane Handbook*: Higgins 2011):

Random sequence generation

- Low risk;
- Unclear risk;
- High risk.

We rated random sequence generation as being at low risk if every participant had an equal chance to be selected for either condition, and if the investigator was unable to predict to which treatment group the participant would be assigned. Use of date of birth, date of admission or alternation was rated as being at high risk of bias.

Allocation concealment

- Low risk - methods to conceal allocation include:
  - central randomization;
  - serially numbered, opaque, sealed envelopes;
  - other descriptions with convincing concealment.
- Unclear risk - authors did not adequately report on method of concealment;
- High risk (e.g. alternation methods were used).

Blinding of participants and personnel

- Low risk;
- Unclear risk;
- High risk.

Since participants cannot be blinded in a music intervention trial, we did not downgrade studies for not blinding the participants. As for personnel, in music therapy studies music therapists cannot be blinded because they are actively making music with the participants. In contrast, in music medicine studies, blinding of personnel is possible by providing control group participants with headphones but no music (e.g. a blank CD). Downgrading for not blinding personnel was therefore only applied in studies that used listening to pre-recorded music.

Blinding of outcome assessors

- Low risk;
- Unclear risk;
- High risk.

Incomplete outcome data

We recorded the proportion of participants whose outcomes were analyzed. We coded loss to follow-up for each outcome as:

- Low risk: if fewer than 20% of participants were lost to follow-up and reasons for loss to follow-up were similar in both treatment arms;
- Unclear risk: if loss to follow-up was not reported;
- High risk: if more than 20% of participants were lost to follow-up or reasons for loss to follow-up differed between treatment arms.

Selective reporting

- Low risk: reports of the study were free of suggestion of selective outcome reporting;
- Unclear risk;
- High risk: reports of the study suggest selective outcome reporting.

Other sources of bias
• Low risk;
• Unclear risk;
• High risk.
Information on potential financial conflicts of interest was considered as a possible source of additional bias.

The above criteria were used to give each article an overall quality rating based on the *Cochrane Handbook*, section 8.5.3 (Higgins 2011):

- Low risk of bias: all seven criteria met;
- Moderate risk of bias: one or more of the criteria only partly met;
- High risk of bias: one or more criteria not met.

Dealing with missing data

We did not impute missing outcome data. We analyzed data on an end point basis, including only participants for whom we had final data point measurement (available case analysis). We did not assume that participants who dropped out after randomization had a negative outcome (i.e. intention-to-treat analysis)..

Assessment of heterogeneity

We investigated statistical heterogeneity using the I^2 test, taking a value greater than 50% to indicate significant heterogeneity (Higgins 2003; Higgins 2011).

Assessment of reporting biases

We tested for publication bias visually in the form of funnel plots (Higgins 2011).

Data synthesis

We entered all trials included in the systematic review into Review Manager 5 (Revman 2012). The main outcomes in this review were physiological responses and psychological responses (anxiety, pain, mood) presented as continuous variables. We used post-intervention scores for the meta-analysis. In the case of multiple music sessions, we used post-intervention data from the last session. In the case of statistically significant baseline differences, we computed change scores (i.e. changes from baseline) according to the guidelines provided by the *Cochrane Handbook* (Higgins 2011). We calculated standardized mean differences (SMDs) for outcome measures using results from different scales, and weighted mean differences for results using the same scales. Studies for which change scores were used were not included in standardized mean difference analyses. For cross-over trials, we used only data from the first phase of the trials. We calculated pooled estimates using the fixed-effect model unless there was significant heterogeneity (I^2 > 50%), in which case we used the random-effects model to obtain a more conservative estimate. We calculated the 95% confidence interval for each effect size estimate.

This review does not include any categorical variables.

We conducted the following treatment comparison: music versus standard care.

Subgroup analysis and investigation of heterogeneity

We had planned the following subgroup analyses a priori, but not all could be carried out because of an insufficient number of studies:
1. Music medicine versus music therapy (as defined by the authors): could not be conducted because only three music therapy studies were included in this review.
2. Different levels of engagement in music experiences (listening, singing, playing instruments): could not be conducted because the majority of the studies used music listening as the intervention.
3. Patient-selected music versus researcher-selected music: was conducted for those outcome variables for which the pooled estimate was heterogeneous.

Patient-type:
The included studies presented three distinct population groups: (a) myocardial infarction patients, (b) surgical or procedural patients, and (c) rehabilitation patients. Although we did not determine this subgroup analysis a priori, the review authors decided it was important to conduct a subgroup analysis comparing the effect on these three groups of studies for those outcome variables for which we found significant heterogeneity.

Sensitivity analysis

We examined the impact of sequence generation by comparing the results of including and excluding trials that used inadequate or unclear randomization methods.

RESULTS

Description of studies

Results of the search

The database searches and handsearching of conference proceedings and journals of the original review (2009) resulted in 702 citations. One review author (JB) examined the titles and abstracts, and retrieved 77 references for possible inclusion. Two review authors then independently screened them, resulting in 29 references to 22 studies that met all the inclusion criteria. Twenty-one references to 20 studies appeared to meet the inclusion criteria but were excluded upon further examination (see Characteristics of excluded studies). A further twenty-seven references turned out not to be relevant to this review as they were program descriptions, review articles, and case studies, or used a combination of treatments (e.g. music and aroma therapy).

The 2012 update of the search resulted in 216 extra citations. One review author (NP) examined the titles and abstracts and retrieved full-text articles where necessary. This resulted in the addition of five new references to four studies (Cutshall 2011; Jafari 2012; Leist

2011; Ryu 2011). Four additional cardiac catheterization studies were considered for inclusion but not all study participants had confirmed coronary heart disease (CHD) (Chang 2011; Ghetti 2011; Goertz 2011; Taylor-Piliae 2002). These studies therefore needed to be excluded. In addition, we decided to include quasi-randomized controlled trials in this update, with the result that two studies (Barnes 1987; Blankfield 1995) that had been excluded from the original review are included in this update. It is important to note that four studies that were included in the original review are excluded from this update (Argstatter 2006; Guzzetta 1989; Robichaud 1999; Zimmerman 1988), due to the fact that not all research participants in these studies had confirmed CHD.

Where necessary we contacted chief investigators to obtain additional information on study details and data.

Included studies

We include 26 studies with a total of 1369 participants. These studies examined the effects of music on psychological, physiological, and physical outcomes in people undergoing cardiac surgery and procedures (14 studies, 955 participants) (Barnason 1995; Blankfield 1995; Broscious 1999; Cadigan 2001; Chan 2007; Cutshall 2011; Hermele 2005; Jafari 2012; Nilsson 2009a; Ryu 2011; Schou 2008; Sendelbach 2006; Stein 2010; Voss 2004), myocardial infarction (MI) (seven studies, 267 participants) (Bolwerk 1990; Cohen 1999; Davis-Rollans 1987; Elliott 1994; White 1992; White 1999; Winters 2005), and cardiac rehabilitation patients (five studies, 147 participants) (Barnes 1987; Emery 2003; Leist 2011; Mandel 2007a; Murrock 2002). The large majority of the participants included in these studies were men (74%). The average age of the participants was 62.86 years. For 14 trials, the ethnicity of the participants was not reported (Barnes 1987; Bolwerk 1990; Cadigan 2001; Chan 2007; Cutshall 2011; Davis-Rollans 1987; Elliott 1994; Jafari 2012; Mandel 2007a; Murrock 2002; Nilsson 2009a; Ryu 2011; Schou 2008; Sendelbach 2006). For those studies that did report on ethnicity, the majority of the participants were white (average of 89.9%). Several studies combined non-white ethnic groups together under 'other', making it hard to estimate the percentage of other specific ethnic groups represented in these trials (Blankfield 1995; Broscious 1999; Cohen 1999; Voss 2004). Trial sample size ranged from 9 to 179 participants with an average sample size of 64 (Median = 58).

Not all studies measured all outcomes identified for this review. For studies with more than one intervention group, we used only data of the participants in the music group and the standard care group.

Twenty-three studies (Barnason 1995; Blankfield 1995; Bolwerk 1990; Broscious 1999; Cadigan 2001; Chan 2007; Cohen 1999; Cutshall 2011; Elliott 1994; Hermele 2005; Jafari 2012; Leist 2011; Mandel 2007a; Murrock 2002; Nilsson 2009a; Ryu 2011; Schou 2008; Sendelbach 2006; Stein 2010; Voss 2004; White 1992; White 1999; Winters 2005) used parallel-group designs, whereas three studies (Barnes 1987; Davis-Rollans 1987; Emery 2003) used cross-over designs. For these cross-over trials, we used only data from the first phase (i.e. before the cross-over) in the meta-analysis.

Details of the studies included in the review are shown in the table Characteristics of included studies.

Twenty-three studies were categorized as music medicine studies (as defined in the Background section above) (Barnason 1995; Barnes 1987; Blankfield 1995; Bolwerk 1990; Broscious 1999; Cadigan 2001; Chan 2007; Cohen 1999; Cutshall 2011; Davis-Rollans 1987; Elliott 1994; Emery 2003; Hermele 2005; Jafari 2012; Murrock 2002; Nilsson 2009a; Ryu 2011; Sendelbach 2006; Stein 2010; Voss 2004; White 1992; White 1999; Winters 2005). Three studies were categorized as music therapy (Leist 2011; Mandel 2007a; Schou 2008). All but two studies (Leist 2011; Mandel 2007a) used music listening as the main intervention. Twelve trials included one music session offered before or during a cardiac procedure or both (e.g. cardiac catheterization) or within 48 hours of hospitalization for MI (Broscious 1999; Cadigan 2001; Chan 2007; Cohen 1999; Davis-Rollans 1987; Emery 2003; Jafari 2012; Nilsson 2009a; Ryu 2011; Voss 2004; White 1992; White 1999). Two trials included two sessions offered over two postoperative days (Barnason 1995; Stein 2010). Twelve trials offered three or more sessions on consecutive days (Barnes 1987; Blankfield 1995; Bolwerk 1990; Cutshall 2011; Elliott 1994; Hermele 2005; Leist 2011; Mandel 2007a; Murrock 2002; Schou 2008; Sendelbach 2006; Winters 2005). The duration of the music sessions varied across trials. Some trials offered music immediately prior to, during, and immediately following a procedure, whereas other trials only offered music during the procedure. For trials in those with MI (Bolwerk 1990; Cohen 1999; Davis-Rollans 1987; Elliott 1994; White 1992; White 1999; Winters 2005), the average length of the music sessions was 30 minutes.

For all studies in this review, the participants in the control group received standard medical care. Within each study, data were obtained from the control group participants at the same time intervals as for the participants in the music intervention group.

All but one study (Hermele 2005) measured the outcome variables immediately following the music intervention.

Eight studies provided detailed information about the music that was used (composition title and composer) (Barnason 1995; Barnes 1987; Blankfield 1995; Bolwerk 1990; Davis-Rollans 1987; Elliott 1994; Emery 2003; Ryu 2011). Twelve studies stated only the different styles of music that were offered to the participants (e.g. jazz, easy listening, country and western, classical music) without any composition- or performance-specific information (Broscious 1999; Cadigan 2001; Chan 2007; Cohen 1999; Cutshall 2011; Nilsson 2009a; Schou 2008; Sendelbach 2006; Stein 2010; Voss 2004; White 1992; White 1999). Only one study provided composition title, composer, and tempo information (Murrock 2002).

Eleven studies used patient-selected music (Barnason 1995; Barnes 1987; Broscious 1999; Chan 2007; Cohen 1999; Cutshall 2011; Jafari 2012; Mandel 2007a; Sendelbach 2006; Voss 2004; Winters 2005), whereas 15 studies used researcher-selected music (Blankfield 1995; Bolwerk 1990; Cadigan 2001; Davis-Rollans 1987; Elliott 1994; Emery 2003; Hermele 2005; Leist 2011; Murrock 2002; Nilsson 2009a; Ryu 2011; Schou 2008; Stein 2010; White 1992; White 1999).

The studies were conducted in seven different countries: USA (20 studies: Barnason 1995; Barnes 1987; Blankfield 1995; Bolwerk 1990; Broscious 1999; Cadigan 2001; Cohen 1999; Cutshall 2011; Davis-Rollans 1987; Emery 2003; Hermele 2005; Leist 2011; Mandel 2007a; Murrock 2002; Sendelbach 2006; Stein 2010; Voss 2004; White 1992; White 1999; Winters 2005), Australia (one study: Elliott 1994), Denmark (one study: Schou 2008), Hong Kong (one study: Chan 2007), South Korea (one study: Ryu 2011), Sweden (one study: Nilsson 2009a), and Iran (one study: Jafari 2012).

Fifteen studies were funded or partly funded by a grant from a foundation (Cutshall 2011; Sendelbach 2006; Stein 2010; Mandel 2007a), University (Elliott 1994; Jafari 2012), professional association (Barnason 1995; Blankfield 1995), nursing honor society (Broscious 1999; Cadigan 2001; Voss 2004), local government (Nilsson 2009a), or federal government (Emery 2003; White 1999; Winters 2005). The remainder of the studies were either unfunded or no report of funding was included in the manuscript.

Excluded studies

The main reasons for exclusion of studies that appeared eligible for this review were (a) not a randomized or quasi-randomized controlled trial, (b) lack of a standard treatment control group, (c) use of cardiac procedures for diagnostic purpose, and (d) participants with unconfirmed CHD diagnosis (e.g. suspected MI). Reasons for exclusion are listed in the table Characteristics of excluded studies.

Risk of bias in included studies

Allocation

We included 24 (92%) trials that used appropriate methods of randomization (e.g. computer-generated table of random numbers, drawing of lots, flip of coins), one trial that used alternate group assignment as the allocation method, and one trial that reported using randomization but failed to state the randomization method.

Eighteen trials (69%) used allocation concealment whereas three trials did not. For the remainder of the trials, allocation concealment was not mentioned.

Blinding

In music intervention studies, participants cannot be blinded (unless in studies that compare different types of music interventions). Two studies that used music listening reported blinding personnel. This was achieved by having both music group and control group participants wear headsets and listen to a compact disk (CD). The control group listened to a blank CD. In music therapy trials, the music therapist cannot be blinded, given the interactive nature of the music-making in the session.

Ten trials reported blinding of the outcome assessors for objective measures. For seven trials, the use of blinding was unclear. The other trials did not use blinding. However, it is important to point out that in case of assessment of subjective outcomes through self-report measures, blinding is often not possible since participants know whether they received the music intervention or a no-music control condition. Only in comparative studies (e.g. studies that compare active music-making with passive listening to music) can participants be blinded to the intervention and can their self report be considered blinded as well (Bradt 2012). We would like to point out that the 'Risk of bias' figure (Figure 4) lists one study as having used blinding for subjective outcomes. However, this study did not include subjective outcomes. A rating of low risk was assigned if studies did not include subjective outcomes.

The lack of blinding of outcome assessors for objective outcomes as well as the inability to blind participants to their self report of subjective outcomes inevitably introduces the potential for biased assessment. As blinding of intervention allocation is not possible in music interventions, this added another layer of possible bias.

Incomplete outcome data

The drop-out rate was less than 20% for 19 (73%) of the trials. For four trials, the drop-out rate was unclear. Three trials had a drop-out rate higher than 20% or their reasons for excluding participant data in the data analysis suggested potential for bias. Most studies reported reasons for drop-out.

Selective reporting

Publication bias for anxiety (Figure 1), heart rate (Figure 2), and systolic blood pressure (SBP) (Figure 3) as outcomes was examined visually in the form of funnel plots. The funnel plots for anxiety and heart rate indicate that there may be publication bias. However, it is also possible that the two smaller studies that appear in the lower part of the funnel plots were of lesser quality and, consequently, resulted in exaggerated effect sizes. The funnel plot on SBP did not show evidence of publication bias.

Figure 1. Funnel plot of comparison: 1 music versus standard care, outcome: 1.2 Anxiety (all measures) - patient type.

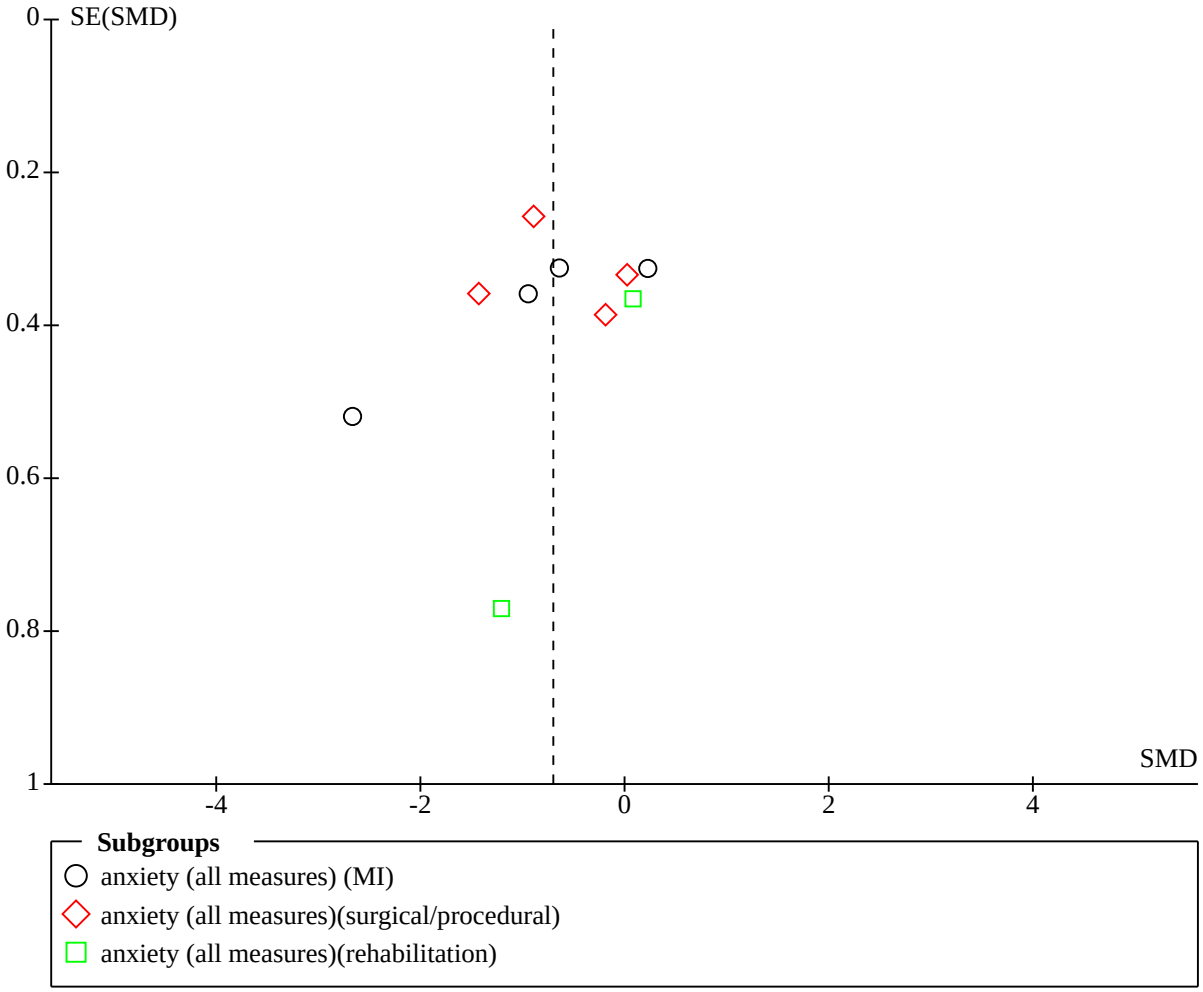


Figure 2. Funnel plot of comparison: 1 music versus standard care, outcome: 1.11 Heart rate-patient type.

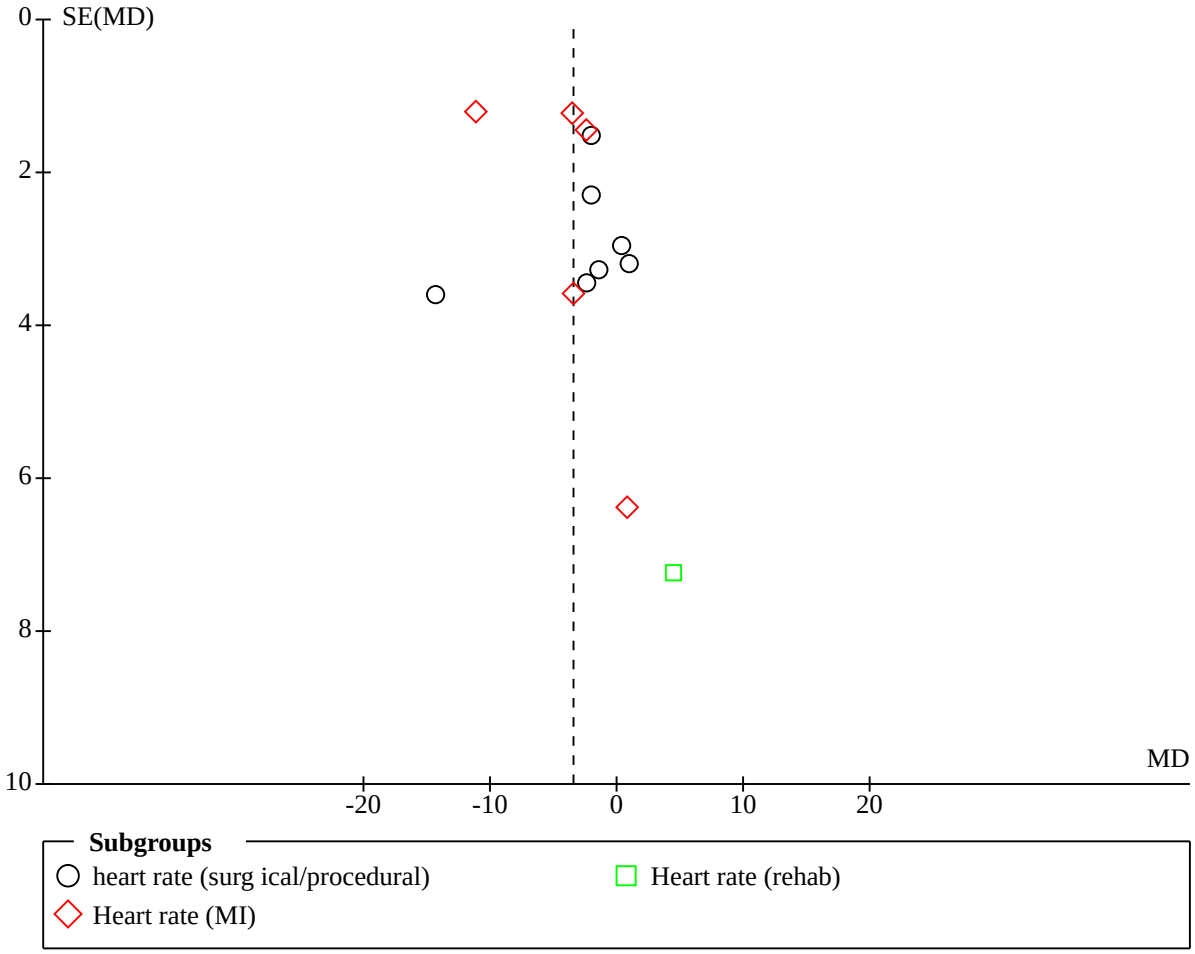
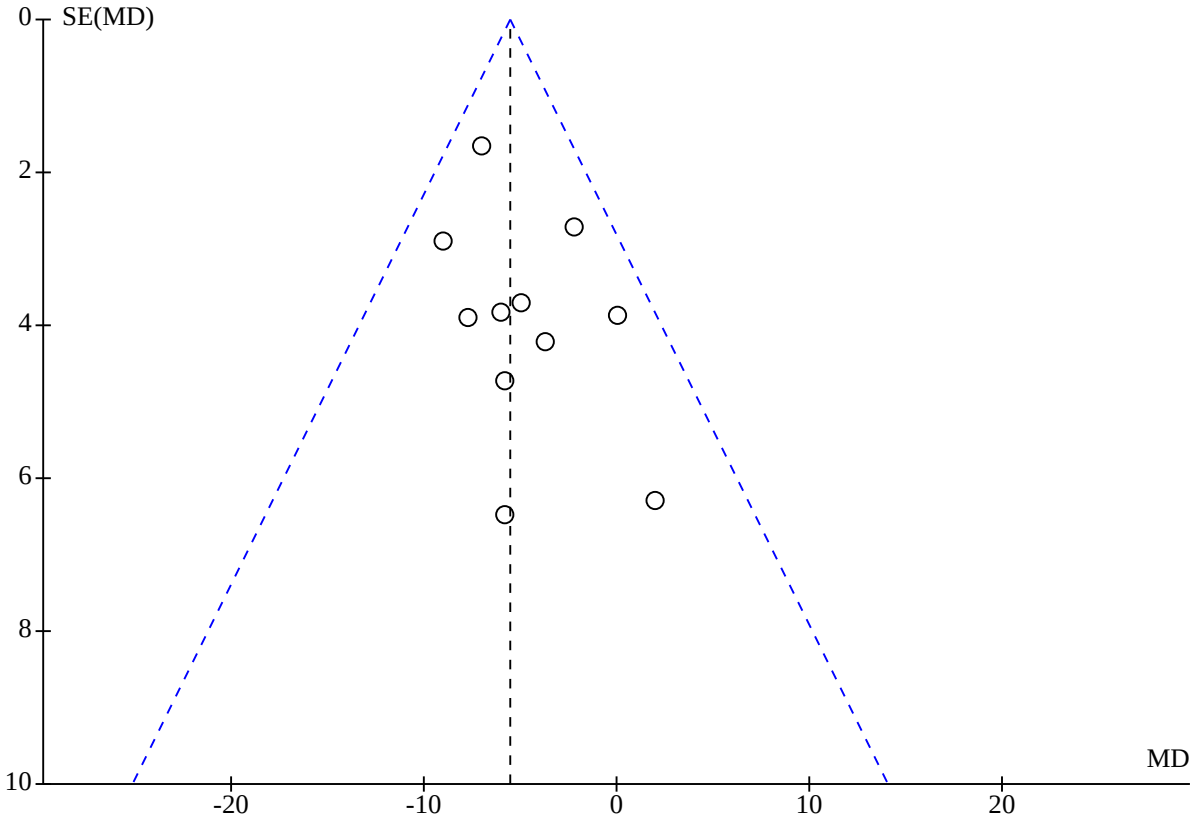


Figure 3. Funnel plot of comparison: 1 music versus standard care, outcome: 1.15 Systolic blood pressure.



Other potential sources of bias

The study reports did not suggest other potential sources of bias.

As a result of the risk of bias assessment, we concluded that two trials were at moderate risk of bias (Jafari 2012; Leist 2011). All other trials were at high risk of bias. The main reason for assigning a high risk of bias rating was the lack of blinding. As mentioned before, blinding is often impossible in music therapy and music medicine studies that use subjective outcomes, unless in studies where the music intervention is compared to another treatment intervention (e.g. progressive muscle relaxation or different type of music intervention). It therefore appears impossible for these types of studies to be rated at a low or even moderate risk of bias, even if all other risk factors (e.g. randomization, allocation concealment, etc.) have been adequately addressed.

Risk of bias is detailed for each trial in the risk of bias tables included with the Characteristics of included studies table and in the 'Risk of bias' Summary (Figure 4). In addition, an overall assessment of risk of bias can be viewed in Figure 5.

Figure 4. Risk of bias summary: review authors' judgements about each risk of bias item for each included study.

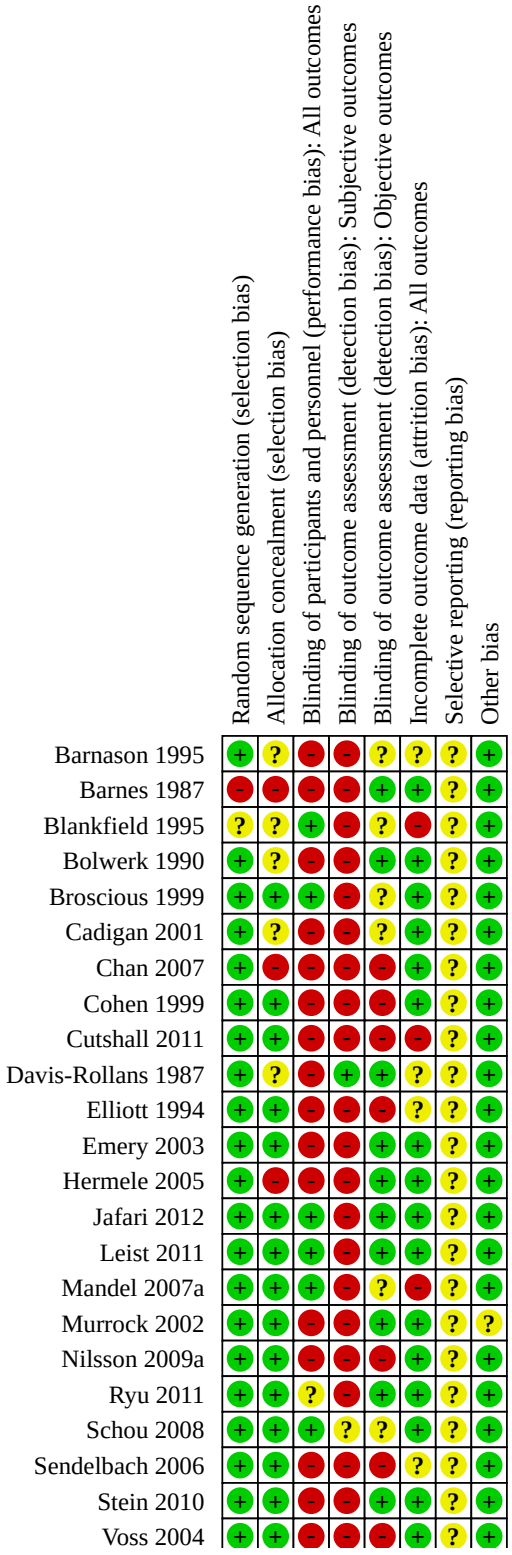


Figure 4. (Continued)

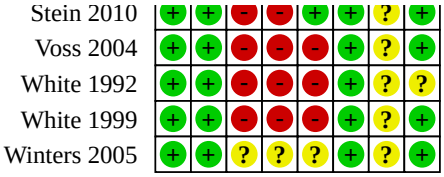
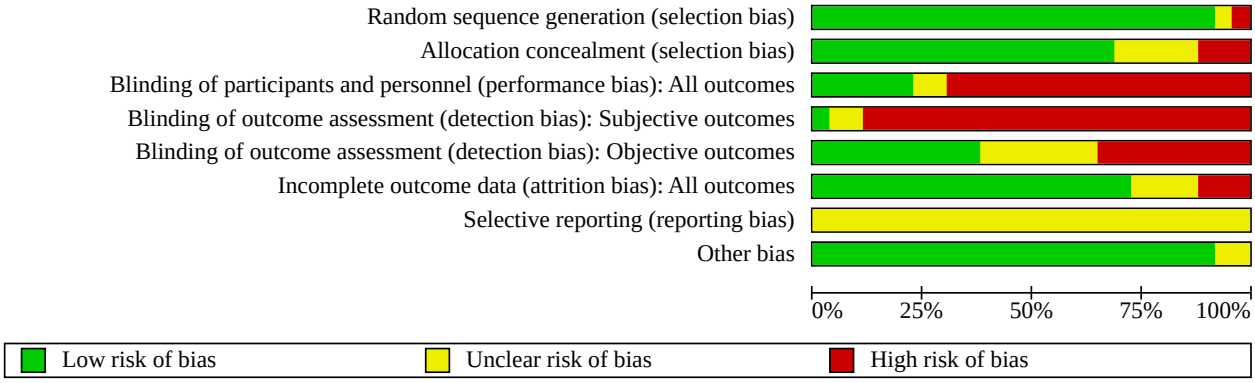


Figure 5. Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included studies.



As all but two trials were rated at the same level (high risk), we did not carry out sensitivity analysis on the basis of overall quality rating. Instead, we conducted a sensitivity analysis to examine the impact of the method of random sequence generation. Excluding those studies that used alternate assignment or for which the randomization method was unclear did not alter the findings of this review. Specific sensitivity analysis findings are reported in the Effects of interventions section.

Overall the quality of the evidence was low. (See the 'Summary of findings' table)

Effects of interventions

See: **Summary of findings 1** Music versus standard care for coronary heart disease

Primary outcomes

Psychological distress

Five studies examined the effects of music listening on psychological distress by use of the Profile of Mood States (POMS) (Cadigan 2001; Hermele 2005, Leist 2011; Schou 2008; Stein 2010) and one study by means of the Brief Symptom Inventory (BSI) (Mandel 2007a). The pooled estimate of those studies that used the POMS (N = 228) indicated a small beneficial effect of music interventions on distress, and this result was consistent across studies (mean difference (MD) = -1.26, 95% confidence interval (CI) -2.30 to -0.22, P = 0.02, I^2 = 0%) (Analysis 1.1). Mandel 2007a (N = 68) did not find statistically significant differences for psychological distress between the music therapy group and the standard care control group at posttest but did find an effect size of 0.54 at four-month follow-up.

Sixteen studies examined the effects of music on anxiety, seven of which reported mean state anxiety as measured by the Spielberger State-Trait Anxiety Inventory (STAI). Nine studies reported mean anxiety measured by other scales such as numeric rating scale and visual analogue scale.

We first conducted an overall analysis of studies that used the STAI to measure anxiety as well as those that used other scales. In order to pool the effect sizes of studies that use different scales, we only included studies that reported post-intervention scores in the analysis.The standardized mean difference (SMD) of those studies (10 studies, N = 353) that reported post-intervention anxiety scores, regardless of the scale used, revealed a moderate (Cohen 1988) effect favoring music interventions (SMD = -0.70, 95% CI -1.17 to -0.22, P = 0.004), but results were inconsistent across studies (I^2 = 77%). Grouping the studies by participant type (myocardial infarction (MI) patients, surgical/procedural patients, rehabilitation patients) (Analysis 1.2) did not resolve heterogeneity. However, grouping the studies by music preference led to homogeneous results for the four studies (N = 144) that used participant-selected music (SMD = -0.89, 95% CI -1.42 to -0.36, P = 0.001, I^2 = 48%) but not for the five that used researcher-selected music (N = 179) (SMD = -0.74, 95% CI -1.55 to 0.08, P = 0.08, I^2 = 85%) (Analysis 1.3).

When pooling studies that only used STAI State Anxiety form (STAI-S) to measure state anxiety (seven studies, N = 310), significantly lower state anxiety was found in participants who received standard care combined with music interventions than those who received standard care alone (MD = -4.58, 95% CI -7.78 to -1.39; P = 0.005). However, considerable statistical heterogeneity remained (I^2 = 88%). Six out of these seven studies included participants with MI and one study included surgical patients. Pooling the results of

only the MI studies (N = 243) resulted in a larger effect size that was more homogeneous (MD = -5.87, 95% CI -7.99 to -.3.75, P < 0.00001, I^2 = 53%) (Analysis 1.4.1).

We then explored whether music preference affected the outcome of state anxiety as measured by STAI-S. Grouping the studies by whether participant-preferred music (three studies, N = 167) or researcher-selected music (four studies, N = 143) was used did not reduce heterogeneity (Analysis 1.5). However, as noted above, all studies in this subgroup analysis were MI studies except for one (Barnason 1995). A subsequent analysis from which we excluded this surgical study suggested a greater anxiety-reducing effect and homogeneity for studies that used participant-preferred music. Studies of people with MI (two studies, N = 100) that used participant-preferred music resulted in an average anxiety reduction of 7.36 units on the STAI (95% CI -9.45 to -5.27, P < 0.00001, I^2 = 0%) compared to a reduction of 4.68 units for those studies that used researcher-selected music (four studies, N = 143) (95% CI -8.27 to -1.10, P = 0.01, I^2 = 66%) (Analysis 1.6).

The pooled estimate for studies that measured anxiety by scales other than the STAI-S (seven studies, N = 248) suggested no strong evidence of an effect (SMD = -0.43, 95% CI -0.93 to 0.06, P = 0.09). Here too, results were statistically heterogeneous (I^2 = 70%). Two studies (Cutshall 2011; Stein 2010) could not be included in the meta-analysis because change scores were used. Cutshall 2011 reported a small effect size of -0.12 (95% CI -0.51 to 0.27) in 100 participants, whereas Stein 2010 (N = 36) resulted in an effect size of -0.35 (95% CI -1.01 to 0.31). Neither effect size was statistically significant. Grouping the studies by type of participant resulted in a larger pooled estimate for surgical/procedural patients (four studies, N = 171) but heterogeneity remained (SMD = -0.63, 95% CI -1.25 to -.0.01, P = 0.05, I^2 = 73%). Three studies with MI and rehabilitation patients (N = 77) did obtain a homogeneous effect but this effect was very small and did not reach statistical significance (SMD = -0.03, 95% CI -0.61 to 0.56, P = 0.93; I^2 = 31%) (Analysis 1.7). A subgroup analysis on the impact of music preference suggested that the use of participant-preferred music (four studies, N = 144) resulted in a large anxiety reduction that was statistically significant and consistent across studies (MD = -0.89, 95% CI -1.42 to -0.36, P = 0.001, I^2 = 48%). In contrast,researcher-selected music (in this case, classical music was used) appeared to slightly increase anxiety although this was not statistically significant (three studies, N = 104) (SMD = 0.11, 95% CI -0.28 to 0.49, P = 0.58, I^2 = 0%) (Analysis 1.8).

Six studies (N = 217) included depression as an outcome. Their pooled estimate indicated that participants who listened to music did not significantly differ in their reported levels of depression from those participants who received standard care (SMD = -0.11, 95% CI -0.38 to 0.16, P = 0.42, I^2 = 0%) (Analysis 1.9).

Two studies (N = 97) used a numeric rating scale to measure the effects of music on mood. Their pooled estimate indicated that participants who listened to music reported greater mood enhancement than those receiving standard care (SMD = 1.08, 95% CI -0.02 to 2.17, P = 0.05); however, there was disagreement between the two studies about the size of the effect (I^2 = 80%) (Analysis 1.10). The results are therefore inconclusive.

Quality of life

Only one study (Mandel 2007a) considered quality of life as an outcome. However, significant data loss greatly reduces the usefulness of the data from this study.

Secondary outcomes

Heart rate

The pooled estimate of 13 studies (N = 828) showed a significant effect on heart rate, favoring music interventions over standard care (MD = -3.40, 95% CI -6.12 to -0.69, P = 0.01). However, the results were inconsistent among studies (I^2 = 78%). Grouping the studies by type of participant (MI, surgical/procedural, rehabilitation) reduced heterogeneity for surgical/procedural patient studies (seven studies, N = 604) somewhat (I^2 = 54%) but the effect was no longer statistically significant (MD = -2.61, 95% CI -5.62 to 0.34, P = 0.09). For studies with MI patients (5 studies, N = 194), the effect remained statistically significant but the results were highly inconsistent across studies (MD =-4.75, 95% CI -9.26 to -0.25, P = 0.04) (Analysis 1.11).

A subgroup analysis by participant-selected versus researcher-selected music produced interesting results. The pooling of studies that used researcher-selected music (six studies, N = 398) resulted in a smaller but homogeneous effect size (MD = -2.67, 95% CI -4.27 to -1.07, P = 0.001; I^2 = 0%). The use of participant-selected music (seven studies, N = 430) resulted in a larger effect size (MD = -4.69, 95% CI -9.40 to 0.02, P = 0.05); however, the results were highly inconsistent between studies (I^2 = 84%) (Analysis 1.12).

Two studies (N = 90) included heart rate variability as an outcome in people with MI. Their pooled estimate suggests that music has no effect on heart rate variability (MD = 0.07, 95% CI -0.34 to 0.48, P = 0.74, I^2 = 0%) (Analysis 1.13).

Respiratory rate

Seven studies (N = 442) examined the effects of music on respiratory rate in people with coronary heart disease (CHD). A heterogeneous pooled estimate of -2.50 (95% CI -3.61 to -1.39, P < 0.00001, I^2 = 79%) was found (Analysis 1.14).

Pooling the studies that used researcher-selected music (four studies, N = 256) had a similar effect on heterogeneity as for the heart rate outcome: the use of researcher-selected music led to a smaller but homogeneous effect size (MD = -1.66, 95% CI -2.20 to -1.12, P < 0.00001, I^2 = 0%). The use of participant-selected music (three studies, N = 186) resulted in a larger but heterogeneous pooled estimate (three studies, MD = -4.42, 95% CI -7.37 to -1.46, P = 0.003, I^2 = 89%) (Analysis 1.14). Statistical heterogeneity was due to one trial (Chan 2007) reporting much larger beneficial effects than the other two trials.

Systolic blood pressure

Listening to music significantly reduced the systolic blood pressure of people with CHD, as indicated by a pooled estimate of -5.52 mmHg (95% CI - 7.43 to -3.60 P < 0.00001) (11 studies, N = 775). The results were consistent across studies (I^2 = 0%) (Analysis 1.15).

Diastolic blood pressure

A pooled estimate of -1.12 mmHg (95% CI -2.57 to 0.34) (nine studies, N = 685) was found for diastolic blood pressure, favoring

music listening, but this difference of effect was not statistically significant (P = 0.13). The results were consistent across studies (I^2 = 14%) (Analysis 1.16).

Mean arterial pressure

Three studies (N = 158) examined the impact of music on mean arterial pressure. Their pooled estimate was not statistically significant (MD = -0.91, 95% CI -4.08 to 2.26, P = 0.57, I^2 = 0%) Analysis 1.17.

Myocardial oxygen demand

Only one study (Winters 2005) included myocardial oxygen demand, or the amount of oxygen required by the heart to function properly, as an outcome. We could not establish the method of measurement, despite attempts to contact the authors. The average myocardial oxygen demand reduction for the music group (N = 30) was 1607.3 (SD = 640.5). In contrast, the average myocardial oxygen demand of the standard care group (N = 30) increased by 447.5 (SD = 1011.1).

Three studies (184 participants) included oxygen saturation levels as an outcome. Their pooled estimate suggested no effect of music (MD = -0.02, 95% CI -1.65 to 1.61. P = 0.98, I^2 = 92%) (Analysis 1.18).

Hormone levels

One study (Nilsson 2009a) examined the effects of listening to music on cortisol levels in 58 participants one day following cardiac surgery; no significant difference was found between the music group and the standard care control group (MD = 1.20, 95% CI -122.83 to 125.23, P = 0.98).

Pain

Music interventions (eight studies) resulted in a statistically significant reduction of pain compared to standard care in 630 participants (SMD = -0.43, 95% CI -0.80 to -0.05, P = 0.03); however, the results were not consistent between studies (I^2 = 81%) (Analysis 1.19).

Only one study used researcher-selected music, and all but one study included surgical or procedural patients. We therefore could not conduct meaningful subgroup analyses for patient type or music preference.

Pooling the effects of those studies that provided two or more music sessions to the participants resulted in a homogeneous effect size that would be considered clinically small in magnitude (three studies, N = 210, SMD = -0.27, 95% CI -0.55 to -0.00, P = 0.05, I^2 = 0%) (Barnason 1995; Mandel 2007a; Sendelbach 2006). In one study (Cutshall 2011), participants listened to pre-recorded music twice a day for three consecutive postoperative days. Because the authors only reported change scores, these results could not be pooled with the other studies. Cutshall 2011 consistently reported lower pain levels in the music listening group compared to the standard care control group for each of the six measurement points. However, this difference was only statistically significant for the second music listening session on postoperative day two with a reduction of 1.4 (SD = 1.4) for the music group versus a reduction of 0.4 (SD = 1.4) for the control group (P = 0.001).

Length of hospital stay

The pooled estimate of two studies (N = 82) indicated no evidence for an effect of music interventions on length of hospital stay (MD = -0.06, 95% CI -1.03 to 0.92, P = 0.91, I^2 = 0%) (Analysis 1.20)..

Opioid intake

Two studies (N = 90) examined the effect of music interventions on opioid intake by patients after coronary artery bypass graft (CABG). Both studies found slightly lower opioid use in those who participated in the music group, but this pooled effect was not statistically significant (SMD = -0.25, 95% CI -0.67 to 0.16, P = 0.23, I^2 = 0%) (Analysis 1.21).

Quality of sleep

The pooled estimate of two studies (N = 122) suggests that listening to music may improve the quality of sleep (SMD = 0.91, 95% CI 0.03 to 1.79, P = 0.04) after a cardiac procedure or surgery. There was considerable heterogeneity between the studies (I^2 = 81%). However, both studies agreed on the direction of the effect and the heterogeneity was due to one study reporting much greater benefits (Analysis 1.22).

Peripheral skin temperature

Only one study (Cadigan 2001) (N = 140) included peripheral skin temperature as an outcome. This study examined the effects of listening to music on patients during bedrest due to procedural sheaths or an intra-aortic balloon pump. No significant difference was found between the music listening treatment group (M = 88, SD = 5.8) and the control group (M = 88, SD = 6.2) for peripheral skin temperature.

Duration of cardiac procedure

No studies examined the effects of music interventions on duration of cardiac procedure.

DISCUSSION

Summary of main results

Psychological outcomes

The results of 10 studies (N = 353) suggest that listening to music has a moderate anxiety-reducing effect in people with coronary heart disease (CHD). However, the results were inconsistent between studies, which were generally small and at high risk of bias, and therefore, need to be treated with caution.

Studies using the same scale (STAI) to measure anxiety obtained consistent anxiety-reducing effects of music (5.87 units on a 20- to 80-point score range) in people with myocardial infarction (MI). A reduction of 5.87 units may be considered small; however, mean baseline STAI scores were relatively low to begin with (ranging from 35.3 to 48.2). In all MI studies, anxiety was reduced after the music intervention to STAI levels that are considered to represent low anxiety. Greater anxiety-reducing effects were found for studies that used participant-preferred music than for those that used researcher-selected music.

The pooled estimate of five studies (N = 228) suggests that music has a small beneficial effect on psychological distress and this difference was consistent across studies.

We found no evidence of an effect of music on depression (six studies; N = 217). This finding is consistent with those of other Cochrane systematic reviews on the use of music interventions with cancer patients (Bradt 2011) and with patients at end-of-life (Bradt 2010a). This result suggests that short-term interventions (one or two music sessions) focused on acute symptom reduction (e.g. state anxiety, pain, distress) are inadequate to relieve depression. The treatment of depression may need a more long-term regimen of music therapy sessions that actively uses the relational aspects of music-making to address the psychotherapeutic needs of the participants rather than focusing on symptom relief.

The pooled estimate of two studies (N = 97) suggests that music listening may enhance mood. However, this finding was not statistically significant. More studies are needed to further evaluate the effect of music on mood as evidenced by the inconsistencies of results across these two studies.

One music therapy study (N = 88) included quality of life as an outcome in a population of cardiac rehabilitation patients. Because of significant rates of attrition in this study, we could draw no conclusions.

Physiological outcomes

Results of this review suggest that listening to music reduces heart rate. However, there was variation among the 13 studies (N = 828) on the size of this effect. In examining the source of the heterogeneity, we discovered that listening to participant-selected music resulted in a heart rate reduction of 4.69 beats per minute (bpm) compared to 2.67 bpm when listening to researcher-selected music. However, in contrast to participant-selected music, the results were consistent across studies when researcher-selected music was used, i.e. no statistical heterogeneity.

In two small studies (N = 90) there was no evidence for an effect of music on heart rate variability.

For respiratory rate, the use of researcher-selected music also led to smaller (reduction of 1.66 breaths per minute) but consistent results (four studies, N = 256), whereas the use of patient-selected music led to larger (4.42 breaths per minute) but inconsistent results (three studies, N = 186).

Pooled estimates indicate that music reduces systolic blood pressure by 5.5 mm Hg consistently across studies (11 studies, N = 775). No evidence of an effect was found for diastolic blood pressure (nine studies, N = 685).

Only one study (N = 60) examined the effects of music listening on myocardial oxygen demand and found a reduction in myocardial oxygen demand in contrast to the standard care group. No evidence of benefit was apparent for music on blood oxygen saturation (three studies, N = 184).

One study (N = 58) reported on the effect of music on cortisol levels but found no evidence for an effect. It is surprising that no other studies examined the effects of music on hormone levels that are of particular relevance to people with CHD, including adrenaline and noradrenaline concentration and other stress hormones that can be deleterious to cardiac functioning.

A small effect was found for music listening on self-reported pain; however the results were inconsistent across studies (eight studies, N = 630). Excluding those studies that only used one music session led to a small effect that was consistent across studies (three studies, N = 210).

The pooled estimate of two studies (N = 90) points to a small but non-significant effect of music on reduced need for opioid pain relief.

Finally, music listening appears to improve patients' quality of sleep following a cardiac surgery or procedure (two studies, N = 122).

Duration-specific outcomes

Two studies (N = 82) examined whether music therapy or music medicine interventions impact the length of hospital stay, but their results suggest no evidence of an effect.

Overall completeness and applicability of evidence

This review includes 26 randomized and quasi-randomized controlled trials.

All but two trials used music listening as the clinical intervention. Twenty-three trials were categorized as music medicine trials, meaning that the music was administered by non-music therapist medical personnel. This clinical uniformity adds to the strength of this review but also limits the applicability of the evidence. The evidence, as presented in this review, speaks only to the effect of listening to music provided by the researcher or selected by the participant from music choices presented by the researcher. This review does not include enough music therapy studies to present evidence on the effects of music therapy interventions, wherein the person is actively involved in a therapeutic process in which a variety of musical experiences (e.g. music improvisation, singing) are used. The data from the three music therapy studies were not analyzed separately because of this small number of studies and because of clinical diversity.

No data can currently be provided regarding costs or cost effectiveness of music medicine applications in cardiac care, as these data were not included in the studies reviewed. Furthermore, no data were provided regarding costs for music therapy interventions, so that no comparisons between these two types of treatments can be conducted. It is recommended that future research include cost effectiveness measures of these two interventions, as well as cost comparisons between them.

The trials in general included very limited information about the music selections used, except for mentioning general music styles (e.g. classical, easy listening, jazz, country). Needless to say, music within each of these styles can vary widely, and more detailed information would help clinicians make well-informed music selections. In several trials, only classical music choices were offered without a good rationale for the music selection. In several trials, participants were allowed to select the music from that which was offered. This decision was based on the assumption that music preference plays an important part in the effectiveness of music relaxation. Certainly, allowing participants to select music that they like may enhance their sense of control; the power of this should not be underestimated as hospitalized people often feel helpless and disempowered. The results of this review indeed suggest that the use of participant-selected music resulted in greater anxiety reduction and more consistent results across studies than the use

of researcher-selected music. However, it needs to be noted that participants could only select from a limited number of music styles presented by the researcher. It is likely that the preferred music of some of the participants was not included in the music selection offered and, even if it was, that they may not have liked the specific composition or song being played. One study explicitly stated that three participants withdrew from the study because they disliked the music (Chan 2007). Another researcher reported that some participants indicated that they would have preferred different music or that they did not care for the music (Bolwerk 1990). We suspect that using music that is truly preferred by the participant may lead to even greater anxiety reduction.

In addition, musical parameters of the music choices offered to participants varied more widely than those of researcher-selected music. This could explain why trials that used participant-selected music had more heterogeneous results for physiological outcomes than trials using researcher-selected music. The results suggest that different music styles (e.g. jazz, country and western, classical, new age, etc.) affect the heart rate and respiratory rate differently. This is not surprising, given the knowledge that music is able to entrain or exert influence on the rate of physiological responses in patients (Bradt 2009b). More research is needed to evaluate the effect of music that is truly patient-preferred as well as the effect of music with different characteristics (tempo, timbre, harmony, emotional intensity, etc.).

The majority of the studies only provided one music session to the participants. Because not all studies in this review addressed all main outcome variables, it was not possible to conduct a subgroup analysis to examine frequency and duration of sessions as moderator variables. Winters 2005 compared the effects of multiple music sessions during the course of a day and found that offering two or three music sessions had greater effects than one or no music sessions on various physiological and psychological responses in individuals after a MI. Offering multiple music listening sessions allows for the participant to give feedback about the music, select different music if needed, and become more skilled in using music for relaxation purposes. In the case of music therapy interventions, multiple sessions allow for the development of a therapeutic relationship and deepening of the therapeutic process through the music. This may lead to greater health benefits. At this time, however, the relationship between the frequency/duration of treatment and treatment effect remains unclear. Further investigation is needed into the optimal frequency and duration of music interventions for people with CHD.

Since the vast majority of participants in these trials were white (90%), generalizability to other ethnic groups is limited. Cultural sensitivity in music selection should always be considered.

Because only a small number of trials investigated the effect of music listening on mood, quality of life, myocardial oxygen demand, stress hormone levels, opioid intake, length of hospital stay, and quality of sleep, this evidence is not clinically applicable at this time. More research is needed.

Quality of the evidence

The quality of reporting in general was poor with only a few authors detailing the method of randomization, allocation concealment, and level of blinding. We needed to contact the chief investigators of most studies to provide additional methodological and statistical information. For many outcomes in this review, there were inconsistencies in effects among studies. In addition, the trials included were generally small (Mean trial size = 64; median = 58) resulting in a lack of precision of treatment effects as evidenced by the rather large confidence intervals. This, combined with the high risk of bias, requires that the results of this review be interpreted with caution. In summary, the quality of evidence was low (Summary of findings 1).

Potential biases in the review process

The strength of our review is that we searched all available databases and a large number of music therapy journals (English, German, and French language), checked reference lists of all relevant trials, contacted relevant experts for identification of unpublished trials, and included publications without language restrictions. In spite of such a comprehensive search, it is still possible that we have missed some published and unpublished trials. We requested additional data where necessary for all trials we considered for inclusion. This allowed us to get accurate information on the trial quality and data for most trials and helped us make well-informed trial selection decisions.

We were able to identify several unpublished studies through communication with experts in the field. It is possible that we did not identify some grey literature, but it is doubtful that this would have a significant impact on our results. Grey literature tends to include trials with relatively small numbers of participants and inconclusive results (McAuley 2000).

Agreements and disagreements with other studies or reviews

We found no other systematic reviews on music interventions with cardiac patients.

The aim of this review was to update the previous version (Bradt 2009a) with the results of trials completed during the four years since its publication. Overall, the results of this review are similar to those of the previous version. The review was expanded with some additional outcomes that are of importance to healthcare costs associated with the treatment of CHD, namely length of hospital stay and opioid intake. However, at this time, there were not enough studies with these outcomes to provide strong evidence for an effect of music interventions on these outcomes.

The anxiety-reducing effects of music interventions found in this review are consistent with the findings of three other Cochrane systematic reviews on the use of music with mechanically-ventilated patients (Bradt 2010b), cancer patients (Bradt 2011), and pre-surgical patients (Bradt 2013).

AUTHORS' CONCLUSIONS

Implications for practice

This systematic review indicates that listening to music may have a beneficial effect for people with coronary heart disease (CHD). The findings of this meta-analysis indicate that listening to music may reduce systolic blood pressure and heart rate and also appears to be effective in reducing anxiety in people with myocardial infarction (MI) upon hospitalization. These results are consistent with the anxiety-reducing benefits of music interventions reported in three other Cochrane systematic reviews on the use of music with

mechanically-ventilated patients (Bradt 2010b), cancer patients (Bradt 2011), and pre-surgical patients (Bradt 2013).

All music medicine studies in this review used sedative music or music that is calming. However, there are many styles of sedative music (e.g. new age, classical, country and western, easy listening, etc.) and, at this time, it is unclear which type of music is most effective. The results of this review furthermore suggest a differential impact of researcher-selected versus participant-selected music on anxiety as well as physiological responses. The results suggest that more consistent yet smaller effects sizes are found in physiological responses when researcher-selected music is used. However, for psychological outcomes such as anxiety, the findings suggest that patient-preferred music leads to greater benefits.

Listening to music may also reduce pain and respiratory rate; however the magnitude of these effects is small. It may also improve patients' quality of sleep after a cardiac procedure or surgery. We found no evidence of effect for depression, heart rate variability, and length of hospitalization. Some studies suggested beneficial effects of music listening on opioid intake but this effect was not statistically significant. Inconsistent results were found for mood. However, only a small number of trials investigated the effects of music on these outcomes.

It is important to note that only three studies in this review used a trained music therapist. Music therapists in medical settings do not limit their interventions to offering music listening for relaxation purposes. Music therapists are specially trained clinically and academically to carefully select music interventions to offer emotional and spiritual support, enhance a sense of control, and improve physical well-being in medical patients. Because of the lack of randomized controlled trials examining the effect of music interventions offered by a trained music therapist for people with coronary heart disease, it is impossible to establish at this time whether these interventions are more effective than listening to pre-recorded music.

Implications for research

This systematic review provides evidence that listening to pre-recorded music may have health benefits for individuals with CHD. The use of other music therapy interventions, such as music improvisation, singing, listening to live music, songwriting, amongst others, with this population needs more research.

The effects of researcher-selected versus participant-selected music need to be further examined. In particular, studies are needed that use music that truly reflects participant preference. In addition, future trials should investigate the differential effects of researcher-selected versus participant-selected music. Future research needs to discuss in greater detail specific characteristics of the music selections. We recommend that researchers consult the reporting guidelines for music-based interventions developed by Robb, Burns, and Carpenter (Robb 2011).

The music therapy literature recommends that when music is used for sedative purposes, patients select music that is characterized by a slow tempo and lack of abrupt changes and sharp timbres. In addition, music that evokes strong emotional reactions, which may be caused by intense memories associated to the music, should be avoided when used for stress and anxiety reduction purposes (Dileo 2007). These recommendations stem from the clinical experience and knowledge of music therapists as well as experimental research in the field of music psychology. More controlled trials are needed with medical patients to further examine which musical characteristics enhance the psychological and physiological benefits from music listening.

Besides music characteristics, more information is needed about dosages as well as timing of music interventions. Future studies need to examine the relationship between the frequency/duration of music interventions and treatment effects.

- Are there optimal lengths of music interventions?
- Do multiple sessions lead to better results?
- For people with MI, are there preferred times during the day?
- For procedural patients, what is the most effective time to start the music intervention?
- Should the music intervention continue after completion of the procedure, and if so, for how long?
- Does listening to music several days or weeks prior to it being used during the procedure impact outcomes differently than listening to the music for the first time just prior to or during the procedure?

Comparative studies are needed to answer many of these questions. Only one study in this review compared the effects of different dosages (once, twice, and three times per day) and timing (morning, afternoon, and evening) of music listening interventions in people with MI. In addition, future studies should examine the impact of patients' preferred coping strategies on the effectiveness of anxiety-reduction interventions such as music listening. Some people may prefer distraction through music listening during a procedure, whereas others may prefer to closely monitor the procedure. None of the included studies considered preferred coping style as a possible confounding variable. The use of culturally relevant music needs to be considered when designing protocols for further research.

In addition, as recommended by Elliott 1994, patient personality traits (especially trait anxiety) and pre-procedural state anxiety need to be considered as impact factors in future studies. People with high levels of trait and state anxiety may report differential benefits from music interventions than those with low levels of anxiety.

Furthermore, several authors recommend that future studies exert better control over the confounding effects of beta-blockers, and other cardiac medication, as well as opioids (Cadigan 2001; Sendelbach 2006) on physiological and physical responses.

In summary, more studies are needed to examine the effects of music interventions on quality of life, mood, and depression in people with CHD, as these are factors relevant to the disease itself. In addition, future studies need to examine the effects of music on physiological responses beyond heart rate and blood pressure. Heart rate variability, myocardial oxygen demand, blood oxygen saturation levels, and stress hormone levels may provide more sensitive measures of effect and may, moreover, provide insight into the underlying physiology of anxiety and stress reduction. We also recommend that future studies consider duration of cardiac procedures as well as long-term outcomes such as length of hospitalization and survival and death.

Few studies in this review included a power calculation. Future studies need to include power calculations so that sufficiently large samples are used.

Formal evaluation of the costs and benefits of music medicine and music therapy is needed.

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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Barnason 1995

Study characteristics	
Methods	RCT

Barnason 1995 *(Continued)*

	3-arm parallel group design
Participants	Adult patients after CABG Total N randomized: not reported N randomized to music group: not reported N randomized to control group: not reported N randomized to music video (visual imaging): not reported (not included in this review) N analyzed in music group: 33 N analyzed in control group: 34 N analyzed in music video group: 29 (not included in this review) Sex: 31 (32%) women, 65 (68%) men Age: 67 (SD 9.9) Ethnicity: 100% white Setting: inpatient Country: USA
Interventions	Three study groups: 1. Music group: listening to music through earphones 2. Control group: scheduled rest Music provided: (a) Country Western instrumental, (b) *Fresh Aire* by Steamroller, (c) *Winter into Spring* by Winston, (d) *Prelude* and *Comfort Zone* by Halpern Number of sessions: 2 Length of session: 30 minutes Categorized as music medicine
Outcomes	Anxiety (STAI): posttest scores postop day 2, posttest scores postop day 3 Anxiety (NRS): posttest scores postop day 2, posttest scores postop day 3 Mood (NRS): posttest scores postop day 2, posttest scores postop day 3 Pain (VRS): posttest scores postop day 2, posttestscores postop day 3 Pain (MPQ): posttest scores postop day 2, posttest scores postop day 3 Quality of sleep (Richards-Campbell Sleep Questionnaire, average of 5 subscales): morning of postop day 3 Unable to use: HR, SBP, DBP: insufficient data
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: " The researcher randomly assigned subjects to one of the three intervention groups by drawing lots." (p.126)
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias)	High risk	Blinding of participants was not possible. Personnel were not blinded.

Barnason 1995 *(Continued)*
All outcomes

Blinding of outcome assessment (detection bias) Subjective outcomes	High risk	Self report measures were used for subjective outcomes.
Blinding of outcome assessment (detection bias) Objective outcomes	Unclear risk	It is unclear whether outcome assessors were blinded
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not reported
Selective reporting (reporting bias)	Unclear risk	Not sufficient information available to make judgment
Other bias	Low risk	Partially supported by a grant from the American Heart Association-Nebraska Affiliate

Barnes 1987

Study characteristics	
Methods	Quasi-RCT Cross-over trial
Participants	10 adults in cardiac rehabilitation program Total N randomized: 10 N randomized to music first sequence: 5 N randomized to control first sequence: 5 N analyzed music first sequence: 5 N analyzed control first sequence: 5 Sex: 4 (40%) women, 6 (60%) men Age: 56.4 Ethnicity: not reported Setting: outpatient rehab Country: USA
Interventions	Two conditions: 1. Music condition: exercise on bicycle ergometer while listening to prerecorded music 2. Control condition: exercise on bicycle ergometer without music Music provided: participants selected from Jazz: selections from *Fun and Games* (C. Mangione); Classical: *Brandengurg concertos Nos 2 and 6* (JS Bach); Country Western: selections from *Greatest Hits* (Kenny Rogers); Popular: selections from *Unforgettable* (Nat King Cole) or *The best of the Supremes* (The Supremes). Number of sessions: 3 in each condition

Barnes 1987 *(Continued)*

	Length of session: 10 minutes Categorized as music medicine
Outcomes	Perceived exertion (Borg Scale of Rating of Perceived Exertion) Unable to use: HR, SBP: insufficient data reporting
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Quote: "The participant was alternately assigned to either group A or B" (p.35).
Allocation concealment (selection bias)	High risk	Allocation concealment was not possible because of alternate assignment
Blinding of participants and personnel (performance bias) All outcomes	High risk	Blinding of participants was not possible. Personnel were not blinded.
Blinding of outcome assessment (detection bias) Subjective outcomes	High risk	Self report measure was used for subjective outcome.
Blinding of outcome assessment (detection bias) Objective outcomes	Low risk	Not included in this review
Incomplete outcome data (attrition bias) All outcomes	Low risk	No subject loss
Selective reporting (reporting bias)	Unclear risk	Not sufficient information available to make judgment
Other bias	Low risk	Unfunded research

Blankfield 1995

Study characteristics

Methods	Quasi-randomized trial 3-arm parallel group design
Participants	Adults undergoing CABG Total N randomized: 66 N randomized to music group: 33 N randomized to control group: 33

Blankfield 1995 *(Continued)*

	N analyzed in music group: 32 N analyzed in control group: 29 Mean age: 61.93 (SD 6.61) years Sex: 18 (28%) women, 48 (72%) men Ethnicity: 57 (94%) white Setting: 2 inpatient settings in hospitals Country: USA
Interventions	Two study groups: 1. Music group: participants listened to audiocassette tapes intraoperatively and postoperatively via headphones 2. Control group: listened to blank cassette tape during surgery to keep surgeon blinded with no post-operative Music provided: *Dreamflight II* by Herb Ernst (no further info about the music was provided in the study report) Number of sessions: Once during surgery and then twice daily for duration of hospitalization Length of sessions: Duration of surgery and then 30 minutes Categorized as music medicine
Outcomes	Postoperative stay (days): mean (SD) Surgical intensive care unit stay (days): mean (SD) Morphine and morphine equivalents: mean (SD) Meperidine: mean (SD) Depression: not included in this review since no standardized measurement tool was used
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomization method is not reported
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Blinding of participants was not possible. Use of blank tapes in the control group blinded the surgeon and medical staff
Blinding of outcome assessment (detection bias) Subjective outcomes	High risk	Subjective outcomes are not included in this review since no standardized measures were used

Blankfield 1995 *(Continued)*

Blinding of outcome assessment (detection bias) Objective outcomes	Unclear risk	It is unclear whether outcome assessors were blinded
Incomplete outcome data (attrition bias) All outcomes	High risk	Attrition rate is 7.6% (n = 5). 3 participants were excluded because their hospitalization stay extended beyond the 2-week study duration and the authors considered them outliers. 2 participants died in the hospital and their data were excluded. The reasons for exclusion are questionable and therefore the study was considered at high risk for attrition bias.
Selective reporting (reporting bias)	Unclear risk	Not sufficient information available to make judgment
Other bias	Low risk	Supported by a grant from the American Academy of Family Physicians along with financial assistance from Fairview General Hospital.

Bolwerk 1990

Study characteristics	
Methods	RCT 2-arm parallel group design
Participants	Adults with medical diagnosis of myocardial infarction (MI) confirmed by enzyme and ECG changes Total N randomized: 40 N randomized to music group: 20 N randomized to control group: 20 N analyzed in music group: 17 N analyzed in control group:18 Sex: 8 (32%) women, 17 (68%) men Ethnicity: not reported Mean age: 58.65 years Setting: Inpatient Country: USA
Interventions	Two study groups: 1. Music group: listening to relaxing researcher-selected music 2. Control group standard care Music provided: compilation tape of (a) *Largo* by Bach, (b) *Largo* by Beethoven, (c) *Prelude to the afternoon of a Faun* by Debussy Number of sessions: 3 sessions on 3 consecutive days Length of session: 22 minutes Categorized as music medicine
Outcomes	Anxiety (STAI): posttest scores after the final session
Notes	Some participants stated that they didn't care for the music; 2 would have liked different music
Risk of bias	

Bolwerk 1990 *(Continued)*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Control was enhanced in the study by random assignment of subjects to two groups-experimental and control-using a table of random numbers" (p.67)
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	Blinding of the participants was not possible. Personnel were not blinded.
Blinding of outcome assessment (detection bias) Subjective outcomes	High risk	Self report measures were used for subjective outcomes
Blinding of outcome assessment (detection bias) Objective outcomes	Low risk	No objective outcomes were used.
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition rate: n = 5 (12.5%)
Selective reporting (reporting bias)	Unclear risk	Not sufficient information available to make judgment
Other bias	Low risk	No report of funding

Broscious 1999

Study characteristics	
Methods	RCT 3-arm parallel group design
Participants	Adult patients during chest tube removal (CTR) Total N randomized: 156 N randomized to music group: 70 N randomized to control group: 50 N randomized white noise group: 36 (not included in this review) N analyzed in music group: 62 N analyzed in control group: 44 N analyzed in white noise group: 36 (not included in this review) Sex: 35 (29%) women, 85 (71%) men Mean age: 66.35 (SD 9.7) years Ethnicity: 97% white Setting: Inpatient Country: USA

Broscious 1999 *(Continued)*

Interventions	Three study groups: 1. Music group: listening to self-selected music through earphones 2. Control group: standard care 3. White noise group; not used in this review Music provided: (a) Big Band, (b) Blues, (c) Classical, (d) Country & Western, (e) Easy Listening, (f) Gospel, (g) Movie musicals, (h) New Age, (i) Patriotic, (j) Rock Number of sessions: 1 Length of session: 10 minutes before procedure and throughout duration of procedure Categorized as music medicine
Outcomes	Pain (NRS): posttest scores immediately following CTR HR, SBP, DBP: posttest scores immediately following CTR
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: " Subjects were randomly assigned to groups by the primary investigator or research assistant who blindly drew a chip from a box containing 3 chips. The chips were labelled "C" for control group, "N" for noise group, and "M" for music group." (p.411)
Allocation concealment (selection bias)	Low risk	Quote: " Subjects were randomly assigned to groups by the primary investigator or research assistant who blindly drew a chip from a box containing 3 chips."
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Blinding of participants was not possible. Personnel were blinded:"the physician assistant or cardiovascular technician removing the chest tubes did not know which tape the patient was listening to."
Blinding of outcome assessment (detection bias) Subjective outcomes	High risk	Self report measures were used for subjective outcomes.
Blinding of outcome assessment (detection bias) Objective outcomes	Unclear risk	It is unclear whether outcome assessors were blinded.
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition rate: n = 14 (11.6%). Reason for withdrawal is not reported.
Selective reporting (reporting bias)	Unclear risk	Not sufficient information available to make judgment
Other bias	Low risk	Supported by a grant from the Epsilon Chi Chapter of Sigma Theta Tau International.

Cadigan 2001

Study characteristics	
Methods	RCT 2-arm parallel group design
Participants	Adult cardiac patients with either intravascular sheets or an intra-aortic balloon pump (IABP) in place. Total N randomized: 140 N randomized to music group: 75 N randomized to control group: 65 N analyzed in music group: 75 N analyzed in control group: 65 Sex: 40 (29%) women, 100 (71%) men Mean age: 62.25 (SD 12.7) years Ethnicity: not reported Setting: Inpatient Country: USA
Interventions	Two study groups: 1. Music group: listening to researcher-selected music through headphones 2. Control group: standard care Music provided: a mixture of symphonic music and nature sounds Number of sessions: 1 Length of session: 30 min Categorized as music medicine
Outcomes	Psychological distress (POMS-Short Form): posttest scores HR, SBP, DBP: posttest scores Pain (VAS): posttest scores Peripheral skin temperature:posttest scores
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "Patients were randomized to either the treatment or control group by means of a table of random numbers."(p.8)
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	Blinding of participants were not possible. Personnel were not blinded.
Blinding of outcome assessment (detection bias) Subjective outcomes	High risk	Self report measures were used for subjective outcomes.
Blinding of outcome assessment (detection bias)	Unclear risk	It is unclear whether outcome assessors were blinded.

Cadigan 2001 *(Continued)*
Objective outcomes

Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition rate: n = 10 (7%). Data on all randomized participants were obtained for physiological data but there was a loss of 10 subjects for the POMS data. No reason was reported.
Selective reporting (reporting bias)	Unclear risk	Not sufficient information available to make judgment
Other bias	Low risk	Supported by Eta Tau Chapter at Salem State College and Alpha Chi Chapter of Sigma Theta Tau International

Chan 2007

Study characteristics	
Methods	RCT 2-arm parallel group design
Participants	Adults with diagnosis of MI, acute coronary syndrome (ACS), or coronary artery disease (CAD), undergoing C-clamp procedure after percutaneous coronary intervention Total N randomized: 70 N randomized to music group: 35 N randomized to control group: 35 N analyzed in music group: 31 N analyzed in control group: 35 Mean age: no means given Sex: 18 (27%) women, 48 (73%) men Ethnicity: not reported Setting: inpatient Country: Hong Kong
Interventions	Two study groups: 1. Music group: listening to self-selected music during procedure through earphones 2. Control group: standard care Music provided: Western and Chinese slow, soft music without lyrics Number of sessions: 1 Length of session: approx. 45 mins Categorized as music medicine
Outcomes	HR, RR, SBP, DBP, oxygen saturation (O_2-sat): measured every 15 minutes; measurement at 45 minutes used for this review Pain (NRS): posttest
Notes	

Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**

Chan 2007 *(Continued)*

Random sequence generation (selection bias)	Low risk	Quote: " Participants were included in the study and, using a random digit generated by research randomizer, they were randomized into the music group or control group."(p.673)
Allocation concealment (selection bias)	High risk	Quote: "No method for concealment of allocation was used" (personal communication with author)
Blinding of participants and personnel (performance bias) All outcomes	High risk	Blinding was not possible for the participants. Personnel were not blinded.
Blinding of outcome assessment (detection bias) Subjective outcomes	High risk	Self report measures were used for subjective outcomes.
Blinding of outcome assessment (detection bias) Objective outcomes	High risk	Quote:"The intervention and data collection were carried out by the same researcher"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition rate: n = 4 (5.7%). 4 participants refused to continue.
Selective reporting (reporting bias)	Unclear risk	Not sufficient information available to make judgment
Other bias	Low risk	No reported funding

Cohen 1999

Study characteristics	
Methods	RCT 2-arm parallel group design
Participants	Adults with MI Total N randomized: 40 N randomized to music group: 20 N randomized to control group: 20 N analyzed in music group: 20 N analyzed in control group: 20 Mean age: 67.8 (SD 13.9) years Sex: 17 (43%) women, 23 (57%) men Ethnicity: 38 (95%) white, 2 (5%) other Setting: inpatient Country: USA
Interventions	Two study groups: 1. Music group: listening to self-selected music

Cohen 1999 *(Continued)*

	2. Control group: standard care Music provided: (a) New Age, (b) music from decades past, (c) contemporary solo instrumentalists, (d) religious, (e) classical Number of sessions: 1 Length of session: 30 min Categorized as music medicine
Outcomes	Anxiety (STAI): change scores HR, mean arterial pressure (MAP), SBP, DBP: change scores
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Subjects were then randomly assigned to the experimental or control groups by the researcher who drew from a box containing 20 slips of paper with "music" and 20 slips of paper with "rest" written on them" (p.66)
Allocation concealment (selection bias)	Low risk	Allocation concealment was ensured by draw of lots method
Blinding of participants and personnel (performance bias) All outcomes	High risk	Blinding of participant was not possible. Personnel were not blinded.
Blinding of outcome assessment (detection bias) Subjective outcomes	High risk	Self report measures were used for subjective outcomes
Blinding of outcome assessment (detection bias) Objective outcomes	High risk	Outcome assessors were not blinded
Incomplete outcome data (attrition bias) All outcomes	Low risk	No loss of subjects
Selective reporting (reporting bias)	Unclear risk	Not sufficient information available to make judgment
Other bias	Low risk	Unfunded research study

Cutshall 2011

Study characteristics

Methods	RCT 2-arm parallel group
Participants	Adults undergoing first-time CABG or cardiac valve surgery Total N randomized: 173

Cutshall 2011 *(Continued)*

	N randomized to music group: 86 N randomized to control group: 87 N analyzed in music group: 49 N analyzed in control group: 51 Mean age: 62.9 (SD 12.65) years Sex: 23 (23%) women, 77 (77%) men Ethnicity: not reported Setting: inpatient Country: USA
Interventions	Two study groups: 1. Music group: listening to prerecorded music combined with nature sounds 2. Control group: 20 minutes of bed rest Music provided: participants were given the choice of four selections of music and nature sounds Number of sessions: 6 Duration of each session: 20 minutes Categorized as music medicine
Outcomes	Pain (VAS): change scores Anxiety (VAS): change scores Satisfaction (VAS): change scores Relaxation (VAS): change scores HR, SBP, DBP: change scores
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Stratification for randomization was based on a pain level of 4 or less (the institutional pain level goal) or greater than 4. The randomization was blocked to ensure balanced allocation throughout the course of the study. There were 25 randomized blocks of 4 patients and 25 randomized blocks of 2 patients. Each set of 50 blocks was changed into a random order as well." (p.17)
Allocation concealment (selection bias)	Low risk	Quote: "The use of cards in sealed envelopes prevented the study coordinator who was enrolling patients from knowing to which group each patient was randomly assigned." (p.17)
Blinding of participants and personnel (performance bias) All outcomes	High risk	Blinding of participants was not possible. Personnel were not blinded.
Blinding of outcome assessment (detection bias) Subjective outcomes	High risk	Quote: "The study coordinator read to the patient a printed script and obtained measurements of pain, anxiety, satisfaction, and relaxation orally with a visual analog scale (VAS)." (p.18)

Cutshall 2011 *(Continued)*

Blinding of outcome assessment (detection bias) Objective outcomes	High risk	Study coordinator obtained the measurements
Incomplete outcome data (attrition bias) All outcomes	High risk	Attrition rate = 73 (42%). Reasons for withdrawal were not reported. The report states that recruitment continued until 100 participants had completed all six sessions
Selective reporting (reporting bias)	Unclear risk	Not sufficient information available to make judgment
Other bias	Low risk	The prerecorded music used in this study was donated by Ambience Medical and the study was funded in part by Richer J and Sharon M Mrocek.

Davis-Rollans 1987

Study characteristics	
Methods	RCT Cross-over trial
Participants	Adults in coronary care unit (CCU) with diagnosis of MI or other cardiac condition Total N randomized: not reported Total N analyzed: 24 Mean age: 62 years Sex: 5 (21%) women, 19 (79%) men Ethnicity: not reported Setting: Inpatient Country: USA
Interventions	Two study groups: 1. Music group: listening to researcher-selected music through headphones 2. Congrol group: background CCU noise as heard through silent headphones Music provided: compilation tape of *Symphony No. 6*, first movement (Beethoven), *Eine Kleine Nachtmusik*, first and fourth movements (Mozart), and *The Moldau* (Smetana) Number of sessions: 1 Length of session: 37 min Categorized as music medicine
Outcomes	HR: during session Number of arrhythmias Mood change: not used in this review due to insufficient data RR: not used in this review due to insufficient data
Notes	

Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**

Davis-Rollans 1987 *(Continued)*

Random sequence generation (selection bias)	Low risk	Quote: "With the use of Latin square design, the three musical selections (A, B, C) were randomly assigned to be presented to the patients in one of three different orders: A, B, C; C, A, B: and B, C, A." (p.372)
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	Blinding of participants was not possible. Personnel were not blinded
Blinding of outcome assessment (detection bias) Subjective outcomes	Low risk	Data for one subjective outcome were obtained but not used in this review because insufficient
Blinding of outcome assessment (detection bias) Objective outcomes	Low risk	Outcome assessor was blinded. Control group participants wore a headset
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not reported
Selective reporting (reporting bias)	Unclear risk	Not sufficient information available to make judgment
Other bias	Low risk	No report of funding

Elliott 1994

Study characteristics	
Methods	RCT 2-arm parallel group design
Participants	Adults with unstable angina pectoris or acute MI Total N randomized: unclear N randomized to music group: unclear N randomized to control group: unclear N randomized to muscle relaxation group: unclear (not included in this review) N analyzed in music group:19 N analyzed in control group:19 N analyzed in muscle relaxation group: 18 (not included in this review) Mean age: 60.6 years Sex: 16 (29%) women, 40 (71%) men for total sample (including muscle relaxation group) Ethnicity: all participants were Australian but no further information is provided Setting: Inpatient Country: Australia
Interventions	Two study groups:

Elliott 1994 *(Continued)*

	1. Music group: listening to researcher-selected music via earphones 2. Control group: standard care. Music provided: light classical music relaxation tape designed by Bonny. Number of sessions: 2 or 3 Length of session: 30 min. Categorized as music medicine
Outcomes	Anxiety (STAI): posttest Anxiety (LAAS): posttest Depression (HADS D-subscale): posttestHR, SBP, DBP: not used in this review because for many participants measurements were only taken 2 - 3 hrs after the intervention.
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Table of random numbers (personal communication with author)
Allocation concealment (selection bias)	Low risk	Serially numbered opaque envelopes (personal communication with author)
Blinding of participants and personnel (performance bias) All outcomes	High risk	Blinding of participants was not possible. Personnel were not blinded
Blinding of outcome assessment (detection bias) Subjective outcomes	High risk	Self report measures were used for subjective outcomes
Blinding of outcome assessment (detection bias) Objective outcomes	High risk	Outcome assessors were not blinded
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not reported
Selective reporting (reporting bias)	Unclear risk	Not sufficient information available to make judgment
Other bias	Low risk	Supported in part by a Cumberland College Research Grant

Emery 2003

Study characteristics

Methods	RCT Cross-over trial
Participants	Adults with CAD enrolled in standard university-based 12-week Phase II CR program. Total N randomized: 33

Emery 2003 *(Continued)*

	Total N analyzed: 30 Mean age: 62.6 (SD 10.5) years Sex: 14 (42%) women, 19 (58%) men Ethnicity: 27 (93%) white, 2 (7%) African-American Setting: outpatient university-based CR program Country: USA
Interventions	Two study groups: 1. Music group: listening to researcher-selected music through earphones 2. Congrol group: listening to a blank tape through earphones Music used: *Four Seasons* (Vivaldi) Number of sessions: 1 music listening and 1 blank tape Length of session: as long as possible for the participant Categorized as music medicine
Outcomes	Anxiety (POMS-SF, tension subscale): posttest Depression (POMS-SF, depression subscale): posttest HR, SBP, DBP: peak exercise Cognitive function (verbal fluency test): posttest Exercise time (mins)
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	List of random numbers (personal communication with author)
Allocation concealment (selection bias)	Low risk	Recruiters were concealed to random sequence (personal communication with author)
Blinding of participants and personnel (performance bias) All outcomes	High risk	Blinding of participants was not possible. Personnel were not blinded
Blinding of outcome assessment (detection bias) Subjective outcomes	High risk	Self report measures were used for subjective outcomes
Blinding of outcome assessment (detection bias) Objective outcomes	Low risk	Outcome assessors were blinded (personal communication with author)
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition rate: n = 3 (9%)
Selective reporting (reporting bias)	Unclear risk	Not sufficient information available to make judgment
Other bias	Low risk	Supported in part by a grant from the National Heart, Lung, and Blood Institute (HL45290).

Hermele 2005

Study characteristics	
Methods	RCT 3-arm parallel group design
Participants	Adult patients during CABG Total N randomized: 117 consented but only 63 were randomized (47 did not complete baseline and 7 did not have CABG) N randomized to music group: 21 assumed (not reported) N randomized to control group: 21 assumed (not reported) N randomized to guided imagery group: 21 assumed (not reported) N analyzed in music group: 17 N analyzed in control group: 19 N analyzed in guided imagery: 20 (not included in this review) Mean age: none reported Sex: 17 (30%) women, 39 (70%) men for total sample (including guided imagery group) Ethnicity: 51 (91.1%) white, 1 (1.8%) African-American, 3 (5.4%) Hispanic, 1 (1.8%) Asian Setting: inpatient Country: USA
Interventions	Two study groups: 1. Music group: listening to researcher-selected music 2. Control group: standard care Music provided: no specifications Number of sessions: daily for one week prior to CABG, during the procedure Length of session: determined by the participant Categorized as music medicine
Outcomes	Anxiety (HADS, anxiety scale): 1 week postop Depression (HADS, depression scale): 1 week postoperatively Mood disturbance (POMS): 1 week postoperatively
Notes	

Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Drawing of lots (personal communication with author)
Allocation concealment (selection bias)	High risk	None used (personal communication with author)
Blinding of participants and personnel (performance bias) All outcomes	High risk	Blinding of participants was not possible. Personnel were not blinded

Hermele 2005 *(Continued)*

Blinding of outcome assessment (detection bias) Subjective outcomes	High risk	Self report measures were used for subjective outcomes
Blinding of outcome assessment (detection bias) Objective outcomes	Low risk	No objective outcomes were included in this study
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition rate: N = 6 (9.5%). 6 participants did not complete posttest.
Selective reporting (reporting bias)	Unclear risk	Not sufficient information available to make judgment
Other bias	Low risk	Unfunded research study

Jafari 2012

Study characteristics	
Methods	RCT 2-arm parallel group design
Participants	Adults who had undergone first-time CABG and valvular surgery Total N randomized: 60 N randomized to music group: 30 N randomized to control group: 30 N analyzed in music group: 30 N analyzed in control group: 30 Mean age: 57.83 (SD 10.62) years Sex: 30 (50%) women, 30 (50%) men Ethnicity: not reported Setting: Inpatient Country: Iran
Interventions	Two study groups: 1. Music group: participants listened to one pre-recorded selection of music 2. Control group: participants were provided headphones with no music Music provided: participants selected their music after listening to one-minute previews of each music option. Relaxation music pieces were selected with consideration for the cultural conditions of the society and the type of recommended music in the literature, i.e. with a tempo of 60 - 80 beats (or even less) per minute Number of sessions: 1

Jafari 2012 *(Continued)*

	Length of sessions: 30 minutes Categorized as music medicine
Outcomes	Pain (0 - 10 NRS): immediately postintervention (used in this review), 30 min after intervention, 1 hr after intervention
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Drawing of lots (personal communication with author)
Allocation concealment (selection bias)	Low risk	Drawing of lots concealed allocation
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Blinding of participants was not possible. Personnel were blinded
Blinding of outcome assessment (detection bias) Subjective outcomes	High risk	Self reports were used for subjective outcomes
Blinding of outcome assessment (detection bias) Objective outcomes	Low risk	This study did not address objective outcomes
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition rate: 0 (0%) Quote: "All randomized patients were included in the analysis and there were no drop outs" (p.3)
Selective reporting (reporting bias)	Unclear risk	Not sufficient information available to make judgment
Other bias	Low risk	Funding for this study was provided by the Research Deputy and Student Research Committee of Mazandaran University of Medical Sciences

Leist 2011

Study characteristics

Methods	RCT 2-arm parallel group design
Participants	Adults who had a heart attack or a heart condition or both, including coronary heart disease, angina, valve disease, or arrhythmia, and had a heart procedure or surgery, including CABG, surgery or percutaneous transluminal coronary angioplasty (PTCA) with stenting, a valve replacement, or placement of a pacemaker or implantable cardioverter defibrillator (ICD) Total N randomized: 10

Leist 2011 *(Continued)*

	N randomized in music therapy group: 5 N randomized on control group: 5 N analyzed in music therapy group: 4 N analyzed in control group: 5 Mean age: 68 years Sex: 5 (56%) women, 4 (44%) men Ethnicity: 39 (100%) white (Italian) Setting: a group meeting room in a neutral non-medical setting Country: USA
Interventions	Two study groups: 1. Music therapy group: each session had an opening, music-assisted relaxation (MAR), active music therapy, and a closing. 2. Control group: standard care (wait-list control) Music provided: the active music-making component included song lyric analysis, expressive singing, songwriting, and instrumental improvisation. Instrumental music selections were drawn from the classical and new age genres. The selections had tempi of 60 to 70 beats per minute, were 3 to 6 minutes in length, and had consistent tempo, dynamics, and instrumentation. The selections gradually increased in length and complexity as the sessions progressed and then ended with a shorter, less complex selection for the last session. The relaxation scripts included autogenic and image-based inductions Number of sessions: 6 weekly sessions over 6 weeks Length of sessions: not reported Categorized as music therapy
Outcomes	Stress (Hassles Scale): posttest scores Anxiety (POMS): posttest scores Depression (POMS): posttest scores Mood disturbance (POMS): change scores Anger-Hostility (POMS): posttest scores Vigor-Activity (POMS): posttest scores
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Each person was given a number between 1 and 10. Using a random number generator (Haahr, n.d.), the investigator assigned each person to one of the groups. A coin toss determined that the first five numbers would comprise the experimental group and the last five numbers would comprise the comparison group." (p.51)

Leist 2011 *(Continued)*

Allocation concealment (selection bias)	Low risk	Allocation was concealed through both the drawing of lots and flip of a coin
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Participants and personnel were unable to be blinded due to the interactive nature of the music therapy session
Blinding of outcome assessment (detection bias) Subjective outcomes	High risk	Self report measures were used for subjective outcomes
Blinding of outcome assessment (detection bias) Objective outcomes	Low risk	This study did not address objective outcomes
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition rate: n = 1 (10%) One participant attended only one treatment session.
Selective reporting (reporting bias)	Unclear risk	Not sufficient information available to make judgment
Other bias	Low risk	Unfunded research study

Mandel 2007a

Study characteristics	
Methods	RCT 2-arm parallel group design
Participants	Adults in phase II cardiac rehabilitation program Total N randomized: 103 Randomized to music group: 55 Randomized to control group: 48 N analyzed in music therapy group: 35 N analyzed in control group: 33 Age: music therapy group: median age 65; control group: median age 64 Sex: 34 (50%) women, 34 (50%) men Ethnicity: not reported Setting: Rehabilitation setting Country: USA
Interventions	Two study groups: 1. Music therapy group: standard care + one music therapy session every other week with a min of 4 music therapy session (max. 6 sessions) 2. Control group: standard care alone Music provided: live vocal music to stimulate discussion and offer verbal support, live music making with assorted instruments, song lyric writing, song lyric interpretation, sharing musical recordings, music-assisted relaxation and imagery. Number of sessions: min of 4 music therapy sessions, max. 6

Mandel 2007a *(Continued)*

	Duration of session: 90 mins. Categorized as music therapy
Outcomes	Trait anxiety (STAI-T): posttest scores Depression (CES-D): posttest scores Distress (BSI): posttest scores General health (MOS SF-36): posttest scores Bodily pain (MOS SF-36): posttest scores SBP, DBP: posttest scores
Notes	Follow-up measures were taken at 1 month, 4 months, and 10 months. These were not included in this review.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Patients' research study numbers (last 4 digits of their social security number) were recorded by the research assistant. A random-number table was utilized by the hospital's research department staff to assign participants to condition one or two, based on their study number" (p.180).
Allocation concealment (selection bias)	Low risk	Central randomization was used
Blinding of participants and personnel (performance bias) All outcomes	Low risk	In music therapy trials, participants and the music therapist cannot be blinding because of the active participation in music making
Blinding of outcome assessment (detection bias) Subjective outcomes	High risk	Self report measures were used for subjective outcomes
Blinding of outcome assessment (detection bias) Objective outcomes	Unclear risk	Not reported
Incomplete outcome data (attrition bias) All outcomes	High risk	Attrition: n = 35 (34%). Reasons for participant loss: illness, non-compliance, music therapist's leave of absence
Selective reporting (reporting bias)	Unclear risk	Not sufficient information available to make judgment
Other bias	Low risk	Supported by a grant from the Kulas Foundation, Cleveland OH

Murrock 2002

Study characteristics

Methods	RCT 2-arm parallel group design
Participants	Adults enrolled in cardiac rehab Phase II program after having undergone their 1st CABG Total N randomized: 33

Murrock 2002 *(Continued)*

	N randomized to music group: unclear N randomized to control group: unclear N analyzed in music group: 15 N analyzed in control group:15 Mean age: 70.43 years Sex: 13 (43%) women, 17 (57%) men Ethnicity: not reported Setting: rehab setting Country: USA
Interventions	Two study groups: 1. Music group: listening to researcher-selected music during exercise session 2. Control group: standard care Music provided: *Hooked on Classics* by Louis Clark and the Royal Philharmonic Orchestra (upbeat tempo of 128 to 160 bpm) Number of sessions: 10 sessions Length of session: 40 min Categorized as music medicine
Outcomes	Mood (Rejeski's Feeling scale; +5 to -5): posttest (during 10th session) Rate of perceived exertion (Borg scale; 12-point scale): posttest (during 10th session)
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Drawing of lots (personal communication with author)
Allocation concealment (selection bias)	Low risk	Drawing of lots prevented knowledge of randomization sequence (personal communication with author)
Blinding of participants and personnel (performance bias) All outcomes	High risk	Blinding of participants was not possible. Personnel were blinded
Blinding of outcome assessment (detection bias) Subjective outcomes	High risk	Self report was used for subjective measures
Blinding of outcome assessment (detection bias) Objective outcomes	Low risk	No objective outcomes included in this study
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition: n = 3 (9%). No reason for participant loss is given
Selective reporting (reporting bias)	Unclear risk	Not sufficient information available to make judgment

Murrock 2002 *(Continued)*

Other bias	Unclear risk	Unfunded research study

Nilsson 2009a

Study characteristics	
Methods	RCT 2-arm parallel group design
Participants	Adults who underwent CABG or aortic valve replacement Total N randomized: 60 N randomized to music group: 30 N randomized to control group: 30 N analyzed in music group: 28 N analyzed in control group: 30 Mean age: 62 (SD 9.5) years Sex: 13 (22%) women, 47 (78%) men Ethnicity: not reported Setting: inpatient Country: Sweden
Interventions	Two study groups: 1. Music group: participants listened to pre-recorded music through a music pillow on their first post-operative day 2. Control group: provided a space for rest with reduced environmental stimuli Music provided: Quote from study report (p. 203): "The music was soft and relaxing, 60 to 80 beats per minute, included different melodies in new-age style for 30 minutes, and played with a volume of 50 to 60 dB". Number of sessions: 1 Length of sessions: 30 minutes Categorized as music medicine
Outcomes	HR: change scores RR, MAP, O_2-sat: posttest scores S-Cortisol: change scores Not used: Anxiety (NRS): not included in this review since range of scores but no SDs were reported. Pain (NRS): not included in this review since range of scores but no SDs were reported.

Nilsson 2009a *(Continued)*

Notes

Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "The patients were randomly allocated to 2 groups, 1 music group and 1 control group, using a computer-generated randomization list created by the statistician" (p. 202).
Allocation concealment (selection bias)	Low risk	Quote: "Three special research nurses allocated the next available number on entry into the trial and conducted all interventions and outcome assessments. The code was revealed to the re- searcher once recruitment, data collection, and laboratory analyses were complete" (p.202)
Blinding of participants and personnel (performance bias) All outcomes	High risk	Blinding of participants was not possible. Personnel were not blinded.
Blinding of outcome assessment (detection bias) Subjective outcomes	High risk	Self report measures were used for subjective outcomes
Blinding of outcome assessment (detection bias) Objective outcomes	High risk	Outcome assessors were not blinded. However, low risk of bias for blood serum cortisol levels as lab technicians were blinded.
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition rate: n = 2 (3.3%). Quote: "Two of those patients, who gave informed consent to participate in the music group, were excluded because of chest pain and the drainage procedure" (p. 203).
Selective reporting (reporting bias)	Unclear risk	Not sufficient information available to make judgment
Other bias	Low risk	Funding for this study was provided by grants received from the Research Committee of Orebro County Council.

Ryu 2011

Study characteristics	
Methods	RCT 2-arm parallel group design
Participants	Adults with confirmed CAD diagnosis undergoing percutaneous transluminal coronary angiography procedures Total N randomized: 60 N randomized to music group: 30 N randomized to control group: 30 N analyzed in music group: 29

Ryu 2011 *(Continued)*

	N analyzed in control group: 29 Mean age: 61.2 years Sex: 20 (34%) women, 38 (66%) men Ethnicity: no information provided Setting: inpatient Country: South Korea
Interventions	Two study groups: 1. Music group: participants listened to sleep-inducing music from 10:00 pm to 5:00 am the next morning 2. Control group: ear plugs were provided from 10:00 pm to 5:00 am the next morning Music provided: the sleep-inducing album entitled *Korean's Brain, Delta wave Clinic Vol 1*. by KK Park which included sequencing of nature sounds, delta wave control music, and *Goldberg Variations* BWV. 988 Number of sessions: 1 Length of sessions: 30 minutes Categorized as music medicine
Outcomes	Quantity of sleep (min) Quality of sleep (Verran and Synder-Halpern Sleeping Scale)
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "The 60 participants were randomly assigned to experimental group or control group using a card number. The participants having an even number were assigned to the experimental group, and those with an odd number were assigned to the control group". (p.730)
Allocation concealment (selection bias)	Low risk	Allocation was concealed by having participants draw the card number
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Blinding of participants was not possible. Personnel were not blinded.
Blinding of outcome assessment (detection bias) Subjective outcomes	High risk	Self report measures were used for subjective outcomes
Blinding of outcome assessment (detection bias) Objective outcomes	Low risk	Quote: "The research assistants were nurses having more than two years of experience in the CCU and who were blinded to which subject was assigned to the experimental group or the control group" (p.731)

Ryu 2011 *(Continued)*

Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition rate: n = 2 (3.3%) One participant in the experimental group was excluded for having taken a sleep-inducing drug taken, and one participant in the control group was transferred to another unit
Selective reporting (reporting bias)	Unclear risk	Not sufficient information available to make judgment
Other bias	Low risk	No report of funding

Schou 2008

Study characteristics	
Methods	RCT 2-arm parallel group design
Participants	Adults, valve replacement or valve replacement and CABG Total N randomized: 68 N randomized to music therapy group:25 N randomized to placebo group: 23 (not used in this review) N randomized to control group: 20 N analyzed in music therapy group: 22 N analyzed in control group: 19 N randomized in placebo group: 22 Mean age: 65 (SD 9.5) years Sex: 14 (21%) women, 54 (79%) men Ethnicity: not reported Setting: inpatient Country: Denmark
Interventions	Two study groups: 1. Music therapy group: music-guided relaxation 2. Control group: standard care Music provided: (a) Easy listening, (b) classical, (c) specially composed (musicure), (d) jazz Number of sessions: 1 pre-operative session and up to 4 postoperative sessions (most participants received 2 postop sessions) Duration of session: 35 mins Categorized as music therapy
Outcomes	Anxiety (VAS): posttest 2nd postop session Mood (POMS): posttest 2nd postop session Pain (VAS): posttest 2nd postop session

Schou 2008 *(Continued)*

	Use of strong opioids (mg): on day of 2nd session
	Use of mild opioids (mg): on day of 2nd session
	Use of paracetamol (gram): on day of 2nd session
	Length of hospital stay
Notes	Most participants only received 2 sessions postoperatively. Therefore, data of the 2nd postop sessions was used for this analysis

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Random block
Allocation concealment (selection bias)	Low risk	Use of codes as group labels, recruiters did not know what group the codes identified (personal communication with author)
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Music therapist and participants could not be blinded given the interactive nature of the music therapy session
Blinding of outcome assessment (detection bias) Subjective outcomes	Unclear risk	Self report measures were used for subjective outcomes
Blinding of outcome assessment (detection bias) Objective outcomes	Unclear risk	Not reported
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition: n = 4 (8.8%). Withdrawals due to early discharge.
Selective reporting (reporting bias)	Unclear risk	Not sufficient information available to make judgment
Other bias	Low risk	Unfunded research study

Sendelbach 2006

Study characteristics

Methods	RCT 2-arm parallel group design
Participants	Adults following non-emergent CAB and/or valve replacement surgery Total N randomized: not reported
	N randomized to music group: unclear
	N randomized to control group: unclear
	N analyzed in music group: 50

Sendelbach 2006 *(Continued)*

	N analyzed in control group: 36 Mean age: 63.5 years Sex: 26 (30%) women, 60 (70%) men Ethnicity: not reported Setting: inpatient Country: USA
Interventions	Two study groups: 1. Music group: listening to self-selected sedative music through earphones 2. Control group: standard care Music selections provided: (a) easy listening, (b) classical, (c) jazz Number of sessions: 2 sessions/day for POD 1 through 3 Length of session: 20 mins Categorized as music medicine
Outcomes	Anxiety (STAI): 6 measurement points. Due to high number of missing values, only posttests POD1 am, POD1 pm and POD2 am were used in research report HR and SBP: 6 measurement points. Due to high number of missing values, only posttest POD1 am, POD1 pm and POD2 am were used in research report Pain (NRS): 6 measurement points. Due to high number of missing values, only posttests POD1 am, POD1 pm and POD2 am were used in research report
Notes	N is highly variable due to high number of missing data

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Flip of coin
Allocation concealment (selection bias)	Low risk	Flip of coin prevented prior knowledge of randomization sequence
Blinding of participants and personnel (performance bias) All outcomes	High risk	Blinding of participants was not possible. Personnel were not blinded.
Blinding of outcome assessment (detection bias) Subjective outcomes	High risk	Self report measures were used for subjective outcomes
Blinding of outcome assessment (detection bias) Objective outcomes	High risk	Outcome assessors were not blinded
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not reported
Selective reporting (reporting bias)	Unclear risk	Not sufficient information available to make judgment

Sendelbach 2006 *(Continued)*

Other bias	Low risk	Supported by a grant from the Allina Foundation Nursing Research Trust Fund.

Stein 2010

Study characteristics	
Methods	RCT 3-arm parallel group design
Participants	Adults awaiting CABG surgery or CABG plus aortic valve repair or replacement Total N randomized: 70 N randomized to music group: unclear N randomized to guided imagery: unclear (not used in this review) N randomized to control group: unclear N analyzed in music group: 17 N analyzed in control group: 19 N analyzed in guided imagery: 20 (not included in this review) Mean age: no information provided Sex: 8 (22%) women, 28 (78%) men Ethnicity: 36 (92%) white, 1 (3%) African-American, 2 (5%) Hispanic Setting: inpatient and outpatient Country: USA
Interventions	Two study groups: 1. Music group: participants listened to audiotapes at least once a day, every day, for 1 week before surgery. Participants were also asked to listen to their tapes intraoperatively 2. Control group: standard care which included access to CAM therapies, including audiotapes, upon request Music provided: *Successful Surgery* by Belleruth Naparstek without the pre-recorded voice-over providing imagery and affirmations Number of sessions: Varied Length of sessions: Varied Categorized as music medicine
Outcomes	Anxiety (HADS - anxiety subscale): change scores Depression (HADS - depression subscale): change scores Mood disturbance (POMS): posttest scores
Notes	

Stein 2010 *(Continued)*

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "patients were randomly assigned via a coin toss" (p.215)
Allocation concealment (selection bias)	Low risk	Coin toss
Blinding of participants and personnel (performance bias) All outcomes	High risk	Music was self-administered at home after participants filled out baseline measurements
Blinding of outcome assessment (detection bias) Subjective outcomes	High risk	Self report measures were used for subjective outcomes
Blinding of outcome assessment (detection bias) Objective outcomes	Low risk	No objective outcomes were included in this study
Incomplete outcome data (attrition bias) All outcomes	Low risk	Unclear how many participants were lost in the music and the control groups. In total (for 3 groups), 14 (20%) participants were lost. Reasons: 7 participants did not undergo CABG procedures or were transferred to another hospital; 7 did not complete the posttest.
Selective reporting (reporting bias)	Unclear risk	Not sufficient information available to make judgment
Other bias	Low risk	Funding for this study was provided by the Foundation for the Advancement of Cardiac Therapies.

Voss 2004

Study characteristics

Methods	RCT 2-arm parallel group design
Participants	Adults in ICU after CABG Total N randomized: 62 N randomized to music group: 20 N randomized to scheduled rest group: 21 (not included in this review) N randomized to control group: 21 N analyzed in music group: 19 N analyzed in scheduled rest: 21 (not included in this review) N analyzed in control group: 21 Mean age: 63 (SD 13) years Sex: 22 (36%) women, 39 (64%) men Ethnicity: 53 (87%) white, 8 (13%) American-Indian

Voss 2004 *(Continued)*

	Setting: inpatient Country: USA
Interventions	Two study groups: 1. Music group: listening to self-selected sedative music through earphones 2. Control group: standard care during chair rest. Music provided: (a) synthesizer music, (b) harp, (c) piano, (d) orchestra, (e) slow jazz, (f) flute. All music was without lyrics with sustained melodic quality, with a rate of 60 - 80 bpm and a general absence of strong rhythms or percussion Number of sessions: 1 Length of session: 30 mins Categorized as music medicine
Outcomes	Anxiety (VAS): posttest Pain sensation (VAS): posttest Pain distress (VAS): posttest
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Written informed consent was obtained, and participants were randomly assigned to the sedative music, scheduled rest, or control group using sealed envelopes with a varied block size prepared by the statistician. The investigator was blind to the block size and could not anticipate group assignment" (p.198)
Allocation concealment (selection bias)	Low risk	Serially numbered opaque sealed envelopes
Blinding of participants and personnel (performance bias) All outcomes	High risk	Blinding of participants was not possible. Personnel were not blinded
Blinding of outcome assessment (detection bias) Subjective outcomes	High risk	Self report measures were used for subjective outcomes
Blinding of outcome assessment (detection bias) Objective outcomes	High risk	Investigator measured objective outcomes
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition: n = 1 (2.4%). One participant was deleted from analysis because of extreme scores (outlier)
Selective reporting (reporting bias)	Unclear risk	Not sufficient information available to make judgment
Other bias	Low risk	Supported by Sigma Theta Tau Phi Chapter Research Grant, 2001–2002

White 1992

Study characteristics	
Methods	RCT 2-arm parallel group design
Participants	Adults with confirmed diagnosis of MI, with STAI scores > 40 Total N randomized: 40 N randomized to music group: 20 N randomized to control group: 20 N analyzed in music group: 20 N analyzed in control group: 20 Mean age: 57.7 (SD 7.57) years Sex: 11 (28%) women, 29 (72%) men Ethnicity: 36 (90%) white, 4 (10%) African-American Setting: inpatient Country: USA
Interventions	Two study groups: 1. Music group: listening to researcher-selected music through earphones 2. Control group: quiet, uninterrupted rest Music provided: 4 classical adagios, tempo of approx. 60 bpm Number of sessions: 1 Length of session: 25 min Categorized as music medicine
Outcomes	Anxiety (STAI): posttest scores HR, RR: posttest scores
Notes	

Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer-generated random number list (personal communication with author)
Allocation concealment (selection bias)	Low risk	Study recruiters were blind to allocation (personal communication with author)
Blinding of participants and personnel (performance bias) All outcomes	High risk	Blinding of participants was not possible. Personnel were not blinded
Blinding of outcome assessment (detection bias) Subjective outcomes	High risk	Self report measures were used for subjective outcomes
Blinding of outcome assessment (detection bias) Objective outcomes	High risk	Outcome assessors were not blinded

White 1992 *(Continued)*

Incomplete outcome data (attrition bias) All outcomes	Low risk	No participant loss
Selective reporting (reporting bias)	Unclear risk	Not sufficient information available to make judgment
Other bias	Unclear risk	Unfunded research study

White 1999

Study characteristics	
Methods	RCT 3-arm parallel group design
Participants	Adults with confirmed diagnosis of MI Total N randomized:45 N randomized to music group: 15 N randomized to control group: 15 N randomized to quiet rest group: 15 (not included in this review) N analyzed in music group: 15 N analyzed in control group:15 Mean age: 63 years Sex: 7 (23%) women, 23 (67%) men Ethnicity: 23 (76.6%) white, 6 (20%) African-American, 1 (3.4%) Hispanic Setting: inpatient Country: USA
Interventions	Two study groups: 1. Music group: listening to researcher-selected music through earphones 2. Control group: standard care Music used: classical music (no further specifications) Number of sessions: 1 Length of session: 20 mins Categorized as music medicine
Outcomes	Anxiety (STAI): posttest HR, RR, SBP: posttest High frequency heart rate variability (HF HRV) (variability power)
Notes	

Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer-generated random number list (personal communication with author)

White 1999 *(Continued)*

Allocation concealment (selection bias)	Low risk	Study recruiters were blind to allocation (personal communication with author)
Blinding of participants and personnel (performance bias) All outcomes	High risk	Blinding of participants was not possible. Personnel were not blinded
Blinding of outcome assessment (detection bias) Subjective outcomes	High risk	Self report measures were used for subjective outcomes
Blinding of outcome assessment (detection bias) Objective outcomes	High risk	Outcome assessors were not blinded
Incomplete outcome data (attrition bias) All outcomes	Low risk	No participant loss
Selective reporting (reporting bias)	Unclear risk	Not sufficient information available to make judgment
Other bias	Low risk	Supported in part by NSRA F 31; Marquette Medical Systems, Inc,; and Eta Nu Chapter of the Sigma Theta Tau International.

Winters 2005

Study characteristics	
Methods	RCT 6-arm parallel group design
Participants	Adults less than 72 hrs post-MI Total N randomized: 184 N randomized to music group who received 1 session (am): unclear N randomized to music group who received 2 sessions (am and pm):unclear N randomized to music group who received 2 sessions (am and noc):unclear N randomized to music group who received 3 sessions (am, pm, noc): unclear N randomized to standard care control group: unclear N randomized to quiet rest group: unclear (not included in this review) N analyzed in standard care group (N = 30) N analyzed in quiet rest group (N = 29) N analyzed in music listening group, 1 session in am (N = 30) N analyzed in music listening group, 2 sessions, am and pm (N = 30) N analyzed in music listening group, 2 sessions, am and noc (N = 30)

Winters 2005 *(Continued)*

	N analyzed in music listening group, 3 sessions, am, pm, and noc (N = 30). Sex: 38 (64%) women, 22 (36%) men Age: no age data reported Etnicity: 117 (63.7%) white, 60 (32.4%) African-American, 4 (2.2%) Asian, 1 (0.6%) Native American, 2 (1.1%) unknown (ethnicity per arm was not reported) Setting: inpatient Country: USA
Interventions	Six study groups: (1) standard care group (N = 30), (2) quiet rest group (N = 29), (3) music listening group, 1 session in am (N = 30), (4) music listening group, 2 sessions, am and pm (N = 30), (5) music listening group, 2 sessions, am and noc (N = 30), and (6) music listening group, 3 sessions, am, pm, and noc (N = 30). Music used: patient-selected relaxing music Number of sessions: 3 (only data of group 6 compared to group 1 was used for this analysis) Duration of session: 20 minutes Categorized as music medicine study.
Outcomes	Anxiety (STAI): change scores HR, RR, SBP, HF HRV (variability power), myocardial oxygen (MVO_2) demand: change scores
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated random number list (personal communication with author)
Allocation concealment (selection bias)	Low risk	Study recruiters were blind to allocation (personal communication with author)
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Blinding of participants was not possible. Personnel were not blinded
Blinding of outcome assessment (detection bias) Subjective outcomes	Unclear risk	Self report measures were used for subjective outcomes
Blinding of outcome assessment (detection bias) Objective outcomes	Unclear risk	Outcome assessors were not blinded
Incomplete outcome data (attrition bias) All outcomes	Low risk	For all study arms combined, there was an attrition of n = 5 (2.7%). Reasons: 2 because of delirium tremors, 3 because of extensive periods of atrial fibrillation.
Selective reporting (reporting bias)	Unclear risk	Not sufficient information available to make judgment

Winters 2005 *(Continued)*

Other bias	Low risk	Supported by NINR 5R01NR005004-06

ACS: acute coronary syndrome; BSI: Brief Symptom Inventory; CABG: coronary artery bypass graft; CAD: coronary artery disease; CAM: complementary and alternative medicine ;CCU: coronary care unit; CES-D: Center for Epidemiological Studies Depression Scale; CR: cardiac rehabilitation; DBP: diastolic blood pressure; ECG: electrocardiogram; HADS: Hospital Anxiety and Depression Scale; HR: heart rate; ICU: intensive care unit; LAAS: Linear Analogue Anxiety Scale; MI: myocardial infarction; mg: milligram; MPQ: McGill Pain Questionnaire; NRS: Numeric Rating Scale, POD: post-operative days; POMS: Profile of Mood States; POMS-SF: Profile of Mood States Short Form; POD: post-operative day; RCT: randomized controlled trial; RR: respiratory rate; SBP: systolic blood pressure; SD: standard deviation; STAI: Spielberger State-Trait Anxiety Inventory; STAI-S: Spielberger State-Trait Anxiety Inventory State Anxiety form; STAI-T:Spielberger State-Trait Anxiety Inventory Trait Anxiety form; VAS; Visual Analogue Scale; VRS: Verbal Rating Scale.

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Aragon 2002	Not a randomized controlled trial
Argstatter 2006	This study was included in the original review but is now excluded because not all participants had confirmed CHD
Bally 2003	Not all participants had confirmed CHD
Bonny 1983	Not a randomized controlled trial. Pretest-posttest single group design
Byers 1997	Not a randomized controlled trial
Chang 2011	Not all participants had confirmed CHD
Claire 1986	Not a randomized controlled trial
Diamandi 2008	No standard care control group. Study compared music therapy with music listening
Dritsas 2006	Insufficient data available
Escher 1996	Insufficient data available
Garcia 2003	Not a randomized controlled trial
Ghetti 2011	Not all participants had confirmed CHD
Goertz 2011	Not all participants had confirmed CHD
Guzzetta 1989	This study was included in the original review but is now excluded because not all participants had confirmed CHD
Hamel 2001	Not all participants had confirmed CHD
Harris 1971	Not all participants had confirmed CHD
Hatem 2006	Interquartile ranges are reported instead of standard deviations. This suggests that the outcome distribution was severely skewed.
Ibhler 2011	Insufficient data available
Jiang 2008	The study intervention was a combination of relaxation training and music listening

Study	Reason for exclusion
MacNay 1995	Not a randomized controlled trial
Mandel 2007b	Not a randomized controlled trial
Micci 1984	Participants received diagnostic angiography procedure
Moradipanah 2009	Participants received diagnostic angiography procedure
Nilsson 2009b	Participants received diagnostic angiography procedure
Nilsson 2012	Participants received diagnostic angiography procedure
Okada 2009	Not a randomized controlled trial
Reisinger 1995	Not all participants had confirmed CHD
Richardson 2004	No standard care control group. Study compared music listening with music/imagery
Robichaud 1999	This study was included in the original review but is now excluded because not all participants had confirmed CHD
Schwartz 2002	No randomization used
Schwartz 2009	Group assignment was based on availability of space
Short 2011	Experimental group was not randomized and there was no control group
Slyfield 1992	Insufficient data
Taylor-Piliae 2002	Not all participants had confirmed CHD
Thorgaard 2004	Unclear randomization methods. Poor data reporting
Twiss 2003	Lack of proper randomization method. In the thesis author explicitly states that only 4 CD players were available. If all CD players were in use, the next group of participants were placed in the control group
Vanderboom 2012	Participants received diagnostic cerebral angiography procedure
Watanabe 2011	Participants received diagnostic angiography procedure
Weeks 2011	Participants received diagnostic angiography procedure
Zimmerman 1988	This study was included in the original review but is now excluded because not all participants had confirmed CHD

DATA AND ANALYSES

Comparison 1. Music versus standard care

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1.1 Psychological distress	5	228	Mean Difference (IV, Fixed, 95% CI)	-1.26 [-2.30, -0.22]
1.2 Anxiety (all measures) - patient type	10	353	Std. Mean Difference (IV, Random, 95% CI)	-0.70 [-1.17, -0.22]
1.2.1 anxiety (all measures) (MI)	4	143	Std. Mean Difference (IV, Random, 95% CI)	-0.94 [-1.95, 0.06]
1.2.2 anxiety (all measures)(surgical/procedural)	4	171	Std. Mean Difference (IV, Random, 95% CI)	-0.63 [-1.25, -0.01]
1.2.3 anxiety (all measures)(rehabilitation)	2	39	Std. Mean Difference (IV, Random, 95% CI)	-0.38 [-1.60, 0.83]
1.3 Anxiety (all measures) - music preference	9	323	Std. Mean Difference (IV, Random, 95% CI)	-0.79 [-1.29, -0.29]
1.3.1 Anxiety (all measures) - partcipant-selected	4	144	Std. Mean Difference (IV, Random, 95% CI)	-0.89 [-1.42, -0.36]
1.3.2 Anxiety (all measures) - researcher-selected	5	179	Std. Mean Difference (IV, Random, 95% CI)	-0.74 [-1.55, 0.08]
1.4 State anxiety (STAI) - patient type	7	310	Mean Difference (IV, Random, 95% CI)	-4.58 [-7.78, -1.39]
1.4.1 State anxiety (STAI) - MI	6	243	Mean Difference (IV, Random, 95% CI)	-5.87 [-7.99, -3.75]
1.4.2 State anxiety (STAI) - surgical/procedural	1	67	Mean Difference (IV, Random, 95% CI)	0.40 [-1.33, 2.13]
1.5 State Anxiety (STAI) - music preference	7	310	Mean Difference (IV, Random, 95% CI)	-4.58 [-7.78, -1.39]
1.5.1 State Anxiety (STAI) - participant-preferred	3	167	Mean Difference (IV, Random, 95% CI)	-4.71 [-10.76, 1.33]
1.5.2 State Anxiety (STAI) - researcher-selected	4	143	Mean Difference (IV, Random, 95% CI)	-4.68 [-8.27, -1.10]
1.6 State Anxiety (STAI) - music preference MI only	6	243	Mean Difference (IV, Random, 95% CI)	-5.87 [-7.99, -3.75]
1.6.1 State Anxiety (STAI) - participant-preferred	2	100	Mean Difference (IV, Random, 95% CI)	-7.36 [-9.45, -5.27]
1.6.2 State Anxiety (STAI) - researcher-selected	4	143	Mean Difference (IV, Random, 95% CI)	-4.68 [-8.27, -1.10]
1.7 Anxiety (non-STAI)-patient type	7	248	Std. Mean Difference (IV, Random, 95% CI)	-0.43 [-0.93, 0.06]

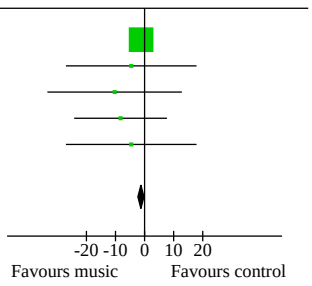
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1.7.1 Anxiety (surgical/procedural)	4	171	Std. Mean Difference (IV, Random, 95% CI)	-0.63 [-1.25, -0.01]
1.7.2 Anxiety (MI and rehabilitation)	3	77	Std. Mean Difference (IV, Random, 95% CI)	-0.03 [-0.61, 0.56]
1.8 Anxiety (non-STAI) - music preference	7	248	Std. Mean Difference (IV, Random, 95% CI)	-0.43 [-0.93, 0.06]
1.8.1 Anxiety (non-STAI) - participant-preferred	4	144	Std. Mean Difference (IV, Random, 95% CI)	-0.89 [-1.42, -0.36]
1.8.2 Anxiety (non-STAI) - researcher-selected	3	104	Std. Mean Difference (IV, Random, 95% CI)	0.11 [-0.28, 0.49]
1.9 Depression	6	217	Std. Mean Difference (IV, Fixed, 95% CI)	-0.11 [-0.38, 0.16]
1.10 Mood	2	97	Std. Mean Difference (IV, Random, 95% CI)	1.08 [-0.02, 2.17]
1.11 Heart rate-patient type	13	828	Mean Difference (IV, Random, 95% CI)	-3.40 [-6.12, -0.69]
1.11.1 heart rate (surg ical/procedural)	7	604	Mean Difference (IV, Random, 95% CI)	-2.61 [-5.62, 0.39]
1.11.2 Heart rate (MI)	5	194	Mean Difference (IV, Random, 95% CI)	-4.75 [-9.26, -0.25]
1.11.3 Heart rate (rehab)	1	30	Mean Difference (IV, Random, 95% CI)	4.50 [-9.68, 18.68]
1.12 Heart rate - music preference	13	828	Mean Difference (IV, Random, 95% CI)	-3.62 [-6.28, -0.95]
1.12.1 Heart rate - participant-selected music	7	430	Mean Difference (IV, Random, 95% CI)	-4.69 [-9.40, 0.02]
1.12.2 Heart rate - researcher-selected music	6	398	Mean Difference (IV, Random, 95% CI)	-2.67 [-4.27, -1.07]
1.13 Heart rate variability	2	90	Std. Mean Difference (IV, Fixed, 95% CI)	0.07 [-0.34, 0.48]
1.14 Respiratory rate - music preference	7	442	Mean Difference (IV, Random, 95% CI)	-2.50 [-3.61, -1.39]
1.14.1 Respiratory Rate - participant-selected	3	186	Mean Difference (IV, Random, 95% CI)	-4.42 [-7.37, -1.46]
1.14.2 Respiratory Rate - researcher-selected	4	256	Mean Difference (IV, Random, 95% CI)	-1.66 [-2.20, -1.12]
1.15 Systolic blood pressure	11	775	Mean Difference (IV, Fixed, 95% CI)	-5.52 [-7.43, -3.60]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1.16 Diastolic blood pressure	9	685	Mean Difference (IV, Fixed, 95% CI)	-1.12 [-2.57, 0.34]
1.17 Mean A rterial Pressure	3	158	Mean Difference (IV, Fixed, 95% CI)	-0.91 [-4.08, 2.26]
1.18 Oxygen Saturation	3	184	Mean Difference (IV, Random, 95% CI)	-0.02 [-1.65, 1.61]
1.19 Pain	8	630	Std. Mean Difference (IV, Random, 95% CI)	-0.43 [-0.80, -0.05]
1.19.1 One music session	5	420	Std. Mean Difference (IV, Random, 95% CI)	-0.55 [-1.16, 0.07]
1.19.2 Two or more music sessions	3	210	Std. Mean Difference (IV, Random, 95% CI)	-0.27 [-0.55, -0.00]
1.20 Length of hospital stay	2	82	Mean Difference (IV, Fixed, 95% CI)	-0.06 [-1.03, 0.92]
1.21 Opioid intake	2	90	Std. Mean Difference (IV, Fixed, 95% CI)	-0.25 [-0.67, 0.16]
1.22 Quality of sleep	2	122	Std. Mean Difference (IV, Random, 95% CI)	0.91 [0.03, 1.79]

Analysis 1.1. Comparison 1: Music versus standard care, Outcome 1: Psychological distress

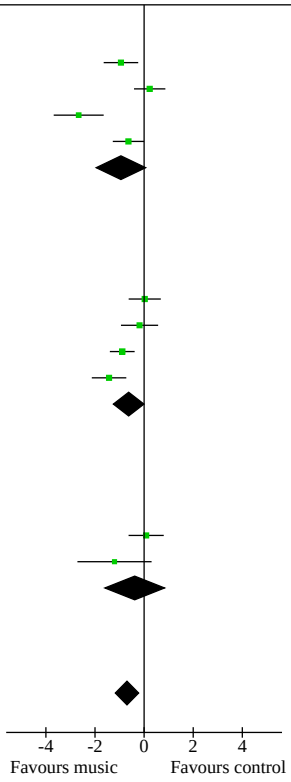
Study or Subgroup	Music Mean	Music SD	Music Total	Control Mean	Control SD	Control Total	Weight	Mean Difference IV, Fixed, 95% CI
Cadigan 2001	5.8	2.8	72	7	3.2	58	98.9%	-1.20 [-2.25 , -0.15]
Hermele 2005	33.88	33.7	17	38.47	35	19	0.2%	-4.59 [-27.05 , 17.87]
Leist 2011	-6.5	12.45	4	3.8	22.41	5	0.2%	-10.30 [-33.42 , 12.82]
Schou 2008	21.6	15.74	10	29.86	17.05	7	0.4%	-8.26 [-24.22 , 7.70]
Stein 2010	33.88	33.7	17	38.47	35	19	0.2%	-4.59 [-27.05 , 17.87]
Total (95% CI)			**120**			**108**	**100.0%**	**-1.26 [-2.30 , -0.22]**

Heterogeneity: Chi² = 1.51, df = 4 (P = 0.83); I² = 0%
Test for overall effect: Z = 2.38 (P = 0.02)
Test for subgroup differences: Not applicable



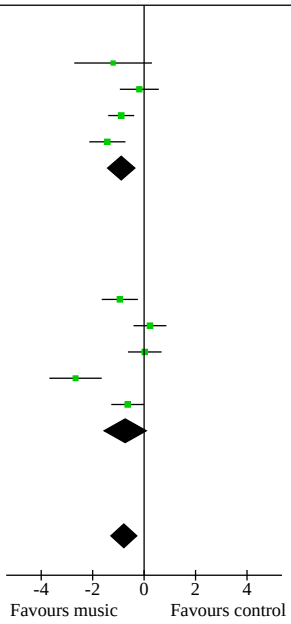
Analysis 1.2. Comparison 1: Music versus standard care, Outcome 2: Anxiety (all measures) - patient type

Study or Subgroup	Music Mean	Music SD	Music Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
1.2.1 anxiety (all measures) (MI)								
Bolwerk 1990	31.17	7.63	17	39.61	9.67	18	10.5%	-0.94 [-1.65 , -0.24]
Elliott 1994	32.1	6.3	19	30.1	10.4	19	10.9%	0.23 [-0.41 , 0.87]
White 1992	31.7	2.5	15	37.9	2	15	8.4%	-2.66 [-3.68 , -1.65]
White 1999	37.15	7.97	20	42.2	7.53	20	10.9%	-0.64 [-1.28 , -0.00]
Subtotal (95% CI)			**71**			**72**	**40.7%**	**-0.94 [-1.95 , 0.06]**
Heterogeneity: Tau² = 0.90; Chi² = 22.93, df = 3 (P < 0.0001); I² = 87%								
Test for overall effect: Z = 1.84 (P = 0.07)								
1.2.2 anxiety (all measures)(surgical/procedural)								
Hermele 2005	7.24	4.96	17	7.11	5.03	19	10.8%	0.03 [-0.63 , 0.68]
Schou 2008	1.72	2.49	13	2.17	2.21	14	10.1%	-0.19 [-0.94 , 0.57]
Sendelbach 2006	13.46	3.71	39	17.55	5.47	29	11.8%	-0.89 [-1.40 , -0.39]
Voss 2004	13	9	19	48	32	21	10.5%	-1.43 [-2.13 , -0.73]
Subtotal (95% CI)			**88**			**83**	**43.2%**	**-0.63 [-1.25 , -0.01]**
Heterogeneity: Tau² = 0.29; Chi² = 11.11, df = 3 (P = 0.01); I² = 73%								
Test for overall effect: Z = 1.98 (P = 0.05)								
1.2.3 anxiety (all measures)(rehabilitation)								
Emery 2003	1.5	2.06	15	1.3	2.58	15	10.4%	0.08 [-0.63 , 0.80]
Leist 2011	2.37	2.2	4	8	5.15	5	5.7%	-1.21 [-2.72 , 0.30]
Subtotal (95% CI)			**19**			**20**	**16.1%**	**-0.38 [-1.60 , 0.83]**
Heterogeneity: Tau² = 0.47; Chi² = 2.29, df = 1 (P = 0.13); I² = 56%								
Test for overall effect: Z = 0.62 (P = 0.54)								
Total (95% CI)			**178**			**175**	**100.0%**	**-0.70 [-1.17 , -0.22]**
Heterogeneity: Tau² = 0.43; Chi² = 38.57, df = 9 (P < 0.0001); I² = 77%								
Test for overall effect: Z = 2.88 (P = 0.004)								
Test for subgroup differences: Chi² = 0.52, df = 2 (P = 0.77), I² = 0%								



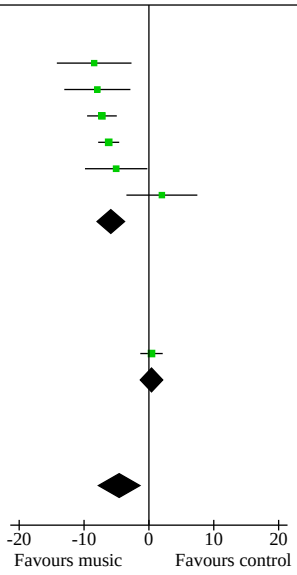
Analysis 1.3. Comparison 1: Music versus standard care, Outcome 3: Anxiety (all measures) - music preference

Study or Subgroup	Music Mean	Music SD	Music Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
1.3.1 Anxiety (all measures) - partcipant-selected								
Leist 2011	2.37	2.2	4	8	5.15	5	6.4%	-1.21 [-2.72 , 0.30]
Schou 2008	1.72	2.49	13	2.17	2.21	14	11.3%	-0.19 [-0.94 , 0.57]
Sendelbach 2006	13.46	3.71	39	17.55	5.47	29	13.1%	-0.89 [-1.40 , -0.39]
Voss 2004	13	9	19	48	32	21	11.7%	-1.43 [-2.13 , -0.73]
Subtotal (95% CI)			**75**			**69**	**42.5%**	**-0.89 [-1.42 , -0.36]**
Heterogeneity: Tau² = 0.13; Chi² = 5.74, df = 3 (P = 0.12); I² = 48%								
Test for overall effect: Z = 3.30 (P = 0.0010)								
1.3.2 Anxiety (all measures) - researcher-selected								
Bolwerk 1990	31.17	7.63	17	39.61	9.67	18	11.7%	-0.94 [-1.65 , -0.24]
Elliott 1994	32.1	6.3	19	30.1	10.4	19	12.2%	0.23 [-0.41 , 0.87]
Hermele 2005	7.24	4.96	17	7.11	5.03	19	12.1%	0.03 [-0.63 , 0.68]
White 1992	31.7	2.5	15	37.9	2	15	9.3%	-2.66 [-3.68 , -1.65]
White 1999	37.15	7.97	20	42.2	7.53	20	12.2%	-0.64 [-1.28 , -0.00]
Subtotal (95% CI)			**88**			**91**	**57.5%**	**-0.74 [-1.55 , 0.08]**
Heterogeneity: Tau² = 0.73; Chi² = 26.53, df = 4 (P < 0.0001); I² = 85%								
Test for overall effect: Z = 1.76 (P = 0.08)								
Total (95% CI)			**163**			**160**	**100.0%**	**-0.79 [-1.29 , -0.29]**
Heterogeneity: Tau² = 0.43; Chi² = 34.52, df = 8 (P < 0.0001); I² = 77%								
Test for overall effect: Z = 3.08 (P = 0.002)								
Test for subgroup differences: Chi² = 0.10, df = 1 (P = 0.76), I² = 0%								



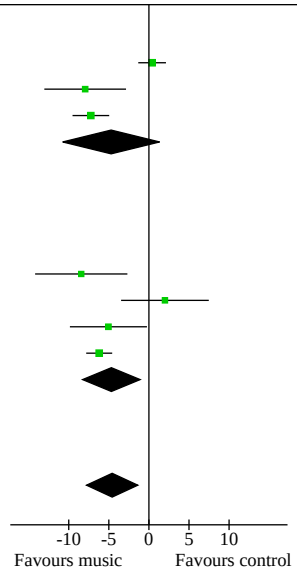
Analysis 1.4. Comparison 1: Music versus standard care, Outcome 4: State anxiety (STAI) - patient type

Study or Subgroup	Music Mean	Music SD	Music Total	Control Mean	Control SD	Control Total	Weight	Mean Difference IV, Random, 95% CI
1.4.1 State anxiety (STAI) - MI								
Bolwerk 1990	31.17	7.63	17	39.61	9.67	18	11.4%	-8.44 [-14.19 , -2.69]
Cohen 1999	-14.65	9.5	20	-6.7	6.7	20	12.4%	-7.95 [-13.04 , -2.86]
Winters 2005	-7.11	4.97	30	0.13	4.02	30	16.7%	-7.24 [-9.53 , -4.95]
White 1999	31.7	2.5	15	37.9	2	15	17.4%	-6.20 [-7.82 , -4.58]
White 1992	37.15	7.97	20	42.2	7.53	20	12.9%	-5.05 [-9.86 , -0.24]
Elliott 1994	32.1	6.3	19	30.1	10.4	19	11.9%	2.00 [-3.47 , 7.47]
Subtotal (95% CI)			**121**			**122**	**82.7%**	**-5.87 [-7.99 , -3.75]**
Heterogeneity: Tau² = 3.24; Chi² = 10.69, df = 5 (P = 0.06); I² = 53%								
Test for overall effect: Z = 5.43 (P < 0.00001)								
1.4.2 State anxiety (STAI) - surgical/procedural								
Barnason 1995	-3.5	3.34	33	-3.9	3.86	34	17.3%	0.40 [-1.33 , 2.13]
Subtotal (95% CI)			**33**			**34**	**17.3%**	**0.40 [-1.33 , 2.13]**
Heterogeneity: Not applicable								
Test for overall effect: Z = 0.45 (P = 0.65)								
Total (95% CI)			**154**			**156**	**100.0%**	**-4.58 [-7.78 , -1.39]**
Heterogeneity: Tau² = 14.60; Chi² = 49.09, df = 6 (P < 0.00001); I² = 88%								
Test for overall effect: Z = 2.81 (P = 0.005)								
Test for subgroup differences: Chi² = 20.23, df = 1 (P < 0.00001), I² = 95.1%								



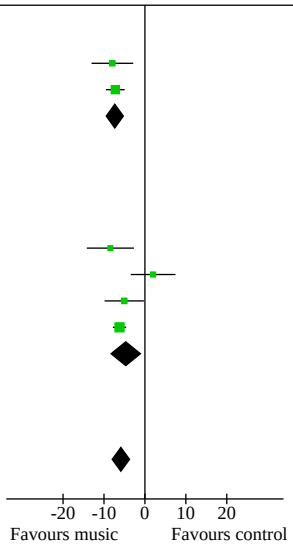
Analysis 1.5. Comparison 1: Music versus standard care, Outcome 5: State Anxiety (STAI) - music preference

Study or Subgroup	Music Mean	Music SD	Music Total	Control Mean	Control SD	Control Total	Weight	Mean Difference IV, Random, 95% CI
1.5.1 State Anxiety (STAI) - participant-preferred								
Barnason 1995	-3.5	3.34	33	-3.9	3.86	34	17.3%	0.40 [-1.33 , 2.13]
Cohen 1999	-14.65	9.5	20	-6.7	6.7	20	12.4%	-7.95 [-13.04 , -2.86]
Winters 2005	-7.11	4.97	30	0.13	4.02	30	16.7%	-7.24 [-9.53 , -4.95]
Subtotal (95% CI)			**83**			**84**	**46.4%**	**-4.71 [-10.76 , 1.33]**
Heterogeneity: Tau² = 25.79; Chi² = 31.59, df = 2 (P < 0.00001); I² = 94%								
Test for overall effect: Z = 1.53 (P = 0.13)								
1.5.2 State Anxiety (STAI) - researcher-selected								
Bolwerk 1990	31.17	7.63	17	39.61	9.67	18	11.4%	-8.44 [-14.19 , -2.69]
Elliott 1994	32.1	6.3	19	30.1	10.4	19	11.9%	2.00 [-3.47 , 7.47]
White 1992	37.15	7.97	20	42.2	7.53	20	12.9%	-5.05 [-9.86 , -0.24]
White 1999	31.7	2.5	15	37.9	2	15	17.4%	-6.20 [-7.82 , -4.58]
Subtotal (95% CI)			**71**			**72**	**53.6%**	**-4.68 [-8.27 , -1.10]**
Heterogeneity: Tau² = 8.45; Chi² = 8.93, df = 3 (P = 0.03); I² = 66%								
Test for overall effect: Z = 2.56 (P = 0.01)								
Total (95% CI)			**154**			**156**	**100.0%**	**-4.58 [-7.78 , -1.39]**
Heterogeneity: Tau² = 14.60; Chi² = 49.09, df = 6 (P < 0.00001); I² = 88%								
Test for overall effect: Z = 2.81 (P = 0.005)								
Test for subgroup differences: Chi² = 0.00, df = 1 (P = 0.99), I² = 0%								



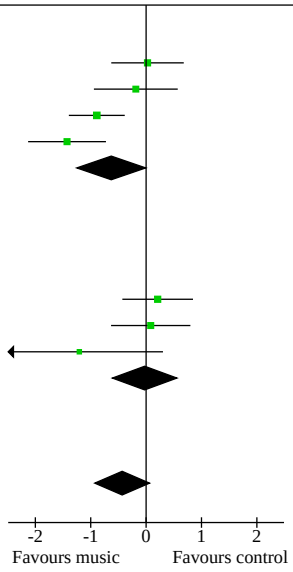
Analysis 1.6. Comparison 1: Music versus standard care, Outcome 6: State Anxiety (STAI) - music preference MI only

Study or Subgroup	Music Mean	Music SD	Music Total	Control Mean	Control SD	Control Total	Weight	Mean Difference IV, Random, 95% CI
1.6.1 State Anxiety (STAI) - participant-preferred								
Cohen 1999	-14.65	9.5	20	-6.7	6.7	20	11.7%	-7.95 [-13.04 , -2.86]
Winters 2005	-7.11	4.97	30	0.13	4.02	30	25.4%	-7.24 [-9.53 , -4.95]
Subtotal (95% CI)			**50**			**50**	**37.1%**	**-7.36 [-9.45 , -5.27]**
Heterogeneity: Tau² = 0.00; Chi² = 0.06, df = 1 (P = 0.80); I² = 0%								
Test for overall effect: Z = 6.91 (P < 0.00001)								
1.6.2 State Anxiety (STAI) - researcher-selected								
Bolwerk 1990	31.17	7.63	17	39.61	9.67	18	9.9%	-8.44 [-14.19 , -2.69]
Elliott 1994	32.1	6.3	19	30.1	10.4	19	10.6%	2.00 [-3.47 , 7.47]
White 1992	37.15	7.97	20	42.2	7.53	20	12.6%	-5.05 [-9.86 , -0.24]
White 1999	31.7	2.5	15	37.9	2	15	29.8%	-6.20 [-7.82 , -4.58]
Subtotal (95% CI)			**71**			**72**	**62.9%**	**-4.68 [-8.27 , -1.10]**
Heterogeneity: Tau² = 8.45; Chi² = 8.93, df = 3 (P = 0.03); I² = 66%								
Test for overall effect: Z = 2.56 (P = 0.01)								
Total (95% CI)			**121**			**122**	**100.0%**	**-5.87 [-7.99 , -3.75]**
Heterogeneity: Tau² = 3.24; Chi² = 10.69, df = 5 (P = 0.06); I² = 53%								
Test for overall effect: Z = 5.43 (P < 0.00001)								
Test for subgroup differences: Chi² = 1.60, df = 1 (P = 0.21), I² = 37.5%								



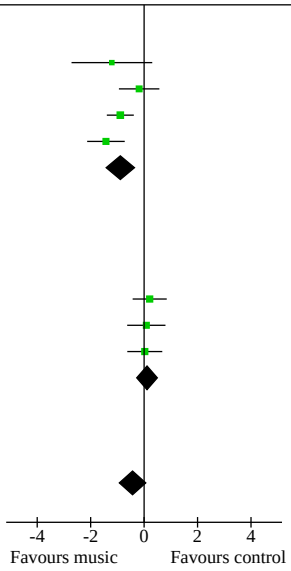
Analysis 1.7. Comparison 1: Music versus standard care, Outcome 7: Anxiety (non-STAI)-patient type

Study or Subgroup	Music Mean	Music SD	Music Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
1.7.1 Anxiety (surgical/procedural)								
Hermele 2005	7.24	4.96	17	7.11	5.03	19	15.6%	0.03 [-0.63 , 0.68]
Schou 2008	1.72	2.49	13	2.17	2.21	14	14.3%	-0.19 [-0.94 , 0.57]
Sendelbach 2006	13.46	3.71	39	17.55	5.47	29	17.5%	-0.89 [-1.40 , -0.39]
Voss 2004	13	9	19	48	32	21	14.9%	-1.43 [-2.13 , -0.73]
Subtotal (95% CI)			**88**			**83**	**62.3%**	**-0.63 [-1.25 , -0.01]**
Heterogeneity: Tau² = 0.29; Chi² = 11.11, df = 3 (P = 0.01); I² = 73%								
Test for overall effect: Z = 1.98 (P = 0.05)								
1.7.2 Anxiety (MI and rehabilitation)								
Elliott 1994	30.8	17	19	26.4	23.7	19	15.8%	0.21 [-0.43 , 0.85]
Emery 2003	1.5	2.06	15	1.3	2.58	15	14.8%	0.08 [-0.63 , 0.80]
Leist 2011	2.37	2.2	4	8	5.15	5	7.1%	-1.21 [-2.72 , 0.30]
Subtotal (95% CI)			**38**			**39**	**37.7%**	**-0.03 [-0.61 , 0.56]**
Heterogeneity: Tau² = 0.08; Chi² = 2.90, df = 2 (P = 0.24); I² = 31%								
Test for overall effect: Z = 0.09 (P = 0.93)								
Total (95% CI)			**126**			**122**	**100.0%**	**-0.43 [-0.93 , 0.06]**
Heterogeneity: Tau² = 0.30; Chi² = 20.04, df = 6 (P = 0.003); I² = 70%								
Test for overall effect: Z = 1.72 (P = 0.09)								
Test for subgroup differences: Chi² = 1.93, df = 1 (P = 0.17), I² = 48.1%								



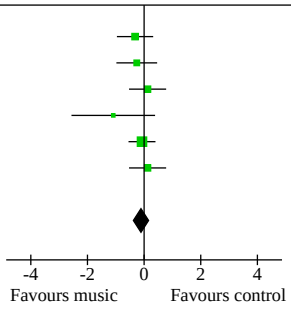
Analysis 1.8. Comparison 1: Music versus standard care, Outcome 8: Anxiety (non-STAI) - music preference

Study or Subgroup	Music Mean	Music SD	Music Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
1.8.1 Anxiety (non-STAI) - participant-preferred								
Leist 2011	2.37	2.2	4	8	5.15	5	7.1%	-1.21 [-2.72 , 0.30]
Schou 2008	1.72	2.49	13	2.17	2.21	14	14.3%	-0.19 [-0.94 , 0.57]
Sendelbach 2006	13.46	3.71	39	17.55	5.47	29	17.5%	-0.89 [-1.40 , -0.39]
Voss 2004	13	9	19	48	32	21	14.9%	-1.43 [-2.13 , -0.73]
Subtotal (95% CI)			**75**			**69**	**53.9%**	**-0.89 [-1.42 , -0.36]**
Heterogeneity: Tau² = 0.13; Chi² = 5.74, df = 3 (P = 0.12); I² = 48%								
Test for overall effect: Z = 3.30 (P = 0.0010)								
1.8.2 Anxiety (non-STAI) - researcher-selected								
Elliott 1994	30.8	17	19	26.4	23.7	19	15.8%	0.21 [-0.43 , 0.85]
Emery 2003	1.5	2.06	15	1.3	2.58	15	14.8%	0.08 [-0.63 , 0.80]
Hermele 2005	7.24	4.96	17	7.11	5.03	19	15.6%	0.03 [-0.63 , 0.68]
Subtotal (95% CI)			**51**			**53**	**46.1%**	**0.11 [-0.28 , 0.49]**
Heterogeneity: Tau² = 0.00; Chi² = 0.16, df = 2 (P = 0.92); I² = 0%								
Test for overall effect: Z = 0.56 (P = 0.58)								
Total (95% CI)			**126**			**122**	**100.0%**	**-0.43 [-0.93 , 0.06]**
Heterogeneity: Tau² = 0.30; Chi² = 20.04, df = 6 (P = 0.003); I² = 70%								
Test for overall effect: Z = 1.72 (P = 0.09)								
Test for subgroup differences: Chi² = 8.95, df = 1 (P = 0.003), I² = 88.8%								



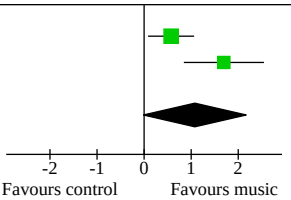
Analysis 1.9. Comparison 1: Music versus standard care, Outcome 9: Depression

Study or Subgroup	Music Mean	Music SD	Music Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Fixed, 95% CI
Elliott 1994	2.9	2.6	19	3.8	2.9	19	17.5%	-0.32 [-0.96 , 0.32]
Emery 2003	0.21	0.4	15	0.36	0.689	15	13.9%	-0.26 [-0.98 , 0.46]
Hermele 2005	6	4.54	17	5.47	3.89	19	16.8%	0.12 [-0.53 , 0.78]
Leist 2011	5.38	11.06	4	26	20.11	5	3.3%	-1.09 [-2.56 , 0.39]
Mandel 2007a	9.8	11.2	35	10.5	6.6	33	31.8%	-0.07 [-0.55 , 0.40]
Stein 2010	6	4.54	17	5.47	3.89	19	16.8%	0.12 [-0.53 , 0.78]
Total (95% CI)			**107**			**110**	**100.0%**	**-0.11 [-0.38 , 0.16]**
Heterogeneity: Chi² = 3.26, df = 5 (P = 0.66); I² = 0%								
Test for overall effect: Z = 0.81 (P = 0.42)								
Test for subgroup differences: Not applicable								



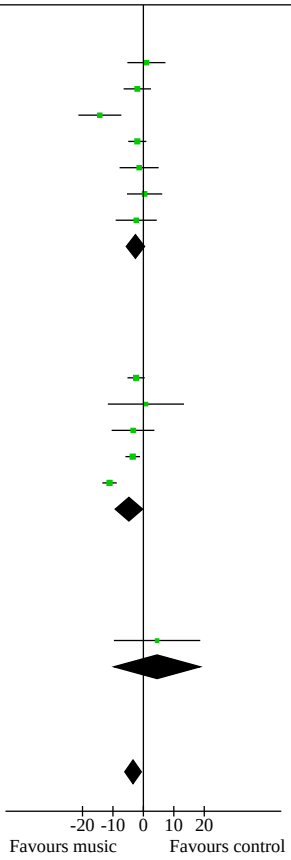
Analysis 1.10. Comparison 1: Music versus standard care, Outcome 10: Mood

Study or Subgroup	Music Mean	Music SD	Music Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Barnason 1995	7.72	1.49	33	6.55	2.42	34	55.0%	0.57 [0.08 , 1.06]
Murrock 2002	4.13	1.25	15	0.33	2.82	15	45.0%	1.70 [0.84 , 2.55]
Total (95% CI)			**48**			**49**	**100.0%**	**1.08 [-0.02 , 2.17]**
Heterogeneity: Tau² = 0.50; Chi² = 5.02, df = 1 (P = 0.03); I² = 80%								
Test for overall effect: Z = 1.93 (P = 0.05)								
Test for subgroup differences: Not applicable								



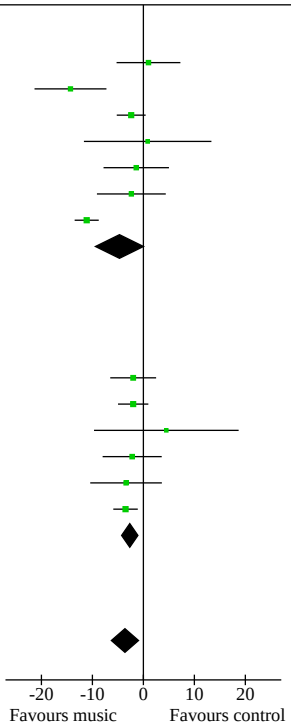
Analysis 1.11. Comparison 1: Music versus standard care, Outcome 11: Heart rate-patient type

Study or Subgroup	Music Mean	Music SD	Music Total	Control Mean	Control SD	Control Total	Weight	Mean Difference IV, Random, 95% CI
1.11.1 heart rate (surg ical/procedural)								
Broscious 1999	90	15	62	89	17	44	7.3%	1.00 [-5.26 , 7.26]
Cadigan 2001	69	13	75	71	14	65	9.0%	-2.00 [-6.50 , 2.50]
Chan 2007	65.5	17.1	31	79.8	11.1	35	6.6%	-14.30 [-21.35 , -7.25]
Cutshall 2011	-0.3	5.1	49	1.7	9.5	51	10.4%	-2.00 [-4.97 , 0.97]
Jafari 2012	-1.6	13.78	30	-0.2	11.47	30	7.1%	-1.40 [-7.82 , 5.02]
Nilsson 2009a	-0.9	11.77	28	-1.3	10.67	30	7.7%	0.40 [-5.40 , 6.20]
Sendelbach 2006	81	15.61	41	83.36	13.98	33	6.8%	-2.36 [-9.11 , 4.39]
Subtotal (95% CI)			**316**			**288**	**54.9%**	**-2.61 [-5.62 , 0.39]**
Heterogeneity: Tau² = 8.46; Chi² = 13.15, df = 6 (P = 0.04); I² = 54%								
Test for overall effect: Z = 1.70 (P = 0.09)								
1.11.2 Heart rate (MI)								
Cohen 1999	-2.4	5.3	20	-0.01	3.7	20	10.5%	-2.39 [-5.22 , 0.44]
Davis-Rollans 1987	75.62	15.88	12	74.78	15.37	12	3.4%	0.84 [-11.66 , 13.34]
White 1992	77.1	13.6	20	80.5	8.48	20	6.6%	-3.40 [-10.42 , 3.62]
White 1999	70.5	3.9	15	74	2.7	15	10.9%	-3.50 [-5.90 , -1.10]
Winters 2005	-8.26	3.88	30	2.86	5.34	30	10.9%	-11.12 [-13.48 , -8.76]
Subtotal (95% CI)			**97**			**97**	**42.3%**	**-4.75 [-9.26 , -0.25]**
Heterogeneity: Tau² = 19.48; Chi² = 30.10, df = 4 (P < 0.00001); I² = 87%								
Test for overall effect: Z = 2.07 (P = 0.04)								
1.11.3 Heart rate (rehab)								
Emery 2003	124.2	20.1	15	119.7	19.53	15	2.8%	4.50 [-9.68 , 18.68]
Subtotal (95% CI)			**15**			**15**	**2.8%**	**4.50 [-9.68 , 18.68]**
Heterogeneity: Not applicable								
Test for overall effect: Z = 0.62 (P = 0.53)								
Total (95% CI)			**428**			**400**	**100.0%**	**-3.40 [-6.12 , -0.69]**
Heterogeneity: Tau² = 16.13; Chi² = 53.62, df = 12 (P < 0.00001); I² = 78%								
Test for overall effect: Z = 2.46 (P = 0.01)								
Test for subgroup differences: Chi² = 1.72, df = 2 (P = 0.42), I² = 0%								



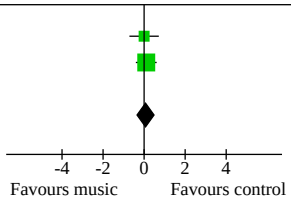
Analysis 1.12. Comparison 1: Music versus standard care, Outcome 12: Heart rate - music preference

Study or Subgroup	Music Mean	Music SD	Music Total	Control Mean	Control SD	Control Total	Weight	Mean Difference IV, Random, 95% CI
1.12.1 Heart rate - participant-selected music								
Broscious 1999	90	15	62	89	17	44	7.2%	1.00 [-5.26 , 7.26]
Chan 2007	65.5	17.1	31	79.8	11.1	35	6.5%	-14.30 [-21.35 , -7.25]
Cohen 1999	-2.4	5.3	20	-0.01	3.7	20	10.6%	-2.39 [-5.22 , 0.44]
Davis-Rollans 1987	75.62	15.88	12	74.78	15.37	12	3.3%	0.84 [-11.66 , 13.34]
Jafari 2012	-1.6	13.78	30	-0.2	11.47	30	7.1%	-1.40 [-7.82 , 5.02]
Sendelbach 2006	81	15.61	41	83.36	13.98	33	6.8%	-2.36 [-9.11 , 4.39]
Winters 2005	-8.26	3.88	30	2.86	5.34	30	11.0%	-11.12 [-13.48 , -8.76]
Subtotal (95% CI)			**226**			**204**	**52.6%**	**-4.69 [-9.40 , 0.02]**
Heterogeneity: Tau² = 30.12; Chi² = 38.19, df = 6 (P < 0.00001); I² = 84%								
Test for overall effect: Z = 1.95 (P = 0.05)								
1.12.2 Heart rate - researcher-selected music								
Cadigan 2001	69	13	75	71	14	65	9.0%	-2.00 [-6.50 , 2.50]
Cutshall 2011	-0.3	5.1	49	1.7	9.5	51	10.5%	-2.00 [-4.97 , 0.97]
Emery 2003	124.2	20.1	15	119.7	19.53	15	2.7%	4.50 [-9.68 , 18.68]
Nilsson 2009a	-0.9	11.77	28	1.3	10.67	30	7.7%	-2.20 [-8.00 , 3.60]
White 1992	77.1	13.6	20	80.5	8.48	20	6.6%	-3.40 [-10.42 , 3.62]
White 1999	70.5	3.9	15	74	2.7	15	11.0%	-3.50 [-5.90 , -1.10]
Subtotal (95% CI)			**202**			**196**	**47.4%**	**-2.67 [-4.27 , -1.07]**
Heterogeneity: Tau² = 0.00; Chi² = 1.79, df = 5 (P = 0.88); I² = 0%								
Test for overall effect: Z = 3.27 (P = 0.001)								
Total (95% CI)			**428**			**400**	**100.0%**	**-3.62 [-6.28 , -0.95]**
Heterogeneity: Tau² = 15.28; Chi² = 51.43, df = 12 (P < 0.00001); I² = 77%								
Test for overall effect: Z = 2.66 (P = 0.008)								
Test for subgroup differences: Chi² = 0.63, df = 1 (P = 0.43), I² = 0%								



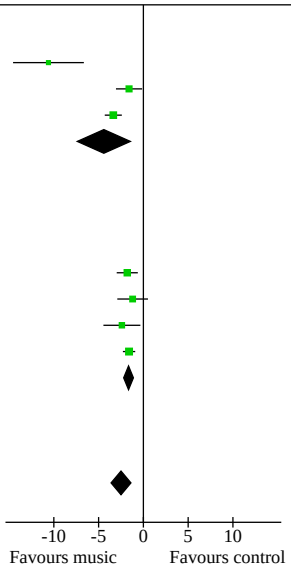
Analysis 1.13. Comparison 1: Music versus standard care, Outcome 13: Heart rate variability

Study or Subgroup	Music Mean	Music SD	Music Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Fixed, 95% CI
White 1999	4.4	0.3	15	4.4	0.4	15	33.4%	0.00 [-0.72 , 0.72]
Winters 2005	-0.58	0.43	30	-1.23	8.7	30	66.6%	0.10 [-0.40 , 0.61]
Total (95% CI)			**45**			**45**	**100.0%**	**0.07 [-0.34 , 0.48]**
Heterogeneity: Chi² = 0.05, df = 1 (P = 0.82); I² = 0%								
Test for overall effect: Z = 0.33 (P = 0.74)								
Test for subgroup differences: Not applicable								



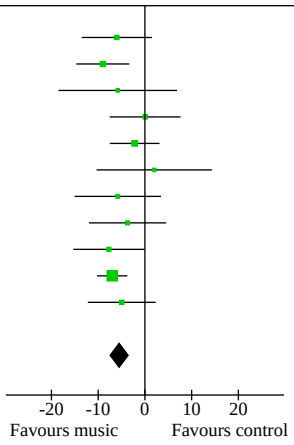
Analysis 1.14. Comparison 1: Music versus standard care, Outcome 14: Respiratory rate - music preference

Study or Subgroup	Music Mean	Music SD	Music Total	Control Mean	Control SD	Control Total	Weight	Mean Difference IV, Random, 95% CI
1.14.1 Respiratory Rate - participant-selected								
Chan 2007	18.3	5.5	31	28.9	10.4	35	5.7%	-10.60 [-14.55 , -6.65]
Jafari 2012	18.2	2.1	30	19.8	3.5	30	15.1%	-1.60 [-3.06 , -0.14]
Winters 2005	-2.26	1.53	30	1.1	2.18	30	17.8%	-3.36 [-4.31 , -2.41]
Subtotal (95% CI)			**91**			**95**	**38.6%**	**-4.42 [-7.37 , -1.46]**
Heterogeneity: Tau² = 5.57; Chi² = 18.16, df = 2 (P = 0.0001); I² = 89%								
Test for overall effect: Z = 2.93 (P = 0.003)								
1.14.2 Respiratory Rate - researcher-selected								
Cadigan 2001	17.3	3.4	66	19.1	3.4	62	16.6%	-1.80 [-2.98 , -0.62]
Nilsson 2009a	15.9	3.6	28	17.1	3	30	13.8%	-1.20 [-2.91 , 0.51]
White 1992	16	3.61	20	18.4	3.02	20	12.0%	-2.40 [-4.46 , -0.34]
White 1999	15.7	0.8	15	17.3	1.1	15	19.0%	-1.60 [-2.29 , -0.91]
Subtotal (95% CI)			**129**			**127**	**61.4%**	**-1.66 [-2.20 , -1.12]**
Heterogeneity: Tau² = 0.00; Chi² = 0.86, df = 3 (P = 0.84); I² = 0%								
Test for overall effect: Z = 6.00 (P < 0.00001)								
Total (95% CI)			**220**			**222**	**100.0%**	**-2.50 [-3.61 , -1.39]**
Heterogeneity: Tau² = 1.56; Chi² = 28.33, df = 6 (P < 0.0001); I² = 79%								
Test for overall effect: Z = 4.42 (P < 0.00001)								
Test for subgroup differences: Chi² = 3.23, df = 1 (P = 0.07), I² = 69.1%								



Analysis 1.15. Comparison 1: Music versus standard care, Outcome 15: Systolic blood pressure

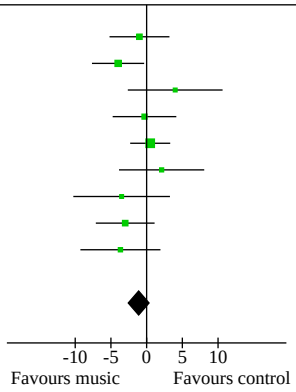
Study or Subgroup	Music Mean	Music SD	Music Total	Control Mean	Control SD	Control Total	Weight	Mean Difference IV, Fixed, 95% CI
Broscious 1999	127	20	62	133	19	44	6.5%	-6.00 [-13.50 , 1.50]
Cadigan 2001	112	16	75	121	18	65	11.4%	-9.00 [-14.68 , -3.32]
Chan 2007	136.1	21.2	31	141.9	31	35	2.3%	-5.80 [-18.50 , 6.90]
Cohen 1999	-0.75	10.7	20	-0.8	13.6	20	6.4%	0.05 [-7.53 , 7.63]
Cutshall 2011	-3.8	15.5	49	-1.6	11.2	51	13.0%	-2.20 [-7.52 , 3.12]
Emery 2003	165.3	17.23	15	163.3	17.23	15	2.4%	2.00 [-10.33 , 14.33]
Jafari 2012	-2.3	19.8	30	3.5	16.67	30	4.3%	-5.80 [-15.06 , 3.46]
Mandel 2007a	126.6	16.9	35	130.3	17.8	33	5.4%	-3.70 [-11.96 , 4.56]
Sendelbach 2006	110.17	17.38	42	117.88	16.25	33	6.3%	-7.71 [-15.35 , -0.07]
White 1999	115	4	15	122	5	15	35.0%	-7.00 [-10.24 , -3.76]
Winters 2005	-7.74	14.31	30	-2.79	14.39	30	7.0%	-4.95 [-12.21 , 2.31]
Total (95% CI)			**404**			**371**	**100.0%**	**-5.52 [-7.43 , -3.60]**
Heterogeneity: Chi² = 7.79, df = 10 (P = 0.65); I² = 0%								
Test for overall effect: Z = 5.64 (P < 0.00001)								
Test for subgroup differences: Not applicable								



Analysis 1.16. Comparison 1: Music versus standard care, Outcome 16: Diastolic blood pressure

Study or Subgroup	Music Mean	Music SD	Music Total	Control Mean	Control SD	Control Total	Weight	Mean Difference IV, Fixed, 95% CI
Broscious 1999	66	9	62	67	12	44	12.0%	-1.00 [-5.19 , 3.19]
Cadigan 2001	57	11	75	61	11	65	15.8%	-4.00 [-7.65 , -0.35]
Chan 2007	72.7	12.9	31	68.7	14.6	35	4.8%	4.00 [-2.63 , 10.63]
Cohen 1999	-1.6	6.4	20	-1.3	7.9	20	10.6%	-0.30 [-4.76 , 4.16]
Cutshall 2011	-0.4	7.1	49	-0.9	7.2	51	26.9%	0.50 [-2.30 , 3.30]
Emery 2003	80.3	8.04	15	78.2	8.62	15	5.9%	2.10 [-3.87 , 8.07]
Jafari 2012	-2	13.9	30	1.5	12.81	30	4.6%	-3.50 [-10.26 , 3.26]
Mandel 2007a	72.9	9.2	35	75.9	8.1	33	12.5%	-3.00 [-7.11 , 1.11]
Sendelbach 2006	56.93	13.06	42	60.6	11.65	33	6.7%	-3.67 [-9.27 , 1.93]
Total (95% CI)			**359**			**326**	**100.0%**	**-1.12 [-2.57 , 0.34]**

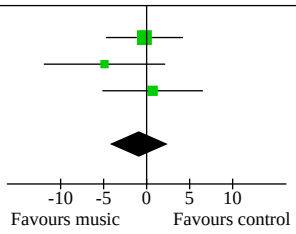
Heterogeneity: Chi² = 9.28, df = 8 (P = 0.32); I² = 14%
Test for overall effect: Z = 1.51 (P = 0.13)
Test for subgroup differences: Not applicable



Analysis 1.17. Comparison 1: Music versus standard care, Outcome 17: Mean A rterial Pressure

Study or Subgroup	Music Mean	Music SD	Music Total	Control Mean	Control SD	Control Total	Weight	Mean Difference IV, Fixed, 95% CI
Cohen 1999	-1.4	6.9	20	-1.15	7.5	20	50.4%	-0.25 [-4.72 , 4.22]
Jafari 2012	-2.3	14.52	30	2.6	13.34	30	20.2%	-4.90 [-11.96 , 2.16]
Nilsson 2009a	73.1	12.4	28	72.4	10.1	30	29.4%	0.70 [-5.14 , 6.54]
Total (95% CI)			**78**			**80**	**100.0%**	**-0.91 [-4.08 , 2.26]**

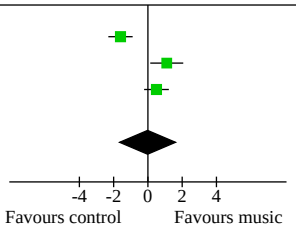
Heterogeneity: Chi² = 1.60, df = 2 (P = 0.45); I² = 0%
Test for overall effect: Z = 0.56 (P = 0.57)
Test for subgroup differences: Not applicable



Analysis 1.18. Comparison 1: Music versus standard care, Outcome 18: Oxygen Saturation

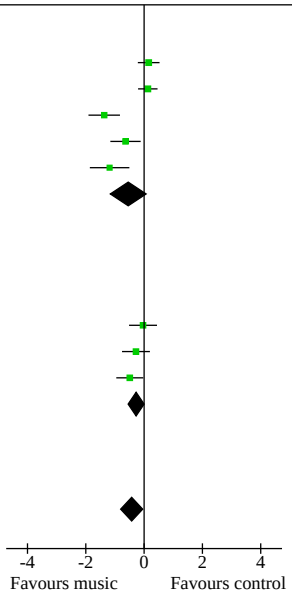
Study or Subgroup	Music Mean	Music SD	Music Total	Control Mean	Control SD	Control Total	Weight	Mean Difference IV, Random, 95% CI
Chan 2007	95.6	1.6	31	97.2	1.3	35	33.9%	-1.60 [-2.31 , -0.89]
Jafari 2012	97.3	1.8	30	96.2	2	30	32.2%	1.10 [0.14 , 2.06]
Nilsson 2009a	96.4	1.4	28	95.9	1.4	30	33.9%	0.50 [-0.22 , 1.22]
Total (95% CI)			**89**			**95**	**100.0%**	**-0.02 [-1.65 , 1.61]**

Heterogeneity: Tau² = 1.91; Chi² = 25.60, df = 2 (P < 0.00001); I² = 92%
Test for overall effect: Z = 0.02 (P = 0.98)
Test for subgroup differences: Not applicable



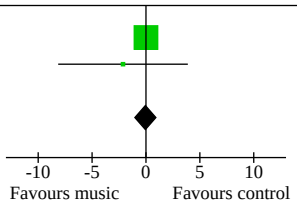
Analysis 1.19. Comparison 1: Music versus standard care, Outcome 19: Pain

Study or Subgroup	Music Mean	Music SD	Music Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
1.19.1 One music session								
Broscious 1999	5.86	2.78	68	5.43	2.63	47	13.7%	0.16 [-0.22 , 0.53]
Cadigan 2001	1.1	1.9	74	0.88	1.5	65	14.0%	0.13 [-0.21 , 0.46]
Chan 2007	2.1	2.7	31	6.3	3.3	35	11.9%	-1.37 [-1.91 , -0.83]
Jafari 2012	3.1	2.1	30	4.7	2.8	30	12.1%	-0.64 [-1.16 , -0.12]
Voss 2004	19	13	19	45	27	21	10.4%	-1.18 [-1.86 , -0.51]
Subtotal (95% CI)			**222**			**198**	**62.1%**	**-0.55 [-1.16 , 0.07]**
Heterogeneity: Tau² = 0.43; Chi² = 35.25, df = 4 (P < 0.00001); I² = 89%								
Test for overall effect: Z = 1.74 (P = 0.08)								
1.19.2 Two or more music sessions								
Barnason 1995	0.38	0.78	33	0.41	0.82	34	12.6%	-0.04 [-0.52 , 0.44]
Mandel 2007a	-69.7	23	35	-63.4	21.5	33	12.6%	-0.28 [-0.76 , 0.20]
Sendelbach 2006	2.05	2.01	42	3.16	2.5	33	12.7%	-0.49 [-0.95 , -0.03]
Subtotal (95% CI)			**110**			**100**	**37.9%**	**-0.27 [-0.55 , -0.00]**
Heterogeneity: Tau² = 0.00; Chi² = 1.78, df = 2 (P = 0.41); I² = 0%								
Test for overall effect: Z = 1.97 (P = 0.05)								
Total (95% CI)			**332**			**298**	**100.0%**	**-0.43 [-0.80 , -0.05]**
Heterogeneity: Tau² = 0.24; Chi² = 37.04, df = 7 (P < 0.00001); I² = 81%								
Test for overall effect: Z = 2.22 (P = 0.03)								
Test for subgroup differences: Chi² = 0.63, df = 1 (P = 0.43), I² = 0%								



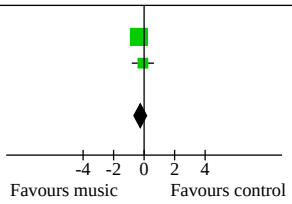
Analysis 1.20. Comparison 1: Music versus standard care, Outcome 20: Length of hospital stay

Study or Subgroup	Music Mean	Music SD	Music Total	Control Mean	Control SD	Control Total	Weight	Mean Difference IV, Fixed, 95% CI
Blankfield 1995	6.5	1.5	32	6.5	2.3	29	97.4%	0.00 [-0.99 , 0.99]
Schou 2008	8.92	4.7	7	11.05	9.36	14	2.6%	-2.13 [-8.14 , 3.88]
Total (95% CI)			**39**			**43**	**100.0%**	**-0.06 [-1.03 , 0.92]**
Heterogeneity: Chi² = 0.47, df = 1 (P = 0.49); I² = 0%								
Test for overall effect: Z = 0.11 (P = 0.91)								
Test for subgroup differences: Not applicable								



Analysis 1.21. Comparison 1: Music versus standard care, Outcome 21: Opioid intake

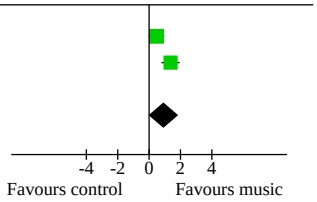
Study or Subgroup	Music Mean	Music SD	Music Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Fixed, 95% CI
Blankfield 1995	15.6	11.2	32	20.2	15.7	29	67.4%	-0.34 [-0.84 , 0.17]
Schou 2008	16.67	26.37	15	18.57	20.23	14	32.6%	-0.08 [-0.81 , 0.65]
Total (95% CI)			**47**			**43**	**100.0%**	**-0.25 [-0.67 , 0.16]**
Heterogeneity: Chi² = 0.32, df = 1 (P = 0.57); I² = 0%								
Test for overall effect: Z = 1.19 (P = 0.23)								
Test for subgroup differences: Not applicable								



Analysis 1.22. Comparison 1: Music versus standard care, Outcome 22: Quality of sleep

Study or Subgroup	Music Mean	Music SD	Music Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Barnason 1995	6.8	2.45	32	5.63	2.43	32	51.4%	0.47 [-0.02 , 0.97]
Ryu 2011	36.14	5.68	29	29.41	3.85	29	48.6%	1.37 [0.79 , 1.94]
Total (95% CI)			**61**			**61**	**100.0%**	**0.91 [0.03 , 1.79]**

Heterogeneity: Tau² = 0.32; Chi² = 5.31, df = 1 (P = 0.02); I² = 81%
Test for overall effect: Z = 2.03 (P = 0.04)
Test for subgroup differences: Not applicable



APPENDICES

Appendix 1. Search strategies 2008

CENTRAL on The Cochrane Library

#1 MeSH descriptor Music this term only
#2 MeSH descriptor Music Therapy this term only
#3 music* in All Text
#4 (#1 or #2 or #3)
#5 MeSH descriptor Myocardial Ischemia explode all trees
#6 MeSH descriptor Heart Diseases this term only
#7 MeSH descriptor Myocardial Revascularization explode all trees
#8 coronary in All Text
#9 (heart in All Text near/6 disease in All Text)
#10 angina in All Text
#11 (heart in All Text near/6 infarct* in All Text)
#12 (myocardial in All Text near/6 infarct* in All Text)
#13 (coronary in All Text near/6 bypass* in All Text)
#14 MeSH descriptor Cardiovascular Diseases this term only
#15 cardiac in All Text
#16 MeSH descriptor Cardiac Surgical Procedures explode all trees
#17 MeSH descriptor Heart Function Tests explode all trees
#18 cardiovascular next disease* in All Text
#19 cabg in All Text
#20 revasculari?ation in All Text
#21 (coronary in All Text near/6 angiograph* in All Text)
#22 (#5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15)
#23 (#16 or #17 or #18 or #19 or #20 or #21)
#24 (#22 or #23)
#25 (#4 and #24)

MEDLINE

1 Music/
2 Music Therapy/
3 music$.tw.
4 or/1-3
5 exp Myocardial Ischemia/
6 Heart Diseases/
7 exp Myocardial Revascularization/
8 Cardiovascular Diseases/
9 (coronary adj3 disease$).tw.
10 angina.tw.
11 (heart adj3 infarct$).tw.
12 (myocardial adj3 infarct$).tw.
13 (heart adj3 disease$).tw.
14 (coronary adj3 bypass$).tw.
15 exp Cardiac Surgical Procedures/

16 exp Heart Function Tests/
17 cardiac.tw.
18 or/5-17
19 18 and 4
20 randomized controlled trial.pt.
21 controlled clinical trial.pt.
22 Randomized controlled trials/
23 random allocation/
24 double blind method/
25 single-blind method/
26 or/20-25
27 exp animal/ not human/
28 26 not 27
29 clinical trial.pt.
30 exp Clinical trials/
31 (clin$ adj25 trial$).ti,ab.
32 ((singl$ or doubl$ or trebl$ or tripl$) adj (blind$ or mask$)).ti,ab.
33 placebos/
34 placebo$.ti,ab.
35 random$.ti,ab.
36 research design/
37 or/29-36
38 37 not 27
39 38 not 28
40 comparative study/
41 exp evaluation studies/
42 follow up studies/
43 prospective studies/
44 (control$ or prospectiv$ or volunteer$).ti,ab.
45 or/40-44
46 45 not 27
47 46 not (28 or 39)
48 28 or 39 or 47
49 19 and 48

EMBASE

1 music therapy/
2 exp music/
3 music$.tw.
4 or/1-3
5 Cardiovascular Disease/
6 exp heart surgery/
7 exp Ischemic Heart Disease/
8 Heart Disease/
9 exp heart function test/
10 (coronary adj3 disease$).tw.
11 angina.tw.
12 (heart adj3 infarct$).tw.
13 (myocardial adj3 infarct$).tw.
14 (heart adj3 disease$).tw.
15 (coronary adj3 bypass$).tw.
16 cardiac.tw.
17 or/5-16
18 17 and 4
19 clinical trial/
20 random$.tw.
21 randomized controlled trial/
22 trial$.tw.
23 follow-up.tw.
24 double blind procedure/
25 placebo$.tw.

26 placebo/
27 factorial$.ti,ab.
28 (crossover$ or cross-over$).ti,ab.
29 (double$ adj blind$).ti,ab.
30 (singl$ adj blind$).ti,ab.
31 assign$.ti,ab.
32 allocat$.ti,ab.
33 volunteer$.ti,ab.
34 Crossover Procedure/
35 Single Blind Procedure/
36 or/19-35
37 (exp animal/ or exp animal experiment/ or nonhuman/) not exp human/
38 36 not 37
39 18 and 38

CINAHL

1music/
2music therapy/
3music$.tw.
4or/1-3
5exp myocardial ischemia/
6exp heart diseases/
7exp myocardial revascularization/
8cardiovascular diseases/
9(coronary adj3 disease$).tw.
10angina.tw.
11(heart adj3 infarct$).tw.
12(myocardial adj3 infarct$).tw.
13(heart adj3 disease$).tw.
14(coronary adj3 bypass$).tw.
15exp Heart surgery/
16exp Heart Function Tests/
17cardiac.tw.
18or/5-17
19(clin$ adj25 trial$).ti,ab.
20((singl$ or doubl$ or trebl$ or tripl$) adj (blind$ or mask$)).ti,ab.
21placebos/
22placebo$.ti,ab.
23random$.ti,ab.
24(control$ or prospectiv$ or volunteer$).ti,ab.
25study design/
26clinical trial.pt.
27exp clinical trial/
28prospective studies/
29comparative study/
30exp evaluation studies/
31Randomized controlled trials/
32or/19-31
33exp animal/ not human/
3432 not 33
354 and 18 and 34

PsycINFO

1 Music/
2 Music Therapy/
3 music$.tw.
4 or/1-3
5 exp myocardial infarction/
6 exp heart diseases/
7 angina pectoris/
8 exp heart surgery/

9 (coronary adj3 disease$).tw.
10 angina.tw.
11 (heart adj3 infarct$).tw.
12 (myocardial adj3 infarct$).tw.
13 (heart adj3 disease$).tw.
14 (coronary adj3 bypass$).tw.
15 cardiac.tw.
16 or/5-15
17. empirical study.md
18 followup study.md
19 longitudinal study.md
20 prospective study.md
21 quantitative study.md
22 “2000”.md (is code for treatment outcome/randomized clinical trial)
23 treatment effectiveness evaluation/
24 exp hypothesis testing/
25 repeated measures/
26 exp experimental design/
27 placebo$.ti,ab
28 random$.ti,ab
29 (clin$ adj25 trial$).ti,ab.
30 ((singl$ or doubl$ or trebl$ or tripl$) adj (blind$ or mask$)).ti,ab
31. or/19-32
32 4 and 18 and 33
33 limit 32 to human

LILACS

1. Music$ [words]
And
2. heart or cardiac or coronary or cabg or angina or cardiovascular or myocardial [words]

ISI Science Citation Index

#32 #31 AND #17 AND #4
#31 #30 OR #29 OR #28 OR #27 OR #26 OR #25 OR #24 OR #23 OR #22 OR #21 OR #20 OR #19 OR #18
#30 TS=(control$ or prospectiv$ or volunteer$)
#29 TS=(prospective studies)
#28 TS=(follow up studies)
#27 TS=(evaluation studies)
#26 TS=(comparative study)
#25 TS=random$
#24 TS=placebo$
#23 TS=(Clinical trial$)
#22 TS=(single-blind method$)
#21 TS=(double blind method$)
#20 TS=(randomized controlled trial$)
#19 TS=(controlled clinical trial$)
#18 TS=(random allocation)
#17 #16 OR #15 OR #14 OR #13 OR #12 OR #11 OR #10 OR #9 OR #8 OR #7 OR #6 OR #5
#16 TS=cardiac
#15 TS=(Heart Function Test$)
#14 TS=(Cardiac Surgical Procedures)
#13 TS=(coronary bypass)
#12 TS=(Myocardial infarct$)
#11 TS=(heart infarct$)
#10 TS=angina
#9 TS=(coronary diseas*)
#8 TS=(Cardiovascular Disease*)
#7 TS=(Myocardial Revascularization)
#6 TS=(Heart Disease*)
#5 TS=(Myocardial Ischemia)
#4 #1 OR #2 OR #3

#3 TS=(singing OR song)
#2 TS=music*
#1 TS=(music therapy)
DocType=All document types; Language=All languages; Databases=SCI-EXPANDED, SSCI, A&HCI; Timespan=1974-2008

Specialist Music Therapy Research Database

The site's research register, dissertation archive, and bibliography were searched in 2007 for the following terms:
"cardiac OR cardiovascular OR myocardial OR angina OR coronary OR heart OR CABG".
This database is no longer functional.

CAIRSS

1. Cardiac OR (myocardial Ischemia) OR (heart diseas?)
2. Coronary OR Angina OR (heart infarct)
3. (cardiovascular diseas?) OR coronary bypass OR(cardiovascular surgical procedures)
4. cardiovascular OR CABG or revascularization

Proquest Digital Dissertations

Music AND Myocardial Ischemia
Music AND Heart Disease*
Music AND Myocardial
Music AND coronary
Music AND heart W/6 disease
Music AND angina
Music AND heart W/6 infarct*
Music AND myocardial W/6 infarct*
Music AND Cardiovascular Disease*
Music AND cardiac
Music AND Heart Function Tests
Music AND cardiovascular W/3 disease*
Music AND cabg
Music AND revascularization

National Research Register

1. Music
2. (music near therapy)
3. 1 OR 2
4. (cardiac OR cardiovascular OR myocardial OR angina OR coronary)
5. (CABG or heart)
6. 4 OR 5
7. 3 AND 6

Current Controlled Trials and ClinicalTrials.gov

1. Music or "music therapy"

Appendix 2. Search strategies 2012

CENTRAL on The Cochrane Library (issue 10, 2012)

#1 MeSH descriptor Music this term only
#2 MeSH descriptor Music Therapy this term only
#3 music* in All Text
#4 (#1 or #2 or #3)
#5 MeSH descriptor Myocardial Ischemia explode all trees
#6 MeSH descriptor Heart Diseases this term only
#7 MeSH descriptor Myocardial Revascularization explode all trees
#8 coronary in All Text
#9 (heart in All Text near/6 disease in All Text)
#10 angina in All Text
#11 (heart in All Text near/6 infarct* in All Text)
#12 (myocardial in All Text near/6 infarct* in All Text)
#13 (coronary in All Text near/6 bypass* in All Text)

#14 MeSH descriptor Cardiovascular Diseases this term only
#15 cardiac in All Text
#16 MeSH descriptor Cardiac Surgical Procedures explode all trees
#17 MeSH descriptor Heart Function Tests explode all trees
#18 cardiovascular next disease* in All Text
#19 cabg in All Text
#20 revasculari?ation in All Text
#21 (coronary in All Text near/6 angiograph* in All Text)
#22 (#5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15)
#23 (#16 or #17 or #18 or #19 or #20 or #21)
#24 (#22 or #23)
#25 (#4 and #24)

MEDLINE (OvidSP)

1 Music/
2 Music Therapy/
3 music$.tw.
4 or/1-3
5 exp Myocardial Ischemia/
6 Heart Diseases/
7 exp Myocardial Revascularization/
8 Cardiovascular Diseases/
9 (coronary adj3 disease$).tw.
10 angina.tw.
11 (heart adj3 infarct$).tw.
12 (myocardial adj3 infarct$).tw.
13 (heart adj3 disease$).tw.
14 (coronary adj3 bypass$).tw.
15 exp Cardiac Surgical Procedures/
16 exp Heart Function Tests/
17 cardiac.tw.
18 or/5-17
19 18 and 4
20 randomized controlled trial.pt.
21 controlled clinical trial.pt.
22 Randomized controlled trials/
23 random allocation/
24 double blind method/
25 single-blind method/
26 or/20-25
27 exp animal/ not human/
28 26 not 27
29 clinical trial.pt.
30 exp Clinical trials/
31 (clin$ adj25 trial$).ti,ab.
32 ((singl$ or doubl$ or trebl$ or tripl$) adj (blind$ or mask$)).ti,ab.
33 placebos/
34 placebo$.ti,ab.
35 random$.ti,ab.
36 research design/
37 or/29-36
38 37 not 27
39 38 not 28
40 comparative study/
41 exp evaluation studies/
42 follow up studies/
43 prospective studies/
44 (control$ or prospectiv$ or volunteer$).ti,ab.
45 or/40-44
46 45 not 27
47 46 not (28 or 39)

48 28 or 39 or 47
49 19 and 48

50.limit 49 to ed=20080612-20121105

EMBASE (OvidSP)

1 music therapy/
2 exp music/
3 music$.tw.
4 or/1-3
5 Cardiovascular Disease/
6 exp heart surgery/
7 exp Ischemic Heart Disease/
8 Heart Disease/
9 exp heart function test/
10 (coronary adj3 disease$).tw.
11 angina.tw.
12 (heart adj3 infarct$).tw.
13 (myocardial adj3 infarct$).tw.
14 (heart adj3 disease$).tw.
15 (coronary adj3 bypass$).tw.
16 cardiac.tw.
17 or/5-16
18 17 and 4
19 clinical trial/
20 random$.tw.
21 randomized controlled trial/
22 trial$.tw.
23 follow-up.tw.
24 double blind procedure/
25 placebo$.tw.
26 placebo/
27 factorial$.ti,ab.
28 (crossover$ or cross-over$).ti,ab.
29 (double$ adj blind$).ti,ab.
30 (singl$ adj blind$).ti,ab.
31 assign$.ti,ab.
32 allocat$.ti,ab.
33 volunteer$.ti,ab.
34 Crossover Procedure/
35 Single Blind Procedure/
36 or/19-35
37 (exp animal/ or exp animal experiment/ or nonhuman/) not exp human/
38 36 not 37
39 18 and 38

40. limit 39 to ew=200805$ to 20121109

CINAHL (OvidSp)

1 music/
2 music therapy/
3 music$.tw.
4 or/1-3
5 exp myocardial ischemia/
6 exp heart diseases/
7 exp myocardial revascularization/
8 cardiovascular diseases/
9 (coronary adj3 disease$).tw.
10 angina.tw.
11 (heart adj3 infarct$).tw.
12 (myocardial adj3 infarct$).tw.
13 (heart adj3 disease$).tw.

14 (coronary adj3 bypass$).tw.
15 exp Heart surgery/
16 exp Heart Function Tests/
17 cardiac.tw.
18 or/5-17
19 (clin$ adj25 trial$).ti,ab.
20 ((singl$ or doubl$ or trebl$ or tripl$) adj (blind$ or mask$)).ti,ab.
21 placebos/
22 placebo$.ti,ab.
23 random$.ti,ab.
24 (control$ or prospectiv$ or volunteer$).ti,ab.
25 study design/
26 clinical trial.pt.
27 exp clinical trial/
28 prospective studies/
29 comparative study/
30 exp evaluation studies/
31 Randomized controlled trials/
32 or/19-31
33 exp animal/ not human/
34 32 not 33
35 4 and 18 and 34

36 limit 36 to ew=200805$ to 20121109

PsycINFO (OvidSP)

1 Music/
2 Music Therapy/
3 music$.tw.
4 or/1-3
5 exp myocardial infarction/
6 exp heart diseases/
7 angina pectoris/
8 exp heart surgery/
9 (coronary adj3 disease$).tw.
10 angina.tw.
11 (heart adj3 infarct$).tw.
12 (myocardial adj3 infarct$).tw.
13 (heart adj3 disease$).tw.
14 (coronary adj3 bypass$).tw.
15 cardiac.tw.
16 or/5-15
17. empirical study.md
18 followup study.md
19 longitudinal study.md
20 prospective study.md
21 quantitative study.md
22 “2000”.md (is code for treatment outcome/randomized clinical trial)
23 treatment effectiveness evaluation/
24 exp hypothesis testing/
25 repeated measures/
26 exp experimental design/
27 placebo$.ti,ab
28 random$.ti,ab
29 (clin$ adj25 trial$).ti,ab.
30 ((singl$ or doubl$ or trebl$ or tripl$) adj (blind$ or mask$)).ti,ab
31. or/19-32
32 4 and 18 and 31
33 limit 32 to human

34. limit 33 to yr="2008 - 2012"

LILACS (Virtual Health Library)

1. Music$ [words]
And
2. heart or cardiac or coronary or cabg or angina or cardiovascular or myocardial [words]

(this database does not have the capacity to apply date limits. Results outputs were reviewed from 2008 onward)

Social Science Citation Index (ISI)

#33 Timespan=2008-2012

#32 #31 AND #17 AND #4
#31 #30 OR #29 OR #28 OR #27 OR #26 OR #25 OR #24 OR #23 OR #22 OR #21 OR #20 OR #19 OR #18
#30 TS=(control$ or prospectiv$ or volunteer$)
#29 TS=(prospective studies)
#28 TS=(follow up studies)
#27 TS=(evaluation studies)
#26 TS=(comparative study)
#25 TS=random$
#24 TS=placebo$
#23 TS=(Clinical trial$)
#22 TS=(single-blind method$)
#21 TS=(double blind method$)
#20 TS=(randomized controlled trial$)
#19 TS=(controlled clinical trial$)
#18 TS=(random allocation)
#17 #16 OR #15 OR #14 OR #13 OR #12 OR #11 OR #10 OR #9 OR #8 OR #7 OR #6 OR #5
#16 TS=cardiac
#15 TS=(Heart Function Test$)
#14 TS=(Cardiac Surgical Procedures)
#13 TS=(coronary bypass)
#12 TS=(Myocardial infarct$)
#11 TS=(heart infarct$)
#10 TS=angina
#9 TS=(coronary diseas*)
#8 TS=(Cardiovascular Disease*)
#7 TS=(Myocardial Revascularization)
#6 TS=(Heart Disease*)
#5 TS=(Myocardial Ischemia)
#4 #1 OR #2 OR #3
#3 TS=(singing OR song)
#2 TS=music*
#1 TS=(music therapy)

Specialist Music Therapy Research Database

This database is no longer functional therefore this search was not included in the update.

CAIRSS (Webvoyage)

1. Cardiac OR (myocardial Ischemia) OR (heart diseas?)
2. Coronary OR Angina OR (heart infarct)
3. (cardiovascular diseas?) OR coronary bypass OR(cardiovascular surgical procedures)
4. cardiovascular OR CABG or revascularization

(this database does not have the capacity to apply date limits. Results outputs were reviewed from 2008 onward)

Proquest Digital Dissertations

Music AND Myocardial Ischemia
Music AND Heart Disease*
Music AND Myocardial
Music AND coronary
Music AND heart W/6 disease
Music AND angina

Music AND heart W/6 infarct*
Music AND myocardial W/6 infarct*
Music AND Cardiovascular Disease*
Music AND cardiac
Music AND Heart Function Tests
Music AND cardiovascular W/3 disease*
Music AND cabg
Music AND revascularization

Search period limited to 2008 - 2012

Current Controlled Trials and ClinicalTrials.gov

1. Music or "music therapy"

Appendix 3. Journals Handsearched

Australian Journal of Music Therapy (1990 - 2012)
Canadian Journal of Music Therapy (1976 - 2012)
International Journal of the Arts in Medicine (1993 - 1999, no longer published after 1999)
Journal of Music Therapy (1964 - 2012)
Musik-,Tanz-, und Kunsttherapie (1999 - 2012)
Musiktherapeutische Umschau (1980 - 2012)
Music Therapy (1981 - 1996, no longer published after 1996)
Music Therapy Perspectives (1982 - 2012)
Nordic Journal of Music Therapy (1992 - 2012)
Music Therapy Today (online journal of music therapy) (2001 - 2007, no longer maintained)
Voices (online international journal of music therapy) (2001 - 2012)
Arts in Psychotherapy (1983 - 2012)
International Latin-American Journal of Music Therapy (1995 - 2000, no longer published after 2000)

WHAT'S NEW

Date	Event	Description
21 September 2021	Amended	New studies have been identified with a recent search (24 October 2019) but the new information does not change the review's findings. The conclusions of this Cochrane Review are therefore still considered up to date.

HISTORY

Protocol first published: Issue 3, 2007
Review first published: Issue 2, 2009

Date	Event	Description
23 July 2013	New citation required but conclusions have not changed	4 new included studies. Conclusion unchanged. New author added.
25 February 2013	New search has been performed	Searches updated November 2012.
5 November 2012	New search has been performed	Searches re-run in November 2012.

CONTRIBUTIONS OF AUTHORS

Joke Bradt: conceived and designed the review, developed the search strategies and wrote the protocol. She is the guarantor for the review and identified potentially relevant trials, extracted eligible articles, extracted data from included studies, performed the statistical analysis and wrote the review text.

Cheryl Dileo: conceived and designed the review, and contributed to writing the protocol. For the original review, she identified potentially relevant trials, tracked eligible articles, extracted data from them, and contributed to writing the text. For the update of the review, she completed the quality assessment of the trials.

Noah Potvin: contributed to the update of this review by screening the database search outputs for eligible trials, updating the handsearches, retrieving full-text articles, completing quality assessment of the trials, extracting data from included studies, and reviewing the text of this review.

DECLARATIONS OF INTEREST

All three authors are trained music therapists.

SOURCES OF SUPPORT

Internal sources

- Temple University, Philadelphia, PA, USA

External sources

- State of Pennsylvania Formula Fund, USA

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

The following subgroup analysis was not included in the protocol:

A comparison of (a) MI patients, (b) surgical or procedural patients, and (c) rehabilitation patients. Although this subanalysis was not determined a priori, the reviewers decided it was important to conduct a subanalysis comparing the effect of these three groups of studies for those outcome variables for which significant heterogeneity was found.

The original review only included randomized controlled trials. For the update of this review, we decided to also include quasi-randomized controlled trials and conduct a sensitivity analysis to examine the impact of such trials on the effect size.

Finally, an explicit statement was added to the method section regarding the exclusion of studies with participants who did not all have a confirmed CHD.

INDEX TERMS

Medical Subject Headings (MeSH)

Anxiety [*therapy]; Blood Pressure [physiology]; Coronary Disease [*psychology]; Heart Rate [physiology]; *Music Therapy; Randomized Controlled Trials as Topic; Respiratory Mechanics [physiology]; Stress, Psychological [*therapy]

MeSH check words

Humans