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

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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 putting them at greater risk for complications. Music interventions have been used to reduce anxiety and distress and improve physiological functioning in medical patients, however its efficacy for CHD patients needs to be evaluated.

Objectives

To examine the effects of music interventions with standard care versus standard care alone on psychological and physiological responses in persons with CHD.

Search strategy

We searched the Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE, CINAHL, EMBASE, PSYCINFO, LILACS, Science Citation Index, www.musictherapyworld.net, CAIRSS for Music, Proquest Digital Dissertations, ClinicalTrials.gov, Current Controlled Trials, and the National Research Register (all to May 2008). We handsearched music therapy journals and reference lists, and contacted relevant experts to identify unpublished manuscripts. There was no language restriction.

Selection criteria

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

Data collection and analysis

Data were extracted, and methodological quality was assessed, independently by the two reviewers. Additional information was sought from the trial researchers when necessary. Results are presented using weighted mean differences for outcomes measured by the same scale and standardized mean differences for outcomes measured by different scales. Posttest scores were used. In cases of significant baseline difference, we used change scores.

Main results

Twenty-three trials (1461 participants) were included. Music listening was the main intervention used, and 21 of the studies did not include a trained music therapist.

Results indicated that music listening has a moderate effect on anxiety in patients with CHD, however results were inconsistent across studies. This review did not find strong evidence for reduction of psychological distress. Findings indicated that listening to music reduces heart rate, respiratory rate and blood pressure. Studies that included two or more music sessions led to a small and consistent pain-reducing effect.

No strong evidence was found for peripheral skin temperature. None of the studies considered hormone levels and only one study considered quality of life as an outcome variable.

Authors' conclusions

Music listening may have a beneficial effect on blood pressure, heart rate, respiratory rate, anxiety, and pain in persons with CHD. However, the quality of the evidence is not strong and the clinical significance unclear.

Most studies examined the effects of listening to pre-recorded music. More research is needed on the effects of music offered by a trained music therapist.

PLAIN LANGUAGE SUMMARY

Music to reduce stress and anxiety for coronary heart disease patients

Individuals with coronary heart disease often suffer from severe distress putting them at greater risk for complications, including sudden cardiac death. This review included 23 randomized controlled trials with a total of 1461 participants. The findings suggest that music listening may have a beneficial effect on blood pressure and heart rate in people with coronary heart disease. Music listening also appears to be effective in reducing anxiety in myocardial infarction patients. No evidence for anxiety-reducing effects of music was found for patients undergoing cardiac procedures. This may be due to the fact that anxiety was measured after the completion of the procedure rather than during it.

Music listening may also reduce pain and respiratory rate, however the magnitude of these effects is small and the quality of the evidence is not strong. Therefore, its clinical importance is unclear.

No evidence of effect was found for depression, heart rate variability, or peripheral skin temperature. Inconsistent results were found for mood. However, only a small number of trials investigated the effects of music on these outcomes. More research is needed.

The vast majority of the studies examined the effects of patients' listening to pre-recorded music. More research is needed on the effects of music offered by a trained music therapist.

BACKGROUND

Description of the condition

Coronary heart disease is the single leading cause of death worldwide. According to the World Health Organization (WHO), 16.7 million people worldwide die of cardiovascular diseases (CVD) each year. By 2020, the WHO estimates 25 million CVD deaths globally (WHO 2003). Heart disease has no geographical, gender, or socioeconomic boundaries (Chockalingam 1999). People with coronary heart disease 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).Therefore, it is of crucial importance that the care of patients with coronary heart disease focuses on psychological needs 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 patients 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. EEG readings) and psychological (e.g. self-report, the Spielberger State-Trait Anxiety Inventory (STAI)) domains (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 (Dileo 2005; Standley 1986; Standley 2000).

Dileo 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 and/or instruments; (4) composing music; and (5) music combined with other modalities (e.g. movement, imagery and art) (Dileo 2007).

Several investigators have examined the effects of music on a variety of outcomes in patients with coronary heart disease including heart rate (Barnason 1995; Davis-Rollans 1987; Hamel 2001), respiratory rate, blood pressure (Barnason 1995; Hamel 2001), myocardial oxygen demand (White 1999), hormone levels (Vollert 2002), skin temperature (Zimmerman 1988), anxiety (Barnason 1995; Bolwerk 1990), and pain (Zimmerman 1996).

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 normal and medical patients. These outcomes have heightened significance when it comes to cardiac patients and, therefore, a systematic review of the existing data is much needed.

Studies on the use of music with patients with coronary heart disease have reported inconsistent findings. This may be due to differences in study design, the music intervention and outcome measurements across studies. In addition, a number of individual factors that are likely to influence responses to music, including age, gender, emotional state, music preference, personal associations with the music, prior musical training and culture, are likely to influence these outcomes (Dileo 2005; Pelletier 2004; Standley 1986; Standley 2000). Besides inconsistent findings, many research studies using music and music therapy frequently suffer from small sample size, making it difficult to achieve statistically significant results. A systematic review is needed to more accurately gauge the efficacy of music with this population, as well as to identify variables that may moderate its effects.

OBJECTIVES

1. To identify randomized controlled trials examining the effects of music on physiological and psychological responses in people with coronary heart disease.

2. To compare effectiveness of participation in music experiences with standard care.

3. To compare effectiveness of different levels of engagement in music experiences.

4. To compare effectiveness of patient-selected music with researcher-selected music.

METHODS

Criteria for considering studies for this review

Types of studies

All randomized clinical trials of any language, published and unpublished, were eligible for entry.

Types of participants

The review included studies of men, women, and children, inpatient or outpatient, with coronary heart disease. No restrictions were imposed 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. Length or frequency of music sessions were not used as inclusion criteria for this review. Most studies included in this review used only one music treatment session (30 minutes). All but one study (Hermele 2005) measured the outcome variables immediately following the music intervention.

Types of outcome measures

Primary outcomes

1. Psychological distress
2. Quality of life

Secondary outcomes

1. Heart rate
2. Respiratory rate
3. Systolic blood pressure
4. Diastolic blood pressure
5. Myocardial oxygen demand
6. Hormone levels
7. Pain

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

Search methods for identification of studies

Electronic searches

The following databases were searched: Cochrane Central Register of Controlled Trials (CENTRAL) on *The Cochrane Library* Issue 2 2008, MEDLINE (1950 to June 12 2008), CINAHL (1982 to May 12 2008), EMBASE (1974 to May 14 2008), PSYCINFO (1806 to May 9 2008), LILACS (1982 to May 12 2008), Science Citation Index (1974 to May 12 2008), the specialist music therapy research database at www.musictherapyworld.net (retrieved on June 16 2007), CAIRSS for Music (retrieved on May 12 2008) Proquest Digital Dissertations (1861 to May 12 2008), ClinicalTrials.gov (www.clinicaltrials.gov) (retrieved on May 12 2008), Current Controlled Trials (www.controlled-trials.com)(retrieved on May 12 2008), and the National Research Register (www.update-software.com/National) (2000 to May 12 2008). The search strategies are listed in Appendix 1.

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, relevant journals were handsearched, see Appendix 2 for full details.

The bibliographies of relevant studies or reviews were checked. Relevant experts were contacted 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 reviewer (JB) scanned the titles and abstracts of each record retrieved from the search. If information in the abstract clearly indicated that the trial did not meet the inclusion criteria, the trial was rejected. When a title or abstract could not be rejected with certainty, the full article was obtained and inspected by the two reviewers independently. Both reviewers used an inclusion criteria form to assess the trial's eligibility for inclusion. If a trial was excluded, a record of both the article and the reason for exclusion was kept.

Data extraction and management

Data from the selected trials were extracted independently by the two reviewers using a standardized coding form. Any differences in data extraction were discussed and collaboratively resolved. The following data (where applicable) were extracted:

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

All included trials were assessed by two reviewers (JB and CD) blinded to each other's assessment for trial quality. Any disagreements was solved by discussion. The following criteria was used for quality assessment:
1. Method of randomization:

- Was the trial reported as randomized? Yes/No.
- Was the method of randomization appropriate? Yes/No/Unclear.

randomization was rated as appropriate if every participant had an equal chance to be selected for either group. The use of date of birth, date of admission, or alternation for randomization was rated as inappropriate, and these trials were excluded from this review.
2. Allocation concealment was rated in accordance with Cochrane Handbook, section 6.3 (Higgins 2005):

- Adequate: methods to conceal allocation include: (1) central randomization; (2) serially numbered, opaque, sealed envelopes; or (3) other descriptions with convincing concealment.
- Unclear: authors did not adequately report on method of concealment.
- Inadequate: allocation was not adequately concealed (e.g. alteration methods were used).
- Not used.

3. Blinding:
With music and music therapy studies, it is not possible to blind participants and those providing the music/music therapy interventions. However, outcome assessors can be blinded. In this review, blinding was marked as 'yes', 'no', or 'unclear' as it pertained to the blinding of outcome assessors.
4. Intention-to-treat analysis:
An intention-to-treat analysis was considered adequate when numbers of drop-outs and reasons for drop-out were reported. If there were no withdrawals and this was indicated in the article, the article received a rating of 'adequate'.
The above criteria were used to give each article an overall quality rating based on the Cochrane Handbook, section 6.7.1 (Higgins 2005):

- Low risk of bias: all four 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.

The quality assessment rating was used for sensitivity analysis.

Dealing with missing data

We could not use intention to treat analysis as the outcomes required patient involvement. Instead, an available case analysis was used.

Assessment of heterogeneity

Heterogeneity was investigated using the I-squared test with I^2 > 50% indicating significant heterogeneity.

Assessment of reporting biases

Publication bias using anxiety (Figure 1), heart rate (Figure 2), and systolic blood pressure (Figure 3) as outcomes was examined visually in the form of funnel plots. The funnel plots 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.

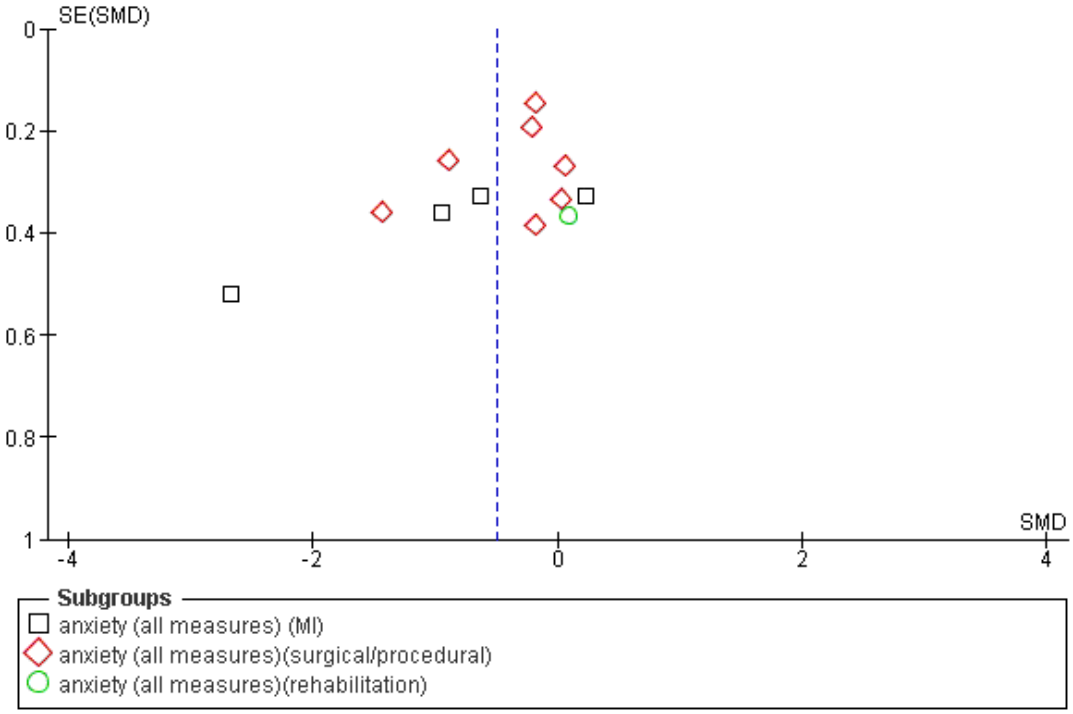


Figure 2. Funnel plot of comparison: 1 music versus standard care, outcome: 1.9 Heart rate-patient type.

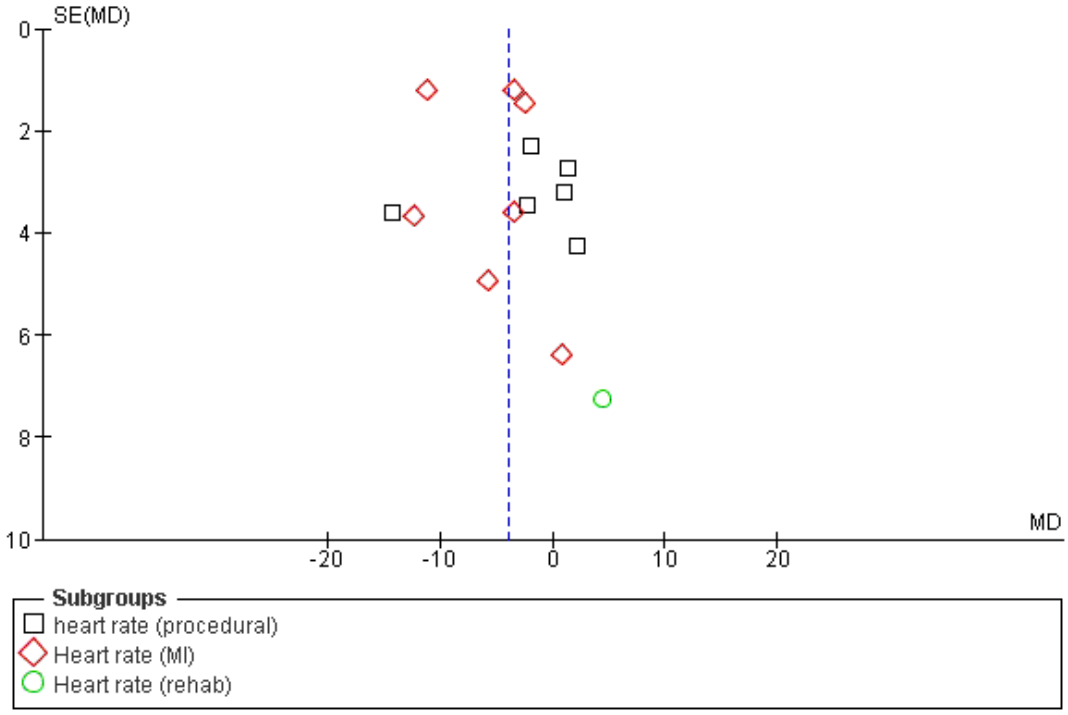
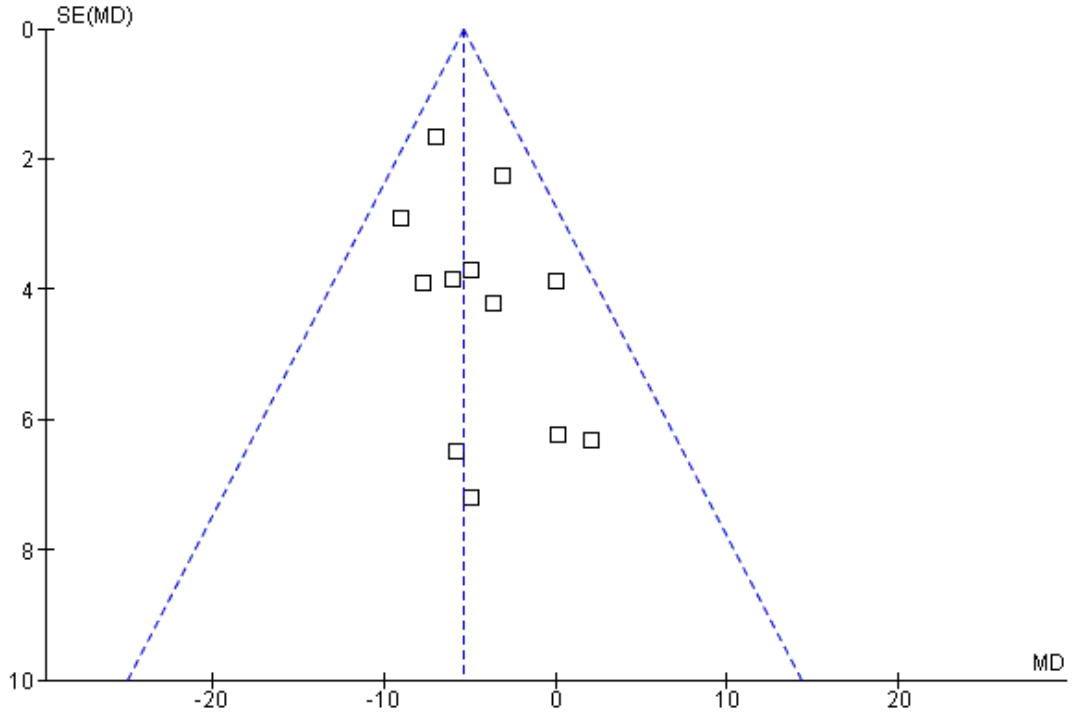


Figure 3. Funnel plot of comparison: 1 music versus standard care, outcome: 1.13 Systolic blood pressure.



Data synthesis

All trials included in the systematic review were entered into Review Manager 5 (Revman 2008). The main outcomes in this review were physiological responses and psychological responses (anxiety, pain, mood) presented as continuous variables. Posttest scores were used for the meta-analysis. In the case of multiple music sessions, posttest data of the last session were used in this review. In the case of statistically significant baseline differences, change scores (i.e. control group minus intervention group differences) were computed according to the guidelines provided by the Cochrane Heart Group. Standardized mean differences (SMD) were calculated for outcome measures using results from different scales; weighted mean differences were used 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, only data of the first phase of the trials were used. Pooled estimates were calculated using the fixed-effect model unless there was significant heterogeneity (I^2 > 50%), in which case the random-effects model was used to obtain a more conservative estimate. 95% confidence intervals were calculated for each effect size estimate.

This review did not include any categorical variables.

The following treatment comparison was made: music versus standard care.

Subgroup analysis and investigation of heterogeneity

The following sub-analyses were planned 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 two 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 all but one study 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.

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

Sensitivity analysis

The influence of study quality was examined using a sensitivity analysis wherein the results of including and excluding lower quality studies were compared.

RESULTS

Description of studies

See: Characteristics of included studies; Characteristics of excluded studies.

Results of the search

The database searches and handsearching of conference proceedings and journals resulted in 702 citations. One reviewer (JB) examined the titles and abstracts, and 77 references were retrieved for possible inclusion. These were then independently screened by the two reviewers resulting in 29 references to 23 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, case studies, or used a combination of treatments (e.g. music and aroma therapy).

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

Included studies

Twenty-three studies with a total of 1461 participants were included. These studies examined the effects of music on psychological, physiological, and physical outcomes in patients undergoing cardiac surgery and procedures (11 studies, 941 participants), myocardial infarction patients (MI) (9 studies, 389 participants), and cardiac rehabilitation patients (3 studies, 131 participants). The large majority of the participants included in these studies were male (67%). The average age of the participants was 63.3 years. For 13 trials, ethnicity of the participants was not reported. For those studies that did report on ethnicity, the majority of the participants were Caucasian (average of 85%). Several studies lumped non-Caucasian ethnic groups together under "other" making it hard to estimate the percentage of other specific ethnic groups represented in these trials. Trial sample size ranged from 30 to 196 participants.

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

Twenty-one studies used parallel group designs whereas two studies (Davis-Rollans 1987; Emery 2003) used cross-over designs. For these cross-over trials, only data of the first phase (i.e. before the cross-over) of the trials were used in the meta-analysis.

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

Twenty-one studies were categorized as music medicine studies (as defined in the Background section above). Two studies were categorized as music therapy. All but one study used music listening as the main intervention. The majority of the trials (14) included one music session offered during a cardiac procedure (e.g. coronary angiography) or within 48 hrs of hospitalization for MI. Two trials included 2 sessions offered over 2 postoperative days. Eight

trials offered 3 or more sessions on consecutive days. 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 with MI patients, 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.

Ten studies provided detailed information about the music that was used (composition title and composer). Eleven studies stated only the different styles of music that were offered to the subjects (e.g. jazz, easy listening, country and western, classical Music) without any composition or performance-specific information. Only two studies provided composition title, composer, and tempo information.

Fourteen studies used patient-selected music, whereas nine studies used researcher-selected music.

The studies were conducted in six different countries: USA (15 studies), Canada (2 studies), Australia (1 study), Denmark (1 study), Germany (1 study), and Hong Kong (1 study).

Excluded studies

The main reason for exclusion of studies that appeared eligible for this review was lack of proper randomization. Reasons for exclusion are listed in the table Characteristics of excluded studies.

Risk of bias in included studies

We only included studies that used appropriate methods of randomization. Studies using non-random methods of allocation (e.g. alternate group assignment) were excluded. Only 52% of the studies used allocation concealment. In 91% of the trials blinding of the outcome assessors was not used and this inevitably introduced potential for biased assessment. Blinding of intervention allocation is not possible in music interventions, adding another layer of possible bias.The dropout rate was less than 20% for 83% of the trials. Three studies had a drop out rate between 21% and 25%. Most studies reported reasons for dropout.

As a result, only one study (Emery 2003) received a low risk of bias rating. For all other studies, there was a high risk of bias. Risk of bias is detailed for each study in the risk of bias tables included with Characteristics of included studies.

As all but one trial was rated at the same level (high risk), sensitivity analysis on the basis of overall quality rating was not carried out. Instead, we conducted a sensitivity analysis to examine the impact of the use of allocation concealment on the obtained effects. Surprisingly, the use of allocation concealment led to more conservative estimates for only three of the 11 outcomes included in this review, namely heart rate, respiratory rate, and psychological distress. For all other outcomes, studies that did not use allocation concealment or that received a rating of "unclear", had a lower pooled estimate than studies that used allocation concealment.

Effects of interventions

Primary outcomes

Psychological distress

Four studies examined the effects of music listening on psychological distress by use of the Profile of Mood States (POMS) (Cadigan 2001, Hermele 2005, Schou 2008) or Brief Symptom Inventory (BSI) (Mandel 2007a). Their pooled estimate indicated no strong evidence of effect of the music intervention (SMD = -0.23, 95% confidence interval (CI) -0.48 to 0.02, P = 0.07) (Analysis 1.1).

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

The standardized mean difference (SMD) of those studies (12 studies) that reported posttest anxiety scores, regardless of the scale used, revealed a moderate (Cohen 1988) effect favouring music interventions (SMD = -0.49, 95% CI -0.83 to -0.15, P = 0.004), but results were inconsistent between studies (Chi^2 = 46.91, P < 0.00001, I^2 = 77%). Grouping the studies by patient type (myocardial infarction (MI) patients, surgical/procedural patients, rehabilitation patients) (Analysis 1.2) or music preference did not resolve this heterogeneity (Analysis 1.3).

When pooling studies that only used STAI State Anxiety form (STAI-S) to measure state anxiety, significantly lower state anxiety was found in participants who received standard care combined with music listening than those who received standard care alone (mean difference (MD) = -3.78, 95% CI -6.31 to -1.24; P = 0.003). However, considerable statistical heterogeneity remained (Chi^2 = 53.51, P < 0.00001, I^2 = 83%). After grouping the STAI studies by type of patients (MI; surgical/procedural), heterogeneity was greatly reduced (Analysis 1.4). Results indicated that music interventions are effective in reducing anxiety (as measured by STAI-S) in MI patients: MI patients exposed to music had 5.72 units (on a possible score range of 20 to 80) less anxiety than unexposed patients (7 studies, 95% CI -7.67 to -3.78, P < 0.00001; Chi^2 = 11.33, P = 0.08, I^2 = 47%). No anxiety-reducing effect was found for surgical/procedural patients (3 studies, MD = 0.0, 95% CI -1.48 to 1.49; Chi^2 = 1.53, P = 0.47, I^2 = 0%). It is important to point out that in surgical or procedural patients, anxiety levels dropped to within normal range (low anxiety) in both the intervention and the standard care groups after the procedure regardless of the intervention. Two studies reported on the effects of music on anxiety in rehabilitation patients. Emery 2003 reported no significant difference between the two groups on the tension-anxiety scale of the Profile of Moods Scale (POMS). Mandel 2007a compared the two groups on the outcome of trait anxiety (STAI Trait Anxiety form (STAI-T)) and found no significant difference at the end of the treatment period. At 4-month follow-up, a significant difference was found (p = 0.03), however, extensive subject loss

at that measurement point greatly reduces the usefulness of these results.

We then explored whether music preference affected the outcome of state anxiety as measured by STAI-S. The pooled estimate of studies that allowed patients to select music from a music selection offered by the researcher was smaller and more heterogeneous with MD = -2.73 (95% CI -3.95 to -1.50, P < 0.0001; Chi² = 31.83, P < 0.00001, I² = 87%) than those who used researcher-selected music (MD = -5.16, 95% CI -6.54 to -3.79, P < 0.00001; Chi² = 14.92, P = 0.005, I² = 73%) (Analysis 1.5).

The pooled estimate for studies that measured anxiety by scales other than the STAI-S indicated that patients who listened to music had greater anxiety reduction than those who did not (7 studies, SMD = -0.34, 95% CI -0.74 to 0.06, P = 0.09). Here too, results were statistically heterogeneous (Chi² = 20.33, P = 0.002, I² = 70%). Grouping the studies by type of patients did not reduce the heterogeneity for the surgical/procedural patients. Two studies with MI and rehabilitation patients did obtain a homogeneous effect but this effect did not reach statistical significance (SMD = 0.15, 95% CI -0.32 to 0.63, P = 0.53; Chi² = 0.07, P = 0.80, I² = 0%) (Analysis 1.6).

Four studies 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 = -0.12, 95% CI -0.42 to 0.18, P = 0.44) (Analysis 1.7).

Two studies used a numeric rating scale to measure the effects of music on mood. Their pooled estimate indicated that participants who listened to music reported significantly more mood enhancement than those receiving standard care (SMD = 0.85, 95% CI 0.43 to 1.28, P < 0.0001), however, there was disagreement between the two studies about the size of the effect (Chi² = 5.02, P = 0.03, I² = 80%) (Analysis 1.8). Therefore, the results are inconclusive.

Quality of life

Only one study (Mandel 2007a) considered quality of life as an outcome, as measured by the Medical Outcomes 36-Item Short-Form Health Survey (SF-36). No significant differences were found between the music therapy group and the control group during the last week of treatment. The authors report the following effect sizes for the 4-month follow-up, but significant subject loss at this measurement point (27 out of 33 control participants and 9 out of 35 experimental participants were lost to follow-up) greatly reduces the usefulness of the data: physical functioning subscale (MD = 11.4, SD = 23.1, effect size = 0.50), body pain (MD = 17.6, SD = 20.1, effect size = 0.87), general health (MD = 23.6, SD = 14.8, effect size = 1.60), social functioning (MD = 26.8, SD = 24.5, effect size = 1.09), mental health (MD = 8.4, SD = 14.0, effect size = 0.60).

Secondary outcomes

Heart rate

The pooled estimate of 14 studies showed a significant effect on heart rate, favoring music interventions over standard care (MD = -3.92, 95% CI -6.84 to -1.00, P = 0.009). However, the results were inconsistent among studies (Chi² = 57.92, P < 0.00001, I² = 78%). Grouping the studies by type of patient (MI, surgical/procedural, rehabilitation) reduced heterogeneity for surgical/procedural patient studies but not sufficiently (Analysis 1.9).

A subgroup analysis by patient-selected versus researcher-selected music produced interesting results. The pooling of studies that used researcher-selected music (5 studies) resulted in a smaller but homogeneous effect size (MD = -2.74, 95% CI -4.69 to -0.79, P = 0.006; Chi² = 2.89, P = 0.58, I² = 0%). The use of patient-selected music (9 studies) resulted in a larger effect size (MD = -6.44, 95% CI -7.94 to -4.94, P < 0.00001), however, the results were highly inconsistent between studies (Chi² = 46.38, P < 0.00001, I² = 83%) (Analysis 1.10).

Two studies included heart rate variability as an outcome with MI patients. Their pooled estimate suggests that music has no effect on heart rate variability (MD = 0.00, 95% CI -0.25 to 0.26, P = 0.97) (Analysis 1.11).

Respiratory rate

Five studies (one with surgical/procedural patients, four with MI patients) examined the effects of music on respiratory rate in people with coronary heart disease. A heterogeneous pooled estimate of -3.05 (95% CI -4.53 to -1.57, P < 0.0001; Chi² = 26.36, P < 0.0001, I² = 85%) was found (Analysis 1.12).

Pooling the studies that used researcher-selected music had a similar effect on heterogeneity as it did for the heart rate outcome: the use of researcher-selected music led to a smaller but homogeneous effect size (3 studies, MD = -1.71, 95% CI -2.28 to -1.14, P < 0.00001; Chi² = 0.55, P = 0.76, I² = 0%). The use of patient-selected music resulted in statistically non-significant and heterogeneous pooled estimate (2 studies, MD = -6.72, 95% CI -13.79 to 0.36, P = 0.06; Chi² = 12.18, P = 0.0005, I² = 92%) (Analysis 1.12).

Systolic blood pressure

Listening to music significantly reduced the systolic blood pressure of patients with coronary heart disease, as indicated by a pooled estimate of -5.34 mmHg (12 studies, MD = -5.34, 95% CI -7.20 to -3.48, P < 0.00001). The results were consistent across studies (Analysis 1.13).

Diastolic blood pressure

A pooled estimate of -1.54 mmHg (9 studies, 95% CI -3.17 to 0.09) was found for diastolic blood pressure, favoring music listening, but this difference of effect was not statistically significant (P = 0.06). The results were consistent across studies (Analysis 1.14). Amongst the nine studies included for this analysis, there was only one cross-over study (Emery 2003). Deleting Emery from the analysis resulted in a statistically significant and homogeneous effect size of -1.84 mmHg (95% CI -3.53 to -0.14, P = 0.03).

Myocardial oxygen demand

Surprisingly, only one study (Winters 2005) included myocardial oxygen demand, or the amount of oxygen required by the heart to function properly, as an outcome. The method of measurement was not specified 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).

One study (Chan 2007) included oxygen saturation levels (SPO_2) as an outcome. The mean SPO_2 level for the music group (n = 31) was 95.6 (SD = 1.6) and 97.2 (SD = 1.3) for the control group (n = 35).

Hormone levels

None of the included studies examined the effects of music on hormone levels that are of particular relevance to CHD patients, including adrenaline and noradrenaline concentrations, cortisol levels and other stress hormones that can be deleterious to cardiac functioning.

Pain

Music interventions resulted in a statistically significant reduction of pain compared to standard care (SMD = -0.32, 95% CI -0.62 to -0.03, P = 0.03), however, the results were not consistent between studies (Chi^2 = 35.65, P < 0.0001, I^2 = 78%) (Analysis 1.15).

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

However, 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 (3 studies, SDM = -0.27, 95% CI -0.55 to -0.00, P = 0.05; Chi^2 = 1.78, P = 0.41, I^2 = 0%).

Peripheral skin temperature

There was no statistically significant effect for peripheral skin temperature. Moreover, the results were not consistent among studies (3 studies, MD = 1.22, 95% CI -1.44 to 3.88, P = 0.37; Chi^2 = 8.09, P = 0.02, I^2 = 75%) (Analysis 1.16). One researcher stated that the lack of increase in peripheral skin temperature may have been due to the use of beta-blockers, known to cause peripheral arterial insufficiency (Cadigan 2001).

DISCUSSION

Summary of main results

Psychological outcomes

The results of 12 studies suggest that music listening has a moderate effect (Cohen 1988) on anxiety in patients with coronary heart disease. However, the results were inconsistent between studies and, therefore, need to be interpreted with caution.

Studies using the same scale (STAI) to measure anxiety obtained consistent anxiety-reducing effects of music (5.72 units on a 20 to 80 point score range) in myocardial infarction patients. A reduction of 5.72 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. In contrast to the MI studies, there was no evidence for an anxiety-reducing effect of music in procedural patients (intracardiac catheterization, coronary angiography, coronary artery bypass grafting) (3 studies). In the latter studies, anxiety levels dropped to within normal range (low anxiety) for both the music intervention group and the standard care group. This suggests that anxiety may be reduced because of the completion of the procedure rather than the intervention used. In contrast, MI patients continue to experience anxiety about their condition, and music interventions were successful with this group of patients. Anxiety levels in procedural patients may need to be tracked during procedures, if possible, rather than at baseline and after the procedure.

The pooled estimate of four studies suggests that music has a small effect on psychological distress, but this difference did not reach statistically significance.

No evidence of an effect of music on depression was found (4 studies). These studies had small sample sizes (30 to 88 patients, totaling 172). More studies are needed. In contrast, the pooled estimate of two studies suggests that music listening may have a significant effect on mood. However, more studies are needed to further evaluate the effect of music on mood as evidenced by the inconsistencies of results across these two studies.

None of the studies in this review included the outcome quality of life.

Physiological Outcomes

Results of this review suggest that listening to music reduces heart rate. However, there was disagreement among the 14 studies on the size of this effect. In examining the source of the heterogeneity, we discovered that listening to patient-selected music resulted in a heart rate reduction of 6.44 beat per minute (bpm) compared to 2.74 bpm when listening to researcher-selected music. However, in contrast to patient-selected music, the results were consistent across studies when researcher-selected music was used.

No evidence for an effect was found for heart rate variability. However, only two studies included this as an outcome and their total sample size was small (90 subjects combined).

For respiratory rate, the use of researcher-selected music also led to smaller but consistent results, whereas the use of patient-selected music led to inconsistent results that did not reach statistical significance.

Pooled estimates indicate that music reduces systolic as well as diastolic blood pressure consistently across studies.

Only one study examined the effects of music listening on my-

ocardial oxygen demand and found a reduction in myocardial oxygen demand in contrast to the standard care group. One study included SpO_2 levels and found slightly higher SpO_2 levels in the standard care group. However, this difference did not reach statistical significance.

None of the studies reported on the effect of music on hormone levels.

A small effect was found for music listening on self-reported pain, however the results were inconsistent across studies. However, excluding those studies that only used one music session led to a small effect that was consistent across studies.

No strong evidence was found for peripheral skin temperature changes in favour of music listening.

Overall completeness and applicability of evidence

This review included 23 randomized controlled trials. 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 restricting language. In spite of such a comprehensive search, it is still possible we 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.

Results of this review indicated that listening to music may be an effective intervention for reduction of heart rate and blood pressure in people with coronary heart disease and reduction of anxiety in myocardial infarction patients. Evidence was also found for reduction of respiratory rate and pain, but these effects were small and, therefore, their clinical relevance is unclear.

All but one trial used music listening as the clinical intervention. Twenty-one 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 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 of the two music therapy studies were not analyzed separately because of this small number of studies and because of clinical diversity.

Presently, no data can 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, therefore, 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. 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 didn't care for the music (Bolwerk 1990). In addition, musical parameters of the choices offered may have differed from researcher-selected music. This could explain why trials that used patient-selected music had more heterogeneous results than trials using researcher-selected music. The fact that trials with researcher-selected music had smaller but homogeneous effect sizes should not be translated into a decision to no longer take patient preference into consideration when offering music to patients with coronary heart disease. 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 myocardial infarction. Offering multiple music listening sessions allows for the patient to give feedback about the music, select different music if needed, and become more skilled in using music for relaxation purposes. In 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 inves-

tigation into the optimal frequency and duration of music interventions for people with CHD is needed.

Since the vast majority of participants in these trials were Caucasian (85%), 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 depression, mood, myocardial oxygen demand, and peripheral skin temperature, the 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. The chief investigators of most studies needed to be contacted to provide additional methodological and statistical information. All but one study in this review received a high risk of bias rating.

For many outcomes in this review, there were inconsistencies in effect among studies. In addition, the trials included were generally small (n = 1461; median = 50) 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.

We are confident that our detailed search strategy combined with extensive handsearching of journals and some conference proceedings identified all relevant trials. 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, however, 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).

AUTHORS' CONCLUSIONS

Implications for practice

This systematic review of randomized controlled trials indicates that music listening may have a beneficial effect for people with coronary heart disease. The findings of this meta-analysis indicate that music listening may reduce systolic and diastolic blood pressure and heart rate. Music listening also appears to be effective in reducing anxiety in myocardial infarction patients upon hospitalization. Therefore, it is recommended that music listening is offered as a stress management intervention to MI patients upon hospitalization. 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 music therapy literature recommends that 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.

No evidence for anxiety-reducing effects of music was found for procedural patients. This may be due to the fact that anxiety was measured after completion of the procedure (when anxiety had dropped in all participants, regardless of intervention), rather than during. The physiological data indicate, however, that patients may experience less anxiety during the procedure when listening to music. Since physiological responses are continuously monitored during procedures with CHD patients, and music interventions can be easily halted in case the patient does not experience beneficial effects, it is recommended that music listening is offered as an anxiety management intervention prior to and during procedures. Several studies reported that patients spontaneously reported beneficial effects of music listening during procedures even though the anxiety posttests did not demonstrate significant results (Bally 2003; Broscious 1999). Unfortunately, data comparing the effectiveness of music medicine or music therapy to other traditional or non-traditional interventions for stress and anxiety reduction are currently limited. Clearly, there is a great need for these studies, so that patients may choose the most effective as well as cost-effective intervention.

Music listening may also reduce pain and respiratory rate, however the magnitude of these effects is small and, therefore, its clinical importance unclear.

No evidence of effect was found for depression, heart rate variability, and peripheral skin temperature. 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 two 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 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 on patients with coronary heart disease, it is impossible to establish at this time whether these interventions are more effective than mere 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 coronary heart disease. The use of other music interventions, such as music improvisation, singing, listening to live music, songwriting, amongst others, with this population still needs to be examined.

Randomized controlled trials on the use of music therapy (provided by a trained music therapist) with this population are urgently needed. All but two studies in this review were carried out by medical personnel. Music therapists are trained professionals who have the skills to tailor music therapy interventions to the specific needs and characteristics of the patient. Although the use of pre-recorded music may be preferred as a standardized stimulus by researchers, it is possible to develop music therapy protocols that will allow for individualization according to patient needs while still adhering to RCT research standards. Music therapists are urged to formalize protocols to test the effectiveness of their interventions through randomized controlled trials.

One should not ignore, however, the importance of qualitative research and non-RCT research to gain a better understanding of the qualitative aspects of the patient's experience and to identify factors that may contribute to or limit the effectiveness of music medicine and music therapy interventions.

The effects of researcher-selected versus patient-selected music need to be further examined. In particular, studies that use music that truly reflects patient preference are needed. In addition, future trials should investigate the differential effects of researcher-selected versus patient-selected music. Could it be that researcher-selected music (with sedative qualities) is more effective for regulation of physiological responses, such as heart rate and blood pressure, whereas patient-preferred music is more effective for psychological outcomes such as depression and mood?

In addition, further exploration is needed of the specific qualities of music for stress and anxiety reduction in CHD and other medical patients. Although music psychology researchers have extensively investigated the effects of specific musical characteristics such as tempo, meter, melody, harmony, tonality and timbre, on emotional responses in non-medical populations, such research is still needed with medical patients. Many of the studies in this review, furthermore, reported few details about the music selections used. Most reports only included a general mention of the music style (e.g. new age, classical, etc). Future researchers need to discuss in greater detail specific characteristics of the music selections.

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 MI patients, 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? To answer many of these questions, comparative studies are needed. 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 with MI patients (Winters 2005). Finally, the use of culturally relevant music needs to be considered when designing future protocols.

Argstatter (Argstatter 2006) recommended that future studies examine the impact of patients' preferred coping strategies on the effectiveness of anxiety reduction interventions such as music listening. Some patients 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.

In addition, several study authors suggested that patient personality traits (especially trait anxiety) and pre-procedural state anxiety need to be considered as impact factors in future studies (Argstatter 2006; Bally 2003; Elliott 1994; Zimmerman 1988) . Their results indicated that patients with high levels of trait and state anxiety reported much greater benefits from the music interventions than patients with low levels of anxiety.

Furthermore, several authors recommended that future studies exert better control over the confounding effects of beta-blockers, other cardiac medication, as well as opioids (Cadigan 2001; Sendelbach 2006) on physiological and physical responses. Cadigan et al. specifically suggested that beta-blockers may interfere with changes in peripheral skin temperature because of the known effect of induced peripheral arterial insufficiency (Cadigan 2001).

More studies are needed examining the effects of music interventions on quality of life, mood, and depression in CHD patients, 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, SpO_2-levels, and stress hormone levels may provide more sensitive measures of effect and may, moreover, provide insight in the underlying physiology of anxiety and stress reduction. Finally, long-term outcomes such as length of hospitalization and survival/death need to be considered.

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

Formal evaluation of cost & benefit 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]*

Argstatter 2006

Methods	RCT Randomization method: permuted block randomization Allocation concealment: unclear Blinding: no Design: pretest-posttest control group design
Participants	Adults admitted for in-patient cardiac catheterization N music therapy group: 28 N music group: 28 (not included in this review) N control group: 27 The music therapy intervention was markedly different than the music intervention and, therefore, data of these two groups were not combined in this review. Because the researchers treated the music therapy group as the intervention group and the music listening and control group as control groups, only the data of the music therapy group and the standard treatment control group were used. Age: 66.5 (10.7) Sex: 35 F, 48 M Setting: Inpatient
Interventions	Three study groups: (1) Music therapy coaching on the day prior to catheterization, music therapeutic relaxation training, and listening to preselected music during procedure, (2) listen to researcher-selected music through headphones during the procedure, (3) standard care. Music selection used: Relaxation by Martin Rummel Number of sessions: Music therapy coaching group received psycho-educative coaching, music therapeutic relaxation training, and advice on stress management the day prior to the catheterization. During the procedure, a trained music therapist provided the S with opportunity to listen to preselected music. The music group received one music listening session during the procedure. Length of session: (1) 50 min of music therapy coaching and listening to music for the duration of the procedure; (2) music group listened to music for the length of the procedure Categorized as music therapy study
Outcomes	Anxiety (STAI): change scores Heart rate, systolic blood pressure, diastolic blood pressure: posttest values
Notes	

Risk of bias

Item	Authors' judgement	Description

Argstatter 2006 (*Continued*)

Adequate sequence generation?	Yes	Permuted block randomization
Allocation concealment?	No	
Blinding? Subjective outcomes	No	
Blinding? Objective outcomes	No	
Incomplete outcome data addressed? All outcomes	No	Number of dropouts reported (N=7) but no reasons given

Bally 2003

Methods	RCT Randomization method: computer-generated random number list Allocation concealment: serially numbered opaques envelopes Blinding: no Design: Pretest-posttest control group design
Participants	Adults undergoing for the first time diagnostic coronary angiography or a percutaneous intervention procedure N music group: 56 N control group: 51 Sex: 49 F, 64 M Age: control group: 58 yrs (11); music group 59 yrs (11) Setting: in-patient
Interventions	Two study groups: (1) Listen to a self-selected audiocassette tape via earphones in addition to standard care, (2) standard care. Music selections provided: (1) classical music, (2) soft rock, (3) relaxation, (4) country, (5) other (i.e. own) Number of sessions: opportunity to listen to music before, during, and after the procedure Length of session: patient-determined Categorized as musicmedicine study.
Outcomes	Anxiety (VAS): posttest scores Pain (VAS): posttest scores Duration of procedure (minutes) Vasovagal ractions Extra analgesic medicine given Unable to use: Heart rate and blood pressure: no SD given

Bally 2003 (*Continued*)

Notes		
Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	computer-generated random number list
Allocation concealment?	Yes	Serially numbered opaques envelopes
Incomplete outcome data addressed? All outcomes	Yes	N=8 drop outs because procedure was cancelled or because of complications before onset of intervention

Barnason 1995

Methods	RCT Randomization method: draw of lots Allocation concealment: unclear Blinding: no Design: Repeated measures control group design
Participants	Adult patients after coronary artery bypass grafting N music group: 33 N control group: 34 N music imagery: 29 (not included in this review) Sex: 31 F, 65 M Age: 67 (9.9) Setting: in-patient
Interventions	Three study groups received assigned intervention on postop day 2 and postop day 3: (1) listening to music through earphones, (2) watching music imagery video, (3) scheduled rest. Listening to music compared to scheduled rest was used for this review. Music selections provided: (1) Country Western instrumental, (2) Fresh Aire by Steamroller, (3) Winter into Spring by Winston, (4) Prelude and Comfort Zone by Halpern Number of sessions: 2 Length of session: 30 minutes Categorized as musicmedicine study.
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

Barnason 1995 (*Continued*)

	Quality of sleep (Richards-Campbell Sleep Questionnaire, average of 5 subscales): morning of postop day 3 Unable to use: Heart rate, systolic blood pressure, diastolic blood pressure: insufficient data
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Draw of lots
Blinding? Subjective outcomes	No	
Blinding? Objective outcomes	No	
Incomplete outcome data addressed? All outcomes	No	

Bolwerk 1990

Methods	RCT Randomization method: table of random numbers Allocation concealment: unclear Blinding: no Design: pretest-posttest control group design
Participants	Adults patients with medical diagnosis of MI confirmed by enzyme and ECG changes N music group: 17 N control group: 18 Sex: 8 F, 17 M Age: control group: 56.3; music group: 61 Setting: Inpatient
Interventions	Two study groups: (1) listening to relaxing researcher-selected music, (2) standard care Music selections used: compilation tape of the following selections: (1) Bach Largo, (2) Beethoven Largo, (3) 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 musicmedicine study.

Bolwerk 1990 (*Continued*)

Outcomes	Anxiety (STAI): posttest scores after the final session	
Notes	Some patients stated that they didn't care for the music; two patients would have liked different music	
Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Table of random numbers
Blinding? Subjective outcomes	No	
Blinding? Objective outcomes	No	
Incomplete outcome data addressed? All outcomes	Yes	5 patients were transferred

Broscious 1999

Methods	RCT Randomization method: Draw of chips Allocation concealment: blindly drawing of chips Blinding: no Design: Pretest-posttest three group design
Participants	Adult patients during chest tube removal N music group: 70 N control group: 50 N white noise: 36 (not included in this review) Sex: 35 F, 85 M Age: 66.35 (9.7) Setting: Inpatient
Interventions	Three study groups: (1) listening to self-selected music through earphones, (2) listening to white noise through earphones, (3) standard care. Music selections offered: (1) Big Band, (2) Blues, (3) Classical, (4) Country & Western, (5) Easy Listening, (6) Gospel, (7) Movie musicals, (8) New Age, (9) Patriotic, (10) Rock Number of sessions: 1 Length of session: ten minutes before procedure and throughout duration of procedure Categorized as musicmedicine study.

Broscious 1999 (*Continued*)

Outcomes	Pain (NRS): posttest scores immediately following CTR HR, SBP, DBP: posttest scores immediately following CTR	
Notes		

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Draw of chips
Allocation concealment?	Yes	Blindly drawing of chips
Blinding? Subjective outcomes	No	
Blinding? Objective outcomes	No	
Incomplete outcome data addressed? All outcomes	Yes	4 withdrawals, 29 excluded because of ineligibility (canceled surgery, unstable condition, equipment failure, chest tube removal before collection of baseline, death before procedure)

Cadigan 2001

Methods	RCT Randomization method: table of random numbers Allocation concealment: unknown Blinding: no Design: pretest-posttest control group design
Participants	Adult cardiac patients with either intravascular sheets or an IABP in place. N music group: 75 N control group: 65 Sex: 40 F, 100 M Age: music group: 62 (11.4); control group: 62.5 (14) Setting: Inpatient
Interventions	Two study groups: (1) listening to researcher-selected music through headphones, (2) standard care Music used: a mixture of symphonic music and nature sounds Number of sessions: 1 Length of session: 30 min Categorized as musicmedicine study.

Cadigan 2001 (*Continued*)

Outcomes	Psychological distress (POMS): posttest scores Heart rate: posttest scores Systolic blood pressure:posttest scores Diastolic blood pressure: posttest scores Pain (VAS): posttest scores Peripheral skin temperature:posttest scores
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Table of random numbers
Blinding? Subjective outcomes	No	
Blinding? Objective outcomes	No	
Incomplete outcome data addressed? All outcomes	No	Data on all randomized patients were obtained for physiological data but there was a loss of 10 subjects for the POMS data. No reason was reported.

Chan 2007

Methods	RCT Randomization method: computer-generated random number list Allocation concealment: not used (personal communication with author) Blinding: No Design: repeated measures control group design
Participants	Adults with diagnosis of MI, ACS, or CAD, undergoing C-clamp procedure after percutaneous coronary intervention N music group: 31 N control group: 35 Sex : 18 F, 48 M Age: no means given Setting: inpatient
Interventions	Two study groups: (1) Listening to self-selected music during procedure through earphones, (2) standard care Music selections provided: Western and Chinese slow, soft music without lyrics

Chan 2007 (*Continued*)

	Number of sessions: 1 Length of session: approx. 45 min Categorized as musicmedicine study.
Outcomes	Heart rate, respiratory rate, systolic blood pressure, diastolic pressure, oxygen saturation: measured every 15 minutes; measurement at 45 minutes used for this review Pain (NRS): posttest
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Computer-generated list of random numbers
Allocation concealment?	No	Personal communication with author
Blinding? Subjective outcomes	No	Personal communication with author
Blinding? Objective outcomes	No	Personal communication with author
Incomplete outcome data addressed? All outcomes	Yes	chart with flow of subjects is provided. Three subjects withdrew because of dislike of music.

Cohen 1999

Methods	RCT Randomization method: draw of lots Allocation concealment: yes Blinding: No Design: pretest-posttest control group design
Participants	Adult patients with MI N music group: 20 N control group: 20 Sex : 17 F, 23 M Age: music group: 65.8 (16); control group: 69.8 (11.8) Setting: Inpatient

Cohen 1999 (*Continued*)

Interventions	Two study group: (1) listening to self-selected music, (2) standard care Music selections provided: (1) New Age, (2) music from decades past, (3) contemporary solo instrumentalists, (4) religious, (5) classical Number of sessions: 1 Length of session: 30 min Categorized as musicmedicine study.
Outcomes	Anxiety (STAI): change scores Heart rate, mean arterial pressure, systolic blood pressure, diastolic blood pressure: change scores
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Draw of lots
Allocation concealment?	Yes	
Blinding? Subjective outcomes	No	
Blinding? Objective outcomes	No	
Incomplete outcome data addressed? All outcomes	Yes	No loss of subjects

Davis-Rollans 1987

Methods	RCT Randomization Method: random assignment to treatment sequence Allocation concealment: not reported Blinding: Outcome assessors were blinded (control group also had headsets) Design: Cross-over trial
Participants	Adult CCU patients with diagnosis of MI or other cardiac condition Total N: 24 Sex: 5 F, 19 M Age: 62 Setting: Inpatient

Davis-Rollans 1987 (*Continued*)

Interventions	Two study conditions: (1) listening to researcher-selected music through headphones, (2) background CCU noise as heard through silent headphones Music selections used: compilation tape: Symphony No. 6, first movement, by Beethoven; Eine Kleine Nachtmusik, first and fourth movements by Mozart; The Moldau by Smetana Number of sessions: 1 Length of session: 37 min Categorized as musicmedicine study.
Outcomes	Heart rate: during session Number of arrhytmias Unable to use: Mood change: insufficient data Respiratory rate: insufficient data
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	
Blinding? Subjective outcomes	No	Self-report measures - blinding of subjects is not possible in music intervention studies
Blinding? Objective outcomes	Yes	
Incomplete outcome data addressed? All outcomes	No	No report on loss of subjects

Elliott 1994

Methods	RCT Randomization method: table of random numbers (personal communication with author) Allocation concealment: serially numbered opaque envelopes (personal communication with author) Blinding: no Design: pretest-posttest control group design

Elliott 1994 (*Continued*)

Participants	Adult patients admitted to CCU with unstable angina pectoris or acute MI N music group: 19 N control group: 19 N muscle relaxation group: 18 (not included in this review) Sex: 16 F, 40 M Age: 60.6 Setting: Inpatient
Interventions	Three study groups: (1) listening to researcher-selected music via earphones, (2) listening to tape with verbal instructions for muscle relaxation, (3) standard care. Music used: light classical music relaxation tape designed by Bonny. Number of sessions: 2 or 3 Length of session: 30 min. Categorized as musicmedicine study.
Outcomes	Anxiety (STAI): posttest Anxiety (LAAS): posttest Depression (HADS D-subscale): posttest Unable to use: Heart rate, systolic blood pressure, diastolic blood pressure: for many patients, measurements were only taken 2-3hrs after the intervention.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	table of random numbers (personal communication with author)
Allocation concealment?	Yes	serially numbered opaque envelopes (personal communication with author)
Blinding? Subjective outcomes	No	
Blinding? Objective outcomes	No	
Incomplete outcome data addressed? All outcomes	Yes	There were no withdrawals or data loss

Emery 2003

Methods	RCT Randomization method: list of random numbers (personal communication with author) Allocation concealment: recruiters were concealed to random sequence (personal communication with author) Blinding: Outcome assessors were blinded (personal communication with author) Design: Cross-over trial
Participants	Adults with CAD enrolled in standard university-based 12-week Phase II CR program. Total N: 33 Sex: 14 F, 19 M Age: 62.6 (10.5) Setting: University-based CR program, outpatient
Interventions	Two study conditions: (1) listening to researcher-selected music through earphones, (2) listening to a blank tape through earphones Music used: Vivaldi's Four Seasons Number of sessions: 1 music listening and 1 blank tape Length of session: as long as possible for the participant Categorized as musicmedicine study.
Outcomes	Anxiety (POMS-SF, tension subscale): posttest Depression (POMS-SF, depression subscale):posttest Heart rate, systolic blood pressure, diastolic blood pressure: peak exercise Cognitive function (verbal fluency test): posttest Exercise time (min)
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	List of random numbers (personal communication with author)
Allocation concealment?	Yes	Recruiters were concealed to random sequence (personal communication with author)
Blinding? Subjective outcomes	No	Self-report measures - subjects cannot be blinded in music intervention study
Blinding? Objective outcomes	Yes	Outcome assessors were blinded (personal communication with author)

Emery 2003 (*Continued*)

Incomplete outcome data addressed? All outcomes	Yes	No subject loss

Guzzetta 1989

Methods	RCT Randomization method: table of random numbers (personal communication with author) Allocation concealment: no concealment (personal communication with author) blinding: No Design: pretest-posttest control group design
Participants	Adults admitted to CCU with presumptive MI N music group: 26 N control group:27 N relaxation group: 27 (not included in this review) Sex: 10 F, 70 M Age: 57.56 (8.06) Setting: Inpatient
Interventions	Three study groups: (1) relaxation induction followed by listening to self-selected relaxing music through headsets, (2) relaxation instructions, (3) standard care Music selections offered: (1) soothing classical music, (2) soothing popular music, (3) nontraditional music (defined as compositions having no vocalization or meter, periods of silence, and a asymmetric rhythm) Number of sessions: 3 sessions Length of session: 20 min Categorized as musicmedicine study.
Outcomes	Heart rate: posttests of session 1, session 2, session 3 Peripheral temperature (finger):posttests of session 1, session 2, session 3 Number of cardiovascular complications
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Table of random numbers (personal communication with author)
Allocation concealment?	Unclear	No concealment (personal communication with author)

Guzzetta 1989 (*Continued*)

Blinding? Subjective outcomes	No	
Blinding? Objective outcomes	No	
Incomplete outcome data addressed? All outcomes	Yes	23 were removed from study because they only received one session since AMI was ruled out. The remaining 80 subjects completed the study.

Hermele 2005

Methods	RCT Randomization method: Draw of lots (personal communication with author) Allocation concealment: none used (personal communication with author) Blinding: No Design: pretest-posttest control group design
Participants	Adult patients during CABG N music group: 17 N control group: 19 N guided imagery: 20 (not included in this review) Sex: 17 F, 39 M Age: no mean given Setting: Inpatient
Interventions	Three study groups: (1) Guided imagery, (2) listening to researcher-selected music, (3) standard care Music used: no specifications Number of sessions: Daily for one week prior to CABG, during the procedure Length of session: determined by the patient Categorized as musicmedicine study.
Outcomes	Anxiety (HADS, anxiety scale): 1 week postop Depression (HADS, depression scale): 1 week postop Mood disturbance (POMS): 1 week postop Pain
Notes	

Risk of bias

Item	Authors' judgement	Description

Hermele 2005 (*Continued*)

Adequate sequence generation?	Yes	Draw of lots (personal communication with author)
Allocation concealment?	No	None used (personal communication with author)
Blinding? Subjective outcomes	No	
Blinding? Objective outcomes	No	
Incomplete outcome data addressed? All outcomes	Yes	117 subjects consented, 47 subjects did not complete baseline or did not listen to tapes, 7 did not have CABG

Mandel 2007a

Methods	RCT Randomization method: computer-generated list of random numbers Allocation concealment: central randomization Blinding: no Design: repeated measures control group design
Participants	Adults in phase II cardiac rehabilitation program N music therapy group: 35 N control group: 33 Sex: music therapy group: 18 F, 17 M ; control group: 16 F, 17 M Age: music therapy group: median age is 65; control group: median age is 64 Setting: Rehabilitation setting
Interventions	Two study groups: (1) standard care + one music therapy session every other week with a min of 4 music therapy session (max. 6 sessions), (2) standard care alone Music therapy session: group session facilitated by a board-certified music therapist; 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 Duration of session: 90 min. Categorized as music therapy study
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 Systolic blood pressure, diastolic blood pressure:posttest scores

Mandel 2007a (*Continued*)

Notes	Follow-up measures were taken at 1 month, 4 months, and 10 months. These were not included in this review.

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Computer-generated list of random numbers
Allocation concealment?	Yes	Central randomization
Blinding? Subjective outcomes	No	
Blinding? Objective outcomes	No	

Murrock 2002

Methods	RCT Randomization method: draw of lots Allocation concealment: draw of lots prevented knowledge of randomization sequence Blinding: No Design: pretest-posttest control group design
Participants	Adults enrolled in cardiac rehab Phase II program after having undergone their 1st CABG N music group: 15 N control group:15 Sex: 13 F, 17 M Age: music group: 70.93, control group: 69.93 Setting: Rehab setting
Interventions	Two study groups: (1) listening to researcher-selected music during exercise session, (2) standard care Music used: 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 musicmedicine study.
Outcomes	Mood (Rejeski's Feelin scale; +5 to -5): posttest (during 10th session) Rate of perceived exertion (Borg scale; 12-point scale): posttest (during 10th session)

Murrock 2002 (*Continued*)

Notes		
Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Draw of lots (personal communication with author)
Allocation concealment?	Yes	Draw of lots prevented knowledge of randomization sequence (personal communication with author)
Blinding? Subjective outcomes	No	
Blinding? Objective outcomes	No	
Incomplete outcome data addressed? All outcomes	No	Loss of 3 subjects is mentioned but no reason is given

Robichaud 1999

Methods	RCT Randomization method: computer-generated list of random numbers (personal communication with author) Allocation concealment: not used Blinding: no Design: pretest posttest control group design
Participants	Adults with CHD waiting in emergency room or prior to catheterization N music group: 98 N control group: 93 Sex: 62 F, 134 M Age: 61 (11.0) Setting: Day hospital
Interventions	Two study groups: (1) listening to patient-selected relaxing music, (2) standard care Music selections offered: (1) Classic 1 (Mozart, Vivaldi, Handel, Marcello), (2) Classic II (Mozart, Chopin, Bach, Telemann, Handel), (3) Classic III (variations of Pachelbel's Canon), (4) Film music themes, (5) Classical music with ocean sounds (Solitudes de Dan Gibson), (6) Guitar (Tino Izzo), (7) Country Ballads (Michael Stanton), (8) Nature sounds with instrumental accompaniment (Dan Gibson, Ashley and Franks), (9) Therapeutic music, recorder (Emmanuel Comte). All music has tempo of approx. 70-80 bpm.

Robichaud 1999 (*Continued*)

	Number of sessions: 1 Length of session: determined by patient Setting: Day hospital or emergency room Categorized as musicmedicine study.
Outcomes	Anxiety (NRS): posttest scores of postoperative day 2 am session Frustration:posttest scores of postoperative day 2 am session Comfort:posttest scores of postoperative day 2 am session Level of control:posttest scores of postoperative day 2 am session Worry:posttest scores of postoperative day 2 am session Heart rate, systolic blood pressure:posttest scores of postoperative day 2 am session
Notes	Due to substantial number of missing data of POD 2 pm, and POD 3 am and pm measurement points, analysis was only performed on POD 1am, POD1 pm, and POD 2 am scores.

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	computer-generated list of random numbers (personal communication with author)
Allocation concealment?	Unclear	Not used (personal communication with author)
Blinding? Subjective outcomes	No	
Blinding? Objective outcomes	No	
Incomplete outcome data addressed? All outcomes	Yes	There was substantial number of missing data. Therefore, analysis wwas only performed on first three measurement points.

Schou 2008

Methods	RCT Randomization method: random block Allocation concealment: use of codes as group labels, recruiters did not know what group the codes identified Blinding: No Design: repeated measures control group design
Participants	Adults, valve replacement or valve replacement and CABG N music therapy group:22 N placebo group: 22 (not used in the review) N control group: 19 Sex: 14 F, 54 M Age: 65 (9.5)
Interventions	Three groups: (1) music-guided relaxation, (2) music listening (placebo), (3) standard care (control group) Music used: (1) Easy listening, (2) classical, (3) specially composed (musicure), (4) jazz Number of sessions: 1 pre-operative session and up to 4 postoperative sessions (most patients received 2 postop sessions) Duration of session: 35 min Categorized as music therapy study
Outcomes	Anxiety (VAS): posttest 2nd post-op session Mood (POMS): posttest 2nd post-op session Pain (VAS): posttest 2nd post-op session Use of strong opiods (mg): on day of 2nd session Use of mild opiods (mg): on day of 2nd session Use of Paracetamol (gram): on day of 2nd session Length of hospital stay
Notes	Most patients only received 2 sessions postoperatively. Therefore, data of the 2nd postop sessions was used for this analysis

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Random block
Allocation concealment?	Yes	Use of codes as group labels, recruiters did not know what group the codes identified (personal communication with author)
Blinding? Subjective outcomes	No	

Schou 2008 (*Continued*)

Blinding? Objective outcomes	No	

Sendelbach 2006

Methods	RCT Randomization method: Flip of coin Allocation concealment: Flip of coin prevented prior knowledge of randomization sequence Blinding: No Design: repeated measures control group design
Participants	Adult patients following non-emergent CAB and/or valve replacement surgery N music group: 50 N control group: 36 Sex: 26 F, 60 M Age: music group: 62.3, control group: 64.7
Interventions	Two study groups: (1) listening to self-selected sedative music through earphones, (2) standard care Music selections provided: (1) Easy listening, (2) classical, (3) jazz Number of sessions: 2 sessions/day for POD 1 through 3 Length of session: 20 min Categorized as musicmedicine study.
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 Heart rate: 6 measurement points. Due to high number of missing values, only posttests POD1 am, POD1 pm and POD2 am were used in research report Systolic blood pressure: 6 measurement points. Due to high number of missing values, only posttests 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

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Flip of coin
Allocation concealment?	Yes	Flip of coin prevented prior knowledge of randomization sequence

Sendelbach 2006 (*Continued*)

Blinding? Subjective outcomes	No	
Blinding? Objective outcomes	No	
Incomplete outcome data addressed? All outcomes	Yes	Due to high number of missing values, only posttests POD1 am, POD1 pm and POD2 am were used in research report

Voss 2004

Methods	RCT Randomization method: random block Allocation concealment: Opaque sealed envelopes Blinding: No Design: pretest-posttest control group design
Participants	Adults in ICU after CABG N music group: 19 N control group: 21 N scheduled rest: 21 (not included in this review) Sex: 22 F, 39 M Age: 63 (13)
Interventions	Three study groups: (1) listening to self-selected sedative music through earphones, (2) scheduled rest, (3) standard care during chair rest. Music selections provided: (1) synthesizer music, (2) harp, (3) piano, (4) orchestra, (5) slow jazz, (6) 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 min Categorized as musicmedicine study.
Outcomes	Anxiety (VAS): posttest Pain sensation (VAS): posttest Pain distress (VAS):posttest
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Random block

Voss 2004 (*Continued*)

Allocation concealment?	Yes	Serially numbered opaque sealed envelopes
Blinding? Subjective outcomes	No	
Blinding? Objective outcomes	No	

White 1992

Methods	RCT Randomization method: computer-generated random number list (personal communication with author) Allocation concealment: study recruiters were blind to allocation (personal communication with author) Blinding: no Design: pretest-posttest control group design
Participants	Adults with confirmed diagnosis of MI, with STAI scores > 40 N music group: 20 N control group: 20 Sex: 11 F, 29 M Age: 57.7(7.57) Setting: Inpatient
Interventions	Two study groups: (1) listening to researcher-selected music through earphones, (2) quiet, uninterrupted rest N music group:20 N control group: 20 Music used: 4 classical adagios, tempo of approx. 60 bpm Number of sessions: 1 Length of session: 25 min Categorized as music medicine study.
Outcomes	Anxiety (STAI): posttest scores Heart rate, respiratory rate: posttest scores
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**

White 1992 (*Continued*)

Adequate sequence generation?	Yes	Computer-generated random number list (personal communication with author)
Allocation concealment?	Yes	Study recruiters were blind to allocation (personal communication with author)
Blinding? Subjective outcomes	No	
Blinding? Objective outcomes	No	

White 1999

Methods	RCT Randomization method: computer-generated random number list (personal communication with author) Allocation concealment: study recruiters were blind to allocation (personal communication with author) Blinding: no Design: three group repeated measures experimental design
Participants	Adults with confirmed diagnosis of MI N music group: 15 N control group (standard care): 15 N quiet rest: 15 (not included in this review) Sex: 7 F, 23 M Age: 63 Setting: Inpatient
Interventions	Three groups: (1) listening to researcher-selected music through earphones, (2) quiet uninterrupted rest, (3) standard care Music used: classical music (no further specifications) Number of sessions: 1 Length of session: 20 min Categorized as music medicine study.
Outcomes	Anxiety (STAI): posttest Heart rate, respiratory rate, systolic blood pressure: posttest High frequency heart rate variability power
Notes	

Risk of bias

White 1999 (*Continued*)

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Computer-generated random number list (personal communication with author)
Allocation concealment?	Yes	Study recruiters were blind to allocation (personal communication with author)
Blinding? Subjective outcomes	No	
Blinding? Objective outcomes	No	

Winters 2005

Methods	RCT Randomization method: computer-generated random number list (personal communication with author) Allocation concealment: study recruiters were blind to allocation (personal communication with author) Blinding: no
Participants	Adults less than 72 hrs post MI N music group who received 3 sessions: 30 N control group: 30 Sex: 64% F, 36% M Age: no age data reported Setting: inpatient
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 (baseline to posttest) Heart rate, respiratory rate, systolic blood pressure, heart rate variability, myocardial oxygen (MVO_2) demand: change scores (baseline to posttest)
Notes	

Winters 2005 (*Continued*)

Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Computer-generated random number list (personal communication with author)
Allocation concealment?	Yes	Study recruiters were blind to allocation (personal communication with author)
Blinding? Subjective outcomes	No	
Blinding? Objective outcomes	No	

Zimmerman 1988

Methods	RCT Randomization method: computer-generated random number list (personal communication with author) Allocation Concealment: no Blinding: no Design: three group repeated measures design
Participants	Adults with MI N music group: 25 N control group: 25 N white noise: 25 (not included in this review) Sex: 26 F,49 M Age: music group: 65, control group: 72 Setting: Inpatient
Interventions	Three study groups: (1) listening to self-selected music via headphones, (2) listening to white noise via headphones, (3) standard care Music selections offered: (1)Halpern tape, (2) classical music, (3) country western Number of sessions: 1 session Length of session: 30 min Categorized as music medicine study.
Outcomes	Anxiety (STAI): posttest Heart rate, systolic blood pressure, diastolic blood pressure: posttest
Notes	

Zimmerman 1988 (*Continued*)

Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	computer-generated random number list (personal communication with author)
Allocation concealment?	No	Personal communication with author
Blinding? Subjective outcomes	No	
Blinding? Objective outcomes	No	

ACS=acute coronary syndrome, BSI=Brief Symptom Inventory, CABG=coronary artery bypass graft, CAD=coronary artery disease, CCU=coronary care unit, CES-D=Center for Epidemiological Studies Depression Scale, CR=cardiac rehabilitation, f=female, HADS=Hospital Anxiety and Depression Scale, ICU=intensive care unit, m=male, LAAS=Linear Analogue Anxiety Scale, MI=myocardial infarction, mg=milligram, MPQ=McGill Pain Questionnaire, NRS=Numeric Rating Scale, POMS=Profile of Mood States, POMS-SF=Profile of Mood States Short Form, POD= post-operative day, RCT=randomized controlled trial, SD=standard deviation, STAI= The Spielberger State-Trait Anxiety Inventory, STAI-S= The Spielberger State-Trait Anxiety Inventory State Anxiety form, STAI-T=The Spielberger State-Trait Anxiety Inventory Trait Anxiety form, VAS=Visual Analogue Scale, VRS=Verbal Rating Scale.

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

Aragon 2002	Not a randomized controlled trial
Barnes 1987	Groups allocated by alternate assignment
Blankfield 1995	Randomization method:unclear. Author did not respond to e-mail requests for additional information.
Bonny 1983	Not a randomized controlled trial. Pretest-posttest single group design
Byers 1997	Not a randomized controlled trial
Claire 1986	Not a randomized controlled trial
Diamandi 2008	No standard care control group. Study compared music therapy with music listening.
Dritsas 2006	Groups allocated by alternate assignment

(*Continued*)

Escher 1996	insufficient data available; randomization method unclear
Hamel 2001	Groups allocated by alternate assignment
Harris 1971	Groups allocated by alternate assignment
Hatem 2006	Groups allocated by alternate assignment
MacNay 1995	Not a randomized controlled trial
Mandel 2007b	Not a randomized controlled trial
Reisinger 1995	Severe sampling bias
Richardson 2004	No standard care control group. Study compared music listening with music/imagery.
Schwartz 2002	No randomization used
Slyfield 1992	Insufficient data
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 patients were placed in the control group

DATA AND ANALYSES

Comparison 1. music versus standard care

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Psychological Distress	4	251	Std. Mean Difference (IV, Fixed, 95% CI)	-0.23 [-0.48, 0.02]
2 Anxiety (all measures) - patient type	12	697	Std. Mean Difference (IV, Random, 95% CI)	-0.49 [-0.83, -0.15]
2.1 anxiety (all measures) (MI)	4	143	Std. Mean Difference (IV, Random, 95% CI)	-0.94 [-1.95, 0.06]
2.2 anxiety (all measures)(surgical/procedural)	7	524	Std. Mean Difference (IV, Random, 95% CI)	-0.38 [-0.71, -0.04]
2.3 anxiety (all measures)(rehabilitation)	1	30	Std. Mean Difference (IV, Random, 95% CI)	0.08 [-0.63, 0.80]
3 Anxiety (all measures) - music preference	11	667	Std. Mean Difference (IV, Random, 95% CI)	-0.54 [-0.90, -0.18]
3.1 Anxiety (all measures) - patient-selected	5	433	Std. Mean Difference (IV, Random, 95% CI)	-0.53 [-0.95, -0.12]
3.2 Anxiety (all measures) - researcher-selected	6	234	Std. Mean Difference (IV, Random, 95% CI)	-0.58 [-1.25, 0.09]
4 State anxiety (STAI) -patient type	10	522	Mean Difference (IV, Random, 95% CI)	-3.78 [-6.31, -1.24]
4.1 STAI (MI)	7	293	Mean Difference (IV, Random, 95% CI)	-5.72 [-7.67, -3.78]
4.2 STAI (procedural)	3	229	Mean Difference (IV, Random, 95% CI)	0.01 [-1.48, 1.49]
5 State Anxiety (STAI) - music preference	10	522	Mean Difference (IV, Fixed, 95% CI)	-3.81 [-4.72, -2.89]
5.1 State Anxiety (STAI) - patient-preferred	5	324	Mean Difference (IV, Fixed, 95% CI)	-2.73 [-3.95, -1.50]
5.2 State Anxiety (STAI) - researcher-selected	5	198	Mean Difference (IV, Fixed, 95% CI)	-5.16 [-6.54, -3.79]
6 Anxiety (non-STAI)-patient type	7	430	Std. Mean Difference (IV, Random, 95% CI)	-0.34 [-0.74, 0.06]
6.1 Anxiety (procedural)	5	362	Std. Mean Difference (IV, Random, 95% CI)	-0.52 [-1.00, -0.03]
6.2 Anxiety (MI and Rehab)	2	68	Std. Mean Difference (IV, Random, 95% CI)	0.15 [-0.32, 0.63]
7 depression	4	172	Std. Mean Difference (IV, Fixed, 95% CI)	-0.12 [-0.42, 0.18]
8 Mood	2	97	Std. Mean Difference (IV, Fixed, 95% CI)	0.85 [0.43, 1.28]
9 Heart rate-patient type	14	948	Mean Difference (IV, Random, 95% CI)	-3.92 [-6.84, 1.00]
9.1 heart rate (procedural)	6	621	Mean Difference (IV, Random, 95% CI)	-2.27 [-6.65, 2.10]
9.2 Heart rate (MI)	7	297	Mean Difference (IV, Random, 95% CI)	-5.78 [-9.66, -1.91]
9.3 Heart rate (rehab)	1	30	Mean Difference (IV, Random, 95% CI)	4.5 [-9.68, 18.68]
10 Heart rate - music preference	14	948	Mean Difference (IV, Fixed, 95% CI)	-5.06 [-6.25, -3.87]
10.1 Heart rate - patient-selected music	9	653	Mean Difference (IV, Fixed, 95% CI)	-6.44 [-7.94, -4.94]
10.2 Heart rate - researcher-selected music	5	295	Mean Difference (IV, Fixed, 95% CI)	-2.74 [-4.69, -0.79]
11 Heart rate variability	2	90	Mean Difference (IV, Fixed, 95% CI)	0.00 [-0.25, 0.26]
12 Respiratory rate - music preference	5	324	Mean Difference (IV, Random, 95% CI)	-3.05 [-4.53, -1.57]

12.1 Respiratory Rate - patient-selected	2	126	Mean Difference (IV, Random, 95% CI)	-6.72 [-13.79, 0.36]
12.2 Respiratory Rate - researcher-selected	3	198	Mean Difference (IV, Random, 95% CI)	-1.71 [-2.28, -1.14]
13 Systolic blood pressure	12	900	Mean Difference (IV, Fixed, 95% CI)	-5.34 [-7.20, -3.48]
14 Diastolic blood pressure	9	630	Mean Difference (IV, Fixed, 95% CI)	-1.54 [-3.17, 0.09]
15 Pain	9	868	Std. Mean Difference (IV, Random, 95% CI)	-0.32 [-0.62, -0.03]
16 peripheral skin temperature	3	243	Mean Difference (IV, Random, 95% CI)	1.22 [-1.44, 3.88]

Analysis 1.1. Comparison 1 music versus standard care, Outcome 1 Psychological Distress.

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

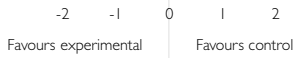
Comparison: 1 music versus standard care

Outcome: 1 Psychological Distress

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Fixed,95% CI	Weight	Std. Mean Difference IV,Fixed,95% CI
Cadigan 2001	72	5.8 (2.8)	58	7 (3.2)		51.3 %	-0.40 [-0.75, -0.05]
Hermele 2005	17	33.88 (33.7)	19	38.47 (35)		14.6 %	-0.13 [-0.79, 0.52]
Mandel 2007a	35	26.7 (24.5)	33	24.7 (17.8)		27.6 %	0.09 [-0.38, 0.57]
Schou 2008	10	21.6 (15.74)	7	29.86 (17.05)		6.5 %	-0.48 [-1.47, 0.50]
Total (95% CI)	**134**		**117**			**100.0 %**	**-0.23 [-0.48, 0.02]**

Heterogeneity: $Chi^2 = 3.00$, df = 3 (P = 0.39); $I^2 = 0\%$

Test for overall effect: Z = 1.80 (P = 0.072)

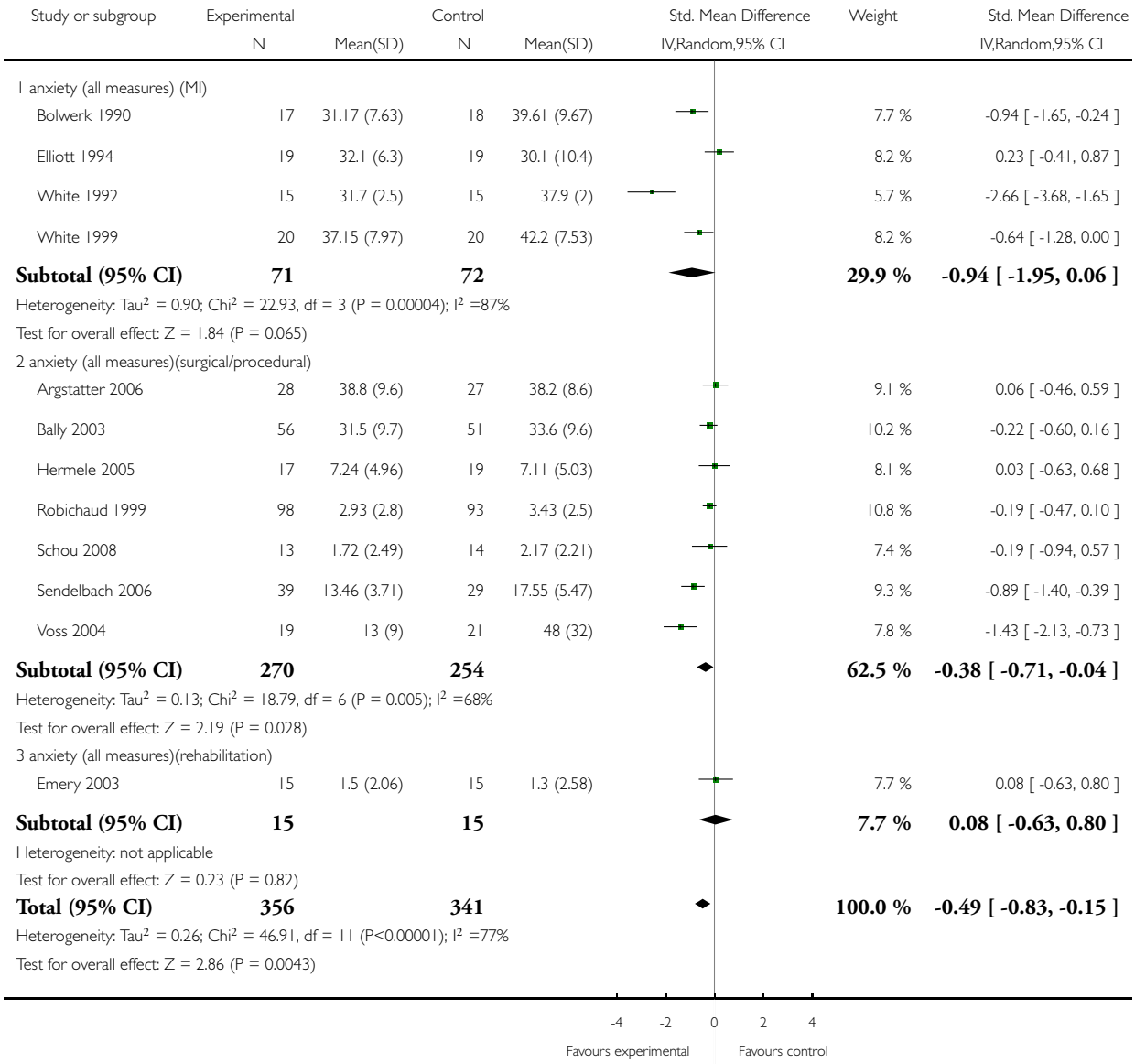


Analysis 1.2. Comparison 1 music versus standard care, Outcome 2 Anxiety (all measures) - patient type.

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

Comparison: 1 music versus standard care

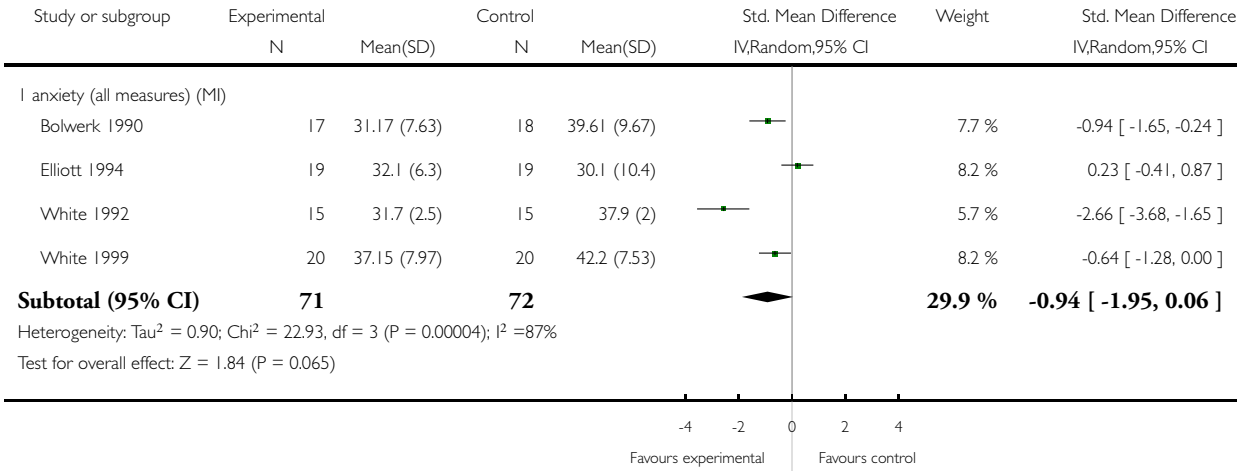
Outcome: 2 Anxiety (all measures) - patient type



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

Comparison: 1 music versus standard care

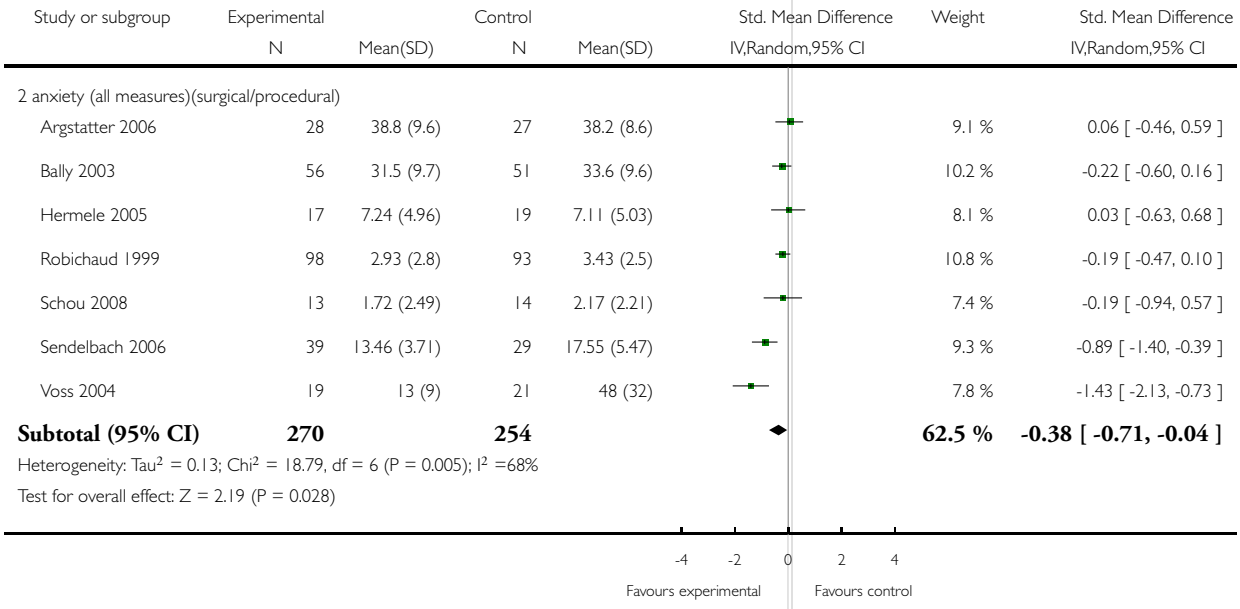
Outcome: 2 Anxiety (all measures) - patient type



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

Comparison: 1 music versus standard care

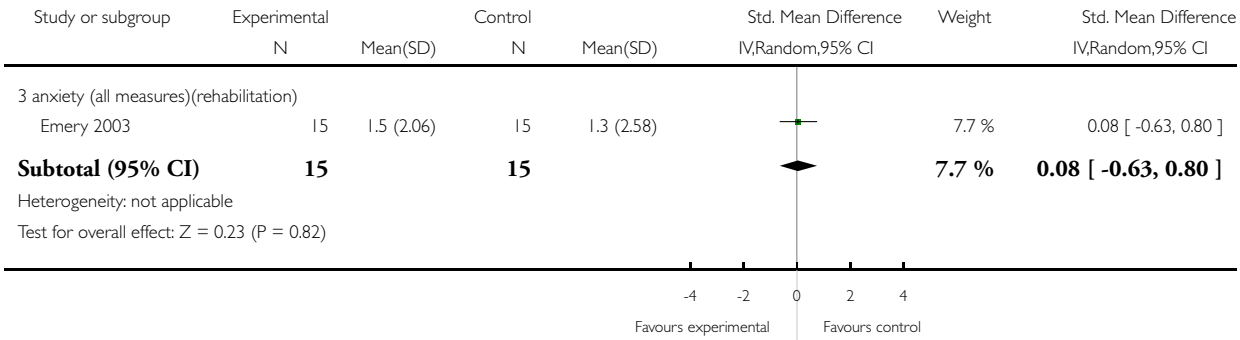
Outcome: 2 Anxiety (all measures) - patient type



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

Comparison: 1 music versus standard care

Outcome: 2 Anxiety (all measures) - patient type



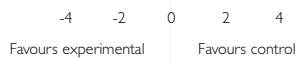
Analysis 1.3. Comparison 1 music versus standard care, Outcome 3 Anxiety (all measures) - music preference.

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

Comparison: 1 music versus standard care

Outcome: 3 Anxiety (all measures) - music preference

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Random,95% CI	Weight	Std. Mean Difference IV,Random,95% CI
1 Anxiety (all measures) - patient-selected							
Bally 2003	56	31.5 (9.7)	51	33.6 (9.6)		10.9 %	-0.22 [-0.60, 0.16]
Robichaud 1999	98	2.93 (2.8)	93	3.43 (2.5)		11.6 %	-0.19 [-0.47, 0.10]
Schou 2008	13	1.72 (2.49)	14	2.17 (2.21)		8.0 %	-0.19 [-0.94, 0.57]
Sendelbach 2006	39	13.46 (3.71)	29	17.55 (5.47)		10.0 %	-0.89 [-1.40, -0.39]
Voss 2004	19	13 (9)	21	48 (32)		8.4 %	-1.43 [-2.13, -0.73]
Subtotal (95% CI)	**225**		**208**			**48.9 %**	**-0.53 [-0.95, -0.12]**
Heterogeneity: Tau² = 0.16; Chi² = 15.19, df = 4 (P = 0.004); I² =74%							
Test for overall effect: Z = 2.51 (P = 0.012)							
2 Anxiety (all measures) - researcher-selected							
Argstatter 2006	28	38.8 (9.6)	27	38.2 (8.6)		9.8 %	0.06 [-0.46, 0.59]
Bolwerk 1990	17	31.17 (7.63)	18	39.61 (9.67)		8.4 %	-0.94 [-1.65, -0.24]
Elliott 1994	19	32.1 (6.3)	19	30.1 (10.4)		8.9 %	0.23 [-0.41, 0.87]
Hermele 2005	17	7.24 (4.96)	19	7.11 (5.03)		8.8 %	0.03 [-0.63, 0.68]
White 1992	15	31.7 (2.5)	15	37.9 (2)		6.2 %	-2.66 [-3.68, -1.65]
White 1999	20	37.15 (7.97)	20	42.2 (7.53)		8.9 %	-0.64 [-1.28, 0.00]
Subtotal (95% CI)	**116**		**118**			**51.1 %**	**-0.58 [-1.25, 0.09]**
Heterogeneity: Tau² = 0.58; Chi² = 30.14, df = 5 (P = 0.00001); I² =83%							
Test for overall effect: Z = 1.69 (P = 0.091)							
Total (95% CI)	**341**		**326**			**100.0 %**	**-0.54 [-0.90, -0.18]**
Heterogeneity: Tau² = 0.27; Chi² = 45.34, df = 10 (P<0.00001); I² =78%							
Test for overall effect: Z = 2.97 (P = 0.0030)							



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

Comparison: 1 music versus standard care

Outcome: 3 Anxiety (all measures) - music preference

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Random,95% CI	Weight	Std. Mean Difference IV,Random,95% CI
1 Anxiety (all measures) - patient-selected							
Bally 2003	56	31.5 (9.7)	51	33.6 (9.6)		10.9 %	-0.22 [-0.60, 0.16]
Robichaud 1999	98	2.93 (2.8)	93	3.43 (2.5)		11.6 %	-0.19 [-0.47, 0.10]
Schou 2008	13	1.72 (2.49)	14	2.17 (2.21)		8.0 %	-0.19 [-0.94, 0.57]
Sendelbach 2006	39	13.46 (3.71)	29	17.55 (5.47)		10.0 %	-0.89 [-1.40, -0.39]
Voss 2004	19	13 (9)	21	48 (32)		8.4 %	-1.43 [-2.13, -0.73]
Subtotal (95% CI)	**225**		**208**			**48.9 %**	**-0.53 [-0.95, -0.12]**

Heterogeneity: Tau² = 0.16; Chi² = 15.19, df = 4 (P = 0.004); I² =74%

Test for overall effect: Z = 2.51 (P = 0.012)

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

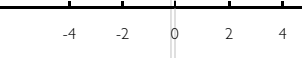
Comparison: 1 music versus standard care

Outcome: 3 Anxiety (all measures) - music preference

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Random,95% CI	Weight	Std. Mean Difference IV,Random,95% CI
2 Anxiety (all measures) - researcher-selected							
Argstatter 2006	28	38.8 (9.6)	27	38.2 (8.6)		9.8 %	0.06 [-0.46, 0.59]
Bolwerk 1990	17	31.17 (7.63)	18	39.61 (9.67)		8.4 %	-0.94 [-1.65, -0.24]
Elliott 1994	19	32.1 (6.3)	19	30.1 (10.4)		8.9 %	0.23 [-0.41, 0.87]
Hermele 2005	17	7.24 (4.96)	19	7.11 (5.03)		8.8 %	0.03 [-0.63, 0.68]
White 1992	15	31.7 (2.5)	15	37.9 (2)		6.2 %	-2.66 [-3.68, -1.65]
White 1999	20	37.15 (7.97)	20	42.2 (7.53)		8.9 %	-0.64 [-1.28, 0.00]
Subtotal (95% CI)	**116**		**118**			**51.1 %**	**-0.58 [-1.25, 0.09]**

Heterogeneity: Tau² = 0.58; Chi² = 30.14, df = 5 (P = 0.00001); I² =83%

Test for overall effect: Z = 1.69 (P = 0.091)



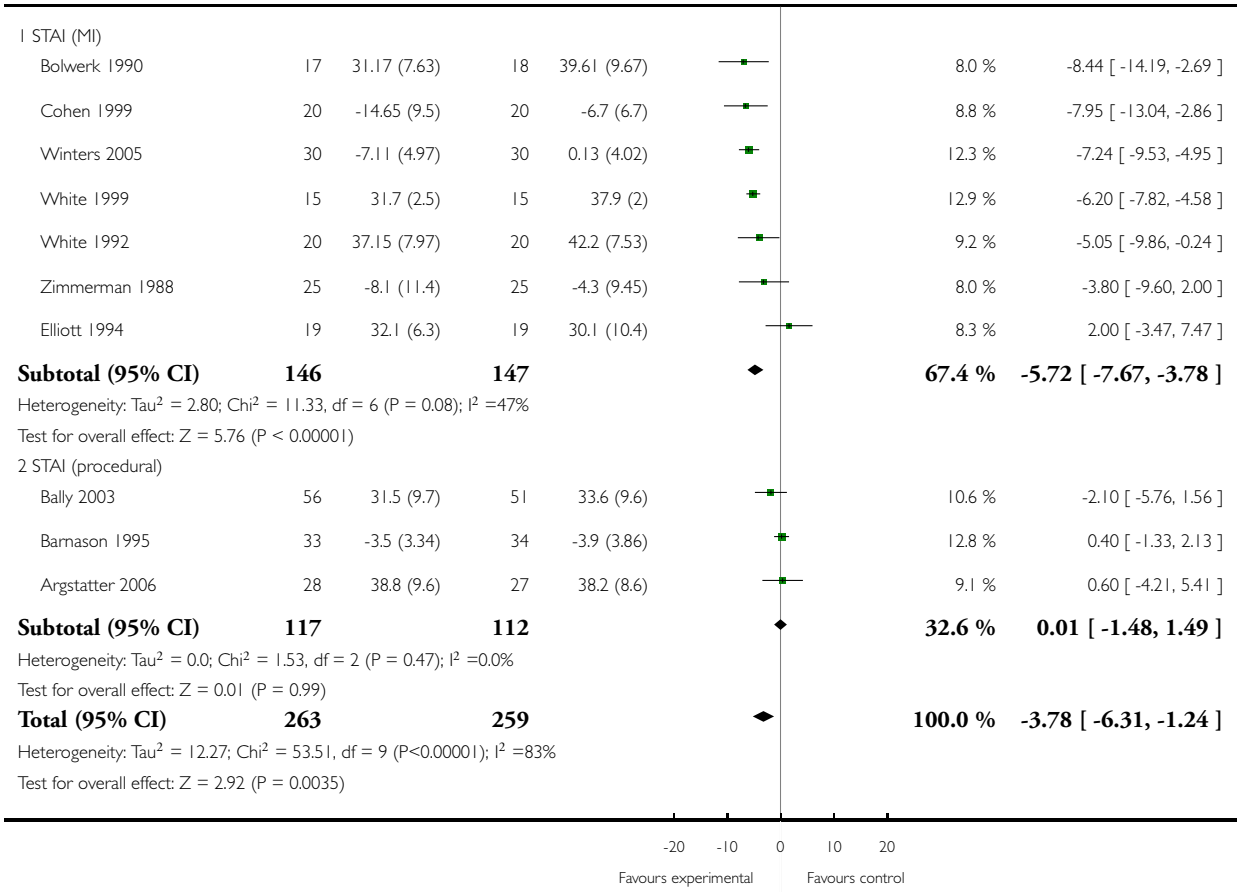
Analysis 1.4. Comparison 1 music versus standard care, Outcome 4 State anxiety (STAI) -patient type.

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

Comparison: 1 music versus standard care

Outcome: 4 State anxiety (STAI) -patient type

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 STAI (MI)							
Bolwerk 1990	17	31.17 (7.63)	18	39.61 (9.67)		8.0 %	-8.44 [-14.19, -2.69]
Cohen 1999	20	-14.65 (9.5)	20	-6.7 (6.7)		8.8 %	-7.95 [-13.04, -2.86]
Winters 2005	30	-7.11 (4.97)	30	0.13 (4.02)		12.3 %	-7.24 [-9.53, -4.95]
White 1999	15	31.7 (2.5)	15	37.9 (2)		12.9 %	-6.20 [-7.82, -4.58]
White 1992	20	37.15 (7.97)	20	42.2 (7.53)		9.2 %	-5.05 [-9.86, -0.24]
Zimmerman 1988	25	-8.1 (11.4)	25	-4.3 (9.45)		8.0 %	-3.80 [-9.60, 2.00]
Elliott 1994	19	32.1 (6.3)	19	30.1 (10.4)		8.3 %	2.00 [-3.47, 7.47]
Subtotal (95% CI)	**146**		**147**			**67.4 %**	**-5.72 [-7.67, -3.78]**
Heterogeneity: Tau² = 2.80; Chi² = 11.33, df = 6 (P = 0.08); I² =47%							
Test for overall effect: Z = 5.76 (P < 0.00001)							
2 STAI (procedural)							
Bally 2003	56	31.5 (9.7)	51	33.6 (9.6)		10.6 %	-2.10 [-5.76, 1.56]
Barnason 1995	33	-3.5 (3.34)	34	-3.9 (3.86)		12.8 %	0.40 [-1.33, 2.13]
Argstatter 2006	28	38.8 (9.6)	27	38.2 (8.6)		9.1 %	0.60 [-4.21, 5.41]
Subtotal (95% CI)	**117**		**112**			**32.6 %**	**0.01 [-1.48, 1.49]**
Heterogeneity: Tau² = 0.0; Chi² = 1.53, df = 2 (P = 0.47); I² =0.0%							
Test for overall effect: Z = 0.01 (P = 0.99)							
Total (95% CI)	**263**		**259**			**100.0 %**	**-3.78 [-6.31, -1.24]**
Heterogeneity: Tau² = 12.27; Chi² = 53.51, df = 9 (P<0.00001); I² =83%							
Test for overall effect: Z = 2.92 (P = 0.0035)							



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

Comparison: 1 music versus standard care

Outcome: 4 State anxiety (STAI) -patient type

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 STAI (MI)							
Bolwerk 1990	17	31.17 (7.63)	18	39.61 (9.67)		8.0 %	-8.44 [-14.19, -2.69]
Cohen 1999	20	-14.65 (9.5)	20	-6.7 (6.7)		8.8 %	-7.95 [-13.04, -2.86]
Winters 2005	30	-7.11 (4.97)	30	0.13 (4.02)		12.3 %	-7.24 [-9.53, -4.95]
White 1999	15	31.7 (2.5)	15	37.9 (2)		12.9 %	-6.20 [-7.82, -4.58]
White 1992	20	37.15 (7.97)	20	42.2 (7.53)		9.2 %	-5.05 [-9.86, -0.24]
Zimmerman 1988	25	-8.1 (11.4)	25	-4.3 (9.45)		8.0 %	-3.80 [-9.60, 2.00]
Elliott 1994	19	32.1 (6.3)	19	30.1 (10.4)		8.3 %	2.00 [-3.47, 7.47]
Subtotal (95% CI)	**146**		**147**			**67.4 %**	**-5.72 [-7.67, -3.78]**

Heterogeneity: Tau² = 2.80; Chi² = 11.33, df = 6 (P = 0.08); I² =47%

Test for overall effect: Z = 5.76 (P < 0.00001)

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

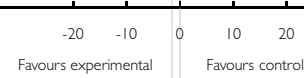
Comparison: 1 music versus standard care

Outcome: 4 State anxiety (STAI) -patient type

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
2 STAI (procedural)							
Bally 2003	56	31.5 (9.7)	51	33.6 (9.6)		10.6 %	-2.10 [-5.76, 1.56]
Barnason 1995	33	-3.5 (3.34)	34	-3.9 (3.86)		12.8 %	0.40 [-1.33, 2.13]
Argstatter 2006	28	38.8 (9.6)	27	38.2 (8.6)		9.1 %	0.60 [-4.21, 5.41]
Subtotal (95% CI)	**117**		**112**			**32.6 %**	**0.01 [-1.48, 1.49]**

Heterogeneity: Tau² = 0.0; Chi² = 1.53, df = 2 (P = 0.47); I² =0.0%

Test for overall effect: Z = 0.01 (P = 0.99)



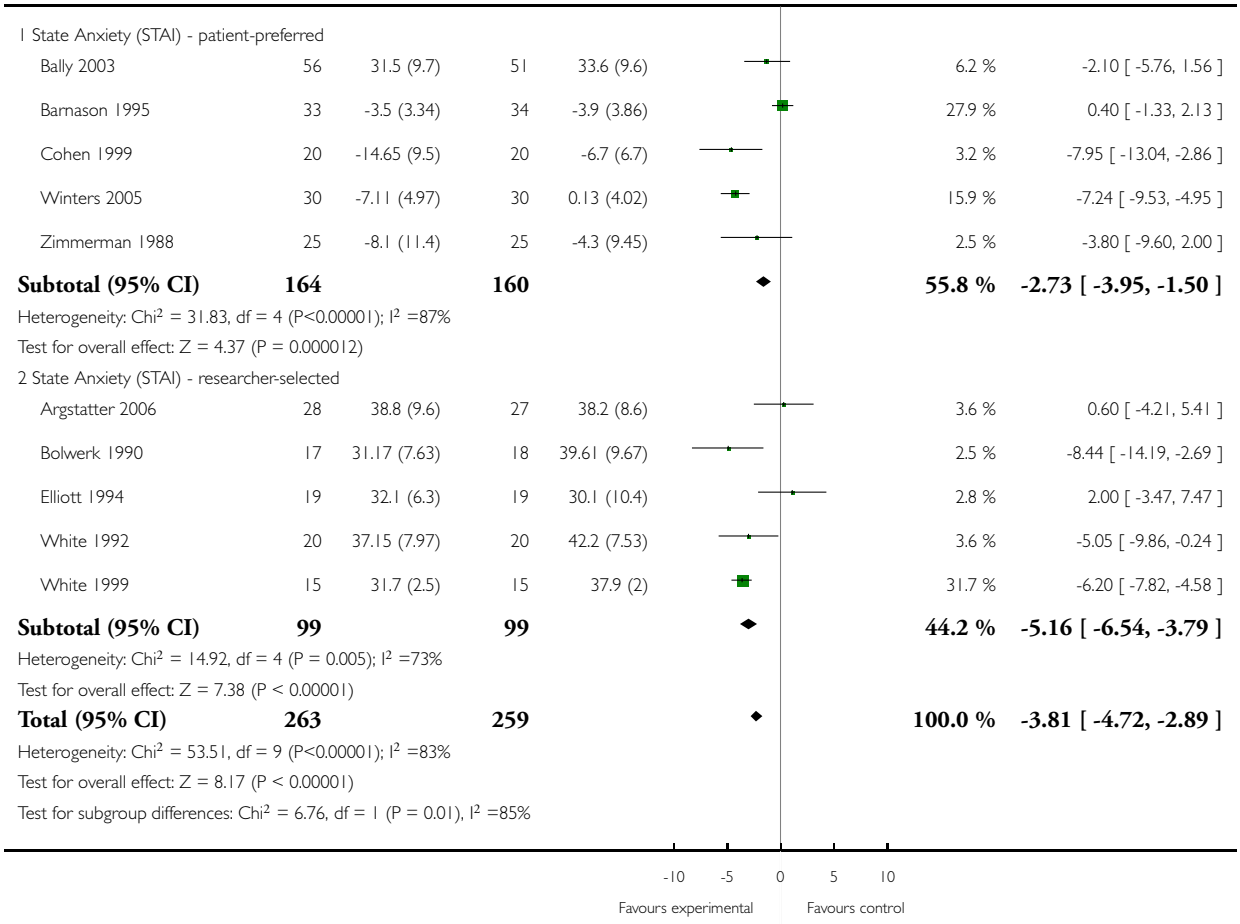
Analysis 1.5. Comparison 1 music versus standard care, Outcome 5 State Anxiety (STAI) - music preference.

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

Comparison: 1 music versus standard care

Outcome: 5 State Anxiety (STAI) - music preference

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 State Anxiety (STAI) - patient-preferred							
Bally 2003	56	31.5 (9.7)	51	33.6 (9.6)		6.2 %	-2.10 [-5.76, 1.56]
Barnason 1995	33	-3.5 (3.34)	34	-3.9 (3.86)		27.9 %	0.40 [-1.33, 2.13]
Cohen 1999	20	-14.65 (9.5)	20	-6.7 (6.7)		3.2 %	-7.95 [-13.04, -2.86]
Winters 2005	30	-7.11 (4.97)	30	0.13 (4.02)		15.9 %	-7.24 [-9.53, -4.95]
Zimmerman 1988	25	-8.1 (11.4)	25	-4.3 (9.45)		2.5 %	-3.80 [-9.60, 2.00]
Subtotal (95% CI)	**164**		**160**			**55.8 %**	**-2.73 [-3.95, -1.50]**
Heterogeneity: Chi² = 31.83, df = 4 (P<0.00001); I² =87%							
Test for overall effect: Z = 4.37 (P = 0.000012)							
2 State Anxiety (STAI) - researcher-selected							
Argstatter 2006	28	38.8 (9.6)	27	38.2 (8.6)		3.6 %	0.60 [-4.21, 5.41]
Bolwerk 1990	17	31.17 (7.63)	18	39.61 (9.67)		2.5 %	-8.44 [-14.19, -2.69]
Elliott 1994	19	32.1 (6.3)	19	30.1 (10.4)		2.8 %	2.00 [-3.47, 7.47]
White 1992	20	37.15 (7.97)	20	42.2 (7.53)		3.6 %	-5.05 [-9.86, -0.24]
White 1999	15	31.7 (2.5)	15	37.9 (2)		31.7 %	-6.20 [-7.82, -4.58]
Subtotal (95% CI)	**99**		**99**			**44.2 %**	**-5.16 [-6.54, -3.79]**
Heterogeneity: Chi² = 14.92, df = 4 (P = 0.005); I² =73%							
Test for overall effect: Z = 7.38 (P < 0.00001)							
Total (95% CI)	**263**		**259**			**100.0 %**	**-3.81 [-4.72, -2.89]**
Heterogeneity: Chi² = 53.51, df = 9 (P<0.00001); I² =83%							
Test for overall effect: Z = 8.17 (P < 0.00001)							
Test for subgroup differences: Chi² = 6.76, df = 1 (P = 0.01), I² =85%							



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

Comparison: 1 music versus standard care

Outcome: 5 State Anxiety (STAI) - music preference

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 State Anxiety (STAI) - patient-preferred							
Bally 2003	56	31.5 (9.7)	51	33.6 (9.6)		6.2 %	-2.10 [-5.76, 1.56]
Barnason 1995	33	-3.5 (3.34)	34	-3.9 (3.86)		27.9 %	0.40 [-1.33, 2.13]
Cohen 1999	20	-14.65 (9.5)	20	-6.7 (6.7)		3.2 %	-7.95 [-13.04, -2.86]
Winters 2005	30	-7.11 (4.97)	30	0.13 (4.02)		15.9 %	-7.24 [-9.53, -4.95]
Zimmerman 1988	25	-8.1 (11.4)	25	-4.3 (9.45)		2.5 %	-3.80 [-9.60, 2.00]
Subtotal (95% CI)	**164**		**160**			**55.8 %**	**-2.73 [-3.95, -1.50]**

Heterogeneity: Chi² = 31.83, df = 4 (P<0.00001); I² =87%

Test for overall effect: Z = 4.37 (P = 0.000012)

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

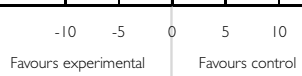
Comparison: 1 music versus standard care

Outcome: 5 State Anxiety (STAI) - music preference

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
2 State Anxiety (STAI) - researcher-selected							
Argstatter 2006	28	38.8 (9.6)	27	38.2 (8.6)		3.6 %	0.60 [-4.21, 5.41]
Bolwerk 1990	17	31.17 (7.63)	18	39.61 (9.67)		2.5 %	-8.44 [-14.19, -2.69]
Elliott 1994	19	32.1 (6.3)	19	30.1 (10.4)		2.8 %	2.00 [-3.47, 7.47]
White 1992	20	37.15 (7.97)	20	42.2 (7.53)		3.6 %	-5.05 [-9.86, -0.24]
White 1999	15	31.7 (2.5)	15	37.9 (2)		31.7 %	-6.20 [-7.82, -4.58]
Subtotal (95% CI)	**99**		**99**			**44.2 %**	**-5.16 [-6.54, -3.79]**

Heterogeneity: Chi² = 14.92, df = 4 (P = 0.005); I² =73%

Test for overall effect: Z = 7.38 (P < 0.00001)



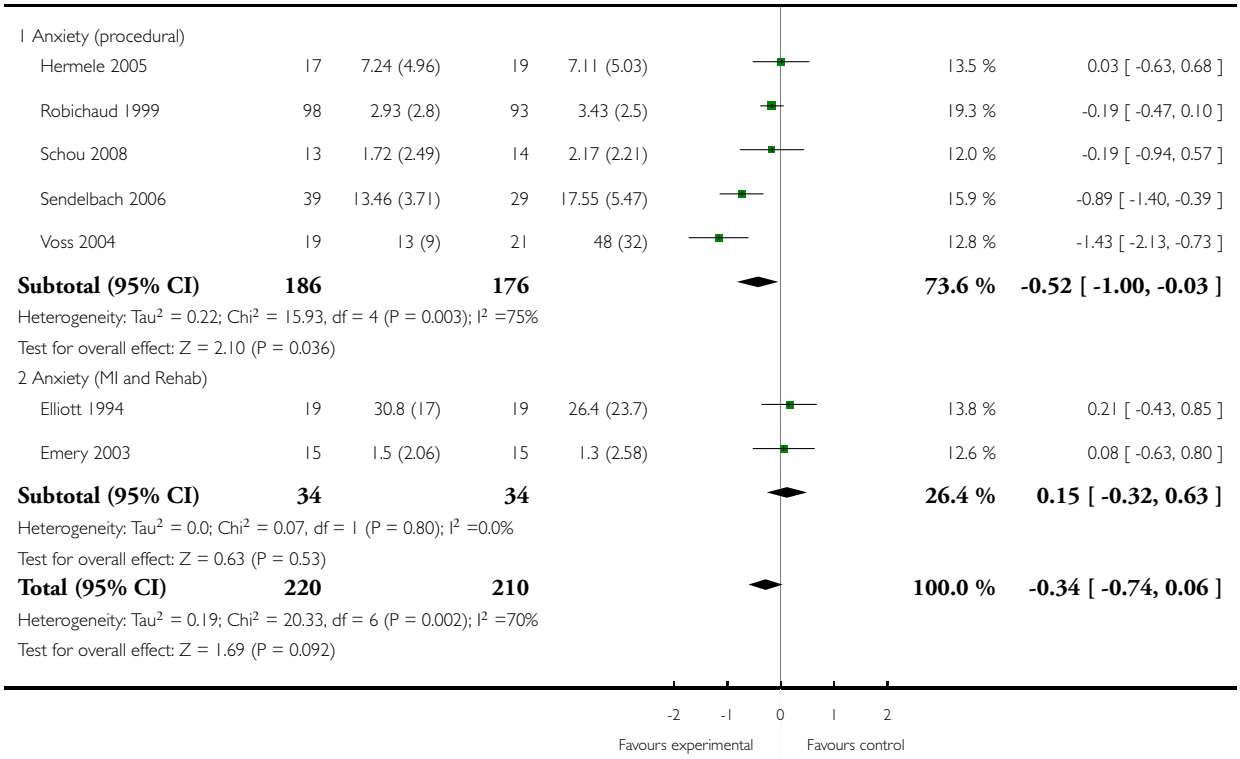
Analysis 1.6. Comparison 1 music versus standard care, Outcome 6 Anxiety (non-STAI)-patient type.

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

Comparison: 1 music versus standard care

Outcome: 6 Anxiety (non-STAI)-patient type

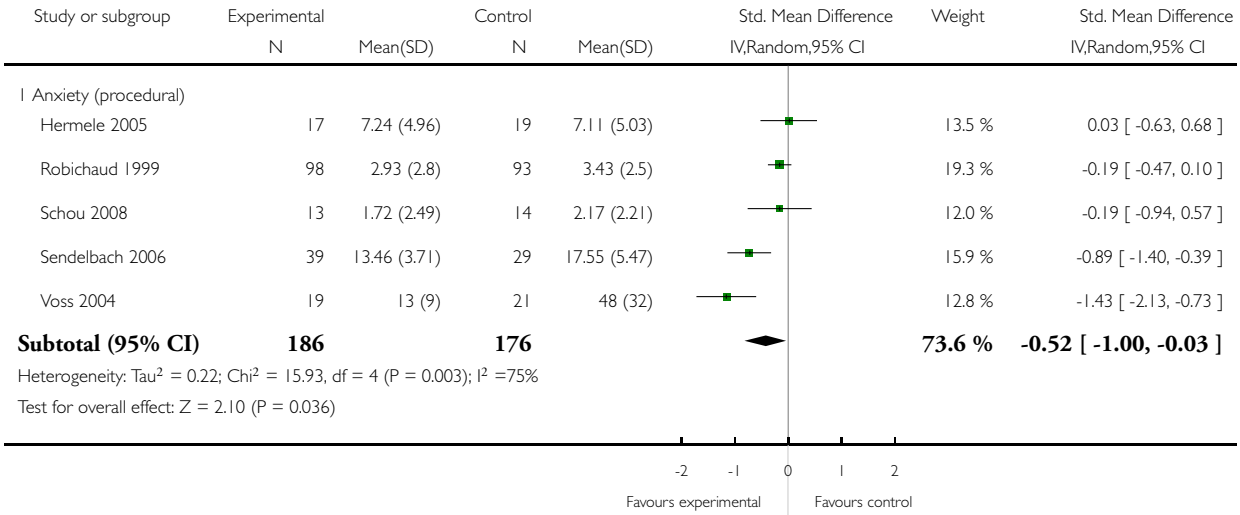
Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Random,95% CI	Weight	Std. Mean Difference IV,Random,95% CI
1 Anxiety (procedural)							
Hermele 2005	17	7.24 (4.96)	19	7.11 (5.03)		13.5 %	0.03 [-0.63, 0.68]
Robichaud 1999	98	2.93 (2.8)	93	3.43 (2.5)		19.3 %	-0.19 [-0.47, 0.10]
Schou 2008	13	1.72 (2.49)	14	2.17 (2.21)		12.0 %	-0.19 [-0.94, 0.57]
Sendelbach 2006	39	13.46 (3.71)	29	17.55 (5.47)		15.9 %	-0.89 [-1.40, -0.39]
Voss 2004	19	13 (9)	21	48 (32)		12.8 %	-1.43 [-2.13, -0.73]
Subtotal (95% CI)	**186**		**176**			**73.6 %**	**-0.52 [-1.00, -0.03]**
Heterogeneity: Tau^2 = 0.22; Chi^2 = 15.93, df = 4 (P = 0.003); I^2 =75%							
Test for overall effect: Z = 2.10 (P = 0.036)							
2 Anxiety (MI and Rehab)							
Elliott 1994	19	30.8 (17)	19	26.4 (23.7)		13.8 %	0.21 [-0.43, 0.85]
Emery 2003	15	1.5 (2.06)	15	1.3 (2.58)		12.6 %	0.08 [-0.63, 0.80]
Subtotal (95% CI)	**34**		**34**			**26.4 %**	**0.15 [-0.32, 0.63]**
Heterogeneity: Tau^2 = 0.0; Chi^2 = 0.07, df = 1 (P = 0.80); I^2 =0.0%							
Test for overall effect: Z = 0.63 (P = 0.53)							
Total (95% CI)	**220**		**210**			**100.0 %**	**-0.34 [-0.74, 0.06]**
Heterogeneity: Tau^2 = 0.19; Chi^2 = 20.33, df = 6 (P = 0.002); I^2 =70%							
Test for overall effect: Z = 1.69 (P = 0.092)							



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

Comparison: 1 music versus standard care

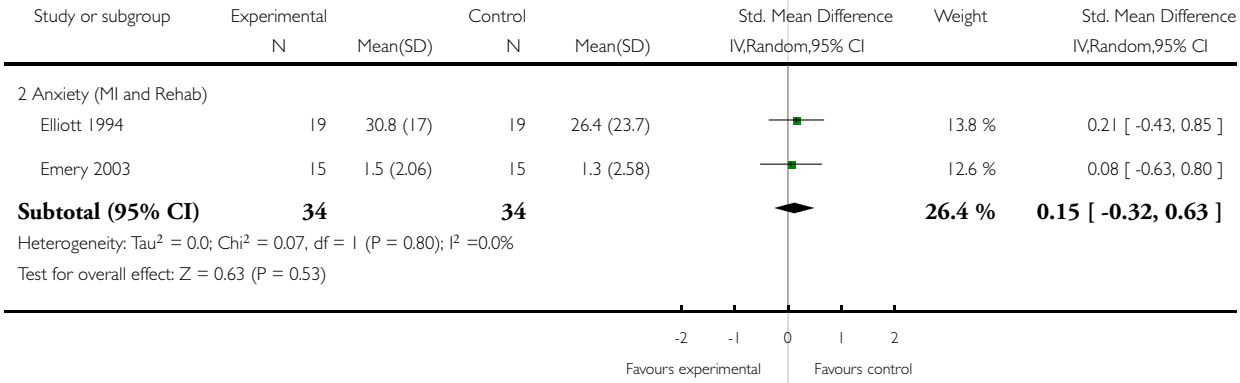
Outcome: 6 Anxiety (non-STAI)-patient type



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

Comparison: 1 music versus standard care

Outcome: 6 Anxiety (non-STAI)-patient type



Analysis 1.7. Comparison 1 music versus standard care, Outcome 7 depression.

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

Comparison: 1 music versus standard care

Outcome: 7 depression

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Fixed,95% CI	Weight	Std. Mean Difference IV,Fixed,95% CI
Elliott 1994	19	2.9 (2.6)	19	3.8 (2.9)		21.9 %	-0.32 [-0.96, 0.32]
Emery 2003	15	0.21 (0.4)	15	0.36 (0.689)		17.4 %	-0.26 [-0.98, 0.46]
Hermele 2005	17	6 (4.54)	19	5.47 (3.89)		21.0 %	0.12 [-0.53, 0.78]
Mandel 2007a	35	9.8 (11.2)	33	10.5 (6.6)		39.7 %	-0.07 [-0.55, 0.40]
Total (95% CI)	**86**		**86**			**100.0 %**	**-0.12 [-0.42, 0.18]**

Heterogeneity: Chi^2 = 1.08, df = 3 (P = 0.78); I^2 =0.0%

Test for overall effect: Z = 0.78 (P = 0.44)

Analysis 1.8. Comparison 1 music versus standard care, Outcome 8 Mood.

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

Comparison: 1 music versus standard care

Outcome: 8 Mood

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Fixed,95% CI	Weight	Std. Mean Difference IV,Fixed,95% CI
Barnason 1995	33	7.72 (1.49)	34	6.55 (2.42)		75.1 %	0.57 [0.08, 1.06]
Murrock 2002	15	4.13 (1.25)	15	0.33 (2.82)		24.9 %	1.70 [0.84, 2.55]
Total (95% CI)	**48**		**49**			**100.0 %**	**0.85 [0.43, 1.28]**

Heterogeneity: Chi^2 = 5.02, df = 1 (P = 0.03); I^2 =80%

Test for overall effect: Z = 3.94 (P = 0.000082)

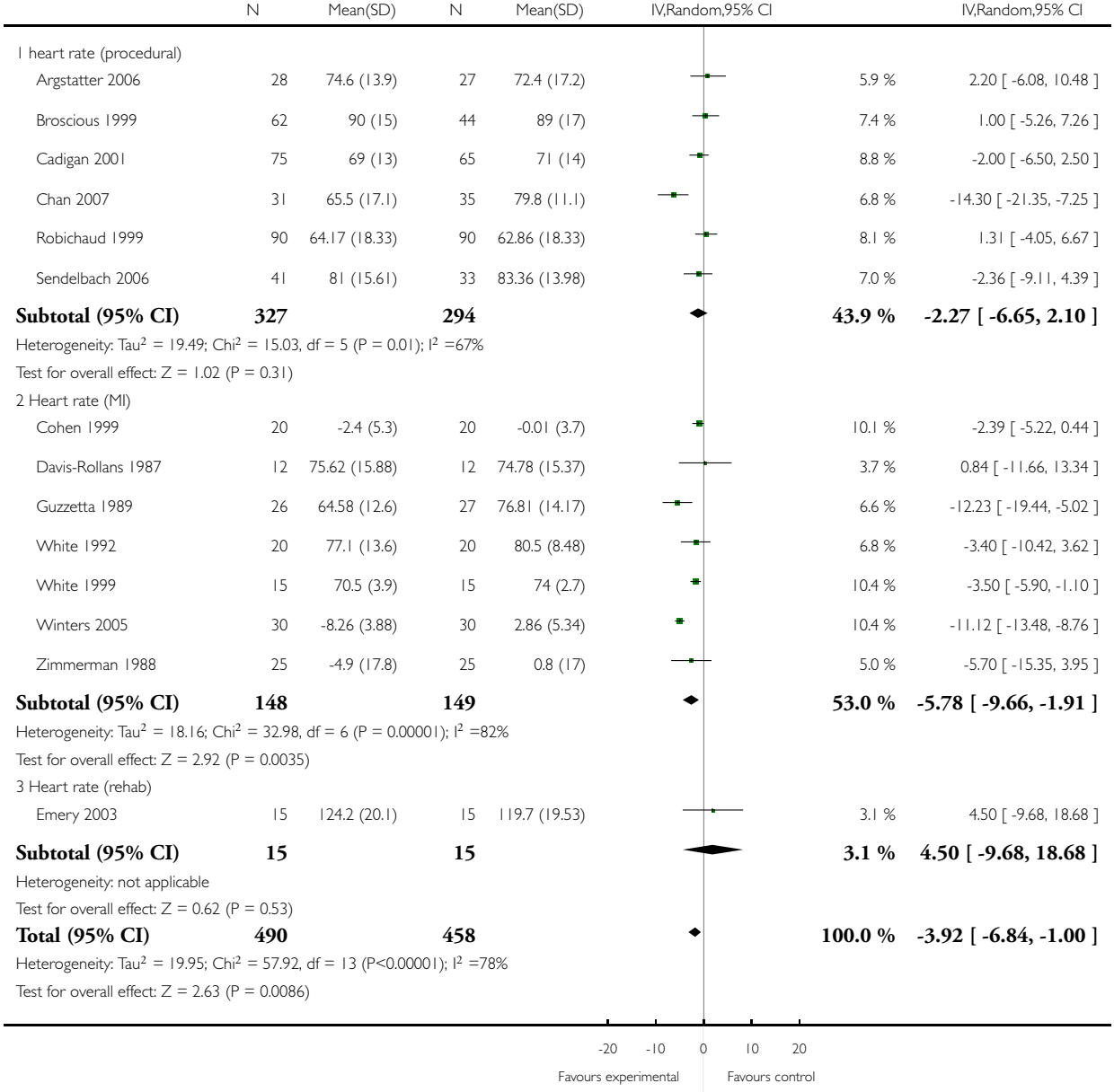
Analysis 1.9. Comparison 1 music versus standard care, Outcome 9 Heart rate-patient type.

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

Comparison: 1 music versus standard care

Outcome: 9 Heart rate-patient type

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 heart rate (procedural)							
Argstatter 2006	28	74.6 (13.9)	27	72.4 (17.2)		5.9 %	2.20 [-6.08, 10.48]
Broscious 1999	62	90 (15)	44	89 (17)		7.4 %	1.00 [-5.26, 7.26]
Cadigan 2001	75	69 (13)	65	71 (14)		8.8 %	-2.00 [-6.50, 2.50]
Chan 2007	31	65.5 (17.1)	35	79.8 (11.1)		6.8 %	-14.30 [-21.35, -7.25]
Robichaud 1999	90	64.17 (18.33)	90	62.86 (18.33)		8.1 %	1.31 [-4.05, 6.67]
Sendelbach 2006	41	81 (15.61)	33	83.36 (13.98)		7.0 %	-2.36 [-9.11, 4.39]
Subtotal (95% CI)	**327**		**294**			**43.9 %**	**-2.27 [-6.65, 2.10]**
Heterogeneity: Tau^2 = 19.49; Chi^2 = 15.03, df = 5 (P = 0.01); I^2 =67%							
Test for overall effect: Z = 1.02 (P = 0.31)							
2 Heart rate (MI)							
Cohen 1999	20	-2.4 (5.3)	20	-0.01 (3.7)		10.1 %	-2.39 [-5.22, 0.44]
Davis-Rollans 1987	12	75.62 (15.88)	12	74.78 (15.37)		3.7 %	0.84 [-11.66, 13.34]
Guzzetta 1989	26	64.58 (12.6)	27	76.81 (14.17)		6.6 %	-12.23 [-19.44, -5.02]
White 1992	20	77.1 (13.6)	20	80.5 (8.48)		6.8 %	-3.40 [-10.42, 3.62]
White 1999	15	70.5 (3.9)	15	74 (2.7)		10.4 %	-3.50 [-5.90, -1.10]
Winters 2005	30	-8.26 (3.88)	30	2.86 (5.34)		10.4 %	-11.12 [-13.48, -8.76]
Zimmerman 1988	25	-4.9 (17.8)	25	0.8 (17)		5.0 %	-5.70 [-15.35, 3.95]
Subtotal (95% CI)	**148**		**149**			**53.0 %**	**-5.78 [-9.66, -1.91]**
Heterogeneity: Tau^2 = 18.16; Chi^2 = 32.98, df = 6 (P = 0.00001); I^2 =82%							
Test for overall effect: Z = 2.92 (P = 0.0035)							
3 Heart rate (rehab)							
Emery 2003	15	124.2 (20.1)	15	119.7 (19.53)		3.1 %	4.50 [-9.68, 18.68]
Subtotal (95% CI)	**15**		**15**			**3.1 %**	**4.50 [-9.68, 18.68]**
Heterogeneity: not applicable							
Test for overall effect: Z = 0.62 (P = 0.53)							
Total (95% CI)	**490**		**458**			**100.0 %**	**-3.92 [-6.84, -1.00]**
Heterogeneity: Tau^2 = 19.95; Chi^2 = 57.92, df = 13 (P<0.00001); I^2 =78%							
Test for overall effect: Z = 2.63 (P = 0.0086)							



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

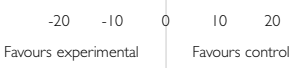
Comparison: 1 music versus standard care

Outcome: 9 Heart rate-patient type

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 heart rate (procedural)							
Argstatter 2006	28	74.6 (13.9)	27	72.4 (17.2)		5.9 %	2.20 [-6.08, 10.48]
Broscious 1999	62	90 (15)	44	89 (17)		7.4 %	1.00 [-5.26, 7.26]
Cadigan 2001	75	69 (13)	65	71 (14)		8.8 %	-2.00 [-6.50, 2.50]
Chan 2007	31	65.5 (17.1)	35	79.8 (11.1)		6.8 %	-14.30 [-21.35, -7.25]
Robichaud 1999	90	64.17 (18.33)	90	62.86 (18.33)		8.1 %	1.31 [-4.05, 6.67]
Sendelbach 2006	41	81 (15.61)	33	83.36 (13.98)		7.0 %	-2.36 [-9.11, 4.39]
Subtotal (95% CI)	**327**		**294**			**43.9 %**	**-2.27 [-6.65, 2.10]**

Heterogeneity: $Tau^2 = 19.49$; $Chi^2 = 15.03$, df = 5 (P = 0.01); $I^2 = 67\%$

Test for overall effect: Z = 1.02 (P = 0.31)



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

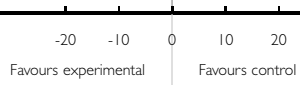
Comparison: 1 music versus standard care

Outcome: 9 Heart rate-patient type

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
2 Heart rate (MI)							
Cohen 1999	20	-2.4 (5.3)	20	-0.01 (3.7)		10.1 %	-2.39 [-5.22, 0.44]
Davis-Rollans 1987	12	75.62 (15.88)	12	74.78 (15.37)		3.7 %	0.84 [-11.66, 13.34]
Guzzetta 1989	26	64.58 (12.6)	27	76.81 (14.17)		6.6 %	-12.23 [-19.44, -5.02]
White 1992	20	77.1 (13.6)	20	80.5 (8.48)		6.8 %	-3.40 [-10.42, 3.62]
White 1999	15	70.5 (3.9)	15	74 (2.7)		10.4 %	-3.50 [-5.90, -1.10]
Winters 2005	30	-8.26 (3.88)	30	2.86 (5.34)		10.4 %	-11.12 [-13.48, -8.76]
Zimmerman 1988	25	-4.9 (17.8)	25	0.8 (17)		5.0 %	-5.70 [-15.35, 3.95]
Subtotal (95% CI)	**148**		**149**			**53.0 %**	**-5.78 [-9.66, -1.91]**

Heterogeneity: $Tau^2 = 18.16$; $Chi^2 = 32.98$, df = 6 (P = 0.00001); $I^2 = 82\%$

Test for overall effect: Z = 2.92 (P = 0.0035)



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

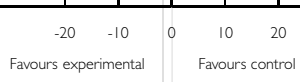
Comparison: 1 music versus standard care

Outcome: 9 Heart rate-patient type

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
3 Heart rate (rehab)							
Emery 2003	15	124.2 (20.1)	15	119.7 (19.53)		3.1 %	4.50 [-9.68, 18.68]
Subtotal (95% CI)	**15**		**15**			**3.1 %**	**4.50 [-9.68, 18.68]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.62 (P = 0.53)



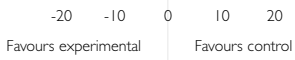
Analysis 1.10. Comparison 1 music versus standard care, Outcome 10 Heart rate - music preference.

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

Comparison: 1 music versus standard care

Outcome: 10 Heart rate - music preference

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 Heart rate - patient-selected music							
Broscious 1999	62	90 (15)	44	89 (17)		3.6 %	1.00 [-5.26, 7.26]
Chan 2007	31	65.5 (17.1)	35	79.8 (11.1)		2.8 %	-14.30 [-21.35, -7.25]
Cohen 1999	20	-2.4 (5.3)	20	-0.01 (3.7)		17.7 %	-2.39 [-5.22, 0.44]
Davis-Rollans 1987	12	75.62 (15.88)	12	74.78 (15.37)		0.9 %	0.84 [-11.66, 13.34]
Guzzetta 1989	26	64.58 (12.6)	27	76.81 (14.17)		2.7 %	-12.23 [-19.44, -5.02]
Robichaud 1999	90	64.17 (18.33)	90	62.86 (18.33)		4.9 %	1.31 [-4.05, 6.67]
Sendelbach 2006	41	81 (15.61)	33	83.36 (13.98)		3.1 %	-2.36 [-9.11, 4.39]
Winters 2005	30	-8.26 (3.88)	30	2.86 (5.34)		25.4 %	-11.12 [-13.48, -8.76]
Zimmerman 1988	25	-4.9 (17.8)	25	0.8 (17)		1.5 %	-5.70 [-15.35, 3.95]
Subtotal (95% CI)	**337**		**316**			**62.7 %**	**-6.44 [-7.94, -4.94]**
Heterogeneity: Chi² = 46.38, df = 8 (P<0.00001); I² =83%							
Test for overall effect: Z = 8.40 (P < 0.00001)							
2 Heart rate - researcher-selected music							
Argstatter 2006	28	74.6 (13.9)	27	72.4 (17.2)		2.1 %	2.20 [-6.08, 10.48]
Cadigan 2001	75	69 (13)	65	71 (14)		7.0 %	-2.00 [-6.50, 2.50]
Emery 2003	15	124.2 (20.1)	15	119.7 (19.53)		0.7 %	4.50 [-9.68, 18.68]
White 1992	20	77.1 (13.6)	20	80.5 (8.48)		2.9 %	-3.40 [-10.42, 3.62]
White 1999	15	70.5 (3.9)	15	74 (2.7)		24.6 %	-3.50 [-5.90, -1.10]
Subtotal (95% CI)	**153**		**142**			**37.3 %**	**-2.74 [-4.69, -0.79]**
Heterogeneity: Chi² = 2.89, df = 4 (P = 0.58); I² =0.0%							
Test for overall effect: Z = 2.76 (P = 0.0059)							
Total (95% CI)	**490**		**458**			**100.0 %**	**-5.06 [-6.25, -3.87]**
Heterogeneity: Chi² = 57.92, df = 13 (P<0.00001); I² =78%							
Test for overall effect: Z = 8.33 (P < 0.00001)							
Test for subgroup differences: Chi² = 8.65, df = 1 (P = 0.00), I² =88%							



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

Comparison: 1 music versus standard care

Outcome: 10 Heart rate - music preference

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 Heart rate - patient-selected music							
Broscious 1999	62	90 (15)	44	89 (17)		3.6 %	1.00 [-5.26, 7.26]
Chan 2007	31	65.5 (17.1)	35	79.8 (11.1)		2.8 %	-14.30 [-21.35, -7.25]
Cohen 1999	20	-2.4 (5.3)	20	-0.01 (3.7)		17.7 %	-2.39 [-5.22, 0.44]
Davis-Rollans 1987	12	75.62 (15.88)	12	74.78 (15.37)		0.9 %	0.84 [-11.66, 13.34]
Guzzetta 1989	26	64.58 (12.6)	27	76.81 (14.17)		2.7 %	-12.23 [-19.44, -5.02]
Robichaud 1999	90	64.17 (18.33)	90	62.86 (18.33)		4.9 %	1.31 [-4.05, 6.67]
Sendelbach 2006	41	81 (15.61)	33	83.36 (13.98)		3.1 %	-2.36 [-9.11, 4.39]
Winters 2005	30	-8.26 (3.88)	30	2.86 (5.34)		25.4 %	-11.12 [-13.48, -8.76]
Zimmerman 1988	25	-4.9 (17.8)	25	0.8 (17)		1.5 %	-5.70 [-15.35, 3.95]
Subtotal (95% CI)	**337**		**316**			**62.7 %**	**-6.44 [-7.94, -4.94]**

Heterogeneity: Chi^2 = 46.38, df = 8 (P<0.00001); I^2 =83%

Test for overall effect: Z = 8.40 (P < 0.00001)

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

Comparison: 1 music versus standard care

Outcome: 10 Heart rate - music preference

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
2 Heart rate - researcher-selected music							
Argstatter 2006	28	74.6 (13.9)	27	72.4 (17.2)		2.1 %	2.20 [-6.08, 10.48]
Cadigan 2001	75	69 (13)	65	71 (14)		7.0 %	-2.00 [-6.50, 2.50]
Emery 2003	15	124.2 (20.1)	15	119.7 (19.53)		0.7 %	4.50 [-9.68, 18.68]
White 1992	20	77.1 (13.6)	20	80.5 (8.48)		2.9 %	-3.40 [-10.42, 3.62]
White 1999	15	70.5 (3.9)	15	74 (2.7)		24.6 %	-3.50 [-5.90, -1.10]
Subtotal (95% CI)	**153**		**142**			**37.3 %**	**-2.74 [-4.69, -0.79]**
Heterogeneity: Chi² = 2.89, df = 4 (P = 0.58); I² =0.0%							
Test for overall effect: Z = 2.76 (P = 0.0059)							

Analysis 1.11. Comparison 1 music versus standard care, Outcome 11 Heart rate variability.

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

Comparison: 1 music versus standard care

Outcome: 11 Heart rate variability

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
White 1999	15	4.4 (0.3)	15	4.4 (0.4)		99.3 %	0.0 [-0.25, 0.25]
Winters 2005	30	-0.58 (0.43)	30	-1.23 (8.7)		0.7 %	0.65 [-2.47, 3.77]
Total (95% CI)	**45**		**45**			**100.0 %**	**0.00 [-0.25, 0.26]**
Heterogeneity: Chi² = 0.17, df = 1 (P = 0.68); I² =0.0%							
Test for overall effect: Z = 0.03 (P = 0.97)							

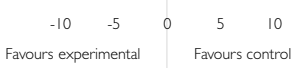
Analysis 1.12. Comparison 1 music versus standard care, Outcome 12 Respiratory rate - music preference.

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

Comparison: 1 music versus standard care

Outcome: 12 Respiratory rate - music preference

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 Respiratory Rate - patient-selected							
Chan 2007	31	18.3 (5.5)	35	28.9 (10.4)		9.3 %	-10.60 [-14.55, -6.65]
Winters 2005	30	-2.26 (1.53)	30	1.1 (2.18)		24.3 %	-3.36 [-4.31, -2.41]
Subtotal (95% CI)	**61**		**65**			**33.6 %**	**-6.72 [-13.79, 0.36]**
Heterogeneity: Tau^2 = 24.06; Chi^2 = 12.18, df = 1 (P = 0.00048); I^2 =92%							
Test for overall effect: Z = 1.86 (P = 0.063)							
2 Respiratory Rate - researcher-selected							
Cadigan 2001	66	17.3 (3.4)	62	19.1 (3.4)		23.1 %	-1.80 [-2.98, -0.62]
White 1992	20	16 (3.61)	20	18.4 (3.02)		17.8 %	-2.40 [-4.46, -0.34]
White 1999	15	15.7 (0.8)	15	17.3 (1.1)		25.6 %	-1.60 [-2.29, -0.91]
Subtotal (95% CI)	**101**		**97**			**66.4 %**	**-1.71 [-2.28, -1.14]**
Heterogeneity: Tau^2 = 0.0; Chi^2 = 0.55, df = 2 (P = 0.76); I^2 =0.0%							
Test for overall effect: Z = 5.86 (P < 0.00001)							
Total (95% CI)	**162**		**162**			**100.0 %**	**-3.05 [-4.53, -1.57]**
Heterogeneity: Tau^2 = 2.11; Chi^2 = 26.36, df = 4 (P = 0.00003); I^2 =85%							
Test for overall effect: Z = 4.03 (P = 0.000055)							



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

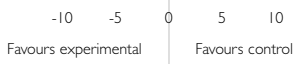
Comparison: 1 music versus standard care

Outcome: 12 Respiratory rate - music preference

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 Respiratory Rate - patient-selected							
Chan 2007	31	18.3 (5.5)	35	28.9 (10.4)		9.3 %	-10.60 [-14.55, -6.65]
Winters 2005	30	-2.26 (1.53)	30	1.1 (2.18)		24.3 %	-3.36 [-4.31, -2.41]
Subtotal (95% CI)	**61**		**65**			**33.6 %**	**-6.72 [-13.79, 0.36]**

Heterogeneity: Tau² = 24.06; Chi² = 12.18, df = 1 (P = 0.00048); I² =92%

Test for overall effect: Z = 1.86 (P = 0.063)



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

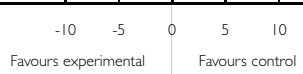
Comparison: 1 music versus standard care

Outcome: 12 Respiratory rate - music preference

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
2 Respiratory Rate - researcher-selected							
Cadigan 2001	66	17.3 (3.4)	62	19.1 (3.4)		23.1 %	-1.80 [-2.98, -0.62]
White 1992	20	16 (3.61)	20	18.4 (3.02)		17.8 %	-2.40 [-4.46, -0.34]
White 1999	15	15.7 (0.8)	15	17.3 (1.1)		25.6 %	-1.60 [-2.29, -0.91]
Subtotal (95% CI)	**101**		**97**			**66.4 %**	**-1.71 [-2.28, -1.14]**

Heterogeneity: Tau² = 0.0; Chi² = 0.55, df = 2 (P = 0.76); I² =0.0%

Test for overall effect: Z = 5.86 (P < 0.00001)



Analysis 1.13. Comparison 1 music versus standard care, Outcome 13 Systolic blood pressure.

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

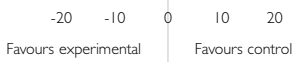
Comparison: 1 music versus standard care

Outcome: 13 Systolic blood pressure

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Argstatter 2006	28	147 (32)	27	152 (20)		1.8 %	-5.00 [-19.05, 9.05]
Broscious 1999	62	127 (20)	44	133 (19)		6.2 %	-6.00 [-13.50, 1.50]
Cadigan 2001	75	112 (16)	65	121 (18)		10.8 %	-9.00 [-14.68, -3.32]
Chan 2007	31	136.1 (21.2)	35	141.9 (31)		2.2 %	-5.80 [-18.50, 6.90]
Cohen 1999	20	-0.75 (10.7)	20	-0.8 (13.6)		6.0 %	0.05 [-7.53, 7.63]
Emery 2003	15	165.3 (17.23)	15	163.3 (17.23)		2.3 %	2.00 [-10.33, 14.33]
Mandel 2007a	35	126.6 (16.9)	33	130.3 (17.8)		5.1 %	-3.70 [-11.96, 4.56]
Robichaud 1999	90	121.89 (15.07)	90	124.99 (15.07)		17.9 %	-3.10 [-7.50, 1.30]
Sendelbach 2006	42	110.17 (17.38)	33	117.88 (16.25)		5.9 %	-7.71 [-15.35, -0.07]
White 1999	15	115 (4)	15	122 (5)		33.0 %	-7.00 [-10.24, -3.76]
Winters 2005	30	-7.74 (14.31)	30	-2.79 (14.39)		6.6 %	-4.95 [-12.21, 2.31]
Zimmerman 1988	25	-5 (23.28)	25	-5.1 (20.64)		2.3 %	0.10 [-12.10, 12.30]
Total (95% CI)	**468**		**432**			**100.0 %**	**-5.34 [-7.20, -3.48]**

Heterogeneity: Chi^2 = 8.23, df = 11 (P = 0.69); I^2 =0.0%

Test for overall effect: Z = 5.62 (P < 0.00001)



Analysis 1.14. Comparison 1 music versus standard care, Outcome 14 Diastolic blood pressure.

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

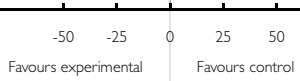
Comparison: 1 music versus standard care

Outcome: 14 Diastolic blood pressure

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Argstatter 2006	28	79 (11)	27	78 (10)		8.6 %	1.00 [-4.55, 6.55]
Broscious 1999	62	66 (9)	44	67 (12)		15.1 %	-1.00 [-5.19, 3.19]
Cadigan 2001	75	57 (11)	65	61 (11)		19.9 %	-4.00 [-7.65, -0.35]
Chan 2007	31	72.7 (12.9)	35	68.7 (14.6)		6.0 %	4.00 [-2.63, 10.63]
Cohen 1999	20	-1.6 (6.4)	20	-1.3 (7.9)		13.4 %	-0.30 [-4.76, 4.16]
Emery 2003	15	80.3 (8.04)	15	78.2 (8.62)		7.5 %	2.10 [-3.87, 8.07]
Mandel 2007a	35	72.9 (9.2)	33	75.9 (8.1)		15.7 %	-3.00 [-7.11, 1.11]
Sendelbach 2006	42	56.93 (13.06)	33	60.6 (11.65)		8.5 %	-3.67 [-9.27, 1.93]
Zimmerman 1988	25	-5.9 (12.16)	25	-1 (13.4)		5.3 %	-4.90 [-11.99, 2.19]
Total (95% CI)	**333**		**297**			**100.0 %**	**-1.54 [-3.17, 0.09]**

Heterogeneity: Chi^2 = 8.92, df = 8 (P = 0.35); I^2 =10%

Test for overall effect: Z = 1.86 (P = 0.063)



Analysis 1.15. Comparison 1 music versus standard care, Outcome 15 Pain.

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

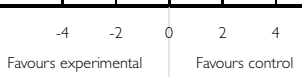
Comparison: 1 music versus standard care

Outcome: 15 Pain

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Random,95% CI	Weight	Std. Mean Difference IV,Random,95% CI
Bally 2003	56	0.4 (1)	51	0.5 (1.2)		11.9 %	-0.09 [-0.47, 0.29]
Barnason 1995	33	0.38 (0.78)	34	0.41 (0.82)		10.7 %	-0.04 [-0.52, 0.44]
Broscious 1999	68	5.86 (2.78)	47	5.43 (2.63)		12.0 %	0.16 [-0.22, 0.53]
Cadigan 2001	74	1.1 (1.9)	65	0.88 (1.5)		12.5 %	0.13 [-0.21, 0.46]
Chan 2007	31	2.1 (2.7)	35	6.3 (3.3)		9.9 %	-1.37 [-1.91, -0.83]
Mandel 2007a	35	-69.7 (23)	33	-63.4 (21.5)		10.7 %	-0.28 [-0.76, 0.20]
Robichaud 1999	98	0.12 (0.39)	93	0.25 (0.92)		13.1 %	-0.18 [-0.47, 0.10]
Sendelbach 2006	42	2.05 (2.01)	33	3.16 (2.5)		10.9 %	-0.49 [-0.95, -0.03]
Voss 2004	19	19 (13)	21	45 (27)		8.3 %	-1.18 [-1.86, -0.51]
Total (95% CI)	**456**		**412**			**100.0 %**	**-0.32 [-0.62, -0.03]**

Heterogeneity: $Tau^2 = 0.15$; $Chi^2 = 35.65$, df = 8 (P = 0.00002); $I^2 = 78\%$

Test for overall effect: Z = 2.13 (P = 0.033)



Analysis 1.16. Comparison 1 music versus standard care, Outcome 16 peripheral skin temperature.

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

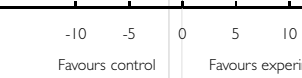
Comparison: 1 music versus standard care

Outcome: 16 peripheral skin temperature

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
Cadigan 2001	75	88 (5.8)	65	88 (6.2)		35.6 %	0.0 [-2.00, 2.00]
Guzzetta 1989	26	93.04 (3.12)	27	88.63 (6.64)		30.0 %	4.41 [1.63, 7.19]
Zimmerman 1988	25	1.4 (2.99)	25	1.7 (4.649)		34.4 %	-0.30 [-2.47, 1.87]
Total (95% CI)	**126**		**117**			**100.0 %**	**1.22 [-1.44, 3.88]**

Heterogeneity: $Tau^2 = 4.15$; $Chi^2 = 8.09$, df = 2 (P = 0.02); $I^2 = 75\%$

Test for overall effect: Z = 0.90 (P = 0.37)



APPENDICES

Appendix 1. Search strategies

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 18561
#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 revascularisation 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 (55)

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 Reseasrch 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. Journals Handsearched

Australian Journal of Music Therapy (1990 - 2007)
Canadian Journal of Music Therapy (1976 - 2006)
International Journal of the Arts in Medicine (1993 - 1999)
Journal of Music Therapy (1964 - 2007)
Musik-,Tanz-, und Kunsttherapie (1999 - 2006)
Musiktherapeutische Umschau (1980 - 2007)
Music Therapy (1981 - 1996)
Music Therapy Perspectives (1982 - 2007)
Nordic Journal of Music Therapy (1992 - 2007)
Music Therapy Today (online journal of music therapy) (2001 - 2007)
Voices (online international journal of music therapy) (2001 - 2007)
Arts in Psychotherapy (1983 - 2007)
International Latin-American Journal of Music Therapy (1995 - 2000)

HISTORY

Protocol first published: Issue 3, 2007

Review first published: Issue 2, 2009

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 contributed to writing the text.

Cheryl Dileo: conceived and designed the review, and contributed in writing the protocol. She identified potentially relevant trials and tracked eligible articles and extracted data from them; she contributed to writing the text.

DECLARATIONS OF INTEREST

Both 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) myocardial infarction 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.