Music therapy for end-of-life care: an updated systematic review

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Abstract

Background: Music therapy during palliative and end-of-life care is well established and positive benefits for patients have been reported.

Aim: Assess the effectiveness of music therapy versus standard care alone or standard care in combination with other therapies for improving psychological, physiological and social outcomes among adult patients in any palliative care setting.

Data sources: In order to update an existing Cochrane systematic review, we searched MEDLINE, CINAHL, EMBASE, PsycINFO, CENTRAL, ClinicalTrials.gov register, and Current Controlled Trials register to identify randomised or quasi-randomised controlled trails published between 2009 and April 2015. Nine electronic music therapy journals were searched from 2009 until April 2015, along with reference lists and contact was made with key experts in music therapy. Only studies published in English were eligible for inclusion. Two reviewers independently screened titles, abstracts, assessed relevant studies for eligibility, extracted data and judged risk of bias for included studies. Disagreements were resolved through

discussion with a third reviewer. Data were synthesised in Revman using the random effects model. Heterogeneity was assessed using I^2.

Results: Three studies were included in the review. Findings suggest music therapy may be effective for helping to reduce pain in palliative care patients (standard mean deviation (SMD) = -0.42, 95% CI -0.68 to -0.17, P = 0.001).

Conclusions: Available evidence did not support the use of music therapy to improve overall quality-of-life in palliative care. While this review suggests music therapy may be effective for reducing pain, this is based on studies with a high risk of bias. Further high quality research is required.

Keywords

Palliative care, music therapy, quality of life, pain, systematic review

Introduction

Music therapy has been defined as the use of music and sounds to facilitate the development of a relationship between patients and professionally trained therapists with the aim of supporting relaxation and improving both physical and emotional well-being.[1] Music therapy has been employed in palliative and end-of-life care for more than a decade to help address the associated psychological and spiritual issues,[2] which often lie beyond the remit of traditional healthcare.[3]

Although music therapy has been widely implemented in palliative and end-of-life care settings both in the United Kingdom[3] and the United States,[5] evidence to support its effectiveness with this client group is equivocal[6] and there is a need to examine the current state of the evidence to ensure that ongoing service developments are evidence based.

This systematic review will examine recent developments in the field by updating an existing Cochrane Systematic review[7] originally conducted in 2009.

Similar to the previous study[7] the questions addressed will include: (a) is music therapy and standard care more effective than standard care alone or standard care combined with other therapies; (b) are different types of music therapy (e.g. improvisation, music listening, lyric writing) more effective?

Methods

Searches were based on the strategy employed in Bradt and Dileo's previous Cochrane review.[7] We searched seven databases, trials registers, and key electronic journals from 2009 until April 2015 (See Appendix 1). Reference lists of relevant studies were also checked to identify further studies. Titles and abstracts of all retrieved articles were screened for eligibility using pre-defined criteria (see Appendix 2). Full text articles were retrieved when the title or abstract could not be rejected with confidence. A record was kept of all excluded studies along with the reason for exclusion. Data were extracted using a standardized coding form. Any discrepancies in data extraction were discussed and resolved by all three review authors. Risk of bias was assessed using the Cochrane Handbook's risk of bias tool[8] Main outcomes were presented as continuous variables. Standardised mean differences (SMDs) were calculated for continuous data using available mean values and their standard deviations (SD), together with 95% confidence intervals (CIs).

We estimated the treatment effects of individual trials and examined heterogeneity between trials by inspecting the forest plots and quantifying the impact of heterogeneity using the I^2 statistic: low (> 25% and < 50%), moderate (≥ 50% and <

75%) and high heterogeneity (≥ 75%).[9] Where heterogeneity was suspected we investigated possible causes, such as differences in study quality and participants.

To measure the impact of heterogeneity on the meta-analysis, the I^2 was used to describe the percentage of variability in effect estimates due to heterogeneity rather than chance. No heterogeneity was indicated with $I^2 = 0\%$. We planned to use funnel plots in order to examine potential bias from selective publication, but were unable to do so as only two published studies were included.

Meta-analysis employing a random effects model was performed using Review Manager Software version 5.2.[10] Subgroup analyses were planned to explore: a) different types of music therapy interventions; b) different duration and frequency of music therapy. However, because of the small numbers of studies included, these analyses were not completed. Again, sensitivity analyses were planned to examine the influence of study quality by comparing results with and without low-quality studies. However, all included studies were rated as containing a high risk of bias.

Results

Figure 1 summarises the review process and results. Only one study completed since the previous Cochrane review[7] was deemed eligible to be added for this review update.

Figure 1. Flow diagram of systematic review update process
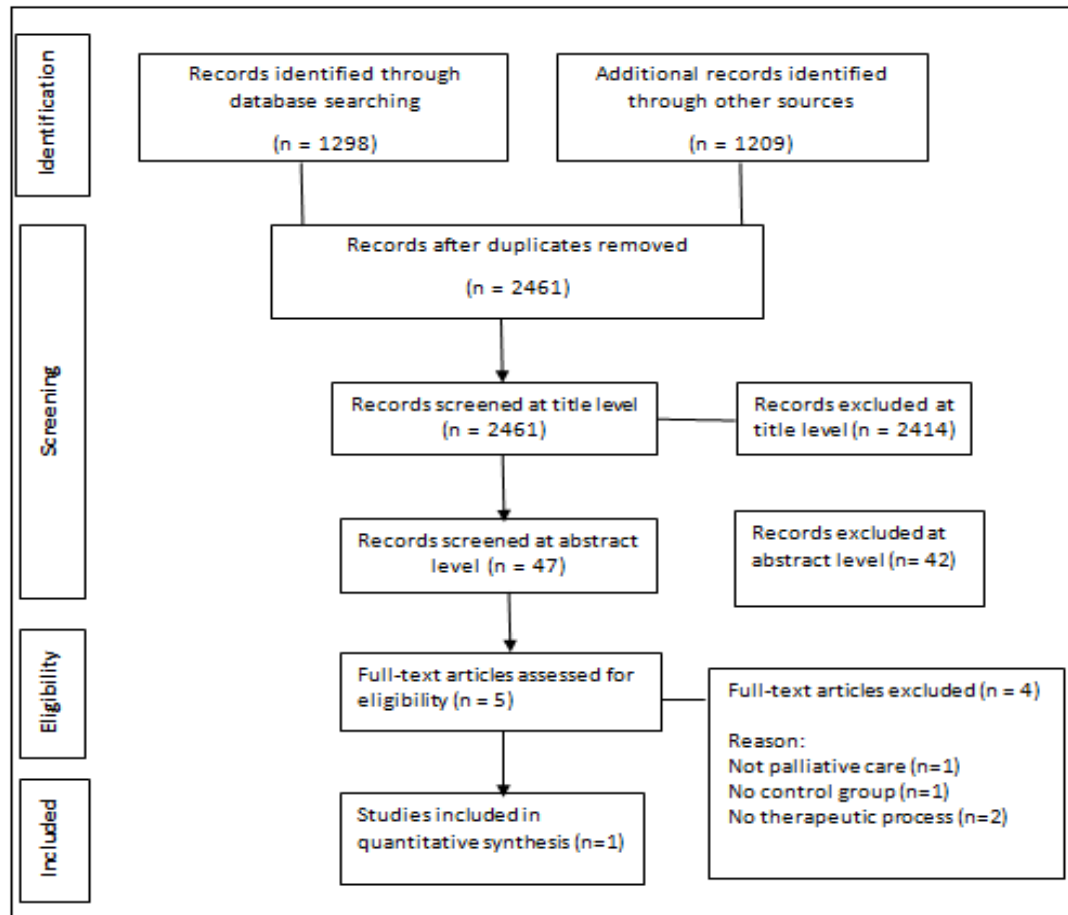
Bradt and Dileo's review[7] identified five eligible studies examining the effect of music therapy on end-of-life care in a range of outcomes such as: pain, depression, quality of life, functional well-being, psychological wellbeing and, social/spiritual well-being. The authors concluded that there was insufficient evidence to support the use of music therapy in end-of-life care. Our searches identified one additional paper[11] which examined the effect of music therapy on pain amongst this client population and we sought to combine these findings with two relevant papers included in the

original review.[12,13] Combining these studies provided a total of 245 participants randomised to music therapy and 243 participants completing the studies. Two studies were conducted in the United States[11,13] and one in Australia[12]. All patients were adults with a mean age of 64.7. Participants had a range of diagnoses including cancer, congestive heart failure and renal failure. Characteristics of the included studies from both the 2009 and the current review are presented in table 1. All studies were rated as having a high risk of bias due to the studies failure to blind assessors to outcomes.

Table 1. Characteristics of the included studies (N = 3).

Author, Year, Country	Study design	Participants	Intervention	Outcome Measures	Results
Gutgsell et al. (2013), USA	Randomised Controlled Trial (RCT) Power (%) 80 Sample size:198	198 hospital inpatients with a diagnosis of advanced, potentially life-limiting illness. Patients were 18 years or older, able to understand English, alert enough to be able to rate pain on a numeric scale, and have pain on a numeric rating scale of three or more (on a scale of Zero to 10). Patients mean age was 56 years.	Music therapy: (n = 99) a professional music therapist delivered individual music therapy sessions focused on lowering pain levels. A standard protocol was used for all patients. Comfort measures included placing a 'Do not disturb' notice on the door, adjusting lights, providing a blanket and turning off any phones. This was followed by verbal instructions for autogenic relaxation which included focusing on relaxing muscles from the head to the feet; imagining a safe place of the patient's own choice, and what they imagined seeing, smelling, hearing, tasting and feeling on their skin in this safe place. The therapist used the ocean drum, followed by the harp while the patient continued to focus on their safe place. The music, played at a low volume in a slow tempo, was chosen by the therapist based on clinical experience. Control: (n = 99) The same comfort measures as for the intervention group. Number of sessions: 1 Length of session: 20 minutes	1. The Numeric Rating Scale (NRS) 2. The Face, Legs, Activity, Cry, Consolability Scale (FLACC) 3. The Functional Pain Scale (FPS)	Pain was significantly lowered for the music therapy group compared to the control group for NRS and FPS. No significant improvement was observed for FLACC. Difference in means between music therapy and control group for pain - Numeric Rating Scale (NRS) -1.39 (1.99) (p < 0.0001), - The Face, Legs, Activity, Cry, Consolability Scale (FLACC) -0.34 (1.68) (p> 0.05) - The Functional Pain Scale (FPS) -0.52 (0.95) (p< 0.0001)

Horne-Thompson et al. (2008) Australia	RCT Power (%) 80 Sample size: 25	25 hospice inpatients receiving palliative care for a diagnosis of a terminal illness. Patients who were referred to music therapy for anxiety, passed a routine cognitive functioning test, and able to speak English were eligible. Patients mean age was 73.9 years.	Music therapy: (n=13) a registered music therapist provided a range of techniques which included singing, playing familiar live or recorded music, music and relaxation, music and imagery, improvisation, and music assisted counselling. The technique used was chosen based on consultation with the participant. Control: (n=12)a single volunteer session consisting of conversation, reading or offering emotional support to the participant. Number of sessions: 1 Length of session: 20-40 minutes	1. The Edmonton Symptom Assessment System (ESAS) 2. A pulse oximeter	Results showed anxiety was significantly reduced for the experimental group (p 0.005). A post hoc analysis showed significant reductions in other measurements on the ESAS in the experimental group for pain (p 0.019), tiredness (p 0.024) and drowsiness (p 0.018). No difference in heart rate was found between experimental and control group.
Nguyen (2003) United States	RCT Power (%) No power calculation Sample size:20	20 adult hospice inpatients receiving palliative care for end of life. Patients were eligible if they had 2 or more: no DNR (do not resuscitate) poor or grave prognosis, prescribed terminally ill and receiving comfort measures only. Patients mean age was 64.5 years.	Music therapy: (n = 10) the first session involved singing music chosen by the patient, finding out the patient's favourite songs, and assessing the patient and family's coping levels. The second session involved an end of life celebration. Control: (n= 10)standard care only Number of sessions: 2 Length of session: not reported	1. Hospice Quality of Life Index-Revised Visual Annalog Scale measured: 1. Anxiety 2. Pain 3. Sadness 4. Stress 5. Hope 6. Discomfort	Anxiety was significantly reduced for the experimental group. No significant difference was found for quality of life between the two groups. (no statistical results provided for pain; posttest scores calculated

				from raw data within Appendix).

Table 2 shows the results of a meta-analysis examining the impact of music therapy for palliative patients on pain. Overall, a statistically significant difference was shown in pain reduction favouring the intervention group when compared to those who received comfort measures, a volunteer visit, or standard care only (three studies, n= 243; SMD -0.42, 95% CI -0.68, -0.17, P=0.001) (Table 2). Overall, the test for homogeneity passed with an I^2 value of 0%.

Table 2. Efficacy: Music therapy versus active control and standard care only for pain

Study or Subgroup	Music therapy			Control			Weight	Std. Mean Difference IV, Random, 95% CI	Std. Mean Difference IV, Random, 95% CI
	Mean	SD	Total	Mean	SD	Total			
Gutsgell	4.74	2.59	99	5.86	2.42	99	81.4%	-0.45 [-0.73, -0.16]	
Horne-Thompson	1.77	2.39	13	2.25	2.73	12	10.5%	-0.18 [-0.97, 0.61]	
Nguyen	23	33.31	10	42.9	38.74	10	8.1%	-0.53 [-1.42, 0.37]	
Total (95% CI)			122			121	100.0%	-0.42 [-0.68, -0.17]	

Heterogeneity: Tau² = 0.00; Chi² = 0.44, df = 2 (P = 0.80); I² = 0%
Test for overall effect: Z = 3.27 (P = 0.001)

Favours [experimental]   Favours [control]

Discussion

The previous systematic review[7] established no strong evidence of music therapy's effectiveness for reducing pain based on a meta-analysis of two small studies (n=45). However, the addition of Gutsgell et al.'s study[11] to this updated review suggests that there is a significant effect for music therapy in reducing pain among palliative care patients. This is an important finding given that pain is a common symptom reported by palliative care patients in a wide range of life-limiting illnesses such as cancer, heart disease, chronic obstructive pulmonary disease, renal disease and acquired immunodeficiency disease.[14] Furthermore, a recent review examining the utilisation of music therapy for palliative care indicated that most referrals were made to alleviate pain.[2]

Like the previous systematic review[7] we were unable to verify music therapy's effectiveness for improving communication or social outcomes for palliative care patients due to the lack of evidence.

However, RCTs may not be the only appropriate way to assess the benefits of music therapy. Other methodologies, which seek to elucidate its processual and qualitative aspects, also have an important contribution to make.[15] Qualitative research suggests that music therapy is beneficial to palliative care patients such as helping them express difficult emotions,[16] helping patients and families find closure at the end of life,[9] and improving staff mood and resilience.[4,10]

A strength of this review is that we built upon existing work and conducted a comprehensive search of several databases and music therapy journals, checked reference lists of all considered studies, and used strict eligibility criteria for reviewed publications. However, due to resource limitations we were only able to consider articles in the English language.

In addition, due to the nature and quality of studies identified it was not possible to carry out subgroup analysis to investigate type of music therapy or duration as moderator variables. Further large scale RCTs are required to inform the development of music therapy interventions for palliative patients.

Conclusion

One advantage of synthesizing the available evidence is that it illustrates clearly the limited extent of our knowledge in this area and highlights the ongoing need for good quality research to guide policy makers and service planners. A key finding in this study was that, during a five-year period, only one new study had been conducted to help inform the development of music therapy services amongst this client group.

This review indicates that music therapy may be effective for reducing pain in palliative care patients. This adds to the previous review's finding that it may be effective for improving quality of life.[7] However, these results are based on findings from studies with a high risk of bias.

The findings of this systematic review, whilst encouraging, demonstrate that, at present, the beneficial therapeutic effects of music therapy for the palliative care population have not been fully demonstrated. This lack of evidence highlights an urgent need for methodologically rigorous trials of clearly defined music therapy interventions with common outcome measures. Such a strategy would enable healthcare policy makers and commissioners to make fully informed decisions about the role that music therapy should play in palliative care.

Contributions

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Declaration of conflicting interests

The authors declare that there is no conflict of interest.

References

1 Bunt L, Hoskyns S. *The handbook of music therapy.* New York: Brunner-Routledge, 2002.

2 Bowers TA, Wetsel MA. Utilization of Music Therapy in Palliative and Hospice Care. *J Hosp Palliat Nurs.* Epub ahead of print June 2014. DOI: 10.1097/NJH.000000000000060.

3 Clements-Cortes A. The role of music therapy in facilitating relationship completion in end-of-life care. *J Music Ther* 2010; 16: 123-147.

4 O'Kelly J, Koffman J. Multidisciplinary perspectives of music therapy in adult palliative care. *Pall Med* 2007; 21: 235-241.

5 Berkovitz A, Sengupta M, Jones A, et al. Complementary and alternative therapies in hospice: The national home and hospice care survey. Report, National Center for Health Statistics, United States, 2011.

6 Korczak D, Schneider M, Wastian M. Music in palliative setting. *GMS Health Technol Assess.* Epub ahead of print 23 July 2013. DOI: 10.3205/hta000113.

7 Bradt J, Dileo C. Music Therapy for end-of-life care. *Cochrane Database of Syst Rev* 2010: Art. No: CD007169. DOI: 10.1002/14651858.CD007169.pub2

8 Higgins JPT and Altman DG. Assessing risk of bias in included studies. In: Higgins JPT and Green S (eds) *Cochrane handbook for systematic reviews of interventions,* Vol version 5.0.1 (updated September 2008). UK: John Wiley & Sons Ltd, 2008.

9 Higgins JPT, Thompson SG, Deeks JJ, et al. Measuring inconsistency in meta-analyses. *BMJ* 2003; 327: 557-560.

10 Review Manager (RevMan) [Computer program]. Version 5.2. Copenhagen: The Nordic Cochrane Centre, The Cochrane Collaboration, 2012.

11 Gutgsell KJ, Schluchter M, Margevicius S, et al. Music therapy reduces pain in palliative care patients: a randomized controlled trial. *J Pain Symptom Manage* 2013; 45: 822-31.

12 Horne-Thompson A, Grocke D. The Effect of Music Therapy on Anxiety in Patients who are Terminally Ill. *J Palliat Med* 2008; 11: 582-590.

13 Nguyen J. *The effect of music therapy on end-of-life patients' quality of life, emotional state, and family satisfaction as measured by self-report.* Master's thesis, Florida State University, USA, 2003

14 Solano JP, Gomes B, Higginson IJ. A Comparison of Symptom Prevalence in Far Advanced Cancer, AIDS, Heart Disease, Chronic Obstructive Pulmonary Disease and Renal Disease. *J Pain Symptom Manage* 2006; 31: 58-69.

15 Porter S, McConnell T, Lynn F, et al. 'Recruiting Participants for Randomized Controlled Trials of Music Therapy. A Practical Illustration' *J Music Ther* 2014; 51: 355-81.

16 O'Callaghan C, Hiscock R. Interpretive subgroup analysis extends modified grounded theory research findings in oncologic music therapy. *J Music Ther* 2007; 44: 256-281.

Appendix 1

Database: MEDLINE (www.nlm.nih.gov/bsd/pmresources.html)
Date: 2009 to April 2015
Total: 42
Strategy:
1   randomized controlled trial.pt. (397786)
2   controlled clinical trial.pt. (90503)
3   random allocation.sh. (83769)
4   double blind method.sh. (131902)
5   single blind method.sh. (20448)
6   or/1-5 (567019)
7   (animals not humans).sh. (3987869)
8   6 not 7 (516832)
9   exp Clinical Trial/ (812011)
10   ((singl* or doubl* or trebl* or tripl*) adj (blind* or mask*)).ti,ab. (129466)
11   placebo.sh. (33956)
12   "placebo*".ti,ab. (159165)
13   "random*".ti,ab. (689992)
14   research design.sh. (81937)
15   or/9-14 (1293126)
16   15 not 7 (1190534)
17   16 not 8 (691845)
18   comparative study.sh. (1726213)
19   exp Evaluation Studies/ (205134)
20   follow up studies.sh. (516468)
21   prospective studies.sh. (388663)
22   (control* or prospective* or volunteer*).ti,ab. (2653016)
23   or/18-22 (4719952)
24   23 not 7 (3679436)
25   24 not (8 or 17) (11134)
26   8 or 17 or 35 (1214099)
27   palliative care/ or terminal care/ or hospice care/ or terminally ill/ (64964)
28   "hospice*".tw. (8287)
29   (palliat* or (terminal* adj6 ill*) or (terminal* adj3 care) or (end adj3 life)).tw. (61654)
30   ((care adj5 dying) or (caring adj5 dying) or (support$ adj5 dying) or (dying adj5 patient$)).tw. (7188)
31   ((advanced adj6 cancer) or (advanced adj6 carcinoma$) or (advanced adj6 neoplasm$) or (terminal$ adj6 cancer$) or (terminal$ adj6 carcinoma$) or (metastatic adj6 cancer) or (metastatic$ adj6 cancer$) or (metastat$ adj6 carcinoma$) or (metastas$ adj6 carcinoma$) or (metastatic adj6 neoplasm$) or (metastas$ adj6 neoplasm$)).tw. (141185)
32   exp heart failure, congestive/ (91265)

33	exp liver failure/ (19064)
34	exp kidney failure/ (129759)
35	amyotrophic lateral sclerosis/ (13790)
36	exp Acquired Immunodeficiency Syndrome/ (75269)
37	exp pulmonary disease, chronic obstructive/ (38111)
38	(heart failure or cardiac failure or liver failure or kidney failure or renal failure or AIDS or ALS or COPD).tw. (355532)
39	or/29-38 (722201)
40	music therapy/ (2456)
41	(music$ or melod$).tw. (12727)
42	(sing or sings or singer$ or singing or song$).tw. (9900)
43	or/40-42 (22087)
44	39 and 43 (583)
45	26 and 44 (85)
46	limit 45 to yr= "2009 – 2014" (42)

Database: PsycINFO (http://www.apa.org/pubs/databases/psychinfo/index.aspx)
Date: 2009 to April 2015
Total: 87
Strategy:

1. palliative care/ or terminal care/ or hospice care/ or terminally ill/ (10479)
2. hospice$.tw. (3700)
3. (palliate$ or (terminal$ adj6 ill$) or (terminal$ adj3 care) or (end adj3 life)).tw. (14773)
4. ((care adj5 dying) or (caring adj5 dying) or (support$ adj5 dying) or (dying adj5 patient$)).tw. (2634)
5. ((advanced adj6 cancer) or (advanced adj6 carcinoma$) or (advanced adj6 neoplasm$) or (terminal$ adj6 cancer$) or (terminal$ adj6 carcinoma$) or (metastatic adj6 cancer) or (metastas$ adj6 cancer$) or (metastat$ adj6 carcinoma$) or (metastas$ adj6 carcinoma$) or (metastatic adj6 neoplasm$) or (metastas$ adj6 neoplasm$)).tw. (3484)
6. Congestive heart failure.mp. (673)
7. kidney failure.mp. (110)
8. liver failure.mp. (200)
9. amyotrophic lateral schlerosis.mp. (3140)
10. exp AIDS/ (13048)
11. chronic obstructive pulmonary disease.mp. (1521)
12. (heart failure or cardiac failure or liver failure or kidney failure or renal failure or amyotrophic lateral sclerosis or AIDS or ALS or COPD or chronic obstructive pulmonary disease).tw. (43926)
13. Or /1-12 (63321)
14. music therapy/ (3402)
15. music/ (11593)
16. (music$ or melod$).tw. (28925)
17. (sing or sings or singer$ or singing or song$).tw. (10716)
18. Or/14-17 (37203)
19. empirical study.md. (1789879)
20. followup study.md. (50543)
21. longitudinal study.md. (110025)
22. prospective study.md. (26739)
23. quantitative study.md. (950976)

24	"2000".md. (28109)
25	treatment effectiveness evaluation/ (17395)
26	exp hypothesis testing/ (2510)
27	repeated measures/ (583)
28	exp experimental design/ (48315)
29	placebo$.ti,ab. (31456)
30	random$.ti,ab. (134926)
31	(clin$ adj25 trial$).ti,ab. (27668)
32	((singl$ or doubl$ or trebl$ or tripl$) adj (blind$ or mask$)).ti,ab. (20080)
33	Or/19-32 (1858542)
34	13 and 18 and 33 (216)

limit 34 to (human and yr="2009 -Current") (87)

Database: CINAHL (http://www.ebscohost.com/academic/cinahl-plus-with-full-text)
Date: 2009 to April 2015
Total: 138
Strategy:

1 (MH "Music Therapy") (3,046)
2 (MH "singing") OR "sing" (1,839)
3 "singer*" (573)
4 "song*" (1,050)
5 "music*" (10.064)
6 "melod*" (243)
7 "music therapy" (3,164)
8 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 (12,008)
9 advanced N6 cancer* (9,305)
10 advanced N6 carcinoma* (1,443)
11 advanced N6 neoplasm* (43)
12 terminal* N6 cancer* (1,100)
13 terminal* N6 carcinoma* (27)
14 metastas* N6 cancer* (3,404)
15 metastat* N6 carcinoma* (1,688)
16 metastas* N6 carcinoma* (1,474)
17 metastas* N6 neoplasm* (18,632)
18 metastat* N6 neoplasm* (63)
19 metastat* N6 cancer* (5,686)
20 9 OR 10 OR 11 OR 12 OR 13 OR 14 OR 15 OR 16 OR 17 OR 18 OR 19 (34,051)
21 (MH "Terminally Ill Patients") OR (MH "Hospice Patients") (8,122)
22 (MH "Terminal Care") OR (MH "Hospice Care") OR (MH "Palliative Care") (35,418)
23 care N5 dying (1,976)
24 caring N5 dying (500)
25 support* N5 dying (263)
26 dying N5 patient* (2,531)
27 palliat* N6 ill* (527)
28 terminal* N6 Ill* (9,817)
29 terminal* N3 care (12,698)
30 end N3 life (10,499)
31 "hospice" (12,889)
32 (MH "Hospice Patients") (256)
33 21 OR 22 OR 23 OR 24 OR 25 OR 26 OR 27 OR 28 OR 29 OR 30 OR 31 OR 32 (46,712)
34 8 AND 20 AND 33 (12)
35 20 OR 33 (77,494)

36   8 AND 35 (303)
37   8 AND 35 (Limited to <2009 to 2014>) (138)

Database: CENTRAL (www.cochrane.org)
Date: 2009 to April 2015
Total: 36
Strategy:

MeSH descriptor PALLIATIVE CARE this term only

MeSH descriptor TERMINAL CARE this term only

MeSH descriptor HOSPICE CARE this term only

(palliat* in Title, Abstract or Keywords or (terminal* in Title, Abstract or Keywords near/6 ill* in Title, Abstract or Keywords) or (terminal* in Title, Abstract or Keywords near/6 care in Title, Abstract or Keywords) or (end in Title, Abstract or Keywords near/6 life in Title, Abstract or Keywords))

((care in Title, Abstract or Keywords near/6 dying in Title, Abstract or Keywords) or (caring in Title, Abstract or Keywords near/6 dying in Title, Abstract or Keywords) or (support* in Title, Abstract or Keywords near/6 dying in Title, Abstract or Keywords) or (patient* in Title, Abstract or Keywords near/6 dying in Title, Abstract or Keywords))

((advanced in Title, Abstract or Keywords near/6 cancer in Title, Abstract or Keywords) or (advanced in Title, Abstract or Keywords near/6 carcinoma* in Title, Abstract or Keywords) or (advanced in Title, Abstract or Keywords near/6 neoplasm* in Title, Abstract or Keywords) or (terminal* in Title, Abstract or Keywords near/6 cancer* in Title, Abstract or Keywords) or (terminal* in Title, Abstract or Keywords near/6 carcinoma* in Title, Abstract or Keywords) or (metastatic in Title, Abstract or Keywords near/6 cancer* in Title, Abstract or Keywords) or (metastas* in Title, Abstract or Keywords near/6 cancer* in Title, Abstract or Keywords) or (metastatic in Title, Abstract or Keywords near/6 carcinoma* in Title, Abstract or Keywords) or (metastas* in Title, Abstract or Keywords near/6 carcinoma* in Title, Abstract or Keywords) or (metastatic in Title, Abstract or Keywords near/6 neoplasm* in Title, Abstract or Keywords) or (metastas* in Title, Abstract or Keywords near/6 neoplasm* in Title, Abstract or Keywords))

MeSH descriptor HEART FAILURE explode all trees

MeSH descriptor LIVER FAILURE explode all trees

MeSH descriptor RENAL INSUFFICIENCY explode all trees

MeSH descriptor NEURODEGENERATIVE DISEASES explode all trees

MeSH descriptor ACQUIRED IMMUNODEFICIENCY SYNDROME this term only

(heart next failure in Title, Abstract or Keywords or liver next failure in Title, Abstract or Keywords or kidney next failure in Title, Abstract or Keywords)

"AIDS" in Title, Abstract or Keywords

neurodegenerative in Title, Abstract or Keywords

(#1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15)

MeSH descriptor MUSIC THERAPY this term only

music* in Title, Abstract or Keywords

melod* in Title, Abstract or Keywords

(sing in Title, Abstract or Keywords or sings in Title, Abstract or Keywords or singer* in Title, Abstract or Keywords or singing in Title, Abstract or Keywords or song* in Title, Abstract or Keywords)

(#17 or #18 or #19 or #20)

(#16 and #21) limited to Publication Year from 2009 to 2014 (36)

Database: EMBASE (http://www.elsevier.com/online-tools/embase)
Date: 2009 to April 2015
Total: 172

Strategy:
1 randomized controlled trial/ (353243)
2 exp controlled clinical trial/ (487963)
3 exp randomization/ (63967)
4 double blind procedure/ (116034)
5 single blind procedure/ (19033)
6 1 or 2 or 3 or 4 or 5 (564138)
7 clinical trial/ (834048)
8 (clin* adj25 trial*).ti,ab. (360497)
9 singl*.ti,ab. (1290854)
10 doubl*.ti,ab. (485029)
11 trebl*.ti,ab. (432)
12 tripl*.ti,ab. (94904)
13 blind*.ti,ab. (270928)
14 mask*.ti,ab. (62531)
15 9 or 10 or11 or 12 (1760700)
16 13 or 14 (331358)
17 15 and 16 (179646)
18 placebo*.ti,ab. (204147)
19 random*.ti,ab. (913640)
20 18 or 19 (991352)
21 placebo.sh. (247319)
22 methodology.sh. (1384991)
23 21 or 22 (1627002)
24 7 or 8 or 17 or 20 or 23 (3053428)
25 comparative study.sh. (646554)
26 follow up.sh. (852227)
27 prospective study.sh. (266630)
28 25 or 26 or 27 (1654016)
29 exp evaluation study/ (10112)
30 control*.ti,ab. (3167675)
31 prospectiv*.ti,ab. (615132)
32 volunteer.ti,ab. (21212)
33 30 or 31 or 32 (3651252)
34 8 or 29 or 33 (4807148)
35 palliative care/ (52118)
36 terminal care/ (24222)
37 hospice care/ (6239)
38 terminally ill/ (5952)
39 35 or 36 or 37 or 38 (76523)
40 "hospice*".tw. (11247)
41 palliat*.tw. (68820)
42   (terminal* adj3 ill).tw. (7150)
43 (terminal* adj3 care).tw. (2779)
44 (end adj3 life).tw. (17891)
45 41 or 42 or 43 or 44 (86652)
46 (care adj5 dying).tw. (2767)
47 (caring adj5 dying).tw. (568)
48 (support$ adj5 dying).tw. (371)
49 (dying adj5 patient$).tw. (6975)
50 46 or 47 or 48 or 49 (8746)

```
51  (advanced adj6 cancer).tw. (74962)
52  (advanced adj6 carcinoma$).tw. (22234)
53  (advanced adj6 neoplasm$).tw. (962)
54  (terminal* adj6 cancer$).tw. (3681)
55  (terminal$ adj6 carcinoma$).tw. (428)
56  (metastatic adj6 cancer).tw. (56002)
57  (metastas$ adj6 cancer$).tw. (62979)
58  (metastat$ adj6 carcinoma$).tw. (27923)
59  (metastas$ adj6 carcinoma$).tw. (31691)
60  (metastatic adj6 neoplasm$).tw. (1923)
61  (metastas$ adj6 neoplasm$).tw. (2182)
62  51 or 52 or 53 or 54 or 55 or 56 or 57 or 58 or 59 or 60 or 61 (242279)
63  exp congestive heart failure/ (76337)
64  exp liver failure/ (46318)
65  exp kidney failure/ (226546)
66  amyotrophic lateral schlerosis/ (22979)
67  exp acquired immune deficiency syndrome/ (128659)
68  pulmonary disease, chronic obstructive.mp. or exp chronic obstructive lung disease
    (72504)
69  39 or 40 or 45 50 or 62 or 63 or 64 or 65 or 66 or 67 or 68 (897665)
70  music therapy/ (4347)
71  music$.tw. 15698)
72  melod$.tw. (1949)
73  sing.tw. (1170)
74  sings.tw. (940)
75  singer$.tw. (2022)
76  singing.tw. (2235)
77  song$.tw. (7879)
78  70 or 71 or 72 or 73 or 74 or 75 or 76 or 77 (29348)
79  69 or 78 (781)
80  6 or 24 or 34 (6847533)
81  79 and 80 (325)
82  limit 81 to yr= "2009-Current" (172)
```

Database: ClinicalTrials.gov (https://clinicaltrials.gov/)
Date: 2009 to April 2015
Total: 765
Strategy:
Music OR (music therapy) OR singing OR song OR songs OR melody

Database: Current Controlled Trials (www.webcitation.org)
Date: April 2015
Total: 58
Strategy:
Music OR music therapy
Sing OR sings OR singing OR song OR songs OR melody OR melodies

Electronic Databases
Date: 2009 to April 2015

1. Australian Journal of Music Therapy
2. Canadian Journal of Music Therapy
3. Journal of Music Therapy
4. Music Therapy Perspectives
5. Nordic Journal of Music Therapy
6. Voices (online international journal of music therapy)
7. New Zealand Journal of Music Therapy
8. The Arts in Psychotherapy
9. Journal of Evidence-Based Complementary and Alternative Medicine

Appendix 2

Inclusion criteria for systematic review of music therapy for end-of-life care

Study Type	Randomised Controlled Trials (published or unpublished)
	Quasi-randomised or systematic methods of treatment allocation (e.g. alternate allocation of treatment
Participants	Specialist Palliative care or hospice settings (inpatient or community)
	Any setting with a diagnosis of advanced life-limiting illness being treated with palliative intent and with life expectancy of less than two years
Type of intervention	Standard care combined with music therapy compared to: 1. standard care alone 2. standard care combined with other therapies
Delivered by	1. Formally trained music therapist or by trainees in a formal music therapy program 2. Therapeutic process present
Personally tailored music therapy interventions used in an individual or group setting	1. Listening to live, therapist-composed, patient-composed, therapist and patient-composed, improvised, or pre-recorded music 2. Performing music on an instrument 3. Improvising music spontaneously using voice or instruments, or both.
Outcome measures for patient	1. Symptom relief (e.g. of nausea, fatigue, pain) 2. Psychological outcomes (anxiety, depression, fear) 3. Physiological outcomes (e.g. respiratory rate, heart rate, IgA levels) 4. Relationship ad social support (e.g. family support, isolation) 5. Communication (e.g. verbilization, facial affect, gestures) 6. Quality of life 7. Spirituality 8. Participant satisfaction
Outcome measures for family members/caregivers	1. Psychological outcomes (e.g. depression, distress, coping, grief) 2. Relationship and social support 3. Communication with participant

	4. Quality of life