The effectiveness of music as an intervention for hospital patients: a systematic review

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Introduction. Over the past few decades there has been a growing interest in the use of music, which has seen it used to achieve a diverse range of outcomes. While music as an intervention for hospital patients has subject to considerable evaluation, many of these studies are small and findings are therefore often contradictory. This systematic review was conducted to investigate the effectiveness of music as an intervention for hospital patients.

Method. A comprehensive search was undertaken involving all major health care databases. For studies to be included in the review they must have investigated the effect of music, involved adult hospital patients and used a randomized controlled trial design. These studies must also have used outcome measures such as anxiety, satisfaction, pain, mood and vital signs. Identified studies were critically appraised, and then categorized according to whether music was evaluated during normal care delivery or during invasive and unpleasant procedures. When appropriate, studies were combined in a meta-analysis.

Results. A total of 29 studies were identified that fulfilled the inclusion criteria, of which 10 were subsequently excluded following critical appraisal. Music played via headphones reduces anxiety of patients during normal care deliver, but it has no impact on the anxiety of patients undergoing procedures such as bronchoscopy, sigmoidoscopy or surgery with a spinal anaesthetic. Music produces a small reduction in respiratory rate during normal care delivery, but appears to have little effect on other vital sign parameters. It has no impact on the vital signs of patients undergoing procedures. Although the evidence is limited, music also appears improve the mood and tolerance of patients.

Conclusion. This review demonstrates the effectiveness of music for the reduction of anxiety during normal care deliver. Given the inexpensive nature of this intervention, and the lack of adverse events, it is recommended as an adjunct to normal care practices. This review also highlights the need for further research into many aspect of this intervention.

Keywords: music, hospital, adults, systematic review, meta-analysis, normal care, invasive procedures, anxiety, pain, vital signs

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Introduction

The application of music as a specific therapeutic intervention is a development largely of the mid twentieth century, although it has existed in various forms in most cultures for many centuries (Marwick 1996). In recent years the use of music therapy has increased and this, to some extent, may reflect the growing interest in complementary therapies in health care. Music as an intervention has been used for patients of all ages including infants (Caine 1991, Lorch *et al.* 1994), children (Dun 1995, Robb *et al.* 1995, Malone 1996), adults (Cowan 1991) and older people (Denney 1997, Janelli & Kanski 1997). Music has also been used in many health care specialties including; intensive care (Johnston & Rohaly-Davis 1996), coronary care (Barnason *et al.* 1995), peri-operative areas (Koch *et al.* 1998, Taylor *et al.* 1998), cancer care (Standley & Hanser 1995), maternity units (Geden *et al.* 1989), geriatric units (Denney 1997), palliative care (O'Callaghan 1996) and outpatient departments (Dubois *et al.* 1995). However, many of these studies involve small numbers of participants and so some lacked the power to detect beneficial outcomes. It is also not surprising that the results of some studies are contradictory. This systematic review was initiated to evaluate the effectiveness of music for adults during hospitalization.

Objectives of the review

The objective of this review is to summarize the best available evidence related to the effectiveness of music as a diversion for hospital patients. The review sought to determine the effectiveness of music for:

- reducing the perception of pain and anxiety,
- minimizing the physiological consequences of pain and anxiety,
- minimizing the impact of unpleasant procedures and situations,
- increasing satisfaction with care.

Definitions

Music in the context of this review was considered to be recorded music played via a tape recorder or compact disc player. Studies involving live music were considered beyond the scope of the review. Music as an intervention in the context of this review was defined as music played for a patient during a single episode of care to produce outcomes that were achievable during that session of music. Music played to patients prior to then following surgery was considered to fit within this definition. Music played to patients as a series of sessions over an extended period of time, and where the outcomes were achieved through participation in the programme of sessions, was considered beyond the scope of this review.

Review method

The review aimed to identify and summarize all studies that provided rigorous evaluations of the use of music as an intervention for hospital patients. To minimize the risk of bias, all methods were developed and documented prior to commencement.

Inclusion criteria

To determine the relevance of studies for inclusion in the systematic review they had to fulfil the systematic review inclusion criteria:

- a study population of adult patients in hospital,
- the intervention evaluated was recorded music,
- the comparison was no music,
- the outcomes used in the study included at least one of the following, anxiety, pain, satisfaction, vital signs analgesic use, sedation use, tolerance, mood, length of stay, and
- the study was a randomized controlled trial.

Studies were excluded from the review if the report was not in English, it was of poor methodologically quality or there was inadequate description of the participants, intervention, outcome measures or the research method. There were no date restrictions and so studies were included regardless of year of publication.

Search strategy

The search for studies evaluating music entailed a series of successive steps (Dickersin *et al.* 1994). The initial search sought to identify optimal search terms and databases likely to reveal relevant studies. The term 'music' was identified as the optimal search term, and was used in a comprehensive search of electronic databases. Databases searched were MEDLINE, CINAHL, Current Contents, Embase, Cochrane Library, Dissertation Abstracts, Psycinfo (Psyclit), Proceeds, HealthStar, Austhealth, and Expanded Academic Index. There were no date restriction, and so all citations in each databases were search. The database, Current Contents was searched monthly during the conduct of the review to identify recently published studies. Journals with a specific focus on both music and health care were hand search, and these journals were International Journal of Arts in Medicine, Journal of Music Therapy, Music Therapy, and Australian Journal of Music Therapy. The reference lists of all retrieved papers were then searched for additional studies.

Studies were selected for retrieval from the library by comparing the information included in the title, abstract or descriptor/MeSH terms against the inclusion criteria. Studies identified during the search of reference lists were selected for retrieval from the library based on the information included in their title. Once the full report had been retrieved, studies were then compared with the inclusion criteria to determine their relevance to the systematic review.

Critical appraisal

All identified studies that met the inclusion criteria were assessed for methodological validity prior to inclusion in the review. This assessment was undertaken using a checklist that focused on potential bias as a result of the process used to allocate participants to study groups, differences in the treatment of study groups, differences in the measurement of outcomes between groups and differences in the attrition of participants.

Data collection and synthesis

The collection of data from studies was achieved using a data collection tool that was developed for the review, and pilot tested prior to use. Double data collection was used to prevent errors during transcription of study results. When appropriate, the findings from individual studies were synthesized in a meta-analysis. Heterogeneity between comparable studies was tested using the Chi-square test and by visual inspection of graphic presentation of results. Significant heterogeneity was considered present when the *P*-value was $< 0{\cdot}05$. Meta-analysis was undertaken using Review Manager 4·0·4 software (The Cochrane Collaboration 1999). For continuous data that used the same scale, the weighted mean difference (WMD) and 95% confidence interval (95% CI) was used as the summary measures (Mulrow & Oxman 1997). When the same outcome was measured by differing scales, such as occurred with anxiety, the standardized mean difference (SMD) was used as the most appropriate summary of effect (Mulrow & Oxman 1997, NHMRC 1999). To ensure studies with more precise estimates contributed more to the final estimate of effect, the inverse of the variance was used to weight each study (Mulrow & Oxman 1997). Double data entry was used to prevent errors during the data entry phase of the review.

During the initial review of the literature it became apparent that there were two distinct study populations. Firstly, some studies evaluated the impact of music during normal care. In these studies patients were typically resting in bed, awaiting surgical procedures or recovering from surgery. A second group of studies evaluated music during invasive or unpleasant procedures. In these studies patients were undergoing procedures such as sigmoidoscopy, bronchoscopy, having chest drains removed or undergoing surgery with a local or spinal anaesthetic. For the purpose of meta-analysis, patients were therefore grouped into one of two categories, hospital patients or procedure patients.

Results

The literature search identified 29 randomized control trials (RCTs) that met the inclusion criteria, nine addressed the category hospital patients (see Table 1) and ten addressed the category procedure patients (see Table 2). One paper by Koch *et al*. (1998) reported two small studies in the same paper. Ten studies were excluded from the review because of:

- multiple reasons for exclusion ($n = 3$),
- attrition ($n = 3$),
- method of allocation ($n = 2$),
- other interventions were used in conjunction with music ($n = 1$), and
- inadequate information provided in report ($n = 1$) (see Table 3).

Incomplete reporting of results was encountered in eight studies and missing data were obtained from three researchers. The type of music used in the 19 included studies was:

- selected from variety of music styles ($n = 9$),
- classical ($n = 4$),
- instrumental ($n = 2$),
- tranquil/relaxing ($n = 1$),
- classical or sounds of nature ($n = 1$),
- piano ($n = 1$),
- new age ($n = 1$).

Investigation of the effectiveness of the specific types of music used in studies, to determine if one type of music was better than other types, was not possible because of issues such as too few studies, different circumstances of study populations and the different outcomes utilized across studies.

Anxiety

A total of 12 RCTs evaluated the impact of music on anxiety. The tools used to measure anxiety were the State Trait Anxiety Inventory (STAI) in nine studies, a Visual Analogue Scale (VAS) was used in one study, one used both the STAI and a VAS and one asked patients if they felt anxious (see Tables 1 and 2). Six of these RCTs evaluated music with hospital patients, and so were combined in a meta-analysis. The results of this meta-analysis, clearly demonstrate that music effectively reduced anxiety of

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Table 1 Randomized controlled trials evaluating music in hospital patients

Author	Population	Number (*n*)	Music	Outcome measures	Results
Barnason *et al.* (1995)	Post-op coronary artery bypass graft	Music (33) No music (34)	Selected	STAI, anxiety VAS, mood scale, vital signs	No difference in STAI, VAS or vital signs Significant improvement mood
Bolwerk (1990)	Post MI with STAI score >40	Music (17) No music (18)	Classical	STAI	Music reduced STAI
Chlan (1995)	Mechanically ventilated	Music (9) No music (11)	Selected	Vital signs, cardiac rhythm, airway pressure, oxygen saturation, POMS	Significant difference for HR, RR and POMS score No difference in other parameters
Chlan (1998)	Mechanically ventilated	Music (27) No music (27)	Selected	Modified STAI, vital signs	Significant difference in STAI, HR and RR
Gaberson (1995)	Pre-operative	Music *n* (16) No music (15)	Tranquil	Anxiety VAS	No difference between groups
Miluk-Kolasa *et al.* (1996)	Pre-operative after being told about surgery	Music *n* (50) No music (50)	Selected	Vital signs, cardiac output, skin temp (every 20 minutes for 1 hour)	More rapid return to normal levels in music group
Taylor *et al.* (1998)	Post-operative women	Total *n* (61) Music (?) No music (?)	Selected	Two pain scales	No difference in pain scores
White (1992)	Post MI	Music (20) No music (20)	Classical	STAI, vital signs	Significant difference in HR, RR, STAI
White (1999)	Post MI	Music (15) No music (15)	Classical	STAI, vital signs (taken every 20 minutes for 1 hour)	Significant difference in HR, RR, STAI

STAI = State Trait Anxiety Inventory; VAS = visual analogue scale; MI = myocardial infarction; POMS = profile of mood states; HR = heart rate; RR = respiratory rate.

this group of patients (SMD –0·71; 95% CI –0·97, –0·46) (see Table 4).

Six RCTs evaluated music with procedure patients. However, only two provide sufficient data to allow meta-analysis (Good 1995, Colt *et al.* 1999), which showed music did not reduce anxiety (SMD 0·06; 95% CI –0·33, 0·44) (see Table 4). Of the remaining RCTs that could not be included in this meta-analysis because of missing data, two found no difference in anxiety between music and control groups (Cruise *et al.* 1997, Koch *et al.* 1998, study 2), a single study showed a reduction in anxiety in the music group (Palakanis *et al.* 1994), while another showed an increase in the anxiety of the music group in relation to the control group (Walther-Larsen *et al.* 1988). Based on the findings of two RCTs, with a total combined population of 102 people, it appears music does not reduce the anxiety of patients undergoing invasive or unpleasant procedures. This finding is supported by three of the four remaining RCTs that used anxiety as an outcome measure, but were not included in the meta-analysis.

Vital signs

Heart rate

Eleven RCTs used heart rate as an outcome measure, however, only six studies provided sufficient data to be included in a meta-analysis. For the category of hospital patients, three studies (White 1992, Chlan 1998, White 1999) provided sufficient data and so were combined in a meta-analysis (see Table 5). This analysis showed no difference in heart rate between groups (WMD –4·97; 95% CI –10·11, 0·17). Of the RCTs not included in the meta-analysis, two studies showed a reduction in heart rate in the music group (Chlan 1995, Miluk-Kolasa *et al.* 1996) and one found no difference (Barnason *et al.* 1995). Based on the findings of three RCTs, involving a total population of 124 people, it appears music has no impact on the heart rate of hospital patients. However, the contradictory results in the studies not included in the meta-analysis suggest that further research is needed.

Table 2 RCT evaluating music during invasive or unpleasant procedures

Author	Population	Numbers (*n*)	Music	Outcome measures	Results
Bampton and Draper (1997)	Upper GI investigation or colonoscopy	Music (28) No music (31)	New age	Tolerance VAS (assessed by patient and nurse), asked would they have procedure again	No difference between groups for patient and nurse assessed tolerance. More in no music group rated procedure moderately unpleasant or worse
Blankfield *et al.* (1995)	Coronary artery bypass surgery (intra-operative)	Music (32) No music (29)	Classical	Duration of post-operative stay, days in SICU, post discharge measures = ADL, cardiac symptom scale	No difference between groups for any outcomes
Broscious (1999)	Cardiac surgical patients during chest tube	Music (70) No music (50)	Instrumental	Pain score VAS, vital signs	No difference between groups
Colt *et al.* (1999)	Fiberoptic bronchoscopy	Music (30) No music (30)	Piano	STAI	No difference between groups
Cruise *et al.* (1997)	Cataract surgery (intra-operative)	Music (32) No music (30)	Classical and sounds of nature	STAI, anxiety VAS, satisfaction VAS, vital signs	No difference for anxiety (STAI or VAS). Difference in BP
Good (1995)	Surgical patients during first post-op ambulation	Music (21) No music (21)	Instrumental	STAI, Sensations of Pain scale, Distress of Pain scale, McGill Pain Questionnaire, amount of narcotics	No difference between groups
Koch *et al.* (1998), Study 1	Urological procedures (intra-operative) with Patient controlled sedation device	Music (15) No music (19)	Selected	Level of sedation, vital signs, amount of sedation	No difference between groups for vital signs or level of sedation. Music group used less sedation
Koch *et al.* (1998), Study 2	Lithotripsy (intra-operative) with PCA	Music (21) No music (21)	Selected	STAI, Pain scale, vital signs, amount of analgesia used	No difference for STAI, pain or vital signs. Music group used less analgesia
Palakanis *et al.* (1994)	Flexible sigmoidoscopy (intra-operative)	Music (25) No music (25)	Selected	STAI, vital signs	No difference in vital signs Reduction in STAI
Walther-Larsen *et al.* (1988)	Orthopaedic and plastic surgery under regional anaesthesia (intra-operative)	Music (32) No music (32)	Selected	Requests for sedatives, satisfaction, anxiety, would they have regional block again	More in music group anxious. Music reduced requests for sedatives

STAI = State Trait Anxiety Inventory; VAS = visual analogue scale; GI = gastrointestinal; SICU = surgical intensive care unit; ADL = activities of daily living; BP = blood pressure.

Five RCTs evaluated music for procedure patients. Three studies evaluating music during chest tube removal (Broscious 1999), urological procedures (Koch *et al.* 1998, study 1) and renal lithotripsy (Koch *et al.* 1998, study 2) provided sufficient data and so were combined in a meta-analysis (see Table 5). Once again there was no difference in heart rate between groups (WMD 1·55; 95% CI –2·16, 5·25). Of the RCTs not included in the meta-analysis, one study showed a reduction in heart rate in the music group (Palakanis *et al.* 1994) and the other found no difference (Cruise *et al.* 1997). These studies also suggest music has no impact on the heart rate of patients during invasive or unpleasant procedures.

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Table 3 Table of excluded studies. Randomized controlled trials that met the inclusion criteria but were excluded following critical appraisal

Author	Population (*n*)	Outcomes	Reason for exclusion
Hospital patients			
Augustin *et al*. (1996)	Pre-operative patients (42)	STAI, vital signs	Method of randomization (alternation) Performance (major differences in the treatment of the two study groups)
Cunningham *et al*. (1997)	Pre-operative patients (50)	Questionnaire	Method of randomization (by day)
Heiser *et al*. (1997)	Post-operative patients (34)	Pain VAS, anxiety VAS, vital signs, analgesia, satisfaction	Attrition (15 of 34 did not complete)
Szeto *et al*. (1999)	Pre-operative patients (12)	STAI, tension scale	Attrition (3 of 6 in control group did not complete)
Winter *et al*. (1994)	Pre-operative patients (62)	STAI, vital signs	Attrition (12 of 31 in control group did not complete)
Procedure patients			
Dubosis *et al*. (1995)	Patients undergoing bronchoscopy (49)	Borg scale, vital signs	Method of randomization (record number)
Grey *et al*. (2000)	Patients undergoing magnetic resonance imaging (64)	STAI	Music combined with other interventions Method of randomization (by day)
Kopp (1991)	Local anaesthetic intra-operative surgical patients (41)	Self developed rating scale	Inadequate information provided about population to allow assessment No results data provided
Miller *et al*. (1992)	Patients receiving dressing to burn (17)	STAI, McGill Pain Questionnaire	Music combined with video
Sabo and Michael (1996)	Patients undergoing chemotherapy (100)	STAI, chemotherapy side-effects	Method of randomization (by office) Music combined with message

Table 4 Anxiety meta-analysis

Study	Music group Mean (SD)	No music group Mean (SD)	Weight (%)	Results SMD (95% CI)
Hospital patients				
Barnasan *et al*. (1995)	34·10 (13·80)	38·20 (16·00)	28·3	−0·27 (−0·75, 0·21)
Bolwerk (1990)	31·17 (7·63)	39·61 (9·67)	13·3	−0·94 (−1·65, −0·24)
Chlan (1998)	10·13 (3·77)	16·15 (4·10)	17·7	−1·51 (−2·12, −0·90)
Gaberson (1995)	2·98 (2·91)	3·92 (2·89)	13·0	−0·32 (−1·03, 0·39)
White (1992)	37·15 (7·97)	42·20 (7·53)	16·2	−0·64 (−1·28, 0·00)
White (1999)	31·70 (9·54)	42·00 (12·81)	11·5	−0·89 (−1·64, −0·13)
Summary				−0·71 (−0·97, −0·46)
Invasive and unpleasant procedures				
Colt *et al*. (1999)	44·00 (10·30)	41·50 (14·80)	58·8	0·19 (−0·31, 0·70)
Good (1995)	40·00 (12·72)	41·67 (10·42)	41·2	−0·14 (−0·75, 0·46)
Summary				0·06 (−0·33, 0·44)

Systolic blood pressure

Eight RCTs used systolic blood pressure (SBP) as an outcome measure (see Table 5). Of four studies involving hospital patients, two provided sufficient data to combine in a meta-analysis (White 1992, White 1999) which found no difference in SBP between groups (WMD 0·26, 95% CI –6·97, 7·50). Two other studies focusing on this group of patients also found no difference in SBP (Barnason *et al*. 1995, Chlan 1995).

Table 5 Vital signs meta-analysis

Study	Music group Mean (SD)	No music group Mean (SD)	Weight (%)	Results WMD (95% CI)
Heart rate				
Hospital patients				
Chlan (1998)	85·90 (15·60)	91·50 (18·90)	30·9	−5·60 (−14·84, 3·64)
White (1992)	77·10 (13·60)	80·50 (8·48)	53·5	−3·40 (−10·42, 3·62)
White (1999)	70·50 (15·21)	79·60 (20·78)	15·6	−9·10 (−22·13, 3·93)
Summary				−4·97 (−10·11, 0·17)
Invasive and unpleasant procedures				
Broscious (1999)	90·00 (15·00)	89·00 (17·00)	39·8	1·00 (−4·88, 6·88)
Koch *et al*. (1998) (study 1)	66·00 (11·00)	61·00 (8·00)	33·6	5·00 (−1·39, 11·39)
Koch *et al*. (1998) (study 2)	80·00 (11·00)	82·00 (13·00)	26·6	−2·00 (−9·19, 5·19)
Summary				1·55 (−2·16, 5·25)
Systolic blood pressure				
Hospital patients				
White (1992)	115·00 (15·64)	121·00 (17·38)	37·4	−6·00 (−17·83, 5·83)
White (1999)	125·00 (16·00)	121·00 (16·00)	62·6	4·00 (−5·14, 13·14)
Summary				0·26 (−6·97, 7·50)
Invasive and unpleasant procedures				
Broscious (1999)	127·00 (20·00)	133·00 (19·00)	53·5	−6·00 (−13·05, 1·05)
Koch *et al*. (1998) (study 1)	129·00 (19·00)	125·00 (16·00)	19·2	4·00 (−7·77, 15·77)
Koch *et al*. (1998) (study 2)	131·00 (17·00)	130·00 (16·00)	27·3	1·00 (−8·88, 10·88)
Summary				−2·17 (−7·33, 2·99)
Respiratory rate				
Hospital patients				
Chlan (1998)	16·40 (5·50)	18·70 (6·10)	24·5	−2·30 (−5·40, 0·80)
White (1992)	16·00 (3·61)	18·40 (3·02)	55·2	−2·40 (−4·46, −0·34)
White (1999)	15·70 (3·28)	18·30 (5·85)	20·4	−2·60 (−5·99, 0·79)
Summary				−2·42 (−3·95, −0·88)

Of the four studies involving procedure patients, three provided sufficient data to be combined in a meta-analysis (Koch *et al*. 1998, Broscious 1999). This analysis also found no difference in SBP between groups (WMD –2·17; 95% CI –7·33, 2·99) (see Table 5). The fourth study reported an increased SBP in the music group (Cruise *et al*. 1997). Based on the findings of three RCTs, involving a total population of 196 people, it appears music has no effect on the SBP of both hospital patients and procedure patients.

Respiratory rate:

Five RCTs used respiratory rate as an outcome measure, however, only three provided sufficient data to be included in a meta-analysis (White 1992, Chlan 1998, White 1999) (see Table 5). These three studies, involving hospital patients, showed a reduction in the respiratory rate of the music group as compared with that of the control group (WMD –2·42; 95% CI –3·95, –0·88). A fourth study in hospital patients also reported a reduction in the respiratory rate of the treatment group (Chlan 1995). However, this

Table 6 Pain meta-analysis

Study	Music group Mean (SD)	No music group Mean (SD)	Weight (%)	Results SMD (95% CI)
Pain (as measured by VAS)				
Invasive and unpleasant procedures				
Broscious (1999)	5·86 (2·78)	5·43 (2·63)	72·1	0·16 (−0·22, 0·53)
Koch *et al*. (1998) (study 2)	3·00 (2·00)	3·00 (2·00)	27·9	0·00 (−0·60, 0·60)
Summary				0·11 (−0·20, 0·43)

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reduced respiratory rate was only 2–3 breaths/min^{-1}, and so the clinical significance of this reduction is not clear. One study in procedure patients found no difference between groups (Cruise *et al.* 1997). These studies demonstrate that the use of music in hospital patients produces a small reduction in respiratory rate, and a single study found it had no effect for patients undergoing invasive or unpleasant procedures.

Pain

Meta-analysis of two studies evaluating the impact of music on procedure patients' assessment of pain using a VAS (Koch *et al.* 1998, study 2, Broscious 1999) found no difference in pain scores between groups (SMD 0·11; 95% CI –0·20, 0·43) (see Table 6). Two studies evaluated the impact of music on the amount of analgesia used by procedure patients (Blankfield *et al.* 1995, Koch *et al.* 1998, study 2), but because of significant heterogeneity of results ($x^2 = 45{\cdot}59$, $P < 0{\cdot}05$), meta-analysis was not appropriate. One of these studies reported no difference between groups (Blankfield *et al.* 1995), while the other reported significantly less narcotic analgesia administered during the procedure via a patient controlled device in the music group (Koch *et al.* 1998). A single RCT evaluated the impact of music played prior to the first post-operative ambulation on patients' perception of pain and found no difference between groups (Good 1995).

The only RCT evaluating the impact of music on perceived pain of hospital patients found no difference in the pain scores of females during the post-anaesthetic care following abdominal hysterectomy (Taylor *et al.* 1998). The findings of these studies demonstrate that music has no effect when patients are asked to think about, and rate, the severity of their pain. However, while the evidence is limited, music may be an effective diversion as demonstrated by the reduction in the use of analgesic in one study.

Sedation

Two studies evaluated the impact of music on the sedation needs of procedure patients. One RCT found the music group administered significantly less sedative via a patient controlled device (mean total = 17 mg propofol) than the no-music group (mean total = 94 mg propofol) (Koch *et al.* 1998, study 1). The second RCT found significantly less patients asked for sedatives in the music group (4 of 32 patients) than in the no-music group (14 of 32 patients) (Walther-Larsen *et al.* 1988). However in this study, a greater number of patients in the music group reported being anxious during surgery (12 of 32 patients) than in the no-music group (5 of 32 patients). Once again while evidence is limited, findings suggest music may act as a distracter as demonstrated by a reduced need for sedation during unpleasant procedures.

Tolerance

A single RCT evaluated the impact of music on procedure patients' tolerance as rated by both patients and nursing staff using a VAS (Bampton & Draper 1997). This study found no difference between groups for tolerance scores. However, contradicting this finding, more patients in the no-music group rated the procedure as moderately unpleasant or worse (10 of 31 patients) than the music group (2 of 28 patients). Currently there is insufficient evidence to evaluate the impact of music on patients' tolerance of unpleasant procedures.

Satisfaction

Two RCTs involving procedure patients used satisfaction as an outcome measure to evaluate the impact of music during minor surgical procedures (Walther-Larsen *et al.* 1988, Cruise *et al.* 1997). While one study found that relaxing music was associated with the highest level of patient satisfaction (Cruise *et al.* 1997), the second study found no difference between groups (Walther-Larsen *et al.* 1988). Currently there is insufficient evidence to evaluate the impact of music on patient satisfaction during unpleasant procedures.

Mood

Two studies evaluated the impact of music on the mood of hospital patients (Barnason *et al.* 1995, Chlan 1995). Because of difference in the way in which mood was measured, studies were not combined in a meta-analysis. However, both studies found that playing music resulted in an improvement in mood of patients. No studies have evaluated the impact of music on procedure patients. These two studies suggest that music is an effective intervention for improving the mood of hospital patients.

Length of stay

One RCT evaluated the impact of music played intra-operatively during coronary artery bypass surgery on length of post-operative stay (Blankfield *et al.* 1995). This study

found no difference between the music and no-music groups for the duration of stay in the surgical intensive care stay or length of hospitalization.

Discussion

This systematic review of music for adults during hospitalization clearly demonstrates its effectiveness for the reduction of anxiety during normal care delivery. However, music has no impact on the anxiety of people undergoing invasive or unpleasant procedures. As the provision of music is a relatively inexpensive intervention, in that the cost is primarily related to the initial purchase of equipment and music, this review supports its use to achieve this specific outcome. Music may also produce other beneficial outcomes, however, many of these outcomes require further investigation. While there may be some potential cost savings related to a decreased use of sedatives and analgesics, on available evidence, the major benefit is that of anxiety reduction.

In summary, the implications of the findings of this review for clinical practice are:

- music effectively reduces the anxiety of hospital patients,
- music does not reduce the anxiety of patients undergoing invasive or unpleasant procedures,
- music has no impact on heart rate of those undergoing invasive or unpleasant procedures, and although findings are contradictory, available evidence suggests it has no effect on the SBP of hospital patients,
- music produces a small reduction in respiratory rate in hospital patients but has little affect during invasive or unpleasant procedures,
- music improves the mood of hospital patients, but its effect on mood during invasive and unpleasant procedures has not been evaluated,
- music has no impact on post-operative length of stay.

Based on very limited evidence, music:

- may reduce the need for sedation during procedures,
- may reduce the need for analgesia during procedures,
- does not alter the patients' perception of pain, and
- may improve the tolerance of patients during procedures.

The evidence is contradictory on whether music improves patient satisfaction.

While this review focused on music delivered as a single episode of care, there appears to have been little rigorous evaluation of music's impact on anxiety when provided on a daily basis. This would suggest that further exploration into the potential cumulative effect of music during hospitalization is also warranted.

Implications for nursing practice

A number of important implications for nursing practice arise from the findings of this systematic review. The review clearly demonstrates that music effectively reduces the anxiety of patients during hospitalization. On this basis, music should become a routine component of the care provide to people during their hospitalization. The aim should be to minimize the anxiety associated with illness, invasive procedures, surgery, or simply as a consequence of being in a hospital. A number of specific clinical situations are worthy of note. Music should be offered to surgical patients during their pre and post-operative care, and to cardiac patients. In both groups, music will help minimize anxiety. However, it is also suggested that given the effectiveness of music for reducing anxiety, it should be offered to hospital patients in all situations that are known to stressful.

The findings of the review also suggest that music may be beneficial during invasive and unpleasant procedures to improve the tolerance of the person. Because of music's lack of harmful side-effects and relative low cost, it is recommended that music become a routine part of the nursing care provided to all people undergoing an invasive or unpleasant procedure. The implication of this is that nurses preparing people for an unpleasant procedure, or providing assistance during the procedure, should ensure that the person is given the opportunity to listen to music.

The effectiveness of music during many specific hospital situations and events is not known. However, this relates more to a lack of evidence rather than to a lack of effect. It is suggested that listening to music become an option available to all patients during hospitalization. Additionally it is anticipated that many uses for music have yet to be fully explored, and so nurses should creatively pursue situations where listening to music may produce beneficial outcomes for the hospital patient.

Study limitations

Caution is needed in interpreting the result of the meta-analyses as many were based on limited evidence. For RCTs involving hospital patients, the mean number of participants per study was only 48·7 people (range 20–100). For RCTs involving procedure patients, the mean number of participants per study was 59·4 people (range 34–120). As a consequence of small sample size, some studies may have lacked the power to adequately detect beneficial outcomes. This highlights the need for further replication of studies to fully evaluate the effectiveness of music.

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Another limitation of this systematic review was the exclusion of non-English language studies. This decision was made for practical reasons based on the increased time, expense and complexity of translating and synthesizing these studies. It is acknowledged that inclusion of these studies may have influence the findings of this systematic review.

Conclusion

This review demonstrates the effectiveness of music for reducing the anxiety of hospital patients. However, the review also highlights a lack of evidence into many specific aspects of music as an intervention. Given the inexpensive nature of this intervention, the lack of harmful side-effects and the relative ease of delivery, it warrants further study to fully investigate all potential benefits.

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