



An investigation into the use of recorded music as a surgical intervention: A systematic, critical review of methodologies used in recent adult controlled trials

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ABSTRACT

Context: While music is being increasingly used as a surgical intervention, the types of music used and the reasons underlying their selection remain inconsistent. Empirical research into the efficacy of such musical interventions is therefore problematic.

Objective: To provide clear guidelines for musical selection and employment in surgical interventions, created through a synthesis of the literature. The aim is to examine how music is implemented in surgical situations, and to provide guidance for the selection and composition of music for future interventions.

Methods: English language quantitative surgical intervention studies from Science Direct, ProQuest, and Sage Journals Online, all published within the last 10 years and featuring recorded music, were systematically reviewed. Variables investigated included: the time the intervention was performed, the intervention length, the outcomes targeted, music description (general and specific), theoretical frameworks underlying the selection of the music, whether or not a musical expert was involved, participant music history, and the participants' feedback on the chosen music.

Results: Several aspects contribute to the lack of scientific rigour regarding music selection in this field, including the lack of a theoretical framework or frameworks, no involvement of musical experts, failure to list the music tracks used, and the use of vague and subjective terms in general music descriptions. Patients are frequently allowed to select music (risking both choosing music that has an adverse effect and making study replication difficult), and patient music history and listening habits are rarely considered. Crucially, five primary theoretical frameworks underlying the effectiveness of music arose in the literature (distraction, relaxation, emotional shift, entrainment, and endogenous analgesia), however music was rarely selected to enhance any of these mechanisms.

Conclusions: Further research needs to be conducted to ensure that music is selected according to a theoretical framework and more rigorous and replicable methodology. Music interventions can be made more effective at improving psychological states and reducing physiological arousal by selecting music conducive to specific mechanisms, and also by considering at what point during the surgical experience the music would be most effective. Greater involvement of music experts in interventions would help to ensure that the most appropriate music was chosen, and that it is clearly and precisely described.

1. Introduction

Music is often used as a surgical intervention. However, many argue that more work needs to be done to refine its use as an adjunct therapy. Clift et al.⁸² argues that despite its growing popularity, arts-based health interventions are still underdeveloped – something that he attributes to the complexity of artistry and the diversity in all forms of art.

Huhtinen-Hildén⁸³ identifies a need for the regular application of 'evidence-based targeted processes' (p. 224) in arts-based music interventions, instead of merely expecting that the general presence of the music will elicit the desired effect. This is evidenced by research such as that by Hole et al.,¹ who did not integrate musical features or evidence-based application of the music according to theoretical frameworks into their meta-analysis.

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This systematic review will address this gap in the literature by investigating the extent to which previous music-based adult surgical intervention studies have used an evidence-based approach to music selection in surgical interventions, and whether or not the selections have been described in a clear and replicable way. The resulting data will be used to aid in devising clear, evidence-based methods for the selection and composition of music in such situations. These parameters should ensure that the effectiveness of music-based surgical interventions is maximised.

2. Methods

The systematic review was conducted under the PRISMA 2009 model,² and so the inclusion criteria were developed and specified in advance. Studies were identified by searching three electronic databases, and through the scanning of reference lists of articles. Searches were performed by the lead author in September 2017, on Science Direct, ProQuest and Sage Journals Online. Full details of the search parameters can be found in Appendix A.

Studies were quantitative controlled trials examining the use of recorded music as a surgical intervention, were English-language only, featured a control condition, and were published between January 2007 and September 2017. Only interventions used for surgical procedures were included. Studies included full-length journal articles only – abstract-only sources were excluded as they lacked sufficient detail for analysis. Only studies with participants over the age of 18 were included – neonates, children and adolescents were excluded, because the psychological mechanisms through which music may affect the body and mind can work differently on younger people. For instance, young infants cannot recognise melodic variation, scale systems or changes in metre,³ children perceive emotional valence differently to adults,⁴ and the areas of brain that process emotion are still developing during adolescence.⁵ Music interventions all featured pure music. Music that included nature sounds, or that used a combination of music and other intervention type (i.e. music with video or verbal guided imagery) were excluded, as these created confounds beyond the scope of this study. For instance, Alvarsson et al.⁶ discuss the complexity of analysing the effect of nature sounds on arousal and stress, including factors such as sound pressure level, familiarity, and the specific sounds within the sonic environment. Similarly, guided imagery is designed to cause the listener to create full sensory images in their mind⁷ – this significant added psychological dimension makes it incomparable to music-only interventions, and thus inappropriate for this review.

Final variables examined included: year of intervention, location (by country and continent), surgical procedure, intervention time (pre-operative, intraoperative, post-operative, perioperative, or a combination thereof), sophistication of music selection, sophistication of method of analysis of music effect, number of interventions per patient, duration of the interventions, number of health outcomes targeted, music selector (researcher, patient, or patient from researcher list), author departmental affiliations, author qualifications, involvement of musician, if music tracks were listed, general music description, reasons given for the music selection, theoretical frameworks underpinning the effectiveness of the music, number of theoretical frameworks listed, and participant feedback on the music.

High levels of heterogeneity between music-intervention studies has been reported by Hole et al.¹ in their meta-analysis between the type of music used and the way that it was employed (which in many cases prevented study replication). As such, true systematic meta-analysis on the effect of music is impossible, and was thus not conducted here. The purpose of this systematic review is therefore to examine what has been done in this field, where issues in the methodology lie, and to provide insight into how to solve these issues. As such, the current review can be differentiated from other recent reviews on use of music in operative settings. Sin and Chow⁸ only concentrated on outcomes including music enabling pharmacological pain-relieving methods. The Hole et al.¹

Table 1
Identified factors contributing to the sophistication of music used in interventions.

Factor	Name	Points
1	Music was selected according to theoretical framework	3, 1*
2	Intervention time reflected framework	2
3	Theoretical frameworks were considered (if not tested directly)	1 point per framework listed
4	Featured replicable music descriptions	1
5	Vague or subjective terms were used to describe the music	– 1
6	Music framework was described in the method section	1
7	The patient was given a set list of researcher-selected music/provided with a controlled number of researcher selected pieces to choose from	1
8	Music analysis considered at least one theoretical framework	3
9	Music analysis compared different musical styles	2
10	Participant music history and listening habits were considered	2
11	Participant feedback on intervention was gathered	1
12	Music tracks were listed	1
13	Volume ^a was controlled and documented	1
14	Number of interventions was documented	1
15	Duration of interventions was documented	1

*1 point awarded if study stated that they chose music according their framework, but did not provide evidence/explanation as to how this music was selected.

^a Volume, in this paper, refers to the amplitude of the music.

meta-analysis focused again on outcomes: whether music relieved pain and anxiety. They claimed that the presence of music had a beneficial effect in all studies, however they did not consider what specific elements of music were causing this effect. Given this, they were unable to conclude how to choose the music that is optimum for particular patients and surgical interventions. The latter is the focus of the current review.

One investigative technique that has been overlooked in meta-analyses is measures of the sophistication of the selection, implementation and analysis of the music. Sophistication can be measured through the creation and application of a checklist to which a points system has been ascribed. This has been promoted as an assessment of methodological quality by researchers such as Downs and Black.⁹ Based upon the variables investigated in this review, factors contributing to the sophistication of the music used in intervention were identified, and weightings were ascribed to each factor according to the following framework (seen in Table 1 below):

3 points: Demonstrated evidence-based music selection/analysis

2 points: Awarded if the factor provided purpose or direction for the music selection/analysis

1 point: Aided the analysis/contributed towards selection/replicability

Two measures of sophistication were developed – one examining the sophistication of the music selection, and the other examining the sophistication of the methods used to analyse the effectiveness of the music (here titled ‘Sophistication of Music’ and ‘Sophistication of Method’ respectively). Each of these new variables were constructed as follows. ‘Sophistication of music selection and implementation’ (Sophistication of Music) constituted the addition of points on Factors 1 through 7, inclusive. ‘Sophistication of methodology in testing music effectiveness’ (Sophistication of Method) constituted the addition of points on Factors 8 through 15, inclusive, as well as Factors 4 and 5.

3. Results

3.1. Screening process

An overview of the screening process can be found in Fig. 1. Articles

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