# The efficacy of music as a non-pharmacological intervention in the endoscopy setting: a literature review


## Abstract

**Background:** Music has been demonstrated to have therapeutic effects for relaxation and pain management in various healthcare settings. However, this practice has not been adopted in the UK in the endoscopy environment. Music as an intervention could potentially lower pain thresholds, promote anxiolysis, reduce sedation and enhance the patient experience. **Aims:** The study aimed to identify, analyse and discuss existing knowledge on the topic of music medicine as an intervention in the endoscopy setting and to expose gaps in previous research and form recommendations for future research. **Methods:** Iterative searching of electronic databases, hand searches and grey literature searches were employed, following inclusion/exclusion criteria to identify relevant studies. Studies were then thematically analysed and themes identified. **Findings:** The search identified 11 relevant studies, with emergent themes of anxiety, patient satisfaction, sedation/analgesia, choice of music and procedure times. **Conclusions:** This literature review showed that music is a safe therapeutic intervention. It has the potential to act as an anxiolytic, reducing amounts of sedation or even replacing sedation in some cases. Patient satisfaction and experience can be enhanced, reducing DNA rates and encouraging greater uptake of repeat procedures.



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## Key words

- Colonoscopy
- Endoscopy
- Music
- Therapy
- Non-pharmacological

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An endoscope is a precision instrument comprising a display monitor and a flexible insertion tube with an optical lens and micro-camera fitted to the tip of the tube. Images are transmitted from the camera to a monitor (Yateks, 2019). The flexible tube can be skilfully driven around cavities of the body with the aid of directional control knobs. Endoscopic procedures to view internal organs can take as little as 5 minutes or last as long as an hour. Passage of the tube along internal cavities can be uncomfortable and anxiety-provoking. Organs commonly investigated with these procedures are the stomach and the large bowel. These procedures are respectively known as oesophageal gastro-duodenoscopy (OGD) and colonoscopy. Traditionally the methods used to control pain, discomfort and anxiety during endoscopy have been pharmacological, that is, intravenous sedation or inhalation of nitrous oxide.

It has been demonstrated that music is a powerful medium for provoking psychological and physical responses in the body (MacDonald et al, 2013). Music is an effective way of engaging multisensory brain networks and may produce benefits for general wellbeing and may influence neurohormonal levels, as well as cognitive and emotional processes in both healthy and ill individuals (MacDonald et al, 2013). Studies have linked music to statistically significant reductions in heart rate, respiration rate and anxiety scores and shown it to be an effective intervention in acute myocardial infarction (White, 1992). In people living with dementia, music has been shown to improve wellbeing and promote a positive environment (Parr Vijinski et al, 2018). In cardiac and critical care, Updike (1990) demonstrated both physiological and psychological benefits of music, with reduced heart and respiration rates, anxiety scores and medication dosages. Handan

et al (2018) highlighted how music reduces the physiological and cognitive responses of anxiety in patients undergoing caesarean section.

The thought of undergoing an endoscopic procedure is often an anxiety-evoking experience for patients. This is born out of a fear of the unknown or recollections of a previous unpleasant procedure, the prospect of pain and embarrassment, the risk of something going wrong or the realisation of a sinister, life-changing diagnosis (Yang et al, 2018). Endoscopic procedures have always fallen under the domain of doctors, until recent years, when non-medical healthcare professionals, mainly nurses, have taken up the role. This has meant that the practice of endoscopy has always been driven by a medical model, with pharmacological interventions used to control anxiety and pain (Leslie and Sgroi, 2018).

With non-medical staff performing endoscopic procedures, this provides an opportunity to bring a non-medical viewpoint to the discipline and explore other, non-pharmacological methods, such as music. This could in turn promote a more patient-centred approach, as advocated by a white paper from the Department of Health and Social Care (DHSC) (2010), as it affords the patient increased choice and control. Other benefits to music include reduced doses of opioids and sedatives (Cepeda et al, 2006), which in turn lead to lower medicinal costs for hospital trusts and fewer side effects for patients (Bernatzky et al, 2013).

A universal definition of music is impossible and appears to be open to interpretation, having different meanings depending on culture, context and subjectivity (Davies, 2012).

Music medicine is the playing of pre-selected music, on a device such as a tablet or a compact disc player, in order to enhance or facilitate treatment and to assist rehabilitation (Trondalen and Bonde, 2013). This term is sometimes used to describe the types of intervention used in the research below. Music medicine should not be confused with music therapy, a relational therapy in which therapist and patient (or client) engage in shared musical activity, traditionally using vocalisation (such as singing) and instruments, but also listening, reflection and other expressive modalities, such as movement, to promote health and wellbeing (Andsell, 2014). The therapeutic use of music is not a new idea and has been the topic of study in the endoscopy setting in the past; studies stretch at least as far back as 1960 (Gardner et al, 1960). However, there has been no conclusive outcome as to whether music is effective in the endoscopy setting (Bechtold et al, 2009; Wang et al, 2014). As such, interventions using music are not currently a Joint Advisory Group (2019) recommendation in the endoscopy setting.

## Aims

This literature review aims to identify, analyse and discuss existing knowledge on the topic of music, as an intervention, in the endoscopy setting, as well as to expose gaps in previous research and form recommendations for future research.

## Methods

An iterative approach was adopted to the literature search, as advocated by Brettle and Grant (2004).

Databases searched were CINAHL, PubMed, Medline, EBSCOhost and Cochrane. Grey literature was also included, and hand searching was employed. Boolean search terms were 'endoscopy', 'colonoscopy', 'flexible sigmoidoscopy', 'OGD', 'gastroscopy', 'music medicine', 'music therapy', 'music intervention' and 'non-pharmacological intervention', along with the use of truncation until data saturation was achieved (Brettle and Grant, 2004). The search term 'Music therapy' was included, because, on reviewing the literature, it became clear that some researchers used this term for what is more commonly termed 'music medicine' (the playing of pre-recorded music).

The researcher then reviewed articles to exclude irrelevant and unsuitable articles, using an evaluation tool developed by Long et al (2002). Inclusion and exclusion criteria limited the search to studies that were:

- Related to endoscopy and a music-based intervention
- Conducted in adults over the age of 17 only
- Written in English
- Published in the past 10 years.

Thematic analysis was then used to determine the key themes and issues, enabling conclusions to be drawn on the efficacy of music as an intervention and areas for further research (Castleberry and Nolen, 2018). A theme matrix was constructed to facilitate theme identification

(Moule and Hek, 2011). Then a process of disassembling, reassembling and interpreting the data was followed to determine key issues, allow for discussion and enable recommendations (Castleberry and Nolen, 2018).

## Results

The literature search identified 30 papers. Of these, 26 were found from searching e-databases, three from hand searches and one from the grey literature. One paper was a duplicate, and the grey literature paper was not supplied by the author. The remaining 28 papers were reviewed, and 17 were excluded for irrelevance. This left 11 papers to be included in the thematic analysis (Brettle and Grant, 2004). The findings are summarised in *Table 1*. From the analysis, five themes emerged:

- Endoscopy-related anxiety
- Patient satisfaction and musical intervention
- The need for sedation/analgesia
- Choice of music
- Evidence for shorter procedure times.

### Endoscopy-related anxiety

Six studies referred to anxiety as a measure in relation to the effects of music in the endoscopy setting. All six indicated that anxiety was reduced by the use of music. Of these, only two demonstrated a significant reduction in anxiety with the music intervention (El-Hassan et al, 2009; Kartin et al, 2017). The other four referred to psychological stress, nervousness, fear and relaxation decreasing, but not significantly (Wang et al, 2014; Ko et al, 2017; Padam et al, 2017; Bashir et al, 2018).

### Patient satisfaction

Costa et al (2010), Wang et al (2014) and Bashir et al (2018) all reported increased participant satisfaction in the music intervention groups. Similarly, Rudin et al (2007), El- Hassan et al (2009) and Costa et al (2010) highlighted an increased willingness to return for a repeat procedure, with reference to using the same music intervention approach. Kartin et al (2017) noted greater compliance with the endoscopy procedure in the music intervention group. In contrast, the meta-analysis of randomised controlled trials (RCTs) by Bechtold et al (2009) evidenced improved patient experience with music, but with no difference between the music and control groups in willingness to repeat the procedure.

### Need for sedation/analgesia

The music groups saw an overall reduction in the use or dosage of pharmacological interventions while undergoing endoscopic procedures. Bashir et al (2018) noted a lower dosage of propofol, and this was supported by Rudin et al (2007), Tam et al (2008), Jangsirikul et al (2017) and Kartin et al (2017), with findings of less sedation in the music intervention groups. Costa et al (2010) demonstrated that fewer patients in the music group had sedation. In comparison, Kartin et al (2017) showed that, although less sedation was needed with musical intervention and pain experienced was decreased, this was not significant. Bechtold et al (2009) described no significant decrease in pain or sedation between music and non-music groups. This was echoed by Wang et al (2014), who, although reporting improved pain scores in the music group, found no difference in analgesia or sedation dosage in either group.

### Choice of music

A vast range of different music genres was included in the studies examined (*Table 2*). However, there is a suggestion that self-selected music is more beneficial and therapeutic. Ko et al (2017), Jangsirikul et al (2017) and Padam et al (2017) postulated that where the participants had some control over music choice, the most significant reductions in pain, sedation dosage and anxiety were seen. None of the reviewed studies facilitated completely patient-led selection of music; some offered a degree of choice, and others were quite limited in terms of music offered.

### Evidence for shorter procedure times

Overall, in the studies that included procedure times, there was no significant reduction between the control groups and the music groups (Bechtold et al, 2009; Kartin et al, 2017). Tam et al (2008) differed by illustrating that procedures in the music intervention group had shorter procedure times.

## Discussion

Endoscopic procedures stir up feelings of anxiety and can at times be painful for patients (Rollbusch et al, 2014). From a provider's point of view, endoscopy in the NHS is under great pressure to perform and meet local and national targets

**Table 1. Articles on music in endoscopy included in the literature review**

| Article | Design and subject | Sample and music type | Results |
|---|---|---|---|
| Bashiri et al (2018) | Quantitative RCT on the effect of music on drug consumption, anxiety and pain in endoscopy | Convenience sample of 154 18–70-year-olds (communication problems excluded) in four groups (conscious or deep sedation, with or without music), with music played via headphones | Anxiety and propofol consumption reduced, and satisfaction increased, but not significantly, with music—desire expressed for the same approach in future |
| Bechtold et al (2009) | Meta-analysis of RCTs on the effect of music on sedation, pain, duration and willingness to repeat in colonoscopy | Eight studies with 712 adult participants | Overall patient experience significantly improved with music, but pain, sedation dose, procedure time and willingness to repeat not affected |
| Costa et al (2010) | Single-blind RCT on the effect of music in colonoscopy | Convenience sample of 109 18–75-year-olds (non-Italian speaking, hearing difficulties, previous colonic surgery excluded) | Satisfaction and willingness to repeat improved, and sedation use and difficulty experienced by the endoscopist reduced, with music |
| El-Hassan et al (2009) | Quantitative RCT on the effect of music on anxiety in endoscopy, using STAI | Convenience sample of 180 adults having endoscopy for the first time (illiteracy, hearing impairment excluded), with participant selecting music from classical, jazz, rock or country and western, provided by researcher and played 15 minutes preprocedure | Anxiety significantly reduced with music in all procedure types and participants wanted the same approach in the future |
| Jangsirikul et al (2017) | Quantitative RCT on the effect of music on psychological and physiological status in older colonoscopy patients | Convenience sample of 113 patients (hearing problems, dementia, significant co-morbidity and previous colorectal surgery excluded), with Thai and instrumental music played before and during procedure | Preprocedural anxiety, sedation and pain reduced with music, especially the Thai music preferred by the focus group—self-selection more beneficial |
| Kartin et al (2017) | Quantitative RCT on the effect of music on medication and music on anxiety, tolerance and pain in colonoscopy, using STAI, VAS and pain questionnaires | Cohort of 60 patients in two groups of 30, with music played during procedure through speakers | Anxiety and sedation dosage significantly reduced, compliance improved and procedure times reduced with music |
| Ko et al (2017) | Quantitative RCT on the effect of music styles on anxiety in colonoscopy without sedation, using STAI | Cohort of 138 patients in three groups (pulmonary embolism, myocardial infarction, cerebrovascular accident, heart disease and gastroeneteritis excluded), with informal classical and light listening music played | Anxiety lower with music, but not significantly, although more so with light-listening music, suggesting music genre or selection may be important |
| Padam et al (2017) | Quantitative RCT on the effect of music on anxiety, blood pressure and Sp02 in gastroscopy | Convenience sample of 199 adults for first-time gastroscopy, with Vedic chants and Indian classical pre-selected by researcher and played 10 minutes preprocedure | Anxiety and blood pressure significantly lower and Sp02 greater with music, especially Indian classical music |
| Rudin et al (2007) | Meta-analysis of RCTs on the effect of music on anxiety, pain, sedation/analgesia dose and procedure time in endoscopy, using STAI | Six studies with 641 participants (non-English excluded) | Anxiety reduced, but not significantly; sedation reduced, approaching significance; willingness to repeat increased; and analgesia and procedure times significantly reduced with music |
| Tam et al (2008) | Meta-analysis of RCTs on the effect of music on procedure time and amount of sedation in colonoscopy | Eight studies with 722 participants (non-English excluded) | Sedation dosages reduced significantly and procedure times reduced, but not significantly, with music |
| Wang et al (2014) | Meta-analysis of RCTs on the effect of music on endoscopy | 21 studies with 2134 participants | Pain, anxiety, heart rate, blood pressure and satisfaction significantly improved in music, but not procedure length or sedation/analgesia dose (no effect in bronchoscopy/colposcopy) |

Note: RCT=randomised controlled trial; Sp02=peripheral capillary oxygen saturation; STAI= State-Trait Anxiety Inventory; VAS=visual analogue scale

(DHSC, 2012; 2017). It is a fast-paced environment, providing more and more specialised services due to advancements in medical technology and the introduction of bowel cancer screening programmes (Shenbagaraj et al, 2019). This presents a risk of losing sight of the patient, which

**Table 2. Music types and genres used in the studies**

| Types mentioned | Studies | Broad genre | Studies |
|---|---|---|---|
| Chinese opera | 1 | Classical | 11 |
| Classical music | 5 | | |
| Film music | 1 | | |
| Indian classical music | 1 | | |
| Turkish classical music | 3 | | |
| Country and Western | 1 | Folk | 4 |
| Folk music | 2 | | |
| Turkish folk music | 1 | | |
| Jazz | 2 | Jazz | 2 |
| Chinese pop | 1 | Pop, rock and rap | 7 |
| Pop music | 3 | | |
| Rap music | 1 | | |
| Rock | 2 | | |
| Traditional religious music | 1 | Religious | 2 |
| Vedic chants | 1 | | |
| Instrumental music | 2 | Unspecified | 10 |
| Light music | 2 | | |
| Music from the radio | 1 | | |
| Not specified | 4 | | |
| Thai music | 1 | | |

could involve neglecting interventions focused on patient-centred care, such as music, which could enhance patient experience by reducing pain and the use of pharmacological agents.

### Endoscopy-related anxiety

Of the six studies where anxiety was a theme, only two indicated that anxiety was significantly reduced as a result of music (*Table 3*). Three of these studies referred to psychological stress, nervousness, fear and relaxation, which, for the purposes of this study, have been grouped under the umbrella of anxiety. However, a reduction was noted overall in all of the anxiety-themed studies, indicating that music does have an anxiolytic effect in the endoscopy setting. Physical care is often prioritised over emotional and psychological wellbeing (Nilsson, 2008). Music can promote relaxation and comfort and help to reduce the anxiety generated by endoscopic procedures (Nilsson, 2008). There is a long history of music as an intervention for relieving anxiety (Yinger and Gooding, 2015). Indeed, Bernatzky et al (2011), when researching music as a non-pharmacological agent, postulated that music held great promise for relieving anxiety. This intervention also provides patients with choice and, in allowing them to contribute to the planning of their own care, responds to the recommendations set out by the DHSC (2010).

**Table 3. Effects of music described in 11 studies**

| Effects of music medicine | Studies describing |
|---|---|
| Reduced need for sedation/analgesia | 7 (64%) |
| Reduced anxiety | 6 (54%) |
| Increased satisfaction | 4 (36%) |
| Greater willingness to repeat | 3 (27%) |
| Greater compliance | 1 (9%) |

### Patient satisfaction and musical intervention

Endoscopic investigations are often viewed as unpleasant experiences that patients do not look forward to and would rather not repeat (Harewood et al, 2007). Three studies reported increased patient satisfaction in the music groups. Furthermore, three studies highlighted an increased willingness to repeat the procedure with the music intervention, and one study noted greater patient compliance during the procedure. Conversely, another study found improved patient experience in the music group, but no difference compared with the control group in willingness to repeat the procedure. Some patients required repeat procedures over many years for conditions such as inflammatory bowel disease or polyp surveillance (Mitchell and MacDonald, 2018). The evidence from this literature review strongly suggests that music enhances patient satisfaction and increases the likelihood of re-attending, if needed. This is important, as potentially life-changing and fatal conditions need monitoring to prevent disease development. Patient satisfaction also serves as a quality indicator and highlights areas for quality improvement (Raleigh et al, 2015). Music could, therefore, play a part in the DHSC (2014) quality improvement strategy.

### The need for sedation/analgesia

The need for, or dosage of, sedation and/or analgesia was found to be reduced in the presence of music. Five studies described significant reductions in the use of pharmacological agents in the endoscopy setting with the application of music. Feedback from one study indicated less sedation was used and pain was reduced in the music group, but not significantly. Paradoxically, one study found pain scores improved with the intervention of music, but there was no difference

in analgesia/sedation dosages between the music intervention and control groups.

Gardner et al (1960) identified the potential for music to be used as an adjunct in pain management, suggesting that music suppressed pain by up to 65% in dental procedures and reduced the need for anaesthesia by up to 25%. This eventually led to more research into the effects of music, with Nadler (2004) and Bernatzky et al (2013) concluding that music affects and stimulates many different parts of the body, as well as emotional and social processes. This potential can be used for non-pharmacological interventions in pain management. The relatively simple approach of music could easily be applied in the endoscopy setting, allowing patients greater options for pain and anxiety relief.

**Choice of music**

A whole range of music was on offer across all of the studies reviewed. Three studies concluded that where participants were given at least some musical choice, the most significant reductions in pain, sedation dosage and anxiety were seen. This suggests that the self-selection of music by participants increases the therapeutic impact of music. Beck (1991), when studying effects of music on pain in cancer patients, found the advantages almost reached statistical significance. However, Beck (1991) also indicated that patients not being able to self-select music hindered the benefits of the intervention. This is a view supported by Mitchell and MacDonald (2018) in an analysis of the literature of researcher-selected music versus self-selected music. Comparing studies, Mitchell and MacDonald (2018) concluded that associations with familiarity and emotional involvement with music gave the listener greater feelings of control over pain and brought familiarity into an unfamiliar environment. They conclude that this level of involvement and therapeutic effect cannot be achieved in music selected by someone else.

An experimental investigation into music and painful stimuli by Mitchell and MacDonald (2006) showed that painful stimuli were tolerated significantly longer, and patients reported a feeling of significantly more control when listening to self-selected music. Relaxing music chosen by the researchers did not significantly increase tolerance of pain. None of the studies in this review facilitated total self-selection of music by participants. Clearly, with the availability of mobile devices and playlists, patients could potentially achieve maximum benefits from self-selected music. Therefore, it could be claimed that existing quantitative studies have failed to understand the nature and advantages of self-selected music in the endoscopy setting. As Parahoo (2006) stated, quantitative research may only offer a partial glimpse of a topic under observation and not lead to a fuller understanding of human experience. Related to this, Sapsford and Abbott (1992) argued that qualitative research provides greater reflexivity, with subjects expressing their own perceptions of their experiences, which further enhances the richness of the data collected.

**Evidence for shorter procedure times**

Within this literature review, three studies incorporated length of procedure. Two studies reported no significant reduction in procedure time, with the remaining study indicating a shorter procedure time. Endoscopist experience should be taken into account, as more skilled endoscopists are likely to complete the procedures in a shorter time (Jain et al, 2016). In this literature review, there is insufficient data to draw any conclusions on this. A study on colonoscopy patients by Smolen et al (2002) found that music was effective in reducing anxiety, concluding that the more relaxed the patient is, the quicker the procedure time. This has not been supported in the findings of this review.

**Implications for practice**

Overall, the findings from this literature review indicate that there is a beneficial, therapeutic effect from music in the endoscopy setting that could be generalised to the wider population. Potentially, patients would be more relaxed and satisfied, and they would need less sedation, leading to safer procedures, quicker recovery times and reduced did-not-attend rates. Patients would need to be informed in advance in the patient information leaflets about the option for music as a therapeutic intervention. This would allow them to prepare their musical selection and bring a suitable device to listen to it. The provision of appropriate audio equipment, such as Bluetooth speakers, would need to be provided in endoscopy units in order to bring about this change. This is, however, a relatively cheap and safe intervention, requiring little training to implement.

## Limitations

All of the studies included in this literature review were quantitative, randomised controlled studies. None of them attempted to collect patients' thoughts and feelings. A qualitative approach, such as phenomenology (Creswell and Poth, 2018), would be concerned with drawing out and understanding the patient's feelings, emotions and experiences, in order to focus on the individual's interpretation of their experiences and how they convey them. These perspectives can be lost with the quantitative stance of reducing responses to figures and potentially missing the essence of the phenomena under study (Sapsford and Abbott, 1992; Parahoo, 2006). A phenomenological approach, for example, would offer a subjective stance, focusing on the patient's experiences and needs (Creswell and Poth, 2018), centring the patient in the study of music in the endoscopy setting. This would be in accordance with the DHSC's (2010) drive to place the patient at the centre of care planning, providing them with greater choice and empowering them to be involved in the decision-making process.

A lack of follow-up in these studies provided limited insight into patient perceptions of music in the endoscopy setting. All of the papers in the review studied participants on the day of the procedure only. Richer data could have been collected had views and experiences been examined post-procedure, 2–7 days afterwards (Parahoo, 2006). Patients would perhaps feel more relaxed and less intimidated if they were followed up outside the hospital environment (Braun and Clarke, 2013). Patients may be more honest in their feedback if they do not have healthcare workers looking after them in close proximity (Braun and Clarke, 2013). It could also provide an opportunity to clarify information already collected on the day of the procedure, providing a more reliable and rigorous dataset (Braun and Clarke, 2013). Out of the 11 studies, only one was a UK, NHS-based study. The rest were undertaken abroad and within differing healthcare systems. This was a product of the search results and a limitation which had to be accepted and worked with. Again, this may have implications for the transference of the findings from these studies to UK-based, NHS services.

Other limitations of this literature review are staffing and resources. Only two researchers worked on this review, which had to fit in around other commitments. More time could have been allotted to hand searches and following up grey literature. Very little financial support was available, and the review had to be conducted with limited resources.

## Conclusion

More could be done to improve the patient endoscopy experience and provide greater options for the management of pain and anxiety in the patient journey. Improvements in this area would offer the patient a higher level of control over their own care and place them at the centre of the decision-making process. This literature review has shown that music is a safe therapeutic intervention. It has the potential to act as an anxiolytic, reducing amounts of sedation or even replacing sedation in some cases. Patient satisfaction and experience can be enhanced, reducing DNA rates and encouraging greater uptake for repeat procedures, if needed. This would also benefit the service provider with increased efficiency of endoscopy lists and attendance for screening endoscopies. This literature review has highlighted areas for further investigation, such as the patients' own account of their experiences, before, during and after the procedure. This would necessitate a qualitative approach, including a follow-up phase. The importance and benefits that can be derived from self-selection of music, with the advent of mobile devices and playlists, warrants further investigation into this area. Following this literature review, a phenomenological research study is proposed to gain insights into the meanings that patients ascribe to their lived experiences of music in the endoscopy setting.

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## CPD reflective questions

- What are the potential effects of music in endoscopy?
- Consider the practicalities of allowing patients to self-select music
- What other types of studies could provide greater insight into the patient experience of music?

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