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Article in Southern Medical Journal · April 2005

DOI: 10.1097/01.SMJ.0000154773.11986.39

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# Music as Therapy

Kathi J. Kemper, MD, MPH, and Suzanne C. Danhauer, PhD

**Abstract:** Music is widely used to enhance well-being, reduce stress, and distract patients from unpleasant symptoms. Although there are wide variations in individual preferences, music appears to exert direct physiologic effects through the autonomic nervous system. It also has indirect effects by modifying caregiver behavior. Music effectively reduces anxiety and improves mood for medical and surgical patients, for patients in intensive care units and patients undergoing procedures, and for children as well as adults. Music is a low-cost intervention that often reduces surgical, procedural, acute, and chronic pain. Music also improves the quality of life for patients receiving palliative care, enhancing a sense of comfort and relaxation. Providing music to caregivers may be a cost-effective and enjoyable strategy to improve empathy, compassion, and relationship-centered care while not increasing errors or interfering with technical aspects of care.

**Key Words:** allied health, anxiety, complementary therapy, music, pain, relaxation, stress

Music has been used since ancient times to enhance well-being and reduce pain and suffering. This article will review the medically relevant effects of music, focusing on pain, anxiety, and mood. We will not discuss the use of music to enhance cognitive development (ie, the “Mozart effect”) or for patients with severe developmental delays, dementia, psychiatric disorders, neurologic disorders, sensory handicaps, or in institutional settings such as correctional facilities or schools, though a great deal of work has been done in these areas.

## Cases and Questions

One of the new physicians on staff in your newborn nursery suggests that you start playing recordings of

classical music for the infants. The day shift nurses usually listen to a soft rock music station on the radio, and are reluctant to change. The evening and night shift nurses have not played any music. Is there any evidence that music affects newborn infants? If so, what kind of music might be best?

Increasing numbers of patients in gastrointestinal clinics bring their own CD or MP3 players to clinic visits to help them relax during colonoscopy. What is the evidence that music reduces anxiety, improves mood, or eases the stress associated with procedures? Do all people respond the same way to the same kinds of music, or should everyone just listen to whatever they like (eg, pop and grunge rock for teenagers, classical music or jazz for adults)?

Some of the nurses in the preoperative and postoperative areas provide headphones and play New Age music for their patients. Is there any evidence that music helps reduce pain or enhances wound healing in the perioperative period?

A harpist volunteers at the local hospice. What role does music have in end-of-life care?

One surgeon prefers to listen to country western while another likes classical. How does listening to music affect clinician or caregiver performance?

Illness, injuries, and hospitalization are stressful. Hospitalized patients are susceptible to environmental stressors such as cold temperatures, noise, and bright lights, in addition to the pain, discomfort, and anxiety associated with their med-

## Key Points

- Music is widely used to promote a sense of well-being and to distract patients from pain and other unpleasant symptoms, thoughts, and feelings, while being convenient and readily available.
- Music helps to improve mood and decrease anxiety, as well as decrease the pain associated with surgery, medical procedures, and chronic conditions; it also helps ease the dying process.
- Music may help premature babies to gain weight more quickly.
- Music may enhance care-giving behavior.

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Supported in part by National Institutes of Health National Center for Complementary and Alternative Medicine grant R25 AT00538.

The authors have no commercial or proprietary interest in any aspect of music therapy.

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Accepted December 13, 2004.

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0038-4348/05/9803-0282

ical conditions and treatments. Stress may interfere with sleep, appetite, digestion, growth, behavior, and wound healing. Stress may also adversely affect the cardiovascular, neuroendocrine, and immune systems, which, in turn, may impair recovery, increase risk for adverse effects, and delay hospital discharge.<sup>1,2</sup> Recently, the use of structured stimuli has been encouraged to reduce stress, using techniques such as regular cycling of light and dark, massage, and music therapy.<sup>3-5</sup>

## Definitions

Environmental sounds that exist without controls for volume, duration, or cause/effect relations are perceived as noise. The most well-known adverse effects of exposure to excessive noise are related to hearing damage; noise also contributes to fatigue, hyperalerting, insomnia, and decreased appetite. In mice, exposure to noise leads to physiologic stress, manifested as significantly increased airway reactivity and increased allergic reactions.<sup>6</sup> Among infants hospitalized in the neonatal intensive care unit, excessive noise is correlated with decreases in oxygen saturation and increases in heart rate and sleep disturbances.<sup>7</sup>

Music is an intentional auditory stimulus with organized elements including melody, rhythm, harmony, timbre, form, and style. Repetitive listening allows the listener to identify and predict sounds.<sup>5</sup> Thus, repeated exposure may enhance clinical effects. However, excessive repetition may lead to boredom and irritation.

## Epidemiology

Music is ubiquitous in all human cultures and is listened to by persons of all ages, races, and ethnic backgrounds. One measure of the popularity of a topic is the number of Internet sites devoted to that topic. Using this metric, music (at 131 million sites) follows sex (at 185 million sites) in terms of the most popular listings on the Google Internet search engine (search October 22, 2003).<sup>8</sup> Not surprisingly, different kinds of music appeal to persons of different ages and ethnic backgrounds, and the same person may desire different kinds of music under different circumstances. For example, nursery rhymes may be soothing for toddlers, but hearing the "Sesame Street" or "Barney" song several times daily can be irritating for adolescents or parents. High-tempo contemporary music is often used to increase athletic performance, whereas baroque music may be preferred for relaxing after a stressful examination, and jazz may be preferred for socializing. Recently, specific types of music have been marketed to enhance pediatric development (eg, the Mozart effect), to address cognitive problems, and to enhance effectiveness of other complementary therapies such as Reiki and massage. Although these strategies remain somewhat controversial, music has long been used as a complementary healing therapy to soothe patients afflicted with pain, anxiety, and a variety of illnesses and injuries.

Music therapy is recognized as an established allied health profession that uses music to facilitate therapeutic processes.<sup>9</sup> Music therapists are typically musicians who have undergone specific training in using music and the therapist's self to accomplish therapeutic aims: the restoration, maintenance, and improvement of mental and physical health. Music therapists work in a variety of settings as part of the health care team. The American Musical Therapy Association has more than 2,500 members working in hospitals, clinics, schools, day care centers, hospices, rehabilitation centers, correctional facilities, and private practice settings. However, even in the absence of a professional music therapist, many patients and clinicians listen to or play music to manage stress, anxiety, and pain in clinical settings.

Music may have different effects, based on listener characteristics: age, culture, medical conditions that affect hearing, musical aptitude, and experience. Other factors affecting music influence include elements of the music (tempo, pitch, harmony, melody, rhythm), means of delivery (headphones, speaker, open air, live versus recorded), setting (group or alone), and active versus passive participation.<sup>10</sup>

## What Does Music Do for Patients?

Music and music therapy may benefit patients directly: physiologically, psychologically, and socioemotionally. Music may also affect patients indirectly through its effects on caregiver attitudes and behaviors. With regard to direct physiologic effects, in animals, music changes neuronal activity with entrainment to musical rhythms in the lateral temporal lobe and in cortical areas devoted to movement. Steady rhythms entrain respiratory patterns. Listening to classical music increases heart rate variability, a measure of cardiac autonomic balance (in which increased levels reflect less stress and greater resilience), whereas listening to noise or rock music decreases heart rate variability (reflecting greater stress).<sup>11,12</sup> In students engaged in stressful tasks, lower salivary cortisol levels are noted in those listening to music compared with control subjects, whose cortisol levels increased.<sup>13</sup> Music affects mu opiate receptor expression, morphine-6 glucuronide, and interleukin-6 levels in healthy volunteers.<sup>14</sup> Its effects may be mediated by nitric oxide, but the precise mechanisms remain speculative.<sup>15</sup>

## Types of Music

Although there are wide individual and cultural variations in types of music preferred, certain kinds of music appear to have consistent physiologic effects.<sup>16</sup> In one study, for example, adults and teenagers listened to four different types of music: classical, grunge rock, new age, and designer (designed to enhance a sense of well-being). At baseline and immediately after listening to each kind of music, respondents completed a survey of personal feelings. Classical music decreased tension but had little effect on other feelings.

Listening to grunge rock led to significant increases in hostility, fatigue, sadness, and tension and significant decreases in relaxation, mental clarity, vigor, and a sense of compassion. With new age music, there was a significant increase in relaxation and reductions in hostility, mental clarity, vigor, and tension. After listening to designer music, subjects reported significantly more relaxation, mental clarity, vigor, and compassion and significantly decreased hostility, sadness, fatigue, and tension. Teenagers had negative psychological and emotional responses to grunge rock music, even when they usually liked listening to it outside the study setting.

## Music for Premature Infants

Among premature infants, lullabies and classical music appear to increase weight gain, decrease episodes of oxygen desaturation, decrease distressed behaviors, and increase non-nutritive sucking, all of which may decrease length of hospital stay.<sup>5,17-20</sup> In premature infants, exposure to harp music resulted in significantly lower salivary cortisol levels and lower respiratory rates. While listening to music, infants become quiet and appear to fall asleep; these decreases in activity may reduce caloric expenditure, enhance weight gain, and hasten hospital discharge.<sup>21</sup> The effects of country western, pop, jazz, and other types of music on premature infants have not been systematically compared with the effects of lullabies and classical music, nor has live music been compared directly with recorded music in this setting.

## Music and Mood in Medical and Surgical Patients

Providing music on a hospital ward and in perioperative or waiting areas can create a positive milieu for patients, families, and staff.<sup>22-24</sup> Creating such an environment can have significant effects on patients' moods in terms of anxiety, depression, and perceived stress. Furthermore, positive physiologic changes such as increased levels of salivary immunoglobulin A and decreased serum cortisol levels often accompany changes in anxiety and stress levels.<sup>25</sup> A review article of 29 randomized, controlled trials (RCTs) of music therapy revealed that music helps reduce anxiety in hospitalized patients.<sup>26</sup>

For example, music can improve mood and reduce anxiety in surgical patients. In a study of effects of listening to music on preoperative anxiety in men undergoing prostate surgery, participants in a music intervention had significantly reduced anxiety and blood pressure.<sup>27</sup> Patients about to undergo surgery with spinal anesthesia who listened to music required less sedative to achieve a similar degree of relaxation compared with a control group.<sup>28</sup> In a study of 20 women awaiting breast biopsy, the group that received 20 minutes of music had less anxiety than usual care patients, after controlling for baseline anxiety.<sup>29</sup> Similarly, a study of a music intervention during the postoperative period after

coronary bypass surgery showed a significant improvement in mood.<sup>30</sup> However, in a study of children undergoing surgery, those who listened to music before surgery had similar reduction in anxiety compared with patients receiving usual care and more anxiety than patients who received midazolam.<sup>31</sup> Taken together, these studies generally demonstrate beneficial effects of music therapy on psychologic outcomes in surgery patients; no adverse outcomes or side effects have been reported.

Music also benefits mood in oncology patients. In a sample of stem cell transplant patients, those receiving music therapy reported substantially lower psychologic distress than a control group, both immediately after the music therapy session and during the course of the inpatient stay.<sup>32</sup> Among cancer patients undergoing radiotherapy, those patients whose anxiety level was higher at the start were most likely to benefit from the music intervention.<sup>33</sup> Music therapy can also improve mood in pediatric oncology patients.<sup>34,35</sup> A study of patients at a cancer help center compared effects of passively listening to music versus active involvement in improvisation in a group setting. Both of these music groups showed a decreased tension level and shared comments about how music affected their mood: "relaxed and uplifted," "soothing and relaxing," "calmed my nerves," and "felt calm and happy."<sup>36</sup>

In other clinical settings including intensive care units (ICU), music has been shown to reduce patients' anxiety and depression.<sup>26,37-39</sup> One study of patients on mechanical ventilators in the ICU demonstrated that music therapy was more effective at decreasing anxiety than an uninterrupted rest period.<sup>40</sup> Another RCT of alert patients on mechanical ventilators randomly assigned to a 30-minute patient-selected music condition or a rest period showed significant between-group differences on anxiety level, heart rate, and respiration rate as well as a greater reduction in anxiety in the music group.<sup>39</sup>

Music also reduces anxiety associated with unpleasant or uncomfortable procedures such as bronchoscopy, colposcopy, and colonoscopy<sup>41-43</sup>; providing recorded music can be as or more effective in reducing patients' anxiety than preoperative teaching, counseling, or relaxation training, while costing far less.<sup>44,45</sup> For example, an RCT of 198 patients having colonoscopy or endoscopy demonstrated that listening to 15 minutes of self-selected music before the procedure significantly reduced anxiety compared with a control group.<sup>42</sup> Another RCT conducted with patients undergoing flexible sigmoidoscopy showed a significant decrease in anxiety for the music group compared with usual care, controlling for baseline anxiety levels.<sup>46</sup> Among patients having day procedures (cytology, cauterization, endoscopy), those who listened to music while awaiting the procedure reported lower anxiety than a control group.<sup>47</sup>

However, other studies of music therapy in patients undergoing procedures have yielded more equivocal findings. In an RCT of 20 patients awaiting cardiac catheterization, those randomly assigned to listen to 20 minutes of preselected

music had significantly lower anxiety than a control group and also showed a significant reduction in anxiety level, blood pressure, and heart rate.<sup>48</sup> Similarly, nearly 70% of patients enrolled in an RCT of music therapy for cardiac catheterization reported that music made them feel less tense, more relaxed, and safer.<sup>49</sup> However, in another RCT of 45 patients undergoing cardiac catheterization, music therapy did not significantly reduce anxiety, improve mood, or reduce patient uncertainty.<sup>50</sup> Similarly, in an RCT of 60 patients undergoing flexible fiberoptic bronchoscopy, no significant between-group differences between music therapy and control groups were demonstrated.<sup>51</sup> Likewise, an RCT of 58 cancer patients having unpleasant medical procedures (tissue biopsy, port placement/removal) randomly assigned to music therapy or simple distraction conditions found no significant effects for a music intervention compared with simple distraction.<sup>52</sup>

In summary, there is good evidence for use of music therapy with surgery patients and cancer patients but mixed evidence for use of music therapy with patients having medical procedures. Perhaps factors that affect the effectiveness of music therapy in patients awaiting or undergoing uncomfortable procedures include individual differences such as music preferences, initial anxiety level, and level of interest in being distracted from the procedure. Music therapy may offer benefit to some patients undergoing these procedures by helping to divert their attention from potentially unpleasant experiences; however, it may be important to tailor the intervention to patient desires and preferences.

## Effects on Pain

Many studies of the effects of music therapy on pain relief have had methodologic problems, such as small sample size, lack of random assignment, and lack of control for patient anesthesia.<sup>53,54</sup> These issues notwithstanding, overall music is a low-cost intervention that is appealing to patients and often helps reduce pain.<sup>53,54</sup>

Playing music for patients during or after surgery helps reduce pain and use of morphine and other sedatives, anxiolytics, and analgesics.<sup>55,56</sup> A series of 17 vascular and thoracic surgery patients who listened to live harp music showed substantially decreased pain levels after the music session.<sup>23</sup> In a study of 311 gynecologic surgery patients, compared with usual care, patients who received music, relaxation, or their combination used substantially less patient-controlled pain medications.<sup>57</sup> A similar study of 500 abdominal surgery patients demonstrated that patients receiving music therapy, relaxation, or a combination reported significantly lower pain levels than a control group.<sup>58</sup> An RCT of 150 patients undergoing inguinal hernia or varicose vein surgery examined differences in pain relief, depending on whether music was played during or after surgery; there were significant short-term pain reductions in both music groups compared with a control group, regardless of whether music was played during or after surgery.<sup>56</sup>

Music has proven effective in reducing pain associated with a variety of procedures, including burn debridement, laceration repair, lumbar punctures, insertion of intravenous lines, immunizations, and dental procedures.<sup>59–65</sup> Several RCTs of music therapy for patients undergoing colonoscopy or flexible sigmoidoscopy have found that compared with patients in control groups, those who listened to music reported significantly lower pain levels, less physician-administered sedation, and shorter examination times.<sup>46,66–68</sup>

Music can effectively decrease patients' perceptions of and responses to pain during labor and in very young premature infants as well as other populations of patients with chronic pain.<sup>69,70</sup> Women in labor who listened to soft music reported substantially less distress related to pain and perceived music as helpful to them.<sup>71</sup> Older adults who listened to music 20 minutes daily for 2 weeks reported decreased chronic osteoarthritis pain compared with a control group whose pain level remained constant.<sup>72</sup> The majority of cancer patients have at least moderate pain relief from music, and music is often offered as an adjunctive therapy in progressive cancer centers.<sup>73,74</sup> A recent pilot study evaluated the impact of music therapy on self-reported pain and nausea as well as the time to engraftment among patients undergoing a bone marrow transplant; in this very ill population, cancer patients who received music therapy with relaxation imagery reported less pain and nausea and objectively had more rapid engraftment of their transplant.<sup>75</sup>

## Music in End-of-life Care

Music therapy can improve the quality of life for dying patients.<sup>76,77</sup> Music therapy can foster supportive interactions between patients and loved ones and help patients connect with and express emotions in a less threatening manner than verbal expression. In working with persons who are dying, music may provide a means of transcending patient experiences of physical symptoms and declines.<sup>22</sup>

Descriptive and qualitative research provides some data on benefits of music therapy in end-of-life care. Regarding their experience in a palliative care music therapy program, 57% of surveyed patients reported that participation in the program helped them to feel more relaxed or improved their affect.<sup>78</sup> Staff members reported that music seemed most effective in the areas of patient satisfaction, stress reduction, anxiety reduction, and patient receptivity.<sup>78</sup> In a palliative care music therapy program where patients wrote songs, lyrical themes that emerged included messages to others (positive feelings and gratitude), self-reflections, compliments (to staff, other patients, family, friends), memories, reflections on significant others, expression of loss and difficulty related to illness, imagery, and prayers.<sup>10</sup>

In a study of single-session music interventions for terminally ill patients, significant pre- to post-session changes were found for pain control, physical comfort, and feelings of

relaxation.<sup>79</sup> In a study of effects of music therapy on home hospice patients, patients were randomly assigned to receive music therapy versus routine hospice care alone<sup>77</sup>; patients in the music therapy group reported higher quality of life, and their quality of life increased with greater numbers of music therapy sessions.

## Effects on Clinicians/Caregivers

Music may also affect patients indirectly through its effects on the perceived environment and on caregivers. For example, one study suggested that self-selected music enhanced speed and accuracy of surgeons' performance on a stressful nonsurgical task compared with those who did not listen to music or listened to music selected by the experimenters.<sup>80</sup> Another study of long-term care workers found that participation in group music therapy sessions yielded less burnout and improved mood.<sup>81</sup> A third study suggested that parents preferred providing chest percussion for their children with cystic fibrosis if music was played during the treatment.<sup>82</sup> In a survey of staff in a neonatal ICU, staff members thought that music could be helpful to patients and would not increase work-related errors but that having a live musician might interfere with work flow; staff in this setting strongly preferred classical or instrumental music to other types of music and preferred recorded to live music.<sup>83</sup> Medical schools are beginning to include music in courses on medical humanism to promote desirable physician characteristics such as caring, empathy, respect for human dignity, compassion, and fostering relationships.<sup>84</sup>

## Risks and Costs

Music is quite safe, as long as common sense precautions are used to avoid excessive volume. With the advent of small boom boxes and personal CD and MP3 players, music is an inexpensive service to provide, even on an individual basis. To minimize the risk of spreading infectious diseases, patients may be advised to bring their own headphones (often available at discount stores).

## Conclusion

Music plays a central role in all human cultures. It has direct and indirect effects on physiology and clinical symptoms. Carefully selected music can reduce stress, enhance a sense of comfort and relaxation, offer distraction from pain, and enhance clinical performance. Additional research is needed to better define its optimal role in comprehensive, cost-effective patient care. With such research ongoing, music therapy appears to be safe and likely helpful to a broad spectrum of patients in diverse clinical situations.

## Resources

### Books

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### Internet sites

American Music Therapy Association. This page provides an address for asking about music therapists in one's geographic area and answers frequently asked questions about professional music therapy. <http://www.musictherapy.org/>.

Music Therapy in Palliative Care. <http://www.mtabc.com/palliative.html>.

University Hospitals of Cleveland. Music as Medicine Program for Pediatrics. [http://www.musicasmedicine.com/info/resc\\_peds.htm](http://www.musicasmedicine.com/info/resc_peds.htm).

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**Criticism is prejudice made plausible.**

—Henry Louis Mencken