

# Music and Health; How to use music in surgical care

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Music is a dynamic experience that can elicit both physiological and psychological responses in the listener. It is a complex blend of expressively organized sound, comprising three elements: rhythm, melody, and harmony. Rhythm is the pattern of the movement of the music. It is one of the most essential structural and organizational elements of music, is the most influential aspect of music and is a key consideration when selecting musical collections for specific purpose (Bunt 1994, White 2000). The music melody results from the sequence of musical pitch and the interval between musical tones (Bunt 1994). Pitch is the number of cycles the sounds vibrates per second. Faster vibrations produce higher pitched tones, while slower vibrations result in lower tones (White 2000). Harmony of the music refers to the way pitches are blended, with the combination of sounds being characterized as consonant or dissonant (Bunt 1994).

Music therapy is an alternative therapy that may improve patients' health and well being (Guzzetta 1988). It is defined as the controlled use of music, its elements and its influences, on human beings to aid the physiological, psychological and emotional integration of the individual during treatment of an illness disability (Munro & Mount 1978).

Music has been used since ancient time to influence human health (Bunt 1994, White 2000). Archaeological findings show that the primitive man used music as a way to appease the "gods" (Henry 1995). The 6th century Greek philosopher Pythagoras, considered as the founder of music therapy and geometry, believed that music greatly contributed to health and often prescribed music and diet to restore and maintain harmony of the body and soul (Olson 1998, White 2001). People in the Renaissance movement demonstrated that various types of music-affected changes in the respiratory rate, heart rate, blood pressure and digestion (Henry 1995). In an unsigned article that appeared in the *Columbian Magazine* in 1789, a case was made for the use of musical experiences to influence and regulate emotional conditions (White 2000) and *The Influence of Music on Health and Life*, which describes the use of music in healing, was written by Chomat in 1846 (Biley 2000). Furthermore, Florence Nightingale recognised the power of music in the environmental milieu of the hospital wards and as a part of the healing process for injured soldiers in the Crimea in the 19th century. Nightingale noted the effects of different types of music, recommending wind instrumental pieces with continuous sound or air as generally having a beneficial effect for the sick and she

remarked that instruments that do not produce continuous sounds would have the opposite effect (Nightingale 1992, McCaffrey & Locsin 2002). Nightingale felt that it was the responsibility of nursing to control the environment in order to put the patient in the best place for healing to occur (McCaffrey & Locsin 2002). In 1926, another nurse, Isa Maud Ilsen, established the National Association for Music in Hospitals. Ilsen advocated implementation of specific prescriptions or treatment regimes (Ilsen 1926).

In the early years of the twentieth century, music was used in hospitals mainly to boost morale, as a general aid to convalescence and as an entertaining diversion. Physicians invited musicians to play to large groups of patients on the vague assumption that it might activate metabolic functions and relieve mental stress. Hunter, in 1892, placed a piano in the Helensburg Hospital in Scotland and, with the aid of volunteer pianists, made an extensive study of the value of music to the patient. He proclaimed that the cessation or at least diminution of pain was marked in many cases, and in seven out of ten the fever was also lowered. Coring in New York in 1899 and Tarchanoff in Russia in 1903, described different effects of various types of music on the pulse and respiration as well as on body secretions. (Light et al 1949).

Recorded music was first used in hospital in the late 1800s, after invention of the phonograph (White 2000). In 1914 Kane (1914) was the first person to provide intraoperative music to distract patients from “the horror of surgery”. In 1949, a group of surgeons studied the use of music in conjunction with psychosomatic factors in physical illness. They performed a series of operations and saw that music had a calming effect on these normally tense and nervous patients when routine medication did not (Light et al 1949). In addition, during the Second World War there was a large influx in the development of music therapy (Bunt 1994). More recently, Paterson and Zderad (1988) described the arts (e.g. music, painting and poetry) as an important part of the nursing discipline.

### Mechanism of action of music therapy

Various complex theories, hypotheses and assumptions exist regarding how music works (Gagner-Tjellesen et al 2001). It has been proposed that music stimuli have a biologically effect on human behaviour by engaging specific brain functions involved in memory, learning and multiple motivational and emotional states (Tauht 1990). The effect of music is perceived in the right hemisphere of the brain (Thaut 1990, Liégeois-Chauvel et al 1998, Myskaja & Lindbaeck 2000), however the left hemisphere may take a greater role in the analytic aspects of the music (Thaut 1990, Myskaja & Lindbaeck 2000). The auditory perception of the music is located in the auditory centre in the temporal lobe, which sends signals to the thalamus, the mid brain, pons, amygdala, medulla and hypothalamus. The physiological effect of music is proposed to act via the hypothalamus and its regulation of adrenaline and other neuro-hormones (Myskaja & Lindbaeck 2000).

Registrations through EEG have shown that music can decrease the bioelectrical activity in the brain from predominant beta waves to alpha and theta waves, which can have consequences for reduction of anxiety, tension and sleeplessness (Shawn 1999).

The mechanism of the pain reducing effect of music has been explained by the gate control theory, which suggests that the transmission of potentially painful impulses can be modulated by a “cellular gating mechanism” found in the spinal cord (Melzack 1973, Whipple & Glynn 1992). Alternatively the beneficial effects may be a result of distraction through cognitive coping strategies by competing stimuli that reduce pain perception (Fernandes & Turk 1989). Music can also act as a distracting agent to refocus the attention from negative stimuli causing the stress, to something that is pleasant; it occupies one’s mind with something familiar, soothing and preferred (Siegele 1974, McCaffery 1992, Mok & Wong 2003), allowing people to escape to “their own world”. The

patient can focus on his or her awareness of the music, as an aid to relaxation (Mok & Wong 2003).

### **Studies with music intra- and postoperatively**

Tsuchiya et al (2003) proposed that the concept of music or sound as modulators of human response to surgical stress under regional anaesthesia may also be valid in unconscious patients under general anaesthesia. However, the effect of sound is somewhat limited in the middle of general anaesthesia period, as compared with regional anaesthesia. There is also evidence that hearing ability seems to be maintained at clinical concentrations of general anaesthesia (Schwender et al 1993, 1994). Studies with music intraoperatively under general anaesthesia are limited. In a study of Blankfeild et al (1995) the patients listened to music intraoperatively under general anaesthesia and postoperatively twice a day for the duration of hospitalisation. There was no significant difference in any of the outcome variables; number of postoperative

days, analgesic consumption, depression, daily living activities and cardiac symptoms.

Nilsson et al (2001 and 2003b) have shown that patients which have been exposed to soft relaxing music intraoperatively had significantly lower pain scores on the first day of surgery compared with the control group patients. Intraoperative music can also lead to less postoperative fatigue and that patients became mobile earlier i.e. time to sit after surgery, (Nilsson et al 2001).

Studies of intraoperative music used during regional anaesthesia have shown reductions in requests for sedatives during orthopaedic and plastic surgery (Walther-Larsen et al 1988) and in day care surgery (Lepage et al 2001). Other studies of intraoperative music during local anaesthesia show decreased anxiety, heart rate and mean arterial blood pressure during sigmoidoscopy (Palakanis et al 1994), reduction in blood-pressure during cataract surgery (Cruise



et al 1997) less analgesia during lithotripsy and less use of sedatives during urological procedures (Koch et al 1998). Yilmaz et al (2003) reported that music during extracorporeal shock wave lithotripsy treatment (ESWL) under local anaesthesia resulted in decreased anxiety and fentanyl requirement, increased oxygen saturation and that the patients with music felt more comfortable during ESWL than those without. However, other studies have reported that patients who listened to music during surgery felt more anxious than the control group (Walther-Larsen et al 1988) or there was no effect on anxiety (Cruise et al 1997) blood pressure, heart rate, oxygen saturation or length of PACU stay (Koch et al 1998).

Studies of the effects of music during the immediate postoperative period are rare however, Nilsson et al (2003b) have shown that the patients who had been exposed to 1 hour of music postoperatively had significantly lower pain scores after one and two hours and required significantly less morphine after one hour at the PACU. Two hours of listening to soft postoperative music can also result in significantly lower pain intensity for this first 2 hours in the PACU (Nilsson et al 2003a). However, the period for the pain reducing effect was of short duration i.e. 2 hours postoperatively (Nilsson et al 2003b). Music can also result in higher oxygen saturation postoperatively (Nilsson et al 2003a) and patients' experience of music listening postoperatively has been expressed as: "Wonderful to wake up to soothing music, it made me feel calm". "Soothing music makes me think positively and I like piano music". "The music was there the whole time and made me feel calm and took the pain impulses away".

In a small quasi-experimental study, Heiser et al (1997) found that music had no impact on postoperative pain, anxiety, heart rate, blood pressure or respiratory rate. The study indicated, however, that the patients were satisfied with listening to music in the PACU and that it helped them to relax and that it functioned as a distracter.

Music interventions performed on postoperative days 2 and 3 after coronary artery bypass grafting have shown improved mood (Barnason et al 1995) and soothing music administered on postoperative days one and two has shown decreased postoperative pain. (Good et al 1999, 2001, 2002). In a qualitative study of the lived experience of listening to postoperative music (McCaffrey & Good 2000), the patients expressed that they were distracted from their fear, pain and anxiety when listening to music. This distraction allowed them to be calmer and helped them to relax. The patients also verbalized that the music helped them to cope with pain, discomfort and a strange environment. The music was under their control and it enabled them to focus on healing rather than on frustration, pain and fear.

### Implications for practice

In clinical practice, a combination of pharmacological and non-pharmacological treatments is desirable in order to achieve additive or synergistic effects (Good & Moore 1996). A non-pharmacological adjuvant could be for example music. The use of music in the surgical care is growing. When starting an intervention with music in the OR or PACU the tempo, volume, and the tone of the music should be considered (Johnston & Rohaly-Davis 1996). The rhythm of the music is suggested to be the most important and it may be the key that has the active function (Bunt 1994, Marwick 2000, White 2000). The rhythm should be slow and flowing with 60-80 beats per minute (Cunningham et al 1997, Chlan 1999, White 2000, Knight & Rickard 2001). The music should be non lyrical and consist predominantly of low tones and the instruments should be mostly strings, with minimal brass or percussion (White 2000). It has also been suggested that it is important to take the patient's preference concerning the music into account (McCaffery 1992, Snyder & Chlan 1999, White 2000, Knight & Rickard 2001). However, these assumptions are needed to be explored further. The use of headphones is advocated, along with an audiotape player or

CD player that is equipped with auto reverse, in order to provide consistent, uninterrupted music and to block unpleasant environmental sounds (Steelman 1990, Nilsson et al 2001, 2003a and 2003b). The noise level in the OR and the PACU can sometimes be as high as >70 dB (Hogue & Thompson 1990, Kain et al 2001, Liu & Tan 2000, Shertzer & Keck 2001). Using headphones to play music as a distraction from the OR and PACU noise has been successful and provides strong support for the positive effect of music on noise control (Kain et al 2001, Shertzer & Keck 2001).

Music therapy is an example of a non-pharmacological activity that can be administered to the surgical patient, which can empower the patient to develop own ability to gain control over negative symptoms. During surgery and postoperative recovery music can become an integral part of the multimodal regime administered to the patient. This intervention represent simple, inexpensive and non-invasive tools that can be applied advantageously during intra- and postoperative care.

## References

- Barnason S, Zimmerman L, Nieveen J. *The effect of music interventions on anxiety in the patient after coronary artery byoass grafting. Heart & Lung* 1995; 24:124-132.
- Benson H. *The relaxation response. GK Hall, Massachusetts.* 1976.
- Biley FC. *The effect on patients' well being of music listening as a nursing intervention: a review of the literature. Journal of Clinical Nursing* 2000; 9:668-77.
- Blankfeild RP, Zyzanski SJ, Flocke SA, Alemangno S, Scheurman K. *Taped therapeutic suggestions and taped music as adjuncts in the care of coronary-artery-bypass patients. American Journal of Clinical Hypnosis* 1995; 37: 32-42.
- Bunt L. *Music Therapy: An Art Beyond Words. Routledge. London. England.* 1994.
- Chlan L, Tracy M F. *Music therapy in critical care: Indications and guidelines for intervention. Critical Care Nurse* 1999; 19:35-41.
- Cruise C J, Chung F, Yongendran S, Little D. *Music increases satisfaction in elderly outpatients undergoing cataract surgery. Canadian Journal of Anaesthesia* 1997; 44:43-48.
- Cunningham MF, Monson B, Bookbinder M. *Introducing a music program in the preoperative area. AORN Journal* 1997; 66:674-682.
- Fernandez E, Turk DC. *The utility of cognitive coping strategies for altering pain perception: a meta-analysis. Pain* 1989; 38:123-135.
- Gagner-Tjellesen D, Yurkovich EE, Gragert M. *The use of music therapy and other ITNIs in acute care. Journal of Psychosocial Nursing* 2001; 39:26-37.
- Good M, Moore SH. *Clinical practice guidelines as a new source of middle range theory: focus on acute pain. Nursing Outlook* 1996; 44:74-79.
- Good M, Stanton-Hicks M, Grass A Cranston Anderson G, Choi C, Schoolmeesters J, Salman A. *Relief of postoperative pain with jaw relaxation, music and their combination. Pain* 1999; 81:163-172.
- Good M, Stanton-Hicks M, Grass A, Cranston Anderson G, Hui-Ling L, Roykulcharoen V, Adler P. *Relaxation and music reduce postoperative pain. Journal of Advanced Nursing* 2001; 33:11-16.
- Good M, Cranston Anderson G, Stanton-Hicks M, Grass A, Makii M. *Relaxation and music reduce pain after gynaecologic surgery. Pain management Nursing* 2002; 3:61-70.
- Guzzetta C. *Music therapy: bearing the melody of the soul. In: Dossey L, Keegan, Guzzetta C and Kolkmeier L (eds) Holistic nursing: A handbook for practice. Aspen Publisher, Maryland* 1988, pp 263-288.

Hamel WJ. *The effect of music intervention on anxiety in the patient waiting for cardiac catheterisation. Intensive and Critical Care Nursing* 2001; 17:279-285.

Heiser, Chiles, Fudge Gray. *The use of music during the immediate postoperative period. AORN Journal* 1997; 65: 777-785.

Henry L. *Music therapy: A nursing intervention for control of pain and anxiety in the ICU: A review of the research literature. Dimensions of Critical Care Nursing* 1995; 14: 295-304.

Hodge B, Thompson JF. *Noise pollution in the operating theatre. Lancet* 1990; 335:891-894.

Isen IM. *How music is used in hospitals. Musician* 1926; 31:15- 30.

Iwanaga M, Ikeda M, Iwaki T. *The effect of repetitive exposure to music on subjective and physiological responses. Journal of Music Therapy* 1996; 33:219-230.

Johnston K, Robaly-Davis J. *An introduction to music therapy: helping the oncology patient in the ICU. Critical Care Nursing Quarterly* 1996; 18:54-60.

Kain Z N, Wang S-M, Mayes L C, Krivutza D M Teague B A. *Sensory stimuli and anxiety in children undergoing surgery: a randomized, controlled trial. Anesthesia & Analgesia* 2001; 92:897-903.

Kane E. *The phonograph in the operating room. JAMA* 1914; 62:1829-1830.

Knight WEJ, Rickard NS. *Relaxing music prevents stress-induced increases in subjective anxiety, systolic blood pressure and heart rate in healthy males and females. Journal of Music Therapy* 2001; 38:254-272.

Koch ME, Kain ZN, Ayoub C, Rosenbaum SH. *The sedative and analgesic sparing effect of music. Anesthesiology* 1998; 89: 300-306.  
Liégeois-Chauvel C, Peretz I, Babai M, Laguitton

V, Chauvel P. *Contribution of different cortical areas in the temporal lobes to music processing. Brain* 1998; 121:1853-1867.

Light G A, Haymond W V, Livingston H M, Willard J. *Use of magnetic recorded "silent" music during operation. Current Researches in Anesthesia and analgesia* 1949; 28: 330-338.

Lepage C, Drolet P, Girard M, Grenier Y, DeGagné R. *Music decreases sedative requirements during spinal anesthesia. Anesthesia & Analgesia* 2001; 93:912-916.

Liu E H; Tan S. *Patients' perception of sound level in the surgical suit. Journal of Clinical Anesthesia* 2000; 12:298-302.

Marwick C *Music therapists chime in with data on medical results. JAMA* 2000; 283:731-733.

McCaffery M. *Response to "Quantification of the effects of listening to music as a non-invasive method of pain control". Scholarly Inquiry for Nursing Practice: An International Journal* 1992; 6:59-62.

McCaffrey RG, Good M. *The lived experience of listening to music while recovering from surgery. Journal of Holistic Nursing* 2000; 18:378-390.

McCaffrey R, Locsin RC. *Music listening as a nursing intervention: a symphony of practice. Holistic Nursing Practice* 2002; 16:70-77.

Melzack R. *The Puzzle of Pain. Middlesex, Penguin.* 1973

Mok E, Wong KY. *Effects of music on patient anxiety. AORN* 2003; 77:396-410.

Munro S, Mount B. *Music therapy in palliative care. Canadian Medical Association Journal* 1978; 119:1029-1034.

Myskja A, Lindbaeck M. *Hvordan virker musikk på menneskekroppen? Tidsskrift for Norsk Laegeforening* 2000;120;1182-1185.

Nightingale F. *Notes of nursing. What it is and what it is not (Commemorative edition).*

Philadelphia, JB, Lippincott (originally published in 1859) 1992.

Nilsson U, Rawal N, Unesthåll L-E, Zetterberg C, Unosson M. Improved recovery after therapeutic suggestions and music during general anaesthesia. *Acta Anaesthesiologica Scandinavica* 2001; 45: 812-817  
 Nilsson U, Rawal N, Engqvist B, Unosson M. Analgesia following music and therapeutic suggestions in the PACU in ambulatory surgery; a randomised controlled trial. *Acta Anaesthesiologica Scandinavica* 2003 (a); 47: 278-283.

Nilsson U, Rawal N, Unosson M. A comparison of intra-operative or postoperative exposure to music – a controlled trial of the effect on postoperative pain. *Anaesthesia* 2003 (b) ;58:699- 673.

Olson S L. Bedside musical care: Applications in pregnancy, childbirth, and neonatal care. *Journal of obstetric, gynaecologic and neonatal nursing* 1998; 27:569-575.

Palakanis KC, DeNobile JW, Sweeney WB, Blankenship CL. Effect of music therapy on state anxiety in patients undergoing flexible sigmoidoscopy. *Diseases of the Colon and Rectum* 1994;37:478-481.

Paterson JG, Zderad LT. *Humanistic Nursing. National League for Nursing. New York. 1988.*

Schwender D, Kaiser A, Klasing S, Peter K, Poppel E. Middle auditory evoked potentials and explicit and implicit memory in patients undergoing cardiac surgery. *Anesthesiology* 1994; 80: 493-501.

Schwender D, Klasing S, Madler C, Poppel E, Peter K. Depth of anaesthesia. Midlatency auditory evoked potentials and cognitive function during general anaesthesia. *International Anesthesiology Clinics* 1993; 31: 89-106.

Shaw GL. Music enhances spatial-temporal reasoning: towards a neurophysiological basis using EEG. *Clinical Electroencephalography* 1999; 30:151-155.

Shertzer KE, Keck JF. Music and the PACU environment. *Journal of PeriAnesthesia Nursing* 2001; 16:90-102.

Siegele D. The Gate Control Theory. *American Journal of Nursing* 1974; 497-500.

Steelman VM. Intraoperative music therapy. *AORN Journal* 1990;52:1026-1034.

Thaut MH. Neurophysiological processes in music perception and their relevance in music therapy. In: Unkefer RF (Ed.) *Music therapy in the treatment of adults with mental disorder* (pp. 3-32) New York. Schirmer Books 1990.

Tsuchiya M, Asada A, Ryo K, Noda K, Hashino T, Sato Y, Sato EF, Inoue M. Relaxing intraoperative natural sounds blunts haemodynamic change at the emergence from propofol general anaesthesia and increases the acceptability of anaesthesia to the patient. *Acta Anaesthesiologica Scandinavica* 2003; 47:939-943.

Walther-Larsen S, Deimar V, Valentin N. Music during regional anaesthesia. A reduced need of sedatives *Regional Anesthesia* 1998; 13:69-71.

White JM. State of science of music interventions. *Critical Care Nursing Clinics of North America* 2000; 12:219-225.

White JM. Music as intervention a notable endeavour to improve patients outcome. *Holistic Nursing Care* 2001; 36:83-92.

Whipple B, Glynn NJ Quantification of the effects of listening to music as a non-invasive method of pain control. *Scholarly Inquiry for Nursing Practice: An International Journal* 1992; 6:43-58.

Wong HL, Lopez-Nabas V, Molasiotis A. Effect of music therapy on anxiety in ventilator-dependent patients. *Heart & Lung* 2001; 30:376-87.

Yılmaz E, Özcan S, Basar M, Basar H, Batislam E, Ferhat N. Music decreases anxiety and provides sedation in extracorporeal shock wave lithotripsy. *Urology* 2003; 61:282-286.