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ANNE VAAJOKI

Postoperative Pain in Adult Gastroenterological Patients – Music Intervention in Pain Alleviation

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ABSTRACT

The purpose of the study was to evaluate the effects of listening to music on the pain intensity and distress, physiological parameters such as blood pressure, heart and respiratory rate, analgesia, adverse effects and the length of hospital stay of adult patients after major abdominal surgery. The data collection was conducted between March 2007 and April 2009. The sample of patients consisted of adult patients who had undergone major elective abdominal surgery at Kuopio University Hospital. A quasi-experimental study with pre-test/post-test measures was used a total of seven times between the operation day and the second postoperative day. In a follow-up visit on the third postoperative day there was no intervention but measurements were taken once. The complete data set consisted of 280 potential abdominal surgery patients, and 168 patients were recruited for the final data set. Descriptive statistics and repeated measures of ANOVA were used, and content analysis was conducted about patients' music listening experiences. On the first postoperative day, systolic blood pressure and respiratory rate were significantly lower in the music group compared with the control group. On the second postoperative day, the intensity and distress of pain at bed rest, during deep breathing and when shifting position were significantly lower in the music group. Also, systolic blood pressures and respiratory rates were significantly lower in the music group on the second postoperative day. On the third postoperative day, when long-term effects of music were assessed, only the respiratory rate was significantly lower in the music group. There were no group differences in analgesia, adverse effects or length of hospital stay. The study provided new information on how listening to music affects pain intensity and distress at bed rest, during deep breathing and when shifting position after major abdominal surgery, and on patients' experiences of listening to music. Patients experienced positive effects while listening to music during their recovery. Moreover the study provided information about the challenges in executing music intervention in a complex clinical setting.

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Medical Subject Headings (MeSH): Music; Pain, Postoperative; Nursing; Intervention Studies

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TIIVISTELMÄ

Tutkimuksen tarkoituksena oli arvioida musiikin kuuntelun vaikutuksia aikuisten potilaiden mahaleikkauksen jälkeisen kivun voimakkuuteen ja epämiellyttävyyteen levossa, syvään hengittäessä ja asentoa vaihtaessa; fysiologisiin tekijöihin, kuten verenpaineeseen, syketasoon ja hengitystiheyteen; kipulääkityksen määrään, kipulääkityksen aiheuttamiin haittavaikutuksiin ja sairaalassaoloaikaan. Tutkimus toteutettiin kvasikokeellisella koeryhmä-kontrolliryhmäasetelmalla toistaen ennen jälkeen mittauksia jokaisen tutkittavan kohdalla leikkauspäivän illan ja toisen postoperatiivisen päivän välisenä aikana yhteensä seitsemän kertaa. Kolmantena postoperatiivisena päivänä tehtiin yksi mittaussarja ilman interventiota. Tutkimusaineisto kerättiin maaliskuun 2007 huhtikuun 2009 välisenä aikana. Kohderyhmän muodostivat Kuopion yliopistollisen sairaalan kirurgian vuodeosastojen ja elektiiviseen maha- ja suolistoalueen leikkaukseen tulevat aikuiset potilaat. Maha- ja suolistoalueen 280 leikkauspotilaan joukosta 168 täytti valintakriteerit ja otettiin mukaan analyysiin. Aineisto analysoitiin kuvailevilla tilasto- ja monimuuttujamenetelmillä ja potilaiden kokemukset musiikin kuuntelusta laadullisella sisällön analyysilla. Tutkimustulokset osoittavat, että ensimmäisenä postoperatiivisena päivänä musiikkia kuuntelevilla potilailla hengitystiheys ja systolinen verenpaine olivat intervention jälkeen tilastollisesti merkitsevästi alhaisemmat kuin kontrolliryhmään kuuluvilla potilailla. Toisena postoperatiivisena päivänä kivun voimakkuus ja epämiellyttävyys levossa, syvään hengittäessä ja asentoa vaihtaessa aleni intervention jälkeen musiikkiryhmässä tilastollisesti merkitsevästi enemmän kuin kontrolliryhmässä. Myös hengitystiheys ja systolinen verenpaine olivat toisena postoperatiivisena päivänä musiikkiryhmässä alhaisempia. Arvioitaessa musiikin kuuntelun pitkäaikaista vaikutusta kolmantena postoperatiivisena päivänä, hengitystiheys oli musiikkia kuuntelevilla potilailla tilastollisesti merkitsevästi alhaisempi kuin kontrolliryhmän potilailla. Kipulääkityksen määrään, sen aiheuttamiin haittavaikutuksiin tai sairaalassaoloaikaan musiikin kuuntelulla ei ollut vaikutusta. Tässä tutkimuksessa saatiin uutta tietoa musiikin kuuntelun vaikutuksista gastroenterologisen potilaan kivun voimakkuuteen ja epämiellyttävyyteen levossa, syvään hengittäessä ja asentoa vaihtaessa leikkauksen jälkeen sekä potilaiden kokemuksista musiikin kuuntelusta. Lisäksi saatiin uutta tietoa interventiotutkimuksen toteuttamisen haasteista hoitotyön toimintaympäristössä.

Luokitus: WO 184; WB 550; M; WY 161
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Kuopio, December 2012

Anne Vaajoki

"Jokainen ihminen on laulun arvoinen, jokainen elämä on tärkeä"
(V.Lavi)

List of the original publications

This dissertation is based on the following original publications:

I Vaajoki A, Pietilä A-M, Kankkunen P, Vehviläinen-Julkunen K. Effects of Listening to Music on Pain Intensity and Pain Distress after Surgery: An Intervention. *Journal of Clinical Nursing 21(5-6): 708-17, 2012.*

II Vaajoki A, Kankkunen P, Pietilä A-M, Vehviläinen-Julkunen K. Music as a Nursing Intervention: Effects of Music Listening on Blood Pressure, Heart Rate and Respiratory Rate in Abdominal Surgery Patients. *Nursing and Health Sciences 13(4): 412-8, 2011.*

III Vaajoki A, Kankkunen P, Pietilä A-M, Kokki H, Vehviläinen-Julkunen K. The Impact of Music Listening on Analgesic Use and Length of Hospital Stay while Recovering From Laparotomy. *Gastroenterology Nursing 35(4): 279–284, 2012.*

IV Vaajoki A, Pietilä A-M, Kankkunen P, Vehviläinen-Julkunen K. Music Intervention study in clinical practice. *International Journal of Nursing Practice, 2012 (In press).*

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Contents

Abbreviations

BDI	Beck Depression Inventory
FRS	Faces Rating Scale
IASP	International Association for Study of Pain
NRS	Numeric Rating Scale
PPI	Present Pain Intensity
STAI	State Trait Anxiety Inventory
TENS	Transcutaneous Electrical Nerve Stimulation
VAS	Visual Analogue Scale
VRS	Verbal Rating Scale

1 Introduction

The goal of postoperative pain management is to ensure the well-being of the individual. Untreated pain can develop into a serious health problem with financial consequences for the individual as well as society. Every patient has a right to high-quality health and medical care, including quality pain management (Act on the Status and Rights of Patients 785/1992).

The postoperative phase begins when the patient has arrived from the operating room to the recovery room and ends when he or she no longer needs surgery-related care. It is the responsibility of the nursing staff to ensure that the patient feels safe during the postoperative recovery period (McGarvey *et al.* 2000). The most common form of postoperative pain management is the administration of opioids through intravenous. Furthermore, anesthetics and opioids administered into the epidural space have become more common in postoperative pain management. In spite of the advancements that have occurred in pain management, more than half of patients suffer moderately or severely after surgery (Gunninberg& Idvall 2007). Insufficient alleviation of postoperative pain can increase dissatisfaction with treatment (Ashburn *et al.* 2004) and the number of days in the hospital, and can cause complications. Moreover, it can decrease appetite (Good *et al.* 2005), disturb sleep (Shang & Gang 2003), and make the pain chronic (Kehlet *et al.* 2006).

Pain measurement refers to the assessment of the intensity and nature of pain. It is one part of the continual assessment of pain, in which the aim is to get a multifaceted overall picture of the patient's pain experience. The basis of pain assessment is regular and systematic assessment of pain (Dahl & Kehlet 2006) from the perspectives of both intensity and distress (Good 2013). Measurement of pain is complicated by the different ways in which individuals react to pain. Verbal descriptions of pain cannot be studied unequivocally, and in particular, the assessments used in measuring pain can mean different things to different people. These can be influenced by age, level of education, nature of illness, depression, culture, and social relationships (Watt-Watson & McGillion 2011; Davidhizar & Giger 2004).

For centuries, music has been known to enhance the mind and body. Primitive peoples used music in rituals to rid the body of a demon's power that was causing illnesses. Ancient Greeks and Romans believed in the magical charm of music, which enhanced the healing of the mind and body (White 2001).

Music is listened to in all cultures without regard to age, race, or ethnicity. It has long been used as a supplement to other treatment to calm patients who are suffering from pain, anxiety, and different kinds of injuries and illnesses (Lim & Locsin 2006; Kemper & Danhauer 2005). The effects of listening to music on relieving anxiety caused by surgery and on management of surgical pain have been studied internationally with gastroenterology patients (Nilsson *et al.* 2005; Good *et al.* 2005), patients who have had heart surgery (Sendelbach *et al.* 2006; Voss *et al.* 2004), orthopedic patients (Allred *et al.* 2010; McCaffrey & Locsin 2006), gynecological patients (Good & Ahn 2008), neurosurgical patients (Walworth *et al.* 2008), breast cancer patients (Binns-Turner *et al.* 2011; Li *et al.* 2011), and day surgery patients (Easter et al. 2010; Hook et al. 2008). The research results of the effects of music on management of surgical pain are mixed (Evans 2002). Methodological weaknesses have been observed in the studies, such as small sample sizes (Evans 2002), heterogenic groups, inaccuracies in pain assessment, short duration of interventions, poor evaluation of reliability, and re-testing problems (Dunn 2004).

Nursing staff are in a key position for suggesting different kinds of pain management methods in addition to pharmacological treatment (Dunn 2004) for treating surgical pain. Nonpharmacological pain management methods diversify the treatment of pain (Pyati &

Gan 2007) and are an important supplement to pharmacological treatment (Nilsson 2009; Ebneshshidi & Mohseni 2008) in reducing pain perception and related sensation (Chan *et al*. 2006). Nonpharmacological methods of medical treatment such as music, relaxation, massage, or guided imagery are used very little and they are not part of the established practices in postoperative pain management (Tracy 2010). Part of the reason for this is the lack of information (also Tracy 2010) and clear evidence of their effects (Hallberg 2009).

Compared to the needs of patients, the results of the care, and the activities of nursing, little clinical nursing sciences research has been produced in Finland and internationally on the effectiveness of the nursing activities. Moreover, there continues to be little development of new interventions for use in nursing practice (Forbes 2009; Hallberg 2009). The factors behind this are the nature of the phenomenon being studied and the resources for carrying out intervention research (Hallberg 2006) in the changing environment of nursing care (Buckwalter et al. 2009). In Finland, pain research has been conducted in nursing science in pain management (Halimaa 2001), children's pain and its assessment (Kankkunen 2003; Salanterä 1999), and treatment of children's postoperative pain using nonpharmacological methods (He 2006; Pölkki 2004). In addition, procedure pain has been studied with patients undergoing a colonoscopy (Ylinen *et al*. 2007, 2009). In the medical field, postoperative pain research has been conducted with patients who have had heart surgery (Pesonen 2011; Perttunen 2003) and with children who have had throat surgery or a tonsillectomy, including Salonen (2002) and Tuomilehto (2002). In social pharmacy, children's pain has been studied by Sepponen (2011) and Hämeen-Anttila (2006) from a pharmacological perspective, and chronic pain of the Finnish population by Turunen (2007). No intervention studies on the effectiveness of nonpharmacological pain management methods on adult patients have been conducted in Finland, whereas numerous international studies exist.

For the purposes of this study, a review of the literature was conducted of publications written in English and Finnish in the period between 1997 and 2011 using CINAHL, PubMed, Medic, MEDLINE, MEDLINE Ovid, PsycINFO, EBSCOhost Academic Search Elite, and Cochrane Library databases. A manual search was also conducted. The key search terms for music intervention studies of postoperative pain management were: *"music"*, *"therapeutic use"*, *"music therapy"*, *"nonpharmacological interventions"*, *"pain"*, *"acute pain"*, *"postoperative pain"*, and *"operation"*. The main search terms for pain assessment were: *"pain assessment"*, *"pain management"*, *"pain measurement"*, *"pain intensity"*, *"Numerical Rating Scale"*, *"Visual Analogue Scale"*, *"Verbal Rating Scale"*, *"Pain Scales"*, *"validity"*, and *"reliability"*. The main search terms for intervention studies were: *"interventions"*, *"nursing interventions"*, *"intervention research"*, *"research strategies"*, *"research design"*, *"clinical interventions"*, *"complex interventions"*, *"randomized controlled trials"*, *"quasi-experimental designs"*, and *"methodology"*.

The purpose of this study was to assess how listening to music affects the intensity of pain and distress experienced by gastroenterological surgery patients at rest, when breathing deeply, and when shifting position; how it affects the amount of analgesia, the adverse effects of analgesia, and the length of hospital stay; and how it affects physiological parameters such as systolic and diastolic blood pressure and heart and respiratory rates. Another purpose of the study was to get information on patients' music listening experiences after surgery. The ultimate aim was to obtain information about the effectiveness of nonpharmacological intervention and establish music listening as a form of postoperative pain management. The study is part of a research program on pain management and its assessment in the Department of Nursing Science at the University of Eastern Finland. (http://www.uef.fi/hoitot/tutkimusohjelma).

2 Postoperative Pain Management in Gastroenterology Surgery Patients

2.1 GASTROENTEROLOGICAL SURGICAL PROCEDURES

Gastroenterological surgery refers to surgical procedures in the digestive system and abdominal wall. These include intestinal diseases from the esophagus to the rectum, as well as medical conditions requiring surgery in the pancreas, liver, bile ducts, and spleen. The most common cancers related to gastroenterological surgery are in the intestinal area—pancreatic and stomach cancers. Methods of treating cancer include surgery, radiotherapy, and medication. Many cancers continue to be treated by surgery. In addition, the success of surgery can be enhanced by means of radiotherapy and chemotherapy (Roberts 2006). The long periods of illness associated with medical ailments in the stomach and intestinal area, as well as the diagnosis of the ailment, which involves a variety of endoscopic procedures, can be a difficult time for the patient (Viklund et al. 2006). After stomach and intestinal surgery, the patient is often left with permanent anatomical and functional changes to his or her body. The recovery time from a surgery is long. Various drains, tubes, and catheters initially limit the patient's ability to move. Possible complications such as wound infections, fistulas, and discharges, as well as difficulties in the functioning of the digestive system can dominate the patient's life for months. Typical problems that undermine the quality of daily life of a patient include lack of appetite, loss of weight, diarrhea, intestinal malfunction, or lack of control over intestinal function and the related shame and loss of dignity. Moreover, stomach pain, physical fatigue, effects on sexuality, difficulty sleeping, and worry and uncertainty regarding the future are part of the everyday life of a patient who has undergone stomach and intestinal surgery (Olsson et al. 2010; Worster & Holmes 2009).

Approximately 3,500 people get cancer in the digestive system in Finland each year. In the region of the university hospital district of Kuopio, where the empirical material of this study was collected and the intervention carried out, there were 896 people with gastrointestinal cancer in 2009 (www. syöpärekisteri.fi. 2011). That is why it is important to continue developing and researching pain caused by procedures and surgeries.

2.1.1 Mechanism of patient's pain

Tissue damage caused by surgery generates a series of complicated electrical and chemical events in a patient's body. Small nerve endings in the tissue conduct nerve impulses along nerve trunks toward the spinal cord and continue as pain flows toward brain centers, ending at the cerebral cortex. The perception of tissue damage as pain is divided into these phases: transduction, transmission, modulation, and perception. In *transduction* the mechanical, chemical, or thermal stimulus causing the tissue damage results in electrochemical activation of the nerve endings. The tissue damage stimulates neurotransmitters, which either sensitize the tissue to other stimuli or cause tissue stimulation directly. In *transmission* peripheral sensory nerves transmit impulses to the spinal cord and from here, by means of neurotransmitters, to the thalamus and on to the cerebral cortex. The *modulation phase* regulates pain in the nervous system. The fourth phase in the transmission of pain is *perception*, which is a subjective response to the function of neurons transmitting pain (Dahl & Kehlet 2006; Heiskanen & Karjalainen 2006). Pain stimuli travel to the central nervous system via pain axons Aδ (delta) and C fibers. Aδ fibers are myelinated and C fibers are unmyelinated nerves. In Aδ fibers the pain stimulus travels rapidly and produces a sharp pain sensation in the brain. The pain stimuli transmitted by C fibers are slower than Aδ fibers and are sensed as a burning or aching pain (Heiskanen & Karjalainen 2006; Kalso 2002).

In 1965 Melzack and Wall presented the gate control theory as a mechanism for regulating pain (Figure 1), according to which pain involves motivational and emotional elements in addition to the sensory event. According to the theory, the nervous system mechanisms of the spinal cord function as a gate that increases or reduces the passage of nerve impulses from the peripheral nervous system via the spinal cord to the brain. Furthermore, there are descending paths from the brain to the spinal cord; pain can be reduced by influencing their functioning. By means of various emotional states or other cognitive factors, the brain's signal to the spinal cord closes the gate and blocks the sensation of pain. The sensation of pain can be reduced from the outside by activating thick and rapid Aδ fibers with massage or touch, for instance, or it can be weakened from the inside by activating inhibitors rising to the brain by using cognitive behavioral methods such as diverting attention away from pain, for example by listening to music (Bonica & Loeser 2001).

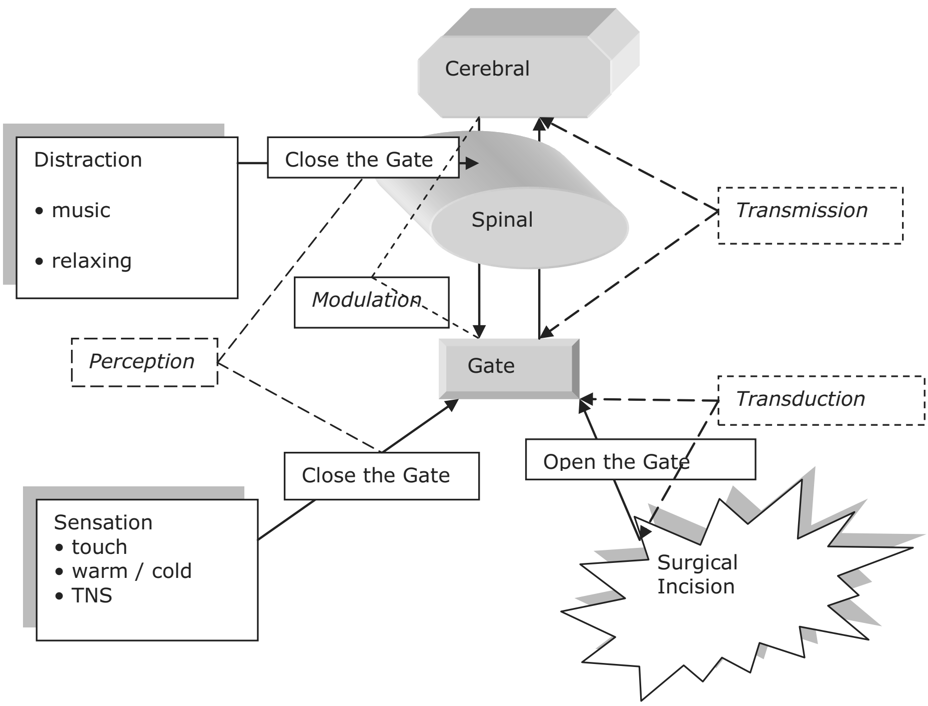


Figure 1 Gate Control Theory (Dunn paraphrase 2004)

2.1.2 Patient's postoperative pain

A patient's postoperative pain can be a result of the operation, complications related to the surgery, drains coming from the area of the surgery, existing illnesses, or procedures related to the symptoms (Pyati & Gan 2007; Ashburn *et al*. 2004). It is classified as acute pain, which varies in intensity and is short-lived. Postoperative pain can be divided into *nociceptive* pain, which results from the tissue damage and inflammatory reaction caused by the surgical incision (inflammatory pain). As a result of this, the pain receptors are activated and sensitized to other external stimuli, too. Nociceptive pain can be either somatic or visceral pain. Somatic pain is easy to locate, such as bone, ligament, or tendon pain, and is often described as a sharp pain. *Visceral* or internal organ pain is difficult to locate, is felt across a larger area, and is often described as a gnawing or pressing pain. It can be associated with nausea, paleness, and palpitation (Shorten *et al*. 2006; McCaffery & Pasero 1999). *Neuropathic* pain comes from a disorder in the nervous system that transmits pain. Postoperative neuropathic pain can be difficult to observe and treat, which increases the risk of the pain becoming chronic (Shorten *et a*l. 2006; McCaffery & Pasero 1999) (see Table 1).

The type of surgery has an effect on pain, although the intensity of a patient's pains does not unambiguously depend on the pain sensitivity of the tissue that is operated on. Thoracotomies and upper gastrointestinal surgeries (Salomäki & Rosenberg 2006) as well as surgeries on the kidneys are painful to patients because the incision is in an area that affects breathing (Bond & Simpson 2006; Ashburn *et al*. 2004). The patient's pain is at its highest intensity immediately following the operation, when the effects of the anesthesia end. Intense pain occurs during the first two days (Salomäki & Rosenberg 2006; Good *et al*. 2001a) and especially when moving (Good *et al*. 1999).

The intensity of the patient's postoperative pain is also influenced by preparation for the surgery, the duration and nature of the procedure, the anesthetic technique, administered medication (Salomäki & Rosenberg 2006; Kalso 2002), and the individual's previous experiences with surgery pain and its management, culture (Salomäki & Rosenberg 2006; Kalso 2002), gender (Cepeda & Carr 2003), and emotional factors such as fear, anxiety, and tension (Bailey 2010; Kalso 2002). In different cultures the patient's attitude and tolerance to pain, as well as reaction to pain, are different (Ton *et al*. 2008). Emotions and moods have an effect on the pain that is experienced. A difficult situation in life, trauma, or illness, as well as the fears and concerns related to these can increase the intensity of pain (Vainio 2002).

Acute pain affects the functioning of the control centers of the autonomous nervous system and hormone secretion located in the hypothalamus. The physiological consequences of postoperative pain to the patient can be weakened breathing activity and tachycardia, which is a result of increased activity of the sympathetic nervous system, and resistance to peripheral circulation and higher blood pressure. Pain increases the workload of the heart and raises oxygen consumption, and can also cause gastric retention, urine retention, and intestinal paralysis. Furthermore, pain can impair the supply of oxygen to tissue by constricting blood vessels, delaying the recovery of a wound (Kalso 2002).

Table 1 Summary of postoperative pain classifications

Type of Pain	Reasons for Pain
NOCICEPTIVE PAIN/INFLAMMATORY PAIN	Tissue damage and inflammatory response caused by surgical incision: redness, burn
• Somatic Pain	• Well localized: joint, bone, or tendon pain
• Visceral Pain	• Well or poorly localized, arises from visceral organs: gnawing pain, nausea, vomiting, looking pale
NEUROPATHIC PAIN	Abnormal processing for sensory input by the peripheral or central nervous system

2.3 GASTROENTEROLOGY PATIENTS' POSTOPERATIVE PAIN ASSESSMENT

After an operation, pain is first assessed on the basis of the patient's pain behavior (crying, complaining, not moving, silence) and on the basis of verbal description. (Jacobi *et al*. 2002). Moreover, a patient's pain can be identified from physiological factors (blood pressure, heart rate, respiratory rate, periphery heat, color of skin) (Herr *et al*. 2006). The patient's pain can also be assessed by determining the concentration of stress hormones in the blood (for example S-cortisol) (Uzunköy *et al*. 2000) or by studying the brain (PET, fMRI) (Pirttilä & Nybo 2004), but their use as a method for assessing postoperative pain is expensive and slow. Due to the multidimensional nature of pain, it is important that a patient's pain be assessed from the perspectives of both intensity of pain and the concern or distress it causes. Because patients themselves assess their pain, it's important to give them exact instructions on how to use the pain scale before the procedure (Good *et al*. 2001b).

The Numeric Rating Scale (NRS) assesses the intensity of pain on a scale of 0–100 or 0–10. The extreme numbers are classified as either (0) "no pain at all" or (10/100) "worst possible pain". The Verbal Rating Scale (VRS) includes a variety of definitions of pain intensity, such as no pain, minor, moderate, or unbearable pain. The patient chooses a word that best describes his or her pain. The Visual Analog Scale (VAS), a graphic classification scale or line scale, measures the intensity of pain on a line with text on both ends that describes the intensity of pain; no pain – unbearable pain. These are the most frequently used, simple, and one-dimensional scales; they measure the intensity of pain, in other words the sensory dimension (Hjermstad *et al*. 2011; Breivik *et al*. 2008; Melzack & Katz 2006) in adult patients.

Furthermore the Present Pain Intensity (PPI) pain scale, which provides points for verbal assessment of pain intensity, is also used in assessing postoperative pain. The PPI scale is a shortened version of the McGill Pain Questionnaire (MPQ) (Gagliese & Katz 2003). The Face Rating Scale (FRS) scale is used to assess the intensity of pain with six different faces, each of which is given a point on a scale of 0–10. The scale is mostly used to assess children's pain, but also adult patients' pain (McCaffery & Pasero 1999). Table 2 shows self-assessment scales used by adult patients in the management of postoperative pain. In this study, patients assessed their pain using the VAS and NRS scales. Furthermore, in connection with assessing pain, the patients' blood pressure, heart rate, and respiratory rate were measured.

Table 2 Adult patients' one-dimensional self-report measures of postoperative pain

Pain scales	Assessment characteristics of pain scale
VAS (Visual Analog Scale)	VAS is a horizontal 10-cm line: no pain on one end – most imaginable pain on the other end.
NRS (Numeric Rating Scale)	The patient is asked to rate pain from 0–10 or 0–100. No pain (0) – worst possible pain (10) or (100). Can be used vertically or horizontally.
VRS (Verbal Rating Scale)	The patient is asked to assess pain verbally such as: no pain, little pain, considerable pain, or terrible pain.
PPI (Present Pain Intensity), part of the MPQ questionnaire	Verbal assessments of pain are numbered: no pain (0), mild (1), discomforting (2), distressing (3), horrible (4), and excruciating (5).
FRS (Faces Rating Scale) Wong-Baker	The patient assesses pain with six facial expressions suggesting various pain intensities 0–10.

It is difficult to draw uniform conclusions on the reliability of pain scales used for assessing pain when managing postoperative pain because surgical procedures, patients' individual differences, and medications vary (Appendix 1). According to Jensen and Karoly (2001), the VAS scale is reliable for measuring the intensity of pain after operation for young people, but it is not sensitive for measuring the pain of elderly patients because it is difficult for them to understand and use only a line (Gagliese *et al*. 2005; Rakel & Herr 2004). In a study by Lundbergin *et al*. (2001), chronic pain assessed on the VAS scale is overrated, and some people felt it was difficult to use. Good *et al*. (2001b) and Jensen *et al*. (2002) came to the opposite conclusion as they reported that the VAS scale is sensitive for assessing the effectiveness of nonpharmacological interventions in the management of postoperative pain also with elderly patients.

The VRS has been demonstrated to be reliable for assessing the intensity of pain (Noble *et al*. 2005), especially with elderly patients (Rakel & Herr 2004; Gagliese & Katz 2003), but it requires verbal skills to describe the intensity of pain verbally (Gagliese & Katz 2003). The NRS has been demonstrated to be reliable for young (Jensen & Karoly 2001) and elderly patients (Gagliese *et al*. 2005). According to an evaluation by Breivik *et al*. (2008), the NRS and VAS measures are sensitive and uniform measures (also Hjermstad *et al*. 2011) when assessing postoperative pain, compared to the VRS pain measure. To prevent breathing and circulation complications, it is important to assess pain at rest, when breathing deeply, when coughing, and when moving. The PPI pain measure is reliable for young people, and also for the elderly when assessing chronic pain (Jensen & Karoly 2001).

The nature of the surgery, uncertainty of the disease and the next procedure, anesthesia, fear of death, complications, and a feeling of helplessness affect the mood and anxiety of a patient (Wakim *et al*. 2010; Hart 2009). Symptoms of somatic pain often include fatigue, lack of appetite, weight loss, inability to focus, and difficulty sleeping. Patients suffering from depression exhibit similar symptoms. Anxiety, depression, and fear before surgery reduce a patient's postoperative tolerance of pain; therefore, it is important to assess the patient's mood in addition to physical symptoms (Wakim *et al*. 2010; Bond & Simpson 2006; Cohen *et al*. 2005.).

The patient's pain and anxiety in postoperative pain management is usually measured with only either the VAS measure (Walworth *et al*. 2008; Good *et al*. 2005) or the NRS measure (Nilsson *et al*. 2005; Nilsson *et al*. 2003). According to Kahl and Cleland (2005), both pain measures are suitable in clinical use for measuring the intensity of pain as well as changes in the intensity of pain (Breivik *et al*. 2008). Furthermore, the anxiety of a patient has been assessed using the STAI (State-Trait Anxiety Inventory) measure, which measures the state and traits of an individual's anxiety at a particular moment (Mok & Wong 2003).

2.4 GASTROENTEROLOGY PATIENTS' POSTOPERATIVE ANALGESIA

Postoperative pain management is planned individually, taking into account the type of surgery, the patient's condition, age, needs, and wishes (Ashburn *et al*. 2004). After large and painful surgery, such as upper gastrointestinal surgery, epidural analgesia is used for pain alleviation in addition to anti-inflammatory drugs, paracetamol, and opioids (Salomäki & Rosenberg 2006). If pain medication cannot be administered orally or if rapid pain alleviation is needed, the medication is administered intravenously (Kalso 2002).

Anti-inflammatory drugs and paracetamol can be used to treat minor or moderate postoperative pain either together or separately. Anti-inflammatory drugs alleviate pain, reduce fever, and inhibit inflammation. Their adverse effects on patients are gastroesophageal reflux, risk of bleeding, and kidney damage. Paracetamol reduces pain and reduces fever, but the drug does not have an anti-inflammatory effect. Damage to the abdomen or kidney does not occur in connection with its use, but when used alone the pain-alleviating effect of paracetamol is weak (Laurila 2006). When pain is intense, either weak or strong opioids are also administered (Bond & Simpson 2006; Salomäki & Rosenberg 2006); these are particularly effective on pain related to tissue damage (Salomäki 2006). The most common adverse effects of opioids are nausea, drowsiness, respiratory depression, and a slowing down of the functioning of the gastrointestinal tract (Salomäki 2006). Studies have shown that joint use of anti-inflammatory drugs and opioids, or paracetamol and opioids, alleviates pain better than if they are used individually (Rakel & Herr 2004; Ashburn *et al*. 2004). Maximum daily dosages have been determined for anti-inflammatory drugs and paracetamol because the risk of adverse effects from these drugs increase with the size of the dosage (Kalso 2002).

Epidural pain alleviation is appropriate after extensive surgical procedures. It is effective if a catheter is placed in the epidural space at a level that corresponds to the surgical trauma, the catheter is fastened securely, and the dosage of medication is appropriate (Salomäki & Rosenberg 2006). The epidural drug mixture can contain an anesthetic, opioids, and adrenaline. Treatment of epidural pain requires that the nursing staff have the knowledge and skills to implement the planned alleviation of pain. The patient's drowsiness, breathing, heart rate, blood pressure, pain, and numbness in the lower limbs are monitored regularly. The advantages of epidural pain alleviation are a reduction in thromboembolic complications, the patient's improved mobility, and functioning of the intestine. The adverse effects of epidural pain alleviation are breathing depression, reduced blood pressure, itching, and motor weakness (Salomäki & Rosenberg 2006; Ashburn *et al*. 2004.).

Block *et al*. (2003) conducted a meta-analysis of administration of epidural analgesia and opioids intravenously or intramuscularly in the management of postoperative pain. The study indicated that on the first four days after surgery, epidural pain management achieved better pain alleviation than parenterally administered medication. No significant differences in pain alleviation were found between drugs administered into the epidural space, such as an opioid and anesthesia, only anesthesia, or only an opioid. Epidural pain alleviation was determined to be better in nearly all surgery. Of the adverse effects, nausea and itching occurred less than expected, and numbness in the lower limbs occurred to some extent. Appropriate epidural analgesia supports the patient's quicker recovery from surgery, reduces complications, and increases satisfaction with treatment.

3 Music as a Nonpharmacological Pain Relief Method in Postoperative Pain Management of Adults

At the end of the 1800s in the USA, music interventions were used for the first time in the treatment of mentally and physically ill patients. At the same time, recorded music was played in hospitals to reduce a patient's anxiety and to help put patients to sleep in connection with surgical operations (White 2001). Dentists began using music to distract patients' attention away from the unpleasant circumstances and sound of the drill as early as the 1940s. Florence Nightingale noticed that listening to music especially that of wind and stringed instruments had a beneficial effect on pain (Nightingale 1969).

Music has been used to alleviate pain of people of different ages, such as the newly born, children, young people, and the elderly. It has been demonstrated to have positive effects after surgery (Chang & Chen 2005), during painful procedures (Weeks & Nilsson 2010; Chan *et al*. 2006), and when giving birth (Siedliecki & Good 2006). It has also been demonstrated to ease long-term pain (Mitchell 2007) and the pain experienced by patients with cancer pain (Huang et al. 2010).

Studies have demonstrated that listening to music, especially one's favorite music, activates the brains and release dopamine pleasure hormones in the brain (Salimpoor *et al*. 2011; Baumgartner *et al*. 2006). Music has a wide-ranging effect on brain activity: identification of the height of pitches and melodies occurs in the listening area of the cerebral cortex in the temporal lobe, identification of harmony in the frontal lobe, and detection of rhythm in the temporal, vertex, frontal lobe, and cerebellum region (Perez & Zatorre 2005). The effects of music are unique to the individual, and the listening experience is affected by the pleasure produced by the music, the individual's mood, alertness, and memories associated with the music (Särkämö *et al*. 2008).

Music contains three essential elements: rhythm, melody, and harmony (White 2001). *Rhythm* refers to the division of time into parts by alternating stressed and unstressed beats. Rhythm gives music a structured, systematic, and regular element; special attention must be given to this element when selecting music for a particular purpose (White 2001). Music with a slow and even rhythm is relaxing (White 2001) and can reduce anxiety, whereas music with a fast tempo can increase tension (Yung *et al*. 2002). *Melody* refers to the formation of consecutive pitches. In music, the melody is comprised of pitches and the duration of tones, i.e. rhythm. The pitch of a melody is determined by how often sound vibrates per second. Rapid vibrations result in high sounds, whereas slow vibrations of sound produce low sounds. High-pitched music can produce tension and low-pitched music can calm the listener. The melody of a musical composition contributes to the listener's emotional reaction (White 2001). *Harmony* refers to the entirety of several melodies played at once. It has a direct effect on the listener's emotions. The listener classifies chords as either consonant or dissonant. Consonant chords are regularly arranged tones. Dissonant chords consist of noise and a chaos of notes (White 2001).

Listening to music is a cognitive behavioral procedure that emphasizes the significance of thoughts, attitudes, and beliefs on emotional responses and behavior. By changing one's thoughts, it is possible to influence the emotions and sensations experienced by an individual (Turner & Romano 2001). Cognitive behavioral methods vary by technique and aims. The most common methods include relaxation, use of guided imagery, use of breathing techniques combined with e.g. relaxation or guided imagery exercises, and directing attention away from pain by listening to music, for instance (Nilsson 2001).

The right half of the human brain reacts to music's non-verbal form. This side of the brain processes information intuitively, in a creative and imaginative way, and generates psychophysiological reactions through the limbic system. The limbic system is the center of emotions, feelings, and sensations, and is involved in the perception of punishment, pleasure, reward, and pain (White 2001). Music affects the perception of pain because of its direct effect on the ability of the cortex of the sensory brain to receive pain sensations.

Music therapy refers to the controlled use of music by a musical therapist (Kemper & Danhauer 2005, McCaffrey & Locsin 2002); its purpose is to support the physical, mental, and emotional wholeness of individuals during illness and produce changes in physiology, behavior, and emotions (Tanguay 2008). When nursing staff use music in nursing care, it is called listening to music, or currently "music medicine" (Nilsson 2011), because nursing staff do not have a music therapist's training, the nurse is not present during the listening, and when the music is selected, particular attention is not given to the patient's whole physchophysical state as it pertains to the rhythm, melody, and harmony of the music (Nilsson 2009; Masuda *et al*. 2005).

3.1 MUSIC LISTENING POSTOPERATIVELY

The purpose of listening to music in treating a patient is to ease his or her recovery and to enhance the patient's feeling of well-being (Bernatzky *et al*. 2011; Phipps *et al*. 2010). Music has been demonstrated to affect an individual's physiology, behavior, and emotions (Phipps *et al*. 2010; Salimpoor *et al*. 2009; Kemper & Danhauer 2005). It can boost a patient's self-esteem, alleviate pain (Ebneshahidi & Mohseni 2008; Good & Ahn 2008; McCaffrey & Locsin 2006; Sendelbach *et al*. 2006) and anxiety (Phipps *et al*. 2010; Walworth *et al*. 2008; Sendelbach *et al*. 2006), reduce mental confusion following surgery, and maintain muscle condition and mobility (McCaffrey & Locsin 2006). Listening to music as a nonpharmacological method is inexpensive, easy to implement (Cepeda *et al*. 2008), and does not cause adverse side effects (Siedliecki *et al*. 2006; Mok & Wong 2003; Nilsson *et al*. 2003), unless the music reminds the listener of unpleasant events (White 2001).

Listening to music in postoperative pain management is listening to music for a set period of time through earphones. The different elements of music (rhythm, melody, pitch), the listener's age, education, culture (Kemper & Danhauer 2005; Good *et al*. 2000), and musical preferences (Sammler *et al*. 2007; McCaffrey & Locsin 2006; Kemper & Danhauer 2005) affect individually and must be taken into account when selecting music (Leardi 2007; Guzzetta 2000). With regard to the patent's feeling of well-being and his or her recovery, it is important that the music be suitable for the patient's mood and preferences (Li *et al*. 2011; Leardi *et al*. 2007; McCaffrey & Locsin 2002). Also significant are the volume of the music and whether the music is listened through earphones or speakers (Kemper & Danhauer 2005). Before listening to music, it is necessary to make sure the listener's position and condition are such that he or she can focus on listening to music. Furthermore, the environment should be made as peaceful as possible by minimizing excessive noises and other activities (Guzzetta 2000).

3.2 MUSIC INTERVENTIONS IN THE PAIN RELIEF OF ADULT SURGERY PATIENTS

The effects of listening to music in the relief of surgical pain in the past decade has been studied preoperatively in elective day surgery (Wang *et al*. 2002), in transurethral prostatectomy (Yung *et al*. 2002), and with patients going to surgery to repair a joint (Brunges & Avigne 2003) (Appendix 2).

Listening to music during surgery has been studied with patients undergoing knee surgery (Kang *et al.* 2008; Simcock *et al*. 2008), C-section patients (Reza *et al.* 2007), and patients undergoing minor surgical procedures (Szmuck *et al.* 2008; Mok & Wong 2003) (Appendix 3). Music intervention studies carried out both before and after surgery have been conducted with gynecology (Hook *et al*. 2008; Ikonomidou *et al*. 2004) and neurosurgery patients (Lin *et al.* 2011; Walworth *et al*. 2008) (Appendix 4). The effects of listening to music have been assessed during and after surgery with patients undergoing inguinal hernia surgery (Nilsson *et al*. 2005) and patients undergoing inguinal hernia and varicose vein surgery (Nilsson *et al*. 2003). Moreover the effect of music intervention has been studied with day surgery patients before and during surgery (Leardi *et al*. 2007). Binns-Turner *et al*. (2011) have studied the effect of listening to music pre-, intra-, and postoperatively with patients undergoing mastectomy (Appendix 5).

The effects of listening to music exclusively after surgery have been assessed with orthopedic patients (Allred *et al*. 2010; McCaffrey & Locsin 2006; Masuda *et al*. 2005), patients who had undergone day surgery (Easter *et al*. 2010), gynecology patients (Ebneshahidi & Mohseni 2008; Good & Ahn 2008), patients who had undergone heart surgery (Özer *et al*. 2010; Sendelbach *et al*. 2006; Voss *et al*. 2004), and sinus surgery patients (Tse *et al*. 2005) (Appendix 6). The study designs in these studies vary with regard to moments of measurement, amounts of intervention, and duration. Also, the sample size is not defined in all of the studies.

Music is also used in combination with a relaxation method (Good *et al*. 2005), guided imagery (Laurion & Fetzer 2003), massage (McRee *et al*. 2003), and therapeutic suggestion (Nilsson *et al*. 2001) (Appendix 7).

Listening to music pre-, intra-, and postoperatively has had a positive effect on patients' experiences of the treatment they receive (Easter *et al*. 2010; McCaffrey & Locsin 2006). It has helped patients relax and direct their thoughts away from pain, fear, and anxiety (Voss *et al*. 2004; Brunges & Avigne 2003; Mok & Wong 2003). Research patients who listened to music were comforted in an unpleasant situation and music felt familiar in an unfamiliar setting (Mok & Wong 2003). Moreover, listening to music after surgery reduced mental confusion and improved patient mobility (McCaffrey & Locsin 2006).

Physiological factors such as heart rate, blood pressure (Tse *et al*. 2005; Ikonomidou *et al*. 2004; McRee *et al*. 2003; Mok & Wong 2003), and respiratory rate (Chlan 1998) have been shown in studies to decline after listening to music. Allred *et al*. (2010), Easter *et al*. (2010) and Özer (2010) *et al*. got opposite results; according to them, listening to music does not affect the physiological factors of patients, such as blood pressure and heart rate or respiratory rate. The concentration of stress hormones, such as cortisol and catecholamine, in the blood rises as a result of stress, anxiety, and pain caused by surgery. The research findings on concentrations of stress hormones after music intervention vary. According to a study by Brunges & Avigne (2003), the level of catecholamine in patients who listened to music declined and the blood's cortisol percentage was lower than in patients who did not listen to music (Leardi *et al*. 2007, Nilsson *et al*. 2005). Likewise, in a study conducted by Wang *et al*. (2002) there were no differences in concentrations of stress hormones (also McRee *et al*. 2003).

Studies have shown that the need for analgesia is less for patients who listen to music after surgery (Tse *et al*. 2005; Nilsson *et al*. 2005, Nilsson *et al*. 2003). The opposite result was obtained by Allred *et al*. (2010), who did not find that music had any effect on the amount of analgesia (also Walworth *et al*. 2008; Sendelbach *et al*. 2006) or well-being. Patients who listened to music after surgery felt less pain (Good & Ahn 2008; McCaffrey & Locsin 2006; Sendelbach *et al*. 2006). On the other hand, according to a study by Nilsson *et al*. (2003), listening to music has a short-term effect on experienced pain, or its effect cannot be demonstrated at all (Allred *et al*. 2010; Easter *et al*. 2010; Ikonomidou *et al*. 2004).

In many music intervention studies, the subjects were satisfied and enjoyed the music they listened to (Easter *et al*. 2010; Walworth *et al*. 2008; Ikonomidou *et al*. 2004). The length of hospital stay was shorter for patients who listened to music in a study conducted by Brunges and Avigne (2003), but Walworth *et al*. (2208), Good *et al*. (2005) and Laurion and Fetzer (2003) did not find that it had any effect. Cepeda *et al*. (2008) reviewed and analyzed the effects of listening to music on the intensity of patients' pain, alleviation of the pain, and the need for analgesia in the management of acute, chronic, and cancer pain. According to the review, listening to music after surgery reduces the intensity of pain and the need for analgesia. However, the significance of these positive results is small and it is unclear whether listening to music alleviates pain after surgery.

Table 3 shows music intervention studies conducted from 2004 to 2010, in which the effectiveness of the intervention is assessed with pretest and posttest measures. The studies mostly demonstrated that listening to music eases pain after surgery. In some studies, patients who listened to music also had lower anxiety.

Table 3 Studies between 2004–2010 on postoperative music interventions in the alleviation of adult surgery patients' pain using a pretest-posttest design

Authors	**Music intervention**	**Sample**	**Instruments and measures**	**Main findings**
Allred *et al*. 2010 USA	Postoperative Music group: Music 1st pop 20 min. before the first ambulation and for a 20 min rest period after the ambulation. Quiet rest group. Pretest - posttest design	Total knee arthroplasty n = 56 Power Analysis	VAS Bp, Hr, Rr SO2 Analgesia Music listening experience	There were no statistically significant differences in pain, anxiety, analgesia used, blood pressure, heart rate or respiratory rate levels, or oxygen saturation between groups.
Özer *et al*. 2010 Turkey	Postoperative Music group: music 1st pop 30 min Control group: bed rest, no music Pretest – posttest design	Heart surgery n = 87 Power analysis	VPS Bp, Hr, Rr SpO2	The music group saw a significant increase in SpO2 and a lower pain score than in the control group. There were no differences in the other physiological parameters between the two groups.
Good *et al*. 2008 Korea	Postoperative The music group: Music on 1st and 2nd postoperative days. Control group: Bed rest Pretest – posttest design	Gynecological surgery n = 73 Power Analysis	VAS	In the music group there was significantly less pain intensity and distress compared with the control group on both days after surgery.
Sendelbach *et al*. 2006 USA	Postoperative Music group: Music 1st. – 3rd postoperative days. Control group: Rest in bed Pretest – posttest design	Cardiac surgery n = 86 No Power Analysis	NRS STAI Bp, HR Analgesia	In the music group there was a significant reduction in anxiety and pain compared with the control group. Between groups there were no significant differences in blood pressure, heart rate, or analgesia used.
Tse *et al*. 2005 China	Postoperative Experimental group: Music ½ - and 4 h after returning to the ward from the operating room and on 1st postoperative day. Control group: No music Pretest – posttest design	Nasal surgery n = 57 No Power Analysis	SBp, Hr VRS Analgesia	In the music group systolic blood pressure, heart rate, and pain intensity were lower during the first day of surgery and the need for analgesic was less.
Voss *et al*. 2004 USA	Postoperative Group 1: Music during chair rest. Group 2: Scheduled rest in the chair, no music. Control group: No music. Pretest – posttest design	Open-heart surgery n = 61 Power Analysis	VAS pain, anxiety, and pain distress Questionnaire about intervention Observation	Music listening during chair rest significantly reduced anxiety, pain sensation, and pain distress compared with scheduled rest in the chair or treatment as usual.

Bp = Blood pressure, Hr = Heart rate, Rr = Respiratory rate, SO2 = Oxygen saturation, VAS = Visual Analog Scale, NRS = Numeric Rating Scale, STAI = State Anxiety Inventory, SBp = Systolic Blood pressure, VRS = Verbal Rating Scale

4 Summary of Existing Literature

A patient's pain is a unique and multidimensional experience (Figure 2). Pain after gastroenterological surgery can result in physiological changes in the patient's body, such as increased blood pressure and respiratory and heart rates. Furthermore, pain can slow down the healing of a wound and cause urine and gastric retention, which delays recovery. The experience of pain after gastroenterological surgery is affected by the patient's life situation, age, beliefs and attitudes toward surgical pain, feelings of fear, anxiety and tension, as well as earlier experience with pain. Insufficient alleviation of pain reduces the patient's satisfaction with his or her care, extends recovery and the length of hospital stay, lowers his or quality of life, and can make the pain chronic. In addition to epidural pain management, pain medication in connection with large and painful gastrointestinal surgery usually includes anti-inflammatory medicine or paracetamol, as well as supplemental opioid, if needed.

Assessment of a patient's postoperative pain requires reliable measures, competent people taking the measurements, and continual and consistent assessment. To be a reliable measure of pain, it must be easy and quick to use and it must be sufficiently accurate and sensitive to assess the effect of the treatment of pain. Furthermore the pain measure must accommodate statistical analysis and be comparable and reproducible in connection with other studies.

According to the gate control theory, pain caused by tissue damage does not always lead to pain perception by the patient. The gate mechanism of the spinal cord can either allow a pain signal to pass through, alter it, or prevent its passage into the central nervous system. According to cognitive behavioral theory, a patient's emotional and cognitive factors can be influenced by directing attention away from pain, for example by listening to music, thus preventing the pain signal from traveling from the brain to the spinal cord.

By listening to music after surgery, it is possible to affect the patient's feelings of joy, sadness, and fear, as well as behavior, by soothingly creating a feeling of comfort and familiarity in a strange environment. Furthermore, listening to music has a beneficial effect on a patient's physiological factors, such as blood pressure, heart rate, and respiratory rate. Factors that affect how a patient experiences listening to music include the nature of the music, the patient's age, mood, musical preferences, and culture.

The results of research on the effects of listening to music in the alleviation of surgery pain and on the reliability of pain assessment measures are somewhat mixed because of the variability of the research data. Samples are small or no power analysis was conducted to determine the sample size. Furthermore, surgical procedures vary from minor surgery to extensive procedures. There are differences in the presentation of questions and the study designs. The number of interventions varies in different studies from one to twelve times, and they are usually carried out on the day of the surgery and on the third postoperative day. Interventions are implemented either by taking initial measurements, by conducting several interventions and final measurements, or by taking measurements before an intervention and immediately after the intervention.

Quasi-experimental music intervention studies after surgery have been conducted before the recovery room phase, but few studies have been conducted in a ward. Generally studies have assessed pain only from a perspective of intensity; very few have looked at pain from the perspective of distress. Also, very few studies have assessed pain in connection with rest, deep breathing, and shifting position. Furthermore, very little attention has been given to assessing respiratory rate. There are very little research data on the long-term effects of listening to music. Moreover, patients' experiences of listening to music after surgery have not been studied systematically. There is little information on the practical implementation of an intervention nationally or internationally. There is a need for more studies that can demonstrate the significance of nonpharmacological methods and develop nursing practices so they can contribute to the postoperative recovery of patients and enhance their feeling of well-being.

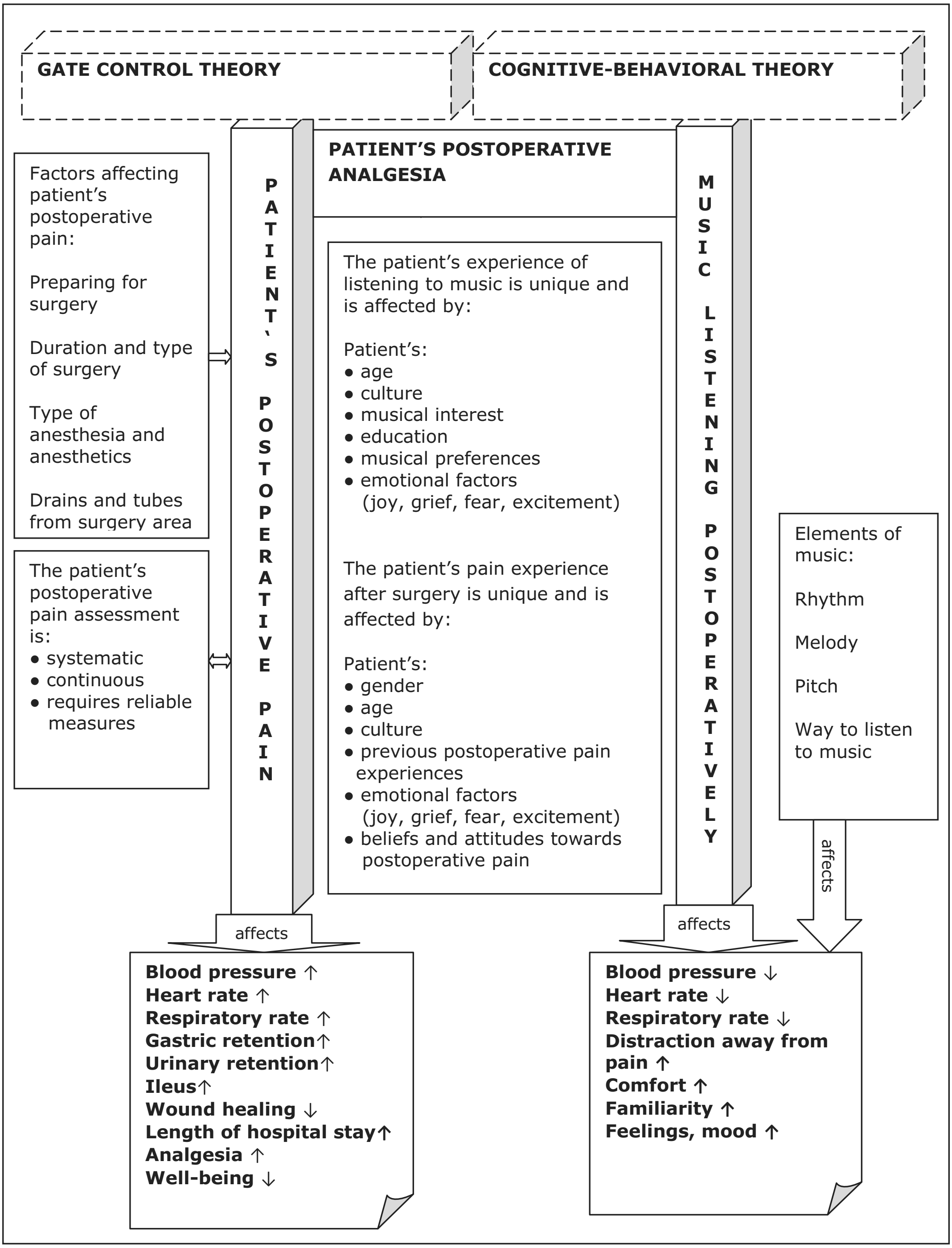


Figure 2 Summary of factors of a patient's postoperative pain and music listening experience and their effects on abdominal surgery patients
↓ = decreases, ↑ = increases

5 Purposes of the study and hypothesis

The purpose of this study was to assess how listening to music affects abdominal surgery patients' pain intensity and distress at rest, during deep breathing, and when shifting position; the amount of analgesia, adverse effects of analgesia, and length of hospital stay; and physiologic parameters such as systolic and diastolic blood pressure and heart and respiratory rates. Moreover, the purpose of the study was to get information on patients' music listening experiences after surgery. The ultimate aim was to both obtain information about the effectiveness of nonpharmacological intervention and establish music listening as a part of pain management. In addition, the study provides information about pain management and intervention research in practice.

The research hypotheses were:

1. Patients in the music group who receive standard care and listen to music after surgery experience less pain intensity and pain distress than those in the control group who get standard care (Articles 1 and 4).

2. Patients in the music group who receive standard care and listen to music after surgery have lower systolic and diastolic blood pressure and heart rate and respiratory rate than those in the control group who get standard care (Articles 2 and 4).

3. Patients in the music group who receive standard care and listen to music after surgery will need less analgesia, experience less adverse effects of analgesia, and have a shorter hospital stay than those in the control group who get standard care. (Articles 3 and 4)

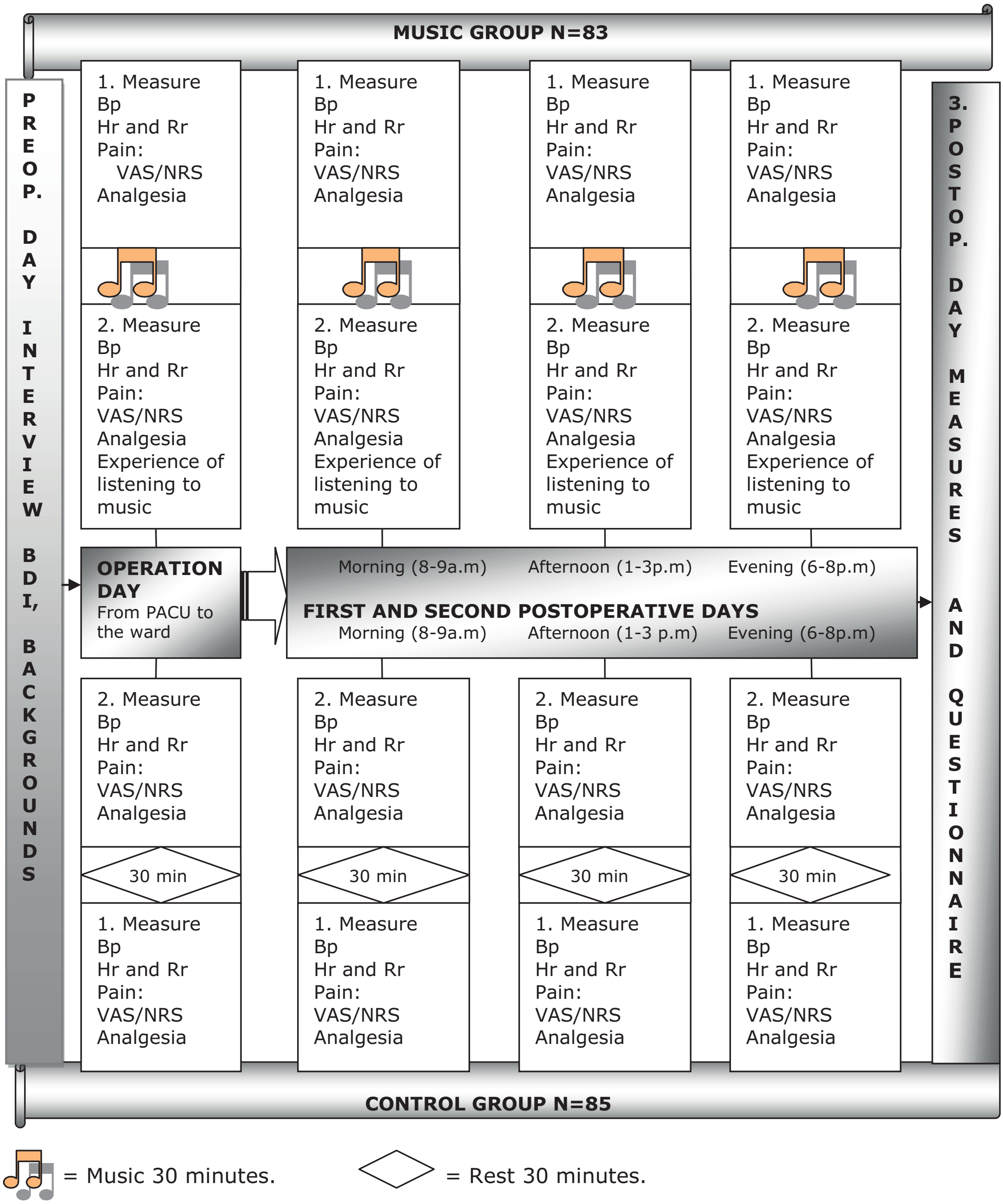
6 Study design and Data

6.1 STUDY DESIGN

The study design was quasi-experimental. This study design made use of manipulation and control, but randomization was not executed through pure randomizing (Craig *et al*. 2008). I influenced the subjects through manipulation by playing music to the subjects who were in the music group. The control group received care that was according to established practice. Patients were included in the music group (n = 83) and control group (n = 85) based on every-other-week. From the beginning of the study, music was listened to every other week (odd-numbered weeks) according to the calendar year, until there were at least 83 patients in the trial and control groups. The research subject was informed whether he or she would be part of the music or control group on the evening of the day of surgery. I collected all the research data myself, so the staff did not receive training in the intervention used.

I looked through the surgery plans of the hospital wards for potential patients that would be suitable for the study. On the day before the surgery, I familiarized myself with the patient's papers, evaluated the exclusion criteria and the appropriateness of the patient for the study, and checked the risk classification of anesthesia from the surgery list and the epidural analgesia of the plan. I interviewed the patients and informed them of the study on the day before the surgery. The patient interview lasted from half an hour to one and a half hours. Before the surgery the subject's current mood was assessed with the Beck Depression Inventory (BDI) measure (Appendix 8). Moreover, the subjects evaluated their previous experiences with postoperative pain, its duration and intensity, as well as their pain at the moment of the interview (Appendix 9).

The study was conducted with a music group-control group design by repeating pretest and post-test measures for each subject a total of seven times between the evening of the surgery day and the second postoperative day. Patients in the music group listened music 30-minute sessions in the evening of the operation day, in the morning (8.00 a.m. – 9.00 a.m.) at midday (1.00 p.m. – 3.00 p.m.) and in the evening (6.00 p.m. – 8.00 p.m.) on the first and second postoperative days. On the third postoperative day one measurement series was conducted (blood pressure, heart rate, respiratory rate, and pain) without an intervention. Patients in the control group were not listening to music, but the measurements were taken half an hour intervals. The measurements were standardized across all patients and were taken immediately before and right after the 30-minutes music intervention (music group) or rest (control group). All of the participants in the study had epidural analgesia after the surgery. In addition, they also received analgesia when needed during the intervention (Figure 3).



Bp = Blood pressure, Hr = Heart rate, Rr = Respiratory rate, VAS = Visual Analog Scale, NRS = Numeric Rating Scale

Figure 3 Music intervention study design

6.2 DATA

Data were collected between March 2007 and April 2009. There are two surgical gastroenterology wards in the Kuopio University Hospital. The specialties of ward 2205 are liver and pancreas surgery, difficult cholangiotomy surgery, gastric banding surgery, treatment of inflammation of the pancreas, adrenal surgery, and other benign gastroenterological surgery. There are 30 beds in the ward. Seventy percent of the patients come to the ward through the emergency ward and the rest are called up for surgery. Ward 2207 is specialized in inflammatory bowel diseases, acute abdominal pains, and gastroenterological diseases such as cancer. The ward has 22 beds and more than half of patients come there through the emergency ward. In 2008 a total of 1784 operations were conducted in the two surgical gastroenterological wards of the Kuopio University Hospital; of these procedures 1179 were elective and 748 were open surgery. Average treatment time in the ward was 4.8 days (Hospital District of Northern Savo 2008).

The target group in this study consisted of adult patients who came for elective gastroenterological surgery in the surgical ward of Kuopio University Hospital and whose estimated hospital stay was at least four days. Their anesthesia classification was 1–3. The anesthesia classification was drawn up by the American Society of Anesthesiologists (ASA) and is a classification of 1–5 that depicts the patient's physical condition and the risks caused by anesthesia. The study participants underwent open surgery and had epidural analgesia following the surgery. They were selected for either the music or control group on the basis of every-other-week. Exclusion criteria were possible known drug abuse, confirmed psychiatric illness, hearing deficiency, dementia, history of chronic pain, or if the patient ended up in another ward during the study.

Based on the power analysis conducted for the study, a sample size of 166, or 83 per group, was calculated, where the mean value used for VAS pain measurements was mean = 3.5, standard deviation SD = 2.4, a clinically significant difference between the groups was defined as 30%, the statistically significant level was $p = 0.05$, and power was 80%. The complete study data set consisted of 280 patients between 21 and 85 years of age coming for gastrointestinal surgery. Ten of them were included in the pilot study. Patients who had been in the pilot study were not included in the final analysis because changes were made to the pain assessment and questionnaire after the pretest.

Twenty-two people declined to participate in the study, fifteen quit voluntarily, and nineteen discontinued for reasons related to the study. The main reason for declining to participate in the study was recently discovered cancer and the shock this caused, as well as fear related to the results of the surgery. The reasons for discontinuing the study were a doctor telling the patient of an unpleasant find in the surgery, an extended period of time in the recovery room, or strong fatigue and frailty after the surgery. Research-related reasons for discontinuing the study were cancellation of the surgery, switching from a laparotomy to a laparoscopy, or the patient was not administered epidural analgesia, in contrast to advance information. Based on the exclusion criteria, 46 patients were excluded from the study. The main reason was a high (4/5) anesthesia classification and dementia. The final number of patients was 168, of which 83 were included in the music group and 85 in the control group.

6.2.1 Music intervention

The patients in the music group received standard treatment after the operation and they listened to music for 30 minutes through earphones on an MP3 player on the day of the operation after coming from the recovery room into the ward, as well as on the mornings, afternoons, and evenings of the first and second postoperative days, a total of three times on both days. Based on a discussion with a music therapist, and based on previous studies

(Leardi *et al*. 2007; Mok & Wong 2003; Wang *et al*. 2003), I decided that the subjects could listen to music they find most enjoyable. I acquired two earphones (Sennheiser HD 555, Tullamore, Ireland and AKG K28NC, Wien, Austria) and two MP3 players (Apple-iPod 8GB, California, USA) for the study. I stored a total of 2,000 pieces of different music on the MP3 player and listed them in a separate folder from which the subjects could select their favorite music. I classified the alternatives as follows: Finnish and foreign hits, dance, pop, rock, soul, blues, spiritual, or classical music. I expanded the selection of music as needed during the study. Few patients did not complete the full 30 minutes music listening time, because of fatigue or severe pain.

The control group received postoperative treatment that was according to established practice, but did not listen to music. Established medical practice refers to pain management designed for the patient and its regular evaluation after the operation.

6.2.2 Instruments and measures

Before their operation the patients filled out a BDI (Appendix 8), which is a self-report measure for mapping the affective, cognitive, and somatic manifestations of a patient's depression symptoms. It contains 21 claims, each of which has 4 choices; the respondent selects the option that best describes his or her mood at that moment. It takes about 5–10 minutes to fill out the BDI. It has proved to be reliable and useful for a variety of patient groups for both clinical and research purposes (Mystakidou *et al*. 2007). The total number of points on the scale varies between 0–63; a higher number of points correspond to a more severe depressive syndrome. The manifestations of depression mapped out in the questionnaire may be congruent with symptoms of somatic illnesses. However, the BDI is a useful measure for screening depressive symptoms even in somatic patients when the numbers of points are examined carefully, looking at different sections and using higher cut-off limits (Viinamäki *et al*. 2004).

Furthermore, the patients responded to background information about their previous experiences with surgical pain and smoking (Appendix 9). For the purposes of this study, I drew up a questionnaire (Appendix 10) to which patients responded on the third postoperative date. The questions were based on previous studies on listening to music, as well as the patients' pain management and assessment. The studies used in drawing up the questionnaire are shown in Appendix 11. The questionnaires were used in the pilot study of the intervention (n = 10), after which changes were added. The reliability of the questionnaire has not been evaluated. To measure blood pressure and heart rates, I used the ward's automatic monitors (Omron M5-I or Omron M6), which are calibrated annually. The VAS and NRS pain measures have been demonstrated to be reliable and sensitive measures of adult postoperative pain (Breivik *et al*. 2008).

The intervention was started on the evening of the operation day if the patient had arrived from the post anesthesia care unit to the ward. Before the intervention I first measured the patient's blood pressure, heart rate, and respiratory rate. I felt the wrist for uniformity of pulse. I counted the respiratory rate from the movements of the chest for half a minute while measuring blood pressure and heart rate. To assess the intensity and distress of pain, I always first used the VAS and then the NRS pain measure. The patient first assessed the intensity of pain at rest, then when breathing deeply, and finally when switching position from one side to another. A small break was taken between each measurement. After the measurements the patients in the music group listened to music for 30 minutes. The patient's spontaneous comments about his or her experience of listening to music were written down immediately after the intervention. The control group had a 30-minute rest between measurements. After the intervention I retook the same measurements in the same order that I had taken before the intervention.

The intervention was conducted on the evening of the operation day and on the mornings, days, and evenings of the second and third postoperative days for a total of seven times. There were no interventions on the third postoperative day, but I still measured the blood pressure, heart rate, and respiratory rate of the subjects. Furthermore, they assessed the intensity and distress of their pain at rest, when breathing deeply, and when moving. Finally, the subjects answered a questionnaire that asked general questions about listening to music and requested the patient to assess the management of their pain after surgery. I wrote down the quantity of analgesia and length of hospital stay from the patient records. In this summary I report only the results obtained from the VAS pain measure.

6.3 DATA ANALYSIS

The data were analyzed with the SPSS 17.0 for Windows statistics software application. Of the 280 gastroenterological patients, 168 met the selection criteria and were included in the analysis. Frequency and percentage distributions, as well as means and distributions, were used in describing the data. Differences between groups, in terms of intensity and distress of pain, and blood pressure, heart rate, and respiratory rate, were analyzed using repeated measures Anova.

The purpose of the analysis was to determine whether there was a difference between groups, whether there was a difference between measurement instances, and whether the groups had similarly-shaped profiles around the mean. Pain measurements on the VAS on the first and second postoperative days are reported as average values. The evening of the operation day was left out of the analysis because more than half of the observed values were missing from the study data set. One of the patients in the control group was blind and assessed his or her pain with the NRS pain scale. Additionally, one patient in the control group was incoherent on the third postoperative day, so his assessment of pain for the third postoperative day was excluded from the analysis. On the third postoperative day the long-term effect of listening to music on the intensity and distress of pain was examined with a non-parametric Mann-Whitney U test of independent groups (Burns & Grove 2005). Qualitative data on the patients' music listening experiences were analyzed with content analysis (Granheim & Lundman 2004). The patients' descriptions of their experiences of listening to music immediately after the music intervention were written down. As I was a researcher, I did not prompt the patients by asking, for instance: "How did listening to music feel?" Rather, the recording of the patients' experiences was based on their spontaneous comments. I began processing the data by writing down one patient's experiences of listening to music during seven different listening times into a uniform format. The phrases expressed by the patients about listening to music were categorized quantitatively. The categorization of content was guided by cognitive behavioral theory and patients' descriptions of experiences with postoperative music listening in earlier studies. The same patient might describe his or her listening to music with several expressions. These were included in the categorization of content, but the same expression was included in the analysis only once for each individual patient.

6.4 ETHICAL CONSIDERATIONS

The ethical principles of the study include, in particular, the researcher's responsibility for the conducting of the research process and the rights of the subjects (Medical Research Act 488/1999, 794/2010; Act on the Status and Rights of Patients 785/1992). To guarantee competence in this study, I collaborated with representatives from the fields of medicine, statistics, and musicology. Furthermore, I consulted with the nursing staff to deal with practical arrangements to ensure the success of the study. I collected the data myself, as a result of which almost no resources of the staff were needed to complete the study (Polit & Beck 2010). I applied for permission to conduct the study from the senior physicians and head nurses of the wards and clinics that participated in the study. Moreover, I received the assent of the research ethics committee (authorization number 6/2007) of Kuopio University Hospital to conduct the study.

I informed the patients who were suitable for the study on the day before the surgery. I went through the written analysis report with the subject, after which the patient was allowed to decide whether or not to participate in the study. I explained the procedure of the study to the subject; how much time it will take and what kind of data would be collected about them during the study (Kuula 2006). I asked all of the patients participating in the study for written consent, and I read it aloud to them before they signed it. In addition to the purpose and implementation of the study, I emphasized that participation in the study was voluntary and declining to participate would not adversely affect the care and treatment they receive. The patients could also discontinue the study if they wished without any particular reason (Länsimies-Antikainen *et al*. 2007). I emphasized the confidentiality of the responses to the subjects and the fact that there were no correct or wrong answers. I processed the responses related to the study confidentially and no record of them was entered into patient records (Burns & Grove 2005). Because I collected the research data myself, the subjects could also ask about the study during the conducting of the study (Act on the Status and Rights of Patients 785/1992; Medical Research Act 488/1999, 794/2010). When I assessed the benefits and risks of the study, I determined that participation would not cause harm to the examinees. On the other hand, my multiple visits during the early stage of recovery may have been a burden to the patients. Some of the subjects felt the visits were pleasant and added variety.

When informing the patients about the intervention being used and while implementing it, I made sure the opinions of the subjects were not manipulated and that the instructions regarding the intervention were presented in a neutral manner. Everyone received analgesia that was part of established standard practice, both during and after the study. I told the subjects about my nursing background and how I was functioning as a researcher at the time of the study. I did not work as a nurse during the time I was collecting data (25 months). The nurse of the ward always estimated the infusion rate of the pain epidural based on the intensity of the patient's pain and administered additional medication as needed. I met the patients participating in the study in civilian clothing and the interaction situations took place on their terms. I usually began the discussion by asking about the well-being of the patient. It was difficult to anticipate the fears, mood swings, physical fatigue, and nausea of the examinees. It required sensitivity and professional skill to assess the situations during the study and the ability to listen to the patient (Kankkunen *et al*. 2002).

While I was collecting the data, I regularly informed the nursing staff, the doctors in the ward, the senior physician of the clinic, and the head nurse about the progress of the study. Furthermore, I submitted a notification of change to the committee of research ethics regarding the prolonged collection of data.

7 Results

7.1 PARTICIPANTS OF THE STUDY

There were 42 men and 41 women in the music listening group. Their average age was 60 years. In the control group there were 48 men and 37 women. Their average age was 63 years. More than half of the patients in the music group were pensioners (56.6%) and were married or cohabitants (72.3%). In the control group 64.7% were pensioners and 76.5% were married or cohabitants. The majority of the operations in the music group (67.4%) and control group (63.5%) were cancer surgery. The duration of anesthesia in both groups was nearly the same: 3 h 29 minutes in the music listening group and 3 h 25 minutes in the control group. Also, there were no significant differences in the duration of the surgery between the music group (2 h 37 minutes) and the control group (2 h 32 min). There were no significant differences between the groups in terms of age, sex, education, occupation, marital status, diagnosis, surgery type, ASA classification, duration of anesthesia or surgery, time in the recovery room, or the duration or amount of analgesia (Table 4).

Table 4 Background of patients in the music group and in the control group

Background	**Music group (n = 83)** n %	**Control group (n = 85)** n %	**Chi-square**	**df**	***p-value***
Age (ka, SD)	60 (13)	63 (12)			0.149
Gender (M/F)	42/41	48/37	0.58	1	0.466
Vocational education			0.04	5	0.998
No vocational education	20 (24)*	20 (24)			
Secondary level	35 (43)*	37 (43)			
College	14 (17)*	15 (18)			
UAS/University	13 (16)*	13 (15)			
Employment status			0.85	6	0.652
Upper/lower level employee	12 (14)	9 (11)			
Employee/ entrenepreur	22 (27)	18 (21)			
Student	2 (2)	3 (3)			
Retired	47 (57)	55 (65)			
Marital status			1.00	3	0.801
married/cohabitant	60 (72)	65 (77)			
Single	8 (10)	7 (8)			
Widow	8 (10)	5 (6)			
Divorced/separation	7 (8)	8 (9)			
Operation diagnosis			10.48	6	0.106
Ventral Hernia	3 (4)	3 (4)			
Diverticulitis	5 (6)	8 (10)			
Intestinal cancer	39 (47)	35 (41)			
Venrticuli cancer	7 (8)	7 (8)			
Pankreas cancer	10 (12)	12 (14)			
Colitis ulcerosa/ Morbus Crohn	15 (18)	6 (7)			
Other	4 (5)	14 (17)			
ASA			1.39	2	0.499
1	5 (6)	2 (2)**			
2	33 (40)	34 (41)**			
3	45 (54)	48 (57)**			
Epidural analgesia			1.39	2	0.498
Mild mixture	38 (46)	36 (42)			
Strong mixture	12 (15)	9 (11)			
Other mixture	33 (40)	40 (47)			
Fear of postoperative pain	50 (61)	37 (44)	4.77	3	0.029*****
	Mean	**Mean**	**Mann-Whitney U-test**		***p-value***
BDI before surgery	9	9	3206.5		0.442
Duration of anestesia	3h29min	3h25min	3340.0		0.552
Duration of surgery	2h37min	2h32min	3395.0		0.674
Duration in post-anesthesia care	5h58min	6h38min	3239.5		0.361

* (n = 82) Missing data (education)
** (n = 84) Missing data (ASA)
******p-value* < 0.05
ASA = Classification (1–5) created by the American Society of Anesthesiologists, of a patient's physical condition and risks posed by anesthesia.
BDI = Beck Depression Inventory

7.2 INTENSITY AND DISTRESS OF PAIN OF GASTROENTEROLOGY PATIENTS AT REST, DURING DEEP BREATHING, AND WHEN SHIFTING POSITION ON THE FIRST AND SECOND POSTOPERATIVE DAYS (Articles 1, 4)

On the first postoperative day the differences between the two groups in pain intensity and distress were not statistically significant.

On the second postoperative day after intervention pain intensity and distress during bed rest, when breathing deeply, and when shifting position decreased in the music group significantly more than in the control group.

In the music group, *pain intensity during bed rest* before intervention on the VAS was 1.3 (SD 1.5) and after intervention, 1.0 (SD 1.2). In the control group, *pain intensity during bed rest* before a half-hour break on the VAS was 1.6 (SD 1.8) and after the break, 1.5 (SD 1.8) (p = 0.02) (Figure 4).

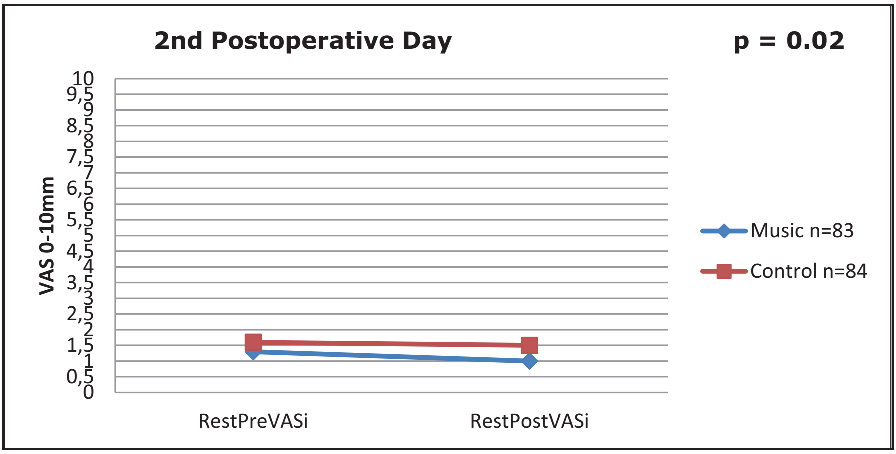


Figure 4 Pain intensity during bed rest on the second postoperative day before (pre) and after (post) intervention in the music group and control group as measured by the VAS 0 – no pain, 1-2 – mild pain (Repeated-measures ANOVA)

Pain distress during bed rest before intervention in the music group on the VAS was 1.3 (SD 1.3) and after intervention, 0.9 (SD 0.9). In the control group, *pain distress during bed rest* before a half-hour break on the VAS was 1.6 (SD 1.8) and after the break, 1.5 (SD 2.0) (p = 0.01) (Figure 5).

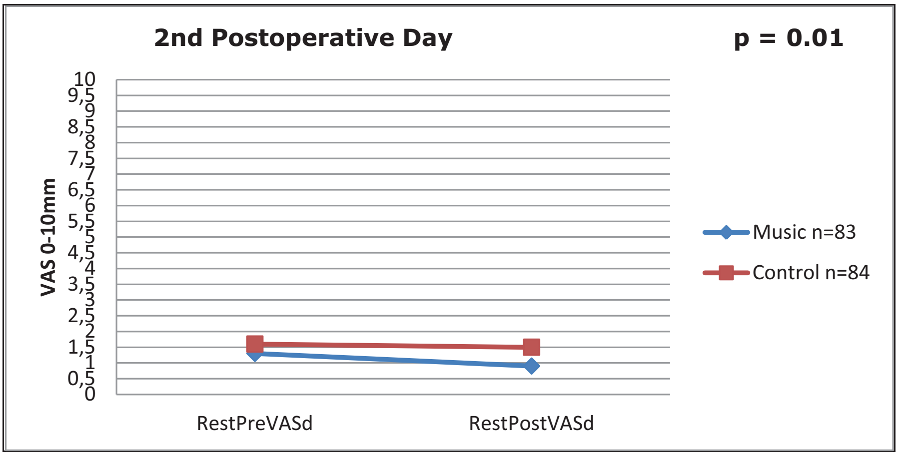


Figure 5 Pain distress during bed rest on the second postoperative day before (pre) and after (post) intervention in the music group and control group as measured on the VAS 0 – pain is not at all unpleasant; 2 – pain is a little uncomfortable (Repeated-measures ANOVA)

In the music group, *pain intensity when breathing deeply* before intervention on the VAS was 1.7 (SD 1.7) and after intervention, 1.3 (SD 1.4). In the control group, *pain intensity when breathing deeply* before a half-hour break on the VAS was 1.9 (SD 2.0) and after the break, 1.9 (SD 2.0) (p = 0.03) (Figure 6).

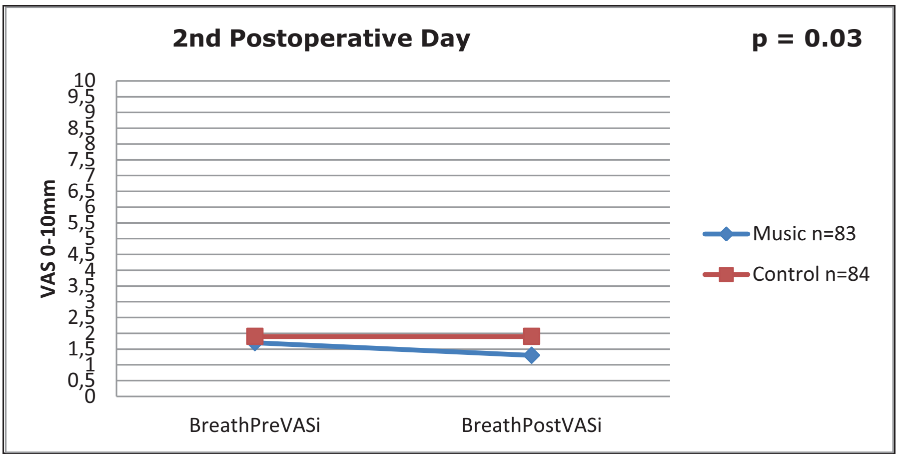


Figure 6 Pain intensity when breathing deeply on the second postoperative day before (pre) and after (post) intervention in the music group and in the control group as measured on the VAS 0 – no pain, 1-2 – mild pain (Repeated-measures ANOVA)

Pain distress when breathing deeply in the music group before intervention on the VAS was 1.7 (SD 1.7) and after intervention, 1.3 (SD 1.4). In the control group, *pain distress when breathing deeply* before a half-hour break on the VAS was 1.9 (SD 2.0) and after the break, 1.8 (SD 2.0) (p = 0.04) (Figure 7).

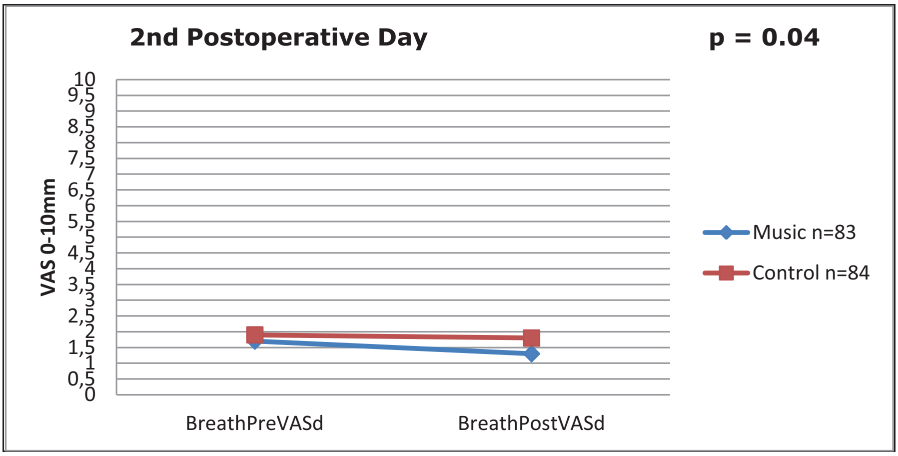


Figure 7 Pain distress when breathing deeply on the second postoperative day before (pre) and after (post) intervention in the music group and in the control group as measured on the VAS 0 – pain is not at all unpleasant, 2 – pain is a little uncomfortable (Repeated-measures ANOVA)

In the music group, *pain intensity when shifting position* before intervention on the VAS was 3.1 (SD 2.2) and after intervention, 2.5 (SD 1.9). In the control group, *pain intensity when shifting position* before a half-hour break on the VAS was 3.4 (SD 2.3) and after the break, 3.3 (SD 2.3) (p = 0.02) (Figure 8).

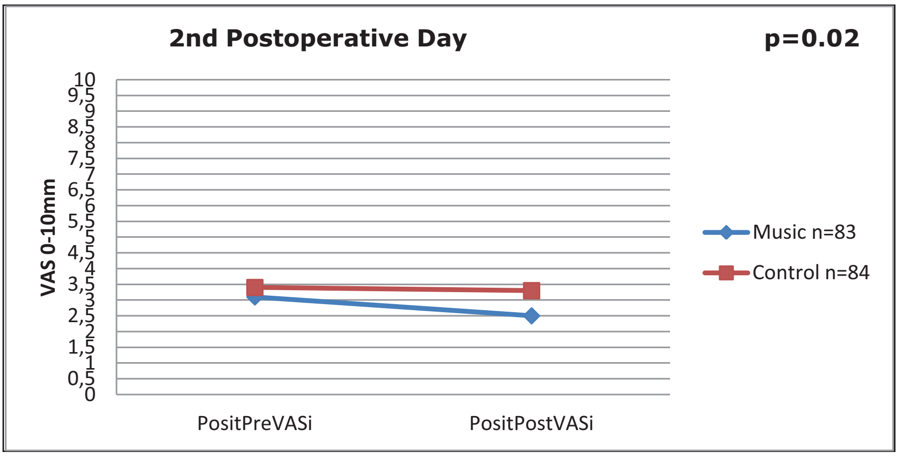


Figure 8 Pain intensity when shifting position on the second postoperative day before (pre) and after (post) intervention in the music group and in the control group as measured on the VAS 0 – no pain, 1-2 – mild pain, 3-4 – moderate pain (Repeated-measures ANOVA)

Pain distress when shifting position before intervention in the music group on the VAS was 3.1 (SD 2.3) and after intervention, 2.5 (SD 2.9). In the control group, *pain distress when shifting position* before a half-hour break on the VAS was 3.3 (SD 2.4) and after the break, 3.2 (SD 2.4) (p = 0.04) (Figure 9).

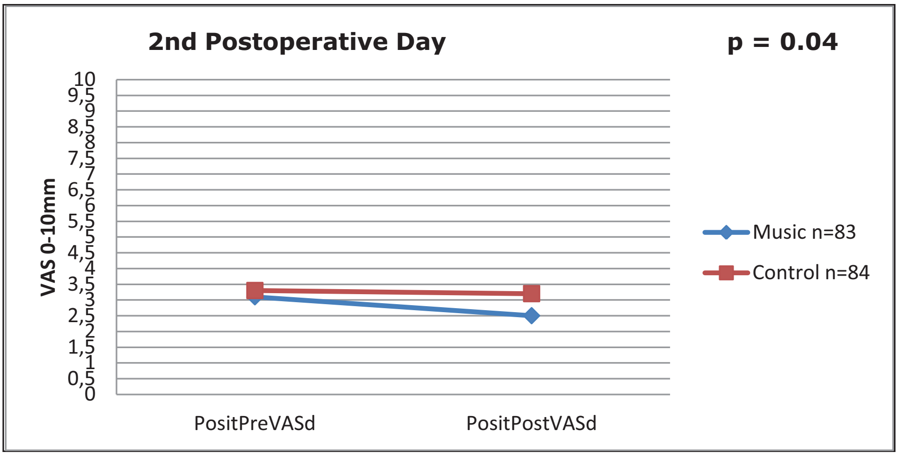


Figure 9 Pain distress when shifting position on the second postoperative day before (pre) and after (post) intervention in the music group and in the control group as measured on the VAS 0 – pain is not at all unpleasant, 2 – pain is a little uncomfortable, 3.5 – pain is moderately unpleasant (Repeated-measures ANOVA)

Pain intensity and distress on the third postoperative day

On the third postoperative day, when evaluating the long-term effects of music listening on pain intensity and distress during bed rest, when breathing deeply, and when shifting position, there were no statistically significant differences between the two groups (Table 5).

Table 5 Pain intensity and distress on the third postoperative day (VAS)

Pain intensity (VAS)	**Music group (n = 83) Mean(+/-SD)**		**Control group (n = 84)* Mean(+/-SD)**		**Mann-Whitney U-test**	**p-value**
at rest	1.0	(1.6)	1.3	(1.7)	3186.0	0.37
during deep breath	1.3	(1.8)	1.6	(1.9)	3050.5	0.19
shifting position	2.3	(2.1)	2.9	(2.3)	2955.0	0.11
Pain distress(VAS)						
at rest	1.0	(1.5)	1.3	(1.7)	3068.5	0.19
during deep breath	1.3	(1.8)	1.6	(1.8)	3083.5	0.22
shifting position	2.2	(2.2)	2.9	(2.3)	2909.5	0.08

*one patient assessed pain with NRS – pain scale

7.3 RESPIRATORY RATES, HEART RATES AND BLOOD PRESSURE LEVELS OF GASTROENTEROLOGY PATIENTS ON THE FIRST AND SECOND POSTOPERATIVE DAYS (Articles 2, 4)

On the first postoperative day in the music group, the *respiratory rate* before intervention was 17/min (SD 3) and after intervention it was 16/min (SD 2). In the control group, the *respiratory rate* before a half-hour break was 18/min (SD 3) and after the break, 18/min (SD 3). The difference was statistically significant between the two groups (p = 0.01) (Figure 10).

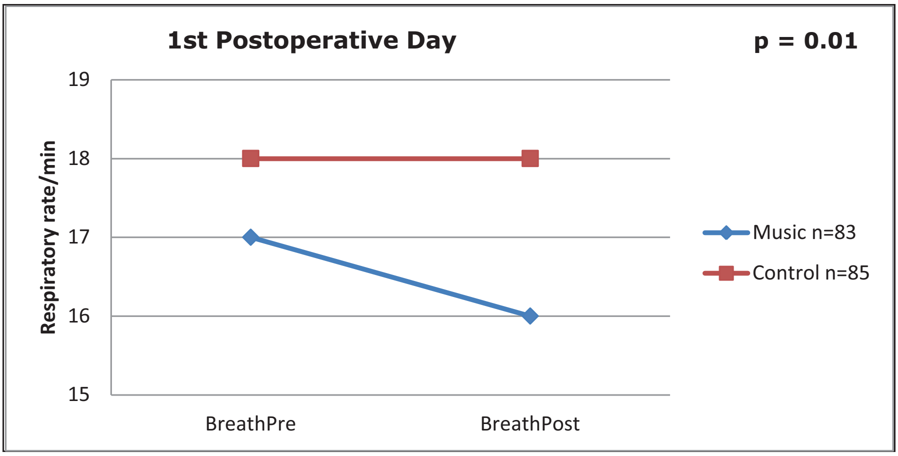


Figure 10 Respiratory rate on the first postoperative day before (pre) and after (post) intervention in the music group and in the control group (Repeated-measures ANOVA)

On the first postoperative day *heart rate* before intervention in the music group was 78/min (SD 12) and after intervention it was 77/min (SD 13). In the control group, *heart rate* before a half-hour break was 75/min (SD 14) and the break it was 78/min (SD 15). The difference between the two groups was not statistically significant (Figure 11).

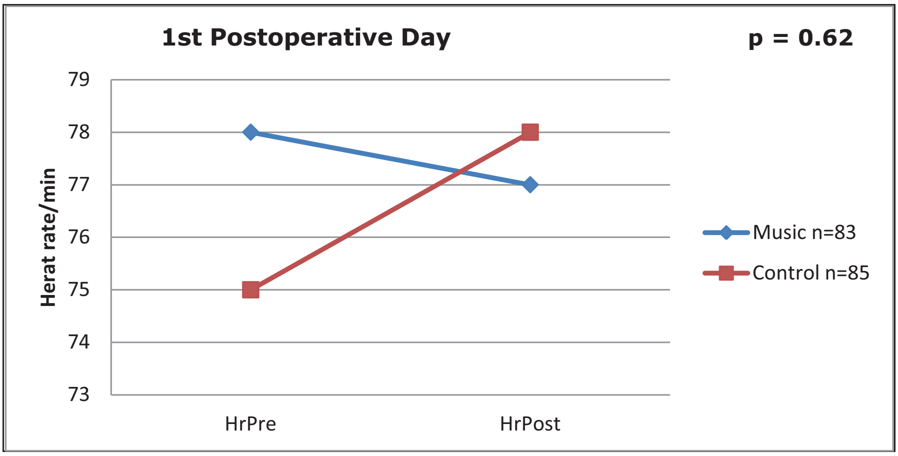


Figure 11 Heart rate on the first postoperative day before (pre) and after (post) intervention in the music group and in the control group (Repeated-measures ANOVA)

On the first postoperative day *systolic blood pressure* before intervention in the music group was 126 mmHg (SD 16 mmHg) and after the intervention it was 124 mmHg (SD 15 mmHg). In the control group, *systolic blood pressure* before a half-hour break was 128 mmHg (SD 18 mmHg) and the break it was 126 mmHg (SD 18 mmHg). The difference between the two groups is statistically almost significant (p = 0.05) (Figure 12).

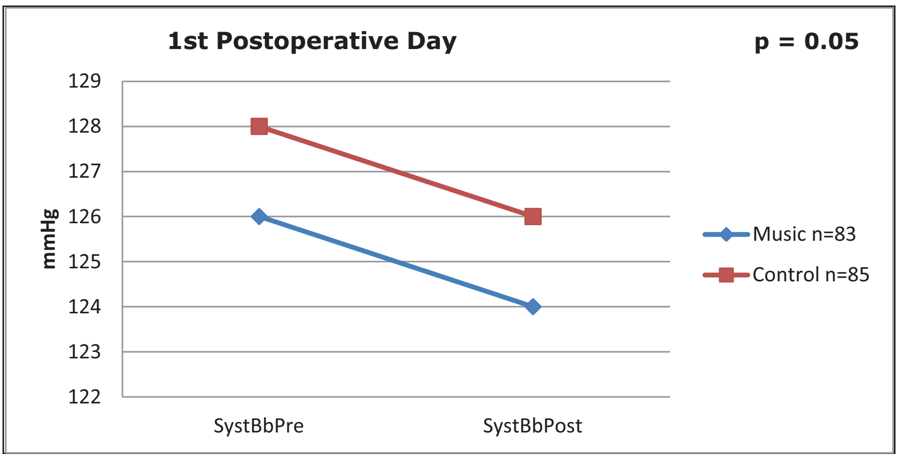


Figure 12 Systolic Blood pressure on the first postoperative day before (pre) and after (post) intervention in the music group and in the control group (Repeated-measures ANOVA)

On the first postoperative day *diastolic blood pressure* before intervention in the music group was 69 mmHg (SD 9 mmHg) and after the break it was 68 mmHg (SD 9 mmHg). In the control group, *diastolic blood pressure* before a half-hour break was 69 mmHg (SD 11 mmHg) and after the break it was 68 mmHg (SD 11 mmHg). The difference between the two groups was not statistically significant (Figure 13).

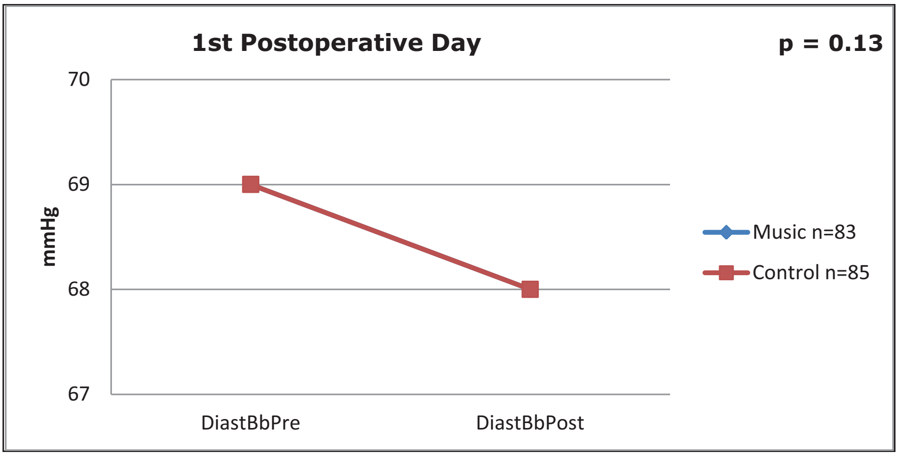


Figure 13 Diastolic Blood pressure on the first postoperative day before (pre) and after (post) intervention in the music group and in the control group (Repeated-measures ANOVA)

On the second postoperative day *respiratory rate* before intervention in the music group was 17/min (SD 2) and after the intervention it was 16/min (SD 3). In the control group, *respiratory rate* before a half-hour break was 18/min (SD 3) and after the break it was 18/min (SD 3). The difference between the two groups was statistically significant ($p = 0.01$) (Figure 14).

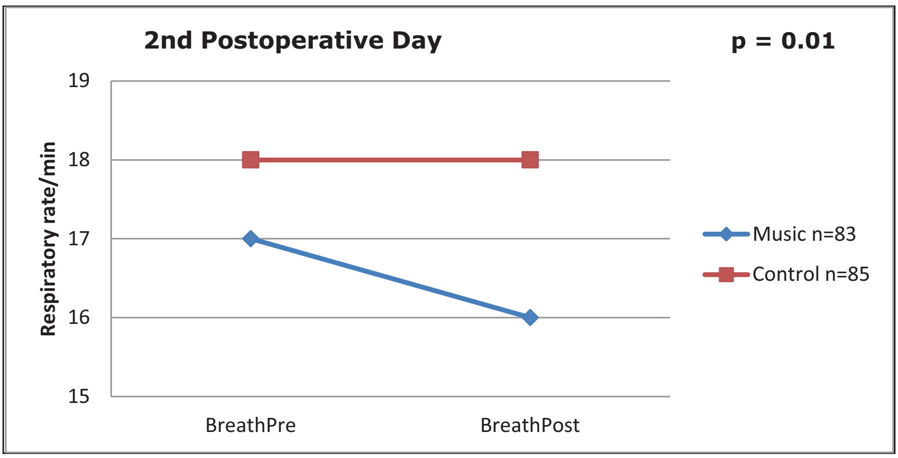


Figure 14 Respiratory rate on the second postoperative day before (pre) and after (post) intervention in the music group and in the control group (Repeated-measures ANOVA)

On the second postoperative day *heart rate* before intervention in the music group was 77/min (SD 13) and after intervention it was 77/min (SD 13). In the control group, *heart rate* before a half-hour break was 78/min (SD 15) and after the break it was 77/min (SD 14). The difference between the two groups was not statistically significant (Figure 15).

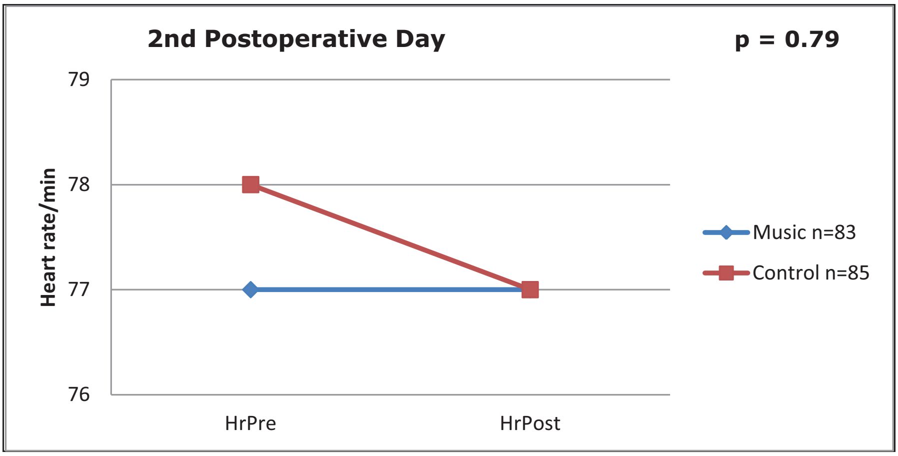


Figure 15 Heart rate on the second postoperative day before (pre) and after (post) intervention in the music group and in the control group (Repeated-measures ANOVA)

On the second postoperative day *systolic blood pressure* before intervention in the music group was 134 mmHg (SD 17 mmHg) and after intervention it was 132 mmHg (SD 17 mmHg). In the control group, *systolic blood pressure* before a half-hour break was 140 mmHg (SD 21 mmHg) and after the break it was 138 mmHg (SD 20 mmHg). The difference between the two groups was statistically significant ($p = 0.04$) (Figure 16).

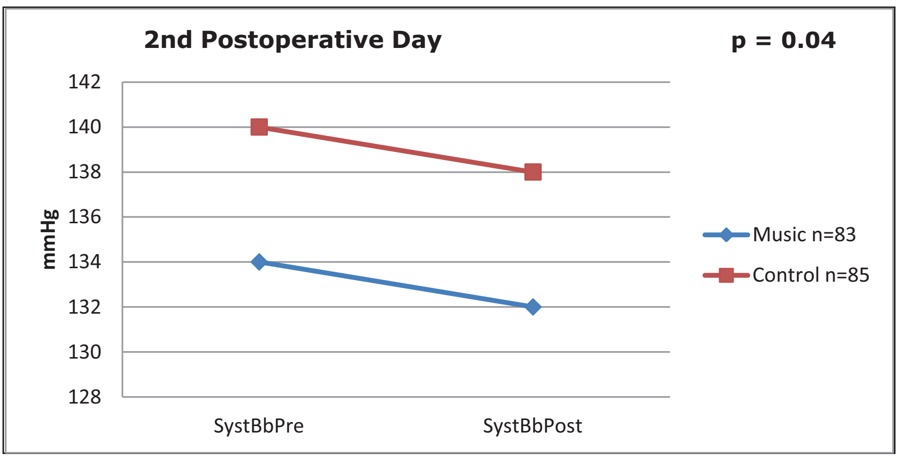


Figure 16 Systolic blood pressure on the second postoperative day before (pre) and after (post) intervention in the music group and in the control group (Repeated-measures ANOVA)

On the second postoperative day *diastolic blood pressure* before intervention in the music group was 75 mmHg (SD 9 mmHg) and after intervention it was 75 mmHg (SD 8 mmHg). In the control group, *diastolic blood pressure* before a half-hour break was 78 mmHg (SD 11 mmHg) and after the break it was 77 mmHg (SD 10 mmHg). The difference between the two groups was not statistically significant (Figure 17).

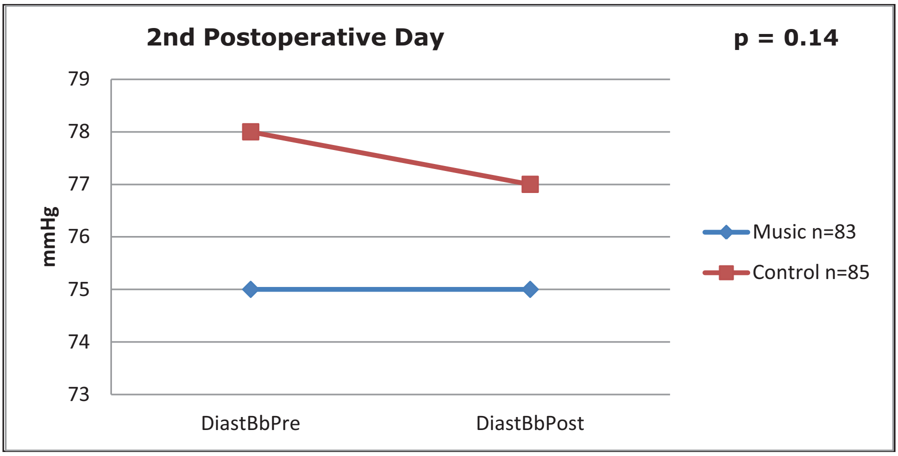


Figure 17 Diastolic blood pressure on the second postoperative day before (pre) and after (post) intervention in the music group and in the control group (Repeated-measures ANOVA)

On the third postoperative day when evaluating the long-term effects on respiratory rate, heart rate, and systolic and diastolic blood pressure, there was a statistically significant difference in respiratory rate (p = 0.001) (Table 6).

Table 6 Systolic and diastolic blood pressure, heart rate, and respiratory rate on the third postoperative day in the music group and in the control group

3rd Postoperative Day	**Music group (n = 83) Mean (+/- SD)**	**Control group (n = 85) Mean (+/- SD)**	**Mann-Whitney U-test**	***p*-value**
Respiratory rate	15/min (4/min)	18/min (3/min)	1760.0	.001*
Heart rate	75/min (16/min)	74/min (14/min)	3391.5	.76
Systolic blood pressure	140 mmHg (23 mmHg)	147 mmHg (24 mmHg)	2814.0	.31
Diastolic blood pressure	81 mmHg (10 mmHg)	82 mmHg (11 mmHg)	3120.5	.24

7.4 ANALGESIC USE, ADVERSE EFFECTS AND LENGTH OF HOSPITAL STAY OF GASTROENTEROLOGY PATIENTS AFTER SURGERY (Articles 3, 4)

The hypothesis that the patients in the music group would require less analgesia after surgery compared with the control group, which received standard care was not supported. In the music group, the patients' opioid consumption was less than that of the control group patients, but the difference was not statistically significant. There was no statistically significant difference between the two groups in length of hospital stay (Table 7).

Table 7 The patients' amount of analgesia after surgery (72 h) and length of hospital stay

Amount of analgesia and length of hospital stay	Music group (n = 83) Mean	Control group (n = 85) Mean	Mann Whitney U-test	p-value
Duration of epidural analgesia	3 days 3h 53 min	3 days 3h 19min	3245.5	0.371
Opioid analgesia after surgery (4day)	21 mg	24 mg	3423.5	0.739
Length of hospital stay	12 days	12 days	3513.0	0.963

When the adverse effects of analgesia after surgery were assessed, there were a total of 90 adverse effects in the music group and 103 in the control group. The difference between the two groups was not statistically significant. The most common adverse effects were pruritus, nausea, fatigue, ileus, and vomiting (Table 8).

Table 8 Adverse effects in the two groups after surgery

Adverse Effects of Epidural Analgesia	Music group (n = 83) n (%)	Control group (n = 85) n (%)
Number of patients with adverse effects	51 (61%)	51 (60%)
Total number of adverse effects	90	103
Individual adverse effects		
Pruritus	31 (37)	27 (32)
Nausea	19 (23)	25 (29)
Fatigue	8 (10)	14 (16)
Ileus	12 (14)	7 (8)
Vomiting	8 (10)	7 (8)
Numbness	3 (4)	5 (6)
Headache	3 (4)	3 (4)
Hallucinations	2 (2)	3 (4)
Dizziness	2 (2)	3 (4)
Hyperthermia	0	3 (4)
Hypotension	1 (1)	1 (1)
Confusion	0	2 (2)
Angina pectoris	1 (1)	0
Desaturation	0	1 (1)
Delirium	0	1 (1)
Shivering	0	1 (1)

7.5 PATIENTS' EXPERIENCES OF LISTENING TO MUSIC AFTER THE MUSIC INTERVENTIONS

After the music interventions, 55 (66%) of the patients in the music group (n = 83) commented spontaneously on their experiences of listening to music. Of these patients, 28 (51%) expressed that the music was lovely and 20 (36%) of the patients said they fell asleep or that listening to music made them sleepy, and three patients (5%) felt it had a calming effect (Table 9).

"Wonderful, the music was just the right thing."

"Lovely music, perfect for this moment."

"Nice to listen to, lulls you to sleep easily."

"This music is a great sedative."

"The music had an extraordinary calming effect, just as I was ready to lose my patience here."

Every third (17, 31%) of the patients considered listening to music to be a pleasant and enjoyable experience, and 16 patients (29%) said listening to music calmed them.

"The pleasant feeling is simply wonderful."

"Being able to listen is a true luxury."

"I became totally calm while listening to the music. Pure pleasure and a feeling of relaxation. My limbs felt so heavy."

The patients also described their experiences of listening to music as making them forget their pains 8/55 (15%), they felt no pain at all or very little pain 7/55 (13%).

"The music felt great. I occasionally forget my pain entirely."

"As you listen to the music you forget everything else. You lose a sense of time."

"It was great to listen, it calmed me wonderfully – the pain did not feel nearly as strong."

Three patients (5%) said listening to music added variety to their day, and ten patients (18%) felt time elapsed quickly.

"Half an hour went by quickly."

"This is a fun program number, adds variety."

The sources of negative expressions related to listening to the music 8/55 (15%) were disruptions in the environment 5/55, intense pain 2/55, or the music selected by the patient does not feel good 1/55.

"I wish it would have been a little louder, the telephone and activity in the ward were disruptive."

"When you have really intense pain, you can't even focus on listening to music."

"The music did not feel good."

Table 9. Experiment group patients' (n = 55) experience of listening to music after the intervention

Experiences of listening to music (f)	Original description
The music was wonderful (28)	"The music was so lovely."
Sleepy effect (20)	"I almost fell asleep." "The music lulled me to sleep easily."
Listening to music was a good experience (17)	"Really great! This feeling is absolutely great." "It is really luxurious to listen to music."
Relaxing effect (16)	"I felt relaxed."
Distractive effect (16)	"Listening to music helped me forget everything else." "Music took my mind off all the pain."
Time passes quickly (10)	"Half an hour went by fast."
Listening to music adds variety to daily routines (3)	"This is definitely the best moment of the day."
Environmental disturbance (7) and severe pain	"The environment was noisy and restless. This interrupted my music listening." "You cannot concentrate on music listening or anything else if you have severe pain."

7.6 SUMMARY OF THE RESULTS

Figure 18 presents a summary of the results of the effects of listening to music on the management of pain in adult gastroenterology patients:

1) On the first postoperative day after the intervention, the respiratory rates of patients who listened to music were significantly lower than those of patients in the control group.
2) On the second postoperative day in the music group, pain intensity and distress at rest, during deep breathing, and when shifting position after the intervention, were milder than among the patients in the control group. Moreover, the respiratory rates and systolic blood pressure of the patients who were listening to music were lower than those of the patients in the control group.
3) On the third postoperative day, the respiratory rates of the patients in the music group were still lower than those of the patients in the control group.
4) Music listening had no effects on the amount of analgesia, adverse effects of analgesia, or length of hospital stay.
5) The patients felt that listening to music after surgery was a pleasant experience; it had a sleepy and relaxing effect, the music distracted them from pain and uncomfortable things, and time passed quickly.
6) Even if there are some statistically significant differences between two groups in pain intensity, pain distress, systolic blood pressure and respiratory rate, clinical signifigances cannot be demonstrated, because variations in these parameters were only marginal between both groups.

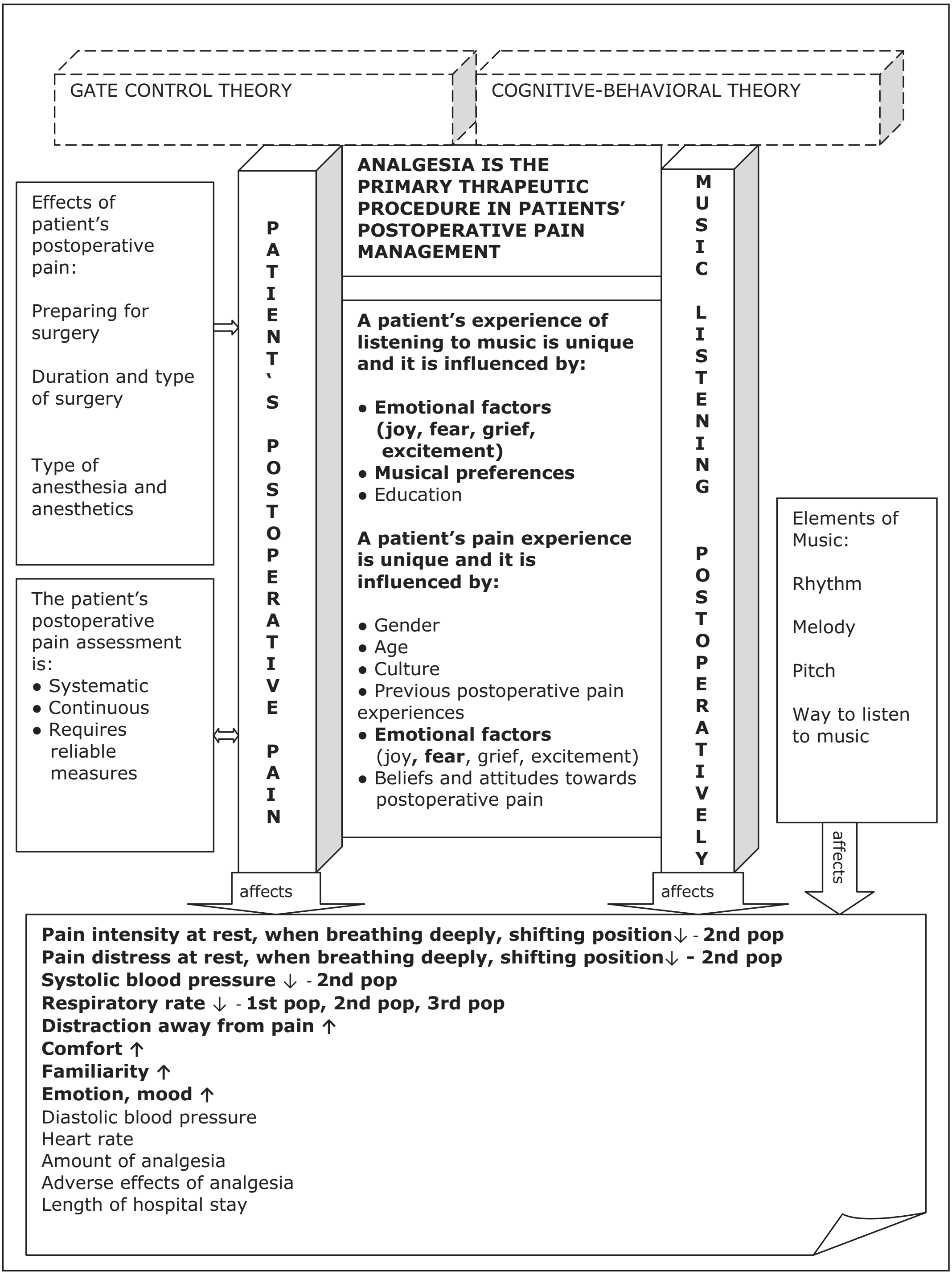


Figure 18 Summaries of the results of the effects of listening to music on adult gastroenterology patients' postoperative pain alleviation

↑ = increase, ↓ = decrease

Bold texts are the results of this study

8 Discussion

The purpose of the study was to assess the effect of listening to music on the intensity and distress of pain experienced by gastroenterological surgery patients at rest, when breathing deeply, and when shifting position; the need for analgesia, the adverse effects of analgesia, and the length of hospital stay; and physiological factors such as systolic and diastolic blood pressure, heart rate, and respiratory rate. Furthermore, the patients' experiences of listening to music were evaluated immediately after the intervention using qualitative methods. The study produced new data on the effect of nonpharmacological intervention after gastroenterological surgery. Moreover, new information was obtained for practical implementation of a pain relief and intervention study. The results of the effects of listening to music on the intensity and distress of pain at rest, when breathing deeply, and when shifting position, and on systolic blood pressure and respiratory rate after gastroenterological surgery are indicative only, and are supported by earlier internationally conducted music intervention studies. No music intervention studies had been conducted previously in Finland. The intensity and distress of pain at rest, when breathing deeply, and when shifting position have been assessed very little in international music intervention studies. Also, patients' experiences of listening to music have not been assessed with qualitative methods in the past. Implementation of an intervention study in the changing nursing environment is challenging and requires human resources, time, and financial resources.

8.1 RESEARCH STRENGTHS AND WEAKNESSES

The purpose of the intervention in this study was to assess the effects of listening to music on the alleviation of pain in gastroenterological surgery patients in a natural operating environment. The review of the literature was not described systematic. The reliability of the study is weakened by the fact that randomization was not done purely randomly. Instead, the patients were randomized by means of an every-other-week system, where the patients who arrived on odd-numbered weeks were part of the music group and the patients who came in on even-numbered weeks were part of the control group. Nevertheless, the groups did not differ from each in terms of background factors (age, sex, education, occupation, marital status, surgery diagnosis, ASA classification, amount of analgesia, duration of anesthesia and surgery, time in the recovery room). According to the literature, if the anticipated differences between groups are small or if the changes require a long time to materialize, randomization is not essential (Craig *et al*. 2008). One selection criterion for participating in the study was that the patient be scheduled to have open surgery or a laparotomy. However, the duration and nature of surgery diagnoses that lead to a laparotomy vary or they can also have an effect on the assessment of the intensity and distress of pain.

When assessing the effect of the intervention it is important to consider whether the result came from listening to music or other mixed factors (Craig *et al*. 2008). Manipulation refers to having an effect on the subjects. In this study, the patients in the music group listened to music through earphones in their own patient rooms for half an hour. I wanted to conduct the study in a patient room alongside the ordinary daily rhythm taking place in the ward. This may have affected the research results. Some of the patients were bothered by the doctor's or nurse's visits, telephone calls, or a disturbance or visit in the room. Furthermore, a few patients needed more analgesia while listening to the music or during the half-hour break, which may also have had an effect on the assessment of the benefit of the intervention. On the other hand, the conditions in the control group were identical.

Participating in an intervention study requires great commitment from both the patient and the conductor of the study. The patients assessed the intensity and distress of pain using two different pain scales before and after the intervention for a total of twelve times, which may have affected the patients' ability to focus on assessing their pain. In addition, some patients in the intervention group did not necessarily focus on or commit to listening to the music for the entire half hour during the seven different listening periods, and this may have affected the measurement results.

The biggest reason for declining to participate in the study was discovered cancer and fear of the surgery results. One patient declined to participate because he would have had to listen to music, and one patient declined because he would not be able to listen to music. The primary reason for a patient voluntarily discontinuing the study was extreme fatigue after the surgery or the doctor had relayed bad news about the surgery results. The study data were collected from two wards in one hospital, so the research results cannot be generalized directly.

The strength of the study was that the intervention study was planned by becoming familiar with earlier music intervention studies and their reliability as well as their multidisciplinary and multiprofessional collaboration. The planning of the intervention lasted half a year, and the actual implementation of the intervention lasted two years.

The significance of the control group in an intervention study is great and the selection criteria are the same as for the patients in the intervention group. In this study, the patients in the control group were selected with the same criteria as the patients who were selected for the music group. They received standard care but they did not listen to music. Instead, there was a half hour break between measurements. They were requested not to listen to music during the half hour (Burns & Grove 2005), but as a researcher I could not influence other conditions.

The study was made more reliable by the fact that before the actual study, the intervention was pretested (n = 10) with the same selection criteria as the patients coming to the actual study, by evaluating the instructions, measurements, data collection, and unforeseen consequences (Craig *et al*. 2008). The pretest was sufficient for evaluating the instructions and measurements, but unforeseen changes did not occur during the pretesting period. Questionnaires were drawn up for the purposes of this study. After pretesting, the questions on the questionnaire and the assessment of pain were edited and the pretest patients were left out of the actual analysis. The sample size of the study was determined by conducting a power analysis using the average value of the VAS pain measures (Easter *et al*. 2010; Lancaster *et al*. 2010) by examining both the pretest data and earlier studies on postoperative pain.

I have years of experience working in a surgical gastroenterology ward, so I was very familiar with nursing work and its operating environment. I collected all of the data myself, from initial interview to final measurement, so I know the data set well (Polit & Beck 2010). I made the measurements with the same method and in the same order. I taught the patients how to use the pain scales on the day before the surgery. Both the VAS and NRS pain scales have been proven to be sensitive and reliable for assessing the effect of intervention on postoperative pain management (Jensen *et al*. 2002). In this study it was difficult for some patients to distinguish between the intensity and distress of pain. The blood pressure monitors were automatic monitors that are used in the ward and calibrated annually. The measurement methods used in this study can be objectively measured and repeated.

As I researcher I was aware whether a patient belonged to the intervention or control group. According to the literature, it may be difficult to make the study blind in nonpharmacological intervention studies (Polit *et al*. 2011). Because the intervention was implemented on an every-other-week basis and the patients participating in the study were usually placed in different rooms, there was little opportunity for the patients to talk about the study. The influence of the researcher in this study is obvious because I met the patients nine times during the study. The patients in both the music and control groups felt that participating in the study added variety and was a pleasant experience. It will remain unclear how much I, as a researcher, influenced the patients' physiological values or assessed points of pain, but I was not able to influence the length of the hospital stay, the amount of analgesia, or adverse effects of analgesia.

8.2 EVALUATION OF MUSIC INTERVENTION AND ITS IMPLEMENTATION IN ADULT GASTROENTEROLOGY SURGERY PATIENTS

The stages of a music intervention study include planning the study design with representatives from different sciences and professions, familiarization with previous studies and literature, acquisition of music equipment, selection and recording of music, pretesting and evaluation of the study, implementation of the actual study, and final analysis (Craig *et al*. 2008). Intervention research in the changing environment of nursing is a challenging and time-consuming process. It requires a long-term commitment from the researcher and the ability to tolerate uncertainty and be patient. The researcher benefits from knowing the operating environment of the organization and nursing. Furthermore he or she must take into account different kinds of patients who are participating in the study, the actions that must be taken for them, variation in recovery time, and rapidly changing situations. In spite of careful planning of the study, unforeseen situations come up which have an effect on the overall timetable of the study. These include cancellation of surgery, a change in the surgery plan, a change in ward operations, or other ongoing research projects in the ward.

The number of interventions in this study was seven. The evening of the operation date proved to be difficult for implementing the intervention because most of the patients were in the recovery room late into the night and even until the next day. Some of the patients were very tired after the extensive, demanding procedure. Furthermore, a cancer diagnosis and the result of the surgery affected participation in the study. Because the intervention took place alongside the normal daily rhythm of the ward, as a researcher I had to be prepared for different kinds of interruptions and delays, such as the doctor's visits, visitors, telephone calls, or a sudden change in the patient's condition. Previous studies have not assessed the suitability of the time when interventions are conducted, but their quantity varied from one (Allred *et al*. 2010; Easter *et al*. 2010; Ebneshahidi & Mohseni 2008) to four (Good & Ahn 2008), six (Sendelbach *et al*. 2006) or twelve (McCaffrey & Locsin 2008).

Previous studies had differing views on what kind of music is most suitable for a patient. In some of the studies, patients were able to select the music that was most desirable to them from a few choices (Voss *et al*. 2004; Masuda *et al*. 2005: Tse *et al*. 2005), whereas in some studies the same music was played to everyone (Ikonomidou *et al*. 2004). Usually the music that was played was instrumental (Nilsson *et al*. 2003), classical (Masuda *et al*. 2005), or music with a peaceful rhythm used for relaxation (Nilsson *et al*. 2005). According to the literature, the best results in pain alleviation and relaxation are achieved when the tempo is 60–80 beats per minute, the music is instrumental, and is no louder than 60 decibels (Nilsson 2008). In this study the patients were able to select the music they most prefer from several choices. The patients were pleased with the wide range of music (Bernatzky *et al*. 2011; Good & Ahn 2008; Mitchell *et al*. 2007) and most listened to music presented by different artists during the seven listening times. Having the possibility to choose may have given the patients a feeling of control and thereby increased their level of satisfaction. The most popular types of music were national hit songs and dance music as well as classical music (Li *et al*. 2011). These types of music mostly fulfilled the criteria presented in the literature; the tempo of the music was 60–80 beats per minute and no louder than 60 decibels.

The 30 minutes reserved for listening to music proved to be a suitable time for listening; in previous studies it had varied from 15 minutes to one hour. Earlier studies had not looked at the suitability of the length of listening time. Patients usually had plenty of strength to listen to the music, and nursing procedures in the ward were not greatly delayed. It is difficult to estimate the optimal time of listening to music while recovering from a surgery because the patient's condition can vary and situations change rapidly.

Disruptions from the environment have a negative effect on the music listening experience. Furthermore if the patient's pain is intense and unbearable, the patient cannot focus on listening to music. That is why it is also important to assess when listening to music doesn't make sense for the patient. Overall, the patients assessed listening to music as a very positive experience (Allred *et al*. 2010, McCaffrey & Locsin 2006; Easter *et al*. 2010). The music was lovely (Good & Ahn 2008), it made the patient sleepy and relaxed (Li *et al*. 2011; Easter *et al*. 2010; Voss *et al*. 2004), time passed quickly, and the music distracted attention away from pain (Li *et al*. 2011).

This study provided new information on how listening to music affects the intensity and distress of pain in gastroenterological surgery patients at rest, when breathing deeply, and when shifting position after the operation, as well as the long-term effect of listening to music on respiratory rate. The study also produced data on patients' experiences of listening to music while recovering from surgery. Moreover, the study provided new information on the implementation of an intervention in a nursing operating environment.

8.3 EVALUATION OF THE RESULTS OF GASTROENTEROLOGY PATIENTS

8.3.1 Pain intensity and pain distress

According to this study, patients who listened to music on the second postoperative day experienced the intensity and distress of pain to be milder at rest, when breathing deeply, and when shifting position. The result is very consistent with a study by Good & Ahn (2008), who found that after listening to music, gynecological surgery (laparotomy) patients felt less pain and the discomfort it causes, on both the first and second postoperative day, than a control group. Other studies also support this result (Ebneshahidin & Mohsenin 2008; MacCaffrey & Locsin 2006; Sendelbach *et al*. 2006; Masuda *et al*. 2005; Tse *et al*. 2005; Voss *et al*. 2004).

In the music group on the first and second postoperative day, both the intensity and distress of pain at rest, when breathing deeply, and when shifting position were lower before the intervention than for the patients in the control group. The reason for this will remain unclear because the groups did not differ from each other in terms of age, sex, education, occupation, marital status, ASA classification, surgery diagnosis, or analgesia. There were also no differences between the groups when asked about pain before the operation, or about earlier experience of surgical pain, but the fear of surgical pain was greater in the music group than in the control group. Fear of illness or surgery can increase the pain experienced by a patient (Good 2013), but the groups did not differ from each other in terms of surgical diagnosis. However, it is possible that the patients in the music group were relieved when their postoperative pain was milder than expected and therefore they assessed the intensity and distress of their pain lower than the patients in the control group.

No long-term effects of listening to music on the intensity and distress of pain were apparent in this study. Even though the intensity and distress of pain in the control group at rest, when breathing deeply, and when shifting position were greater than in the music group, the differences were not statistically significant. The result is consistent with a study conducted by Nilssonin *et al*. (2003), in which listening to music affected the intensity of pain for two hours in the recovery room phase, when the effects of sedatives and analgesia were at their greatest.

In this study all the patients had epidural and paracetamol analgesia after their surgical operations. Lower averages in the number of pain points indicate that the pain management of gastroenterological surgery patients has been largely successful by pharmacological means. However, the pain experienced by the patients in the study varied during the study period from no pain (0) to unbearable (10). The average intensity and distress of the patients' pain in both groups after surgery was mild at rest and moderate when breathing deeply or shifting position; this indicates that differences between the groups are not significant in terms of pharmacological treatment. On the other hand, careful consideration must be given to the question of whether it is ethically right, or does it make sense for the patient, to offer music when his or her pain is intense and unbearable, even for research purposes. It is also possible that stronger evidence of the effect of intervention was not achieved in this study with a data set of this size, and the quasi-experimental design was not sufficiently sensitive to demonstrate it.

8.3.2 Respiratory rate, heart rate, and blood pressure levels

This study produced evidence of the long-term effect of listening to music on respiratory rate. On the third postoperative day, respiratory rate in the control group was significantly higher than of patients in the music group even though they no longer were listening to music. Good *et al*. (2002) discovered the same result after intervention when they studied the effects of music and/or relaxation on respiratory rate. On the other hand, this may be biological variation and strong evidence cannot be demonstrated. According to the literature, upper gastrointestinal surgeries are painful because the incision is located in an area that affects the functioning of breathing muscles. The low respiratory rate in the music listening group may be mainly a result of good analgesia but also because of the patients' favorite music which they listened to (Mitchell *et al*. 2006). Choosing your own favorite music may bring about relaxation (Nilsson 2009) and reduce muscle tension, which results in a slower and deeper respiratory rate. In this study the patients felt that listening to music made them more sleepy and relaxed. Pain and analgesia may also affect physiological factors such as blood pressure, heart rate, and respiratory rate, but their connection is not clear. Furthermore, it is not possible to draw only pain-related conclusions from variations in blood pressure, heart rate, and respiratory rate.

The systolic blood pressure and respiratory rate of patients in the music group of this study were lower on both the first and second postoperative days compared with the patients in the control group. The research finding was partly in line with the study by Tse *et al*. (2005), in which nose surgery patients who listened to music had lower blood pressure. It must be noted, however, that this was a different kind of surgery and thus is not directly comparable. Opposite results were obtained by Nilsson (2209), Sendelbach *et al*. (2006), and Masuda *et al*. (2205), according to whose studies there was no difference in blood pressure levels between music and control groups. Variations in blood pressure level and heart rate especially were affected by external factors such as irritability, moving, eating, etc. The use of these parameters when assessing the effect of listening to music on postoperative pain should be evaluated in greater detail in the future.

8.3.3 Amount of analgesia, adverse effects of analgesia, and length of hospital stay

This study did not produce evidence that listening to music after surgery would reduce the amount of analgesia. The finding is in contrast to earlier studies (Ebneshahidi & Mohseni 2008; McCaffrey & Locsin 2006; Nilsson *et al*. 2005; Tse *et al*. 2005; Ikonmoidou *et al*. 2004). It is debatable whether it makes sense to assess the effects of listening to music on the amount of analgesia, as the patients have regular epidural analgesic medication for an average of three days after a surgery and the intensity and distress of patients' pain on the VAS of 0–10 was less than three, on average (Good 2013).

The most frequent adverse side effects of analgesia were pruritus, nausea, intense fatigue, ileus, and vomiting. These are in line with previous literature (Salomäki & Rosenberg 2006; Ashburn *et al*. 2004; Rakel & Herr 2004; Kalso 2002.). A few patients discontinued the study because of intense fatigue or nausea. There were no differences between the groups in terms of adverse effects caused by epidural analgesia.

Also, listening to music does not have an effect on gastroenterological surgery patients' length of hospital stay. Brunges & Avigne (2003) got an opposite result with hip surgery patients. Patients who listened to music after hip surgery were in a hospital for a shorter time than patients in a control group.

The reason for the conflicting research results may be the different kinds of treatment methods and surgery types. Postoperative complications are more common in gastroenterological operations than in many other kinds of surgical procedures and increase the number of treatment days (Lång *et al*. 2001). One surgical complication in this study extended the length of the patient's hospital stay by ten days. Thus, assessment of the effect of listening to music on the length of hospital stay was not adequate.

9 Conclusions and suggestions for further research

The study provided new information on the effects of listening to music on the management of postoperative pain in gastroenterological surgery patients, as well as patients' experiences of listening to music after the interventions. Furthermore, new information was provided on the implementation of an intervention in a nursing operating environment. This music intervention study meets the objective set for research in nursing science, namely to develop interventions and assess their effects.

The following conclusions can be presented on the basis of this study:

1) The primary form of care after gastroenterological surgery is medication. Listening to music as a supplement to medication may alleviate the intensity and distress of patients' pain at rest, when breathing deeply, and when shifting positions. However, the evidence was not strong.
2) Music listening is an effective adjuvant to analgesics. When pain intensity and distress is mild or moderate, music may comfort the patient, increase the relaxation response and thus lower both patients' systolic blood pressure and respiratory rate.
3) There is no evidence that listening to music reduce the amount of analgesia, adverse effects of analgesia or length of hospital stay. In the future relevant measurements should be considered more carefully.
4) Gastroenterological surgery patients felt that listening to music had positive effects during the recovery phase after their operation. It is relaxing and takes their thoughts away from pain. More systematically collected data on patients' experiences of listening to music is needed as part of an impact study.
5) Successful implementation of an intervention study in the changing operating environment of nursing requires of the researcher careful planning, perseverance, multidisciplinary collaboration, and research resources so the study can be conducted reliably without burdening the nursing staff that is engaged in practical nursing work.

Suggested areas for further studies based on this study:

1) Music intervention research in the treatment of a variety of surgical patient groups and in a variety of clinical situations. A special topic of research could be patients for whom epidural analgesia cannot be used.
2) Music intervention for different patient groups as a multidisciplinary national multicenter study.
3) Investigate the experiential dimensions of music intervention using qualitative methods.
4) Listening to music on a schedule decided by patients, and its effect on postoperative pain.

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Appendices

Appendix 1 Studies of the validity of pain measures in postoperative pain assessment in the period 2001–2005.

Authors	Purpose	Measures	Sample	Main findings
Gagliese *et al*. 2005 Kanada	To compare the feasibility and validity of the pain scales for the assessment of pain intensity in younger and older patients after surgery.	NRS VDS VAS-H (horizontal) VAS-V (vertical) MPQ	n = 504 18–86 year Young <60 years Elderly >60 years 24h after surgery	The NRS was the most preferred scale both young and elderly: low errors, high validity. The VDS was second preferred scale by both young and elderly: good validity. The VAS was not valid with elderly: requires practice in advance. The VAS-V was associated with lower error rates and higher validity than the VAS-H.
Gagliese & Katz 2003 Kanada	To analyze psychometric properties of commonly used pain scales by younger and older men after surgery.	MPQ PPI VAS	n = 200 50–70 year Young <63 years Elderly >64 years 24h and 48h after surgery	Using the MPQ scale, older men assessed pain lower than younger men. Using the PPI scale, the pain of older men was lower than of younger men. Using the the VAS there were no differences in pain intensity between younger and older men.
Jensen *et al*. 2002 USA	To compare the sensitivity of three pain scales in measuring pain and analgesic effects.	VAS, VRS-4 (pain intensity: 0 = no pain, 1 = mild, 2 = moderate, 3 = extreme pain) VRS-5 (pain relief: 0 = not at all, 1 = little, 2 = some, 3 = a lot, 4 = completely)	n = 248 33–75 year n = 123 knee surgery n = 124 laparotomy during 24h and 16 times	The VRS-4 scale is less sensitive in measuring changes in pain intensity than the VAS. The VRS-5 scale is sensitive in measuring pain relief.
Lundberg *et al*. 2001 Sweden	To evaluate the sensitivity and validity of three pain scales before and after TENS.	VAS NRS Painmatcher	n = 69 19–72 year Pain assessment before and after TENS.	There were no differences in sensitivity and validity between the VAS-NRS and Painmatcher.
Good *et al*. 2001 USA	To compare the validity and sensitivity of the VAS and NRS in assessing pain sensation and distress.	VAS NRS	n = 384 20–70 year Abdominal surgery patients I and II postoperative day before and after intervention.	The VAS is more sensitive in measuring pain sensation and distress than the NRS. Moreover the VAS is greater sensitivity to analgesics compared to the NRS. The validity and consistency of both the VAS and NRS were the same.

Appendix 2 Preoperative music intervention studies in pain relif in adult patients in the period 2002-2011.

Authors	Music intervention	Sample	Instruments and measures	Main findings
Brunges *et al*. 2003 USA	Preoperative Control group: no music, standard care Music group: music via headphones 30 min. Post test	Total joint replacement n = 44	•Questionnaire about perceptions of the music effect •U-Epinephrine	In the music group the U-Epinephrine level was lower than in the control group. Patients in the music group felt that music decreased anxiety before surgery. Their length of hospital stay was also shorter compared with the control group.
Wang *et al*. 2002 USA	Preoperative Music group: music via headphones 30 min. Control group: headphones, but no music. Pre test – post test	Elective outpatient surgery n = 93 Power analysis 90% α = 0.05	•STAI (State-Trait Anxiety-Inventory) •Blood pressure and heart rate •EDA (electro dermal activity) •P-cortisol, Epinephrine, Norepinephrine	In the music group, patients were less anxious after intervention than patients in the control group. In the music group, the measured state anxiety level before intervention decreased 16% compared with the state anxiety level after intervention. There were no differences in physiological measures or blood tests.
Yung *et al*. 2002 China	Preoperative Music group: music 20 min. before surgery Nurse presence group: nurse present before surgery Control group: standard care Pre test – post test	TURP n = 30	•C-STAI (Chinese-State-Trait- Anxiety-Inventory) •Blood pressure and heart rate	Music intervention significantly decreased blood pressure levels compared with the other two groups. There were also greater reductions in state anxiety scores in the music group.

Appendix 3 Intraoperative music intervention studies in pain relief in adult patients in the period 2002–2011.

Authors	Music intervention	Sample	Instruments and measures	Main findings
Kang *et al*. 2008 South-Korea	Intraoperative Music group: music during sedation Silence group: Ear plugs during sedation, no music Noise group: no music nor headphones	Total knee replacement n = 63 Power analysis 80% α = 0.05	•Bispectral index (x 7) during operation •VAS – anxiety, comfort and pain intensity before and after surgery	Between the three groups, the bispectral index was significantly lower in the silence group than in the noise group. There were no differences in anxiety before or after surgery nor pain intensity or comfort between the three groups.
Simcock *et al*. 2008 USA	Intraoperative Music group: music during surgery Control group: headphones, no music	Total knee arthroplasty n = 30	•VAS pain intensity Baseline, 3h, 6h, 24h •Wong-Baker-patient satisfaction 3h, 6h and 24h	In the music group, patients' pain scores were clearly reduced after 3 h and 24 h compared with the control group.
Szmuk *et al*. 2008 USA	Intraoperative Music group: music during surgery Control group: headphones, no music	Laparoscopic hernias or cholecystec-tomy n = 40 Power analysis 80% α = 0.05	•End-tidal sevoflurane % •VAS pain intensity •MAP (mean arterial pressure) and heart rate at 5 min intervals from intubation to extubation	There were no differences between the two groups in pain intensity, end-tidal concentration of sevoflurane, mean arterial pressure, or heart rate.
Reza *et al*. 2007 Iran	Intraoperative Music group: music during surgery Control group: headphones, no music	Cesarean section n = 50	•VAS pain intensity •amount of analgesia •anxiety •vomiting were evaluated up to 6h after discharge	There were no differences between the two groups in pain intensity, amount of analgesia, anxiety, or vomiting.
Mok & Wong 2003 Hong Kong	Intraoperative Music group: music 30 min. during surgery Control group: No music Pretest – Posttest	Minor surgical procedure anesthesia n = 80 Power analysis 80% α = 0.05	•Background information form •C – STAI anxiety •Blood pressure and heart rate •Questionnaire after intervention	In the music group, there was less anxiety, lower blood pressure and heart rate levels than in the control group. Patients in the music group felt that music has a relaxing effect and it distracted them from a stressful situation.

Appendix 4 Music intervention studies in pain relief before and after surgery in adult patients in the period 2002–2011.

Authors	Music intervention	Sample	Instruments and measures	Main findings
Lin *et al*. 2011 Taiwan	Pre- and postoperative Music group: music once a day and 1 h before the surgery and once on the 1st and 2nd postoperative day. Control group: no music	Spine surgery n = 60	•VAS pain intensity •VAS anxiety •STAI (State-Trait Anxiety-Inventory) •Blood pressure and heart rate •24h-urinanalysis	In the music group, patients had less anxiety and pain after surgery. Their blood pressure levels were lower 1 h after surgery compared with the control group.
Hook *et al*. 2008 USA	Pre- and postoperative Music group: music x 1 before surgery and x3/day after surgery control group: no music	Gynecological surgery n = 102 Power analysis 80% α = 0.05	•VAS pain intensity, pain distress and anxiety •STAI (State-Trait Anxiety-Inventory)	In the music group, patients had less anxiety before and after surgery than in the control group. Pain intensity and pain distress were milder in the music group compared with the control group.
Walworth *et al*. 2008 USA	Pre- and postoperative Music group: live music before surgery and once a day after surgery during hospitalization Control group: no music	Brain surgery n = 27	•VAS anxiety, mood, pain, perception of hospitalization, relaxation and stress	Live music had a positive effect on patients' anxiety, perception of hospitalization, relaxation, and stress levels compared with the control group. There were no differences in pain, amount of analgesia, or mood between the two groups.
Ikonomi-dou *et al*. 2004 Sweden	Pre- and postoperative Music group: music 15 min. before surgery and 15 min. after surgery. Control group: headphones, no music. Pretest - posttest	Gynecologic laparoscopy n = 60 Power analysis 80% α = 0.05	•Background information form •VAS pain, nausea and well-being •Blood pressure and heart rate •Questionnaire about attitude toward music listening	In the music group, patients' blood pressure levels were lower than in the control group. Cumulative opioid consumption was lower among patients in the music group. There were no differences in heart rate, pain, or well-being between the two groups. Patients enjoyed listening to music.

Appendix 5 Music intervention studies in pain relief before, during, and/or after surgery in adult patients in the period 2002–2011.

Authors	Music intervention	Sample	Instruments and measures	Main findings
Binns-Turner *et al*. 2011 USA	Pre- intra- and postoperative Music group: music throughout the preoperative period Control group: no music	Mastectomy n = 30	•MAP (mean arterial pressure) •Heart rate •SAI anxiety •VAS pain	In the music group there was a greater decrease in MAP, anxiety, and pain during the perioperative period compared with the control group.
Leardi *et al*. 2007 Italy	Pre- and intraoperative Group1: relaxing music 1h pre- and intraoperatively. Group 2: Classic, country, pop or dance music 1h pre- and intraoperatively Control group: no music	Day surgery n = 60 Power analysis 90% α = 0.05	•HAS (Hamilton Anxiety Scale)- 14 items •P- Cortisol •Lymphocytes •VAS pain scale •Analgesia	During surgery, both music groups' plasma levels of cortisol and lymphocyte levels decreased, but increased in the control group. In group 2, in which patients listened to a choice of music, cortisol level decreased the most. There were no significant decreases in pain and amount of analgesia between the groups.
Nilsson *et al*. 2005 Sweden	Intra- and postoperative Group 1: music 38–40 min. during surgery, sham CD after surgery. Group 2: sham CD during surgery, music immediately after surgery 38–40 min.	Hernia repair surgery n = 75 Power analysis 80% α = 0.05	•Background information form •P-Cortisol, B-gluck, IgA •NRS – pain and anxiety •Blood pressure, heart rate and oxygen saturation	Patients who listened to music postoperatively had significantly lower plasma levels of cortisol, less anxiety and pain. Patients who listened to music intraoperatively had less pain 1h after surgery. There were no differences in blood pressure, heart rate, or oxygen saturation between the two groups.
Nilsson *et al*. 2003 Sweden	Intra- and postoperative Group 1: music 42–44 min. intraoperatively, blank CD postoperatively Group 2: blank CD intraoperatively, music postoperatively Control group: sham CD intra- and postoperatively.	Hernia Inguinal surgery (n = 99) Varicose veins (n = 52) n = 151 Power analysis 80% α = 0.05	•Background information form •NRS – anxiety preoperative •NRS – pain, nausea, anxiety and fatigue postoperative •Analgesia •Patient diary, nausea, anxiety, sleep and satisfaction with perioperative care.	Preoperatively there were no differences in anxiety between the two groups. In both music groups there was less pain after 1h and 2h. There were no differences in the amounts of analgesia, nausea, anxiety, or fatigue. Patients in three groups were very satisfied with the perioperative care.

Appendix 6 Postoperative music intervention studies in pain relief in adult patients in the period 2002–2011.

Authors	Music intervention	Sample	Instruments and measures	Main findings
Li *et al*. 2011 China	Postoperative Music group: Music in the morning 30 min and in the evening 30 min. during hospital stay. Control group: no music	Radical mastectomy n = 120 Power analysis 80% α = 0.05	●SF-MPQ China ●VAS pain intensity ●PPI present pain intensity 1st day after surgery, before discharge, 2nd and 3rd before chemotherapy	In the music group, pain intensities on the VAS and PPI were lower on the first, second, and third postoperative days.
Easter *et al*. 2010 USA	Postoperative Music group: music during PACU stay. Control group: no music	Day surgery n = 213 Power analysis 90% α = 0.05	●Pain ●Analgesia ●Blood pressure, heart rate, ●Respiratory rate, ●Oxygen saturation ●Satisfaction admission – discharge	There were no differences in pain or physiological parameters. Patients in the music group reported increased satisfaction with their PACU experience.
Sen *et al*. 2010 Turkey	Postoperative Music group: music 1h postoperatively Control group: no music	Cesarean section n = 70	●VAS ●Analgesia 4h, 8h, 12h, 16h, 20h and 24h	In the music group, patients' pain intensity was lower than in the control group. After 4h and 24h, the need for analgesia was lower in the music group compared with the control group.
Ebnes-hahidi *et al*. 2008 Iran	Postoperative Music group: music during PACU stay. Control group: headphones, no music	Cesarean section n = 80 Power analysis 80% α = 0.05	●VAS pain/anxiety ●Analgesia ●Blood pressure, heart rate preoperatively and after 30 min. intervention	In the music group, patients had less pain intensity and they needed less analgesia than patients in the control group.
McCaffrey *et al*. 2006 USA	Postoperative Music group: music postoperatively 1h x 4/day. Control group: no music	Hip and knee surgery n = 124	●NRS ●Analgesia ●Acute confusion ●Mobilization after surgery ●Satisfaction every 8h after surgery and satisfaction 2 weeks after surgery	In the music group, patients had less pain, they needed less analgesia, and they experienced fewer episodes of acute confusion postoperatively compared with the control group. Patients in the music group were able to ambulate further distances and their hospital experience was more positive than in the control group.
Masuda *et al*. 2005 Japan	Postoperative Music group: music during bed rest. Control group: no music.	Orthopaedic surgery n = 44	●VAS, FS ●Blood pressure, heart rate ●Skin temperature and blood flow at the finger	In the music group, pain decreased significantly on the VAS and FS compared with the control group. There were no differences in skin temperature or blood flow between the two groups.

Appendix 7 Intervention studies of music and relaxation, imagery, or massage in pain relief in adult surgery patients in the period 2001-2005.

Authors	Music and other nonpharmacological intervention	Sample	Instruments	Main findings
Good *et al*. 2005 USA	Postoperative Group 1: Taped jaw relaxation x 1/ min. Group 2: Music 60 min. Group 3: Taped jaw relaxation and music Control group: Standard care	Abdominal surgery n = 167	• Background information form •VAS – pain sensation and distress •Heart rate and respiratory rate •Sleep •1st flatus, removal of nasogastric tube and 1st liquids per os •End of PCA, discharge •Jaw relaxation scale	In intervention groups 1-3 there was significantly less pain on the 1st postoperative day when preparing an ambulation, during ambulation, and after the recovery period in bed. On the 2nd postoperative day patients in intervention groups had significantly less pain when preparing an ambulation and after the recovery period in bed. There were no differences between the 4 groups in heart and respiratory rates or quality of sleep, complications, or time of discharge. Patients in intervention groups felt that both music and relaxation relieved pain. Music had a relaxing effect and it distracted from pain.
Laurion *et al*. 2003	Per-, intra-, and postoperative Group 1: guided imagery Group 2: music Control group: Standard care	Laparoscopic gynecologic surgery n = 84	•VRS-pain arrival to PACU, 1h and discharge •Nausea and vomiting •Analgesia •Length of hospital stay	The control group had a higher pain score when discharged home compared with group 1 or 2. There were no differences in nausea or vomiting between the three groups. The amount of analgesia was least in the music group, but the difference was not significant.
McRee *et al*. 2003	Preoperative Group 1: massage and music 30 min. Group 2: massage Group 3: Music 30 min. Control group: Standard care	Abdominal, urological, gynecological and orthopaedic surgery n = 52	•STAI-6 (State-Trait-Anxiety-Inventory) •Blood pressure, heart rate pre-, intra- and postoperatively •S-cortisol ja S-prolactin before and after surgery •Analgesia	After surgery anxiety was lower in all groups. There were no differences in cortisol or prolactin levels or blood pressure or heart rate levels or amounts of analgesia.

to be continued…

Appendix 7 continued

Authors	Music and other nonpharmacological intervention	Sample	Instruments	Main findings
Good *et al*. 2002 USA	Postoperative Group 1: jaw relaxation 30 min. Group 2: Music 30 min. Group 3: jaw relaxation and music Control group: Standard care	Gynecological surgery n = 311	•VAS – pain sensation •VAS – pain distress before, during and after ambulation •Analgesia •Sleep	In groups 1-3 patients had significantly less pain on the 1st and 2nd postoperative days than in the control group. In groups 1–3 patients' pain was 9–29% lower than in the control group. The low level of pain was related to mobilization, heart and respiratory rates, and mastery of the use of the intervention. Patients who slept well had less pain on the next day.
Good *et al*. 2001 USA	Postoperative Group 1: jaw relaxation 30 min. Group 2: Music 30 min. Group 3: jaw relaxation and music 30 min. Control group: Standard care	Abdominal surgery n = 468	• Background information form •VAS pain scale •Jaw relaxation scale	In the intervention groups 1-3 pain sensation and distress was significantly less than in the control group. There was less pain on the 1st and 2nd postoperative days both at rest and during ambulation. Patients who listened to music (G2, G3) experienced music as a relaxing distraction from pain effect.
Nilsson *et al*. 2001 Sweden	Intraoperative Group 1: Music 90-96 min. Group 2: Music and therapeutic suggestion Control group: operation room sounds	Gynecological surgery n = 90 Power analysis 80% α = 0.05	• Background information form •VAS – pain scale •Patient diary mobilization, 1st flatus, fatigue, well-being (5-grade scale) and nausea (4-grade scale)	On the day of surgery patients who listened to music and therapeutic suggestion required less analgesia than patients in the control group. In the music group (G1) there was significantly less pain on the 1st postoperative day and patients could mobilize earlier than control group patients. In both intervention groups, patients had less fatigue compared with control group patients.

Seuraavaksi on 21 väittämää koskien mielialaanne.
Ympyröikää kustakin väittämästä yksi vaihtoehto sen mukaan millaiseksi tunnette mielialanne juuri nyt.
Varmistakaa, että olette vastanneet jokaiseen kohtaan.

1. 0 en ole surullinen
1 olen surullinen
2 olen aina alakuloinen ja surullinen, enkä pääse tästä mielialasta eroon
3 olen niin onneton, että en enää kestä

2. 0 tulevaisuus ei erityisesti pelota minua
1 tulevaisuus pelottaa minua
2 tunnen, että tulevaisuudella ei ole minulle mitään tarjottavana
3 tunnen, että tulevaisuus on toivoton enkä usko asioiden tästä paranevan

3. 0 en tunne epäonnistuneeni
1 uskon epäonnistuneeni useammin kuin muut ihmiset
2 menneisyydessä näen vain sarjan epäonnistumisia
3 tunnen olevani täysin epäonnistunut ihmisenä

4. 0 asiat tuottavat minulle tyydytystä kuten ennenkin
1 en osaa nauttia asioista samalla tavalla kuin ennen
2 en saa todellista tyydytystä enää mistään
3 olen tyytymätön ja kyllästynyt kaikkeen

5. 0 minulla ei ole erityisiä syyllisyydentunteita
1 minulla on usein syyllinen olo
2 tunnen melkoista syyllisyyttä suurimman osan ajasta
3 tunnen jatkuvasti syyllisyyttä

6. 0 en koe, että minua rangaistaan
1 uskon, että minua saatetaan rangaista
2 odotan, että minua rangaistaan
3 tunnen, että minua rangaistaan

7. 0 en ole pettynyt itseeni
1 olen pettynyt itseeni
2 inhoan itseäni
3 vihaan itseäni

8. 0 tunnen olevani yhtä hyvä kuin kuka muu hyvänsä
1 arvostelen heikkouksiani ja virheitäni
2 moitin itseäni virheistäni
3 moitin itseäni kaikesta mikä menee pieleen

9. 0 en ole ajatellut tappaa itseäni
1 olen joskus ajatellut itseni tappamista, mutten kuitenkaan tee niin
2 haluaisin tappaa itseni
3 tappaisin itseni, jos siihen olisi tilaisuus

10. 0 en itke tavallista enempää
1 itken nykyisin enemmän kuin ennen
2 itken nykyisin aina
3 ennen kykenin itkemään, mutta nyt en pysty, vaikka haluaisinkin

11. 0 en ole sen ärtyneempi kuin yleensäkään
1 ärsyynnyn nykyisin helpommin kuin ennen
2 tunnen itseni ärtyneeksi koko ajan
3 asiat, jotka ennen raivostuttivat minua, eivät liikuta minua enää lainkaan

12. 0 olen kiinnostunut muista ihmisistä
1 muut ihmiset kiinnostavat minua nykyään vähemmän kuin aikaisemmin
2 kiinnostukseni ja tunteeni muita ihmisiä kohtaan ovat miltei kadonneet
3 olen menettänyt kaiken mielenkiintoni muihin ihmisiin

13. 0 pystyn tekemään päätöksiä kuin aina ennenkin
1 lykkään päätöksentekoa useammin kuin ennen
2 minun on hyvin vaikea tehdä päätöksiä
3 en pysty enää lainkaan tekemään päätöksiä

14. 0 mielestäni ulkonäköni ei ole muuttunut
1 pelkään, että näytän vanhalta ja vähemmän viehättävältä
2 ulkonäössäni on tapahtunut pysyviä muutoksia, ja niiden takia näytän vähemmän viehättävältä
3 uskon olevani ruma

15. 0 työkykyni on pysynyt suunnilleen ennallaan
1 työn aloittaminen vaatii minulta ylimääräisiä ponnistuksia
2 voidakseni tehdä jotain minun on suorastaan pakotettava itseni siihen
3 en lainkaan kykene tekemään työtä

16. 0 nukun yhtä hyvin kuin ennen
1 en nuku yhtä hyvin kuin ennen
2 herään nykyisin 1-2 tuntia liian aikaisin ja minun on vaikea päästä uudelleen uneen
3 herään useita tunteja aikaisemmin kuin ennen enkä pääse uudelleen uneen

17. 0 en väsy nopeammin kuin tavallisesti
1 väsyn nopeammin kuin tavallisesti
2 väsyn lähes tyhjästä
3 olen liian väsynyt tehdäkseni mitään

18. 0 ruokahaluni on ennallaan
1 ruokahaluni ei ole niin hyvä kuin ennen
2 ruokahaluni on nyt paljon huonompi kuin ennen
3 minulla ei ole lainkaan ruokahalua

19. 0 painoni on pysynyt viime aikoina ennallaan
1 olen laihtunut yli 3kg (viime aikoina)
2 olen laihtunut yli 5kg
3 olen laihtunut yli 7kg

Yritän tarkoituksellisesti pudottaa painoani syömällä vähemmän (rastita)
Kyllä □ Ei □

20. 0 en ole huolissani terveydestäni enempää kuin tavallisestikaan
1 olen huolissani ruumiini vaivoista: säryistä, kivuista, vatsavaivoista tai ummetuksesta
2 olen hyvin huolissani ruumiini vaivoista ja minun on vaikea ajatella muita asioita
3 olen niin huolissani ruumiini vaivoista, etten pysty ajattelemaan mitään muuta

21. 0 kiinnostukseni sukupuolielämään on pysynyt ennallaan
1 kiinnostukseni sukupuolielämään on vähentynyt
2 kiinnostukseni sukupuolielämään on huomattavasti vähäisempää kuin ennen
3 en ole lainkaan kiinnostunut sukupuolielämästä

AIKUISTEN GASTROENTEROLOGISTEN POTILAIDEN LEIKKAUKSEN JÄLKEINEN KIPU – MUSIIKKI-INTERVENTIO KIVUN LIEVITTÄMISESSÄ

Taustatiedot

1. Aikaisemmat leikkaukset

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____

2. Sairaudet

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3. Käytössä oleva lääkitys

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4. Anestesialääkitys

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____

5. Onko Teillä aikaisempia kokemuksia leikkauksen jälkeisestä kivusta ja sen hoidosta?
a) ei b) kyllä

6. Kuinka kauan leikkauskipu silloin kesti?
a) < 5vrk b) > 5vrk c) > 7vrk d) en muista

7. Kuinka voimakasta kipu silloin oli?
a) lievää b) kohtalaista c) voimakasta d) sietämätöntä

8. Tupakoitteko?
a) en b) < 10/vrk c) 10–20/vrk d) > 20/vrk

e) lopettanut, milloin? ______

Tiedot sairaalassaoloaikana

1 Paino __________

2 Pituus __________

3 ASA ______________________________

4 Esilääkitys ______________________________

5 Diagnoosi ______________________________

6 Toimenpidediagnoosi ______________________________

7 Anestesian kesto ______________________________

8 Toimenpiteen kesto ______________________________

9 Heräämössä oloaika____

10 Kipulääkityksen määrä leikkauksen jälkeen (3vrk)

Epiduraali (Fentanyl, Naropin, Adrenalin) ________________________________

Oxanest ____

Parasetamol ____

Ibuprofen____

Muu ____

11Haittavaikutukset____

12 Sairaalassaoloaika____

13 Komplikaatiot____

AIKUISTEN GASTROENTEROLOGISTEN POTILAIDEN LEIKKAUKSEN JÄLKEINEN KIPU – MUSIIKKI-INTERVENTIO KIVUN LIEVITTÄMISESSÄ
KYSELY TUTKITTAVILLE

Vastatkaa kysymyksiin rengastamalla oikean vaihtoehdon numero tai kirjoittamalla vastaus sille varattuun tilaan.

1. IKÄ ____________________

2. SUKUPUOLI
1 nainen
2 mies

3. AMMATILLINEN KOULUTUS
1 ei ammattikoulutusta
2 ammattitason tutkinto tai ammattikurssi
3 opistotason tutkinto
4 ammattikorkeakoulututkinto
5 yliopistotutkinto
6 muu, mikä______________________________

4. AMMATTIASEMA (nykyinen tai viimeisin)
1 ylempi toimihenkilö
2 alempi toimihenkilö
3 työntekijä
4 yksityisyrittäjä
5 opiskelija
6 eläkeläinen
7 muu

5. SIVIILISÄÄTY
1 naimisissa tai avoliitossa
2 naimaton
3 leski
4 eronnut tai asumuserossa

6. ASUINPAIKKA
1 maaseutu
2 kaupunki
3 taajama
4 muu

7. KUINKA USEIN YLEENSÄ KUUNTELETTE MUSIIKKIA?
1 useasti päivän aikana
2 kerran päivässä
3 kerran viikossa
4 harvemmin tai en koskaan

8. HARRASTATTEKO MUSIIKKIA?

1 ei
2 kyllä

9. JOS VASTASITTE KYLLÄ, MILLAISTA MUSIIKKIA HARRASTATTE?

1 kuuntelen musiikkia
2 soitan jotain instrumenttia
3 laulan
4 jotain muuta, mitä?____

10. MILLAISTA MUSIIKKIA KUUNTELETTE MIELUITEN?

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11. MILLOIN KUUNTELETTE MUSIIKKIA MIELUITEN?

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____

12. MILLAISTA TIETOA SAITTE KIVUSTA JA SEN HOIDOSTA ENNEN TÄTÄ LEIKKAUSTA?

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13. NEUVOTTIINKO TEILLE ERILAISIA KIVUNLIEVITYSMENETELMIÄ?

1 ei
2 kyllä

14. JOS VASTASITTE KYLLÄ, MILLAISIA KIVUNLIEVITYSMENETELMIÄ TEILLE NEUVOTTIIN?

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15. MITÄ MIELTÄ OLETTE SAAMASTANNE KIVUN HOIDOSTA LEIKKAUKSEN JÄLKEEN?

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____
____

Rengastakaa väittämien 16 – 21 kohdalla parhaiten Teidän käsitystänne kuvaava vaihtoehto.

16. PELKÄSIN ETUKÄTEEN LEIKKAUKSEN JÄLKEISTÄ KIPUA

1 täysin samaa mieltä
2 jokseenkin samaa mieltä
3 jokseenkin eri mieltä
4 täysin eri mieltä

17. HOITAJA TIETÄÄ PARHAITEN MILLOIN MINULLA ON KIPUJA

1 täysin samaa mieltä
2 jokseenkin samaa mieltä
3 jokseenkin eri mieltä
4 täysin eri mieltä

18. LÄÄKÄRI TIETÄÄ PARHAITEN MILLOIN MINULLA ON KIPUJA

1 täysin samaa mieltä
2 jokseenkin samaa mieltä
3 jokseenkin eri mieltä
4 täysin eri mieltä

19. TIEDÄN ITSE PARHAITEN MILLOIN MINULLA ON KIPUJA

1 täysin samaa mieltä
2 jokseenkin samaa mieltä
3 jokseenkin eri mieltä
4 täysin eri mieltä

20. VOIMAKKAAT KIPULÄÄKKEET AIHEUTTAVAT RIIPPUVUUTTA

1 täysin samaa mieltä
2 jokseenkin samaa mieltä
3 jokseenkin eri mieltä
4 täysin eri mieltä

21. LEIKKAUKSEN JÄLKEEN KIPU KUULUU ASIAAN

1 täysin samaa mieltä
2 jokseenkin samaa mieltä
3 jokseenkin eri mieltä
4 täysin eri mieltä

22. MITEN KEHITTÄISITTE LEIKKAUKSEN JÄLKEISTÄ KIVUN HOITOA?

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23. MITÄ MUUTA HALUAISITTE SANOA?

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Kiitos vastauksistanne☺

Appendix 11 Studies used in preparation of the questionnaire

Subject of the Questionnare	Questions	Authors
Musical background information	7 – 11	
• How often do you listen to music	7	Leardi 2007; McCaffrey & Locsin 2006; Kemper & Danhauer 2005; Mok & Wong 2003; Good *et al*. 2000
• Musical interest	8 - 11	Leardi 2007; McCaffrey & Locsin 2006; Kemper & Danhauer 2005; Mok & Wong 2003; Good *et al*. 2000; Guzzetta 2000.
Information about pain and pain management before surgery	12 - 14	Pellino *et al*. 2005; Rakel & Herr 2004; Apfelbaum *et al*. 2003; Good *et al*. 2001
Do you have pain at the moment (before surgery)	Measurement form	Cohen *et al*. 2005; Botti *et al*. 2004; Apfelbaum *et al*. 2003
Evaluation of pain management after surgery	15	
Attitudes towards pain management	16 -21	
• Fear of postoperative pain	16	Cohen *et al*. 2005; Rakel & Herr 2004; Apfelbaum *et al*. 2003
• Who is the expert on pain	17 - 19	Botti *et al*. 2004
• Analgesics cause addiction	20	Botti *et al*. 2004; Apfelbaum *et al*. 2003; Good *et al*. 2001
• Postoperative pain is relevant	21	Botti *et al*. 2004; Apfelbaum *et al*. 2003

ORIGINAL PUBLICATIONS (I-IV)

I

Effects of listening to music on pain intensity and pain distress after surgery: an intervention

Vaajoki A, Pietilä A-M, Kankkunen P & Vehviläinen-Julkunen K

Journal of Clincal Nursing 2012, 21 (5-6), 708–717

II

Music as a nursing intervention: effects of music listening on blood pressure, heart rate, and respiratory rate in abdominal surgery patients

Vaajoki A, Kankkunen P, Pietilä A-M, Vehviläinen-Julkunen K

Nursing & Health Sciences 2011, 13(4), 412–418

III

The impact of music listening on analgesic use and length of hospital stay while recovering from laparotomy

Vaajoki A, Kankkunen P, Pietilä A-M, Kokki H, Vehviläinen-Julkunen K

Gastroenterology Nursing 2012, 35(4), 279-284

IV

Music Intervention Study in Abdominal Surgery Patients: Challenges of an Intervention Study in Clinical Practice

Vaajoki A, Pietilä A-M, Kankkunen P & Vehviläinen-Julkunen K

International Journal of Nursing Practice

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Anne Vaajoki

Postoperative Pain in Adult Gastroenterological Patients – Music Intervention in Pain Alleviation

This thesis evaluated the effects of listening to music on pain alleviation. Listening to music as a supplement to medication may alleviate patients' pain after surgery. Listening to music had positive effects during the recovery phase. Nonpharmacological pain management methods diversify the treatment of pain and are an important supplement to pharmacological treatment.

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