

EFFECTS OF LISTENING TO MUSIC AS AN INTERVENTION FOR PAIN AND
ANXIETY IN BONE MARROW TRANSPLANT PATIENTS

By

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This dissertation is dedicated to two special people;

Barbara Achando and Andrea Alali.

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LIST OF ABBREVIATIONS

ABP	Arterial blood pressure
ALL	Acute lymphoblastic leukemia
AML	Acute myelogenous leukemia
ANOVA	Analysis of variance
ANS	Autonomic nervous system
BMT	Bone marrow transplant
BP	Blood pressure
CAM	Complementary and alternative medicine
CML	Chronic myelogenous leukemia
DHEA	Dehydroepiandrosterone
EMG	Electromyogram
ESWL	Extracorporeal shock wave lithotripsy
GI	Guided imagery without music
GIM	Guided imagery with music
HR	Heart rate
ICU	Intensive Care Unit
IDEA	Individuals with Disabilities Act
IRB	Institutional Review Board
RR	Respiratory rate
SI	Self-generated imagery without music
SIM	Self-generated imagery with music
SPSS	Statistical Package for Social Sciences
STAI	State-Trait Anxiety Inventory
VAS	Visual Analogue Scale

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Using the Gate Control Theory as the conceptual framework for this study, the effect of music on the pain perception and anxiety of 15 bone marrow transplant (BMT) patients was conducted. Subjects in the BMT unit listened to their choice of music for 30 minutes. In this repeated measures design study, subjects served as their own controls. Data were collected in a series starting from pre-intervention, during music intervention, and then post-musical intervention.

Data were analyzed to test the hypothesis that, following music listening, BMT patients have a greater decrease in self-reported pain, anxiety, blood pressure, heart rate, and respiratory rate compared to baseline reports. Subjects' pain perception was measured by a numeric rating scale, the Visual Analogue Scale (VAS) and State Trait Anxiety Inventory (STAI), for anxiety prior to and after the intervention session. Analysis of data indicated a statistically significant difference in the subjects' pain and anxiety scores following the musical sessions.

It is well recognized that pain and anxiety affect the autonomic nervous system (ANS) activity and balance. The interaction among feeling states, immunity, and autonomic function has been demonstrated by a number of studies. These studies show that pain perception and anxiety stimulate sympathetic activity, increase cortisol ratio, and suppress the immune system. These studies also demonstrate that positive emotional states created by music enhance parasympathetic activity, increase physiological coherence, reduce the cortisol ratio, and boost immunity.

Recent research has examined the physiological and psychological effects of music in both healthy populations and in clinical conditions under anxiety and pain. This research demonstrates that music helps reduce stress and negative emotions, while increasing positive emotions. In particular, recent research shows that specifically designed rhythmic patterns, tone textures, chord progressions, and harmonic resonances help reduce anxiety, facilitate the experience of pain perception, and enhance the benefits of stress-management interventions. Used regularly, music has been found to increase dehydroepiandrosterone (DHEA), coherence in the ANS, reduce cortisol, improve autonomic balance, and facilitating the entrainment of physiological systems.

The goal of this research is to extend this approach to the patient population aged 7 years and older who are receiving BMT. The study, conducted at Shands Hospital at the University of Florida, examined the whether or not music can potentiate the immunoenhancing effects of positive pain and anxiety states. Such interventions may yield significant health benefits in healthy individuals as well as BMT patients who exhibit both immunosuppression and autonomic imbalance.

CHAPTER 1 INTRODUCTION

“Listening to music has made me feel better. When you played Beethoven’s *Fifth Symphony*, I felt as though someone was scratching the cancer cells out of my body,” commented a 51-one-year old bone marrow transplant patient after music intervention.

Little research exists on music intervention on pain and anxiety in bone marrow transplant patients. Music intervention is defined as “the use of music to influence the patients’ physical, mental, or emotional states before, during, or after medical treatment” (Bruscia, 1989, p. 87). Despite the lack of research validating music intervention on pain and anxiety, efforts are ongoing to develop and assess new evidence on the cathartic nature of music. Existing evidence indicates that music can reduce the need for pain medication by reducing pain perception, diminishing the amount of anesthetic patients need before surgery, reducing the amount of time patients need to be in the hospital after surgery, speeding the healing process, increasing endurance during exercise or physical therapy, and helping regulate pulse, respiration, and blood pressure.

Pain and anxiety are common problems for bone marrow transplant patients during infusion and following the transplant (Bottomly, 1998; Cleeland et al., 1994). Cancer-related pain and anxiety have been reduced effectively through music listening (Bailey, 1983; Beck, 1991; Cook, 1986; Zimmerman, Pozehl, Duncan, & Schmitz, 1989). The management of such pain and anxiety is a special challenge for all health care personnel. Music appears to be particularly effective in the treatment of cancer-related pain (Kerkvliet, 1990). It is well recognized that pain and anxiety can affect the activity and

balance of the autonomic nervous system (ANS). Smeltzer and Bare (1996) observed that the contractions of muscles that are not under voluntary control, including the heart muscle, secretions of all digestive and sweat glands, and the activity of certain endocrine organs, are controlled by a major component of the nervous system known as the autonomic nervous system (ANS). The authors also concluded:

The term autonomic refers to the fact that the operations of this system are independent of the desires and intentions of the person. The autonomic nervous system is not subject to one's will--that is, it is in a sense autonomous. (p. 1686)

Interaction among emotional states, immunity, and autonomic function have been demonstrated by a number of studies, which showed that noxious stimuli, such as physiological and psychological sympathetic activity, increase cortisol levels. These stimuli also can alter the immune system, while positive emotional states can enhance parasympathetic activity, increase physiological coherence, reduce the cortisol ratio, and boost immunity.

Recent research has examined the physiological and psychological effects of music on both healthy and unhealthy populations, especially those experiencing anxiety and pain. Bone marrow transplant patients have a greater decrease in self-reported pain, anxiety, blood pressure, heart rate, and respiratory rate compared to baseline values (Sahler, Hunter, & Liesveld, 2003).

In the present research, attention is focused on the possible benefits of using music as an intervention on pain perception and anxiety in patients undergoing bone marrow transplants. Recent data show that certain rhythmic patterns, tone textures, chord progressions, and harmonic resonance help reduce anxiety, diminish the experience of pain, and enhance the benefits of stress management interventions (McCarty, 1999). Used regularly, music therapy has also been found to reduce cortisol levels, improve the

autonomic balance, and increase dehydroepiandrosterone (DHEA) levels.

Dehydroepiandrosterone is a steroid hormone made by the adrenal glands that acts on the body and is converted into testosterone and estrogen (Regelson & Kalimi, 1994).

The goal of this research is to extend this approach to patients aged 7 and older who are receiving BMTs. The study was conducted at Shands Hospital at the University of Florida (Shands at UF). The investigation examined whether or not music can be designed to potentiate the immunoenhancing effects of positive psychological states. This study investigated whether or not the use of music, an inexpensive and non-invasive method, could be used to enhance the management of pain and anxiety. The data, combined with the existing literature, were examined to determine if the effects of music in the intervention of pain and anxiety were likely to be autonomically mediated and facilitated by increased physiological coherence. These interventions may yield significant benefits to healthy individuals, such as schoolchildren, as well as to a variety of clinical conditions in which immunosuppression and autonomic imbalance are observed.

The Problem of the Study

According to Stewart (2005), bone marrow transplants are a relatively new medical procedure now used to treat diseases once thought incurable. Since its introduction in 1968, BMTs have been used to treat patients diagnosed with leukemia, aplastic anemia, lymphomas such as Hodgkin's disease, multiple myeloma, immune deficiency disorders, and some solid tumors caused by diseases, such as breast and ovarian cancer.

A bone marrow transplant is used to treat diseases affecting the bone marrow, which is a spongy tissue found inside bones (Stewart, 2005). The bone marrow in the breastbone, skull, hips, ribs, and spine contains stem cells that produce the body's blood

cells. These blood cells include 1) white blood cells (leukocytes), which fight infection; 2) red blood cells (erythrocytes), which carry oxygen to and remove waste products from organs and tissues; and 3) platelets, which enable the blood to clot. The purpose of a BMT is to replace nonfunctioning or defective bone marrow with healthy stem cells. In this process, the patient is administered drugs that kill all cells in the bone marrow, and then he receives an infusion of healthy new cells. During this moment patients endure a certain amount of psychological and physiological distress whenever they are experiencing the treatment (Spintge, 1989). As the cancerous cells grow and expand in the bone marrow, they cause pain and anxiety as they destroy normal bone tissue.

Despite opioid medication, moderate to severe anxiety and pain have been reported during bone marrow transplants. The anxiety tends to exacerbate the level of pain (Voss, 2005). During a bone marrow infusion, the patient may experience any or all of the following symptoms: chills, fever, hives, and chest pain. The researcher postulates that music may alleviate certain pain and anxiety symptoms because music can make patients feel much more confident about dealing with their pain (Voss, 2005). Pain is a psycho-physiological entity and therefore requires to be treated via a multi-disciplinary therapeutic approach (Rogers, 1995; Schorr, 1993).

Research Hypotheses

The following five hypotheses are examined in this study:

1. Bone marrow transplant patients have lower levels of self-reported pain as compared to the baseline measurements while listening to preferred music.
2. Bone marrow transplant patients have lower levels of state anxiety levels as compared to the baseline measurements while listening to preferred music.
3. Bone marrow transplant patients have lower systolic blood pressure (SBP) as compared to the baseline measurements while listening to preferred music.

4. Bone marrow transplant patients have lower heart rate (HR) as compared to the baseline measurements while listening to preferred music.
5. Bone marrow transplant patients have lower levels of respiratory rate (RR) as compared to the baseline measurements while listening to preferred music.

Limitations

The subjects in this study include only those patients diagnosed with acute leukemia, chronic leukemia, lymphoma, and multiple myelomas. These are conditions marked by excessive growth and malfunction of plasma cells in the bone marrow, which interfere with the production of red blood cells, white blood cells, and platelets. The following nine conditions were not controlled in this study:

1. Factors that influence pain such as pain tolerance
2. Pain threshold
3. Previous pain experience
4. Interpretation of the pain
5. Cultural influences
6. Individual patient characteristics
7. Variability in the amount and type of analgesics being administered
8. Variability in the distribution of analgesics that result from disparities in age, height, metabolic rate, and so forth
9. Pertinent patient demographic data

The researcher did not attempt to draw conclusions about the most prevalent musical style in pain and anxiety management, but instead offered suggestions on the most effective musical stimuli for pain and anxiety interventions in patients undergoing BMTs. In this study, the researcher provided only a few examples of musical styles that could be used in pain and anxiety intervention modalities in BMT patients.

Due to sampling specifications, the generalizability of this research may be limited. For instance, only those patients who are undergoing a BMT were studied. In addition, subjects were 7 years of age or older due to difficulties with self-reported pain assessments of subjects who are younger than this age. Since listening to music is an

independent variable in this study, those subjects with hearing difficulties were excluded from the study. Study sessions were initiated after 24 hours of baseline recorded indices and four hours after analgesics were administered to decrease the probability of measuring dependent variables prior to the peak drug concentrations. Patients undergoing BMTs are routinely administered strong anti-anxiety drugs. Many of the patients were also taking medications which affect their heart rate and blood pressure. It is not known what effect, if any, these medications have on the study results.

Definition of Terms

Acute lymphoblastic leukemia (ALL), also known as acute lymphocytic leukemia: This is a cancer of white blood cells, characterized by the overproduction and continuous multiplication of malignant and immature white blood cells (referred to as *lymphoblasts*) in the bone marrow. It is a hematological malignancy. It is fatal if left untreated as ALL quickly spreads into the bloodstream and other vital organs (it is therefore called "acute"). It affects mainly young children and adults 50 years old and older.

Acute myelogenous leukemia (AML), also known as acute myeloid leukemia: This is a cancer of the myeloid line of blood cells. It is the most commonly diagnosed type of adult leukemia, but it is rare among children. The malignant cells called *myeloblasts* fail to mature into different types of blood cells, a process called differentiation. If differentiation does not occur, myeloblasts accumulate and overtake the number of healthy blood cells, spreading into the bloodstream and other vital organs. The lack of healthy blood cells results in symptoms such as anemia and abnormal bruising. Myeloid leukemias are characterized as "acute" or "chronic," based on how quickly they progress if not treated. Patients with chronic myelogenous leukemia (CML) often show

no symptoms, and the disease can remain dormant for years before transforming into a crisis, which is markedly similar to AML.

Analogue: This is compound that is structurally similar to another compound.

Anxiolytic: This is a medication used to reduce anxiety, tension, or agitation.

Anxiolytic music: This is sedative music considered to be slow (60~80 beats/minute), melodic, and instrumental (without words) such as slow jazz, harp music, flute music, orchestral music, and piano music.

Autonomic: This is self-controlling, functionally independent.

Aplastic anemia: This form of anemia occurs when bone marrow ceases to produce sufficient red and white blood cells. It may be induced by exposure to high levels of toxic chemicals, radiation, and certain drugs.

Cortisol: This is a major adrenal glucocorticoid. It stimulates conversion of proteins to carbohydrates, raises blood sugar levels, and promotes glycogen storage in the liver.

Chronic myelogenous leukemia (CML): This is a form of chronic leukemia characterized by increased production of myeloid cells in the bone marrow. The overwhelming majority of cases of CML are due to a characteristic chromosomal translocation termed the *Philadelphia chromosome*. It is traditionally treated with chemotherapy, interferon, and bone marrow transplantation, but a specific inhibitor (imatinib mesylate) has radically changed its management.

Complementary and Alternative Medicine (CAM): This is a group of diverse medical and health care systems, practices, and products that are not presently considered to be part of conventional medicine.

Dehydroepiandrosterone (DHEA): This is a steroid hormone made by the adrenal gland that acts on the body much like testosterone, and it is converted into testosterone and estrogen.

Dicrotism: This is a condition in which the pulse is felt as two beats per single heartbeat.

Distraction: This is a condition where concentration of attention is disturbed, difficult, or virtually impossible due to irrelevant stimuli.

Electromyogram (EMG): This measures body temperature.

Ethnomusic therapy: This refers to the use of ethnic music for healing.

Eysenck's personality: Named after a prominent German psychologist Hans Eysenck, this is a personality based theory of extraversion, psychoticism and neuroticism as advanced by Hans Eysenck which he observed that defined the cognitive nature of humans.

Hodgkin's disease: This is a human malignant disorder of lymph tissue (lymphoma) that appears to originate in a particular lymph node and later spreads to the spleen, liver, and bone marrow. It occurs mostly in individuals between the ages of 15 and 35 years. It is characterized by progressive, painless enlargement of the lymph nodes, spleen, and general lymph tissue.

Holistic healers: These are professionals trained in alternative methods of healing the mind, body and spirit using programs like aromatherapy, astrology, hypnosis, meditation, natural and energy healing, new age, spiritualism, yoga, massage therapy, imagery, music and dance among others.

Leukemia: This is an acute or chronic disease of unknown cause in humans and other warm-blooded animals that involves the blood-forming organs. It is characterized by an abnormal increase in the number of leucocytes in the tissues of the body with or without a corresponding increase in those in the circulating blood. It is classified according to the type of leukocyte most prominently involved.

Lymphoma: This is a general term for various neoplastic diseases of the lymphoid tissue.

Multiple myeloma, also known simply as myeloma or plasma cell myeloma, or as Kahler's disease after Otto Kahler, multiple myeloma is defined as a incurable hematological malignancy of plasma cells, which are the cells of the immune system that produce antibodies. Although it initially develops in the bone marrow, it spreads to the peripheral blood, lymph nodes, and other organs. Despite therapy, its prognosis is generally poor, and treatment may involve chemotherapy and a bone marrow transplant.

Music therapy: This refers to the prescribed use of music by a qualified person to effect positive changes in the psychological, physical, cognitive, or social functioning of individuals with health or educational problems.

Music therapy intervention: This is a form of intervention which includes: singing; playing both composed and improvised music; creating song lyrics, melodies, harmonies, and orchestrations; moving to music; and listening actively to music to facilitate imagery and teach specific relaxation skills.

Nociceptor: These are receptors which are sensitive to painful mechanical stimuli, extreme heat or cold, and chemical stimuli. All nociceptors are free nerve endings.

Non-Hodgkin's lymphoma: This is a type of cancer. A lymphoma is a general term for cancers that develop in the lymphatic system. Hodgkin's disease is one type of lymphoma. All other lymphomas are grouped together and called non-Hodgkin's lymphomas. Lymphomas account for about 5% of all cases of cancer in the United States.

Nulliparous: This term is used to refer to a female who has never given birth to a viable infant.

Opioids: Originally, these were agents that caused somnolence or induced sleep. However, presently the term refers to any derivative, natural or synthetic, of opium or morphine or any substance that has similar effects. Narcotics have potent analgesic effects associated with significant changes in mood and behavior, and with the potential for dependence and tolerance following repeated administration.

Pethidine: This is a drug used to treat moderate to severe pain.

State anxiety: This is a state which reflects a transitory emotional state or condition of the human organism that is characterized by subjective, consciously perceived feelings of tension and apprehension, and heightened autonomic nervous system activity.

State Trait Anxiety Inventory (STAI): This is a self-report inventory established by Charles Spielberg (1976) to assess anxiety. The STAI is designed to differentiate between the temporary condition of "state anxiety" and the more general and long-standing quality of "trait anxiety" in adults. It consists of two categories with 20 items in each category. One category measures how respondents feel "right now, "state anxiety" and the other measures how one normally feels "trait anxiety."

Themes: Abstract constructs, which researchers identify before, during, and after data collection.

Unmet Analgesic Needs Questionnaire: This is a tool designed for cancer patients designed by Zhukovsky (1994) to measure prevalence and intensity of pain, and identify characteristics associated with unmet analgesic needs and dissatisfaction with pain control.

Visual Analogue Scale (VAS): This is a measurement instrument that measures the amount of pain that a patient feels ranging across a continuum from none to an extreme amount of pain. It consists of a horizontal line, 100 mm in length, anchored by word descriptors at each end of the spectrum (e.g., "no pain" and "the worst possible pain").

Significance of the Problem

The purpose of this study is to examine the effects of listening to music on pain and anxiety in BMT patients. In this study, the researcher attempted to provide evidence as to whether or not music can be used as an intervention for pain and anxiety through empirical methods and discourses.

Music for healing is a practice that has persevered through time (Spintge, 1989). From ancient times, music has been used to evoke potent forces, as well as for the compassionate treatment of individuals with physical, mental, and emotional illness. This practice is manifested through musical contexts by the dissemination of music as a product of human behavior. The practice includes reflections on the philosophical, religious, and ritualistic ideals aligning with a cosmic concept that there is an intrinsic healing power in music (Flanagan & Jupp, 1996). The debate on the effects of music

upon the human body has been one of the most controversial topics in the field of holistic and complementary therapies in health science. Peck (2002) observed:

Medications possess the notorious quality of being double-edged swords. This is true ... of modern synthesized pharmaceuticals. While they benefit the patient, they also pose risks of dangerous side effects. (p. 65)

For this reason, the application of music in pain management and the control of anxiety in patients have become popular during the past several decades. Music is considered to be a medium which eases anxiety, reduces pain perception, and increases pain thresholds. Although music therapy is an established allied health profession and is used with increasing frequency in the treatment of those with illnesses, a lack of empirical research literature exists supporting the use of music in the mitigation of pain and anxiety. In addition, many of these studies are insufficient, and their findings are therefore often contradictory. Ikonomidou and Rehnström (2004) noted:

Most studies in the literature have not been carried out according to standard principles for randomization or controlled circumstances, and statistical methods have been poorly documented, thus advocates of music therapy have referred to empirical database for positive effects of this intervention. (p. 274)

In this study, the researcher examined how listening to music affects bone marrow transplant patients. In this study, the researcher examined how patients felt about themselves, what benefits they derived from listening to music, and whether or not these experiences carried meaning for them beyond the act of listening to music. Study participants were recruited from Shands Hospital at the University of Florida (Shands at UF), a community health care hospital serving North and Central Florida, as well as adjacent parts of southeastern United States. During the past five years, Shands at UF conducted transplants in 100 to 130 patients per year. Transplants in the Pediatric ward

fluctuated between 8% and 20% of all cancer patients. Table 1-1 shows the breakdown of these patients by disease during the past five years.

Table 1-1. Proportions of Bone Marrow Transplants by Disease at Shands at UF from 1999 to 2004

Diagnosis	Percentage
Acute leukemia	25%
Lymphoma	25%
Myeloma	25%
Bone marrow failure state	15%
Other cancers	10%

The use of music in pain management as a form of analgesia has become popular in the last 80 years (Spintge, 1989; Browning, 2000). Patients have demonstrated significant results in studies involving the use of music with post-operative surgery, dentistry, spinal cord injuries, pediatric treatments, and chronic pain (Browning, 2000). Additionally, in this study the researcher examined how caregivers can benefit from this knowledge in making better, more clinically astute interventions. Shultis (1999) stated:

The steadily decreasing length of inpatient hospital stays requires rethinking and redeveloping, as well as retraining, in order for music therapists to work within a new conceptual model. Decreased financial resources contribute to the pressure to demonstrate the efficacy of music therapy in short-term treatment. (para. 3)

Scholars have defined *pain* in many ways. Chapman and Stillman (1996) defined *pain* as a phenomenon of consciousness that does not exist outside the realm of awareness. It is not an observable phenomenon and has no objective markers while it defies objective measurement (p. 315). Pellino et al. (2005) stated:

Pain is a multidimensional experience, consisting of not only physical stimuli but also psychological interpretations of pain. Internal processes, such as increased anxiety, and external forces can influence how a person experiences pain. (p. 182)

Other scholars consider pain to be an independent sensation with specialized peripheral sensory receptors (nociceptors). These receptors respond to damage and send

signals through pathways (along nerve fibers) in the nervous system to target centers in the brain (Smeltzer & Bare, 1996). These brain centers process the signals to produce the experience of pain. Merskey and Bogduk (1994) defined pain as: “An unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage” (para. 11). While the phenomenon of pain itself is so elusive, both scientists and allopathic healers have a myriad constructs to ponder in trying to comprehend its correlates.

Anesthetists use all the medication at their disposal to control and reduce pain, but in many cultures from the past, music healers and traditional medicine men used music and herbs to bring healing to patients. This ancient practice is still in use today in some societies. However, during the past decade, many scholars, who have turned their attention to alternative therapies including music, have embraced the phenomenological approach used by traditionalists. In this study, the researcher sought to find a meaningful consensus from a scientific standpoint for this interaction. Voss (2005) stated:

Drugs alone sometimes aren't quite enough. We need to find additional ways to decrease anxiety and pain. My belief is if patient anxiety and distress [are] reduced, then pain is also reduced. (para. 7)

Epistemological thought on the use of music for health and how it was used in ancient times is a fascinating field of study. It has nonetheless received limited attention. With the exception of anecdotes about Pythagoras's ability to calm an agitated youth bent on violence by having the piper change from one mode to another (Opsopaus, 2004), the efficacy of music as a healing agent has been dismissed in the recent past. Music has often been deliberately perceived as inconsequential to the development of modern science. Fortunately, some scholars are beginning to address this field of inquiry. Many current scholars are discovering that music can be cathartic for some patients. Gilchrist

(2002), a London-based physician, has written about the power of music to bring about healing. He observed, "I am a very conventional doctor, but I do like to use other sources for emotional problems where conventional medicine has little to offer" (p. x, para. 10).

On the power of music in Arabian societies, Alakbarov (2003) noted:

In the 13th century, the Turnini Dervishes (Mavlavi) considered that knowledge of God was possible only when they fell into a trance brought on by listening to special music and which slowly turned into a mystical dance. (para. 2)

As 21st century researchers, we carry out this research with the following five questions in mind:

1. What effect does listening to music have on a patient's pain?
2. What effect does listening to music have on a patient's anxieties?
3. What effect does listening to music have on a patient's blood pressure (BP)?
4. What effect does listening to music have on a patient's heart rate (HR)?
5. What effect does listening to music have on a patient's respiratory rate (RR)?

This study was done to determine whether or not listening to music has any effect on pain and anxiety levels in a select group of hospitalized persons. For the hospital environment, these data may have tri-partite role; 1) to support the development of more extensive music programs to support patients; 2) to support the caregivers; and 3) to motivate the nursing caregivers. The increasing perception of nursing as a less desirable career choice continues to have effects on the profession. Keating and Sechrist (2001) observed that stressful working conditions - night and weekend shifts, exposure to contagious elements, reduced time for patient care, and employer policies that push individuals to do more with less - do not project the profession of nursing as an attractive career choice, as it once was. With these far-reaching effects on the human capital, music listening in this environment will thus possibly bring to and retain more individuals in the field of nursing to lessen the nursing shortage. These potential outcomes will benefit the well-being of the caregivers and the health of their patients.

The results from this research should facilitate the reappraisal of the competing theories and disciplinary conflicts that have existed for more than two centuries between music and medicine. There is inadequate research in the field of music and healing. In addition, these few available studies report insignificant results from music intervention, hence additional research is needed (Mok & Wong, 2005). The subject of music and healing has a high profile in public awareness because of a series of scientific discoveries in sound and imagery therapy. This study provided possible interpretations of the data, based on the self-reported pain ratings found on a Visual Analogue Scale (VAS) and a calculated anxiety rating derived from the State Trait Anxiety Inventory Scale.

Implications of the Study to Music Education

The effects of anxiety on children have become a national concern (Brophy, 1986). Anxiety in children can be physically and emotionally debilitating. Physical problems, such as headaches resulting from anxiety, are common among children (Giles, 1990). Research during the last 20 years has built a good case for the effectiveness of music as a therapeutic tool for reduction of anxiety in both adults and children in the school system (Giles, 1990). Music plays a major role in helping students lower their anxieties, and music has been used to reduce anxiety in many situations (Cobb & Evans, 1981; O'Regan, 1979; Peretl & Swenson, 1974; Richter, 1984; Zimny & Weidenfeller, 1962) and increase attentiveness (Wagner, 1975).

A wide range of emotional, stress-related problems, such as teenage suicide, teenage pregnancies, delinquency, violence in school, physical and sexual abuse of children, and drug trafficking among youth are of national concern (Zill, 1993). Crimes committed by children, even murder, are increasing (Giles, 1996). Mental health professionals and parents have witnessed a dramatic 25% increase in the numbers of

reported cases of seriously emotionally disturbed schoolchildren due to anxiety in the last 10 years (Zill, 1993). Giles (1996) observed that “emotional states of students should be addressed . . . their feelings are as important, perhaps more important than the lessons to be taught” (para. 13). Misbehavior in schools is pervasive, and parents are concerned for their children's safety while in school (Goodland, 1984). Many students in today's classes are suffering from chronic stress and withdrawal, or they live in a constant state of anger or rage. They cannot think clearly under these conditions; they are wrapped up in their own little world. They carry these negative, unproductive emotions like baggage from class to class, seemingly traveling in a morass of emotions that prohibits learning. In extreme cases students become ill, and perhaps they may die or commit suicide (Goodland, 1984; Giles, 1990).

Children with anxieties who display many signs of misbehaviors could be described as “at risk,” a precondition to becoming conduct-disordered. Giles (1990) stated: “It is this group that is most prevalent in the classroom, and it is this group that could be helped by music” (p. 11). Recently, such long-lasting, stress-related behaviors have been described as personality disorders and conduct disorders, serious conditions that should be given the same attention by school authorities as other debilitating physical and emotional problems (Rizzo & Zabel, 1988).

In using music to heal schoolchildren, Giles (1996) observed:

Given the body of evidence for music's power to heal, one wonders why music is not used more often in schools for those purposes. Music education needs to do more than just cope with and manage the at-risk child. We should recognize the potential for good that music can bring, select appropriate music and give it to our students for a healthy tomorrow. (para. 18)

Music educators have recognized intuitively the powers of music. Giles (1996) posed several questions worth noting:

How often have we seen students who were on the brink of failure in school lift their self-esteem through music, and "find their way?" How many times have we seen little sad faces light up to the strains of "Zip-eh-dee-doo-dah" or some other happy song? (para. 4)

Giles (1996) observed that educators know in their hearts that music can do something for these students. For many years, research has shown the efficacious nature of music on physical and emotional states. Giles (1990) observed that children can be helped to reduce stress in their lives, lift their self-esteem, and be inspired to an emotionally healthy state of mind. During times of duress and anxiety, children can be uplifted and given hope through music (Wagner, 1975).

The effects of music on anxiety within the school system can also be examined in the context of other subjects. When referring to the effects of anxiety on math performance in schools, Martin (2003) noted that in math and science classes, students are often so uncertain that they become anxious, and this anxiety interferes with their learning. Furner and Berman (2006) observed:

When anxiety is reduced, students can become more successful at math, and be better equipped to be successful in a world that is highly technologically and mathematically oriented. (para. 21)

In today's world, we see strife and anxiety everywhere (Giles, 1996). American schools, faced with violence and crime, are looking for hope and new direction. Giles (1996), observing that children in school carry these anxieties from class, stated:

It is no wonder that so many are at risk for emotional problems, physically debilitating conditions, and failure in school. There is no better time to bring music into the schools as a healing force. (para. 6)

Music teachers can utilize the healing powers of music in the classroom to help the students who need to reduce stress in their lives. Giles (1996) pointed out that we must recognize and be more aware of the potential good in music to heal and produce

emotional health. It is imperative to study the psychological effects of music to alter negative emotions, such as anger, rage, and depression, to feelings of contentment or happiness. This research supports the idea that music can help students' anxiety. Giles (1996) observed:

Few music teachers have made a serious effort to study the specific attributes of music for healing, with the deliberate intention of incorporating health and healing into the music curriculum. (para. 8)

Giles (1996) also pointed out that most educators recognize that slow, moderately soft music is soothing. These styles of music can be used to uplift and calm students. Recognizing these effects can assist the teacher in the selection of appropriate music for students to hear or perform. Consciously selecting a piece of music for its emotional effects, in order to promote emotionally healthy students, represents a new direction in using music to promote health in schools. Alsalam et al. (1991) have estimated that 46% of students in American schools are now at risk, virtually half of the student body suffering from poverty or conditions leading to failure in school. Music educators are in a position to help these students through music activities. When this new dimension is added to the curriculum, students are involved in music activities that can ultimately reduce the stress in their lives and replace them with new self-esteem (Giles, 1996).

CHAPTER 2 REVIEW OF THE LITERATURE

Introduction

In this chapter, the philosophical rationales that support this work are examined. Relevant theories are presented, followed by selected literature on the efficacy of music intervention on the physiology of patients and healthy populations.

Philosophical Rationales

“Pain can be an isolating event in the human experience. Whenever I am in pain, I feel isolated from the society. This isolation brings me anxieties. When I am in pain and listen to music, I feel connected to the society. Music helps me in this way” commented a 68-year-old bone marrow transplant patient after music intervention.

Ancient healers and philosophers regarded music as a bridge between the body, soul, and earth. The philosophical foundations of music and healing in Western culture can be traced to classical antiquity. When it comes to this modern era, the Greek philosophers are credited with the ideology of the cathartic nature of music. The subject of music and healing, especially as revealed in its manifold and remarkable manifestations--throughout Ancient Greece until the dawn of the 18th century--has never been candidly and fairly examined in the European tradition. The only sound sources of information are anecdotes, which provide eyewitness accounts of individual music healers. The anecdotes reproduce evidence verbatim, as recorded in treatises of healing rituals.

Rationales

Pythagoras (c. 560 - c. 480 B.C.)

Pythagoras, who is sometimes regarded as the “Father of Psychotherapeutics,” championed the discipline of nature in therapy. His philosophy was enshrined in the fact that psychics and physics were inseparably mingled into a regimen of life. Pythagoras conducted perhaps the world’s first physics experiment. By playing strings of different lengths, Pythagoras discovered that sound vibrations naturally occur in a sequence of whole tones or notes that repeat in a pattern of seven. As with the seven naturally occurring colors of the rainbow, there is an octave of seven tones. He conceived of the universe as a vast musical instrument and reportedly heard the music of the spheres (Koestler, 1959). Other thinkers in this arena, who are considered to be the greatest writers on music in antiquity, were Plato and Aristotle, who reached the very pinnacle of psychosomatic speculation. Both Plato and Aristotle believed in the unity of the soul and body through the medium of scientific investigation.

Plato (427 B.C. - 347 B.C.)

Plato believed that music occupied the leading position among the arts, where he saw an analogy between the movement of the soul and musical progressions (*φωράι*). While synthesizing Plato’s ideals on the significance of music, Lang (1946) concurred: “Therefore the aim of music cannot be mere amusement but perfection of soul and the quieting of passions” (p. 13). These ideals were depicted in Plato’s treatises, *Laws*, *Republic*, *Gorgias*, *Philebus*, and the *Temaus*. In *Temaus*, Plato described the numerical (vibrational–musical) creation of the physical universe and the soul, which animates it. Plato called his students to activate the ancient shrines and sacred temples of the earth with sacred song, thereby employing perpetual choirs as if to imitate the harmonies of the

Heavenly Choir. Plato observed that "music is a prime factor in transformation . . . for music is medicine of the soul" (Schullian & Schoen, 1948 quoting Plato, p. 57)

Arthur Schopenhauer (1788 - 1860)

The effects of music on the mind are similar to those on the body. By listening to music, a more recent philosopher, Schopenhauer (1788-1860), stated:

For a moment we are in touch with something outside the empirical realm, a different order of being: we literally have the experience of being taken out of time and space altogether, and also out of ourselves, even out of the material object that is our body. (Magee, 1998, p. 144)

Schopenhauer, a German post-Kantian philosopher, who considered true philosophy as art, regarded music as “a sort of super-art, transcending all the others in metaphysical significance making, Wagner and Mahler regard their writings on music as being the profoundest that there are” (Magee, 1998, p. 144). Schopenhauer's philosophy was the biggest non-musical influence on the life of Richard Wagner (1813-1883). It was due to Schopenhauer’s metaphysical philosophy of loving-kindness or *caritas* (ἀγάπη) which Wagner discovered in 1854 that he developed his intuition regarding emotion in the *Parsifal* (Raphael, 1969).

Aesthetic experience quits the will within us. Music is, according to Schopenhauer, a direct manifestation of well-being. It is the voice of the metaphysical will. When music, suitable to any scene, action, event, or environment, is played, it seems to disclose to us its most secret meaning (Schopenhauer, 1958).

René Descartes (1596 - 1650)

Debates on the mind and body as a composite whole are evidenced in the writings of these ancient philosophers and through later ones as well. According to Descartes' famous dualist theory, human beings are composed of physical bodies and immaterial

minds. Descartes (1694) divided music into three basic component parts: 1) the mathematical-physical aspect of sound; 2) the nature of sensory perception; and 3) the ultimate effect of such perception on the individual listener. He characterized the process of sensory perception as being autonomous, self-regulating, and measurable.

Baruch Spinoza (1632 - 1677)

Spinoza, whose writings are replete with acute psychological insights, disagreed with Descartes' idea. In his masterwork, *The Ethics*, published in 1677 after his death, Spinoza argued that body and mind are not two separate entities, but one continuous substance. This concept contributed a great deal on affecting the body through the mind. According to Spinoza, in fact, anxiety was "uncertain pain," an emotion that can be overcome only by a stronger one. Music can bring about such stronger emotions; hence music can be useful in these situations (Spinoza, 1910).

Summary and Implications of the Present Study

Music has played important roles in schools for almost two centuries. In Europe, it has been used since early 1840s (Arveiller, 1980). For instance, in France, music education was introduced into public schools, and the National Academy of Music was created in Paris (Conservatoire). The idea was that music, through harmony, had the power to develop positive emotions, eradicate animosity, and promote wellness (Arveiller, 1980; Lecourt, 1992). For these reasons, the masses were educated through music, and music was considered beneficial for those who were sick.

In Europe, the first students of the Paris Conservatory were also the first music therapists, as they were sent into hospitals to give concerts and to offer music lessons to psychiatric patients (Arveiller, 1980; Lecourt, 1992). During this time, the consideration and the treatment of anxieties in schools and other mental illnesses began such as

psychiatry, which was developed by the work of Dr. Philippe Pinel (Bynum, Porter, & Shepherd, 1985).

Music therapy had, in essence, two main functions: a social and educational function and a more psychological regulating role (Arveiller, 1980; Lecourt, 1992). The social function was associated with nationalist objectives for which music constituted an instrument of national regrouping and a relational model. Musical societies, such as the Orpheons (choral groups and brass bands), developed throughout France (with national and international exhibitions). The groups shared the conviction that music education for the masses and workers would transform society and make people feel better (Arveiller, 1980; Lecourt, 1992). This music would also transform those with anxieties and reinstate patients in what they referred to as a musically harmonized nation (Lecourt, 1992).

In addition to its social function, music also had a regulatory role in schools. Music was expected to calm the restless students and stimulate the apathetic ones through mood and behavior regulation. These objectives were mainly developed through having students and patients listen to concert music. The students also organized musical events in hospitals while offering music education courses for patients in the hospital (Arveiller, 1980; Lecourt, 1992).

Music has long been used to produce therapeutic physiological and psychological results. Even though the historical and the philosophical debates on the efficacy of music as a healing device are not the focus of this research, these rationales nonetheless provide a background upon which the research is based.

These philosophers continued to influence psychologists in the science academies in the centuries that followed. In the 18th and 19th centuries, pragmatists especially in the

United States, led by John Dewey (1859-1952) began a new revolution in philosophy. They first confounded the scientific process of arriving at information. For the pragmatists, the five-step scientific process was the source of ultimate reality. Instead of relying on tradition, belief, religion, and myth about music and its efficacious nature to heal illnesses, 18th and 19th century scientists changed the format of the intellectual pursuit of knowledge. Tong (2003) observed that science is good at explaining concepts, but not necessarily good in explaining why such concepts exist or for what purpose. Assuming that science acts with perfect wisdom and does nothing in vain, Dewey argued that every step of the scientific process is crafted for its proper function. These ideas led scientists to theories of pain and anxiety.

Theoretical Rationales

Pain is the most common reason people seek help from the medical profession (Sokka, 2003). The questions addressed in this study can be linked to several theories. Based on these theories, health care providers use many approaches to treat pain, such as: 1) pain medication; 2) imagery; 3) deep breathing; and 4) music. Theories of pain have evolved from foundations created by ancient philosophers who considered pain to be an emotion. Aristotle (384 BCE – 7, 322 BCE) the Greek scientist and philosopher called it a “passion of the soul.” The concept then progressed through time, culminating into the pain theories of the 18th and 19th century psychologists.

Gate Control Theory

The Gate Control Theory of Pain was first proposed by Ronald Melzack and Patrick Wall (1965). They suggested that there is a "gating system" in the central nervous system (in the spinal cord where the nerves come in from an injury) that opens to let pain messages through to the brain and closes to block them. Melzack and Wall were

governed by theories of evolutionary psychology in developing the Gate Control Theory of Pain. One theory of evolutionary psychology holds that the evolution of intelligence in any natural environment historically begins with the recognition of an entity's own body--called the *kinesthetic sense*. Melzack and Wall suggested that the gate inhibits or facilitates passage rather than completely opening or closing, so it opens more or restricts the passage of pain signals. Pain is in the brain, according to Melzack and Wall (1965), and *only* there. According to the Gate Control Theory of Pain, our thoughts, beliefs, and emotions may affect how much pain we feel from a given physical sensation. The fundamental basis for this theory is the belief that psychological, as well as physical factors guide the brain's interpretation of painful sensations and the subsequent response. These emotions and attention open and shut the "gate." Although the physical causes of pain may be identical, the perceptions of pain can dramatically differ.

Pain perception was conceptualized in the Gate Control Theory as many non-pharmacological interventions are based on this theory (Melzack & Wall, 1997). To date, the Gate Control Theory, even though controversial, is the most influential and studied theory in relation to the nature of pain (Tse, Chan, & Benzie, 2005). This theory provided the conceptual framework for this study.

At the inception of this theory in 1965, Melzack and Wall (1965, 1983) proposed that a neural mechanism in the dorsal horns of the spinal cord acts like a gate to increase or decrease neural impulses from peripheral nerves to the central nervous system. Before pain is perceived or responded to, the gate serves as a modulating factor. The gate is influenced by large and small diameter fibers, chemical substances such as acetylcholine

and serotonin, and descending influences from the brain. A pain response is activated when the number of impulses passing through the gate exceeds a critical level.

According to Cooper (1990) and Melzack and Wall (1983), free nerve endings in the area of the injury serve as afferent pain receptors. When a sufficient number of these fibers are activated over an area (spatial summation) and over a period of time (temporal summation), the pain message is amplified and carried to the spinal cord via afferent nerves.

However, before nerve impulses can ascend to the brain, a portion of them must go through the densely packed, diffusely interconnected nerve fibers called the *substantia gelatinosa*. This region is found on both sides and throughout the length of the spinal cord within the dorsal horns. Between this transmission, from sensory neurons to ascending spinal cord neurons, that impulse pattern can be modified. Some fibers continue to the thalamus, and others penetrate the reticular formation in the lower part of the brain, then go to other sensory portions of the brain. Other fibers are carried along pathways to the limbic system (Bonica, 1977; Melzack & Wall, 1983).

The *substantia gelatinosa* play a role in the inhibition and activation of neural impulses. Injury produces signals that are transmitted from small diameter fibers to the dorsal horns, which may activate the *substantia gelatinosa* in the spinal cord. This activation then opens the gate in order to transmit the message further to the brain as indicated in the schematic representation of the theory (see Figure 2-1).

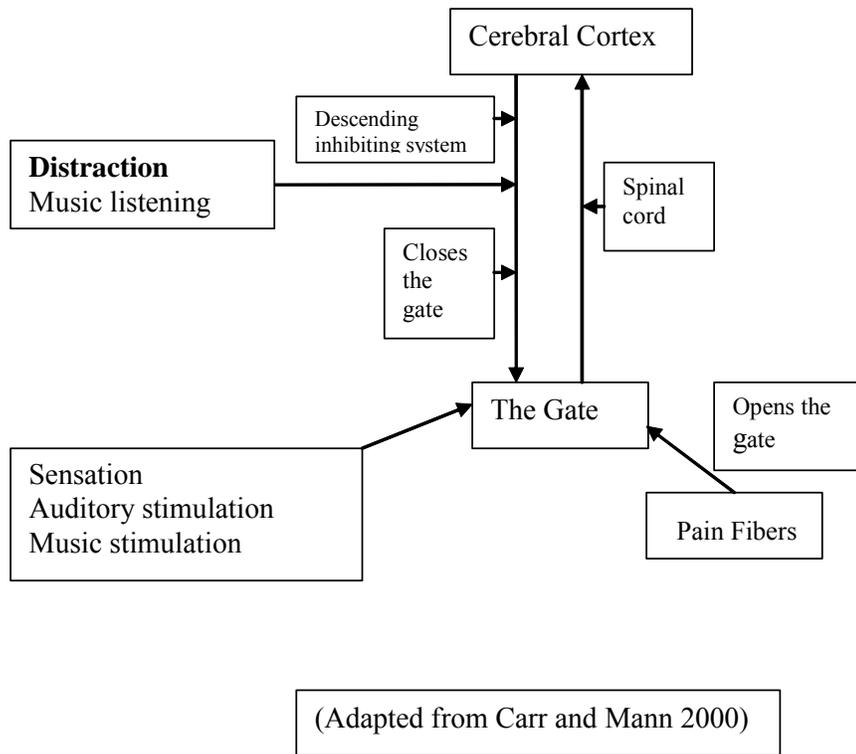


Figure 2-1. Schematic representation of the Gate Control Theory.

On the other hand, large diameter fibers may exert an inhibitory influence on the cells in the *substantia gelatinosa*, which result in inhibition and closure of the gate, preventing the continued transmission of the impulse to the brain. The reticular formation and the limbic system also exert a powerful inhibitory control over information projected by the *substantia gelatinosa* cells. When the level of neurotransmitters (i.e., acetylcholine, prostaglandin) exceeds the level of neuromodulators (i.e., serotonin, endorphins) at the synapse, the pain impulse continues to the next synapse (Melzack & Wall, 1983).

According to the Gate Control Theory, many factors come into play in an individual's perception and response to pain. Various psychological processes, such as past experience, cultural learning, the meaning of the situation, individual pain

threshold, attention, and emotions, influence pain perception and response via action on the spinal gating system (Melzack & Wall, 1965, 1983). The focus or attention an individual gives to the painful experience may increase the intensity of the painful experience. Several researchers have found distraction of attention--by means of auditory inputs--effective in decreasing pain (Gardner & Licklider, 1959; Melzack, Weisz, & Sprague, 1963). However, Melzack and Wall (1983) later found distraction to be effective only if the pain was steady or if it rose slowly in intensity, such as in post-operative pain. Subjects were able to use auditory stimulation to distract their attention from the pain before it reached an intolerable level. Drever (1952) defined distraction as "a condition where the concentration of attention is disturbed by irrelevant stimuli . . . or where concentration of attention is difficult or virtually impossible" (p. 72).

As spinal activity is initiated through the spinal pathways, the sympathetic nervous system is also activated. The sympathetic nervous system response commonly referred to as a "fight, fright or flight" response, contributes to the emotional response of the pain experience (Cooper, 1990; Melzack & Wall, 1983). Janig (1990) proposed that tachycardia, hypertension, tachypnea, and diaphoresis do not result directly from pain, but instead are manifestations of the anxiety response.

Specificity theories

Specificity theories consider pain as an independent sensation with specialized peripheral sensory receptors (nociceptors), which respond to damage and send signals along pathways (nerve fibers) in the nervous system to target centers in the brain. These brain centers process the signals to produce the experience of pain (Kent & Molony, 2001).

Pattern theories

Pattern theories consider that peripheral sensory receptors, which respond to touch, warmth, and other damaging and non-damaging stimuli, give rise to painful or non-painful experiences. These occurrences are a result of differences in patterns of the signals sent through the nervous system (Kent & Molony, 2001).

Nociception versus pain theories

Nociception is detection of a noxious stimulus, whereas “pain” is an “experience,” that is the product of the parts of the brain responsible for mental processing of the noxious stimulus. According to Kent and Molony (2001), "Pain occurs in the brain and it is only there that you can find it." (para. 3)

Implications of Gate Control Theory for the Present Study

The Gate Control Theory has important implications for pain control (Melzack & Wall, 1970). When pain messages reach the spinal cord, they meet up with specialized nerve cells that act as gatekeepers, which filter the pain messages on their way to the brain (Melzack & Wall, 1970). Music may trigger the brain to block out the pain messages by keeping the gate closed. Melzack and Wall (1990) observed that “this method, we believe, holds promise as an effective tool for the pain control” (p. 30).

Research

Patients who have undergone bone marrow transplant report less pain and anxiety after listening to music. Perhaps most intriguing is that the therapy may also shorten the time for the new marrow to start producing blood cells (Leingang, 2003, para.1).

This chapter presents previous research in areas related to the current study topic. It includes past research on the efficacy of music intervention on the physiology and psychology of both patients and healthy populations.

Clinical Effects of Music

Music therapy is defined as a systematic process of intervention wherein the therapist helps the client to achieve better health using musical experiences and the relationships that develop through them as dynamic forces of change (Bruscia, 1989). Music in the health care setting is defined as "the use of music to influence the patient's physical, mental, or emotional states before, during, or after medical treatment" (Bruscia, 1989, p. 87). The goal of the application of music in health care settings is the improvement in a patient's physiological and psychological status through the processing of music. In bone marrow transplant patients, the goal of music intervention is to reduce pain and anxiety levels with beneficial physiological and psychological effects.

Music has been used as an intervention in health care settings to decrease pain and anxiety during dental procedures, childbirth, surgical procedures, and terminal illnesses (Cook, 1981; Standley, 1986). Standley performed a meta-analysis of 30 medical and dental studies using music intervention. The average effect size--across all 55 physiological, behavioral, and psychological dependent variables analyzed--was 0.98, indicating that the groups receiving music intervention scored almost one standard deviation better than the control groups for each variable. No study has shown a negative response to music. This meta-analysis supports the use of music to decrease stress and pain in multiple health care situations.

The use of music has been recommended in critical care settings to decrease psychological and physiological stress (Collins & Kuck, 1991; O'Sullivan, 1991). Cook (1981) advocated the use of music as an intervention for patients exposed to altered sensory environments, including increased, decreased, or distorted stimuli. Cook hypothesized that in such situation, listening to music can normalize stimulation of the

reticular activating system, and it can decrease unpleasant stimulations. When people listen to music, they process it through their reticular activating system, and they respond individually to its pitch, tempo, rhythm, and volume. Listening to music alters the prominence of environmental noise and serves as a coping resource.

Phenomenological Approaches

Neither the sound nor musical notation of the music used for healing in ancient civilizations remains. Apart from sparse written records, the only information provided is from ancient inscriptions of musical instruments or music-healing ceremony paintings unearthed by archeologists. Until the mid-19th century, the entire assessment of the cathartic nature of music was based on sources such as the *Bible*, *Talmudic* and *Sanskrit* texts, mythology, cosmology, or wisdom. Since these sources are clearly non-scientific, scholars have disregarded all the efficacies therein with regard to health care.

In order to understand the rationale for this study, it is important to examine the practice of using music for healing through these ancient cultural traditions. Even though ancient approaches to the study of music and healing are purely anecdotal, this chapter examines the literature, which defines the characteristics of music used in healing. The chapter also illuminates the significance of music rituals, music and trance, and music in healing. A significant body of literature shows profiles of usage of music in healing among traditional societies in pre-colonial and post-modern Western and ancient civilizations. Insufficient research exists to address the effects of music on pain and anxiety among bone marrow transplant patients per se. But the literature reviewed herein nonetheless provides a background on the role of music in healing with reference to pain from both physiological and psychological standpoints.

For much of the history of mankind, music and healing have been universal experiences. The practice of using music for healing has been an ongoing phenomenon for millennia. Many scholars (Benenzon, 1997; Eliade, 1962; Friedson, 1998; Mullings, 1984; Nketia, 1962) have recognized the use of music for curative purposes. Benenzon observed that the practice may be almost as old as music itself. Darrow, Gibson & Heller, (1985) suggested that the idea of using music to treat injury or disease is as old as civilization itself (p. 18). Music and healing, as disciplines of inquiry, have their origins in ancient civilizations, such as Mesopotamian, Egyptian, Hindu, and Chinese. In Egypt, the use of music in healing was discovered at Kahum by Petrie in 1889, and the archeological evidence showed that it dated back to 2500 B.C. (Podolsky, 1934). The beginning in Greek civilization was during the era of Thales of Miletus (624-546 B.C.E), the first known Greek philosopher, scientist, and mathematician (Ueberweg, 1972). Early Greek legends show that in the year 600 B.C., Thales was credited with curing a plague in Sparta through musical powers. At the very heart of Greek civilization, music was divine. Demigods, such as Apollo, Amphion, and Orpheus, conjured up notes of sonic energy into a revered purifier of body, soul, and mind (Grout & Palisca, 1996).

Davis (1999) addressed the historical perspectives of the practice of music therapy where he noted that music was regarded as a special force over thought, emotions, and physical health in ancient Greece. Music was described as an art exerting great power (ethos) over human beings, and certain musical styles came to be associated with particular peoples and deities. The *kithara*, a plucked string instrument, came to be linked with Apollo, the god of the sun and reason. A loud double-reed instrument, the *aulos*, came to be identified with Dionysus, the god of wine and ecstatic revelry. The most

important of the mythic musicians in ancient Greek culture was Orpheus, whose music reportedly had the power to cause inanimate objects to move and even influence the supernatural forces (Lippman, 1964). Nearly two centuries ago, in his monograph entitled *An Inaugural Essay on the Influence of Music in the Cure of Diseases*, Atlee (1804) recommended the use of music in the treatment of diseases. Atlee argued that music healing offered a unique, and occasionally instantaneous, power for healing. Innumerable studies have been carried out since then.

Moreno (1995) observed that music in the Shamanic ritual can be considered a stimulus that sedates and reshapes the left hemisphere of the patient's brain from immediate temporal distractions, thereby liberating the right hemisphere to attend to the conceptualized world of the spirits. Holistic healing is based on the belief that invisible forces or spirits that affect the lives of the living pervade the visible world (Taussig, 1987). Moreno observed further that the Shaman trance process is determined by four factors: 1) a specific stimulus; 2) the times of the day when music is played; 3) cultural determinants; and 4) imagery of the spirits. For example, the specific timbre of the instruments--together with the sound intensity--has variable effects on a patient. Certain kinds of music are more effective during certain times of the day. When music is performed, the patient not only interprets it within culturally defined norms, but also sees into the future in order to reveal the deities' expectations for the people.

Moreno (1995) was concerned with music as therapy and music as guided imagery. He observed that direct uses of music in therapeutic contexts bring about psychological changes. He also noted that these changes are measured by overt behavior, while physiological change is measured by standardized medical criteria. In comparing the

direct use of music in therapy and guided imagery, researchers (Marina, 1991; Moreno, 1995) concur that music assists patients in traveling to their unconscious to discover and come to terms with important inner material.

Music and Healing in Non-European Traditions

In this study, this researcher makes reference to the concept of holistic healing because the epistemological thought of the ancient civilizations being referenced--such as long-standing health care practices from East Africa to Southeast Asia—creates the ancient holistic approaches upon which all healing was based (Sommer, 1996). Holistic healing is viewed to consist of multiple biological, psychological and social factors that are interlinked (Lipowski 1977). Hassed, (1998) has observed:

The ancient view on healing was essentially a holistic one, i.e. an intimate interaction of body, mind, environment and spirit. The human being, and the whole of society and nature for that matter, was viewed as being intelligent, conscious and ordered. Nature had laws and in order to stay well or to treat illness one had to work with those laws. (para. 4)

Several scholars (Eliade 1962; Rouget, 1985; Moreno 1995) examined music and healing in these ancient civilizations from a holistic healing perspective. For example, Moreno, highlighted the use of ethnic music for healing, a concept which he called “ethnomusic therapy” during his study of the holistic healers or Shamans of Brazil. He observed that “music facilitates the Shaman’s travels to the spirit world to establish those connections that will be a benefit to the patient” (p. 331). Even though Moreno’s study was within the confines of Brazil, the myths revealed here share several parallels with those of the Taita tribe of Kenya and the Balinese of Southeast Asia. Moreover, Moreno noted the use of music in many world cultures as a vehicle for inducing a trance for the purposes of healing while a holistic healer mediates the process. Moreno viewed ethnomusic therapy as a discipline that considers the impact of music in ritual

performances upon the measured progress of the patient-participant with psycho-physiological problems of a known etiology.

Moreno also connected cultural music-making to the existence of a deity. He observed that music, as a part of the culture, is capable of transforming the mental state and infusing supernatural healing in a patient within the cultural context. According to Moreno, the supernatural healing that is achieved by way of communication between the spirit and the patient is due to music. He contended that the auditory power of the drums of the healer or Shaman induces changes in the alpha and theta waves within the brain. These changes, in turn, induce a trance-like state, allowing the healer to fly to the sky to encounter the spirits. This metaphysical effect of healing using music continues to challenge many scientists (Mullings, 1984). Consequently, this idea has led many of them to give credence to the thought that the uses of music in therapy may precipitate epistemological issues of the “placebo” effect (Engel, Guess, Kleinman, & Kusek, 2002; Mullings, 1984). Hart (1999) observed that the placebo response represents the mysterious self-healing forces generated by the mind-body connection. According to Shapiro and Shapiro (1972), the term *placebo* first appeared in the medieval Catholic liturgy to describe a flattery, and since the 19th century, the term has been used to refer to medicine given more to please than to benefit the patient. The word placebo (in Latin, "I will please") has been defined as an inactive substance or preparation given to satisfy the patient's symbolic need for drug therapy and used in controlled studies to determine the efficacy of medicinal substances (Achterberg, Dossey, Gordon, Hegedus, Herrmann & Nelson, 2006). The connection between the efficacies of music healing to the placebo effect has been discussed (Engel, Guess, Kleinman, & Kusek, 2002). Observations have

also been made to support the fact that placebos still flourish in contemporary medicine where antibiotics prescribed for viral colds and flu have proven to be ineffective. This has led many scientists to believe in the placebo (Engel et al., 2002).

Whatever the nature of placebos, certain conditions clearly need to be met if music-based healing is to take place. Moreno (1995) observed that one condition was a high level of belief on the part of the patient. Sufficient belief, it seems, can trigger physiological change. This belief is also true of the Taita, a Bantu-speaking tribe of Kenya. Moreno's sentiments are that belief and trust in the powers of the supernatural are catalyzed with music, and therefore music and belief must be present prior to healing. This allegorical argument leaves the reader to choose one of the paradigms: music or belief in the gods. Many authors (Eliade, 1962; Nketia, 1962; Mullings, 1984; Benenson, 1997) seem to point to music as the most fundamental phenomena in healing. In many parts of the non-Western world, a healer initiates the healing process. The music healer, usually performs the healing process using several stages.

Kovach (1985) identified four stages. The first stage is the preparatory stage in which the subjects, the audience, and the Shaman are prepared and initiated into the process with slow rhythms and soft music. The process begins with a diagnostic test for the patient. When a patient is diagnosed, usually by the Shaman and preferably in the Shaman's home, both the client's immediate family members and the community are invited to the healing ceremony. The second stage is the actualization of the spirit helpers in which the medium of music, bells, and costumes are dedicated to the spirits. The healer who normally plays *ngoma mwazindika*--a composite of text, song, and dance--provides the beat and the tempo from patterns of established Taita traditions. The third stage is the

trance state, where, with the help of the Shaman, the patient's souls travels into the ecstatic state where he meets the spirit as the *ngoma mwazindika* escorts his soul to heavenly skies. After being exorcised, the soul then returns to earth anew. The fourth stage is the termination of the ritual where consciousness and healing are achieved as normality returns (Kovach, 1985).

According to the rich scientific and musical heritage of our ancestors, it therefore seems that not only did the ancestors listen to music for enjoyment and entertainment, but also they perceived music as a potent force in the prevention and treatment of various diseases (Alakbarov, 2003).

The playing of music is intertwined with the creation concepts of many of the world's cultures. The Taita of Kenya, for instance, have a culture whose cosmology associates the creation of the world with superior powers that bring healing and comfort through music. The Taita are a small ethnic group of people who live in a coastal province of Kenya, close to the Tanzanian border to the east of Mt. Kilimanjaro. The Taita's legend of creation is imbued with supernatural powers, and it is attributed to musical powers. According to Taita cosmology, their country was created on regular and irregular musical rhythms, which are manifested in the topography of the land where the Taita live. The land is interspersed with mountains, plateaus, and valleys.

Throughout the ages, music played an important role when healing was needed. It has been noted that in all cultures and at all times, healers knew the positive effects of music. Even though the specific role and application of music in healing has been noted in Africa, systematic studies of the variety of forms used in these processes have lagged far behind for two possible reasons. One reason is that the use of healing music, among

the Taita of Kenya for instance, is an area instilled with esoteric beliefs. Another reason is that the cultural notions of the etiology of diseases are still based on myth rather than empiricism. For example, the belief in the vitality of the Taita ancestral spirits (*pepo*) remains strong. While the Taita cosmology holds that there are two kinds of *pepo*, beneficial and evil, the cosmology also associates the origin of all diseases with the evil *pepo* or *pepo shetani*. Whenever an individual becomes is in pain, the general belief is that the patient is possessed by the *pepo*. A healing ritual for the patient is then initiated in which traditional music (*ngoma*) plays a core role in the healing pain and exorcising of the spirit that brings illness to the patients.

The modern scientific and medicalized construction of pain provides a totally different perspective. Efforts to effect an epistemological compromise between the scientific objectivism and the non-scientific subjectivism has been a challenge for almost two centuries (Turk & Melzack, 1992). Kaufman-Osborn (2002) has observed:

To the biomedical researcher, pain is understood not as a manifestation of some disorder or malady stitched into the very seams of the cosmos, but as an aversive effect occasioned by changes in various etiological mechanisms, including sensory receptors, afferent neuronal relays, and spinal-cord, midbrain, or higher cortical modulating systems. Read as an indicator of nociception, as a sign or symptom of injury or disease, pain is to managed by removing its cause or, failing that, by administration of analgesia (p. 137)

In adding credence to the traditional and cultural beliefs, Cornelius (1990) observed that sound is used to reach outwards towards the deities. In turn, it is through the vibratory matrix which sound provides that the deities themselves descend from the spiritual abode to participate in the world of man. Cornelius' reflection provides new insights into what Harper (1969) observed three decades earlier that dance is the vortex of religious ritual. In her examination of the function of dance in Nigeria, Harper concluded

that the main purpose of dance was to appease the supernatural powers, solicit divine protection, and give thanks to the guardian spirits of the community.

From a biomedical standpoint, Graham-Pole (2000) noted that “dancing is good for your circulation, your balance, your fine muscle control, sense of self-esteem” (p. 140). Africans generally tend to approach healing through music and dance. For example, in northern Nigeria among the Hausa (Friedson 1998) observed that the sounds of the *garaya* (a two-stringed plucked lute) and *buta* (a gourd rattle) call the divine horsemen of the sacred city of Jangare to descend into the heads of *bòorii*, thereby healing the people they have made sick.

However, the foregoing phenomenological practices of using music to cure diseases have not gone without some challenges. Even though historical debates on the efficacy of music as a healing device are not the focus of this study, a few instances are worth mentioning. Early 19th century Americans used herbal remedies to deal with common discomforts, such as colds or constipation. These remedies came to be called “snake oil” (Carol, 2000). Snake oil was originally associated with Chinese railroad laborers in the 1860s. As an opioid, snake oil, which had no addictive ingredients, was given without restriction (Carol, 2000). Just as more scientists questioned the efficacy of such remedies, Mullings (1984) questioned the legitimacy of music as a healing agent, branding it merely as “brainwashing” technique (p. 181). In Mullings’ view, it was the excitement and exhaustion from music, rather than the music itself that led to alterations in brain functioning (p. 181). Mullings observed that these changes promoted the disruption of old behavior patterns and facilitated the promotion of new ones.

Specific musical instruments in Africa have been associated with affecting changes in human health. Drums are an example of such important instruments. Throughout the world, the drum has been used for healing purposes. The drum has also long been used in tribal societies with holistic healing traditions while communicating with the gods.

Klöwer (1997) observed that “it is clear that the drum has been used since time immemorial as a regular part of healing traditions, where it was used in religious ceremonies, accompanied by singing and dancing” (p. 21). Klöwer also noted:

The drum is connected with the Shamanistic practices and rituals in all of Central Asia, from Tibet to Northern Siberia, as well as those of the Eskimos and Native Americans. (p. 21)

In West African wisdom teachings, Cottrell (2001) noted that emotional disturbance manifests as an irregular rhythm which blocks the vital physical energy flow. Cottrell also referred to current medical research, which has shown that stress is a cause of 98% of diseases, such as heart attacks, strokes, and immune system breakdowns. Recent biofeedback studies (Echenhofer, 1987; Harner, 1990; Spintge & Droh, 1992; Turow, 2005) show that drumming along with one’s own heartbeat alters brainwave patterns and dramatically reduces stress.

Rhythm is the element of music that distinguishes it from other auditory stimuli (Scartelli, 1989). Wertheim (1997) hypothesized that rhythm may have an impact on the entire cerebral cortex and large subcortical areas. This information reaches the medial geniculate by way of the ascending reticular formation. This formation activates the limbic system and cortex. Ancient civilizations, such as those in Africa, however, do not relate to disease from this perspective. Their understanding of the disease etiology is embedded in their cosmological viewpoints.

Among the Taita, a regular and balanced meter is regarded as a sign of good health. Even during improvisation, performers are expected to render an exact replica of a standardized musical practice. Such mythologies can relay regular and replicated rhythms to heal the person in an immediate and powerful way by removing blockages and releasing tension. They can be seen in the performance of musical ensembles (*ngoma*) as well. The lead drummer plays a *glissando* by gliding the left hand from the middle of the drum to the edge (*kusira ngoma*). By doing this, the drummer not only offers an emotionally expressive pattern at the climax of the healing ritual, but he also provides functional significance to the healing process. During this moment, the drummer sedates the beneficial spirit (*pepo*) so that it can descend and exorcise the evil spirit from the patients. *Kusira ngoma*, which literally translates as “going beyond with music,” is the climax of the healing ritual and its ultimate extreme. This is the stage at which the patient shivers, falls to the ground, and ultimately goes into a trance.

Many theories have been postulated regarding the condition of a patient in a trance following a session of musical healing. Convulsions have been reported in some instances (Erdtsieck, 1997). Some patients may be possessed by the *pepo* that comes with the music, which causes them to run away from home. This running may simulate the symptoms of one suffering from *fugue* (a kind of dissociative disorder). This disorder is synonymous with the term *kuchima na pepo* that means “to run with the spirit,” as opposed to “rolling with the spirit” (*kugaragara na pepo*) (Erdtsieck, 1997). *Fugue*, or “flight,” involves presumed forgetting. It also refers to fleeing from one's home and identity for days, months, or even years. Usually when people are stricken with fugue, they flee from their home and move to a new location. They may give themselves a new

name or even choose a new group of friends. Once patients are brought back to their original surroundings, they will usually remember a face or a place, but they will not admit to remembering (Hollandsworth, 1990). In the case of the Taita, when such patients hear the *ngoma* music, they run to the rhythm of the beat to maintain their health.

During this performance, the lead drummer controls the emotions of the patients while they unlock their inner subconscious mind. In the middle of the performance when the interlocking parts become intense, a state is induced in patients in which they begin to dance pathogenically as they respond to the *mwazindika* drum, letting their souls soar into the supernatural world to meet the deity. In a similar supernatural mediation, Cornelius (1990) found that the *bata* drums are believed to be capable of talking and communicating directly with the *Orishas*, or Yoruba gods, to bring healing.

As patients delve into their subconscious worlds, the healer plays a *glissandi* (*kusira ngoma*) on the *mwazindika*. The healer, who occasionally wets his left thumb with saliva and glides it from the edge to the middle of the drum, continues to pound from the edge to the middle with his right hand until the patient stands and exits the healing arena. Janzen (1978) wrote:

Music with the assistance of medicines brings out the speech in the sufferer, which then indicates to the presiding witchdoctor *mganga* which spirit must be dealt with. Specific instruments play distinctive rhythms appropriate to each spirit. (p. 126)

Music and Healing in Southeast Asia

The Balinese also believe that illnesses are a result of evil spirits who may be inveigled by the malevolent goddess, *Rangda*, or through evil persons called *orang jahat*. Larco (1997) observed that illness is a cultural construct, and, in the context of the prevailing norms, the culture's perceptions for diagnosis and cure are efficacious. In the midst of all the foregoing mythological patterns, both the Taita and the Balinese believe

strongly in the effects of music, which compel the white, or beneficial, gods to descend to Earth to provide healing. For this reason, music is evidently ubiquitous in the healing ceremonies of the Taita who use folk music and a healing drum ensemble, or *ngoma*. It is also evident among some Balinese who use folk music with a healing ensemble, or *gamelan gong beri*, or the 20th century *gong kebyar*. Jilek (1999) equated the therapeutic effectiveness of indigenous treatment methods with the current Western therapies (Jilek, 1984).

In his research on the social role of music healers in Sri Lanka, Kapferer (1983) stated that the exorcist must achieve a high status and reputation in order to exorcise those in the higher caste (p. 42). Because of these expectations, healers are held in high esteem. Findings in this study show that that belief in the healer himself as a member of the high caste is essential as well.

Music and Healing in European Traditions

The first metamorphosis is mentioned and fully explained in the *Musica Medicina* of Richard Browne (1605~1683), published after his death. Browne ran an apothecary in Oakham in Rutland County, England where he stressed the possibility of a shift from description and prediction to control, and the introduction of the manipulative standpoint into the contemplative. Browne showed how to formulate scientific questions in a search for causes of illnesses, which would lead to some tangible prognosis. He showed a heightened interest in integrative care--the blending of complementary and alternative medicine (CAM) with conventional medical practice. He therefore anticipated some physiological reactions to music, and he proposed that music be used as preventive treatment in health care. Browne himself favored "the fine Adagio and Allegro Parts in Italian Operas" (p. 38). He concluded his 125-page essay with a lengthy discussion of

various diseases and how patients respond to musical stimuli. *Musica Medicina* sets the stage for scientific inquiry into the discipline by attempting to bring normativists and scientists to the forefront of research in music and health care in order to improve the quality of life (QOL) for humankind. Quality of life is a multidimensional concept an individual's satisfaction or happiness with life in domains he or she considers important (Bergner, 1989).

Modern-day researchers are intrigued about treatment and therapy. They believe that treatment and therapy can produce some kind of desired remedy, or change, and can soothe, mollify, and channel energy in the state of the person who is ill or dying. In all cases, the therapist is trying to make the patient's future, in some sense different from the present. Browne (1729) developed nine cogent theories about music and medicine:

- Success in music does not depend on the proficiency attainable only by practiced musicians but rather on success at one's appropriate ability and function levels.
- Music can change and evoke moods.
- Music can give rise to extra-musical associations.
- Emotions can cause psychosomatic disorders.
- Stimulating music and sedative music have differing effects on individuals.
- Music can influence physiological processes.
- Music may be harmful in treating some health conditions.
- Music has a wide variety of therapeutic applications.
- Music may be used in preventive health care.

The influence of Browne's treatises on the use of music as medicine has brought a phenomenon change in the subject. Browne's contribution was followed closely by two of his medical students: Benjamin Rush, who is regarded as the "father of American

psychiatry” and Samuel Matthews, whose publications *Music in Medicine (1808)* and *On the Effect of Music in Curing and Palliating Diseases (1806)* contributed immensely to the field of music and medicine.

Browne’s theories led to the development of scientific approaches to music and healing in the Western world. The implementations of these theories were seen in Victorian England in the 1890s when the Society of St. Cecilia began to employ London musicians to give concerts in London hospitals (Davis, 1989). Anecdotes and traces of some quasi-scientific approaches to the field of music and healing in the United States occur where music was performed for hospitalized patients. These anecdotes go as far back as 1789 (Heller, 1987). Although elaborate therapeutic procedures fascinated 18th century physicians, this period also produced pragmatic reformers who realized that complementary and alternative medicine (CAM) would help match the standardized scientific interventions. During this Age of Enlightenment, to borrow the ideas of Magner (1992), social and medical reformers were inspired by the belief that it was possible to improve the human condition through the application of aesthetics. The idea that listening to music could cure illnesses reached its peak with the invention of the phonograph in 1877. The new invention provided music to greater numbers of hospitalized patients as the cost of delivering this service became economically feasible (Taylor, 1981).

At the turn of the 20th century, scientists began to develop music therapy programs in hospitals, by carrying out systematic studies in both England and the United States. Treatment of World War I veterans led to the acceptance of psychiatry as a way to deal with certain changes. World War II witnessed an amazing growth in the interdependence of music and medicine, as doctors began to use music to help patients in what was known

as *adjunct therapy* (Schullian & Schoen, 1948). Patients responded very well, and, in some instances, their stay in the hospital was shortened. Since then, many studies have been carried out on pain and anxiety based purely on scientific models. Such experiments were conducted in many regions of the world including Japan, Britain, Australia, and the United States.

Music continues to have a place in contemporary healing. Regarding his work with an autistic child, Alvin (1991) stated:

I hoped that in time, music could reach his subconscious and bring out his feelings of aggression, fear or anger so that it could relieve his anxieties and tensions, provide a non-threatening environment in which he could express himself freely and find his identity; help him to develop his perceptual awareness and motor control. (p. 32)

Research carried out by Neher (1961) suggested that repetitive African drum patterns might promote an altered state of consciousness leading to healthful results (Mullings, 1984). In fact, African music has been credited with affecting musical heart rate rhythmicity (HRR), which is a specific kind of heart rate variability (HRV). The heart rate variability corresponds to the predominance and cyclicity of (binary) patterns in a series of respiratory rate interval differences (Bettermann, 2002).

Music and Anxiety in the 20th Century

Ladies and Gentlemen, my respected and beloved music friends! *Musica animae levamen*, music is medicine for our souls. (Rueger, 1991)

For the purpose of this study, the researcher makes reference to a myriad definition of anxiety, including behaviorist and psychoanalytic points of view. Anxiety is a biologically mediated response to stress or change (May, 1977). Anxiety has been additionally defined as the apprehension cued by a threat to some value that the

individual holds essential to his existence as a person. Its special characteristics are the feelings of uncertainty and helplessness in the face of danger (May, 1977; Selye, 1977).

Anxiety is a common phenomenon occurring in hospitalized patients, a condition nurses deal with on a daily basis (Shuldham, Cunningham, Hiscock, & Luscombe, 1995). Anxiety has been used as a nursing diagnosis, defined as a process that includes constructs of stress and perceived threat resulting in states of anxiety that are transitory in nature (Carpenito, 1993). Spielberger, Gorusch, Lushene, Vagg, and Jacobs (1983) described a state of anxiety, as characterized by subjective feelings of tension, apprehension, nervousness, and worry, and also by the activation or arousal of the autonomic nervous system.

Selye (1977) defined anxiety as reactions to stress. A year later, Cannon (1978) defined anxiety as “irritation of the entire organism and an activation of instinctive defense mechanisms.” He called these mechanisms "alarm reactions" which were identified in many clinical studies. These pathophysiological reactions, which have also been referred to as “psychovegetative reactions,” can cause the patient more suffering (Bodley, 1974; Birbaumer, 1977). These reactions can also make medical treatment more difficult and reduce resistance in the organism (Gedda & Rizzi, 1962; Williams & Jones, 1968; Wilson, 1969).

Wolpe (1958) defined anxiety as “a set of emotional predispositions attributed to a special kind of circumstance” (p. 4). According to the National Institutes of Mental Health, approximately 19 million Americans suffer from anxiety disorders (NIMH, 2006). Citing several scholars, Shultis (1999) showed: 1) how technology and research have identified the physiological benefits of music on the immune system (Rider, Floyd,

Kirkpatrick, 1985; Lane & Wilkins, 1994); 2) the benefits of music for relaxation and stress management (Davis, 1992); 3) the application of music to memory and attention (Morton, Kershner, & Seigel, 1990); and 4) music-related long-term changes in the behaviors of depressed elderly patients (Hanser & Thompson, 1994).

For the better part of the previous decade, scholars have researched the use of music to control anxiety. Many scholars (Stevens & Phil 1983) have addressed alleviation of stress and anxiety among students. Hammer (1996) studied the relationship between music therapy and participants' perceived stress level. The participants were engaged in a music therapy sessions that included relaxation techniques and guided imagery. The State Trait Anxiety Inventory (STAI) was administered before and after the music therapy session. In the experimental group, a slight reduction in the STAI levels and a perceived decline in stress levels occurred after the music therapy sessions.

Vink (2001) reminded us of these opening lines of the book *Die musikalische Hausapotheke (The Musical Home Medicine Cabinet)* written by the German musicologist Christoph Rueger. As cited by Vink, in his work, Rueger (1991) described a variety of musical recipes to cure an equally impressive variety of disorders. By closely examining his laboratory, it is obvious that listening to Beethoven's *Symphony No. 2* helps an individual cope with feelings of depression and doubt. Clark (1970) emphasized this point by stating:

Beethoven's idea in regard to his own music was that it was his means of serving humanity; the phrase "suffering humanity" was often on his lips and is to be found in his letters. (p. xxx)

Rueger also stated the popular *Goldberg Variations* of Bach decrease sleeping disorders created by anxiety (1991, p. 144). Shultis (1999) commented:

Rethinking the application of music therapy has required the development of methodology that is observable and measurable, and can be applied to many different treatment settings. (p. xxx)

Effects of Music on Anxiety

Patients undergoing a bone marrow transplant often experience anxiety in anticipation of events that are unfamiliar, uncomfortable or have undesirable results. Numerous studies have researched the effects of music on anxiety levels in different types of subjects. Music is an easily administered, nonthreatening, noninvasive, and inexpensive tool that can be used to calm the anxiety experienced by bone marrow transplant patients. Lee, Chung, Chan, and Chan (2005) observed:

ICU patients are not only compromised by illness, but also exposed to a wide range of stresses, including invasive treatments, the experience of pain, threat of death, insufficient sleep, continual exposure to noise, reduced personal dignity and the loss of interaction with family and friends. (p. 610)

Increased anxiety activates the sympathetic nervous system, as manifested by an increased heart rate (HR), blood pressure, respiratory rate (RR), and neurohumoral responses, possibly leading to a destructive anxiety syndrome (Lee, et al., 2005). Since the first transplant in the 1950s, reports have been made that patients who underwent bone marrow transplantation had a poor prognosis if they experienced anxiety prior to and during transplantation (Illescas-Rico, Amaya-Ayala, Jimenez-Lopez, Caballero-Mendez, & Gonzalez-Llaye, 2002).

Summers, Hoffman, Neff, Hanson, and Pierce (1990) hypothesized that test-taking anxiety is decreased in nursing students listening to music with a rhythm of 60 beats per minute due to synchronization between a subject's pulse and the music. An experimental design with 45 subjects was used. No significant changes in the State-Trait Anxiety Inventory (STAI) scores or test anxiety scores were noted between groups

or within groups over a period of time. STAI is a self-report inventory established by Charles Spielberg (1976) to assess anxiety. No significant differences occurred in pulse rates before and after testing in either the experimental or control group. However, the standard deviation of the experimental group decreased, which might reflect a statistically nonsignificant trend toward synchronization between the pulse and the musical beat.

Four different studies assessed the effects of music on patients' anxiety in a coronary care unit (Bolwerk, 1990; Elliot, 1994; White, 1992; Zimmerman, Pierson, & Marker, 1988). Zimmerman et al. (1988) randomly assigned 75 subjects with suspected myocardial infarction to one of three groups: 1) listening to relaxing music; 2) listening to white noise; or 3) being subjected to a 30-minute period with no musical intervention. State anxiety (as measured by the STAI), heart rate, blood pressure, and digital skin temperature were compared before and after the music interventions. No statistically significant decrease in state anxiety scores was noted in any group, but the music intervention group had the largest decrease. No significant changes in physiologic variables were noted among the groups, but pooled data revealed significant differences over a period of time.

Bolwerk (1990) compared the effects of listening to relaxing music ($n = 20$) to a control group ($n = 20$) of myocardial infarction patients who scored as being *anxious* on the STAI at the baseline. Baseline differences in anxiety scores between music and control groups were statistically nonsignificant. Post-intervention, however, the music group's STAI scores were significantly lower ($p < 0.007$) compared to the control group. The decrease in the music groups' pre- and post-intervention anxiety scores was also

significant ($p < 0.001$). In that study, music was helpful in decreasing anxiety in myocardial infarction patients. A methodological difference from Zimmerman et al.'s (1988) study, which may have influenced the results, was that Bolwerk provided three sessions of music instead of one and each session had a greater period of time (three days) from pre- to post-testing.

Elliot (1994) randomized 56 coronary care unit patients with unstable angina or acute myocardial infarction into three groups: 1) classical music audiotape intervention; 2) muscle relaxation audiotape; and 3) control (uninterrupted rest). Subjects received two or three 30-minute intervention sessions over a period of 24 hours. No differences were found among the groups in STAI scores, Hospital Anxiety and Depression Scale scores, Anxiety Visual Analogue scores, heart rate (HR), or blood pressure (BP). The effect sizes were 0.19~0.22, which demonstrate a degree of effect on anxiety. The small sample size in each group may have resulted in a type II error. Also, the HR and BP assessments were not concurrent with the interventions; therefore, changes in the HR and BP may have occurred during the intervention period.

White (1992), used an experimental design similar to Zimmerman et al.'s (1988), and compared the STAI scores, heart rate (HR), and respiratory rate (RR) in 40 myocardial infarction patients. The experimental group listened to 25 minutes of relaxing classical music, whereas the control group received 25 minutes of uninterrupted rest. A statistically significant decrease in STAI scores post-intervention occurred for both groups: the control group $p < 0.02$ and the intervention group $p < 0.001$. Statistically significant decreases in HR and RR were noted in the experimental group, but not in the control group.

The use of music as an intervention to reduce anxiety in post-operative coronary artery bypass graft patients has also been evaluated. Barnason, Zimmerman, and Nieveen (1995) randomized 96 patients into either music intervention, music-video intervention, or scheduled rest groups. Subjects received their assigned intervention for 30 minutes once daily on post-operative days 2 and 3. Patients were in either intensive care or progressive care unit settings. No significant changes in anxiety, as measured by the STAI and a numerical rating scale, were found. Subjects in the music intervention group reported significant improvement in mood, as measured by a numerical rating scale following the two music intervention sessions. No differences in the HR or BP were noted between groups, but all physiologic measures had a main effect over a period of time, demonstrating a downward trend that may reflect relaxation.

Moss (1988) researched the effect of self-selected music played from the pre-operative to the post-operative period on state anxiety. A significant decrease in STAI scores occurred in the experimental group compared to the control group. The p value was not cited. Weaknesses in this study were the small sample size ($n = 17$) and administration of the STAI while the subjects were still recovering from anesthesia. However, these findings are partially supported by the later work of Kaempf and Amodei (1989), who evaluated the use of music in the pre-operative holding area. This study randomized 33 subjects into an experimental and control group, comparing pre- and post-intervention STAI scores, HR, BP, and RR. The experimental group listened to sedative music for 20 minutes in the holding area, resulting in significantly decreased STAI scores ($p = 0.005$) and RR ($p = 0.002$) post-intervention. Decreases in systolic blood pressure (SBP) were marginally statistically significant ($p = 0.055$) in the

same group. The control group also demonstrated decreased STAI scores ($p = 0.049$) and SBP ($p = 0.029$) between the baseline and post-intervention. The only change that was significant between the groups was the decrease in the RR, which was significantly greater ($p = 0.047$) in the experimental group. Both Moss and Kaempf and Amodei's small-scale studies demonstrate a possible trend toward decreased anxiety with the use of music in the surgical setting. Collectively, research supports the usefulness of music in decreasing anxiety.

Recent studies (Campbell, 1997; Panksepp, 1995; Sloboda & Juslin, 2001; Tse, et al. 2005) have shown that music lowers a patient's blood pressure, basal metabolism, and respiration rates, and it increases the production of endorphins that reduce pain. Endorphins are the body's natural pain medication hormones. Endorphins, when released, make a person feel better, improve his mood, increase his pleasure, and minimize his pain (Smeltzer & Bare, 1996). Considerable scientific rationale in the 20 century supports the use of music to increase the production of endorphins and reduce pain and anxiety in patients. Music's ability to alter pain and emotional states has long been known experientially, and more recently this ability has been scientifically documented.

Studies continue to show the effects of music on human health. Brownley, McMurray, and Hackney (1995) carried out research on the influence of music on physiological and effective exercise responses in eight trained and eight untrained runners under three music conditions ("no," "sedative," and "fast") during low-, moderate-, and high-intensity exercise. Repeated-measures ANOVA revealed increased respiratory frequency (RF) during fast music, as compared to the "no" music and "sedative" music conditions ($p < 0.01$).

In an investigation on music and labor pain, Geden, Lower, Beattie, and Beck (1989) carried out two studies to examine the effects of music on analogued labor pain using volunteer nulliparous subjects who were randomly assigned to treatment groups ($n = 10$ per group). Assessments of treatments were made in a one-hour session involving 20 80-second exposures to a laboratory pain stimulus. The stimulus was patterned to resemble labor contractions. In the first experiment, it was hypothesized that subjects listening to easy-listening music would report lower pain ratings and cardiovascular responses than subjects listening to rock music, self-selected music, or a dissertation (placebo-attention) as compared to subjects in a no-treatment control group. Significant group effects were found. Subjects spontaneously reported using imagery as a pain reduction technique. In the second study, a combination of music and imagery was examined by randomly assigning subjects to one of five groups: 1) self-generated imagery with music (SIM); 2) guided imagery with music (GIM); 3) self-generated imagery without music (SI); 4) guided imagery without music (GI); or 5) a no-treatment control. Again, significant group effects were obtained for heart rate and systolic and diastolic blood pressures. Statistical analysis showed significantly lower pain perception in the music group compared to the control group. This finding is important for health care professionals; music may be an effective treatment for women who have trouble coping with pain sensation.

In another study on the effect of music on stress levels, Migneault et al. (2004) examined the effect of music on the neurohormonal stress response to surgery under general anesthesia. Their study found that several pharmacological interventions reduced pre-operative stress hormone release during surgery under general anesthesia. They also studied listening to music and therapeutic suggestions, and found a positive effect on post-operative recovery

and the need for analgesics. In that study, they evaluated the effect of listening to music under general anesthesia on the neurohormonal stress response to surgical stress, as measured by appropriate medical procedures.

In a study on effective music and its effects on state anxiety, Rohner and Miller (1980) observed that music in various institutions and other research settings has the potential to reduce anxiety in high-anxiety subjects. They randomly assigned 10 sections of introductory psychology students ($n = 321$) to one of four treatment conditions or to the control group. The state portion of the STAI questionnaire was administered in a counterbalanced fashion prior to and following the music (or no music) treatment. State anxiety (S-Anxiety) refers to the subjective and transitory feeling of tension, nervousness, and worries and may be characterized by activation of the autonomous nervous system, at a given moment (Fountoulakis, Papadopoulou, Kleanthous, Papadopoulou, Bizeli, Nimatoudis, et al., 2006). Results proved to be statistically nonsignificant. In addition, a trend of sedative music having some anxiety-reducing effects upon high state anxiety subjects was noted.

In an attempt to respond to the issue of whether or not singing promotes well-being, Grape, Sandgren, Hansson, Ericson, and Theorell (2003) carried out an empirical study of professional and amateur singers during a singing lesson. This study explored the possible beneficial effects of singing on a patient's well-being during a singing lesson. Eight amateur musicians were included, consisting of two males and six females between the ages of 28 and 53 years, and eight professional singers consisting of four males and four females, between the ages of 26 and 49 years, who had been taking singing lessons for at least six months. Five visual analogue scales (VAS)--sad-joyful, anxious-calm, worried-elated, listless-

energetic, and tense-relaxed--were scored before and after the lesson. In addition, a semi-structured interview was performed. Heart rate variability analyses showed significant changes over a period of time in the two groups for total power and low- and high-frequency power. Power increased during singing in the professionals, but no changes occurred in the amateurs. A power increase during singing in the professionals indicates an ability to retain more "heart-brain connection," that is, more cardio-physiological fitness for singers. In another study on anxiety, Yilmaz, Ozcan, Basar, Basar, Batislam and Ferhat (2003) carried out a study to determine if music decreases anxiety and provides sedation with extracorporeal shock wave lithotripsy (ESWL). Yilmaz et al. (2003) concluded that listening to music by patients during the ESWL treatment is a feasible and convenient alternative to sedatives and anxiolytics.

Winter, Paskin, and Baker (1994) observed that many patients become stressed and anxious prior to and after surgery, and one means of helping reduce anxiety in patients is to incorporate music in the surgical holding area. In their study, they divided subjects into two groups: one group of patients listened to music while a second group did not listen to music. The researchers noted that patients who listened to music while in the surgical holding area had significantly less stress and anxiety than those patients who did not listen to music. Both groups spent similar lengths of time in the surgical holding area. They concluded that all the patients preferred the musical intervention since they experienced less anxiety.

Researchers at the Bryan Memorial Hospital in Lincoln, Nebraska, investigated the influence of music therapy on the mood and anxiety of patients undergoing heart surgery. Ninety-six patients, who underwent elective heart bypass surgery at the cardiovascular intensive care and progressive care units of this midwestern community hospital,

participated in the study. Data relating to anxiety and mood were obtained through blood pressure and heart rate using Spielberger's (1983) State-Trait Anxiety Inventory (STAI). The study revealed that patients' mood ratings showed significant improvement in mood among those patients who were in the "music therapy" group after the second intervention. Significant main effects were also observed over a period of time for heart rate, systolic and diastolic blood pressures in the music therapy group, which indicated a generalized physiologic relaxation response. Reduced anxiety and improved mood were indicated in all three groups, and the researchers noted that all the interventions demonstrated generalized relaxation (Barnason et al., 1995). To support the use of music in patients undergoing open-heart surgery, Voss (2005) noted:

Health care providers should feel confident in using music for post-operative open-heart patients and should try it with other patients to decrease anxiety and pain. From a clinical perspective, sedative music is low risk, and it is therefore recommended in addition to pain medication to relieve anxiety and pain for cardiac patients during chair rest following surgery. (p. xx)

In another study, Augustin and Hains (1996) examined the role that music therapy plays in a post-operative setting for ambulatory patients. In the Day Surgery Unit of St. Mary's Hospital in Mequon, Wisconsin, the authors investigated 42 ambulatory surgery patients assigned to either an experimental group, which received music therapy along with the standard pre-operative instructions, or a control group, which received the standard pre-operative instruction alone. The results revealed that patients in the experimental group showed significantly lower heart rates compared to those in the control group. The experimental group also showed greater improvements in blood pressure and respiration rate. The researchers concluded that music therapy offers demonstrable benefits for ambulatory surgery patients and recommended that patients be

offered music as an effective option to help alleviate post-operative anxiety (Augustin & Hains, 1996).

Effects of Music on Pain

The arts are quintessentially holistic in their healing effects, promoting as they do the personal and collective health of the body, mind and spirit. (Graham-Pole, 2005, para. 1)

The newest statistics on pain management have been addressed in recent research (Magni, Marchetti, Moreschi, Merskey, & Luchini, 1993). The National Center for Health Statistics estimates that 32.8% of the U.S. general population has persistent or chronic pain symptoms (Magni et al., 1993). It is further estimated that 94 million U.S. residents have some form of episodic or persistent pain, that is, pain associated with cancer, migraine or tension headaches, chest pain, pain from diabetes with neuropathy, arthritis, fibromyalgia, neuralgias, neck and back disorders, facial pain disorders, functional or organic bowel disorders, or pelvic disorders (Gallagher, 1999).

Various types of music have been investigated as a means to decrease pain and the need for analgesics. In a small laboratory study with 10 healthy female subjects, Whipple and Glynn (1992) investigated the effect of soothing and stimulating music on tactile thresholds, pain thresholds, HR, and BP. Collectively, their research supported the usefulness of soothing and stimulating music in decreasing pain in subjects. Stimulating music significantly increased pain and tactile thresholds, whereas soothing music increased pain threshold but not tactile thresholds. No significant changes in HR or BP were detected.

Heitz, Symrend, and Scamman (1992) randomized 60 post-anesthesia general surgical patients into three experimental groups: 1) headphones with self-selected music; 2) headphones with no music; and 3) no headphones. Analysis of variance

(ANOVA) yielded no significant differences in pain levels among groups, as measured by a VAS, morphine use, HR, RR, or mean arterial blood pressure (ABP). However, subjects receiving music rated their post-anesthesia care unit experience as being more pleasant ($p < 0.05$) than the other groups rated their experience, both at one-day and one-month post-surgery.

Good (1995) compared the individual and combined effects of jaw relaxation and music in a control group on pain levels of 84 abdominal surgery patients during their first post-operative ambulation. Subjects were randomized into groups and instructed in the interventions pre-operatively using an audiotape. After the analysis of the taped interventions for 2 postoperative days, 89% of experimental subjects reported that music had helped them reduce sensation and distress of pain.

Musical Preferences of Patients

Podolsky (1934) noted that “Good music and good health are intimately associated with each other” (p. 200). Perhaps the greatest challenge in the effective use of music in health care settings is the selection of specific music pieces. Many scholars have defined music differently. Brophy (2000) observed, “Music consists of melody, rhythm, harmony, timbre, and form” (p. 40). Individual tastes and varied qualities of the music may cause different physical and psychological responses (Gardner, 1990). Music therapists and music healers sometimes believe that their own favorite music is universally liked and therapeutic for everyone (Good et al. 2000). Elements of music that should be considered include its drone, repetition, harmonics, rhythm, melody, instrumental colors, form, and intent (Gardner).

During World War II, an assumption arose that wounded Hungarian soldiers would recover quickly if made to listen to music of their cultural background; in this

case, Hungarian dances such as Johannes Brahms's *No. 5 in G minor* (Rorke, 1996). The wounded Czech soldiers on the other hand, would respond well to Czech songs (Rorke). Good et al. showed that cultural awareness, cultural knowledge, cultural skill, cultural encounters, and cultural desire are all needed in this endeavor.

Music appropriate for stress reduction has a slow, steady rhythm, low-frequency tones, orchestral effects, and a relaxing melody (O'Sullivan, 1991). The music must be played at a comfortable volume level and have no negative associations for the listener (Cook, 1981). The use of music in post-operative cardiac surgery patients in critical care units should theoretically substitute pleasing, meaningful sounds for loud, unfamiliar sounds, thus resulting in decreased levels of annoying noises.

Atlee (1804), completed a work entitled "An Inaugural Essay on the Influence of Music in the Cure of Disease." Atlee advanced two music therapy concepts that are still accepted today. He was a proponent of using music favored by the patient, and he developed a therapeutic program relative to the patient's interests and background (Davis, 1987, quoting Atlee, 1804). Kopacz (2005) stated:

In choosing music for therapeutic purposes, one should take into account individual differences connected with temperament traits, and most particularly with the need for stimulation. Ignoring such differences could have contrary effects, unintended by the therapist. Exceeding the optimal dose for musical stimulation or lack thereof can produce symptoms of stress. Music with a high stimulative value, as preferred by extroverts, may lead to stress in introverts. On the other hand, music with low stimulative value, as preferred by introverts, may be a source of stress for extroverts. (p. 234)

Musical preferences and their effect on different individuals have been debated during the past decade. Knowledge of musical preferences is enormously significant in the selection of music for therapeutic work (Kopacz, 2005). Research into personality-dependent musical preferences has a long history, but little research has been conducted

on how such preferences affect those in pain or those with anxiety. Kopacz noted that most of the research has been associated with Eysenck's personality dimensions: extraversion, introversion, neuroticism, and psychoticism. Extroverts usually prefer homogenous, lively, emotional, vigorous, and sensual music, whereas introverts prefer intellectual, mystical, deep, introspective, and restrained music (Burt, 2003).

Research conducted by Furnham, Trew, and Sneade (1999) revealed that music, as a means of stimulation, may aid cognitive activity in extroverts and suppress cognitive activity among introverts. It would be interesting to see how this theory might be applied to patients who are in pain or experiencing anxiety, and how these factors affect their musical preferences. With this consideration in mind, the researcher decided to underscore the importance of a narrower dimension of pain perception and its usefulness in the study of artistic preferences on pain and anxiety.

Type of Music

Many pieces of great music will uplift you in body, mind and spirit. But of course we all have different tastes in the sort of compositions we enjoy, be they classical, country and western, jazz, or rock and roll. Music of different tempos and rhythms, and played on different instruments, will also have varying effects on you. (Graham-Pole, 2000, p. 122)

Music is defined as a complex of expressively organized sounds composed of some key elements: rhythm, pitch, harmony, and melody (Alvin, 1991; Priestley, 1975).

Rhythm and melody have a common nature, being made up of vibrating movements in variable frequencies. These frequencies foster the transmission of mechanical energy and form the dynamic basis of music. The rhythmic structure, as well as the dynamic and predictable nature of music, may be received by and resonate with different parts of the body (Lee, et al., 2005).

The ideal music should be calming. The calming and soothing properties of an appropriately chosen piece of music can help alleviate physical pain and anxieties. The selection of music for the pain and anxiety experience is very important. The music must be well balanced and somewhat stable in terms of harmony, rhythm, instrumentation, melodic elements, tempo, and timbre. Overly dissonant intervals or harmonic progressions should not be sustained during long periods of time, and the music that exhibits tensions within tonality needs to be resolved (Spintge, 1989). Podolsky (1934) observed “Good music and good health are intimately associated with each other” (p. 200).

In this study, the pre-recorded audio music used was based on pieces selected by the subjects. Favorite music was identified by the subjects and prerecorded on a CD. In cases where the subjects were unable to select any music, the researcher used relaxation and support music of a classical nature with definite melodic structure and generally little dynamic variation. This kind of music fits Spintge’s (1989) definition of anxiolytic music. According to Spintge, music is anxiolytic if it has an effect on the cardiovascular system, respiratory system, endocrine system, metabolism, motor system, exocrine secretion and excretion, reception and perception. Examples of this music would include Beethoven’s *Adagio* from *Piano Sonata #8 (Pathetique)* and Gluck’s *Dance of the Blessed Spirits* from *Orpheus and Euridice*.

Podolsky (1934) also examined the effects of different kinds of music where he found that gay music such as Sousa’s marches produced an accentuation of *dicrotism*, a condition in which the pulse is felt as two beats per single heartbeat. Sedative music is considered to be slow and between 60 and 80 beats a minute. It should also have a

melody and preferably be instrumental, such as slow jazz, harp music, flute music, orchestral music, or piano music (Voss, 2005).

To achieve these effects, Spintge (1989) suggested four criteria:

1. Musical works should be selected according to duration, instrumentation, dynamics, and interpretation. It is important that there are no extremes in rhythm, melody, or dynamics and that instrumental rather than vocal music be chosen.
2. Patients should make their own selections.
3. The effects of individual pieces and combinations of pieces should be tested and verified in ongoing clinical studies so that new trends and new technologies can also be considered.
4. Recordings should be of high quality, yet technically simple and reliable (laser-CD-disc preferable).

The type of music an individual listens to tends to influence his response to therapy (Spintge, 1989). Podolsky (1934) discussed in detail an earlier 1918 study of the effects of three rapid music selections on the heart rate and blood pressure. Patients listened to music while cardiograms were continuously recorded. Polodosky found that when any of three rapid music selections were played, a slight increase in heart rate and blood pressure resulted.

In another study, Ellis and Brighthouse (1952) measured the heart rate and respiration of 36 students who were randomly selected from a group of college volunteers. Heart rate and respiration were measured before, continuously during music therapy, and after 30 minutes of music, over a three-day period. None of the music selections was accompanied by significant changes in heart rate. For one selection that had a rapid rhythm, almost all the subjects experienced an increase in heart rate.

In a study of 66 college students (Smith & Morris, 1976), music was played during a testing procedure. Subjects were allowed to listen to the type of music they desired. A

greater decrease in anxiety occurred as reflected by exam scores in subjects who listened to sedative music, compared to those who listened to stimulative music.

Kaempf and Amodei (1989) studied the effects of sedative music therapy on the anxiety of 33 surgical patients in the operating room holding area. The experimental group received 20 minutes of sedative music therapy via a tape recorder placed on a nearby bedside stand, while the control group received no music therapy. Both groups showed reductions in blood pressure and heart rate after the 20-minute period. However, the music group had greater reductions in respiration than the control group had.

Summers et al. (1990) found that when 45 college students listened to fast rhythms, their heart rates increased. However, slower rhythms of 60 beats per minute resulted in lower heart rates and blood pressures.

Music as a Form of Distraction

Drever (1952) defined *distraction* as a condition where concentration of attention is disturbed, difficult, or virtually impossible, as caused by irrelevant stimuli. Distraction is regarded as a major influencing factor in the perception of pain. Gardner and Licklider (1959) and Melzack et al. (1963) reported that pain is influenced by cognitive and psychological activities, such as anxiety, expectations, and attention-distraction levels. This is consistent with the Gate Control Theory of pain. Loosin (1981) observed that attention switching might not always be easily achieved but may be learned and used to aid in pain control. Pleasant music played repetitively may enhance distraction.

In the early 18th century, French dentists traveled through the countryside and brought small orchestras in their caravans as a means of causing distracting to those who were in pain or were anxious. The orchestral accompaniment was also found to distract the patient's attention and that would result in his feeling less pain, thereby decreasing his

suffering resulting from the crude dental practices of the time (Good, Stanton-Hicks, Grass, Anderson, Lai, Roykulcharoen, & Adler, 2001). The mind can exert a powerful influence over the perception of pain. A distraction or stimulus can elicit changes in the lower synapses of the sensory pathways, and this is influenced by the significance of the stimulus and past experiences (Hernandez-Peon, Scherrer, & Jouviet, 1956). The selection of sensory information with respect to pain occurs at successive synaptic levels during its transmission, and it is under the dynamic control of the brain (Melzack et al., 1963).

While researching the results of auditory stimulation on the perception of pain, Melzack et al. (1963) exposed healthy males to four 15-minute sessions of pain, which were repeated over a one-to three-day period. They found that this stimulation, accompanied by suggestion, produced a marked increase in the tolerance duration of pain compared to the control condition without auditory stimulation. When intense auditory stimulation--without explicit suggestions--was given to reduce the subject's pain, the auditory stimulation was found to have an insignificant effect. In addition, suggestion alone without auditory stimulation was found to be ineffective in reducing perceived pain (Melzack & Wall, 1983). Melzack and Wall (1983) concluded that distraction of central attention (i.e., auditory stimulation) away from noxious inputs, together with central nervous system involvement (i.e., from suggestion), could act on input patterns evoked by noxious stimuli during their transmission.

Locsin (1981) conducted a study of 24 obstetric patients to determine the effects of music therapy on post-operative pain. The women received 30-minute sessions of music therapy every 2 hours during the first 48 hours post-operatively. Heart rates of the music

therapy group were significantly lower at 48 hours but not at 24 hours post-operatively, compared to the control group. Analysis showed that blood pressure readings of the music group were significantly lower than those of the control group at 24 and 48 hours post-operatively. No significant changes were noted in respiratory rates at 24 or 48 hours in the two groups. Post-operative patients, who listened to music therapy during the first 48 hours post-operatively, used less pain medication than patients in the control group. When asked how the music therapy affected their post-operative pain, eight patients responded that music lessened the pain and four stated that the music caused some form of distraction to their pain perception. In addition, 100% of the subjects indicated that they would recommend music for post-operative patients during the first two post-operative days (Locsin). In a study of 17 adult post-operative patients, Moss (1988) found that patients' musical preferences seemed to influence whether or not music therapy was soothing. Patients reported that the music they selected helped them relax by providing a distraction from external noises.

Updike (1990) suggested that a reduction of pain can result from a physical and/or an emotional etiology. Pain may either be diverted via the concentration aspect of music listening or may raise the pain threshold by use of specific music therapy selections. Updike studied the effects of self-selected music therapy on 20 intensive care unit (ICU) patients with various diagnoses. Significant reductions in systolic blood pressure and mean arterial pressure were found when comparing pretest and posttest measures of patients who listened to music therapy. A non-directive, open-ended questionnaire was used to obtain data on patients' emotional responses before and after the music therapy. Analysis of patients' moods indicated a shift toward a more desirable state of well-being.

Music therapy was found to reduce anxiety, depression, and pain experience. Listening to music is a useful technique for distraction and reducing pain perceptions as an adjunct to traditional pharmacological therapy. Distraction in this respect involves a change in focus. It is condition where concentration of attention is disturbed.

Hernandez-Peon (1960) suggested a neurophysiological explanation for the effect of music on humans. He thought that when a person is exposed to pleasurable sensory stimuli, activation of sensory pathways results in the blocking of the transmission of other sensations. Pain perception may therefore be reduced by inhibiting the psychological feedback of noxious stimuli from the areas of surgical injury. Hernandez-Peon's study supports the idea that music not only serves as a distraction, but if the type of music is considered pleasurable, it may also block the transmission of other sensations.

Studies and observations discussed in this chapter have thus far revealed that both ritual and scientific practices themselves produce therapeutic, psychological results through altered states of consciousness. Even though historical debates on the efficacy of music as a healing device are not the focus of this research, a few instances are worth mentioning. Among the more modern researchers on this particular argument of the influence of musical stimuli were Mullings (1984) and Sargant (1973) whose controversial views on the efficacy of the cathartic nature of music acted as a catalyst for subsequent research. In Sargant's views, it was violent dancing, which by bringing on perspiration, effected the cure. Mullings and Sargant observed that the new and healthier behavior patterns facilitated following the musical stimuli brought desired change.

Summary and Implications for the Present Study

A review of the music therapy literature delineates at least three broad domains of functioning where music therapy has successfully been utilized in the treatment of

emotionally disturbed children: 1) affect regulation; 2) communication; and 3) social/behavioral dysfunction. Assessment and intervention in each of these domains require strong grounding in developmental theory, which is a key component in the training of music therapists. In the middle of the 20th century, music therapy was identified as an intervention to treat impairments in effective functioning, including reducing levels of anxiety (Cooke, 1969), and music therapy became a tool to improve emotional responsiveness (Wasserman, 1972). Music therapy is well suited to help improve communication deficits and stimulate nonverbal communication in children. Numerous positive outcomes in improving social functioning, social awareness, and cooperation (Werbner, 1966) and decreasing disruptive behaviors (Hong, Hussey & Heng, 1998) have been reported. Conservative estimates from epidemiological studies suggest that 8%, approximately 470,000 of the U.S. school population--have been identified through their schools as exhibiting significant levels of anxieties (U.S. Department of Education, 2001). As a benefit for children with anxiety, Hussey and Layman (2003) summarized:

An advantage of music therapy is that it is an inherently non-threatening and inviting medium. It offers a child a safe haven from which to explore feelings, behaviors and issues ranging from self-esteem to severe emotional deregulation. (p. xx)

Perron and Schonwetter (2001) observed that patients do not always receive sufficient relief from opioids. They also noted that opioids may have undesirable side effects, hence using intervention such as music would be appropriate.

CHAPTER 3 METHODOLOGY AND PROCEDURES

This chapter is divided into six sections. In the first section, the 15 subjects included in the study are discussed. The second section describes the procedures and setting used during the study. The third section discusses the data collection process and the instruments used. The fourth section includes the reliability procedures. The fifth section presents the instruments that were used. The sixth section includes a description of the statistical analysis.

Quantitative scientists argue that music in health care requires empirical study, but that type of study cannot be simply observed or verbalized. Scientific orthodoxy stresses the primacy of cause-and-effect accounts, and most empirical studies of this nature operate at a meta-analysis level. The empirical method accepted by positivists, according to Wheeler (1995), tests theories through procedures for scientific objectivity, including careful observation of behavior, the isolation and manipulation of variables, and hypothesis testing. Citing Hamilton (1994), Wheeler (1995) observed:

The roots of qualitative, as distinct from quantitative, research can be traced to an eighteenth century debate between Descartes, who spoke of the importance of mathematics and objectivity in the search for truth, and Kant, who suggested that human knowing is dependent upon what goes on inside the observer. (p. 11)

The following discussion presents a methodology that incorporates an empirical study based on scientific evidence. The basis of scientific inquiry is evidence derived from observations made on the subjects and from experiments designed to test hypotheses proposed to explain those observations. This chapter also presents a

discussion on the methodology based on data collected ethnographically, with a limited amount of controlled experimental work. In this chapter, the researcher presents the procedures under which the research study was conducted.

Research Design

This research study used a repeated-measures design. In a within-subjects design, each participant provides more than one response (Becker, 1999). In this repeated-measures design, the participant responded both before the treatment and after the treatment. This according to Becker (1999), is a typical within-subjects design. According to Becker, the pre-post aspect of the design is a within-subjects factor. This type of design is also known as a "repeated measures" design (Becker, para. 1). The participants are assigned to an immediate treatment or a delayed treatment condition. Measures of pain (using the VAS scale) and anxiety (using the STAI) scale were recorded in five different time series (see Appendix D). In this time-based, repeated-measures design, the repeated contrasts were useful in interpreting the time-main effect. Assessments were made at five different times (see Appendix D).

Control was achieved by using the baseline readings of pain, anxiety, blood pressure, heart rate, and respiratory rate. Each of the subjects received music intervention for 30 minutes. Using the Visual Analogue Scale (see Appendix B), each subject was asked to rate his pain level as follows:

- 24 hours before the beginning of the intervention (T1)
- Immediately before the intervention (T2)
- 15 minutes in-between the intervention (T3)
- 30 minutes at the end of the intervention (T4)
- 45 minutes post-intervention (T5)

Upon commencement of the first session, subjects enrolled in the study were given the opportunity to choose the type of music they would prefer to listen to during the study. The researcher used the Modified Hartsock Music Preference Questionnaire (see Appendix D). The purpose of this questionnaire is to determine what type of music the clients prefer (Hartsock, 1982). Using this questionnaire ten choices of music were offered: Classical, Country, 20th Century, New Age, Jazz, World Music, Hip Hop/Rap, Gospel, Rock, Other. The data collection method used in this study was self-report. Since the analysis method in this research required comparing means, the t-test was most suited since it is the most commonly used method to evaluate the differences in means between groups (Glass & Hopkins, 1996). The assumptions of the t-test must be met in order to provide the most powerful test of the hypothesis. If the assumptions of the t-test are not met, then other statistical tests should be considered (Becker, 1999). The assumptions are:

- Assumption 1 (independence) is not met because I get more than one score from each person: Therefore we used the paired samples t-test rather than the independent samples t-test. The observations in the groups of data, such as pre and post-test, are not independent.
- Assumption 2 (scale of measurement): The scale of measurement for the pain and anxiety response measure is ratio.

The researcher chose other sets of supportive indicators for within-subject factors, for example, SBP, HR, and RR levels brought about by different music, as determined by subjects' musical preferences. The researcher achieved this by comparing the mean differences as within-subject factors variables.

Subjects

In order to investigate the effects of listening to music on pain and anxiety, 15 eligible patients (subjects) aged 7 and older from the Bone Marrow Transplant Unit at

Shands Hospital at UF participated in the study. Participants were interviewed individually either in a clinic or in a private room within the BMT area. Four health care professionals with medical or doctoral degrees assisted in conducting the structured, semi-structured, and unstructured interviews. In this particular research the issue of language barrier did not arise since all the subjects spoke English as their native language or mother tongue.

Pregnant subjects were excluded from the study. Participants were interviewed individually in a clinic or in a private room within the BMT area. Four health care professionals with medical, doctoral, or nursing degrees assisted in conducting the semi-structured interviews, assessing pain, state anxiety, and recording of the three vital signs selected: blood pressure, respiratory rate, and heart rate. The health care personnel also assisted in arranging meetings with the patients during the post-intervention period. The subjects were required to be able to communicate in English because the research instruments, such as the STAI scale, were designed in English. Patients excluded from the research included those who: are incubated; have a hearing deficit; are unable to speak and read English; require artificial pacing which would preclude assessment of heart rate; are unable to give informed consent; those not oriented to time, place, or person; and have complications.

Once the protocol was begun, patients were withdrawn from the study if: they developed any complications; they requested that the intervention be terminated; and if they were interrupted during the time for the music intervention by medical or nursing care activities. If the patients were administered analgesic medication, efforts were made

to delay the study sessions until after the end of peak drug levels--about four hours from the last time they had taken the medication.

Full panel Institutional Review Board (IRB) approval was obtained to conduct the study in the BMTU. An explanation of the study was presented to each subject. If the subject agreed to participate in the study, a signed consent form was obtained from the subject and from the parent if the subject was between the age of 7 and 18.

Following the IRB approval, the subjects were recruited from patients requiring a bone marrow transplant. After their admission into the BMT Unit, eligible patients were informed about the purpose of the study. The patients who expressed a willingness to participate in the study were asked to sign and provide salient information that would help in data analysis. The data collected included:

- Sociodemographic data (age, gender, race)
- Diagnosis (reasons for BMT)
- Musical preference (subjects were asked to indicate which type of music they would prefer to listen to)

The methods used in the data collection process included: self-reported pain; patients' music preferences; and comments by the subjects recorded on the data collection sheet (see Appendix D). The researcher then collected information regarding the diagnosis of the subjects based on the available medical data. The information included for example, neurologic status, leukemia, aplastic anemia, lymphomas such as Hodgkin's disease, multiple myeloma, fear and anxiety, and so forth. Then the researcher, with the help of research assistants, examined the physiological parameters, which included the vital signs. This was done a day before the musical intervention. Other points of interest included the sociocultural and psychospiritual concerns of the patients

toward music. The researcher engaged the patients in a dialogue to see if they listened to music at home. If spiritual or gospel music was favored by the patient, the

psychospiritual issues were noted and documented, but not discussed with the patient.

The term “psychospiritual” refers to adding psychology to matters spiritual (McMahon, 2006; Reinert, 2000). McMahon, (2006) observed:

Psychospiritual would include one or more of the following innovations: supplementing spiritual content with psychological concepts; interpreting or explaining the spiritual through psychological concepts; validating the spiritual through the alleged science of psychology; integrating the spiritual with psychology . . . the spiritualizing of psychology. (para. 3)

Other aspects that were discussed in the questionnaire included the level of musical knowledge, such as formal and non-formal music education. In this context, the researcher noted every patient’s music listening experience prior to the music intervention.

Procedures

Qualitative data analysis is a search for general statements about relationships between categories of data (Marshall & Rossman, 1994), and no single right way exists to analyze the data in a qualitative study (Leedy & Ormond, 2001). The researcher used the data collection tool (see Appendix D) to provide the framework for the data analysis. In this study, the researcher began with a large body of information and through inductive reasoning (from particular to general), sorted and categorized the data, and gradually condensed the data to a small set of abstract, underlying themes (Creswell, 1998; Leedy & Ormond, 2001). An analytical search for what Creswell called “patterned regularities” in the data was conducted. The researcher examined how listening to self-selected music affected the following variables: self-reported pain, anxiety, blood pressure, heart rate, and respiratory rate.

Also, using an inductive approach, the researcher examined the data for unanticipated categories that may have emerged from the data. Efforts were made to focus upon discovering salient themes, such as recurring ideas or patterns of musical preferences, time of day, gender, and age that link people and settings together (Marshall & Rossman, 1994). Analytical procedures fell into the following modes: organizing the data; generating categories, themes, and patterns; and testing the emergent hypotheses against the data (Marshall & Rossman, 1994).

Using researcher-constructed typologies to locate naturally occurring variations in this researcher's observations, the salient, grounded categories of meaning held by the participants (Marshall & Rossman, 1994) were identified. The researcher also created several categories, based upon research questions and themes that emerged from the data. These categories were then used to code the data initially for subsequent analysis. The researcher looked for and described alternative explanations for the data and the linkages among them as suggested (Marshall & Rossman). As suggested, this critical analysis assisted in facilitating explanations that were the most plausible (Marshall & Rossman 1994).

The researcher used the Statistical Package for Social Sciences (SPSS base 11.5 for Windows, 2002, SPSS Inc., Chicago, IL) for data management, analysis, and graphical presentation of results. The data were entered as text into MS Word using codes. The degree of the coding was based on three factors offered by Neuman (2000): the research questions, the richness of the data, and this study's research purposes. The researcher marked, labeled, and sorted the data in order to find relationships between music and pain indices, music and anxiety indices, music and BP indices, music and RP indices, and

music and RR indices. Similarities or dissimilar trends, themes, and behavior were examined. As new ideas, concepts, and themes emerged, the researcher recoded the data.

After the initial coding process and locating themes and assigning the initial codes or labels to condense the large set of data into categories, the researcher then conducted axial coding. Axial coding is a technique that facilitates building connections within categories, that is, between categories and sub-categories (Neuman, 2000). The researcher re-read the transcripts, reviewed the initial codes, organized the key concepts into categories and concepts that clustered, and linked concepts and themes arising from the observed and documented evidence from the study (Neuman, 2000; Leedy & Ormond, 2001). Additionally, the researcher marked respondent quotes to support summary statements (see Table 4-15).

For each individual who was analyzed separately, the researcher used the SPSS computer software program to index, code/label, and extract themes. The researcher then summarized the data and incorporated respondent quotations to support the data. The summary was then cross-referenced with unfolding themes, differences in the respondents' points of views, what they said, as well as their negative comments and special concerns during music intervention.

An explanation of the study was presented to each subject, and when the subject agreed to participate in the study, a signed consent form was obtained from the subject and from the parent if the subject was aged 7 or older. The study was explained and then a signed consent was obtained from each subject (see Appendix G). Demographic data were collected from the patients and other data from the chart (see Appendix A). The researcher neither influenced the patients' musical preferences, nor did the researcher

require the patients to choose from the provided categories. The given taxonomy based on the Modified Hartsock Music Preference Questionnaire (Appendix E) acted only as a guide for the patients to make their musical preferences appropriately. The varieties of musical selections and categories are presented in Appendix F.

Approximately 24 hours before the start of music intervention, the researcher conducted a pre-screening of the patients. The researcher then liaised with the health care personnel in the BMT Unit, such as the nurses and physicians on duty; to make sure the patient was in his room at an appropriate time following the infusion or to learn if the patient had undergone any other pharmacological or non-pharmacological procedures that would affect his ability to participate.

The researcher then discussed the concept of pain with the subjects and defined the kind of pain patients should address in their self-evaluation. The researcher also addressed the concept of comfort or the concept of having no pain in order to help the patients understand the VAS numerical scale. Points of interest included presence of pain, pain intensity, age of patient, language, condition, and a cognitively rate their pain using the VAS pain rating scale, for example, “0 to 10.” Other points of interest included their anxiety at that particular moment. This was measured using the STAI scale (Appendix C). For consistency, the pain assessment method was the same for all the patients.

The researcher then discussed with the patient and their families (Appendix G) information about reporting pain intensity using VAS rating scales and available pain relief and comfort measures, including discussion of the patient's musical preferences selected from choice, (i.e., Baroque, Country and Western, Classical, Gospel/Religious, Rock/Disco, Movie Soundtracks, Romantic, Jazz/Blues, other) (see Appendix E).

Modified Hartsock Music Preference Questionnaire

Modified Hartsock Music Preference Questionnaire was first developed in 1982 by Jane Hartsock. The questionnaire was to determine if listening to favorite music affects the levels of anxiety in the listener (Hartsock, 1982). Since then it has been used to assess the usefulness of music in improving the quality of life for patients (Gerdner, 2000). The questionnaire first consisted of short questions where the respondent selected the appropriate answers from the given choices regarding his favorite piece of music: title, performer, composer (in the case of classical music), and the title of the recording where the work was to be found. This questionnaire was also used to obtain personal data (Hartsock, 1982).

Findings from the Modified Hartsock Music Preference Questionnaire (see Appendix E) guided the selection of individualized music. The researcher discussed and dispelled misconceptions about pain and anxiety management, respectively. The researcher then explained to the patients the purpose of music intervention, which is, using the arts as Complementary and Alternative Medicine (CAM) to support the controlled analgesia, and also to educate them about the use of nonpharmacologic methods (e.g., relaxation with music). The researcher discussed potential outcomes of pain and discomfort interventions using music. The researcher discontinued using a subject from the study if the patient became uncomfortable with the study. The researcher arranged for parents of pediatric patients to be present during music intervention.

Visual Analogue Scale

Approximately one minute prior to the music, heart rate and blood pressure were recorded from a monitor at the nurses' station. The data were obtained from an arterial

line, which was already in place, using a Hewlett-Packard monitor. The equipment was connected with a Transpac II Sorenson transducer in the first facility and from a previously inserted arterial line, using a Hewlett-Packard monitor with a Baxter transducer, in the second facility. The research assistants were able to record the vital signs. The researcher then verified the choice of music with the patient using the Modified Hartsock Music Preference Questionnaire. Patients were asked to rate their pain with the Visual Analogue Scale (VAS). The VAS used in this study consisted of a 10-cm line anchored by two extremes of pain (see Appendix B). Patients were asked to make a selection from numbers “0” through “10” that represented the patients’ level of perceived pain intensity. The VAS line was designed in such a way that “0” means no pain at all and “10” means the worst pain possible.

Each subject was then advised that the music is believed to help reduce pain. Next, the self-selected music was played using a portable CD player for the patients for 30-minutes. The curtain was pulled down and doors closed to decrease white noise and other nonessential sensory stimuli. The caregivers were notified that no interruption could occur during the 30 minutes of music intervention.

Even though the music was self-selected, each musical selection was matched by other selections that consisted of relatively uniform rhythm and tone quality and was between 60 and 70 beats per minute. None of the music selections had words so the patient's thoughts could focus on the music itself without the influence of a verbal message. The musical selections were classified as follows:

- Baroque
- Country and Western
- Classical
- Gospel/Religious

- Rock/Disco
- Movie Soundtracks
- Romantic
- Jazz/Blues
- Other

Data Collection

Data collected during the study included: subjects' biographical information; subjects' self-report of pain; anxiety measures; blood pressure; heart rate; respiratory rate; music preference; and subjects' general comments related to the intervention. All this information was recorded by the researcher on the data collection sheet (see Appendix D).

If patients expressed a willingness to participate in the study, and upon signing the consent form, the following data were collected:

Sociodemographic data (age, gender, race)

- Diagnosis (reasons for BMT)
- Musical preference (subjects were asked to indicate which type of music they would prefer to listen to)

The following variables were examined in the study:

- Pain: All the subjects completed standard assessments of pain each time before, during, and after the musical intervention.
- Anxiety: All the subjects completed standard assessments of anxiety each time before, during, and after the musical intervention.
- Vital signs: Vital signs of all the subjects were recorded each time before, during, and after the musical intervention.
- Satisfaction: All subjects completed standard patient satisfaction assessments at the end of the research after each musical intervention

Table 3-1. Data Collection Process

T1	24 hours before the intervention (-24 h)
T2	Immediately before the intervention (0)
T3	15 minutes into the intervention (+15 minutes)
T4	At the end of the intervention (+30 minutes)
T5	15 minutes after the intervention (+45 minutes)

The day before intervention (24 hours – T1), pain and anxiety scores were collected from each subject in the study sample. This initial recording was aimed at assessing the consistency of the pain, anxiety, and the vital signs prior to music intervention. The second reading (T2) just before the music intervention, however, acted as the baseline reading. The recording was also taken immediately before the musical intervention. After every 15 minutes, more readings were taken and recorded on a sheet (see Appendix D).

After 30 minutes, the investigator then entered the room and discontinued playing the music. Subjects were asked to rate their pain using the numeric VAS from the post-intervention pain score. After 45 minutes, the researcher asked the patient to rate his pain for the last time. This concluded the interview and the same procedure was repeated with other subjects in the sample. The researcher then asked for comments from the subjects related to the intervention, and he recorded these comments on the data collection sheet. Subjects were allowed to make other music selections if they preferred another music style during subsequent sessions.

Patients were asked whether or not the music was of some support during their stay in the BMT Unit, and the degree of this support, as measured on an attitudinal scale. Patients were also asked if they would have preferred not to listen to music. At the end of

the music intervention, patients were asked to indicate whether or not they would have preferred to listen to music and the reasons for this preference. Patients' participation in this study was entirely voluntary. Uncontrolled variables, such as sedatives, were recorded on the patient interview sheet, as well as the type of analgesics taken.

The selection criteria of the music utilized in the Bone Marrow Transplant Unit included the patient's cultural and religious background, which provided a personalized approach. In all instances, the patient's musical preferences were of primary importance.

Sampling

The researcher used the convenience sampling (also known as accidental sampling). Convenience sampling approach that makes no pretense of identifying a representative subset of a population, but rather, it takes people who are readily available (Leedy & Ormond 2001). This sampling method is also referred to as a nonprobability sampling technique, commonly used in exploratory research. This research therefore included willing patients recruited from the Bone Marrow Transplant Unit at Shands Hospital at UF. The criteria for inclusion were that the patients must be diagnosed with any or a combination of the following: 1) acute leukemia; 2) chronic leukemia; 3) lymphoma; and 4) multiple myelomas. The size of the sample depended on how homogenous or heterogeneous the population was--how alike or different its members are with respect to the characteristics of the research interest (Leedy & Ormond. The use of the purposive convenience sampling strategy in this study does not presuppose generalizability to all patients in this category.

This kind of sampling allowed the researcher to generate a representative sample of the BMT patient population and eradicate the problematic issues of money and time required to select the sample. As a result, this research may be most applicable to the

BMT setting. But this BMT Unit is a setting with people who are in dire pain and filled with anxiety, hence, understanding their musical preferences is of great importance.

As illustrated (see Appendix D), the first data collection day (T1) was 24 hours pre-intervention--a day for interaction. Patients were visited by the Primary Investigator (PI) and trained assistants. The data collectors administered the two self-report scales: the Visual Analogue Scale (VAS) for pain and the State Trait Anxiety Inventory (STAI) for anxiety. The VAS is the most commonly used pain measurement tool in both research and clinics. The VAS scales can vary but generally, they consist of a 100mm line bounded with two descriptors as *no pain* and *worst pain possible*. On the other hand, the STAI distinguishes between a general proneness to anxious behavior rooted in the personality and anxiety as a fleeting emotional state. The instrument consists of a 20-item scale that is easy to read and can be administered verbally (see Appendix C). This process was repeated immediately before the musical intervention (T2). Musical interventions were then provided to the subject for a period of 30 minutes. Pain and anxiety were measured after the first 15 minutes (T3), immediately after the intervention (T4), and 45 minutes post-intervention (T5).

Instruments

The instruments used in this study measured two groups of variables: 1) physiological parameters; and 2) psychological parameters.

Physiological Parameters

A bedside monitor was used to collect systolic blood pressure, heart rate, and respiratory rate. Data were collected at baseline before the bone marrow transplant, 24 hours before music intervention, immediately before the intervention, 15 minutes during intervention, 30 minutes at the end of the intervention, and 45 minutes post-intervention.

Visual Analogue Scale (VAS)

The Visual Analogue Scale (VAS) used to measure the pain levels is one of the most frequently used measurement scales in health care research (Gould et al., 2001). A Visual Analogue Scale is an instrument that measures a characteristic or attitude that is believed to range across a continuum of values and cannot easily be directly measured (Gould 2001).

Gould (2001) described the VAS as a horizontal line, 100 mm in length, and anchored by word descriptors at each end, as illustrated (see Appendix B). The descriptors range from “0” (*no pain*) to “10” (*very severe pain*). The amount of pain that a patient feels ranges across a continuum from none to an extreme amount of pain. From the patient's perspective, this spectrum appears to be continuous; therefore, his pain does not take discrete jumps. The feelings are categorized as *no pain*, *mild pain*, *moderate pain*, and *severe pain*. Many other ways exist in which the VAS has been presented, including vertical lines and lines with extra descriptors (Gould 2001). The patient marks on the line the point that he feels represents his perception of his current state.

The VAS, a pain rating scale (see Appendix B), was used to assess the patient's perception of pain intensity. The VAS has been found to be superior to categorical scales in differentiating between precise changes in degrees of pain. It is therefore more useful in studies pertaining to analgesic efficacy. The VAS is a reliable categorical scale, but it is more sensitive and valid because the VAS has a straight line continuum rather than categorical responses (Sriwatanakul et al., 1983a). Reville, Robinson, Rosen, and Hogg (1976) reported that, among 10 females in acute labor pain, a 10 cm VAS was as reliable and sensitive as a 15 cm and a 20 cm VAS, even under the influence of *pethidine*, a drug used to deal with moderate to severe pain. Researchers conducted another study of 1,497

patients with various diagnoses, comparing the reliability of a 10 centimeter VAS and a 10 centimeter descriptive scale (Littman, Walker, & Schneider, 1985). The researchers found a high correlation between the two scales among patients with post-operative pain, orthopedic pain, and chronic cancer pain (Littman et al.). The reliability of the VAS ranged from $r = 0.82$ to $r = 0.93$ (Littman et al.). The scale is considered to be reasonably valid (McGuire, 1988). The limitations of the VAS include its unidimensional and linear characteristic, and the inability of some subjects to understand how to use it due to the abstract thought process required in interpreting personal pain intensity (Kremer, Atkinson, & Ignelzi, 1981; McGuire, 1988). The VAS is considered easy to administer and score, but may be confusing to some patients who have difficulty visualizing pain as a straight line (Kremer et al., 1981; McGuire, 1988).

Psychological Parameters

The State Trait Anxiety Inventory, which is the anxiety assessment tool, was used to collect anxiety scores. It is one of the most popular tools used in clinical settings and it is available in seven languages: 1) Dutch; 2) English; 3) German; 4) French; 5) Spanish; 6) Italian; and 7) Norwegian (Stouthard, Hoogstraten, & Mellenbergh, 1995). The STAI is intended to help care providers assess anxiety and help patients according to their needs. MacArthur & MacArthur (2006) have stated:

Among many instruments to assess anxiety, one stands out: the *State-Trait Anxiety Inventory*. This does not mean that it is an ideal measure but it is the most frequently used scale in research world-wide, and no *other* measure has received as many foreign language adaptations and citations in the last three decades. Thus, it is the standard in the field. (para. 8)

The STAI consists of a 20-item questionnaire with questions about how the patient is feeling (see Appendix C). Data were collected at baseline before the bone marrow transplant, 24 hours before music intervention, immediately before the intervention, 15

minutes during intervention, 30 minutes at the end of the intervention, and 45 minutes post-intervention.

The instrument that was used to obtain blood pressure and heart rate in the first facility was a Hewlett-Packard monitor with a Transpac II Sorenson transducer. The instrument that was used to obtain blood pressure and heart rate readings in the second facility was a Hewlett-Packard monitor with a Baxter transducer.

Both Hewlett-Packard monitors provided bedside monitoring up to 12 continuously monitored parameters. Included in these was EGG processing with heart rate and hemodynamic processing with blood pressure (Hewlett-Packard, 1988). Both the Transpac II Sorenson transducer and the Baxter transducer had electronic sensors that transmitted electronic signals, that reflected changes in pressure from body fluid. The Hewlett-Packard monitor was able to test itself each time it was turned on, giving credence to the equipment's accuracy and stability. While in operation, the monitor continually tested itself with a background mode that resulted in error messages if any problems were found. The monitor had a numeric display for heart rate and systolic/diastolic/mean pressure(s) derived from an arterial line. Regarding the reliability of the equipment, Hewlett-Packard (1988) reports that the monitor has an accuracy within two beats and 2% for a constant rate input. The input sensitivity was 40/uv/V/mmHg or 5/uv/V/mmHg. Automatic calibration was accurate within 1% (Hewlett-Packard).

State-Trait Anxiety Inventory

Anxiety was assessed with the State-Trait Anxiety Inventory-state portion (STAI-s) (Spielberger et al., 1983). The STAI-s measures feelings of apprehension, tension, nervousness, and worry. Scores increase in response to physical danger and psychological stress. The scale consists of 20 statements that evaluate how respondents

feel "right now, at this moment," rated on a "1" (*not at all*) to "4" (*very much so*) scale. The STAI takes approximately 5 to 10 minutes to complete. An overall score is derived by coding positive statements (e.g., *I feel secure*) and then adding all items. Possible scores for each scale are between 20 and 80. A higher score indicates more anxiety. The STAI has been used extensively and has reported reliability (Cronbach's alpha) ranging from .83 to .92 (Spielberger et al.). Cronbach's alpha is an index of reliability associated with the variation accounted for by the true score of the underlying construct (Cronbach, 1951). A sample item states, "*I feel at ease.*"

The State-Trait Anxiety Inventory (STAI) was initially conceptualized as a research instrument for the study of anxiety. It is a self-report assessment device that includes separate measures of state and trait anxiety. According to Spielberger et al. (1983), state anxiety reflects a transitory emotional state or condition of the human organism that is characterized by subjective, consciously perceived feelings of tension and apprehension, and heightened autonomic nervous system activity. State anxiety has a tendency to fluctuate over a period of time and may vary in intensity. In contrast, trait anxiety denotes "relatively stable individual differences in anxiety proneness." Trait anxiety refers to a general tendency to respond with anxiety to perceived threats in the environment (Spielberger et al., 1983).

Scoring and Norms

Scores on the STAI have a direct interpretation: high scores on their respective scales mean more trait or state anxiety, and low scores mean less trait or state anxiety. Both percentile ranks and standard (T) scores are available for male and female adults in three age groups (19 to 39, 40 to 49, and 50 to 69), male and female high school and college students, male military recruits, male neuropsychiatric patients, male medical

patients, and male prison inmates. In this study, the participants were asked to rate their overall sense of control over pain using the numeric rating scale with options ranging from “0” (*no pain at all*) to “10” (*worst pain possible*) (Kwekkeboom, 2003).

Reliability Procedures

The STAI scale has been demonstrated to be reliable and valid and has been used with cancer patients. Kwekkeboom (2003) observed that this numerical rating scale measure of pain has been used successfully in recent research by other investigators (p. 435). In addition, the stability of the STAI scales was assessed on male and female samples of high school and college students for test-retest intervals, ranging from one hour to 104 days. The magnitude of the reliability coefficients decreased as a function of interval length. For the Trait-anxiety scale, the coefficients ranged from .65 to .86, whereas the range for the State-anxiety scale was .16 to .62. This low level of stability for the State-anxiety scale is expected since responses to the items on this scale are thought to reflect the influence of whatever transient situational factors exist at the time of testing (Spielberger et al., 1983).

Validity

The VAS scale has been evaluated in terms of validity and responsiveness. In general, the scaling method seems to be valid and responsive (Bolton & Wilkinson, 1998; Vickers, 1999; Wewers & Lowe, 1990). Correlations are presented in the manual between this scale and other measures of trait-anxiety: the Taylor Manifest Anxiety Scale, the IPAT Anxiety Scale, and the Multiple Affect Adjective Check List. These correlations are .80, .75, and .52, respectively (Spielberger et al., 1983).

Audio Recording

Audio recordings are an essential form of data for music and healing research due to their excellent time resolution. With the audio equipment available today, obtaining good quality recordings do not present serious difficulties. Although audio player machines do not cause much of a problem in the bone marrow transplant unit, the number and placement of these machines require careful consideration. Therefore, portable players were used in the rooms only during music sessions. Existing recordings are quite useful for investigating the effects of music on health, and this effect was applied in the pain and anxiety phenomena (Standley, 1986).

Statistical Procedures

Although the reduction in pain and anxiety indices following music intervention do not necessarily prove the efficacy of music in these conditions, the effects can be suspected only if they reduce every time those musical stimuli are applied and all data analyzed. At the heart of qualitative and qualitative data analysis is the task of discovering themes. The first step of analysis, therefore, is to look for themes. Themes are abstract -- often uncertain -- constructs, which researchers identify before, during, and even after data collection. Theme identification is one of the most fundamental tasks in qualitative research. One such theme may include the musical preferences of the patients under pain and anxiety.

Caution is generally demanded because analyses are a complex, dynamic process, not a fixed state. A single observation is not sufficient to identify the effects of certain types of music on patients. Time series data are required, that is a series of observation data or measurements of the respective behaviors over a period of time. These data can then be analyzed in order to detect the presence of themes. For instance, the mere

demonstration of a covariance of two variables is not sufficient to prove the efficacy of music in the alleviation of pain and anxiety. In order to identify these themes, it is necessary to examine and review the literature. Ryan and Bernard (2003) stated:

Richer literatures produce more themes. They come from the characteristics of the phenomena being studied. And they come from already-agreed-upon professional definitions, from local common-sense constructs, and from researchers' values, theoretical orientation, and personal experience with the subject matter. (p. 88)

Interpretation of Data

As previously suggested, the empirical and/or experimental research can flow out of and serve to illuminate the interpretation of qualitative data. Serious consideration of music and healing in the field of health care research, supported by a myriad development of methodologies, could potentially lead to a significant shift in the focus of music and healing. In fact, as empirical and experimental approaches continue to be integrated with ethnographic approaches, the discipline will gain credence. The ways in which qualitative and empirical methods continue to be integrated between substantially different research contexts are particularly important. However, each of these approaches should feed into the other; in other words, qualitative methods should direct empirical research because empirical research offers intuitions as to which phenomena seem to be especially important in specific artistic contexts since empirical research can generate questions for qualitative methods (Ryan & Bernard, 2003).

The analysis of the data from the post-intervention questionnaire (see Appendix K) was done with the use of the Statistical Package for the Social Sciences (SPSS) software. This software includes a spreadsheet-type data entry window, statistical capabilities, and graphics. The software features are modules for statistical data analysis, including descriptive statistics such as plots, frequencies, charts, and lists. The software package

also includes sophisticated inferential and multivariate statistical procedures, such as analysis of variance (ANOVA), factor analysis, cluster analysis, and categorical data analysis. The SPSS package is particularly well suited to survey research, but by no means is it limited to just this topic of exploration.

Descriptive statistics were used to describe the groups' characteristics. Non-parametric tests were used. A paired sample t-test was used to determine whether or not the differences were statistically significant for all dependent variables between groups at each time period (baseline, 15, 30, and 45 minutes). For physiological variables, the independent t-test was used to test for any statistically significant differences between the groups for each dependent variable at five time points. Multiple comparisons were performed using a paired sample t-test to compare each pair (baseline vs. 15 minutes, baseline vs. 30 minutes, and baseline vs. 45 minutes). The level of significance was set at .05.

The researcher concluded the data analysis when the critical categories were defined and the relationships among them established (Marshall & Rossman 1994). At this point, the researcher no longer found significant variability between the paired recordings of pain, anxiety, and vital signs.

With the use of the qualitative methods of in-depth interviews, participant observation, field notes, and use of the questionnaire data, the researcher used a triangulation of methodologies that tested the findings. This research design was valuable for ensuring that the researcher captured the necessary data needed for addressing the research objectives and understanding the personal testimonies, beliefs,

and behaviors plus the social, cultural, and environmental aspects affecting the quality of life of the patients receiving BMT.

Data Management

The data collected, generally known as protected health information (PHI), was stored in locked filing cabinets or in computers with security passwords. Only the researchers and health care personnel had the legal right to review these research records because the data were protected to the extent the law stipulates. University of Florida officials, the hospital and the clinical staff involved in this research, and the Institutional Review Board (IRB) also had access to this PHI.

CHAPTER 4 RESULTS

Introduction

The purpose of this study was to determine the effect of music on patients' pain, anxiety, blood pressure, heart rate, and respiratory rate during their stay in the BMT Unit. This chapter presents the research findings of the study in three broad categories. First, a description of the sample characteristics is presented. Second, the hypotheses posed in Chapter 1 are addressed. Third, descriptive findings are presented.

Sample Characteristics

Data from 15 patients were studied. Their reasons for admission which were comparable within the subjects formed a core of their demographic characteristics. These are represented in Table 4-1. The total sample was composed of 60.0% males and 40.0% females, with a mean age of 47.60 (range, 18 to 72 years). Further descriptions of the types of cancer and the length of time each subject had been in the BMT Unit were also collected as part of the demographic data (see Appendix A).

Initially, a total of 20 patients agreed to participate in the study. However, three subjects withdrew from the study for being too sick while two subjects were younger than 7 years old. The final sample consisted of 15 individuals who were between the ages of 7 and 72 years. The majority of the subjects were male ($n = 15$; 40%). There were differences among subjects with regard to their musical preferences. About 26% of the clients (4) chose each of the following: country, baroque, and classical music while only 13% (2) chose jazz. Only 6% (1) chose hip hop (see Table 4-2). One individual asked for

gospel music, but picked country music as the second choice. Another patient also requested that Peter Gabriel's rock tune *All That You Can't Leave Behind* be changed since it elicited disturbing memories. Trial 1 occurred 24 hours before the music intervention. Trial 2 occurred just before the music intervention at Time 2, while trial 3 was performed 15 minutes after the music intervention had started (Time 3). The next trial was at the end the of the music intervention (T4) while the final trial was 45 minutes following the termination of the musical intervention (T5).

Patients' cancer types varied; but acute leukemia patients were the most common (46.7%). Most of the subjects (80%) had experienced pain for at least six months but less than three years. Combinations of two to four pain medications were being used most often on a regular basis.

Table 4-1. Reasons for Admission

Diagnosis	No. of patients	Percent	Valid Percent	Cumulative Percent
Acute leukemia	7	46.7	46.7	46.7
Lymphoma	3	20.0	20.0	66.7
Myeloma	2	13.3	13.3	80.0
Other cancers	2	13.3	13.3	93.3
Bone marrow failure states	1	6.7	6.7	100.0
Total	15	100.0	100.0	

Musical Preferences Questionnaire

Hartsock Music Preference Analysis. The musical preferences were determined from the responses given to the modified Hartsock Music Preference Questionnaire (see Appendix D). The purpose of this questionnaire was to determine what type of music the BMT client preferred. These data are presented in Table 4-2. The majority (53.40%) of the subjects selected classical, country and western, and other popular music.

Table 4-2. Musical preferences

Type	Frequency	Percent	Valid Percent	Cumulative percent
classical	4	26.7	26.7	26.7
country	4	26.7	26.7	53.3
jazz	2	13.3	13.3	66.7
hip hop	1	6.7	6.7	73.3
other	4	26.7	26.7	100.0
Total	15	100.0	100.0	

Effect of the Music Intervention on Pain

To analyze the difference in pain intensity reduction between baseline values and the trials, an independent t-test was used to examine relationships between sample variables and the change in pain intensity.

Hypothesis 1 Itemized subject VAS scores are presented in Appendix G. The results support Hypothesis 1: The VAS was used to determine this variable, with a possible range score of 0 to 10 cm. An independent t-test was employed to compare pretest-posttest measures for each subject between trials. The effect of music was evaluated by a timed interaction, which assessed differences between the baseline and subsequent trial readings with the music intervention. As shown in Table 4-3, there was a general downward trend in the mean VAS index. The results showed a significant change in VAS scores (see Table 4-4).

Table 4-3. Mean Pain Readings from Visual Analogue Scale at Timed Intervals during Music Intervention

	N	Minimum	Maximum	Mean	Standard Deviation
pain 24 hr pre-intervention	15	0.00	10.00	4.4000	3.35517
pain immediately before	15	0.00	9.00	3.0000	2.95200
pain at 15 min. During	15	0.00	7.00	2.0667	2.63131
pain at 30 min. at End	15	0.00	4.00	1.4000	1.72378
pain at 45 min. Post-intervention	15	0.00	2.00	0.7333	0.88372
Valid N (listwise)	15				

Table 4-4. Visual Analogue Scale Scores Between Time 1 (T1) and Time 5 (T5)

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std Deviation	Std. Error of the Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
T1-T2	stai 24 hr pre-intervention - stai immediately before	1.4000	1.50238	.38791	.56801	2.23199	3.609	14	.003
T2-T3	pain immediately before - pain 15 min. During	0.9333	1.43759	0.37118	0.1372	1.7294	2.514	14	.025
T2-T4	pain immediately before - pain 30 min. at End	1.6000	1.84391	0.47610	0.5789	2.6211	3.361	14	.005
T2-T5	pain immediately before - pain 45 min. Post-intervention	2.2667	2.31352	0.59735	0.9855	3.5479	3.795	14	.002

The mean VAS score at the baseline was 4.4 (SD = 3.35) for Time 1. The mean VAS score for Time 2 was 3.0 (SD = 2.95). The mean VAS score for Time 3 was 2.07 (SD = 2.63). Time 4 gave a mean VAS score of 1.40 (SD = 1.72), while the mean VAS score for Time 5 was 0.73 (SD = 0.88) (see Table 4-2). An independent t-test was conducted on all the VAS trials. The independent t-test comparing the VAS readings at Time 2 baseline and Time 3 showed statistical difference, $t = 2.51$ with $p = 0.025$, at a 95% confidence interval (see Table 4-4). Significant relationships were observed between actual VAS scores between the baseline and Time 4, $t = 3.36$ with $p = 0.005$ at a 95%

confidence interval (see Table 4-4). Significant relationships were also observed between baseline and Time 5, $t = 3.79$ with $p = 0.002$. at a 95% confidence interval.

Effect of Music Intervention on Anxiety

Hypothesis 2. The researcher compared patients' anxiety levels obtained before and after the music intervention using independent t-test. Hypothesis 2 stated: Bone marrow transplant patients have lower levels of state anxiety levels as compared to the baseline measurements while listening to preferred music.

This hypothesis was evaluated using an independent t-test. The STAI score was defined as below the baseline mean of 48.20. A high STAI score was defined as at or above the baseline mean of 48.20. Table 4-5 provides a comparison of the average of the dependent state anxiety variable over a period of time. Hypothesis 2 was supported. A significant difference in the state anxiety variables occurred over a period of time.

Table 4-5. Mean Scores for the state portion of the State Trait Anxiety Index (STAI) at Timed Intervals During Music Intervention

	N	Minimum	Maximum	Mean	Standard Deviation
STAI 24 hr. pre-intervention	15	33.00	59.00	49.0667	6.86052
STAI immediately before	15	41.00	60.00	51.6667	5.17779
STAI at 15 min. During	15	42.00	58.00	49.0667	4.28397
STAI at 30 min. at End	15	40.00	55.00	47.4667	4.24040
STAI at 45 min. Post-intervention	15	38.00	52.00	45.2000	4.81367
Valid N (listwise)	15				

The mean STAI scores at the baseline was 49.07 (SD = 6.86) for Time 2. The mean STAI score for Time 3 was 49.06 (SD = 4.28). The mean STAI score for Time 4 was 47.46 (SD = 4.24). Time 5 gave a mean STAI score of 45.20 (SD = 4.81) as shown in Table 4-6.

Table 4-6. State Portion of the State Trait Anxiety Index (STAI) Scores Between Time 1 (T1) and Time 5 (T5)

		Paired Differences				t	df	Sig. (2-tailed)	
		Mean	Standard Deviation	Standard Error of the Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
T1-T2	STAI 24 hr pre-intervention - STAI immediately before	-2.60000	6.98774	1.80423	-6.46968	1.26968	-1.441	14	.172
T2-T3	STAI immediately before - STAI 15 min. During	2.6000	4.38830	1.13305	0.1698	5.0302	2.295	14	.038
T2-T4	STAI immediately before - STAI 30 min. at End	4.2000	4.58569	1.18402	1.6605	6.7395	3.547	14	.003
T2-T5	STAI immediately before - STAI 45 min. Post-intervention	6.4667	6.61024	1.70676	2.8060	10.1273	3.789	14	.002

An independent t-test was conducted on all the STAI trials. The results were significant, $t = 2.30$ with $p = 0.038$, at a 95% confidence interval (see Table 4-6).

Significant relationships were observed between actual STAI readings scores between the baseline and Time 4, $t = 3.55$ with $p = 0.003$, at a 95% confidence interval (see Table 4-6). Significant relationships were also observed between baseline and Time 5, $t = 3.79$ with $p = 0.002$ (see Table 4-6).

Effect of Music Intervention on Systolic Blood Pressure (SBP)

Hypothesis 3. Hypothesis 3 stated: Bone marrow transplant patients have lower systolic blood pressure (SBP) as compared to the baseline measurements while listening to preferred music. The t -test statistics on blood pressure indicated that a decrease in the

indices of blood pressure compared to the baseline, which supports the assumption of the functional importance of music in the health of patients. The effect of music was evaluated by a change in time and by the interaction between group and time.

As shown in Table 4-7, the mean systolic blood pressure (in mmHg) during Time 2 was 61.07 (SD =13.29) for Time 1. During the music intervention, the means varied considerably. The changes indicated 66.86 (SD = 13.34) for Time 2. The mean SBP during Time 3 was 63.60 (SD = 10.56), and the SBP for Time 4 was 60.07 (SD = 10.54). The mean systolic blood pressure increased from 61.07 to 66.87 mmHg in Time 2 but reduced to 63.60 mmHg in Time 3. The SBP further decreased from 63.60 mmHg in Time 3 to 60.07 in Time 4, culminating to a minimum of 58.73 mmHg in Time 5 ($p < 0.05$, independent t-test). A t-test analysis found a significant difference in SBP over a period of time ($F = 5.109$, $p = 0.014$). Further analyses found a significant difference in SBP between the baseline and during the music intervention between Time 3 and Time 5 ($p = 0.024$) and during Time 3 and Time 5 ($p = 0.01$). Using the t-test, the study showed no significant change in systolic blood pressure within patients during Time 2 and Time 3 (see Table 4-8). However, significant relationships were observed between Time 2 and Time 5, $t = 4.02$ with a $p = 0.001$ at a 95% confidence interval (see Table 4-8).

Table 4-7. Mean scores for the Systolic Blood Pressure (SBP) at Timed Intervals During Music Intervention

	N	Minimum	Maximum	Mean	Standard Deviation
SBP 24 hr. pre-intervention	15	40.00	82.00	61.0667	13.29053
SBP immediately before	15	42.00	89.00	66.8667	13.33560
SBP at 15 min. During	15	46.00	85.00	63.6000	10.56139
SBP at 30 min. at End	15	43.00	83.00	60.0667	10.54559
SBP at 45 min. post intervention	15	40.00	87.00	58.7333	10.74022
Valid N (listwise)	15				

Table 4-8. Systolic Blood Pressure (SBP) Scores Between Time 1 (T1) and Time 5 (T5)

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Standard Deviation	Standard Error of the Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
T1-T2	bp 24 hr * pre- intervention - bp immediately before	-5.80000	11.63247	3.00349	-12.24185	.64185	-1.931	14	.074
T2-T3	sbp immediately before - bp 15 min. During	3.2667	6.56252	1.69444	-0.3675	6.9009	1.928	14	.074
T2-T4	bp immediately before - bp 30 min. at End	6.8000	5.41427	1.39796	3.8017	9.7983	4.864	14	.000
T2-T5	bp immediately before - bp 45 min Post- intervention	8.1333	7.83642	2.02336	3.7937	12.4730	4.020	14	.001

Effect of the Music Intervention on Heart Rate

Hypothesis 4. The independent t-test was employed to examine the hypothesis that following music intervention, BMT patients have a significant decrease in heart rate compared to the baseline heart rate. Analysis supported a significant change in the heart rate within subjects at the 0.05 level of significance. The mean heart rate significantly decreased.

The mean HR (in beats per minute) during the baseline was 88.47 (SD = 18.43). During the music intervention, HR was 91.60 (SD = 19.42) during Time 2. The mean HR for Time 3 during intervention was 82.27 (SD = 17.43), and that for Time 4 was 78.80 (SD = 17.36). Time 5 intervention rating was 76.8 (SD = 16.92). Using the t-test, significant relationships were observed between baseline (T2) and Time 3, $t = 2.51$ with a

$p = 0.025$ at a 95% confidence interval (See Table 4-10). A significant relationship was also observed between baseline and Time 4, $t = 3.64$ with a $p = 0.003$ at a 95% confidence interval (See Table 4-10).

Table 4-9. Mean scores for the Heart Rate (HR) at Timed Intervals during the music intervention

	N	Minimum	Maximum	Mean	Standard Deviation
HR 24 hr pre-intervention	15	59.00	128.00	88.4667	18.43857
HR immediately before	15	68.00	130.00	91.6000	19.42311
HR at 15 min. During	15	59.00	126.00	82.2667	17.42521
HR at 30 min. at End	15	55.00	121.00	78.8000	17.36252
HR at 45 min. Post-intervention	15	55.00	120.00	76.8667	16.92364
Valid N (listwise)	15				

Table 4-10. Heart Rate (HR) Scores Between Time 1 (T1) and Time 5 (T5)

		Paired Differences				t	df	Sig. (2-tailed)	
		Mean	Standard Deviation	Standard Error of the Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
T1-T2	HR 24 hr pre-intervention - HR immediately before	-3.13333	15.33375	3.95916	-11.62488	5.35821	-7.91	14	.442
T2-T3	HR immediately before - HR 15 min. During	9.3333	14.38584	3.71441	1.3667	17.2999	2.513	14	.025
T2-T4	HR immediately before - HR 30 min. at End	12.8000	13.62875	3.51893	5.2526	20.3474	3.637	14	.003
T2-T5	HR immediately before - HR 45 min. Post-intervention	14.7333	13.31737	3.43853	7.3584	22.1082	4.285	14	.001

Effect of the Music Intervention on Respiratory Rate

Hypothesis 5. To analyze the Respiratory Rate reduction between the baseline and the trials, a t-test was used to test whether or not listening to music affected respiratory rate. As shown in Table 4-11, the mean RR 24 hours pre-intervention was 20.4 (SD = 6.8 for Time 1 and 21.47 (SD = 5.42) for Time 2. During the music intervention, RR was 18.8 (SD = 4.59) for Time 3 and 17.47 (SD = 4.31) for Time 4. After 45 minutes following music intervention the mean RR was 16.67 (SD = 3.09) for Time 5. A t-test was used and found no significant change in RR between baseline and Time 4 and between baseline and Time 5 (see Table 4-12). However, further analysis using a t-test found a significant change in RR between baseline and Time 3 ($p = 0.002$).

Table 4-11. Mean Scores for the Respiratory Rate (RR) at Timed Intervals During Music Intervention

	N	Minimum	Maximum	Mean	Standard Deviation
RR 24 hr pre-intervention	15	16.00	44.00	20.4000	6.81175
RR immediately before	15	16.00	38.00	21.4667	5.42305
RR at 15 min. During	15	14.00	30.00	18.8000	4.58569
RR at 30 min. at End	15	12.00	30.00	17.4667	4.30725
RR at 45 min. Post-intervention	15	12.00	26.00	16.6667	3.08607
Valid N (listwise)	15				

Table 4-12. Respiratory Rate (RR) Scores Between Time 1 (T1) and Time 5 (T5)

	Paired Differences				t	df	Sig. (2-tailed)	
	Mean	Standard Deviation	Standard Error of the Mean	95% Confidence Interval of the Difference				
				Lower				Upper
T1-T2 * RR 24 hr pre-intervention - RR immediately before	-1.06667	3.45309	.89158	-2.97892	.84559	-1.196	14	.251

Table 4-12. Continued

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Standard Deviation	Standard Error of the Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
T2-T3	RR immediately before - RR 15 min. During	2.6667	2.69037	0.69465	1.1768	4.1565	3.839	14	.002
T2-T4	RR immediately before - RR 30 min. at End	4.0000	2.92770	0.75593	2.3787	5.6213	5.292	14	.000
T2-T5	RR immediately before - RR 45 min. Post intervention	4.8000	3.52947	0.91130	2.8454	6.7546	5.267	14	.000

Research Hypothesis

Hypothesis 1 was statistically supported by this study: Clients undergoing BMT report a greater reduction in pain intensity after listening to their preferred music. A t-test was used to analyze differences in pre-and post-VAS scores. The results indicated that a significant difference existed in the pre-post VAS intensity scores between Time 1 and Time 5, as measured by a visual analogue scale (VAS). Table 4-4 depicts the mean difference in VAS scores in pre-post VAS intensity scores ($r = 0.71$). The music significantly decreased the VAS scores. Itemized VAS scores are presented (see Appendix L). Other parameters of interest include the analyses of the relationships among the following variables: age, gender, race, length of time in program, type of cancer, type of music, and the differences in VAS scores.

Hypothesis 2 was statistically supported by this study: Listening to music can significantly reduce cancer pain intensity in clients receiving BMT. Further

recommendations for future research and discussion regarding to this study's significance to nursing practice and education are presented in Chapter 5.

The follow-up questionnaire Likert-type scale item on enjoyment of the music was used to measure satisfaction with the music intervention. Using the Likert scale, the mean satisfaction score for those who would prefer music throughout their stay in the hospital was 8 (SD = 0.41).

Table 4-13. Mean Score on the Likert Scale for Those Preferring Music of a Longer Duration and those who felt pleasant

	N	Minimum	Maximum	Mean	Standard Deviation
preferring music 24 hrs	15	1.00	10.00	8.000	4.1404
Feeling pleasant	15	10.00	10.00	10.00	00.00
Valid N (listwise)	15				

Hypothesis 3 was statistically supported by this study: Listening to music, subjects would have lower BP. The overall satisfaction index was assessed on a 10-point Likert-type scale item in the follow-up questionnaire. This assessment was evaluated using the Likert scale of 0 to 10 where “0” is *don't like it at all* and “10” is *like music extremely*.

The mean overall music satisfaction score for subjects was 8. (SD = 4.14).

A descriptive data analysis was performed on all data obtained from the Likert-type scale items in the follow-up questionnaire. The scale ranged from 1 to 10 (see Appendix K). Two open-ended questions were asked regarding what might have interfered with the subject's concentration or enjoyment of music during the musical intervention. The identified interferences are summarized in Appendix K. The types of interferences that the subjects found most annoying were either noise generated by the staff or environmental/equipment noise.

The majority of subjects reported that the music intervention experience was positive. Regardless of their musical preferences, all subjects (100.0%) answered “Yes” to the item in the follow-up questionnaire of *Would you have liked to listen to music for a longer period of time instead of just 30 minutes?* “Yes or No.” All the patients said they had a pleasant experience as indicated in Table 4-13. On the follow-up questionnaire, the subjects actually reported that they felt the music was relaxing, and they would have liked to have listened to music longer and more often. In addition, when asked after the musical intervention had ceased whether or not they had any comments regarding the music intervention, the majority of respondents reported that listening to music especially while in their hospital beds was a positive experience. Thirteen of 15 subjects made positive comments. The themes of these comments included: the subjects enjoyed the music; they found it relaxing; and they would suggest the use of music for all patients. Specific comments are given in Table 4-14.

Table 4-14. Responses to the Questionnaire

“Pain can be an isolating event in the human experience. Whenever I am in pain, I feel isolated from the society. This isolation brings with it certain anxieties. When I am in pain and listen to music, I feel connected to the society. Music helps me in this way.”
“When I listened to Beethoven’s <i>5th Symphony</i> , I felt as though someone was scratching the cancer cells out of my back.”
“I enjoyed listening to the music.”
“When I was listening to the music I felt more relaxed.”
“I would have liked to listen to music longer.”
“I would have liked to listen to music more often.”

Data were obtained from subjects to assess a subjective report concerning two questions. All the subjects were asked what they thought of the music. Each one of the

subjects who completed the study reported that the music helped to decrease their pain. All the subjects (100%) recommended music for those receiving BMT, and two added that it was necessary that the patient enjoy music. Thirteen subjects (65%) said that the music distracted them from their pain. One patient stated he completely forgot about his pain during the music sessions. One subject declared that the music blocked out the other noises in the ICU and replaced them with pleasant sounds. Five subjects commented that the music was either soothing or relaxing. One subject remarked that he usually preferred faster music but liked the relaxing music in this particular situation. Thirteen subjects (65%) reported that the music was a pleasant experience. Two subjects said they fell asleep during the music. One of those who fell asleep stated that music helped decrease his pain while he was asleep. Two subjects (13.3%) reported the same comment: that they would have enjoyed the music more if they had not "felt so badly all over."

Summary of Results

This chapter presented the data obtained during the study. Background characteristic data about the subjects, including demographic information and background information, were presented. Results of the data analyses were presented hypothesis by hypothesis. The last section of this chapter discussed the data analyses of the additional research questions.

Statistically significant decreases in pain, anxiety, BP, HR, and RR occurred during the music intervention when compared to baseline levels in these BMT subjects. Pain and anxiety levels significantly decreased during the music intervention periods compared to the baseline period. The majority of subjects concurred that the music intervention was enjoyable and that music helped them feel more relaxed. The tendency toward relaxation was further supported by the downward trend in blood pressure, heart rate, and

respiratory rate, and the fact that 55% of the time subjects fell asleep during the music intervention period.

According to the subjective reports, all the subjects in the group benefited from listening to music. Based on the analysis of this research, music was significantly effective in reducing pain, as reported on the VAS and via subjective comments. Music was also significantly effective in decreasing systolic blood pressure during Trial 1, but music produced no significant change during Trial 2.

Trials took place prior to peak drug concentrations. Medications that could affect a change in blood pressure, heart rate, or level of self-reported pain were recorded. Medications that were administered included morphine sulfate, oxycodone, prochlorperazine, digoxin, metoprolol, and nitroglycerin. The peak concentration is important in differentiating between the medication effect and the music effect on blood pressure, heart rate, and pain measured on a VAS. If the music listening occurred during the time when medication levels were rising, that is, the time prior to peak concentration, the researcher could not determine whether or not a decrease in pain, systolic blood pressure, or heart rate resulted from the music or the medication. However, if the music was introduced after the peak concentration of a medication, and the patient had a decrease in self-reported pain, blood pressure, or heart rate, it is possible that the music was effective in producing the decrease in pain.

CHAPTER 5 DISCUSSION AND RECOMMENDATIONS

“I would have liked to listen to music more often.” commented an eighteen year old BMT patient after music intervention.

The purpose of this research was to determine the effect of music listening with positive suggestion on BMT patients’ self-reported pain, anxiety, blood pressure, heart rate, and respiratory rate. The five hypotheses were based on the premise that observed reduction in pain, anxiety, and vital signs, such as blood pressure, heart rate, and respiratory rate, results from listening to music (Bolwerk, 1990; Guzzetta, 1989; Zimmerman et al., 1988). This chapter presents a discussion of the research findings relative to the five proposed hypotheses. Comparison is then made of the research findings to results of similar studies. Implications and recommendations are also included in this chapter.

Findings

According to the Gate Control Theory of pain, an individual's pain perception may be altered by refocusing the subject's attention from pain to some other experience that is more pleasing. This is a kind of sensory excitation which stimulates closure of the gate, resulting in interruption of the neurotransmission of the pain signal (Siegele, 1974). In this study, music was offered to the subjects as an “auditory distraction” from pain.

Previous studies in the area of pain management have established a positive relationship between the use of music and pain intensity reduction, as measured by both subjective and physiologic indicators (Bolwerk, 1990; Gardner et al., 1961; Guzzetta,

1989). Other parameters of interest that have been studied include subjective variables such as mood and anxiety levels, as determined by questionnaire and interview responses (Beck, 1988, 1991; Bolwerk, 1990; Guzzetta, 1989; Munro & Mount, 1978; Updike & Charles, 1987). Physiologic variables that have been studied include autonomic responses to pain (e.g., blood pressure, heart rate, respiratory rate, and peripheral temperature (Beck, 1991; Curtis, 1986; Guzzetta, 1989; Lavine, Buchsbaum, & Poncy, 1976; Locsin, 1981; Melzack et al., 1963; Updike & Charles, 1987).

Music is not always useful to patients when it comes to helping their subjective and physiologic indicators. The subject who requested that Peter Gabriel's rock tune *All That You Can't Leave Behind* be changed due to its referent nature to bad memories for the subject is a case in point. The fact that this music selection did not help the patient, this conception suggests the importance of philosophical ideology on emotion and meaning in music as debated by recent scholars. To indicate his construction of emotion and meaning in music, Meyer (1956) defined and contrasted classic positions in philosophical aesthetics and proposed what he called the *referentialist's approach*. By this he meant that emotions and meaning in music are associated with extramusical world of concepts such as actions, emotional states, and character (Meyer, 1956). From this account occluding Meyer's philosophical standpoint, not all studies have established a positive relationship between anxiety and pain reduction and the use of music listening (Beck, 1991; Curtis, 1986; Zimmerman et al., 1988). These inconsistent results regarding the therapeutic benefits of music on pain and anxiety reduction led the researcher to undertake this study. The five research hypotheses within this study were:

1. Bone marrow transplant patients have lower levels of self-reported pain as compared to the baseline measurements while listening to preferred music.

2. Bone marrow transplant patients have lower levels of state anxiety levels as compared to the baseline measurements while listening to preferred music.
3. Bone marrow transplant patients have lower systolic blood pressure (SBP) as compared to the baseline measurements while listening to preferred music.
4. Bone marrow transplant patients have lower heart rate (HR) as compared to the baseline measurements while listening to preferred music.
5. Bone marrow transplant patients have lower levels of respiratory rate (RR) as compared to the baseline measurements while listening to preferred music.

The results of this study supported these five hypotheses. By analyzing the data from the STAI questionnaire, it appeared that the State-Trait Anxiety levels of the subjects were significantly different (analysis of the mean difference made using the t-test). These results are consistent with those of several scholars (Beck, 1991; Curtis, 1986; Davis-Rollans & Cunningham, 1987; Gardner & Licklider, 1959; Guzzetta, 1989; Lavine et al., 1976; Locsin, 1981; Melzack et al. 1963; Updike & Charles, 1987) who also found significant reduction in pain intensity and anxiety levels after the use of music. As in the present study, these researchers compared baseline measurements with trial measurements. However, differences in population samples, length of time using the music interventions, and differences in outcome variables studied (e.g., use of control groups) make comparisons somewhat difficult.

Because the BMT patients in this study received pharmacologic treatment for pain and anxiety, comparisons with studies by Beck (1991) and Zimmerman et al., (1988) are more appropriate. These researchers studied pain intensity levels in cancer patients using VAS pain scales before and after the use of music. Their conclusions supported music listening as an effective pain-intensity reducing intervention.

Overall, the present study showed a significant reduction in pain intensity after music intervention (see Table 4-4). This result is consistent with reports by Bolwerk (1990), Guzzetta (1989), and Zimmerman et al. (1988). The results of this study are also consistent with a study on the effect of music on anxiety among cardiac patients (Bolwerk, 1990) which demonstrated that music listening significantly lowered anxiety levels within the music group when compared to a control group.

Hypothesis 1

The results of this study supported Hypothesis 1: Following music listening sessions, BMT patients would have a greater decrease in self-reported pain and anxiety compared to the baseline levels. The level of self-reported pain decreased significantly during Time 2 and Time 3.

Each one of the subjects gave a self-report that music decreased his pain. Moreover, 75% of those who listened to music during the intervention said it distracted them from their pain. In addition, One hundred percent of the patients said the music was a pleasant experience.

This study, like that of Melzack et al. (1963) demonstrates that pain levels may be decreased by music listening. These results of the study are also consistent with Updike (1990), who found that patients with various diagnoses in an ICU had a decrease in pain perception after listening to anxiolytic and sedative music.

The inference can be made from this research and previous studies is that music listening affects a significant decrease in self-reported pain among the sample population studied. When given an opportunity to express additional feelings about the music listening sessions, subjects in this research and in Locsin's (1981) research stated that music helped to distract them from their pain. Therefore following music listening, BMT

patients have a greater decrease in self-reported pain compared to the baseline reported pain.

Hypothesis 2

Results of the study also supported Hypothesis 2: Following music listening, BMT patients would have a greater decrease in anxiety compared to baseline anxiety reading. The results of this study suggest that music listening significantly diminished the State portion of the anxiety, especially between baseline and 45 minutes post- intervention (see Table 4-6. In contrast, an increase in anxiety occurred between Session 1 and Session 2 (see Table 4-5). The reasons for this increase may point to psychological just as much as physiological phenomena since scholars have observed that when transplant nears, anxiety and worries usually increase leading to problems with sleep, irritability or low mood (Bottomly, 1998; Cleeland et al., 1994). The results of this study, however, were consistent with the findings of other researchers who have reported a significant decrease in patients' anxiety (Hanser & Thompson, 1994). Similarly, subjects in the ICU had a significant decrease in state portion of anxiety after listening to music (Rohner & Miller, 1980).

The results of this research are also consistent with that done in school environments where it was found that music had a decrease in test taking anxiety among undergraduate nursing students (Summers et al., 1990). The results of this research like that of Summers et al., (1990) supported Hypothesis 2 that Bone marrow transplant patients have lower levels of state anxiety levels as compared to the baseline measurements while listening to preferred music.

Hypothesis 3

Results of the study also supported Hypothesis 3: Bone marrow transplant patients have lower systolic blood pressure (SBP) as compared to the baseline measurements while listening to preferred music. Following music sessions, BMT patients had a significant decrease in blood pressure compared to the baseline blood pressure. The results of this study suggest that music listening had a significant influence on systolic blood pressure between Session 2 and Session 5 (see Table 4-8). In contrast, there was no decrease in systolic blood pressure in between Session 2 and Session 3 (see Table 4-8). Unexpectedly, a significant increase in systolic blood pressure occurred between Session 1 and Session 2 (see Table 4-7). This can be attributed to the fact that the measures were taken in the morning when the cortisol levels are normally high as compared to the evening (Mores, Martire, Pistritto, Volpe, Menini, Folli et al., 1994). Blood pressure is a physiological indicator of anxiety and therefore when anxiety increases, the blood pressure may also increase (Bailey, 1983; Beck, 1991; Cook, 1986; Zimmerman, Pozehl, Duncan, & Schmitz, 1989).

Results of this study were consistent with the findings of Zimmerman et al., (1988) whose studies reported a significant decrease in systolic blood pressure following music listening compared to baseline measurements of systolic blood pressure. This study is also consistent with that of Updike (1990) who also found a significant decrease in systolic blood pressure of patients after listening to music of their choice. Consequently, this research and other studies support Hypothesis 3 that music listening may have a decrease in systolic blood pressure among a sample population.

Hypothesis 4

Results of the study supported Hypothesis 4: Following music listening, BMT patients would have a greater decrease in heart rate compared to their baseline heart rate indices. Even though heart rate did not change significantly between Session 1 and Session 2 (see Table 4-10), there was a consistent decrease in heart rate in the subsequent sessions as compared to baseline (see Tables 4-16 and 4-17). These data supported the results of other researchers (Zimmerman et al., 1988; Summers et al., 1990) whose research found that patients listening to music with slow *tempos* of between 60 and 70 beats per minute had a significant decrease in heart rate.

There is no linear relationship between music listening and the reduction in pain and anxiety indices as observed in the study. The reason for this is that results of this and other earlier studies are inconclusive. The absence of isomorphic or linear causal relationship between music listening and heart rate suggest the need for more controls. Perhaps increasing the frequency of music listening sessions may have resulted in a significant decrease in heart rate. It should be noted at this point that the researcher attempted to control for the effect of medications that affect self-reported pain, blood pressure, and heart rate. Since this was a sample of convenience and hence, randomization of patients was not employed thereby decreasing the probability that patients received an even distribution of medications. Therefore there is likelihood that distribution of medication might have influenced the dependent variables. Although the researcher took into consideration the peak time of medication administered on patients and gave music intervention after peak drug effects, additional research with more rigorous control for the effects of medications is needed.

Hypothesis 5

Results of the study also supported Hypothesis 5: Following music listening, BMT patients would have a greater decrease in respiratory rate (RR) compared to baseline respiratory rate. The results of this study suggest that music listening had a significant influence on respiratory rate, especially between baseline (T2) and 15 minutes (T3) following music intervention (see Table 4-12). In contrast, an increase in RR occurred between Session 1 and Session 2 (see Table 4-11). A plausible explanation for this is perhaps that high RR is a physiological indicator of high anxiety and hence when anxiety reduces, the RR also reduces (Anderson, Coyle, & Haythornwaite, 1992).

Issues

The significant decrease in noise annoyance during the three music intervention periods compared to baseline was expected. Music eliminates noise annoyance. No previous research had evaluated the effect of music intervention on noise annoyance in the BMT patient population. However, the previous success of music intervention in the reduction of pain and anxiety has been reported in the research of several scholars (Bolwerk, 1990; Moss, 1988; Standley, 1986; Whipple & Glynn, 1992; White, 1992). The research suggested that the music intervention could serve as a positive coping resource for the subjects such as the ones in this study. Thus, music intervention may decrease the subject's pain and anxiety when the intervention is in tandem with the cognition of environmental noise annoyance.

Heart rate and blood pressure variables demonstrated a downward trend from baseline levels during music intervention periods. Even though these findings had been anticipated, the decrease in HR and SBP during the music intervention most likely reflects decreased stimulation of the sympathetic central nervous system (CNS). This

decrease is secondary to observable decrease in pain and anxiety during the music intervention. This observation therefore supports the conceptual framework of this study.

The results of the study generally showed that a reduction in pain and anxiety, including some measures of the physiologic variables, such as systolic blood pressure, heart rate, and respiratory rate, were statistically significant during the music intervention periods compared to baseline levels. However, the amount of decrease was too small to neither alter clinical management of the subjects' pain and anxiety nor substitute for medication. However, it is noteworthy that during 15 data collection periods (55% of the time), subjects fell asleep during the music intervention, whereas no subjects fell asleep during the baseline data collection periods. So even though clinical management of the subjects was not altered by the significant decreases in HR and some BP variables, the subjects experienced less pain and anxiety and became psychologically more relaxed. This was evidenced by the subjects falling asleep during the music intervention. When cancer patients experience pain and anxiety, they usually have difficulties sleeping (Engstrom, Strohl, Rose & Stefanek, 1999).

Another possibility is that in this sample the STAI may not be a valid measure of a subject's anxiety. Theoretically, the STAI assesses a person's anxiety at that very moment (Spielberger, 1976). However, historically the STAI is a psychometrically a reliable instrument for assessment of state anxiety (Spielberger, 1976). Since pain has been regarded as radically solipsistic and inherently subjective (Kaufman-Osborn, 2002) and culturally determined (Bates, Rankin-Hill, & Sanchez-Ayendez, 1997), render the VAS scale simply inexplicable. Tacitly acknowledging the subjectivism of pain assessment, Kaufman-Osborn observed:

Because pain can neither be identified with nor located neatly within any determinate embodied site, it would seem to follow that it must be something that resides in the ethereal and invisible domain of consciousness. Precisely because it is so located, anyone's claim to be in pain is strictly speaking, incorrigible in the sense that it cannot meaningfully be denied by another. (p. 139)

Additional use of other scales such as the McGill Pain Questionnaire and Unmet Analgesic Needs Questionnaire (Zhukovsky, Gorowski, Hausdorff, Napolitano & Lesser, 1995) would therefore provide more validity to the measurements of pain. Turk and Melzack (1992) observed:

A number of cultural, economic, social, demographic, and environmental factors, along with the individual's personal history, situational factors, interpretation of the symptoms and resources, current psychological state, as well as physical pathology, all contribute to the response to the question 'How does it hurt?' (p. xi)

In this study, most subjects, regardless of pain levels, agreed or strongly agreed, as indicated on the follow-up questionnaire, that they enjoyed the music intervention, that it was relaxing, that they would have liked to listen to the music longer and more often. Themes about the music intervention, which were identified by subjects during open-ended questioning, indicated that music listening was enjoyable, relaxing, and that it should be used with all patients.

In this study, reports on relaxation following music intervention are similar to those found by previous researchers (Bolwerk, 1990; Elliot, 1994, White, 1992, Zimmerman et al., 1988). These researchers' findings also demonstrated a trend toward decreased anxiety following listening to music through headphones in coronary care unit patients.

Subjects also reported an improvement in their mood and attitude following the periods of music intervention. Although not measured objectively, these findings are similar to those noted in previous research. Barnason et al. (1995) documented an improvement in mood.

Based on the findings of this study, the researcher supports offering patients a choice of musical selections when administering music intervention. The impact of the subject's personality traits was not considered in this research. It has been observed that multiple personal and environmental factors have an impact on anxiety (Shuldham, Cunningham, Hiscock, & Luscombe, 1995). This impact can influence patients' musical preferences.

Implications for Future Research

The results from this study have implications for nursing research as well as education. Each implication will be discussed in this section. Music demonstrated a significant reduction in pain intensity. The difference between baseline and post-timed post-test sessions of pain intensity scores was significantly different. Results were supportive of the use of music as a distraction, but generalizability was not obtained.

A need therefore exists for continued research to determine whether or not music listening is more effective in pain and anxiety management for clients who are receiving a BMT. Since the researcher did not control for the previous pain and anxiety experiences with the use of music as a distraction strategy on pain, perhaps the past experience influenced the reduction of VAS scores found within the subjects. Future studies, which are related to the use of music listening as a distraction, should minimally include this information on all subjects since pain perception can be altered by these past experiences (Iadarola & Caudle, 1997).

Implications for Future Clinical Practice

This research, along with previous research, suggests that music listening can be used effectively as a modality for intervention due to its potential benefits to pain perception and anxiety management for both bone marrow transplant clients as well as

school students. This intervention is generally low in cost and is readily available to clients. Any care giver or educator, with some form of training in the use of music listening to alleviate symptoms of pain and anxiety, could offer this alternative pain and anxiety intervention. Clients should be encouraged to use music listening in a place where other pain and anxiety mitigating methods are likely to be minimal. In hospitals, offering music intervention as a coping resource significantly decreased pain, anxiety, and physiological variables, such as blood pressure, heart rate, and respiratory rates. Follow-up questionnaire data supported the efficacy of the music intervention in this sample of bone marrow transplant patients.

Implications for Music Education

The hypotheses that music listening is effective in reducing anxiety was supported by this research. The use of self-selected music listening is therefore suggested as an additional anxiety-relieving measure for children in schools. This research shows that music can play a major role in helping students lower their anxieties.

If anxiety is relieved, physical problems such as headaches resulting from anxiety will be relieved. Ultimately, the students will be more comfortable and they may have less fear and stress. Also, a wide range of emotional, stress-related problems, such as teenage suicide, teenage pregnancies, delinquency, violence in school, physical and sexual abuse of children, and drug trafficking among youth, may be alleviated (Zill, 1993). Music can help these students (Giles, 1996). Crimes committed by children, even murder, which are all linked to anxiety may be reduced by music listening (Giles, 1996).

Strategies should be implemented in the schools to enable students to cope with their anxieties through music listening. Students' self-selected music should be used, but care must be taken to help students select music that does not have inappropriate lyrics.

In fact, it is recommended that selected music should be without any lyrics (Browning, 2000; Spintge, 1989). Selecting a piece of music for its emotional affects, in order to promote emotionally healthy students, represents a new direction in using music to promote health in schools. If this new dimension is added to the curriculum, students will be involved in music activities that can ultimately reduce their stress levels and anxieties and replace them with new self-esteem (Giles, 1996).

Chronic pain is prevalent among people and K-12 students are not exempt. The results of this research show that patients respond well to music intervention on pharmacological pain regimen. Therefore, school children may also benefit from listening to music to help control their chronic pain. When chronic pain is controlled, the quality of life is also improved and this improvement may lead to a better academic achievement for students. Anxiety is also prevalent among students. Music plays a major role in helping students lower their anxieties. Stress-related problems such as teenage suicide, teenage pregnancies, delinquency, violence in school, physical and sexual abuse of children which come mostly as a result of server anxiety, may be reduced using music as modality for intervention.

Implications for Theory

A limitation of this study is that changes in HR and BP in this sample of 15 BMT patients may have been due to factors other than music listening. The administration of medications, pain, fever, or anxiety may have caused physiologic changes. This effect was minimized in the research design by the fact that subjects served as their own control.

Several potential threats occurred to the external validity of the findings in this study sample. Because of their involvement in the study, subjects may have experienced

a Hawthorne effect, which altered their responses. The Hawthorne effect--a scientific presumption that evolved in the 1920s referred to behavior during the course of an experiment that could possibly be altered due to the subject's awareness of participating in the experiment (Jones, 1992). Also, the subjects were asked about their levels of pain, which might have heightened their pain perception. Additionally, the subjects may have answered the follow-up questionnaire in the manner they believed the researcher wanted, resulting in a social desirability bias. Generalizability of the findings is also limited since the study was done in one unit with a homogenous sample in terms of diagnosis and BMT transplantation. The current sample included only six women so generalizability to women is also limited. The music preferences questionnaire had content validity, and one item was able to be tested for construct validity. However, reliability of the tool was not assessed. This questionnaire assessed different constructs, and therefore tests for internal consistency were inappropriate. Testing-retesting was also not possible because subjects' musical preferences in the critical care unit experience may change over a period of time. Therefore, use of this questionnaire may have resulted in measurement error.

Limitations

One of the problems of the study was the length of time that participants were exposed to music. The participants listened to music only for a short period of time. In this experiment, the participants were exposed to music for exactly 30 minutes. In much of the past research, however, participants were exposed to the music for longer periods of time (Hammer, 1996), and in some cases an entire day (Brennan & Charnetski, 2000; McCraty). The only reason for exposing the participants to music for only a short period of time in this study was to increase the external validity of the study. Patients in the BMT Unit often cannot listen to music all day due to limited personnel and an intricate

environment that does not allow for additional equipment in the room. With proper planning, however, they can be given music for short intervals of time during their stay in the hospital.

Another problem posed in this study was the use of the STAI. Some of the past research used more objective measurements, such as salivary recordings and nervous system activity (Brennan & Charnetski, 2000). Because the participants were administered the state portion of the STAI, several times, within a short period of time, their answers might have been influenced by their previous answers. The study results included some significant relationships between the sexes and how their anxieties fluctuate with music practice. The participants were exposed to music only for a short time, therefore the results could indicate that participants must be subjected to music for a much longer time in order for music to significantly affect their levels of pain and anxiety.

Also, music therapy was not incorporated into this study. Music therapy, such as the guided imagery used in Hammer's (1996) experiment or the positively induced emotional state used by McCraty et al. (1998), compels the participant to become actively involved in reducing his stress levels while actually playing music (Hammer, 1996). This study could have implications for people who passively practice specific types of music intended to relieve stress for short periods of time. They may think that they are lowering their stress levels. Bone marrow transplant patients may need to listen to music throughout the day and incorporate some type of music therapy, such as guided imagery, into their music experience. They may gain the maximum potential of the possible benefits of music listening. Since music was practiced only for a short period of time, the

relationship between music listening, pain, and anxiety would have to be strong for the results to be significant. A relationship could exist, but it might be too weak to be demonstrated in this study.

For future studies, researchers should expose BMT patients to music listening for a longer period of time so that the music could have a greater effect. Also, physiological measures, such as skin temperature, EEG, and neurohormone levels, should preferably be used if possible. These methods are more expensive, but they provide more objective and reliable data.

Studies have suggested that the use of music as a distraction therapy may effectively reduce pain (Beck, 1991; Curtis, 1986; Landreth & Landreth, 1974; Munro & Mount, 1978). Future researchers may want to investigate the relationship between music therapy and other pain-related variables. For example, variables of interest may include pain patterns, coping styles, and comparable dosages of pain medications.

Finally, the use of music listening, as an intervention for pain and anxiety reduction, may be more effective when used in an environment with more diverse subjects in terms of race, gender, age, educational level, and socioeconomic status. At the very least, future investigators should take every precautionary measure to control for all other confounding variables and other distractions during data collection periods. Perhaps conducting the study in a home environment or a hospice setting would offer more control over extraneous environmental variables.

Sample

During data analysis, a larger sample size would allow further stratification of subjects according to age, gender, educational level, and history of pain and anxiety in the patients' demographics. Significant differences in dependent physiologic variables

might be seen between subjects with high, medium, or low scores, compared to subjects with scores above or below the mean, as used in the current study.

A larger sample would also permit a study that evaluates the impact of prior formal music education on responses to a planned music intervention. In schools, music majors tend to listen more vigilantly to music than biology majors (Vanderark & Ely, 1992). Subjects with prior music education may exhibit a different response to a music intervention than subjects without music training. Since musical education was not taken into account in this study, future research should include this fundamental variable.

A more diverse sample of subjects, including different diagnoses, level of consciousness, and physical location of the study would increase the generalizability of the research findings to a broader patient population. Music intervention might prove to be even more effective during very stressful moments for both students and patients, which would further examine this study's conceptual framework by testing Melzack's Gate Control Theory (Melzack & Wall, 1970). In addition, a larger sample would allow for further investigation of the findings according to the subject's age.

Based on the fact that all subjects requested a choice of music, it is important to investigate whether or not self-selected music would have similar or more beneficial results, as compared to music that the researchers provide while disregarding patients' preferences. Future studies should look specifically at which of the variables, such as pain, anxiety, or vital signs, such as blood pressure, heart rate and respiratory rate, might be affected, as compared to the baseline measures.

Conclusions

This chapter discussed the findings of this study investigating the relationships between music listening, pain intensity, anxiety levels, blood pressure, heart rate, and

respiratory rate in a sample of 15 BMT patients. Conclusions and potential study limitations were presented. Recommendations for research, practice, and education were offered.

This study was done for the purpose of furthering the study of music listening as a modality for intervention for pain and anxiety. The results were supportive of five research hypotheses, and hence suggest a positive relationship between the use of music and pain reduction and anxiety among patients undergoing BMT. This research has demonstrated effectiveness in reducing pain and decreasing anxiety. In addition, music has been used as a process to distract persons from unpleasant sensations and empower them with the ability to heal from within. As nurses develop practice patterns that are evidence based, the use of music listening could become an integral nursing intervention (McCaffrey & Locsin, 2002). More research needs to be conducted in the area of music styles and their effect on different behavioral conditions, such as hyperactivity, aggression, or withdrawal--individual differences notwithstanding (Giles, 1999).

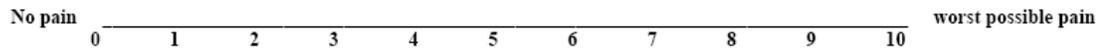
From this research, it seems prudent for health care professionals to understand general pain theory in order to adequately assess, diagnose, and treat clients who experience much pain and anxiety. The study also highlights the need for the appropriate use of distraction therapy, including music listening. The study proposes that music listening be taught as an adjunctive pain management option. Music education programs should also offer current information concerning non-pharmacological anxiety management methods for schoolchildren.

As a healing component, music is perceived as a positive addition to the school curriculum (Giles, 1990; Sahr, 2000). Music as healing agent has already been perceived

by school administrators and music educators as an effective addition for students' total educational experience (Beczka, 1997). Most schools suffer from financial constraints and as such, their priorities are highly compromised. In many school districts in the United States, music has often been the first subject to be eliminated or cut back when school districts faced financial constraints (Carlton & Weikart, 1994). It is unfortunate that most schools cannot support music and healing programs even though research shows that schools which infused music therapy in their curriculum have not only produced higher student grades but more positive teacher assessments of students as well (Amaral, 1991; Lathrop & Boyle, 1972). The use of music for healing in the school curriculum is now being acknowledged as essential in helping students achieve better scores (Carlton & Weikart, 1994; Giles, 1990). Anxieties such as those caused by math have been healed with music. In a study by Madsen and Forsythe (1973), higher math scores were obtained by groups of students who listened to a contingent of anxiolytic music. In this study, students could earn time to listen to soothing music to heal anxiety leading them to provide correct responses to math problems. North, Hargreaves, and O'Neill (2000) conclude that music is important because it allows adolescents' emotions to be pacified. Music teachers need to be cognizant of this fact and do all they can to integrate music and healing in the school curriculum.

APPENDIX B
VISUAL ANALOGUE SCALE (VAS)

1 – What is your pain RIGHT NOW?



APPENDIX C
STATE TRAIT ANXIETY INVENTORY (STAI)

State Trait Anxiety Form Y-1 (State Form)



DIRECTIONS:

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you feel *right now*, that is, *at this moment*. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

VERY MUCH SO
MODERATELY SO
SOMEWHAT
NOT AT ALL

- | | | | | |
|--|---|---|---|---|
| 1. I feel calm | 1 | 2 | 3 | 4 |
| 2. I feel secure | 1 | 2 | 3 | 4 |
| 3. I am tense..... | 1 | 2 | 3 | 4 |
| 4. I feel strained | 1 | 2 | 3 | 4 |
| 5. I feel at ease..... | 1 | 2 | 3 | 4 |
| 6. I feel upset..... | 1 | 2 | 3 | 4 |
| 7. I am presently worrying over possible misfortunes | 1 | 2 | 3 | 4 |
| 8. I feel satisfied..... | 1 | 2 | 3 | 4 |
| 9. I feel frightened..... | 1 | 2 | 3 | 4 |
| 10. I feel comfortable..... | 1 | 2 | 3 | 4 |
| 11. I feel self-confident | 1 | 2 | 3 | 4 |
| 12. I feel nervous | 1 | 2 | 3 | 4 |
| 13. I am jittery | 1 | 2 | 3 | 4 |
| 14. I feel indecisive..... | 1 | 2 | 3 | 4 |
| 15. I am relaxed..... | 1 | 2 | 3 | 4 |
| 16. I feel content..... | 1 | 2 | 3 | 4 |
| 17. I am worried..... | 1 | 2 | 3 | 4 |
| 18. I feel confused | 1 | 2 | 3 | 4 |
| 19. I feel steady..... | 1 | 2 | 3 | 4 |
| 20. I feel pleasant | 1 | 2 | 3 | 4 |

APPENDIX D
DATA COLLECTION SHEET

	T1 _____ — 24 hours pre- intervention (-24 h)	T2 _____ — Immediately before the intervention (0)	T3 _____ — Mid- intervention 15 min. (+15 min.)	T4 _____ At the end of the intervention (+30 min.)	T5 _____ — After the intervention (+45 min.)
VAS					
STAI					
BP					
HR					
RR					

APPENDIX E
MODIFIED HARTSOCK MUSIC PREFERENCE QUESTIONNAIRE

The following questions are concerned with music likes. All information will be kept confidential. There are no right or wrong answers.

1. The following is a list of different types of music. Please indicate your three (3) most favorite types of music with 1 being the most favorite choice.
 Baroque
 Country and Western
 Classical
 Gospel/Religious
 Rock/Disco
 Movie Soundtracks
 Romantic
 Jazz/Blues
 Other

Please put a check (✓) beside your choice in the following questions.

2. What form does your favorite music take?
Vocal
Nonvocal
Both
Other (e.g., nature sounds)
3. What type of music makes you feel the most happy?
Country and Western
Classical
Spiritual/Religious/Gospel
Rock/Disco
Blues/Jazz/Folk Movie soundtracks. Other None
4. Is there any particular artist/performer you enjoy listening to most?
5. What type of music makes you feel the most sad?
Country and Western
Classical
Spiritual/Religious/Gospel
Rock/Disco
Blues/Jazz/Folk
Movie soundtracks
Other
None
6. Before your hospitalization, how important a role did music play in your life?
 1. Very important
 2. Moderately important
 3. Slightly important
 4. Not important

APPENDIX F
MUSICAL SELECTIONS

Baroque Music

Johann Sebastian Bach (1685-1750)

French Suite No. 4 in E Flat Major BWV815 Allemande

Antonio Vivaldi (1678-1741)

The Four Seasons, RV.269, 315, 293, 297, Op.8, Nos.1-4

No.1. La Primavera (Spring) in E, RV.269, Op.8, No.1

1.Allegro; 2.Largo; 3.Allegro

Violin Concerto in D, RV.208a, Op.7, No.11

Classical Music

Ludwig Van Beethoven (1770-1827)

Symphony No. 5: Allegro con brio

Für Elise

Violin Romance No. 2

Moonlight Sonata: Adagio sostenuto

Minuet

Symphony No. 8 in F major: Allegretto scherzando

Coriolan" Overture

Piano Concerto No. 2: Adagio

Symphony No. 5 in C minor: Allegro

Egmont": Overture

Sonata No. 14 Op. 27 No. 2 in C Sharp Minor

Franz Schubert (1797-1828)

Impromptu Op. 90 No. 3 in G Flat Major D. 899

Impromptu Op. 90 No. 4 in A Flat Major D. 935

Frederic Chopin (1810-1849)

3 Nocturnes, Op.9
 Nocturne in Bb-, Op.9, No.1
 Nocturne in Eb, Op.9, No.2
 Nocturne in B, Op.9, No.3
 Piano Sonata No.3 in B Op.58

Robert Schumann (1800-1856)

Kinderszenen Scenes from Childhood Op. 15
 Von Fremden Landern Und Menschen (From Foreign Lands & People)
 Traumerei (Dreaming)
 Der Dichter Spricht (The Poet Speaks)
 Intermezzo Op. 118, No. 2 in A Major
 E'tude Op. 10 No. 6 in E Flat Minor
 Nocturne Op. 72, No. 1 in E Minor 'Posthumous'
 Consolation No. 3 in D Flat Major

Claude Debussy (1862-1918)

ClairDeLune (From Suite Bergamsque)

Pop

I Can Only Imagine by Mercy Me
 You Raise Me Up by Stacie Orrico
 Adore by Jaci Velasquez
 Flood by Jars Clay
 Never Give Up by Yolanda Adams

Jazz

Duke's Place (Ellington/Katz/Roberts/Thiele) - 5:03
 I'm Just a Lucky So and So (David/Ellington) - 3:09
 Cottontail (Ellington) - 3:42
 Mood Indigo (Bigard/Ellington/Mills) - 3:57
 Do Nothin' Till You Hear from Me (Ellington/Russell) - 2:38
 Beautiful American (Ellington) - 3:08
 Black and Tan Fantasy (Ellington/Miley) - 3:59
 Drop Me off in Harlem (Ellington/Ellington) - 3:49
 Mooche (Ellington/Mills) - 3:38
 In a Mellow Tone (Ellington) - 3:48
 It Don't Mean a Thing (If It Ain't Got... (Ellington/Mills) - 3:58
 Solitude (DeLange/Ellington/Mills) - 4:55
 Don't Get Around Much Anymore (Ellington/Russell) - 3:31
 I'm Beginning to See the Light (Ellington/George/Hodges/James) - 3:37
 Just Squeeze Me (Ellington/Gaines) - 3:58
 I Got It Bad (And That Ain't Good) (Ellington/Webster) - 5:31
 Azalea (Ellington) - 5:02

Artist: Kenny G

Summertime
 The Look of Love
 What a Wonderful World
 Desafinado
 In a Sentimental Mood
 The Girl from Ipanema
 Stranger on The Shore
 Body and Soul
 Round Midnight
 Over the Rainbow

Country Western

American Soldier by Toby Keith
 In My Daughter's Eyes by Martina McBride
 Sweet Southern Comfort by Buddy Jewell
 Perfect by Sarah Evans
 I Wish by Jo De Messina
 Remember When by Alan Jackson
 Drinkn' Bone by Tracy Byrd
 Little Moments by Brad Preistley
 Texas Plates by Kellie Coffey
 Simple Life by Carolyn Dawn Johnson
 Paint Me a Birmingham by Tracy Lawrence
 Watch the Wind Blow by Tim McGraw
 Songs about Rain by Gary Allan
 My Last Name by Dierks Bentley
 I Can't Sleep by Clay Walker

Artist: Johnny Cash

1. Walk the Line
2. I Still Miss Someone
3. The Legend of John Henry's Hammer
4. Don't Take Your Guns to Town
5. In the Jailhouse Now
6. Ring of Fire
7. Understand Your Man
8. The Ballad of Ira Hayes
9. Folsom Prison Blues
10. Daddy Sang Bass
11. A Boy Named Sue
12. Sunday Morning Coming Down
13. Flesh and Blood
14. Man in Black
15. One Piece at a Time
16. (Ghost) Riders in the Sky

Artist: Faith Hill

Someone Else's Dream
 Let's Go to Vegas
 It Matters to Me
 Bed of Roses
 A Man's Home Is His Castle
 You Can't Lose Me
 I Can't Do That Anymore
 A Room in My Heart
 You Will Be Mine
 Keep Walkin' On

Artist: Toby Keith

How Do You Like Me Now?!
 Country Comes to Town
 You Shouldn't Kiss Me Like This
 I'm Just Talkin' about Tonight
 I Wanna Talk about Me
 My List
 Courtesy of the Red, White and Blue (The Angry American)
 Who's Your Daddy?
 Beer for My Horses
 Stays in Mexico
 Mockingbird
 You Ain't Much Fun (Live)
 Should've Been a Cowboy (Live)

Show Tunes/Soundtracks**Disney World Movie Music**

The Beauty and the Beast
 Original Motion Picture Soundtrack
 Prologue
 Belle 3) Belle (Reprise)
 Gaston 5) Gaston (Reprise)
 Be Our Guest
 Something There
 The Mob Song
 Beauty and the Beast
 To the Fair
 West Wing
 The Beast Lets Belle Go 13) Battle on the Tower
 Transformation 15) Beauty and the Beast (Duet)

Hank Williams

Hey Good Lookin'
 Jambalaya on the Bayou
 Move It on Over
 Long Gone Lonesome Blues
 Honky Tonk Blues
 Why Don't You Love me
 Honky Tonkin'
 Lost Highway
 Lonesome whistle
 I Saw the Light
 Lovesick Blues

Rock 'n' Roll**Aerosmith**

Train Kept a Rollin'
 Kings and Queens
 Sweet Emotion
 Dream On
 Mama Kin
 Three Mile Smile/Reefer Head Woman
 Lord of the Thighs

Artist: U2

All That You Can't Leave Behind
 Zooropa
 Achtung Baby
 Rattle and Hum

Hip Hop**Artist: Bun B**

Inauguration, The
 Get Throwed - (featuring Z-Ro/Pimp C/Young Jeezy/Jay-Z)
 I'm Fresh - (featuring Mannie Fresh)
 Pushin - (with Scarface)
 What I Represent (UGK)
 Hold U Down - (featuring Trey Songz/Mike Jones/Baby)
 Git It - (with Ying Yang Twins)
 Retaliation Is a Must - (with Mddl Fngz)
 Late Night Creepin' - (with Skinhead Rob)
 Bun
 Draped Up - (with Lil' KeKe)
 Trill Recognize Trill - (with Ludacris)
 I'm Ballin' - (featuring Jazzy Pha)
 The Story
 I'm a "G" - (featuring T.I.)

Story, The
 Draped Up (H-Town Mix) - (featuring The H-Town All Starz)

Will Smith

Girls Ain't Nothing But Trouble (1988 Extended Remix) (w/DJ Jazzy Jeff)
 Parents Just Don't Understand (w/DJ Jazzy Jeff)
 A Nightmare on My Street (w/DJ Jazzy Jeff)
 The Fresh Prince of Bel Air (w/DJ Jazzy Jeff)
 Summertime (w/ DJ Jazzy Jeff)
 Just Cruisin' (w/ DJ Jazzy Jeff)
 1,000 Kisses Radio (feat. Jada)
 Men in Black
 Gettin' Jiggy Wit It
 Miami
 Freakin' It
 Will 2K (feat. K-Ci)
 Wild Wild West (feat. Dru Hill & Kool Mo Dee)
 Nod Ya Head (The Remix)

Funk

Lionel Richie

Hello
 Running with the Night
 Penny Lover
 Easy
 Dancing on the Ceiling
 Stuck on You
 Brick House
 Three Times a Lady
 All Night Long
 Say You, Say Me
 Angel
 Still
 Goodbye

APPENDIX G
CONSENT FORM

IRB# 482-2005

*Informed Consent to Participate in Research
and Authorization for Collection, Use, and
Disclosure of Protected Health Information*

University of Florida
Health Center
Institutional Review Board
APPROVED FOR USE

9/2/06
TDL

If you are a parent, as you read the information in this Consent Form, you should put yourself in your child's place to decide whether or not to allow your child to take part in this study. Therefore, for the rest of the form, the word "you" refers to your child.

If you are a child, adolescent, or adult reading this form, the word "you" refers to you.

You are being asked to take part in a research study. This form provides you with information about the study and seeks your authorization for the collection, use and disclosure of your protected health information necessary for the study. The Principal Investigator (the person in charge of this research) or a representative of the Principal Investigator will also describe this study to you and answer all of your questions. Your participation is entirely voluntary. Before you decide whether or not to take part, read the information below and ask questions about anything you do not understand. If you choose

not to participate in this study you will not be penalized or lose any benefits to which you would otherwise be entitled.

1. Name of Participant ("Study Subject")

2. Title of Research Study

Effectiveness of Listening to Music as an Intervention on Pain and Anxiety in Bone Marrow Transplant Patients.



3. Principal Investigator and Telephone Number(s)

David Otieno Akombo (352) 392-0223 ext. 306

Co-Principal Investigator

John Graham-Pole (352) 392-5633

4. Source of Funding or Other Material Support

University of Florida

5. What is the purpose of this research study?

To assess the effects of recorded music on pain and anxiety levels in bone marrow transplant patients.

6. What will be done if you take part in this research study?

You are being asked to take part in this research study because you are greater than age 7 years. Those persons who are hospitalized for bone marrow transplant often exhibit some form of anxiety and pain during their hospitalization. The purpose of this study is to assess the effects of music on pain and anxiety levels in these patients. If you willing and able to participate in the study, we will spend 30 minutes with you playing a CD or

tape of your chosen music. We will ask you to complete a 20 -item questionnaire measuring your anxiety and a 100 mm scale to record your response before and after listening to the music.

You are being asked to take part in this research study because you are greater than age 7 years, and are an inpatient undergoing bone marrow transplant. Those persons who are hospitalized for bone marrow transplant often exhibit some form of anxiety and pain during their hospitalization. The purpose of this study is to assess the effects of music on pain and anxiety levels in these patients. If you are willing and able to participate in the study, we will record some background information about you and your diagnosis in our secure computer (password-protected) database. You will be given the opportunity to select your favorite music or type of music, and, a day or two later, we will spend 30 minutes with you playing a CD or tape of your chosen music. We will measure the effect of this procedure by having you fill out a 20 item questionnaire and marking a special scale before, during, and after the music is played, for a total of 6 times over 2 days.

Of the procedures outlined above, filling out the questionnaires and scales would be regarded as investigational or experimental.



If you have any questions now or at any time during the study, you may contact the Principal Investigator listed in #3 of this form.

7. If you choose to participate in this study, how long will you be expected to participate in the research?

You will only be asked to participate in this study on two days.

8. How many people are expected to participate in this research?

We expect 40 people to participate in the study.

9. What are the possible discomforts and risks?

We do not know of any discomforts or risks from this study. Throughout the study, the investigators will notify you of any information that may become available and that might affect your decision to remain in the study.

If you wish to discuss the information above or any discomforts you may experience, you may ask questions now or call the Principal Investigator or contact person listed on the front page of this form.

IOa. What are the possible benefits to you?

Possible benefits for study subjects participating are pain and anxiety reduction. By listening to their chosen music, we hope that the subjects will therefore find this a benefit to their well being. We hope you will enjoy the music and will continue listening to prerecorded music on tape and CDs that will be provided.

IOb. What are the possible benefits to others?

By participating in this study you will be helping us understand if music has any effect on pain and anxiety levels in hospitalized persons. This information will support the development of more extensive music programs to support patients in your situation and their caregivers, thus possibly improving the quality of life for these patients.

11. If you choose to take part in this research study, will it cost you anything?

No.

12. Will you receive compensation for taking part in this research study?

No.

13. What if you are injured because of the study?

If you experience an injury that is directly caused by this study, only professional medical care that you receive at the University of Florida Health Science Center will be provided without charge. However, hospital expenses will have to be paid by you or your insurance provider. No other compensation is offered. Please contact the Principal Investigator listed in Item 3 of this form if you experience an injury or have any questions about any discomforts that you experience while participating in this study.

**14. What other options or treatments are available if you do not want to be in this study?**

Patient may listen to the music that is provided to other patients on the unit.

15a. Can you withdraw from this research study?

You are free to withdraw your consent and to stop participating in this research study at any time. If you do withdraw your consent, there will be no penalty, and you will not lose any benefits you are entitled to.

If you decide to withdraw your consent to participate in this research study for any reason, you should contact David Otieno Akombo at (352) 392-0223 ext. 306 or Dr. John Graham-Pole at (352) 392-5633.

If you have any questions regarding your rights as a research subject, you may phone the Institutional Review Board (IRB) office at (352) 846-1494.

15b. If you withdraw, can information about you still be used and/or collected?

If you withdraw, we will not use any of the information about you in the study.

15c. Can the Principal Investigator withdraw you from this research study?

You may be withdrawn from the study without your consent for the following reasons:

- We reserve the right to exclude your data from the final analysis if more than 50% of your survey questionnaires are left blank.

16. If you agree to participate in this research study, the Principal Investigator will create, collect, and use private information about you and your health. Once this information is collected, how will it be kept secret (confidential) in order to protect your privacy?

Information collected about you and your health (called protected health information), will be stored in locked filing cabinets or in computers with security passwords. Only certain people have the legal right to review these research records, and they will protect the secrecy (confidentiality) of these records as much as the law allows. These people include the researchers for this study, certain University of Florida officials, the hospital or clinic (if any) involved in this research, and the Institutional Review Board (IRB; an IRB is a group of people who are responsible for looking after the rights and welfare of people taking part in research). Otherwise your research records will not be released without your permission unless required by law or a court order.

If you participate in this research study, the researchers will collect, use, and share your protected health information with others. Items 17 to 26 below describe how this information will be collected, used, and shared.



17. If you agree to participate in this research study, what protected health information about you may be collected, used and shared with others?

Your protected health information may be collected, used, and shared with others to determine if you can participate in the study, and then as part of your participation in the study. This information can be gathered from you or your past, current or future health records, from procedures such as physical examinations, x-rays, blood or urine tests or from other procedures or tests. This information will be created by receiving study treatments or participating in study procedures, or from your study visits and telephone calls. More specifically, the following information may be collected, used, and shared with others:

- Demographics (age, gender, race, place of birth and geographic location where they live)
- Current Diagnosis and medication currently being taken

If you agree to be in this research study, it is possible that some of the information collected might be copied into a "limited data set" to be used for other research purposes. If so, the limited data set may only include information that does not directly identify you. For example, the limited data set cannot include your name, address, telephone number, social security number, or any other photographs, numbers, codes, or so forth that link you to the information in the limited data set. If used, limited data sets have legal agreements to protect your identity and confidentiality and privacy.

18. For what study-related purposes will your protected health information be collected, used, and shared with others?



Your protected health information may be collected, used, and shared with others to make sure you can participate in the research, through your participation in the research, and to evaluate the results of the research study. More specifically, your protected health information may be collected, used, and shared with others for the following study-related purpose(s):

- to assess the effects of music on pain and anxiety levels in patients having a bone marrow transplant

19. Who will be allowed to collect, use, and share your protected health information?

Your protected health information may be collected, used, and shared with others by:

- the study Principal Investigators, David Otieno Akombo and Dr. John Graham-Pole
- the University of Florida Institutional Review Board
- Other professionals at the University of Florida

20. Once collected or used, who may your protected health information be shared with?

Your protected health information may be shared with:

- United States and foreign governmental agencies who are responsible for overseeing research, such as the Food and Drug Administration, the Department of Health and Human Services, and the Office of Human Research Protections
- Government agencies who are responsible for overseeing public health concerns such as the Centers for Disease Control and Federal, State and local health departments.

21. If you agree to participate in this research, how long will your protected health information be used and shared with others?

Forever. However, all information is combined and presented so that no single person can be identified.

22. Why are you being asked to allow the collection, use and sharing of your protected health information?

Under a new Federal Law, researchers cannot collect, use, or share with others any of your protected health information for research unless you allow them to by signing this consent and authorization.

23. Are you required to sign this consent and authorization and allow the researchers to collect, use and share with others your protected health information?



No, and your refusal to sign will not affect your treatment, payment, enrollment, or eligibility for any benefits outside this research study. *However, you cannot*

participate in this research unless you allow the collection, use and sharing of your protected health information by signing this consent/authorization.

24. Can you review or copy your protected health information that has been collected, used or shared with others under this authorization?

You have the right to review and copy your protected health information. However, you will not be allowed to do so until after the study is finished.

25. Is there a risk that your protected health information could be given to others beyond your authorization?

Yes. There is a risk that information received by authorized persons could be given to others beyond your authorization and not covered by the law.

26. Can you revoke (cancel) your authorization for collection, use and sharing with others of your protected health information?

Yes. You can revoke your authorization at any time before, during, or after your participation in the research. If you revoke, no new information will be collected about you. However, information that was already collected may still be used and shared with others if the researchers have relied on it to complete and protect the validity of the research. You can revoke your authorization by giving a written request with your signature on it to the Principal Investigator.

27. How will the researcher(s) benefit from your being in this study?

In general, presenting research results helps the career of a scientist. Therefore, the Principal Investigator may benefit if the results of this study are presented at scientific meetings or in scientific journals.



28. Signatures

As a representative of this study, I have explained to the participant the purpose, the procedures, the possible benefits, and the risks of this research study; the alternatives to being in the study; and how the participant's protected health information will be collected used and shared:

Signature of Person Obtaining Consent & Authorization Date

If VAMC patients will be included in this study, or if the study is to be conducted in part on VA premises or performed by a VA employee during VA-compensated time, review by the VA Subcommittee for Clinical Investigations is required.

You are responsible for notifying all parties about the approval of this study, including your co-Investigators and Department Chair. If you have any questions, please telephone the IRB-01 office at (352) 846-1494.

cc: IRB file / Pharmacy / VA Research Center / Clinical Research Center
An Equal Opportunity Institution

APPENDIX H
COVER LETTER TO SUBJECTS

11/2/05

David O. Akombo,
University of Florida School of Music,
130 Music Building,
P.O. Box 117900,
Gainesville, FL 32611-7900,
Tel: (352) 392-0223 Ext. 306
Fax:(352)392-0461
dakombo@ufl.edu

Dear Participant:

I am a doctoral student at the University of Florida. As part of my graduation requirements for the doctoral degree, I am conducting a research the purpose of which is to determine the effectiveness of listening to music as an intervention on pain and anxiety in bone marrow transplant patients. I am asking you to participate in this interview because you are greater than age 7 years, and are an inpatient undergoing bone marrow transplant. Those persons who are hospitalized for bone marrow transplant often exhibit some form of anxiety and pain during their hospitalization. The purpose of this study is to assess the effects of music on pain and anxiety levels in these patients. If you are willing and able to participate in the study, you will be given the opportunity to select your favorite music or type of music, and, a day or two later, we will spend 30 minutes with you playing a CD or tape of your chosen music. We will measure the effect of this procedure by having you fill out a questionnaire and marking a special scale before, during, and after the music is played, for a total of 6 times over 2 days.

There are no anticipated risks, compensation or other direct benefits to you as a participant in this survey. You are free to withdraw your consent to participate and may discontinue your participation in the survey at any time without consequence.

If you have any questions about this survey, please contact my faculty supervisor, Dr. Timothy Brophy, at (352) 392-0223 x222 or me at (352) 392-0223 ext. 306. Questions or concerns about your rights as a research participant rights may be directed to the UFIRB office, University of Florida, Box 100173, Gainesville, FL 32610; ph (352) 846-1494.

Please sign and return this copy of the letter in the enclosed envelope. A second copy is provided for your records. By signing this letter, you give me permission to report your responses anonymously in the dissertation to be submitted to the University of Florida Graduate School as part of my PhD degree requirements.

David O. Akombo _____

I have read the request described above for my participation in the music, pain and anxiety research. I voluntarily agree to participate in the research and I have received a copy of this description.

Signature of participant Date _____

APPENDIX I
COVER LETTER TO PARENTS

04/02/2005

David O. Akombo,
University of Florida School of Music,
130 Music Building,
P.O. Box 117900,
Gainesville, FL 32611-7900,
Tel: (352) 392-0223 Ext. 306
Fax: (352) 392-0461
dakombo@ufl.edu

Dear Parent:

I am a doctoral student at the University of Florida. As part of my graduation requirements for the doctoral degree, I am conducting a research the purpose of which is to determine the effectiveness of listening to music as an intervention on pain and anxiety in bone marrow transplant patients. I am asking you consent to your child's participation in this interview because your child is greater than age 7 years, and is an inpatient undergoing bone marrow transplant. Those persons who are hospitalized for bone marrow transplant often exhibit some form of anxiety and pain during their hospitalization. The purpose of this study is to assess the effects of music on pain and anxiety levels in these patients. If you consent to this study, and your child is able to participate in the study, the child will be given the opportunity to select his/her favorite music or type of music, and, a day or two later, we will spend 30 minutes with him/her playing a CD or tape of their chosen music. We will measure the effect of this procedure by having him/her fill out a questionnaire and marking a special scale before, during, and after the music is played, for a total of 6 times over 2 days.

There are no anticipated risks, compensation or other direct benefits to your child as a participant in this survey. You are free to withdraw your consent for your child to participate and may discontinue your participation in the survey at any time without consequence.

If you have any questions about this survey, please contact my faculty supervisor, Dr. Timothy Brophy, at (352) 392-0223 x222 or me at (352) 392-0223 ext. 306. Questions or concerns about your rights as a research participant rights may be directed to the UFIRB office, University of Florida, Box 100173, Gainesville, FL 32610; ph (352) 846-1494.

Please sign and return this copy of the letter in the enclosed envelope. A second copy is provided for your records. By signing this letter, you give me permission to report your responses anonymously in the dissertation to be submitted to the University of Florida Graduate School as part of my PhD degree requirements.

David O. Akombo

I have read the request described above for my child's participation in the music, pain and anxiety research. I voluntarily consent to my child's participation in the research and I have received a copy of this description.

Signature of parent/guardian

Date

APPENDIX J
INSTITUTIONAL REVIEW BOARD LETTER



UNIVERSITY OF
FLORIDA

Health Center Institutional Review Board

FWA00005790

PO Box 100173
Gainesville, Florida 32610-0173
Tel: (352) 846-1494
Fax: (352) 846-1497

MEMORANDUM

DATE: October 14, 2005
TO: David Otieno Akombo
130 Music Bldg
Campus,
FROM: Richard E. Neiberger, M.D., Ph.D.
Vice Chairman, IRB - 01

R. Neiberger

SUBJECT: EXPEDITED IRB #482-2005

EXPIRES: Friday, September 22, 2006

TITLE: EXPEDITED: EFFECTIVENESS OF LISTENING TO MUSIC AS AN INTERVENTION ON PAIN AND ANXIETY IN HOSPITALIZED BONE MARROW TRANSPLANT PATIENTS

You have received IRB approval to conduct the above-listed research study. Approval of this study was granted on October 8, 2005. Enclosed is the dated, IRB-approved Informed Consent Form that must be used for enrolling subjects into this project from October 8, 2005 through September 21, 2006. This study is approved as expedited as it poses minimal risk and is approved under the following expedited category/categories:

Expedited #7: Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies. Note: Some research in this category may be exempt from the HHS regulations for the protection of human subjects. 45 CFR § 46.101(b) (2) and (b)(3). This listing refers only to research that is not exempt.

You are responsible for applying for renewal of this study prior to the expiration date. Re-approval of this study must be granted before the expiration date, or the study will automatically be suspended. If suspended, new subject accrual must stop. Research interventions must also stop unless there is a concern for the safety or well-being of the subjects. You MUST respond to the Continuing Review questions within 90 days or your study will be referred to the Board for termination.

The IRB has approved exactly what was submitted. Any change in the research, no matter how minor, may not be initiated without IRB review and approval, except where necessary to eliminate hazards to human subjects. If a change is required due to a potential hazard, that change must be promptly reported to the IRB.

If applicable, only a qualified clinician may be responsible for study-related healthcare decisions.

Any severe and unanticipated side effects or problems and all deviations from federal, state, university, or IRB regulations must be reported, in writing, within 5 working days.

Upon completion of the study, you are REQUIRED to submit a summary of the study and a Study Closure report to the IRB office.

APPENDIX K
POST-INTERVENTION QUESTIONNAIRE

1. Was there anything that interfered with (or restricted the enjoyment of) your listening?

Yes No (please check the appropriate box)

-If yes, please give details

Responses given by BMT patients:

“I would have enjoyed more if the nurse didn’t interfere.”

“Please remove that music because it brings bad memories.”

“This blood transfusion is worrying me.”

“Please do not let anyone interrupt me when I am listening to music”

2. On a scale of 0-10 where 0 is no interference and 10 is extreme interference, how would you rate that interference?

0 1 2 3 4 5 6 7 8 9 10

3. Would you have liked to listen to music for a longer period of time instead of just 30 minutes?

Yes No (please check the appropriate box)

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BIOGRAPHICAL SKETCH

David Otieno Akombo received his PhD in Music Education from the University of Florida. Prior to doing graduate studies, Akombo received his Bachelor of Education degree in music education from Kenyatta University in Nairobi, a Master of Arts in Education degree from Point Loma Nazarene University in California and a Master of Music in ethnomusicology degree from Bowling Green State University in Ohio.

Akombo's interest in music and healing research led him to co-found Music Therapy International, a not-for-profit organization that helps children to heal from post-traumatic stress disorder (PTSD). Akombo has also jointly worked with the University of Florida's Center for Arts in Healthcare Research and Education to establish the Arts in Medicine program in Nairobi, Kenya. Located at Mater Hospital and funded by the State of Florida Center for Cultural Affairs, this is the first known Arts in Medicine program to be established in Africa.

Akombo has taught music at Alliance High School in Nairobi, Kenya, Daystar University in Nairobi, Kenya, Africa Nazarene University in Ongata Rongai, Kenya, and Bowling Green State University in Bowling Green, Ohio. He has published one composition with Alfred Publishing (formerly Warner Bros. Publications) and authored a book titled "Music and Healing Across Cultures" published by Culicidae Press. Akombo is a member of the Music Educators National Conference, the Florida Music Educators Association, American Music Therapy Association, Society for Ethnomusicology, Society for the Arts in Healthcare, and World Federation of Music Therapy.